This disk contains the entire series “Straight Talk About Bent Pipes” by Charles Givins that ran in the Narrow Gauge & Shortline Gazette from September of 1975 though the January / February 1979 issue. All material should be considered copyright of Benchmark Publications and used for your own personal uses only!

# STRAIGHT TALK ABOUT BAR PIPES

by Charles Givens

This is the first in a series of articles aimed at the model rail without a large technical library of his own. I plan to present information showing where various details were placed on locomotives and cars and why they were used. I will explain how they work in enough detail to prevent modeling boners without getting tedious on prototype operations. In other words I won't deal with the rules for handling the air down a 4% grade but will provide details explaining the retainer valve which is a needed detail.

The series will begin with locomotives and after I get tired of writing about #6 distributing valves and Monitor injectors I will begin on car details. Drawings will be included whenever possible. Since we are interested in small-time railroading the appliances for very large and modern steam locomotives as well as streamlined passenger equipment will not be discussed. Mostly I will cover the normal practice for narrow gauge, logging and shortline railroading from about 1900 to the end of the small steam era. It seems that after about 1929 the technology stood still.

All information will be presented as per prototype. This is a series on what to model and why, but not how to do it.

So let's begin! Basic piping is my first subject. Most pipework on rolling stock is done in ¼" to 2" IPS (Iron pipe size) using cast fittings and taper threads. So here is the first rub, the nominal size has nothing to do with the actual outside diameter. Table I shows actual OD's. Table 2 is a listing of standard AAR fittings and Table 3 lists standard AAR valves. Many other variations were also used but these were universal. Regular exceptions will be covered when I explore air brakes and certain steam lines in future issues.

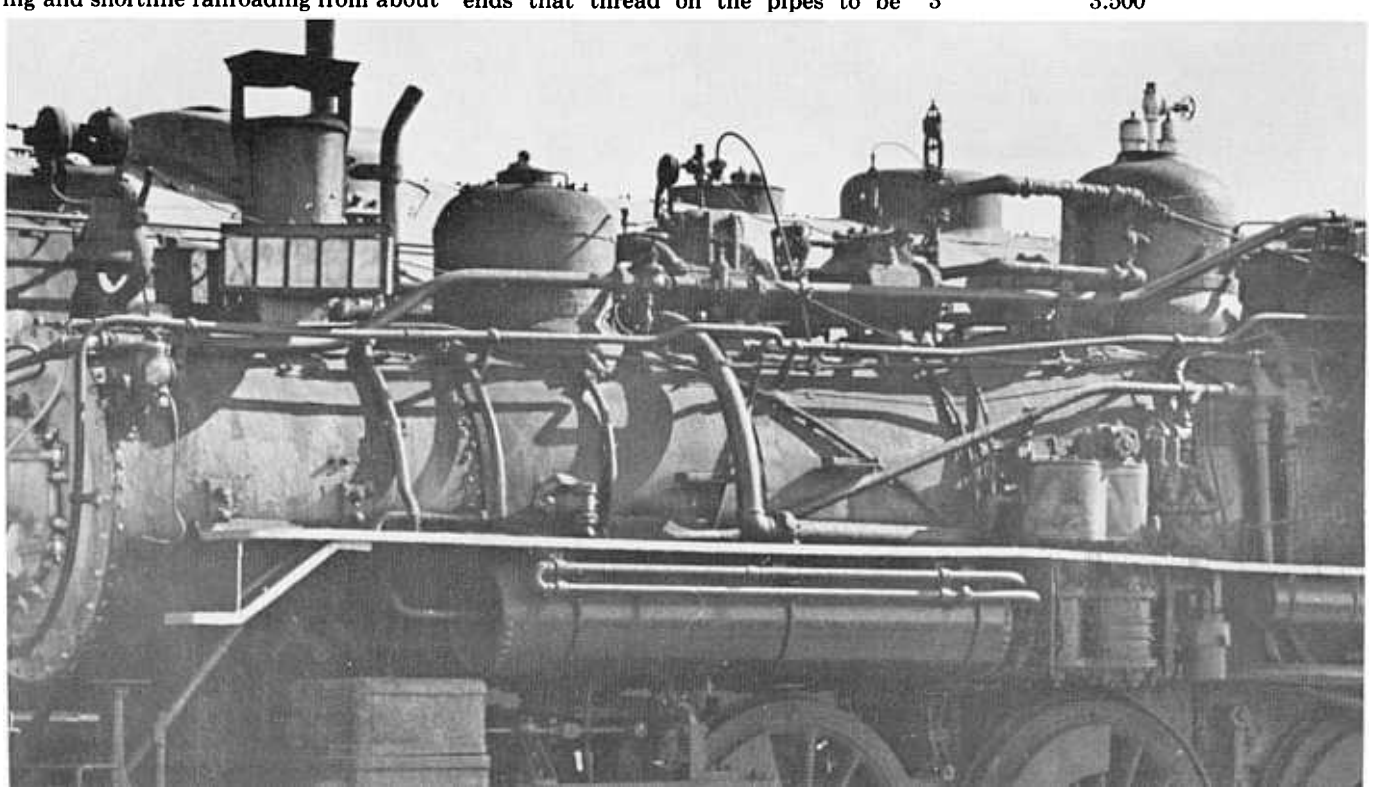
When laying out piping remember that the pipe fitters had to screw things together so that a large number of unions were used to make assembly possible. A union is a three piece fitting with ends that thread on the pipes to be joined and a coupling that holds machined seats together. Thus pipes can be joined without turning them. Looking at some photos and giving a little thought will indicate where to use them.

Three major types of valves are used — gate, globe, and check. Gate valves are for closed or wide open use and were rarely used on locomotives. Globe valves were used by the gross! Angle valves are a variation of globe types. Check valves are automatic one-way valves. The style illustrated was most used on locomotives. They must be installed in a horizontal pipe run, cap up, as illustrated.

Lubricator lines and air brake control lines were usually tubing. Tubing sizes are actual O.D. and the tubing is bent to fit. Fittings are used only on the ends.

TABLE 1.
Actual Outside Diameter (O.D.) of Standard Iron Pipe Sizes

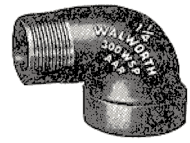
| Nominal Size | Actual O.D. |
|---|---|
| ⅛" | .405" |
| ¼" | .540" |
| ⅜" | .675" |
| ½" | .840" |
| ¾" | 1.050" |
| 1" | 1.315" |
| 1¼" | 1.660" |
| 1½" | 1.900" |
| 2" | 2.375" |
| 2½" | 2.875" |
| 3" | 3.500" |



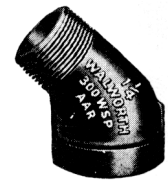
# AAR Malleable Iron Fittings and Bronze AAR Locomotive Valves

90° Elbow

45° Elbow



90° Street Elbow



45° Street Elbow

Tee

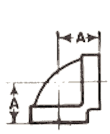
Cross

Cap

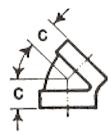
Coupling

Reducing Coupling

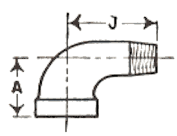
## Dimensions



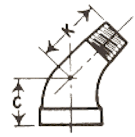
90° Elbow



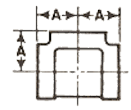
45° Elbow



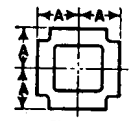
90° Street Elbow



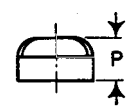
45° Street Elbow



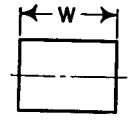
Tee



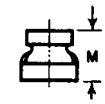
Cross



Cap

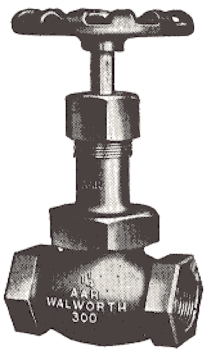


Straight Coupling

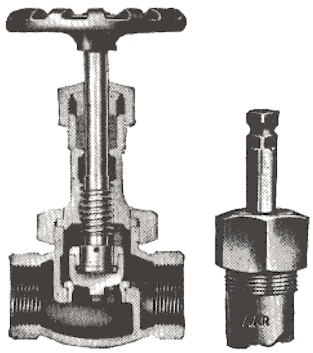


Reducing Coupling

| Size | | inches | ¼ | ⅜ | ½ | ¾ | 1 | 1¼ | 1½ | 2 | 2½ | 3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| A | | inches | 15/16 | 1 1/16 | 1 1/4 | 1 7/16 | 1 5/8 | 1 15/16 | 2 1/8 | 2 1/2 | 2 15/16 | 3 3/8 |
| C | | inches | 13/16 | 7/8 | 1 | 1 1/8 | 1 5/16 | 1 1/2 | 1 11/16 | 2 | 2 1/4 | 2 1/2 |
| J | | inches | 1 7/16 | 1 5/8 | 2 | 2 3/16 | 2 9/16 | 2 7/8 | 3 1/8 | 3 11/16 | 4 1/2 | 5 1/8 |
| K | | inches | 1 1/8 | 1 1/4 | 1 3/8 | 1 9/16 | 1 13/16 | 2 1/8 | 2 5/16 | 2 11/16 | .... | .... |
| M | | inches | .... | 1 7/16 | 1 11/16 | 1 3/4 | 2 | 2 3/8 | 2 11/16 | 3 3/16 | 3 11/16 | 4 1/16 |
| P | | inches | 3/4 | 7/8 | 1 | 1 1/16 | 1 1/4 | 1 3/8 | 1 7/16 | 1 11/16 | 2 1/16 | 2 3/16 |
| W | | inches | 1 3/8 | 1 5/8 | 1 7/8 | 2 1/8 | 2 3/8 | 2 7/8 | 2 7/8 | 3 5/8 | 4 1/8 | 4 1/8 |

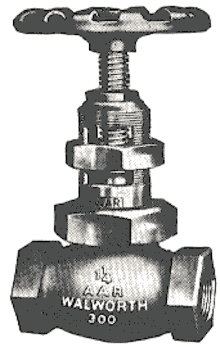


No. 256



No. 256 Cross Section


Universal Joint Connection



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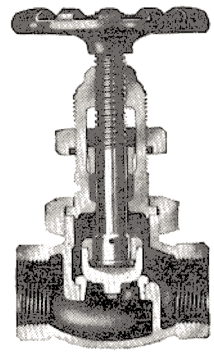
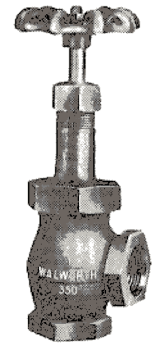

No. 259 Cross Section

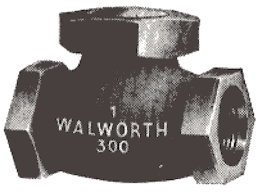


No. 227P

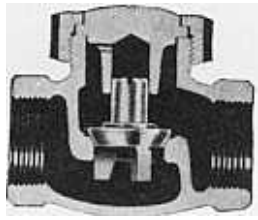
## Dimensions

| Size | | inches | ¼ | ⅜ | ½ | ¾ | 1 | 1¼ | 1½ | 2 | 2½ | 3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| End to End, Globe | | inches | 2 3/16 | 2 1/2 | 2 7/8 | 3 3/16 | 4 1/8 | 4 3/4 | 5 1/4 | 6 3/8 | 7 3/8 | 8 3/8 |
| Center to End, Angle | | inches | 1 5/32 | 1 1/4 | 1 7/16 | 1 25/32 | 2 1/16 | 2 3/8 | 2 5/8 | 3 3/16 | 3 11/16 | 4 1/8 |
| Center to Female Union End | | inches | 2 1/8 | 2 5/16 | 2 1/2 | 3 1/8 | 3 9/16 | 4 1/8 | 4 11/16 | 5 5/16 | 5 13/16 | .... |
| Center to Top of Wheel, Open, IS | | inches | 4 7/8 | 4 7/8 | 5 9/16 | 6 7/16 | 7 9/16 | 8 3/8 | 9 1/4 | 10 5/8 | 12 1/16 | 14 3/16 |
| Center to Top of Wheel, Open, OS&Y | | inches | .... | .... | 5 5/16 | 5 11/16 | 6 9/16 | 7 1/2 | 8 7/16 | 10 | .... | .... |
| Diameter Handwheel | | inches | 2 13/16 | 2 13/16 | 3 | 3 7/16 | 4 3/8 | 4 7/8 | 5 5/16 | 5 13/16 | 6 3/8 | 6 3/4 |

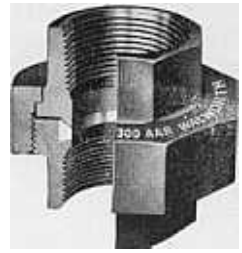
## Bronze Check Valves



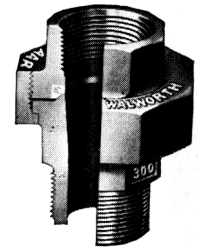
No. 215


Cross Section

## Unions



Female Ends



Male and Female Ends

# Straight Talk about Sand Pipes

**by Charles Givens**

This month I will examine the devices used to measure water level in the boiler of a locomotive.

Water level is *critical*. Too low water level exposes the crownsheet, this has lead to bits of engine and enginemen being spread about the landscape, a consequence of tragic proportions. Too high water level and water will carry over into the cylinder heads. These are highly undesirable consequences but at least not usually fatal.

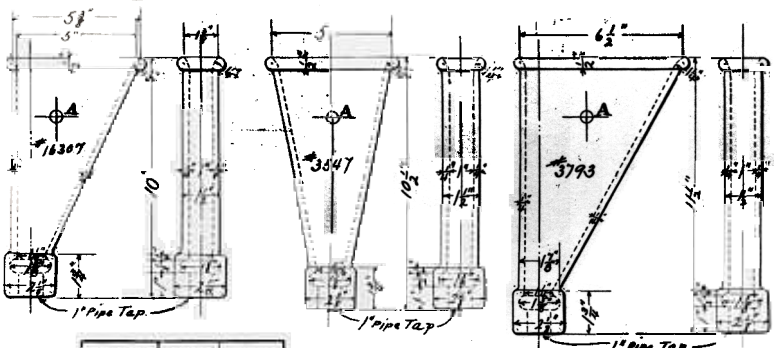
Two devices were used to check water level. 1) the water glass and 2) gauge cocks. The most used by enginemen was the water glass with its shut-off cocks and drain cock. The bottom of the water glass was at least 3" above the crownsheet, its length varied but was arranged so that half full was the normal level and the level would be visible at all times from both sides of the cab. Sometimes this required two water glasses, sometimes one. The number was not always governed by the size of the engine.

Two types of water glasses were used: the plain tubular glass and the reflex glass. Tubular glasses always had a guard to keep flying glass and live steam from injuring enginemen. The reflex glass used a ribbed, flat, thick glass that was almost shatter-proof. The reflex prisims caused the liquid to show black, and the steam space, silvery white. If the prisms were worn reading became difficult. The proponents of tubular glasses were quick to point this out.

Gauge cocks were installed in sets of three, diagonally on the engineer's side of the backhead, and in easy reach. The bottom cock was at least 3" above the crown sheet and the spacing between the cocks was at least 3" vertically. A drip funnel was provided underneath the cocks with a drain of ¾" or 1" pipe through the cab floor. The engineer opened the valve and observed whether dry steam or water, flashing to steam, escaped. This was crude but accurate, and allowed a check on the water glass, which could give occasional false readings.

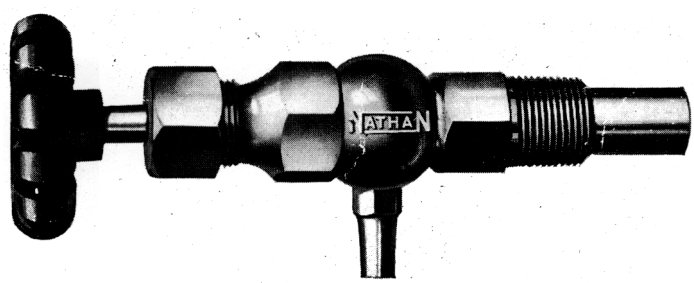
One last note for modelers, the water gauges *should* always be mounted vertically. When detailing your boiler backhead do this unless you have positive knowledge to the contrary and can keep the nitpickers at bay. ■

*Drip Funnels.*

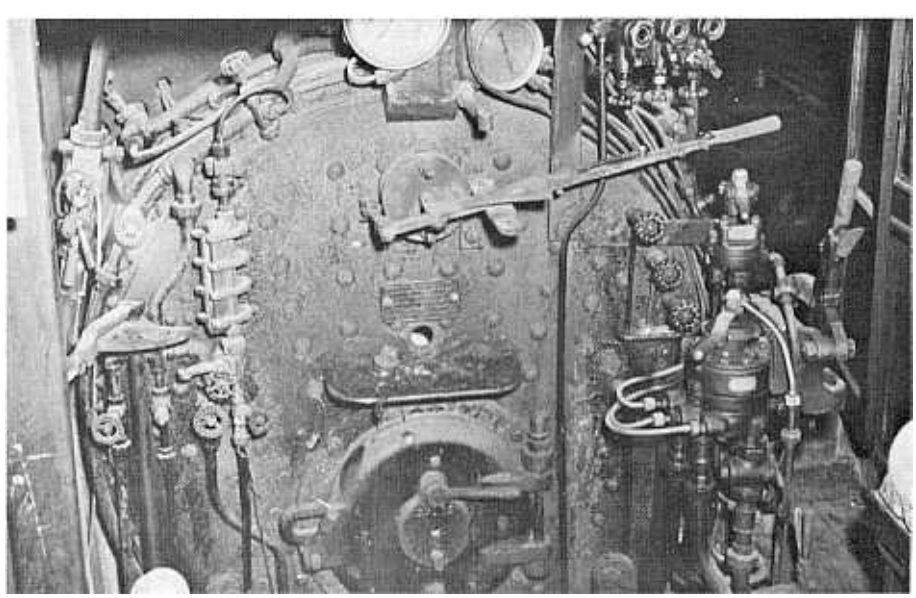



| Card | Pattern | Drip Pipe |
|---|---|---|
| #404 | 3793 | Iron |
| #520 | 3547 | Iron |
| #563 | 3793 | Iron |
| #904 | 3793 | Brass |

Position of Hole A to be Specified by Erecting Shop.

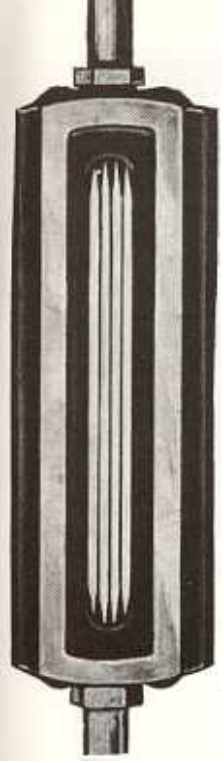



GAUGE COCKS TYPES 272 A 1000 AND 272 A 1001



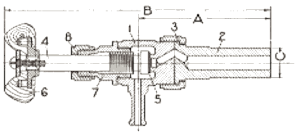
Backhead of Casper, South Fork & Eastern #5, the "Trojan", a very small oil-burning 2-6-6-2. The reflex water glass shows on the left of fireman's side. Note that the top connection is in the top of the boiler, the preferred but far from universal case. On this engine the engineer can't see the glass, an unusual situation. The gauge cocks show under the throttle lever on the right side.

*Photo by Charles Givens.*

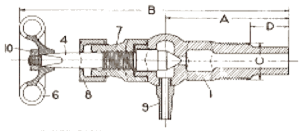




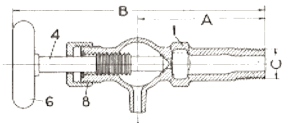
# GAUGE COCKS



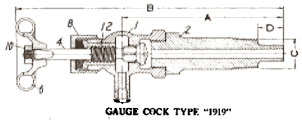
LEE'S GAUGE COCK



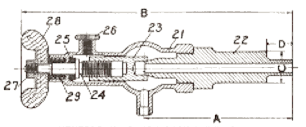
GAUGE COCKS TYPES 272 A 1000 AND 272 A 1001



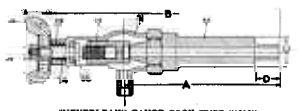
"NATHAN" STANDARD GAUGE COCK



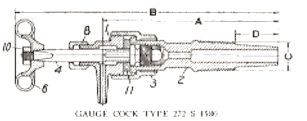
GAUGE COCK TYPE "1919"



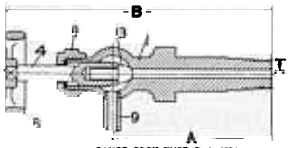
"NEVERLEAK" GAUGE COCK TYPE "C"



"NEVERLEAK" GAUGE COCK TYPE "1918"



GAUGE COCK TYPE 272 S 1580



GAUGE COCK TYPE C. A. 2794

| Gauge Cock | A | | C | | | D |
|---|---|---|---|---|---|---|
| | | | Diameter | Number of Threads per Inch | Taper Ins. per foot | |
| Lee's | 4" | 2⅛" | | ⅛" Pipe size | | |
| 272 A 1000 | 4¼" | 8⅞" | 1⅛" | 12 | ¾ | 1¼" |
| 272 A 1001 | 5⅛" | 10⅝" | 1⅜" | 12 | ¾ | 1¾" |
| Nathan ⅛" | 3⅛" | 6⅝" | | ⅛" Pipe size | | |
| Nathan ¾" | 4⅛" | 7⅛" | | ¾" Pipe size | | |
| Type 1919 No. 1038 | 6⅜" | 10⅜" | 1⅛" | 12 | ¾ | 1" |
| Type 1919 No. 1039 | 3½" | 7½" | 1⅜" | 12 | ¾ | |
| "Neverleak" Type "C" | 5¾" | 10¾" | | 1⅛" blank unless otherwise ordered | | 1" |
| "Neverleak" Type "1918" | 6⅜" | 10¾" | | 1¾" blank unless otherwise ordered | | 1" |
| Type 272 S 1580 | 6⅞" | 10" | 1⅛" | 12 | ¾ | 1¾" |
| Type C. A. 2794 | 4½" | 7⅜" | ⅞" | 12 | ½ | |



# "DELCO" SAFETY WATER GAUGE

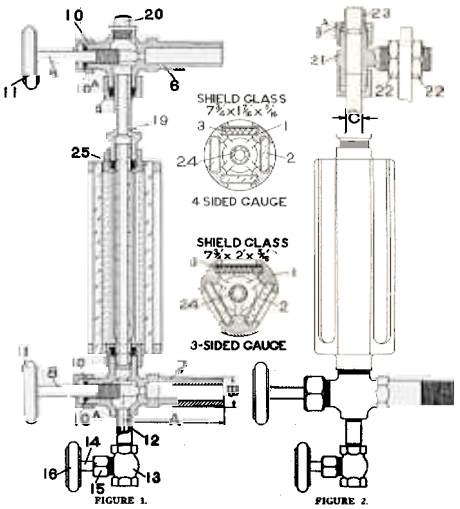
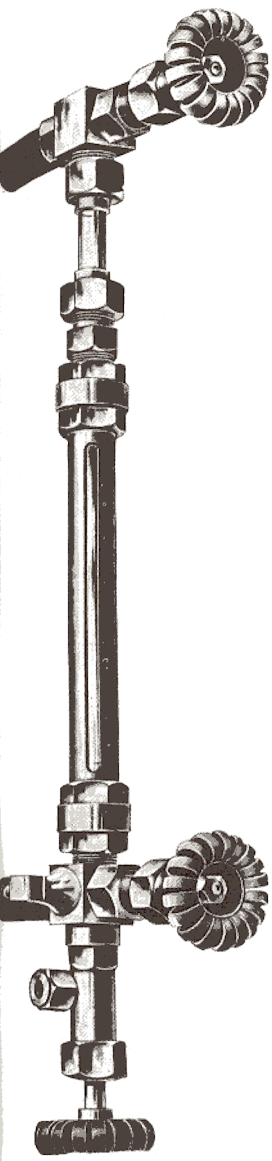



FIGURE 1. FIGURE 2.

MADE IN TWO STANDARD SIZES.

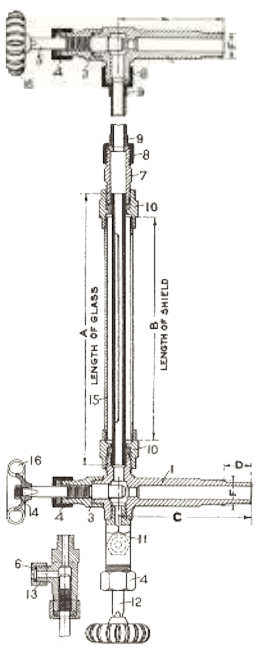
Size 1. (3 or 4 sided.)
Sight length (Exposed length of glass) ..... 6 15-16 in
Distance between valve centers..... 15½ "
Length of gauge stem..... 5 "

Size 2. (4 sided only.)
Sight length (Exposed length of glass) ..... 5⅛ in.
Distance between valve centers..... 12 "
Length of gauge stem..... 2⅜ "



273A2000
273A2001






| Water Gauge | A | B | C | D | E | Diameter of Glass | F | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | Diameter | No. of Threads | Taper, Inches Per Foot |
| 273-A-2000 | 12" | 10" | 6" | 1⅜" | 4⅜" | ⅜" | 1¼" | 12 | ¾ |
| 273-A-2001 | 15" | 8" | 6" | 1¾" | 4¾" | ⅜" | 1¼" | 12 | ¾ |

Any other length or diameter of shank or form of gauge will be made on special orders.
Glasses are furnished only on special orders.



# TYPE B—"NATHAN" REFLEX WATER GAUGE

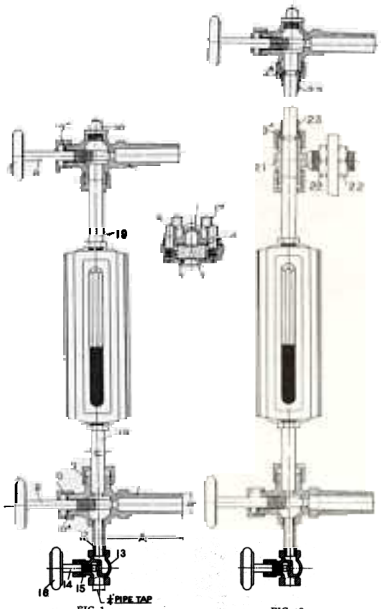



FIG 1. FIG. 2

GAUGE SIZES AND DIMENSIONS

| No. | For Distance Between Nuts of Stuffing Boxes | Length of Bolt | Exposed Length of Glass (Sight Length) |
|---|---|---|---|
| 6 | 2 inches | 4⅜ inches | 2¼ inches |
| 7 — 8 | " | 5⅝ " | 3⅜ " |
| 8 — 9 | " | 6⅞ " | 4⅝ " |
| 9 — 10 | " | 7⅛ " | 5⅝ " |
| 10 — 11 | " | 8⅜ " | 6⅝ " |
| 11 — 12¼ | " | 9⅝ " | 7⅝ " |
| 12½ — 13½ | " | 10¾ " | 9⅛ " |
| 13½ — 15 | " | 12 " | 10½ " |
| 15 — 16 | " | 13½ " | 11⅞ " |
| 16 inches and over | | 14¼ " | 12⅝ " |

# STRAIGHT TALK ABOUT BOILER PIPES

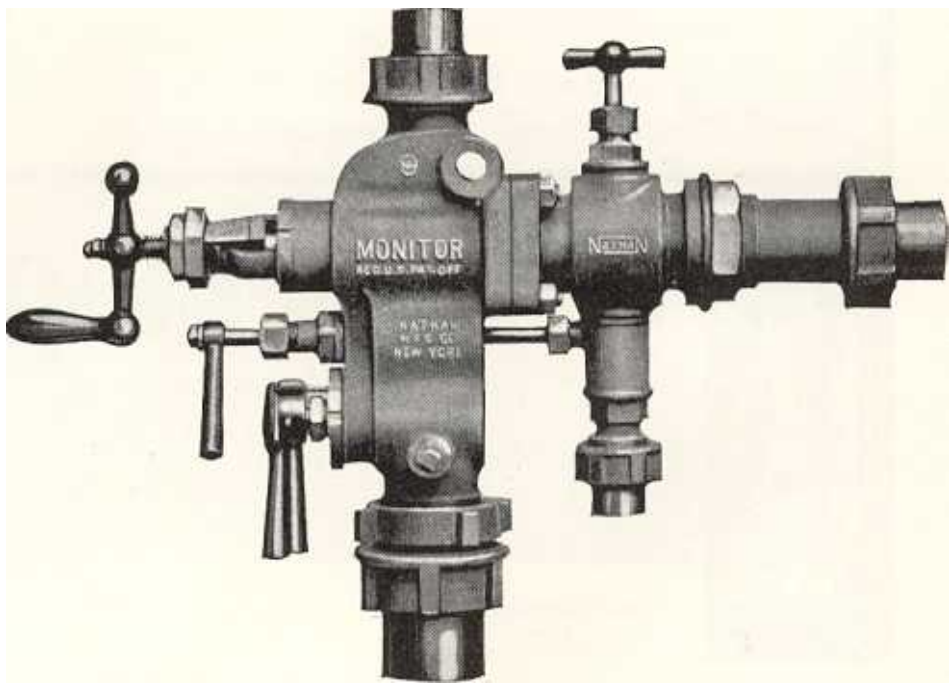
by Charles Givens

This month we will consider the injector, a part of the feedwater system. Most narrow gauge, shortline, and logging locomotives used lifting injectors and very, very few used feedwater heaters. Therefore we won't discuss feedwater heaters such as Elesco, Worthington, etc. at all but will deal only with injectors.

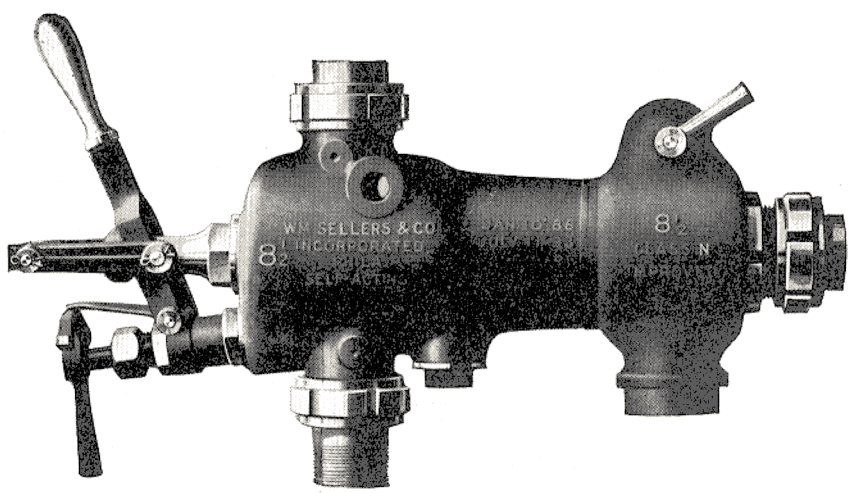
The injector is a device which uses steam velocity to force water into the boiler against boiler pressure. In the process, the heat of the steam is returned to the boiler by heating the feedwater. Injectors are divided into two classes, lifting and non-lifting. Lifting injectors are normally placed above the tender water level while non-lifting have a gravity water supply.

This month we discuss lifting injectors; next month, non-lifting. Two means of feeding water to the boiler must be provided; there are no exceptions to this. On these small engines this usually means that there must be two lifting injectors, one on each side of the cab. Each is supplied from the tender through a hose and pipe of 1½" to 3" I.P.S. size. The only valve in this line is the tank valve. Steam is supplied from the boiler (usually from the turret) through a main steam valve and pipe the same size or smaller than the water line. The delivery pipe to the boiler is about the same size as the steam line and never has any sharp bends. Most often, the pipe is bent and no els are used up to the boiler check valve (a most important item). Injectors were often placed in the cab to prevent freezing and for ease of operation. By means of reach rods, however, they could be placed forward on the boiler. If you are modeling one of these engines check your prototype! Also don't forget the end of the overflow pipe which must be visible from the cab for operation of the injector.

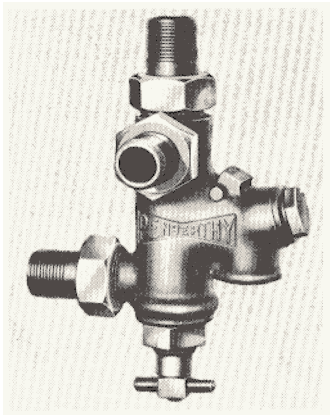
Many makes, sizes, shapes, and styles of injectors were used through the years but most common were the Monitor, Sellers, Nathan, Simplex, and Hancock Inspirator. The most common injector for stationary service was the Pemberthy. They were cheap, reliable, simple and none of the valves were built in. The larger Pemberthys, however, were rarely used on locomotives. Monitor and Sellers injectors were most popular on shortlines and in the woods. The Monitor was least convenient to use but very reliable and would work when worn more than others. Sellers introduced the injector to American practice and was the leader in the field until the decline of steam.



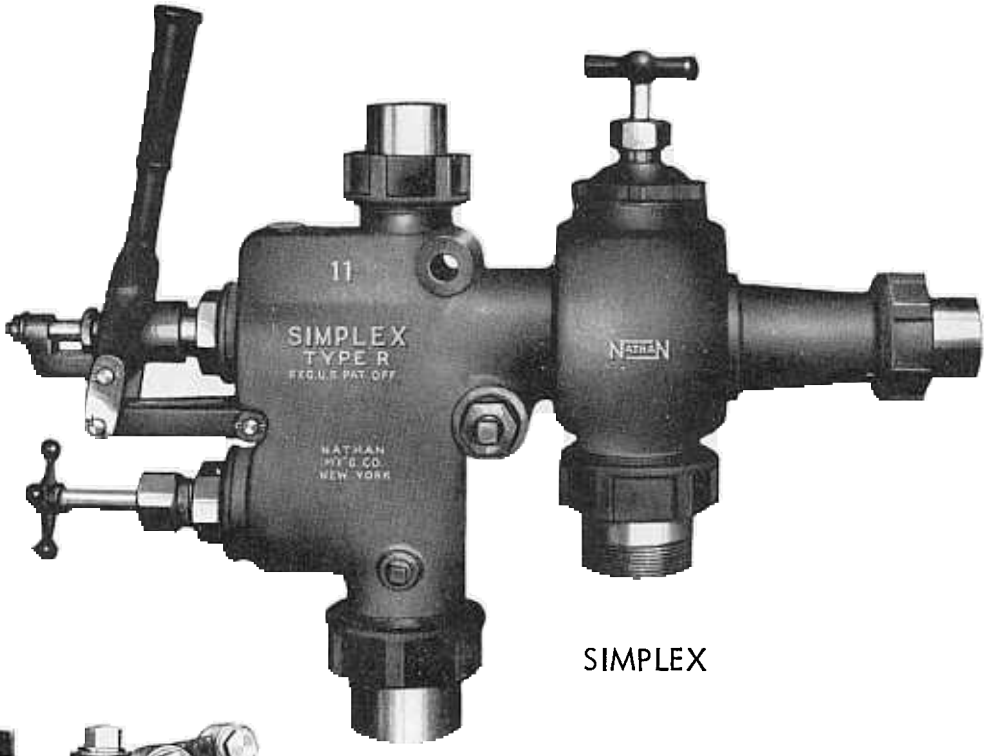

MONITOR



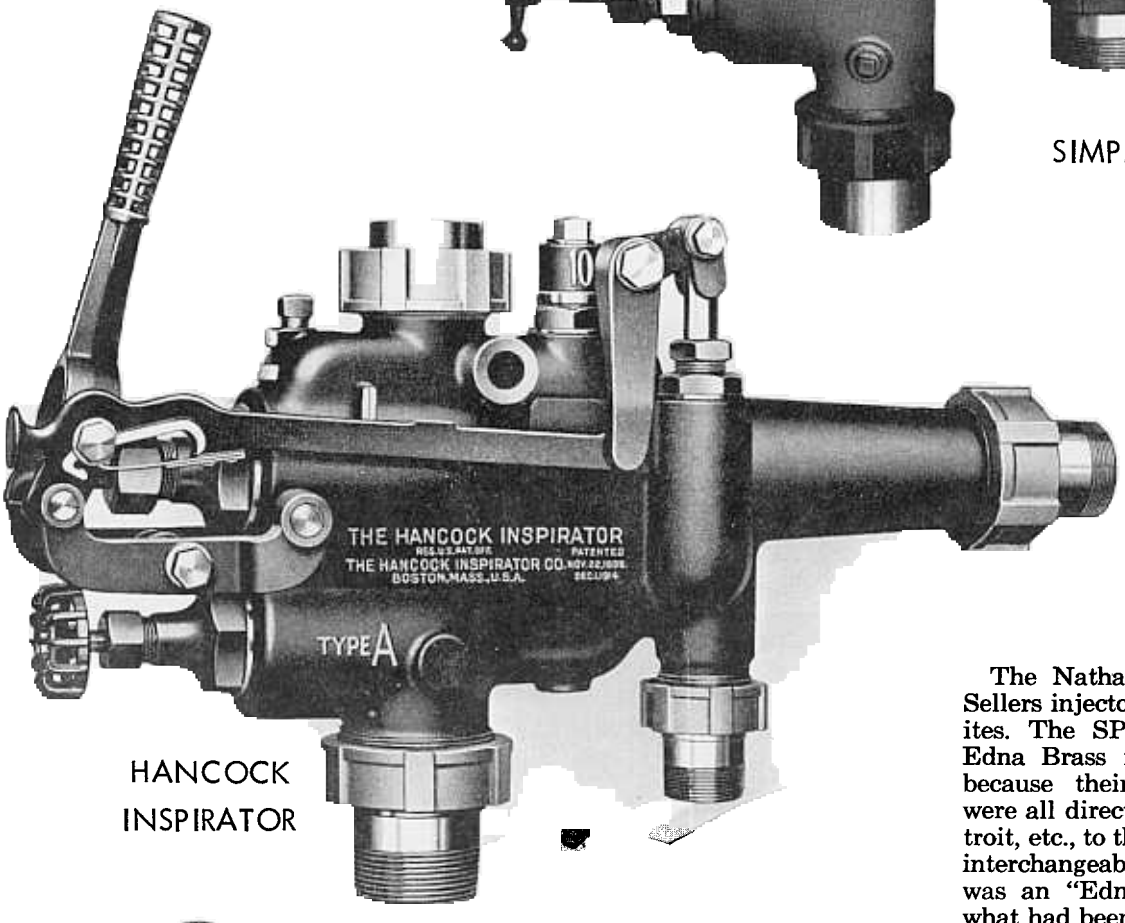

SELLERS



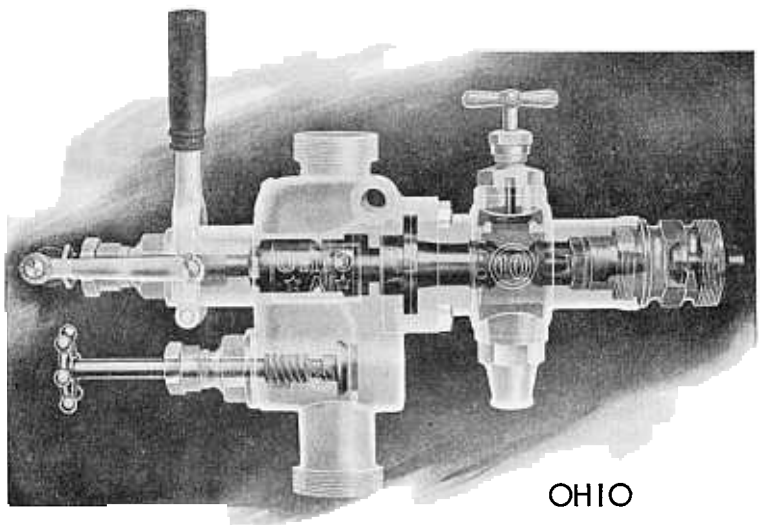
PENBERTHY




SIMPLEX




HANCOCK
INSPIRATOR



OHIO

The Nathan, Simplex, and large Sellers injectors were mainline favorites. The SP was big on Simplex. Edna Brass is an interesting firm, because their locomotive products were all direct copies of Nathan, Detroit, etc., to the point that parts were interchangeable. So if the injector was an "Edna" you need to know what had been copied. Usually it was a Monitor.

Inspirators had an extra set of lifting tubes but otherwise worked like other injectors. The Northern Pacific was a big user as they thought that inspirators were more resistant to freezing. Inspirators were installed alongside the firebox or boiler, set horizontally about one foot above water level; height of lift should not exceed seven feet according to Wm. Sellers and Co. instructions. There were also some backhead mountings, notably on the Pennsy. Next issue we will continue with the boiler checks, valves, etc. used with injectors and add a bit about non-lifting types.

# Straight Talk About Feedwater Pipes

**by Charles Givens**

Let's take a quick look at non-lifting injectors. These were rarely, if ever, used on our shortline engines but here is some information if you need it. They were always placed under the cab so that water would gravity feed from the tender. The Nathan sketch shows a typical installation on the engineer's side. A lifting injector or feedwater heater might be on the fireman's side. Note that the steam valve is separate in the form of an "intermediate steam valve" or "starting valve."

The boiler check is the final device we will examine in the feedwater path. Special forms of check valves as illustrated were standard, but when in the woods or on poverty level operations many were the variations! Ordinary pattern check valves would be used, as many as three or more in line, to stop leaks. Leakage from the boiler would overheat the injector, which would then not work. So the leakage was stopped in any way possible.

To conclude our feedwater survey we have prepared the following sketch. Note that a tank valve in the tender is always the beginning of the water path, through a hose to the injector, through a boiler check to the boiler. The checks are side (usually) or top mounted. The steam travels from the turret through a main steam valve (always!) to the injector. The overflow is run down to near track level (12" or more above) and must be in sight of the operator.

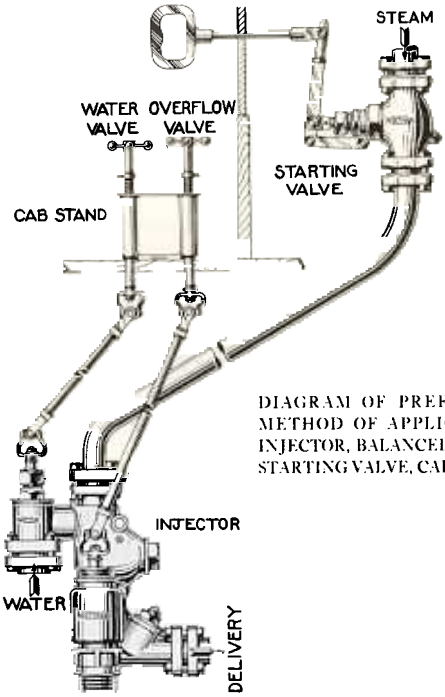
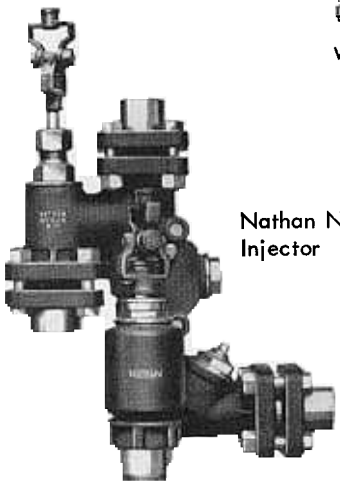
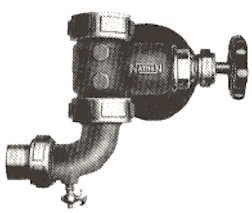


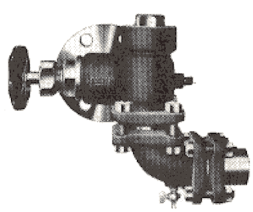

DIAGRAM OF PREFERRED METHOD OF APPLICATION INJECTOR, BALANCED LEVER STARTING VALVE, CAB STAND



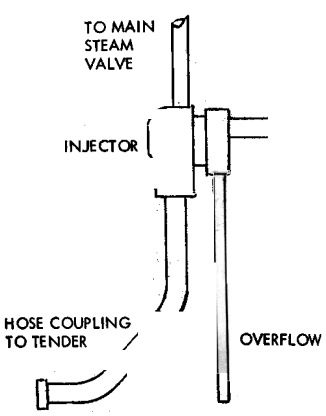
Nathan Non-lifting Injector

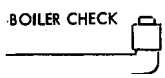
Top Mount Boiler Check



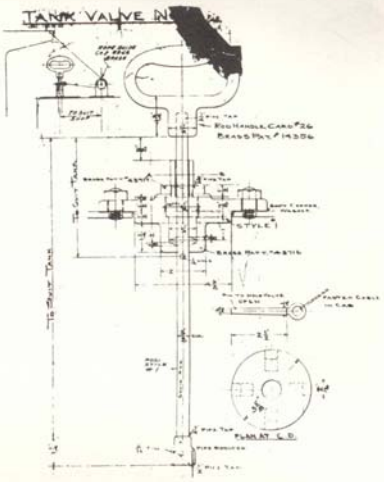


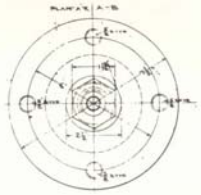
Typical Boiler Checks




# STRAIGHT TALK ABOUT OIL PIPES



**by Charles Givens**

Now that we have water in the boiler let's make it hot. We'll take a look at oil burning equipment this month. The drawing below shows the layout of Sierra RR #24, a 2-8-0.

Now we must generalize. Most all oil burners were piped similarly with these main points:

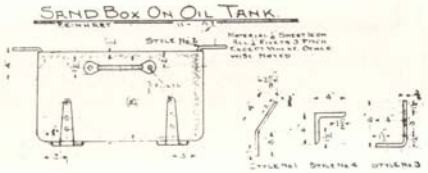
1. All locomotives have a blower line to the smokebox to create a draft for the fire when not working the engine. On the 24, ¾" pipe was used.

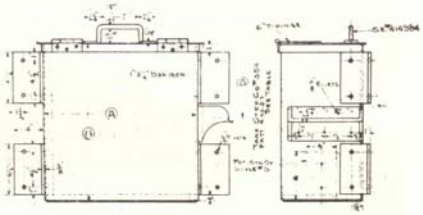
2. The burner is in the front of the firebox aimed to the rear. A brick-lined firepan is used and dampers are provided to admit air to the fire. The damper arrangements varied widely as to location and control.

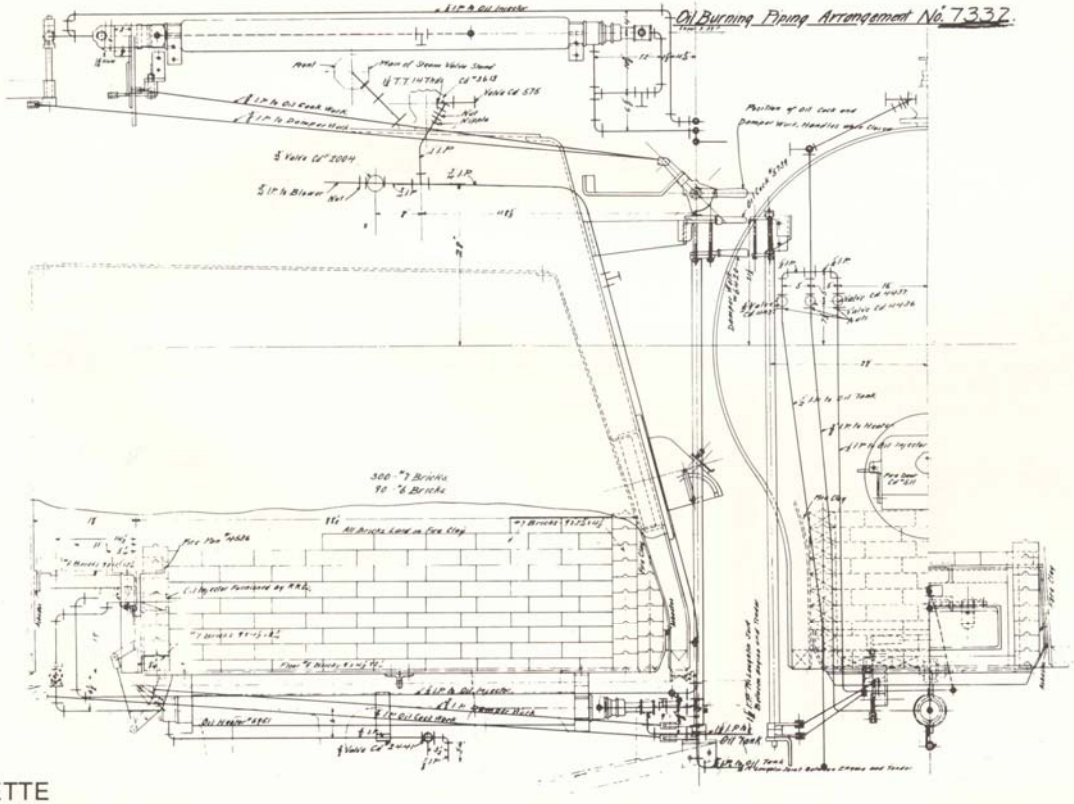
3. Fuel oil is thick and must be heated to flow freely so a steam line goes to the tender tank heater. A drain is under the tender for condensate. On the 24 this was ½" pipe on the engine and ¾" to the tender. Also, a steam jacketed heater is on the engine underneath the firebox as in the drawing. On the SP this was called a "superheater" just to make terms confusing.

4. The oil flows through a tank valve and swing joints to the heater and the control cock to the burner. The atomizer line is ½" pipe to the burner and supplies steam to spray the oil into the fire. The tank valve is spring loaded and uses a pin to hold it open. A wire to the cab from the pin provides means of quickly closing the valve in emergencies.

5. A sandbox on the tender supplies sand for "sanding the flues." The draft sucks sand from a trowel-like gadget that the fireman puts in a small hole in the firedoor. The sand cleans the soot out of the flues. The sandbox is on the tender deck in front of the oil tank.





# STRAIGHT TALK ABOUT AIR PIPES

**by Charles Givens**

This series now completes its first year. We will celebrate (?) by beginning our discussion of Mr. Westinghouse's great invention, the air brake. But first- if any of you find any errors, need more data, or can supply more data please write to me c/o *The Gazette*. I'd like to hear from you.

Let's begin our study of the air system. The apparatus evolved continuously from the beginnings around 1870 until about 1900. Most of the apparatus found on narrow gauge, shortline, and logging engines to the end of steam was in use before 1910. If you are modeling in the 19th century-good luck. You must depend on photos or drawings for details. The 1879 and 1888 Car Builder's Dictionaries are the best resource easily obtained these days. (Newton K. Gregg reprints)

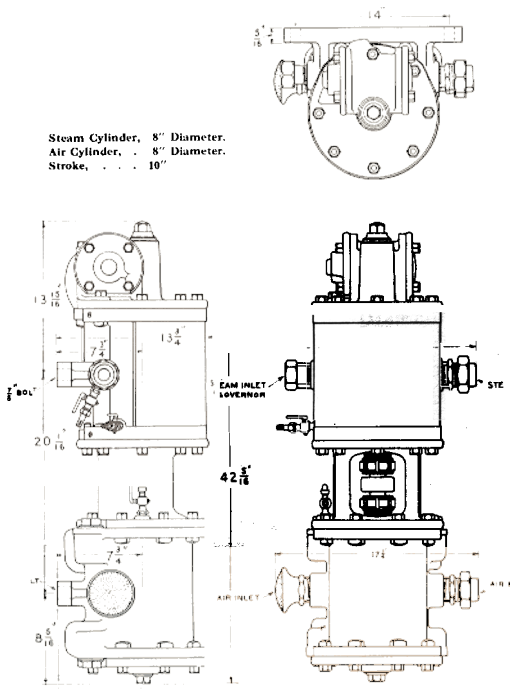
Except for compressors we will confine our discussion to the post-1900 equipment. Westinghouse Air Brake Co. had a monopoly until the New York Air Brake Co. appeared about 1900. Except for compressors the N.Y. equipment was very similar to Westinghouse, and the compressors are the only N.Y. items we will review.

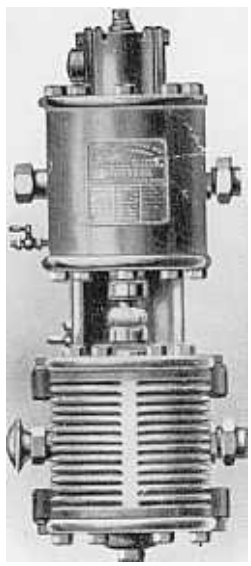
The heart of the system and the most visible model-wise is the steam driven air compressor or air pump as it is commonly called. Except for early evolution and a few "Sports", all air pumps are readily cataloged. All operate with a steam piston directly connected thru a rod to an air piston. The 6", 8", 9½", and 11" pumps all use a single cylinder each end and are single *stage* pumps. The word "phase" is improper here. All size disignations refer to steam cylinder diameter. The 8½" cross compound and the six sizes of New York A.B. Duplex pumps round out the lot.

The 6" pumps came in many variants but for model buildings you only need to worry about two- the long, standard, pump and the short, narrow gauge, pump. The "narrow-gauge" type was most likely originated for the D&RG, a very early air brake user. The standard long pump appears in many very old D&RG, photos and the short version somewhat later, during the 1880's. All were obsolete before 1900 and most were already replaced by that date.

8-INCH x 8-INCH x 10-INCH AIR COMPRESSOR.

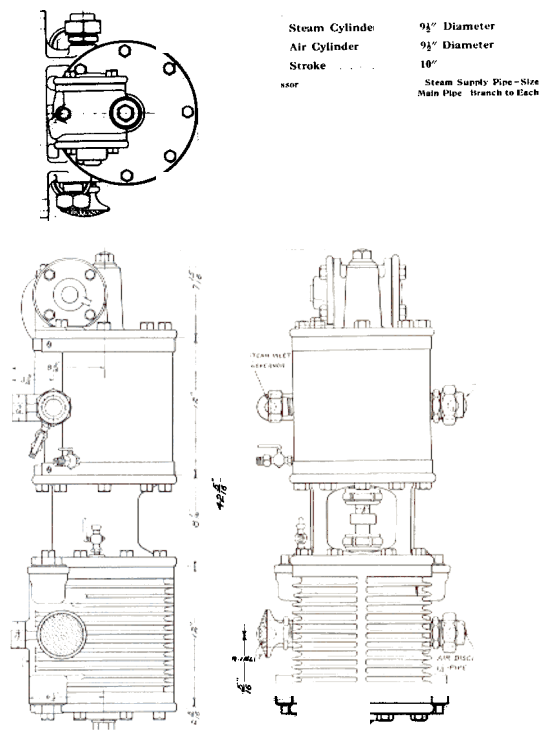
DIMENSION SHEET.



9½-INCH x 9½-INCH x 10-INCH AIR COMPRESSOR.

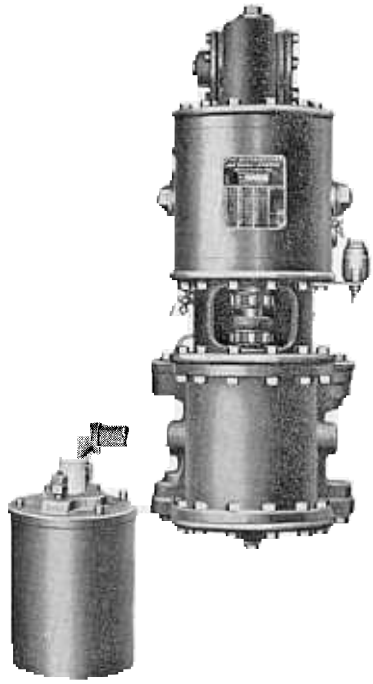
DIMENSION SHEET.

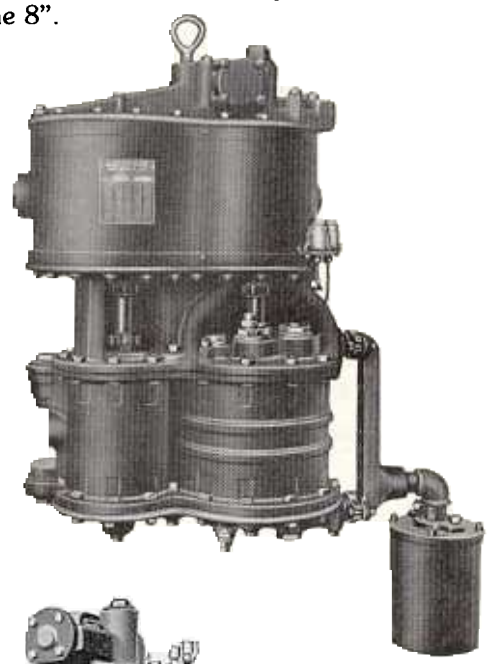


Next came the 8" pump which appeared in oringinal form in the 1880's as "extra size for freight service". The newer version was obsolete for new Railway service by 1916, but the Hawaii Ry. 2-4-2 built in 1925 used an 8" pump and long obsolete A-1 brake equipment. You must know your prototype. The early and late designs were quite different, but for model builders the visual differences were slight and mostly confined to the top steam cylinder head. Our drawing is the new version.

The 9½" pump was used in huge numbers. It was far and away the standard on small locomotives. The 9½" may easily be recognized because of the radiation ribs on the air (lower) cylinder. None of the other single-stage compressors had this ribbing. All variations were visually identical.

Largest of the single stage pumps was the 11". It looks like the 8", but about 20% taller. Also, if you can see them, the cylinder bolt pattern uses 14 bolts for the 11" and only 8 bolts for the 8".



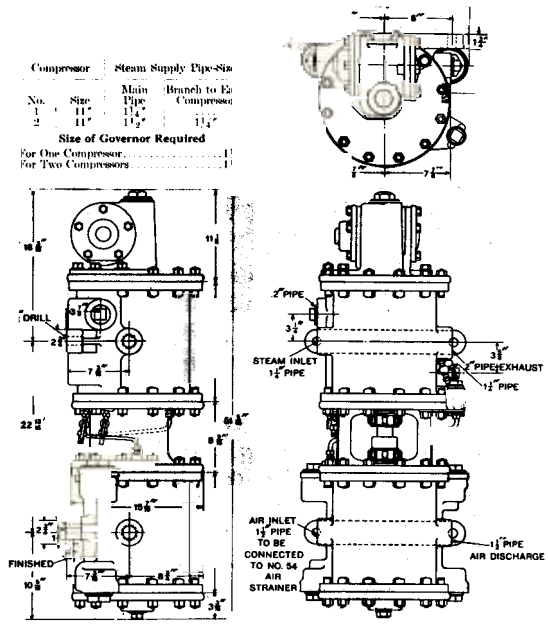


11-INCH x 11-INCH x 12-INCH AIR
DIMENSION SHEET

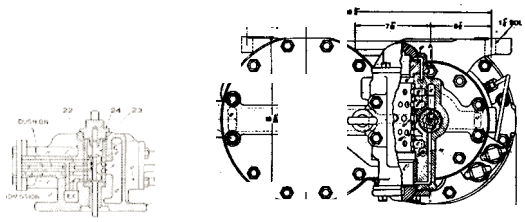
GENERAL DATA

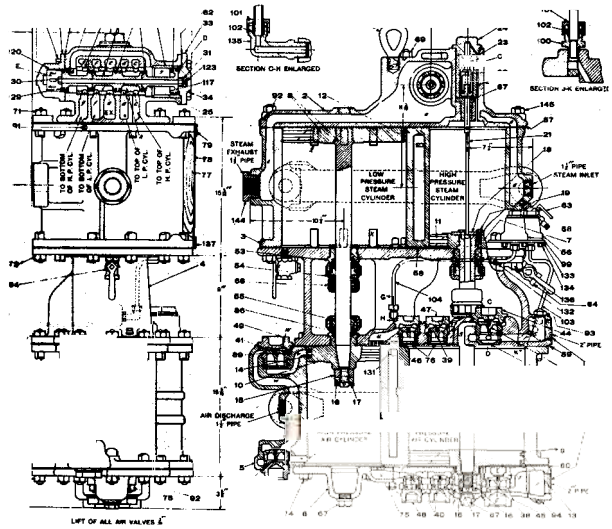
| Compressor No. | Size | Steam Supply Pipe-Size Main Pipe | Branch to Ea Compressor |
|---|---|---|---|
| 1 | 11" | 1¼" | 1¼" |
| 2 | 11" | 1½" | 1¼" |

Size of Governor Required
For One Compressor ..... 1
For Two Compressors ..... 1




8½"-120






Net Weight 1475 lbs.
Shipping Weight 1625 lbs.

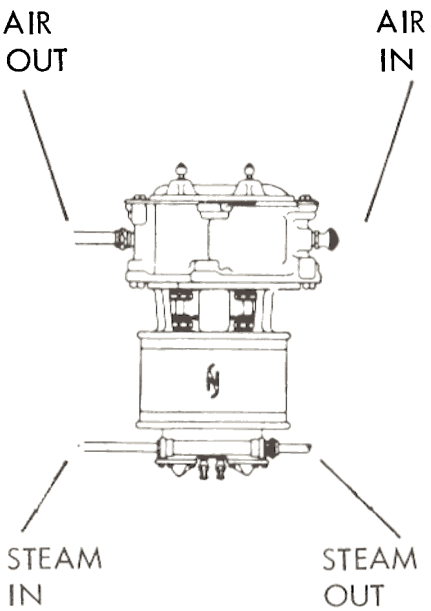
The 8½" cross-compound is unique in appearance. It was used wherever a large air supply was needed and the 1500 lb. weight would not be a disadvantage. Both steam and air ends were compound, the high pressure steam driving the low pressure air and the low pressure steam driving the high pressure air.

The New York Duplex pump used two high pressure steam cylinders to drive compound air cylinders. They look a lot like Elesco feedwater heater duplex pumps. New York was big on the GN. The Harriman roads were early big users but they were mostly replaced by 8½" cc Westinghouse by the late 1920's, at least on the S.P.

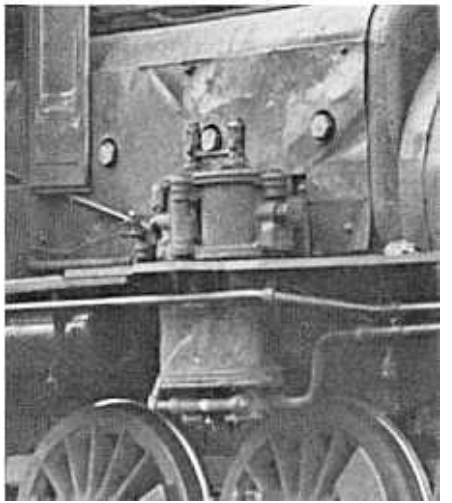
A few notes in general- first, the locomotive size has less to do with pump size than service. On our small railroads this means steep grades require more air. Sierra RR #18, a very small s.g. consolidation, used an 11" pump. The small consolidations on the D&RGW at the end mostly had two single stage pumps. On the other hand, many much larger more or less "flatland' engines used one 9½" pump. Logging lines with air only on the engine used a 9½".

On the single stage Westinghouse compressors the air inlet and discharge is always as shown on the drawings but the steam end can be either right or left-hand (inlet and exhaust may be reversed). The 8½" cross compound had no such piping option. Three visual versions of the 8½" cross compound have been identified. The early version has no ribs on the air end. The drawing shows the most common, with ribs on the air end. In 1938 a new style was introduced with the rib on top added.

The air inlet should have a strainer. The old style "rose" is shown on the 8" and 9½" pumps. It strained out bees, birds and large cinders. The large can "No. 54" strainer, common after about




NEW YORK DUPLEX PUMP



1918, is much more effective. Note that the cross compound has two air inlets and that they were usually piped as in the 1938 photo.

These and several other size steam driven compressors were also widely sold for stationary service. It is correct to use them at sawmills and foundries, etc. They were often set outside the buildings. But remember that they only work with the piston rod in a vertical position.

Next, the steam piping for compressors.

# STRAIGHT TALK ABOUT STEAM PIPES

## AIR COMPRESSORS (CONTINUED)

by Charles Givens

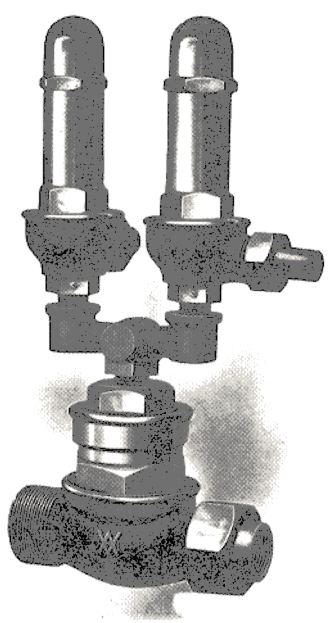
The steam piping is basically simple but with many detail variations. Starting at the cab turret with a steam valve (often Westinghouse) the steam pipe runs to a tee fitting which is the lubricator fitting, then to the pump governor, about which more in a moment, and then to the pump steam end. As mentioned last issue, on the single stage pumps the steam inlet may be either right- or left-hand, with the exhaust opposite. The cross-compound pumps are always arranged as in the drawing.

The exhaust line most often ran into the smoke box to help provide draft for the fire. However, many installations were just piped up to the open air or behind the stack. Always exhaust up high, though, so as not to obscure the enginemen's vision forward. Note that no valves are needed or used in the exhaust line, unless of course you find one in a photo of your prototype.

A drain cock might be placed in the lowest part of both the steam and the exhaust lines, especially in very cold climates.

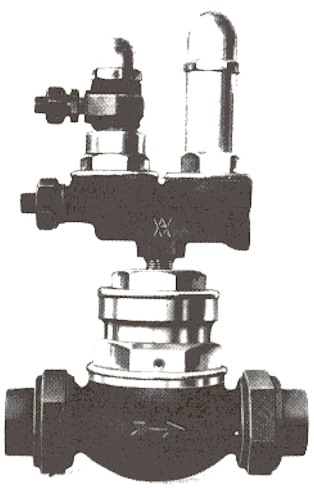
Steam Valve

Type S



Type SD

Type SF



Type SG

Type A, AD & AF

The Westinghouse diagrams show the various arrangements and pipe sizes recommended.

The governor throttles the pump to maintain the desired main reservoir air pressure. We are concerned with seven types in two series. Any type may be used with any pump as long as its steam pipe is the right size for the pump.

The S-series was in universal use until about 1929 when the A-series was introduced. The A-series can be used with superheated steam; otherwise the two series are interchangeable in service. As a practical matter all seven styles were used on loggers, N. G., and shortlines, but the "S" and "A" would be rarely encountered as its control was from the main reservoir only and the double-top types also provided for more pressure when recharging train brakes - a most desirable feature.

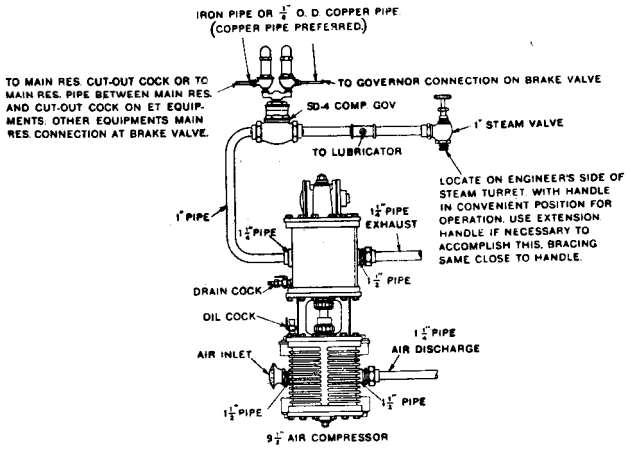
Note that single or double top has no relation to single stage or cross compound; or one or two pumps. That is strictly a function of governor size.

Most of our small engines used either the SD or the SF styles, with the latter the standard supplied by Westinghouse.

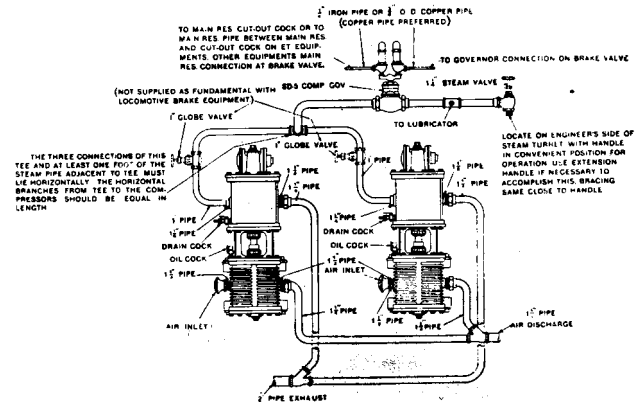
All the different size governors vary in height only about 1", even though there are a variety of pipe sizes.

The air connections of the governors as well as lubricators, will be covered later in the series.

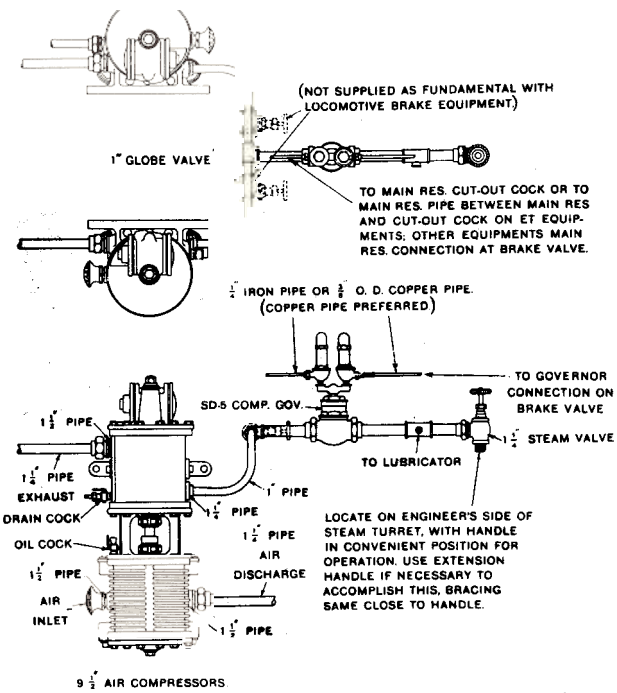
| Pipe Sizes | 3/4" | 1" | 1¼" | 1½" |
|---|---|---|---|---|
| **Single Top** | | | | |
| "S" | S-3 | S-4 | S-5 | S-6 |
| "A" | - | A-4 | A-5 | A-6 |
| **Double Top** | | | | |
| 2 air connections one to each top | | | | |
| "S" | - | SD-4 | SD-5 | - |
| "A" | - | AD-4 | AD-5 | AD-6 |
| 2 air connections (Both to one top) | | | | |
| "S" | - | SG-4 | SG-5 | |
| 3 air connections | | | | |
| "S" | - | SF-4 | SF-5 | SF-6 |
| "A" | - | AF-4 | AF-5 | AF-6 |



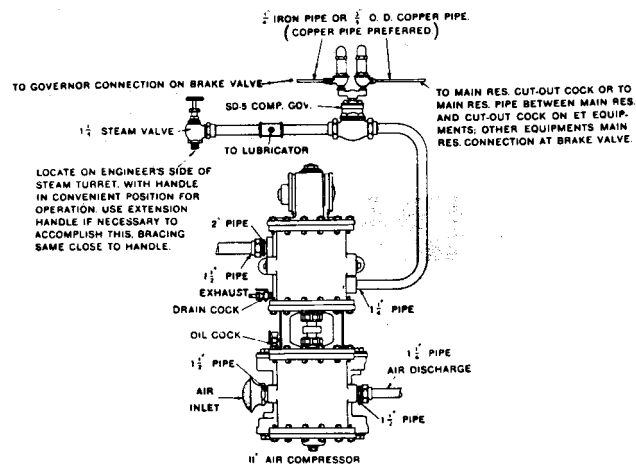

Installation Diagram of 8-inch or 9½-inch Steam Driven Air Compressor



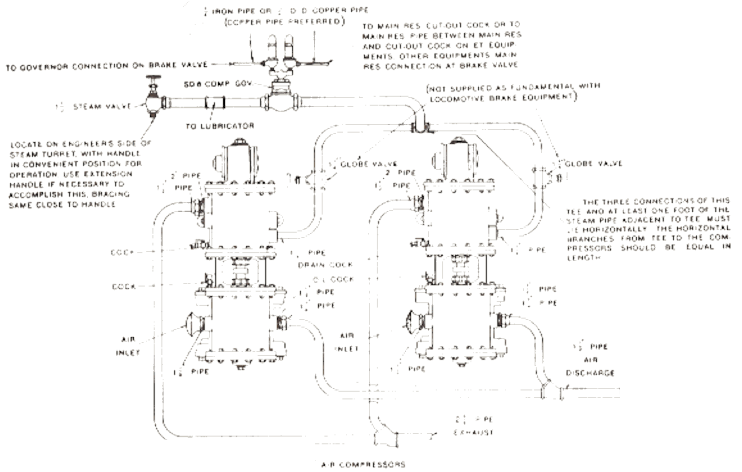

Installation Diagram of two 9½-inch Steam Driven Air Compressors Located on the same side of the Locomotive



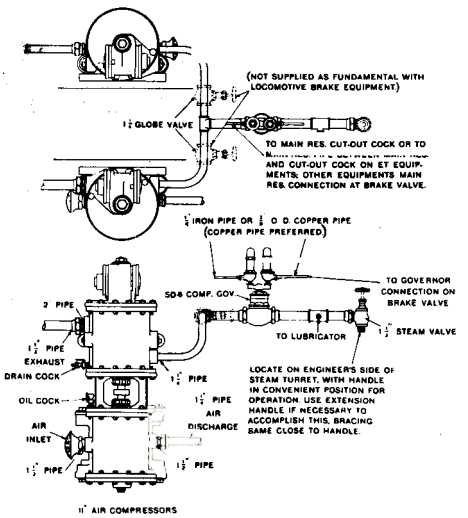

Installation Diagram of two 9½-inch Steam Driven Air Compressors located on opposite sides of the Locomotive



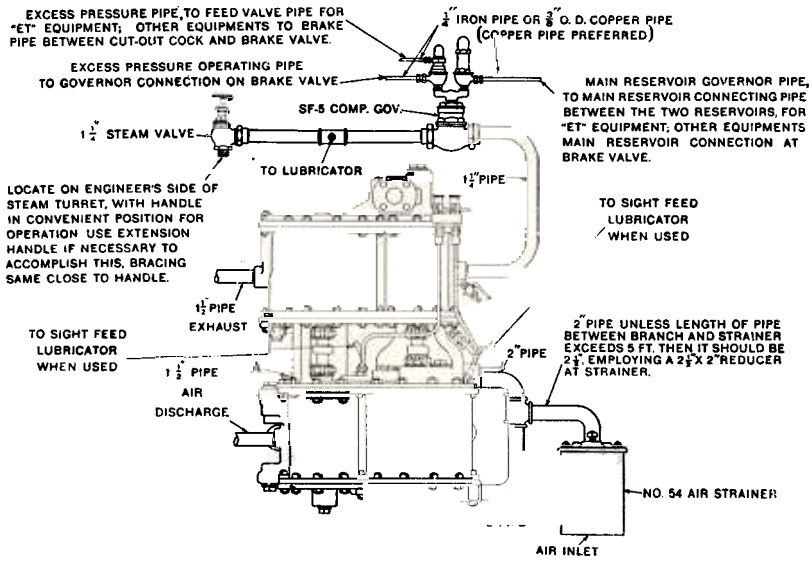

Installation Diagram of 11-inch Steam Driven Air Compressor



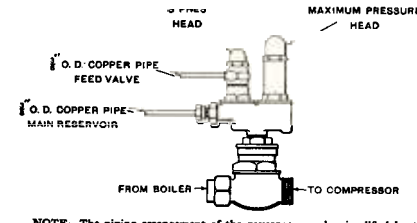

**Installation Diagram of two 11-inch Steam Driven Air Compressors located on the same side of the Locomotive**



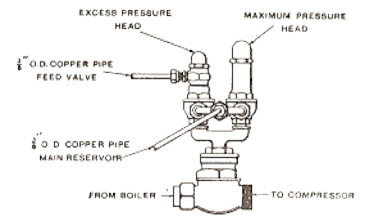

**Installation Diagram of two 11-inch Steam Driven Air Compressors located on opposite sides of the Locomotive**



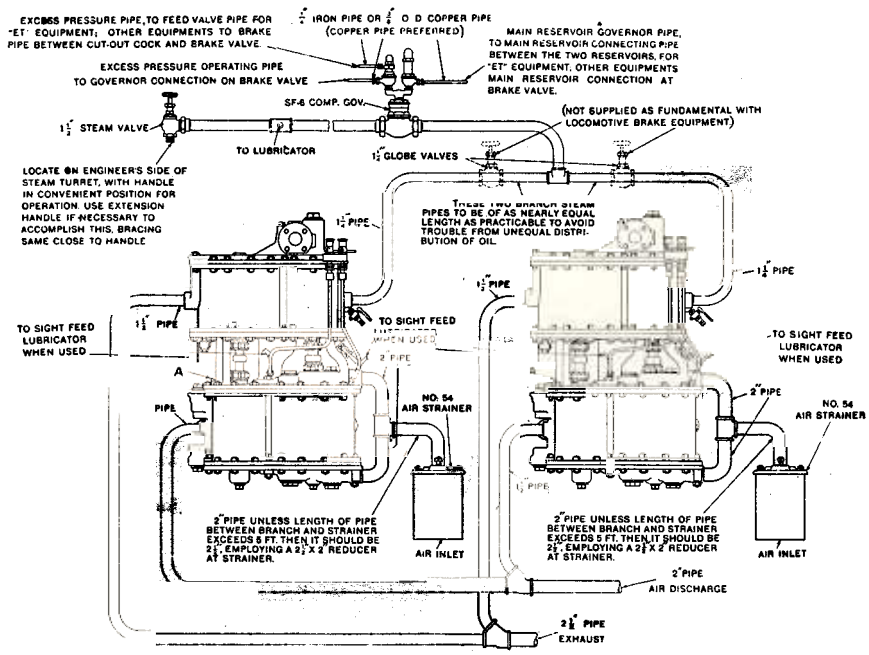

**Installation Diagram of 8½-Inch Cross Compound Air Compressor**




NOTE—The piping arrangement of the governor may be simplified by the use of the SG type of governor, as illustrated above, with the No. 6 ET Equipment instead of the SF Type. The use of the SG governor eliminates the long copper pipe between the diaphragm portion of the excess pressure governor top and the H-6 brake valve.




NOTE—The simplification of piping secured by the use of the SG type of governor, as above described, may also be secured with the SF governor by connecting the two diaphragm portions together either by piping, or by the use of a duplex pipe fitting or manifold, as illustrated.




**Installation Diagram of Two 8½-Inch Cross Compound Air Compressors**

# STRAIGHT TALK ABOUT AIR BRAKE PIPES

## Main Reservoirs
by Charles Givens

Now that we have the compressor running on steam let's store up some air. All of the air brake systems we will discuss are identical through the main reservoirs, so next issue we will look at the old A-1 or quick action equipment, followed by 6ET at a later date.

The main reservoirs store a sufficient volume of air to insure proper operation of the brakes. For yard and passenger (and most short line) engines 40,000 cu. in. was minimum. For large freight engines 60,000 cu. in. minimum capacity was used. Usually at least two reservoirs are used and as much pipe is used from the pump to the first and from the first to the second reservoir as possible for heat radiation. A minimum of 40 feet each was recommended. The usual cooling coils for this purpose may be outside the reservoir under the running board, next to the boiler behind the reservoir, above the running board, flat under the running boards, etc. On N.G. and Short Line engines the radiating pipe varied from full coils, both sides, to nothing more than the connecting pipe needed. These pipes are of the sizes shown last issue for the various compressors. The reservoirs came in standard sizes. (see table.) If you are freelancing or are short on detail information always use the standard sizes and be sure you are providing enough volume. Don't forget that each reservoir has a drain valve.

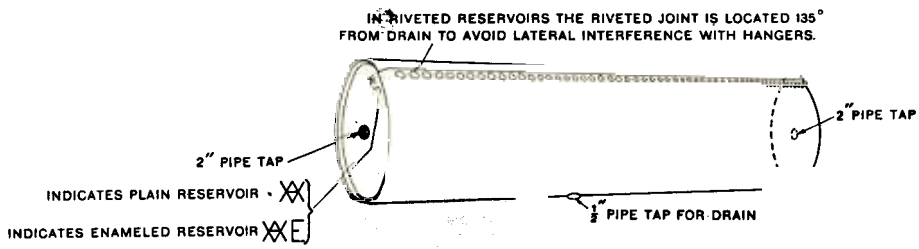
The other air reservoirs on the locomotive will be covered in future columns.

Now for a clarifying note. I was a little too general in the July issue. The steam piping for single stage pumps should be thus noted:

1. 8" pumps right hand only (steam inlet leftside only).
2. 9½" pumps right hand only or left hand and right hand.
3. 11"pumps all left and right hand.

The left and right hand pumps have inlet and exhaust pipe connections on both sides. The connections not used are plugged. See the 11" pump drawing to help make this clear.

### MAIN RESERVOIR SPECIFICATIONS
FOR STEAM LOCOMOTIVE USE*




Reservoirs of the following sizes are manufactured regularly.

| TYPE CONSTRUCTION | Shell, O. D. Pipe; Semi-Convex Heads Welded in | | | | Shell, Riveted Joint; Semi-Convex Heads Welded in | | | | Shell, Riveted Joint; Semi-Convex Heads Riveted in | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Outside Diameter | 10" | 12" | 14" | 16" | 18½" | 20½" | 22½" | 24½ | 26½" | 28½" | 30½" |
| Thickness Stock, Shell | .165" | .180" | | .220" | ¼" | | | | | ⅜" | |
| Length | 36" to 168" in steps of 6"<br>Note—The 14" and 16" Diameters are also available in 33" length | | | | | | | | | | |

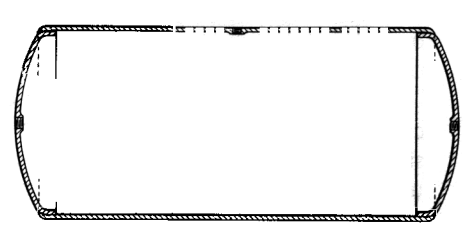
### STANDARD MAIN RESERVOIRS
FOR STEAM LOCOMOTIVES

In the following table are listed our Standard sizes of Main Reservoirs for Steam Locomotives; we endeavor to carry these sizes in stock. Special effort should be made to see that these sizes are specified wherever possible.

| Size Inches | Capacity Cu. In. | Net Weight Lbs. | Size Inches | Capacity Cu. In. | Net Weight Lbs. |
|---|---|---|---|---|---|
| 16x 36 | 6295 | 176 | 20½x 60 | 17852 | 392 |
| 16x 48 | 8577 | 216 | 20½x 66 | 19775 | 420 |
| 16x 60 | 10859 | 256 | 20½x 72 | 21698 | 453 |
| 16x 84 | 15423 | 336 | 20½x 84 | 25544 | 514 |
| 16x 96 | 17705 | 376 | 20½x 96 | 29390 | 575 |
| 16x120 | 22269 | 456 | 20½x102 | 31313 | 605 |
| | | | 20½x120 | 37082 | 697 |
| 18½x 60 | 14745 | 339 | | | |
| 18½x 72 | 17885 | 393 | 22½x 72 | 25810 | 498 |
| 18½x 84 | 21024 | 447 | 22½x 84 | 30317 | 564 |
| 18½x 96 | 24163 | 500 | | | |
| 18½x102 | 25732 | 527 | | | |
| 18½x120 | 30441 | 607 | | | |

NOTE—Orders for main reservoirs differing from those listed above must invariably specify the outside diameter, length over all in inches, finish (plain or enameled), working pressure, and should include a sketch showing location and size of tapping, hand holes and any other special features required.

SHOWING SEMI-CONVEX TYPE OF HEAD.



SHOWING CONVEX TYPE OF HEAD.

# STRAIGHT TALK ABOUT AIR BRAKE PIPES

**by Charles Givens**

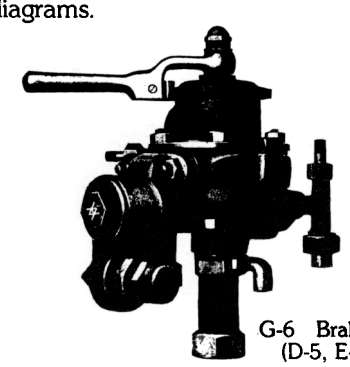
It's finally time for us to look at locomotive air brakes. For our purposes all Westinghouse locomotive equipment is one of two systems. The A-1 equipment was standard on new engines from the 1890's to about 1906 and used in some special applications much later. From 1906 until the end of small steam engines the No. 6 ET equipment was standard. On modern large locomotives from about 1936 on the No. 8ET equipment was used. For you with large modern power the obvious difference between 6ET and 8ET is the distributing valve. Cal Scale makes both in HO; the 8ET valve is part of set 2002.

This month we show diagrams of the parts of the A-1 equipment and a list of parts needed from the main reservoir on. Note that A-1 included no independent brake. To this day Sierra RR #3 operates with just the basic A-1 equipment. Truck brakes and tender brakes also were separate schedules. I have included FL tender equipment on the list.

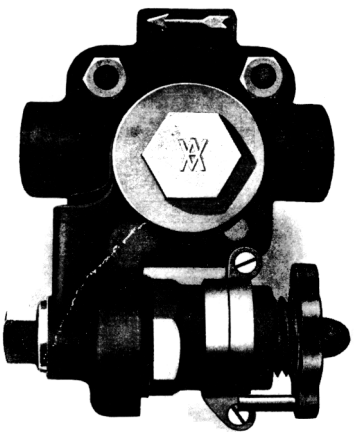
The independent straight air schedules SWA (engine) and SWB (tender) are listed separately. Your prototype is the best guide as to the need of the extra plumbing.

Of course tank and geared engines would not use tender equipment but the straight air is still optional.

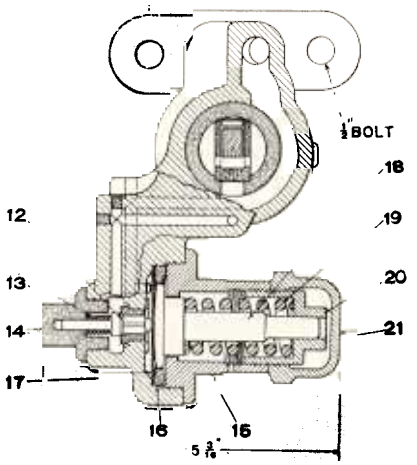
The auxilliary reservoir size depends on brake cylinder size. A size chart will be included next issue with the piping diagrams.

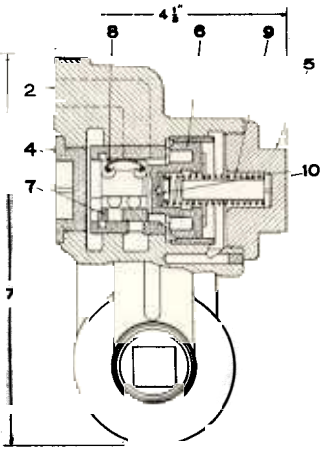


G-6 Brake Valve
(D-5, E-6, F-6 were similar)

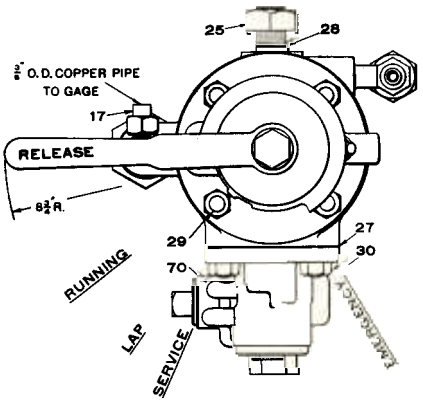


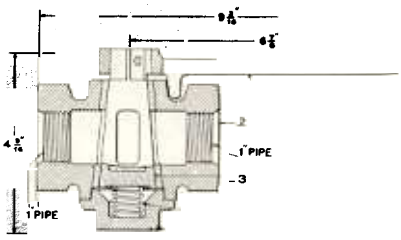
B-6 Feed Valve



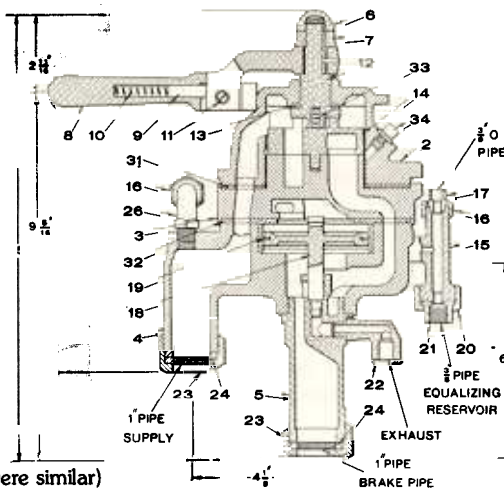



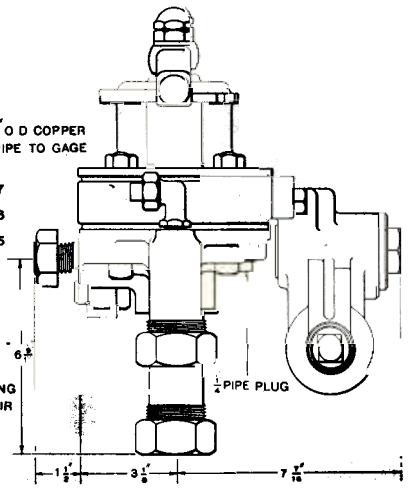
C-6 Feed Valve



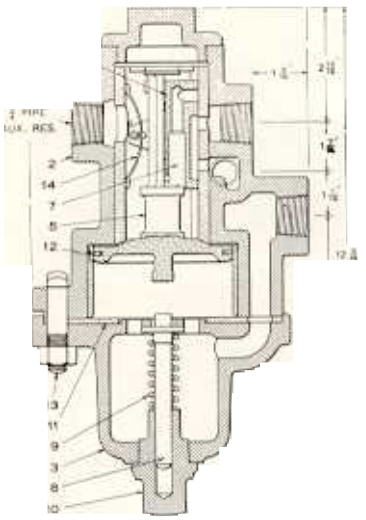



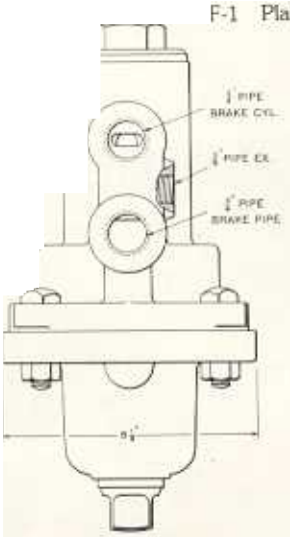

Cut-Out Cock (Brake Valve)



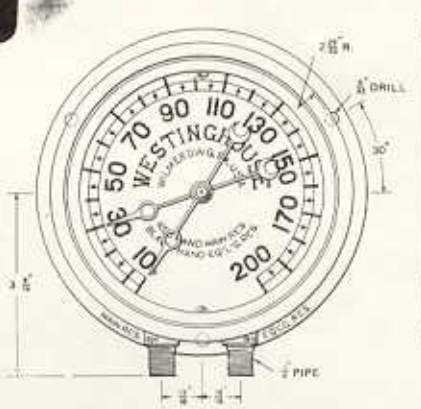
F-1 Plain Triple Valve (F-2 same size)

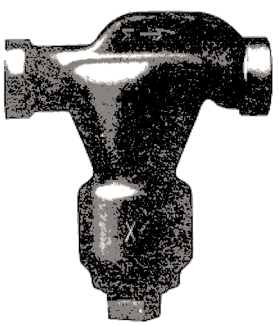


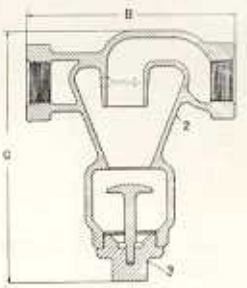




Dual Air Gauge

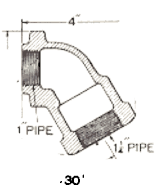


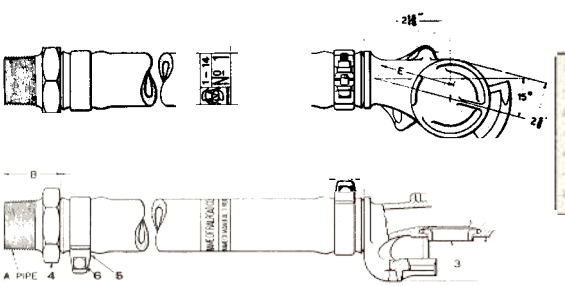


Centrifugal Dirt Collector

Air Hoses w/Glad Hands

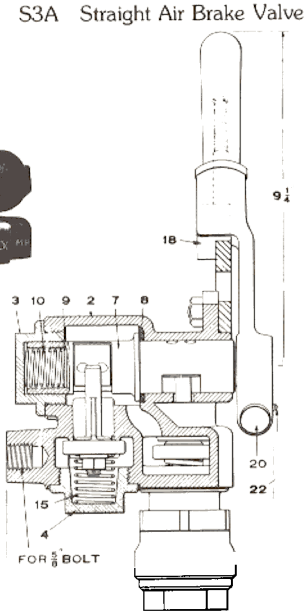



Angle Fitting

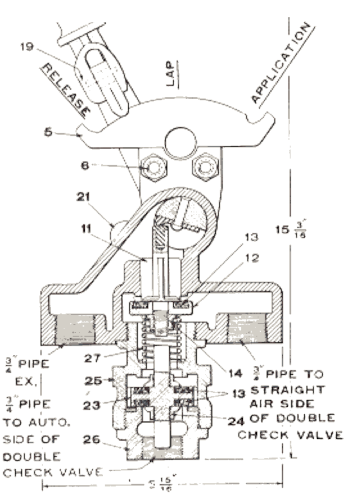


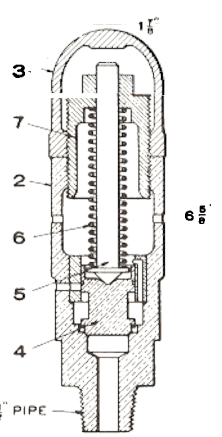
| Pc. No. | Diam. of Hose | Size of Nipple A | B | C | D | E |
|---|---|---|---|---|---|---|
| 46242 | 1¼" | 1¼" | 1⅝" | 22° | 3¼" | 2¼" |
| 46283 | 1¼" | 1¼" | 1⅝" | 22° | 2⅛" | 2¼" |
| 46252 | 1¼" | 1" | 1¼" | 22° | 2¼" | 2¼" |

S3A Straight Air Brake Valve



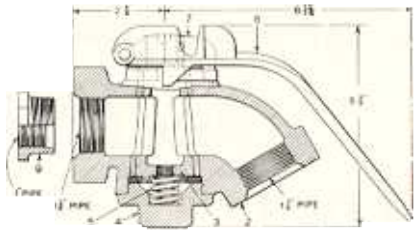





E-1 Safety Valve (Used w/st. air)

# Straight Talk About Air Pipes



Angle cock

**by Charles Givens**

## A-1 Locomotive (Continued)

Well — space limitations made me a liar last issue. All the tables and charts aren't appearing on schedule! Let's continue now with a discussion of the parts — mostly pictures last issue. For those who care, the centrifugal dirt collector dimensions "B" and "C" are 7½" and 9-9/16".

For A-1 equipment, in the cab we have the following:

*G-6 Brake valve with attached C-6 feed valve* This obviously must be mounted for convenience of the engineer in use. D-5, E-6 and F-6 valves used an older style feed valve and would not be found in service much after 1910. The "E-6" brake valves available in O and HO appear to be G-6 types in reality.

*Brake valve cut-out cock* Is in the brake pipe under the G-6 valve.

*Duplex air gage* Mounted to be in full view of the engineer.

With SWA straight-air add the following:

*S-3 or S-3A brake valve* This is mounted in a location convenient to the engineer.

*C-6 feed valve* Is mounted on a pipe bracket convenient to maintain but out of the way otherwise.

*Single Pointer air gage* mounted next to Duplex gage. This shows brake cylinder pressure.

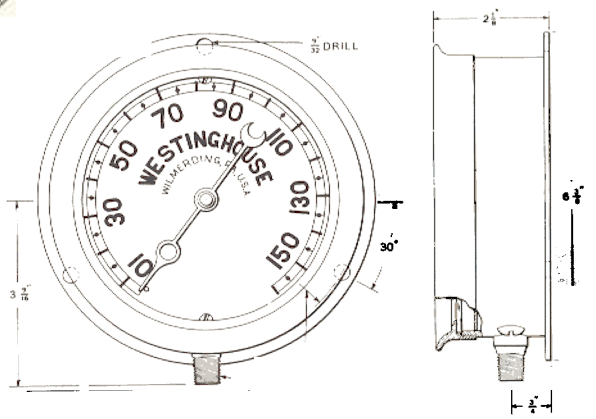
The following parts are placed as noted:

*10" Dia. by 14×" equalizing reservoir* Generally mounted under the cab or under the running board just ahead of the cab. Almost always on the right side. Used on all A-1 and 6ET equipment.

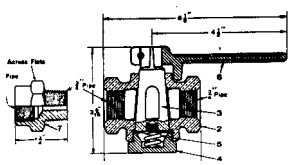
*One auxiliary reservoir* Size determined by brake cylinder size. Usually mounted under the cab on the left side. If engine truck has brakes a second auxiliary reservoir will be used, size to match truck brake cylinder. Each auxiliary reservoir has a drain cock.

*One plain triple valve, Type F* Usually mounted on a pipe bracket just in front of the auxiliary reservoir for the driver brakes. A cut-out cock and a centrifugal dirt collector are in the line between the triple valve and the brake pipe. (In all our discussions the "brake pipe" is the pipe that connects the engine and cars through the hoses and glad hands. Also called the "train line").

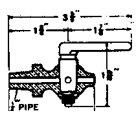
*Brake cylinders* Usually two. Your prototype is the location key. We will explore brake rigging in the future.



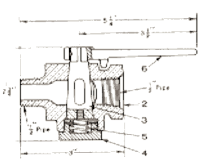

Air gage for straight air (shows brake cyl. pressure)



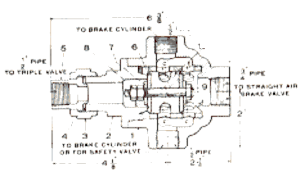
Triple Valve cut-out lock (#2233)



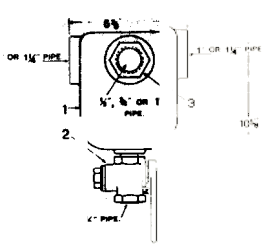
Aux. reservoir drain cock (#41814)



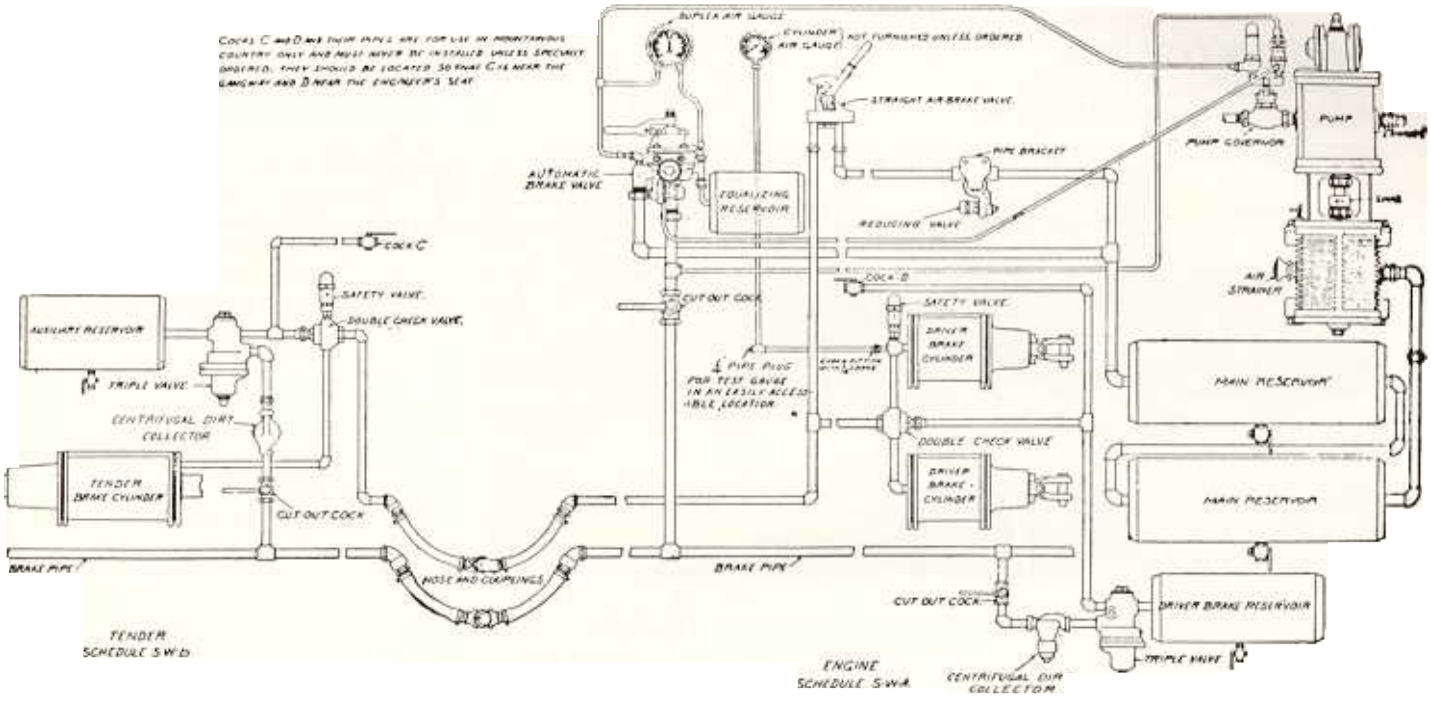
Main reservoir drain cock (#7716)



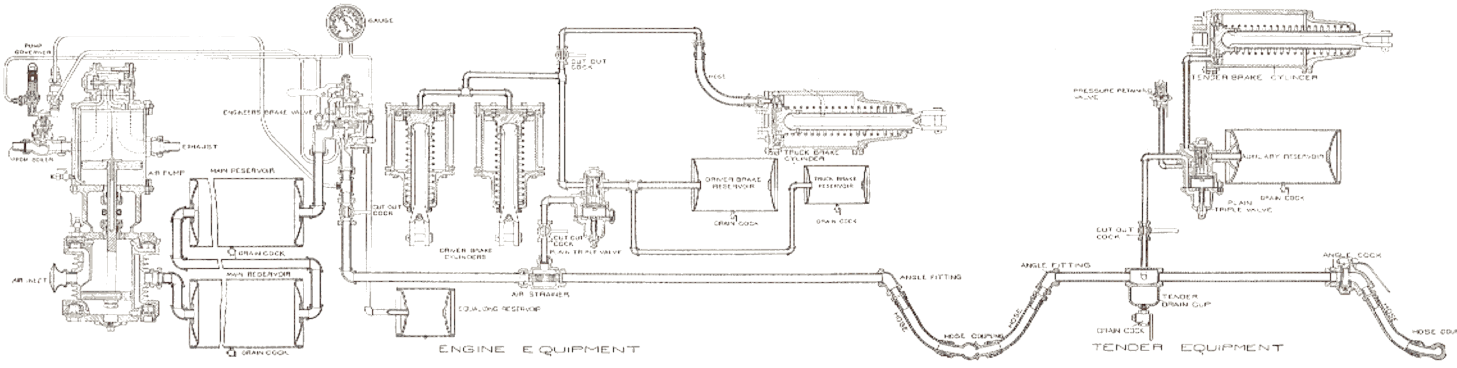
#2 Double Check Valve



Tender Drain Cup




Combined automatic and straight air brake for locomotive and tender. SF pump governor shown.




A-1 air brake with SWB tender brake without straight air feature. SF pump governor shown and retainer shown on tender brake. Train line goes to front and rear, not just rear as shown.

The brake pipe on the locomotive may be either 1" or 1¼" pipe. It terminates under the cab in an angle fitting and hose. On the pilot we have a cut-out cock, angle fitting and hose. The straight-air, in addition to the above, will include a No. 2 double check valve and an E-1 Safety Valve. These were usually located near the brake cylinders.

On the tender for A-1 equipped engines (FL equipment):

*Brake cylinder, Type L, of size needed for tender weight and auxiliary reservoir of matching size* the reservoir will have a drain cock.

*A plain triple valve (F type)* mounted on a bracket in front of the auxiliary reservoir.

*A tender drain cup and a centrifugal dirt collector.* The drain cup acts as the tee from the brake pipe and the dirt collector is in the line to the triple valve.

*Brake Pipe* 1" or 1¼" to match locomotive, with angle fitting and hose in front and angle cock and hose in back.

For straight-air add the following:

A ¾" air line from locomotive through two angle fittings and two hoses. A No. 2 double check valve and an E-1 safety valve in pipe from triple valve to brake cylinder.

Many variations were used. The most obvious visual variations were on the tender. A quick-action triple valve (type H) was sometimes used instead of the Type F. This would be mounted on the brake cylinder head. A retainer valve could be used. A brake pipe vent valve was sometimes used. This will be described with the 6ET equipment.

On the engine with straight-air the diagram shows the S-3 valve. The S-3A brake valve allowed independent release of driver brakes and was shown last issue. The S-3A required an extra pipe from the valve to the automatic side of the double check valve. Brake cylinders and auxiliary reservoirs will be shown next issue.

# STRAIGHT TALK ABOUT BENT PIPES

**by Charles Givens**

This month's column is mostly a mass of tabular data. The size and style of brake cylinders used depends on your prototype. I am presenting all this data so that you can decide from photos what cylinder was used and the size of the auxiliary reservoirs used with the A-1 equipment. No aux. reserviors were used with 6ET equipment but the brake cylinders were used with both equipments.

We will refer to the different cylinder styles at a future time when we discuss foundation brake rigging. Also we will show some drawings of typical placement or parts on some specific locomotives. Otherwise this concludes our look at the A-1 equipment.

PRESSURE HEADS FOR TRUCK AND TENDER BRAKE CYLINDERS

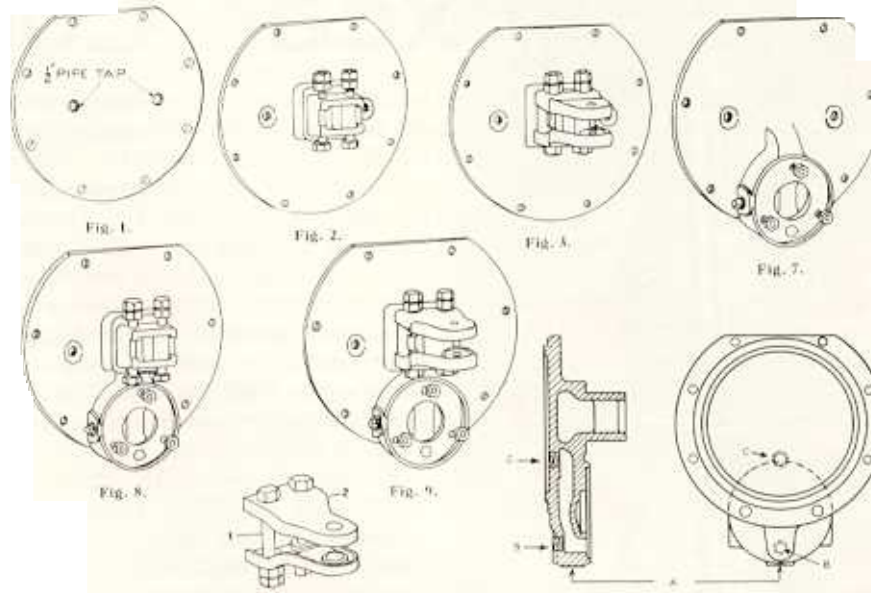



Fig. 1. Fig. 2. Fig. 3. Fig. 7.

Fig. 8. Fig. 9. Fig. 10. Fig. 11.

NOTE—All Tender Brake Cylinder Pressure Heads with connection for Quick-Action Triple Valve are now furnished as shown in Fig. 11, except that for ordinary equipments Port C is not tapped, and bosses A and B are neither of them drilled. When ordering such Pressure Heads for the combined Automatic and Straight Air Brake equipment, Schedule SWA-SWB, it is necessary to specify that Port C should be tapped for ¾-inch pipe and plugged,—plug to be flush on cylinder side of head; also that either of bosses A or B should be drilled and tapped for ¾-inch pipe.

**FL Tender Equipment for Freight or Switch Locomotives already provided with Old Standard A-1, AD or AG Engine Equipments**
**Now Superseded by Standard No. 6 ET Equipment**

| Schedule Designation | FL-812 | FL-1012 | FL-1212 | FL-1412 | FL-1612 |
|---|---|---|---|---|---|
| Brake Cylinder Size | 8" x 12" | 10" x 12" | 12" x 12" | 14" x 12" | 16" x 12" |
| Auxiliary Reservoir Size | 10" x 24" | 12" x 27" | 12" x 33" | 14" x 33" | 16" x 33" |
| Drain Cock Size | ¼" | ¼" | ¼" | ¼" | ¼" |
| Triple Valve Type | F-1 | F-1 | F-2 | F-2 | F-2 |

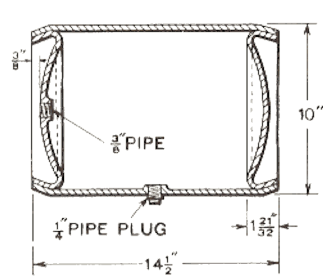
NOTE A—For Engines used in Double-Heading Service or as "Helpers," we recommend including with this equipment at the additional price involved, a Brake Pipe Vent Valve, Pc. 15280, List Price $12.00 with 10-inch x 24-inch Reservoir, Pc. 3091, List Price $4.50 and a 1-inch Centrifugal Dirt Collector, Pc. 36454, List Price $1.20. As a Vent Valve is much less sensitive than a Quick-Action Triple Valve, this apparatus can be used wherever brake pipe venting is desired, with entire freedom from undesired quick action. At the same time, it insures the certainty of obtaining quick action throughout the entire train when desired.

**HK and PK Tender Equipment, for Passenger Locomotives already provided with Old Standard A-1, AD or AG Engine Equipments**
**Now Superseded by Standard No. 6 ET Equipment**

| Schedule Designation | HK-812 | PK-1012 | PK-1212 | PK-1412 | PK-1612 |
|---|---|---|---|---|---|
| Brake Cylinder Size | 8" x 12" | 10" x 12" | 12" x 12" | 14" x 12" | 16" x 12" |
| Auxiliary Reservoir Size | 10" x 24" | 12" x 27" | 12" x 33" | 14" x 33" | 16" x 33" |
| Drain Cock Size | ¼" | ¼" | ¼" | ¼" | ¼" |
| Triple Valve Type | H-1 | P-1 | P-2 | P-2 | P-2 |

NOTE A—If Triple Valve is to be mounted on Bracket, order should so state and suitable bracket, see Part Catalog 3210-2, will be furnished and Type L Brake Cylinder substituted for Type K in above schedules.

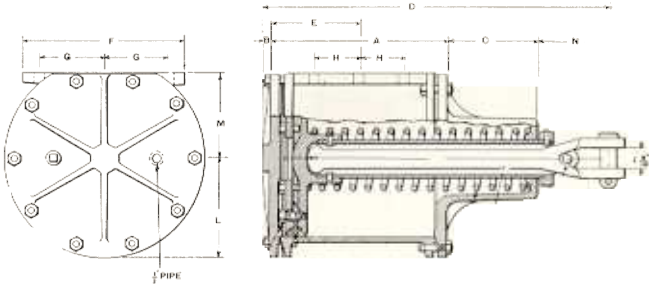
EQUALIZING RESERVOIR.




## LOCOMOTIVE BRAKE CYLINDERS

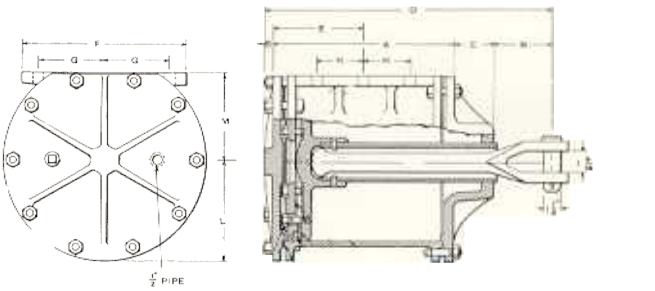
| Type | DRIVER BRAKE CYLINDER Size Diameter | Stroke | No. | AUXILIARY RESERVOIR Size |
|---|---|---|---|---|
| B | 6" | 8" | 48-B | 10" x 24" |
| B | 8" | 6" | 33-B | 10" x 33" |
| B | 8" | 7" | 11-B | 10" x 33" |
| B | 8" | 12" | 43-B | 10" x 33" |
| B | 10" | 6" | 51-B | 12" x 33" |
| B | 10" | 8" | 55-B | 12" x 33" |
| B | 10" | 10" | 35-B | 12" x 33" |
| B | 10" | 12" | 99-B | 12" x 33" |
| B | 12" | 8" | 13-B | 14" x 33" |
| B | 12" | 10" | 15-B | 14" x 33" |
| B | 12" | 12" | 39-B | 14" x 33" |
| B | 14" | 10" | 21-B | 16" x 33" |
| B | 14" | 12" | 42-B | 16" x 33" |
| B | 16" | 10" | 101-B | 16" x 42" |
| B | 16" | 12" | 47-B | 16" x 42" |
| C | 8" | 6" | 33-C | 10" x 33" |
| C | 8" | 7" | 11-C | 10" x 33" |
| C | 10" | 6" | 30-C | 12" x 33" |
| C | 10" | 8" | 55-C | 12" x 33" |
| C | 10" | 10" | 35-C | 12" x 33" |
| C | 10" | 12" | 99-C | 12" x 33" |
| C | 12" | 8" | 13-C | 14" x 33" |
| C | 12" | 10" | 15-C | 14" x 33" |
| C | 12" | 12" | 39-C | 14" x 33" |
| C | 14" | 10" | 21-C | 16" x 33" |
| C | 14" | 12" | 42-C | 16" x 33" |
| PushDown | 6" | 6" | 66 | 10" x 24" |
| " | 6" | 8" | 48 | 10" x 24" |
| " | 8" | 6" | 33 | 10" x 33" |
| " | 8" | 7" | 11 | 10" x 33" |
| " | 10" | 6" | 30 | 12" x 33" |
| " | 10" | 8" | 55 | 12" x 33" |
| " | 10" | 10" | 35 | 12" x 33" |
| " | 10" | 12" | 99 | 12" x 33" |
| " | 12" | 8" | 13 | 14" x 33" |
| " | 12" | 10" | 15 | 14" x 33" |
| " | 12" | 12" | 39 | 14" x 33" |
| " | 14" | 10" | ... | 16" x 33" |
| " | 14" | 12" | 42 | 16" x 33" |

| TRUCK BRAKE CYLINDER Diameter | Stroke | No. | AUXILIARY Size |
|---|---|---|---|
| 6" | 8" | 48-D | 10" x 14½" |
| 8" | 7" | 11-D | 10" x 20" |
| 8" | 12" | 43-D | 10" x 20" |
| 10" | 8" | 55-D | 10" x 28" |
| 10" | 10" | 35-D | 10" x 28" |
| 10" | 12" | 99-D | 10" x 28" |
| 12" | 8" | 13-D | 12" x 27" |
| 12" | 12" | 39-D | 12" x 27" |




## TYPE "B" DRIVER BRAKE CYLINDERS.

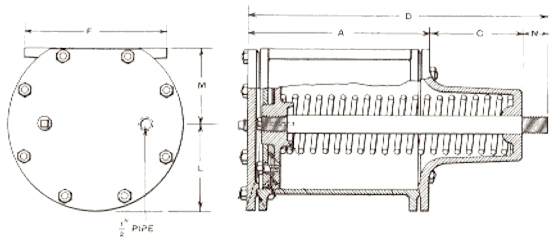
| CYLINDERS Dia. | Stroke | No. | A | B | C | D | E | F | G | H | L | M | N |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 6 | 6 | 66-B | 8½ " | 1 " | 5½ " | 19½ " | 4½ " | 9½ " | 3½ " | 1½ " | 4½ " | 3½ " | 4½ " |
| 6 | 8 | 48-B | 11⅜ " | 1 " | 5½ " | 22⅛ " | 5½ " | 9½ " | 3½ " | 2½ " | 4½ " | 3½ " | 6½ " |
| 8 | 6 | 33-B | 9⅞ " | 1 " | 5 " | 19¼ " | 4½ " | 10½ " | 4½ " | 2½ " | 5⅛ " | 4½ " | 4⅜ " |
| 8 | 7 | 11-B | 10¹³⁄₁₆ " | 1 " | 5 " | 21⅛ " | 5½ " | 10½ " | 4½ " | 2½ " | 5⅛ " | 4½ " | 4⅜ " |
| 8 | 12 | 43-B | 16¹³⁄₁₆ " | 1 " | 6⅛ " | 28⅛ " | 8½ " | 10½ " | 4⅛ " | 4½ " | 5⅛ " | 4⅜ " | 4½ " |
| 10 | 6 | 51-B | 9⅞ " | 1 " | 6⅛ " | 21⅛ " | 4½ " | 11 " | 4½ " | 3½ " | 6½ " | 5½ " | 4½ " |
| 10 | 8 | 55-B | 11⅜ " | 1 " | 6⅛ " | 23⅛ " | 5½ " | 11 " | 4½ " | 3½ " | 6½ " | 5½ " | 4½ " |
| 10 | 10 | 35-B | 13⅜ " | 1 " | 6⅛ " | 25⅛ " | 6½ " | 11 " | 4½ " | 3½ " | 6½ " | 5½ " | 4½ " |
| 10 | 12 | 99-B | 15⅜ " | 1 " | 6⅛ " | 27⅛ " | 7⅛ " | 11 " | 4½ " | 4½ " | 6½ " | 5½ " | 4½ " |
| 12 | 8 | 13-B | 11⅜ " | 1 " | 7 " | 24½ " | 6 " | 12½ " | 5½ " | 3½ " | 7½ " | 6½ " | 5⅞ " |
| 12 | 10 | 15-B | 13⅜ " | 1 " | 7 " | 26⅛ " | 8½ " | 12½ " | 5½ " | 3½ " | 7½ " | 6½ " | 6½ " |
| 12 | 12 | 39-B | 15⅜ " | 1 " | 7 " | 28⅛ " | 7⅛ " | 12½ " | 5½ " | 4½ " | 7½ " | 6½ " | 6½ " |
| 14 | 10 | 21-B | 14½ " | 1 " | 7 " | 26⅛ " | 6½ " | 15½ " | 6½ " | 3½ " | 8½ " | 7⅛ " | 6½ " |
| 14 | 12 | 42-B | 15⅜ " | 1 " | 7 " | 29⅛ " | 7⅛ " | 15½ " | 6½ " | 4½ " | 8½ " | 7⅛ " | 6½ " |
| 16 | 10 | 101-B | 14⅜ " | 1 " | 7 " | 27⅛ " | 7⅛ " | 19 " | 8½ " | 4 " | 9½ " | 9 " | 5½ " |
| 16 | 12 | 47-B | 16⅜ " | 1 " | 7 " | 29⅛ " | 8½ " | 19½ " | 8½ " | 4½ " | 9½ " | 9 " | 5½ " |




## TYPE "C" DRIVER BRAKE CYLINDERS.

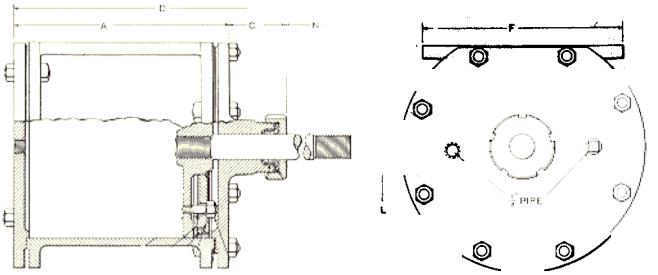
| CYLINDERS Dia. | Stroke | No. | A | B | C | D | E | F | G | H | L | M | N |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 8 | 6 | 33-C | 9⅞ " | 1 " | 3⅛ " | 17 " | 4½ " | 10½ " | 4½ " | 2½ " | 5⅛ " | 4½ " | 3½ " |
| 8 | 7 | 11-C | 10¹³⁄₁₆ " | 1 " | 3⅛ " | 18½ " | 5½ " | 10½ " | 4½ " | 2½ " | 5⅛ " | 4½ " | 4⅛ " |
| 10 | 6 | 30-C | 9⅞ " | 1 " | 3 " | 17⅛ " | 4½ " | 11 " | 4½ " | 2½ " | 6½ " | 5½ " | 4 " |
| 10 | 8 | 55-C | 11⅜ " | 1 " | 3 " | 19½ " | 5½ " | 11 " | 4½ " | 2½ " | 6½ " | 5½ " | 4½ " |
| 10 | 10 | 35-C | 13⅜ " | 1 " | 3 " | 21⅛ " | 6½ " | 11 " | 4½ " | 3½ " | 6½ " | 5½ " | 4 " |
| 10 | 12 | 99-C | 15⅜ " | 1 " | 3 " | 23 " | 7⅛ " | 11 " | 4½ " | 4½ " | 6½ " | 5½ " | 4 " |
| 12 | 8 | 13-C | 11⅜ " | 1 " | 3 " | 19⅜ " | 6 " | 12½ " | 5½ " | 3½ " | 7½ " | 6½ " | 4⅜ " |
| 12 | 10 | 15-C | 13⅜ " | 1 " | 3 " | 21⅛ " | 6½ " | 12½ " | 5½ " | 3½ " | 7½ " | 6½ " | 4⅜ " |
| 12 | 12 | 39-C | 15⅜ " | 1 " | 3 " | 23⅛ " | 7⅛ " | 12½ " | 5½ " | 4½ " | 7½ " | 6½ " | 4⅜ " |
| 14 | 10 | 21-C | 13⅜ " | 1 " | 3 " | 21⅛ " | 6½ " | 15½ " | 6½ " | 3½ " | 8½ " | 7½ " | 3½ " |
| 14 | 12 | 42-C | 15¼ " | 1 " | 3 " | 23⅛ " | 7½ " | 15½ " | 6½ " | 4½ " | 8½ " | 7½ " | 3½ " |

## PUSH-DOWN TYPE DRIVER BRAKE CYLINDERS.



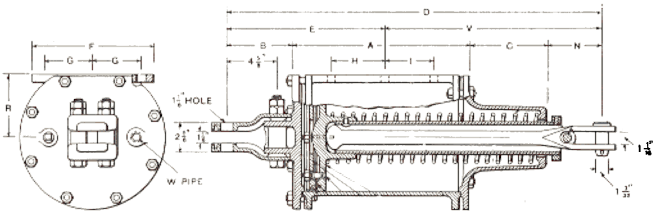

| CYLINDERS Dia. | Stroke | No. | A | C | D | F | L | M | N |
|---|---|---|---|---|---|---|---|---|---|
| 6 | 6 | 66 | 8½ " | 3½ " | 14¹¹⁄₁₆ " | 9½ " | 4½ " | 3½ " | 2½ " |
| 6 | 8 | 48 | 10⅝ " | 3½ " | 16¹³⁄₁₆ " | 9¼ " | 4⅝ " | 3⅝ " | 2½ " |
| 8 | 6 | 33 | 9⅞ " | 5 " | 16⅝ " | 10½ " | 5⅛ " | 4⅝ " | 2⅛ " |
| 8 | 7 | 11 | 10¹³⁄₁₆ " | 5 " | 17⅝ " | 10¼ " | 5⅛ " | 4⅝ " | 1⅞ " |
| 10 | 6 | 30 | 9½ " | 7 " | 18½ " | 11 " | 6⅝ " | 5¼ " | 1½ " |
| 10 | 8 | 55 | 11½ " | 7 " | 20½ " | 11 " | 6⅝ " | 5¼ " | 1½ " |
| 10 | 10 | 35 | 13½ " | 7 " | 22½ " | 11 " | 6⅝ " | 5¼ " | 1½ " |
| 10 | 12 | 99 | 15⅝ " | 7 " | 24⅝ " | 11 " | 6⅝ " | 5¼ " | 2⅛ " |
| 12 | 8 | 13 | 11½ " | 7 " | 20¼ " | 12⅝ " | 7⅛ " | 6½ " | 1⅞ " |
| 12 | 10 | 15 | 13⅝ " | 7 " | 22¼ " | 12⅜ " | 7⅛ " | 6½ " | 1½ " |
| 12 | 12 | 39 | 15⅝ " | 7 " | 24½ " | 12⅜ " | 7⅛ " | 6½ " | 1½ " |
| 14 | 10 | ... | 14½ " | 7⅛ " | 23½ " | 15½ " | 8⅝ " | 7½ " | 2⅛ " |
| 14 | 12 | 42 | 16⅜ " | 7⅛ " | 25¾ " | 15½ " | 8⅝ " | 7½ " | 2⅛ " |

## PULL-UP DRIVER BRAKE CYLINDERS.

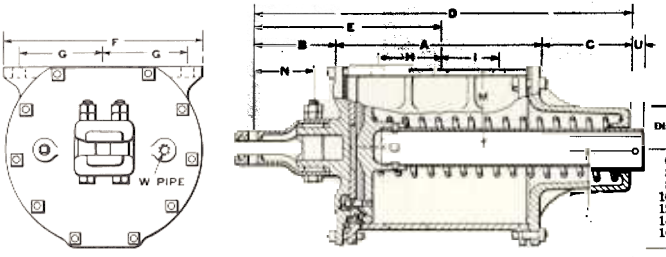



| CYLINDERS Dia. | Stroke | No. | A | C | D | F | L | M | N |
|---|---|---|---|---|---|---|---|---|---|
| 6 | 6 | 6 | 8⅝ " | 3⅛ " | 19½ " | 9½ " | 4½ " | 3½ " | 8⅝ " |
| 6 | 8 | ... | 10⅝ " | 3⅛ " | 24⅛ " | 9¼ " | 4½ " | 3½ " | 10⅞ " |
| 8 | 6 | 3 | 9⅞ " | 3⅛ " | 20⅞ " | 10½ " | 5⅛ " | 4½ " | 7½ " |
| 8 | 7 | 1 | 10¹³⁄₁₆ " | 3⅛ " | 22⅛ " | 10½ " | 5⅛ " | 4½ " | 8½ " |
| 10 | 8 | 5 | 11½ " | 3⅛ " | 24½ " | 11 " | 6½ " | 5½ " | 9½ " |
| 10 | 10 | 32 | 13½ " | 3⅛ " | 28½ " | 11 " | 6½ " | 5½ " | 12⅛ " |
| 10 | 12 | 9 | 15⅝ " | 3⅛ " | 32⅛ " | 11 " | 6½ " | 5½ " | 13½ " |
| 12 | 8 | 12 | 11½ " | 2⅜ " | 24½ " | 12⅝ " | 7⅛ " | 6½ " | 9½ " |
| 12 | 10 | 14 | 13⅝ " | 2⅜ " | 28⅝ " | 12⅝ " | 7⅛ " | 6½ " | 11½ " |
| 12 | 12 | 37 | 15⅝ " | 2⅜ " | 32⅛ " | 12⅝ " | 7⅛ " | 6½ " | 13½ " |
| 14 | 10 | 21 | 13½ " | 3½ " | 28⅝ " | 15½ " | 8½ " | 7½ " | 11½ " |
| 14 | 12 | 41 | 15⅞ " | 3½ " | 32½ " | 15½ " | 8½ " | 7½ " | 13½ " |

## TYPE "D" ENGINE-TRUCK BRAKE CYLINDERS.

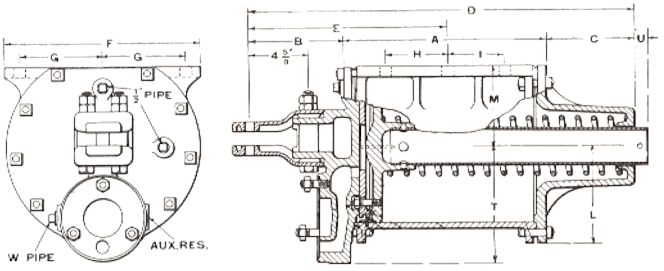



| CYLINDER Dia. | Stroke | No. | A | B | C | D | E | F | G | H | I | N | R | V |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 6 | 8 | 48-D | 11¹³⁄₁₆ " | 6½ " | 5½ " | 28⅞ " | 12¹³⁄₁₆ " | 9¼ " | 3½ " | 2½ " | 2½ " | 4½ " | 3½ " | 15¾ " |
| 8 | 7 | 11-D | 10¹³⁄₁₆ " | 6 " | 5 " | 26⅝ " | 11½ " | 10½ " | 4½ " | 2½ " | 2½ " | 4½ " | 4⅝ " | 15⅝ " |
| 8 | 12 | 43-D | 16¹³⁄₁₆ " | 6 " | 6½ " | 33⅞ " | 14⅛ " | 10½ " | 4⅛ " | 4½ " | 4½ " | 4½ " | 4⅜ " | 19¹³⁄₁₆ " |
| 10 | 8 | 55-D | 11⅜ " | 6 " | 6½ " | 29½ " | 11⅞ " | 11 " | 4½ " | 2½ " | 2½ " | 5⅛ " | 5⅛ " | 17½ " |
| 10 | 10 | 35-D | 13⅜ " | 6 " | 6½ " | 31⅞ " | 12⅞ " | 11 " | 4½ " | 3½ " | 3½ " | 5 " | 5¼ " | 18¼ " |
| 10 | 12 | 99-D | 15⅜ " | 6 " | 6½ " | 33⅞ " | 13½ " | 11 " | 4½ " | 4½ " | 4½ " | 4½ " | 5¼ " | 19⅜ " |
| 12 | 8 | 13-D | 11⅜ " | 6½ " | 7 " | 30⅞ " | 12⅛ " | 12⅝ " | 5½ " | 2½ " | 2½ " | 5⅜ " | 6½ " | 18⅛ " |
| 12 | 12 | 39-D | 15⅜ " | 6½ " | 7 " | 33½ " | 14⅛ " | 12⅝ " | 5⅝ " | 4½ " | 4½ " | 4½ " | 6½ " | 19⅜ " |




## TYPE L TENDER BRAKE CYLINDERS.
## WITH DETACHABLE FULCRUM HEAD.

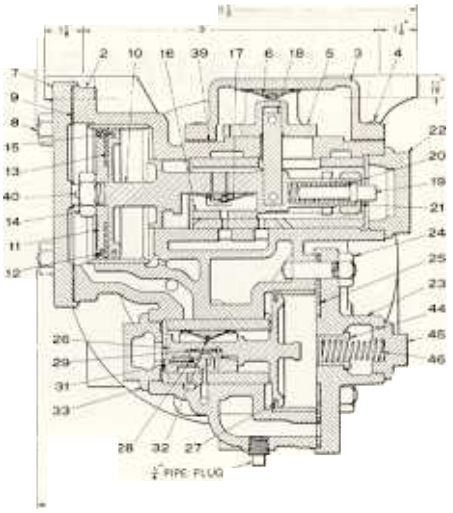
| Dia. | Stroke | A | B | C | D | E | F | G | H | I | L | M | N | U | W Pipe When Used With ET Equipment | W Pipe When Used With Plain Triple Valve |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 6 | 8 | 11⅛" | 6½ " | 5½ " | 28⅜ " | 12⅛ " | 9¼ " | 3½ " | 2½ " | 2½ " | 4½ " | 3⅝ " | 4½ " | 1½ " | 1" | 1" |
| 8 | 8 | 10¹³⁄₁₆" | 6 " | 5 " | 26⅝ " | 11½ " | 10½ " | 4½ " | 2½ " | 2½ " | 4½ " | 4⅛ " | 4½ " | 1½ " | 1" | 1" |
| 8 | 12 | 16¹³⁄₁₆" | 6 " | 6½ " | 33⅞ " | 14⅛ " | 10½ " | 4⅛ " | 4½ " | 4½ " | 4½ " | 4⅝ " | 4½ " | 1½ " | 1" | 1" |
| 10 | 12 | 15⅜ " | 6½ " | 6½ " | 28⅝ " | 13⅜ " | 11 " | 4½ " | 4½ " | 4½ " | 6½ " | 5½ " | 4½ " | 1½ " | 1" | 1" |
| 12 | 12 | 15⅜ " | 6½ " | 7 " | 29¼ " | 14 " | 15½ " | 6½ " | 4½ " | 4½ " | 6½ " | 5½ " | 4½ " | 1½ " | 1" | 1" |
| 14 | 12 | 15⅝" | 6½ " | 7⅛ " | 29¼ " | 14⅛ " | 15½ " | 6½ " | 4½ " | 4½ " | 8½ " | 7⅛ " | 4½ " | 1½ " | 1" | 1" |
| 16 | 12 | 16⅜" | 6½ " | 7 " | 29⅞ " | 14⅜ " | 19½ " | 8½ " | 4½ " | 4½ " | 9½ " | 9 " | 4½ " | 1½ " | 1" | 1" |




| Dia. | Stroke | A | B | C | D | E | F | G | I | L | M | T | U |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 8 | 12 | 16⅜" | 8½" | 6½" | 31½" | 16½" | 10½ " | 4½ " | 4½ " | 5¼" | 4⅝ " | 8½ " | ¾ " |
| 10 | 12 | 15⅜" | 7⅛" | 6½" | 29½ " | 14½ " | 11 " | 4½ " | 4½ " | 6¼ " | 5½" | 8½ " | 1⅛" |
| 12 | 12 | 15½" | 7⅛" | 7 " | 30½ " | 15½ " | 15½ " | 6½ " | 4½ " | 7¼ " | 6½ " | 9¼" | 1⅛" |
| 14 | 12 | 15½" | 7⅛" | 7⅛" | 30⅞ " | 15⅞ " | 15½ " | 6½ " | 4½ " | 8½ " | 7½" | 9½" | 1 " |
| 16 | 12 | 16⅜" | 7⅛" | 7 " | 30½ " | 15½" | 19½ " | 8½ " | 4½ " | 9½ " | 9 " | 10½" | 1⅛" |

# STRAIGHT TALK ABOUT AIR BRAKE PIPES

**by Charles Givens**



No. 6 DISTRIBUTING VALVE

## The 6-ET Locomotive Brake Equipment

In the early 1900's Westinghouse was developing a better airbrake control system to cope with ever longer and heavier trains. After several experiments the 6-ET system was first produced about 1906 and remained the standard steam locomotive equipment until superceeded by 8-ET equipment in the mid-30's. I would guess that a majority of all steam locomotives in North America air brake equipped had the 6-ET equipment.

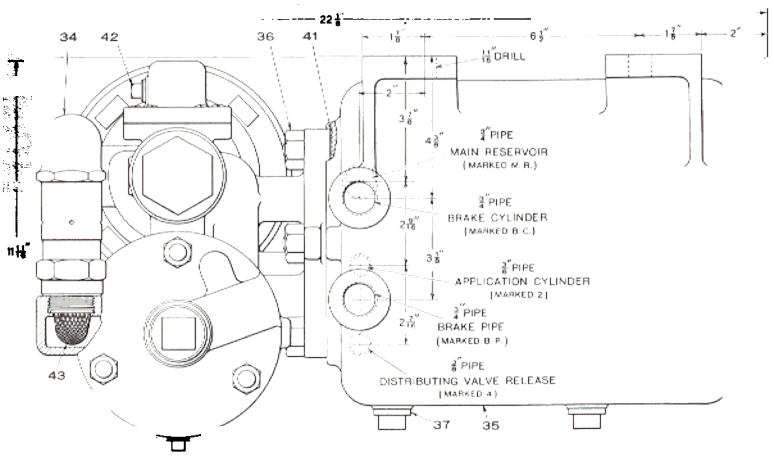
The chief identifying feature of the equipment is the #6 distributing valve, almost always located under or in front of the cab on the engineer's side. Also, the small equalizing reservoir is still used but no auxiliary reservoir is needed. On the tender only the pipes, brake cylinder, and often a brake pipe vent valve are used. Many models goof at this point and sport an auxiliary reservoir—on 6-ET engines no air reservoirs are used on the tender (unless, of course, the main reservoir is on the tender).

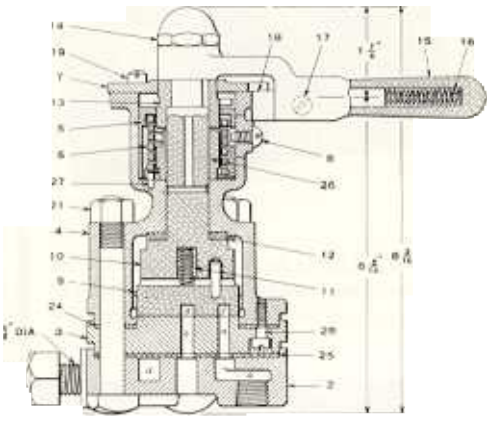
A main feature of the 6-ET was the independent brake which was an integral part of the equipment and not an addition as with the A-1 equipment.

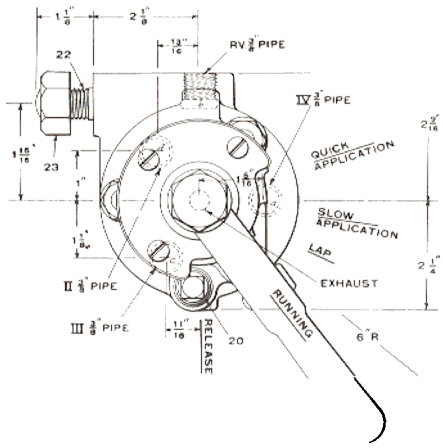
**In the cab:**

1. H-6 Automatic brake valve.
2. S-6 Independent brake valve.
3. 5" duplex air gage. (same as A-1 equipment)
4. 3½" duplex air gage.
5. B-6 or M-3-A feed valve.
6. C-6 or M-3 reducing valve.

The M-3 and M-3-A feed valves replaced the B-6 and C-6 styles about 1929. By the late 1940's the M-3 style was quite common even on older locomotives as the old valves wore out. Note that the B-6 feed valve was not



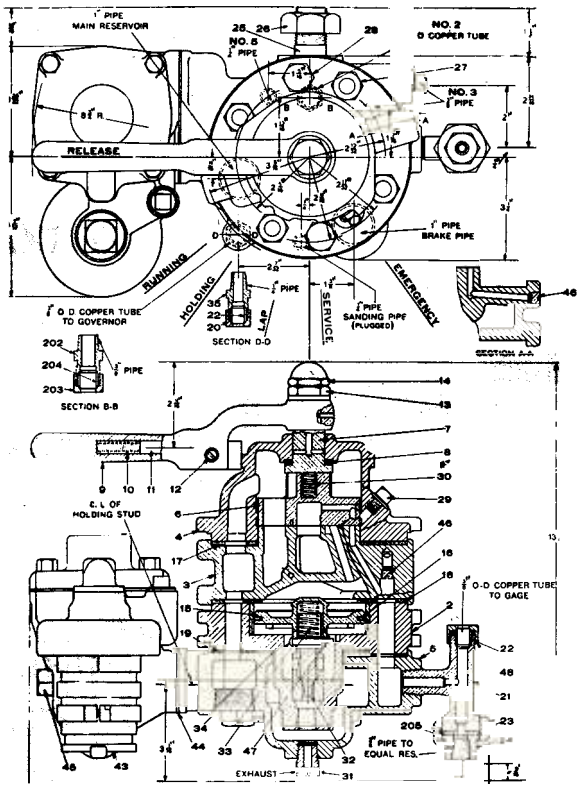



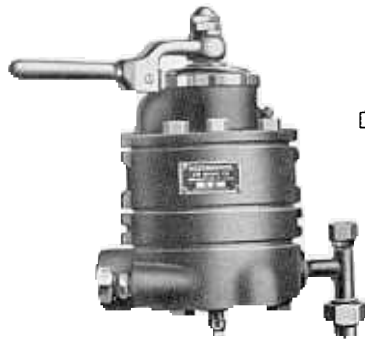


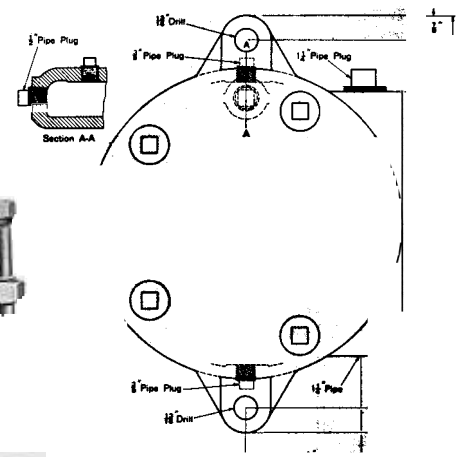

S-6 INDEPENDENT BRAKE VALVE.

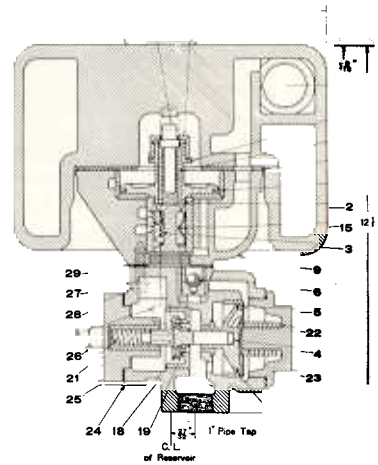
## H-6 AUTOMATIC BRAKE VALVE

WITH COLLAPSIBLE EQUALIZING PISTON AND TYPE "C" PIPE BRACKET

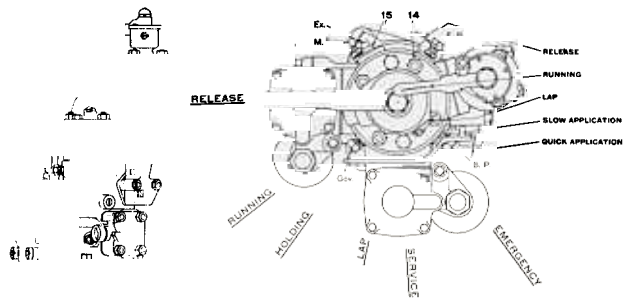


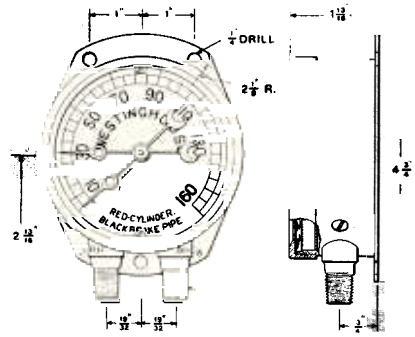


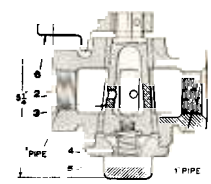




## L-6-BPD PEDESTAL BRAKE VALVE




## 3½" Duplex Air Gage, complete

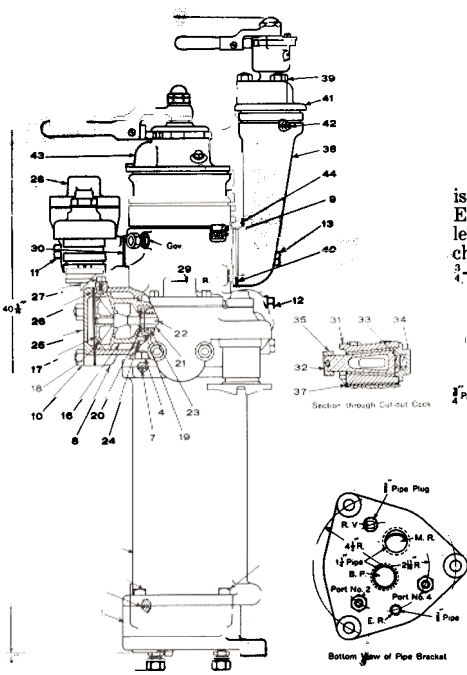



1" Main Reservoir Cut-out Cock with ¼" Side Vent, complete (Std. for No. 6 ET)

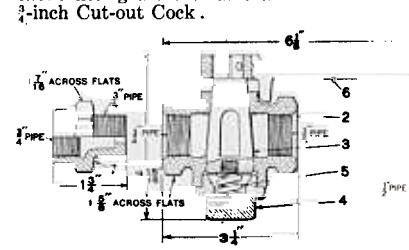
Pedestal Brake Valve With Angle Filling Piece

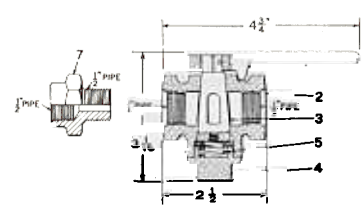
Pedestal Brake Valve With Straight Filling Piece




## CUT-OUT COCKS

¾-inch Cut-out Cock with Choke Fitting is furnished with ET Locomotive Brake Equipments, for use in brake cylinder pipe leading to tender. All details except the choke fitting are the same as the standard ¾-inch Cut-out Cock.




½-inch Cut-out Cock with Choke Fitting is furnished with ET Locomotive Brake Equipments, for use in brake cylinder pipe leading to front truck brake cylinder. All details except the choke fitting are the same as the standard ½-inch Cut-out Cock.

## NO. 4 PNEUMATIC BRAKE PIPE VENT VALVE

attached to the automatic brake valve as was the case with the G-6 valve, but is mounted on a separate pipe bracket.

**Outside the cab:**

1. No. 6 distributing valve. Always mounted with reservoir horizontal and never mounted with reservoir end outside (the cylindrical end is the reservoir end).
2. 10" dia. x 14½" equalizing reservoir (same as A-1 equipment)
3. Centrifugal dirt collectors —
   a. between #6 Dist. valve and brake pipe
   b. between main reservoir and H-6 brake valve (often omitted).
4. Brake cylinders — as needed (at least two)

**Tender:**

1. Type "L" brake cylinder
2. Brake vent pipe valve (No. 4 is newer style). Used on all passenger engines. Usually omitted on short line engines not used with passenger equipment.

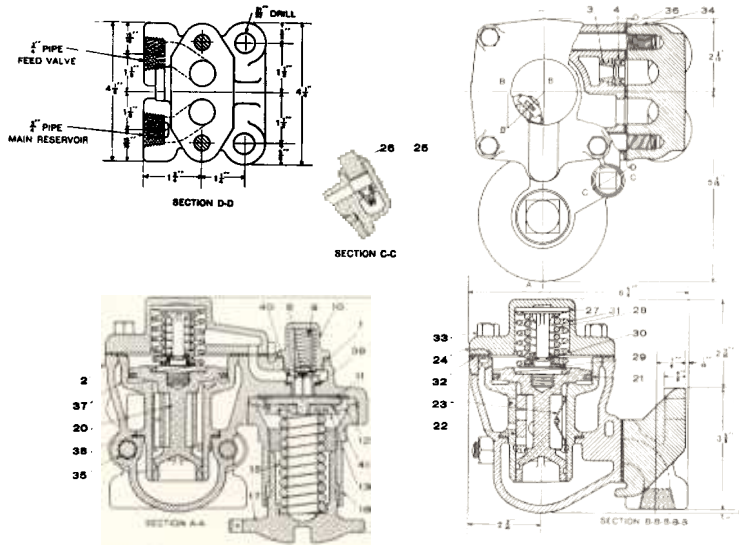
In the late 1920's a pedestal brake stand was cataloged for 6-ET equipment. This was used on some small locomotives, including Sierra Ry. #36.

In last issue's mass of tables we didn't identify the bottom cylinder on page 65. It's a type K tender cylinder used with schedules HK and PK. The L cylinder was used with schedule FL and the 6-ET equipment.

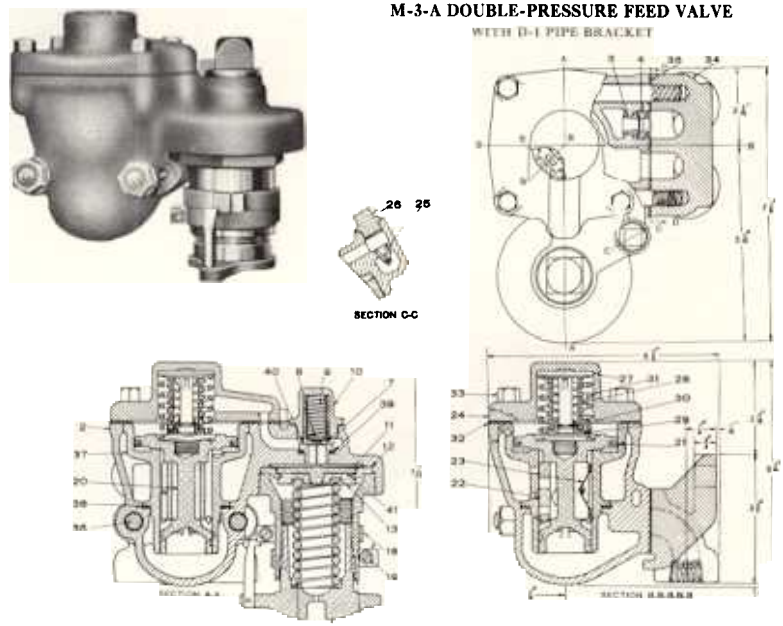
More on 6-ET next issue.



M-3 SINGLE-PRESSURE FEED VALVE
(WITH D-1 PIPE BRACKET)




M-3-A DOUBLE-PRESSURE FEED VALVE
WITH D-1 PIPE BRACKET



# Straight Talk About Air Pipes

**by Charles Givens**

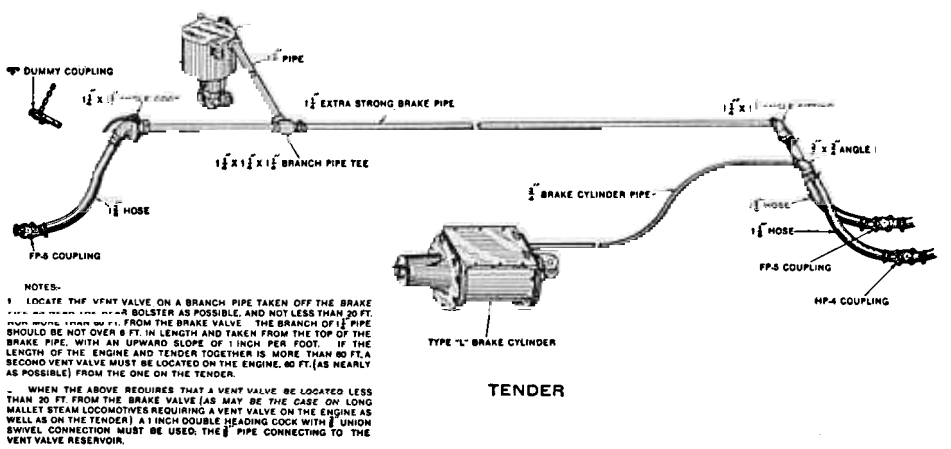
## 6-ET (Part 2) and Some Notes —

This month we present the engine and tender piping diagrams for the 6-ET equipment in its most modern form (circa 1940).

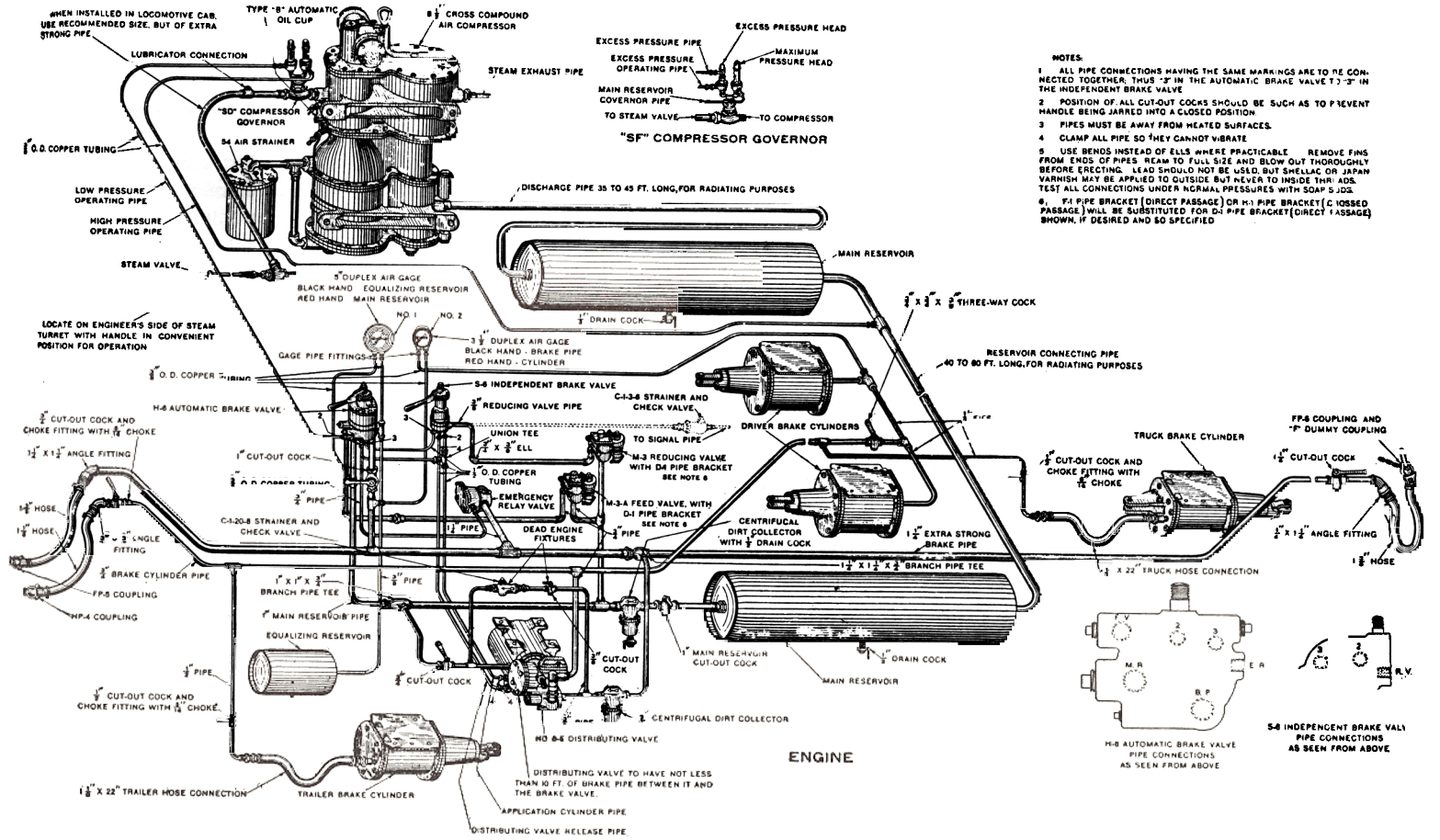
At this time a few general notes are in order concerning both A-1 and 6-ET equipment.

1) The emergency relay valve shown on the 6-ET diagram was not generally used on smaller, older engines. Just omit pipe from brake pipe, valve, and pipe to brake valve.
2) The feed valve and reducing valve were placed under the brake valve, much as on the pedestal type shown last issue. The automatic and independent brake valves were placed to be convenient to the engineer's right hand, usually with the independent (S-6) forward and higher than the automatic valve (H-6). Same comments for A-1, except that the straight air valve when used, was found in a variety of locations.
3) Westinghouse had recommended locations of centrifugal dirt collectors and air strainers, but many variations occurred in service.
4) The 6-ET equipment will have the distributing valve showing and the A-1 will have an auxiliary reservoir and a triple valve on the engine. The D&RGW K-36 class was built with A-1 equipment in 1925! After WWII these engines were changed to 6-ET. Photos are your guide.
5) Of course, many other "Field expedient" variations occurred in practice. For example, the (late) V&T #28 4-4-0 uses a steam jamb valve for the straight air control. In 1977, yet!

More on steam jambs, lubricators, and cab interiors next.




Piping Diagram of Westinghouse No. 6-ET Air Brake Equipment for Steam Locomotive Tender.




NOTES:

1 ALL PIPE CONNECTIONS HAVING THE SAME MARKINGS ARE TO BE CONNECTED TOGETHER, THUS "3" IN THE AUTOMATIC BRAKE VALVE TO "3" IN THE INDEPENDENT BRAKE VALVE

2 POSITION OF ALL CUT-OUT COCKS SHOULD BE SUCH AS TO PREVENT HANDLE BEING JARRED INTO A CLOSED POSITION

3 PIPES MUST BE AWAY FROM HEATED SURFACES.

4 CLAMP ALL PIPE SO THEY CANNOT VIBRATE

5 USE BENDS INSTEAD OF ELLS WHERE PRACTICABLE. REMOVE FINS FROM ENDS OF PIPES, REAM TO FULL SIZE AND BLOW OUT THOROUGHLY BEFORE ERECTING. LEAD SHOULD NOT BE USED, BUT SHELLAC OR JAPAN VARNISH MAY BE APPLIED TO OUTSIDE BUT NEVER TO INSIDE THREADS. TEST ALL CONNECTIONS UNDER NORMAL PRESSURES WITH SOAP SUDS.

6 D-1 PIPE BRACKET (DIRECT PASSAGE) OR H-1 PIPE BRACKET (CROSSED PASSAGE) WILL BE SUBSTITUTED FOR D-2 PIPE BRACKET (DIRECT PASSAGE) SHOWN, IF DESIRED AND SO SPECIFIED

Piping Diagram of Westinghouse No. 6-ET Air Brake Equipment for Steam Locomotives. (Engine Portion.)

# Straight Talk About Air Pipes

**by Charles H. Givens**

Let's start with steam brakes. About the only steam brakes one found after 1900 were on small industrial engines and logging engines — especially on shays. The basic rigging is a pipe from boiler to valve to the brake cylinder(s), with an exhaust from the valve to outside the cab. Brake cylinders were not used for combined air and steam operation, but many engines with steam brake (or jam) were air-equipped for train operation. Steam jam cylinders were more likely to be "pull in to apply" than air cylinders.

Shays used a slightly more complicated system as shown in the diagram. Steam is used both to apply and release the brakes and two pistons are used in one cylinder. The pistons are the same size on two truckers and the rear piston is larger on three truckers, as on the diagram. The larger piston acuates both 2nd and 3rd truck brakes. Note the lubricator connection. This is typical of all steam jams.

Many shays used steam brakes 'til the end. Cass Scenic RR still does. The practice of steam brakes on the shay, and air brakes on the train was apparently more widespread in the east than in the west. A left side view of a shay is instant proof of brakes — the steam cylinder was very prominent alongside the firebox.

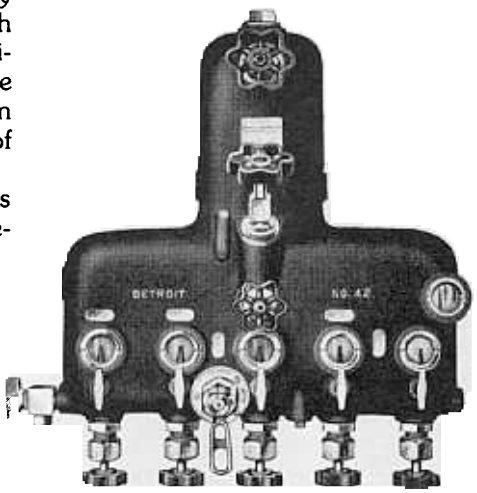
One other major appliance was located in almost all locomotive cabs until relatively recent years. This is the hydrostatic lubricator. The lubricator supplies oil to the main valves and cylinders, the steam end of the air pump, and any auxiliary used such as steam brake, stoker engine, etc. Many sizes and capacities were made, with from one to eight feeds. The mechanical lubricator, driven from the valve gear, replaced the hydrostatic type on many engines during the later years of steam.

The hydrostatic lubricator was placed in the cab in a location convenient to the engineman for filling and operation. It had to be high up in the cab, as oil flowed from it by gravity. And lastly, it must be mounted absolutely vertically.

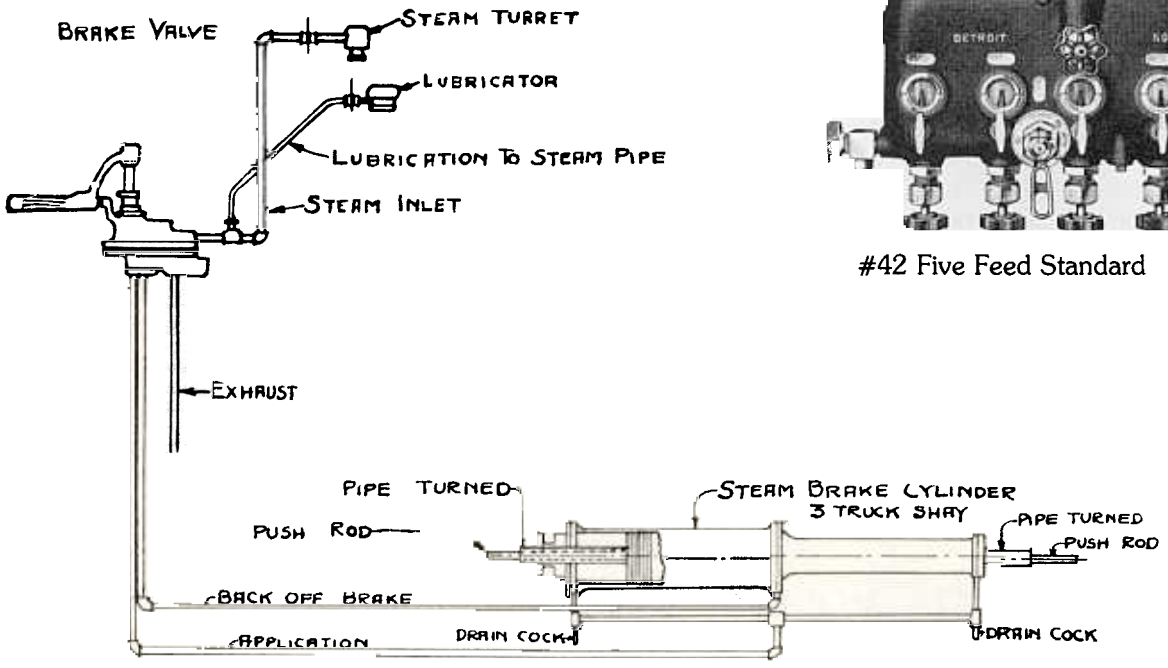
Connections were simple. A 1" OD (or larger) copper tube steam pipe ran from the top of the lubricator to the boiler or turret. A stop valve would usually be placed in this line. Copper tubes of ½" OD would carry the oil, usually under the boiler jacket, to the cylinders and air pump steam line just before the pump governor.

The mechanical lubricator is simply a small pump activated by reciprocating motion. Usual location was in the general area above the valve stem. One or two were used on one or both sides. Many more feeds were used than on the hydrostatic type because many of the chassis parts were often pressure lubed from the mechanical type. On shay locomotives, the mechanical lubricator was placed on the cylinder cover, directly in front of the engineer. "Manzel" brand lubricators were much used on shays.

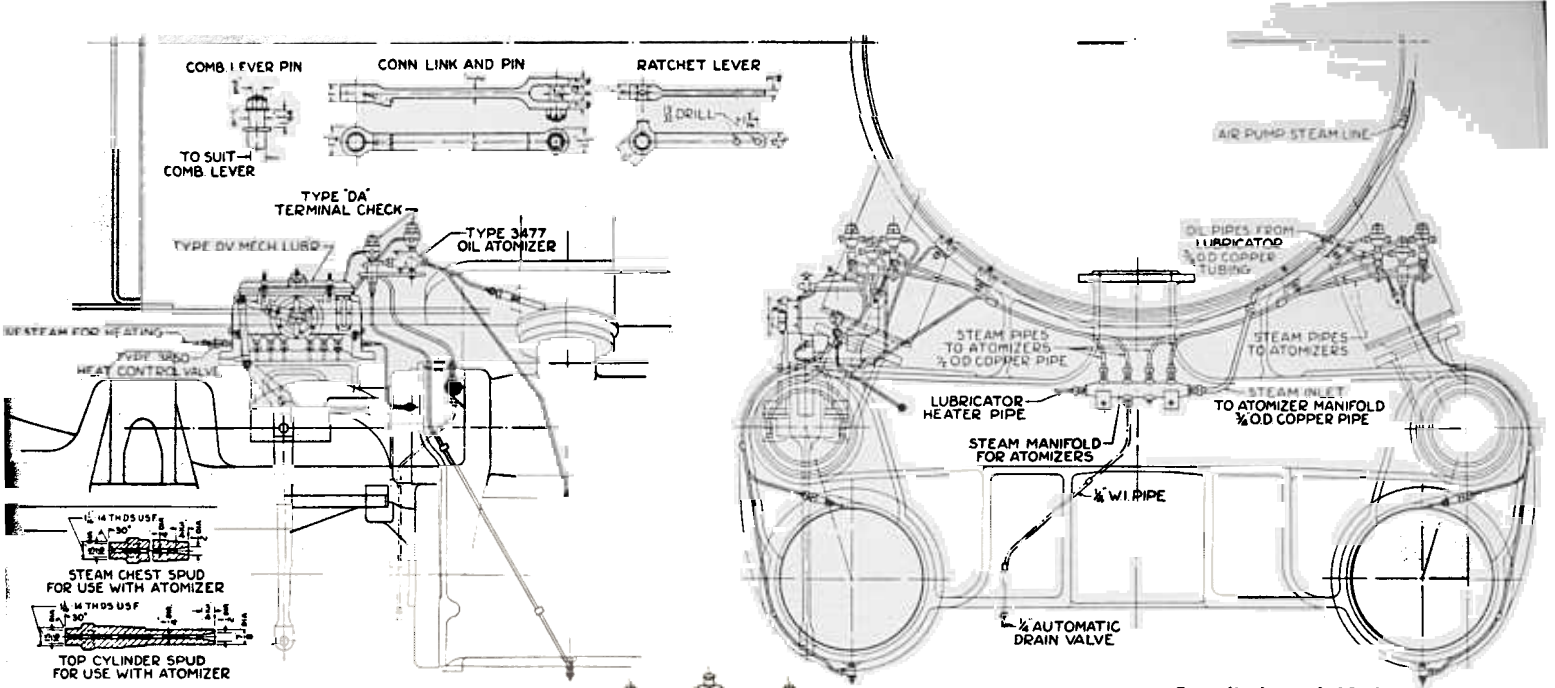
**Detroit Bullseye Locomotive Lubricators**



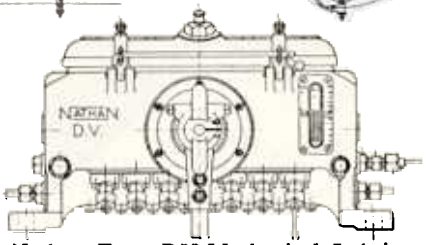
#42 Five Feed Standard




The Lima steam brake equipment for Shay locomotives




Installation of Nathan Type DV. Mechanical Lubricator and Oil Distributors for Lubrication of Locomotive Cylinders and Valves.




Nathan Type DV. Mechanical Lubricator.

## *Notes on MDC Consolidation Drive*

Dear Bob,

**Pensacola, Florida:**

The Gulf Coast Narrow Gauge Soci-

# STRAIGHT TALK ABOUT BOILER PIPES

## Cab Details

by Charles H. Givens

Now that we have examined most of the gadgets found in the locomotive cab let's take a look at them in their natural habitat. This month we will look into the cab of Caspar, South Fork & Eastern #5, a very small 2-6-6-2. This engine was an oil burner, thus the fireman's (left) side and the fire-box door are different than those of a wood or coal burner.

First, a few general notes. All controls and gauges must be accessible/visible from the engineman's seats, except the rarely touched main turret steam valves and controls such as air pump, generator, injector stop valves, lubricator steam valve, and oil firing steam manifold main valve. None of these require any use while running except in rare instances.

Let's start on the fireman's side. After all, he boils the water! Gauge glass and steam gauge must be visible from his seat. Injector controls and blower valve ditto. On oil burners the firing valve and attendant steam valves must also be conveniently placed for the fireman's use.

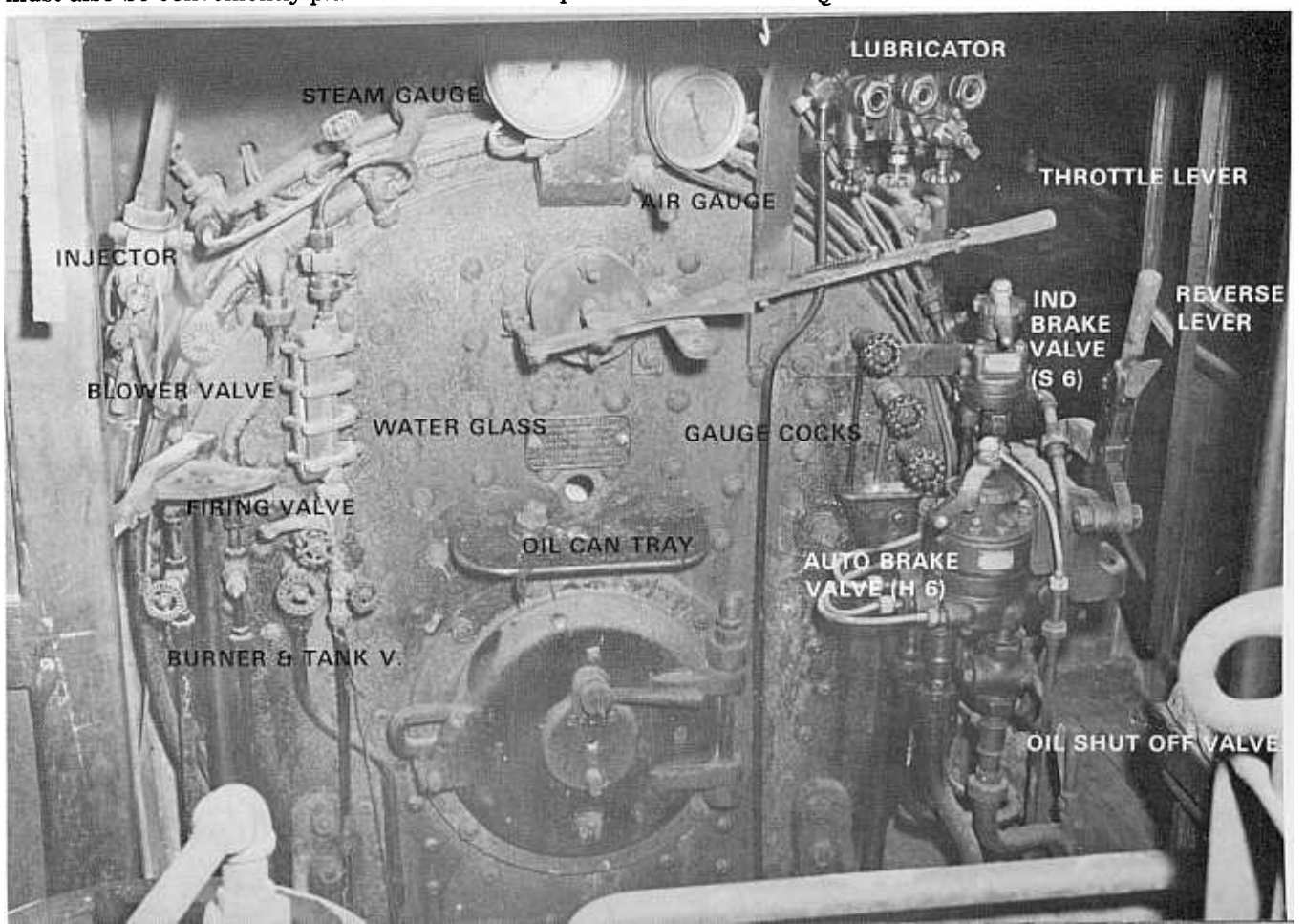
The tray above the firedoor is used as a resting place for oil cans and long oilers when the engine is in service. Number 5 had been slumbering ten years in the enginehouse when the photo was taken.

On the engineer's side things are more crowded and complex. The throttle lever is angled to have the handle at a convenient height—it slants up on this and other small engines, down on larger engines. The reverse lever must clear the side of the boiler, must allow leg room, and should be convenient. The brake valve handles are always located for easy use, usually with the independent valve mounted higher as here. Of course, the steam and air gauges must be easily visible and the water glass usually is also, but not on this engine. The lubricator must have its sight glasses visible and regulating valves accessible, although on larger engines the engineer may have to stand up to check the operation as location height is critical to the lubricator's proper operation.

This engine has seatboxes for the crew. Many engines, especially "deckless" types such as D&RGW C-classes, used a drop seat to allow ingress and egress.

Other controls in the cab include the whistle lever or cord from the cab roof, engineer's side; Bell cord strung to cab roof, fireman's side; cylinder cock lever or air actuating valve, engineer's side; sander lever(s) or air valve(s) engineer's side; and headlight and cab light switches over the side window (above the seat) on one or both sides.

With this installment we have covered most of my original goals on presenting appliances and piping for smaller locomotives. We will next turn our attention to brakes on other rolling stock. Do you have any suggestions for future topics? If so, please let me know, c/o the **GAZETTE**.



# STRAIGHT TALK ABOUT PIPES

by Charles H. Givens

Let's leave those dirty old steam engines this month. Instead let's examine air brake equipment on other rolling stock. Until about 1934 all freight cars used simple and fairly uniform appearing air brake apparatus. Each car usually had the following:

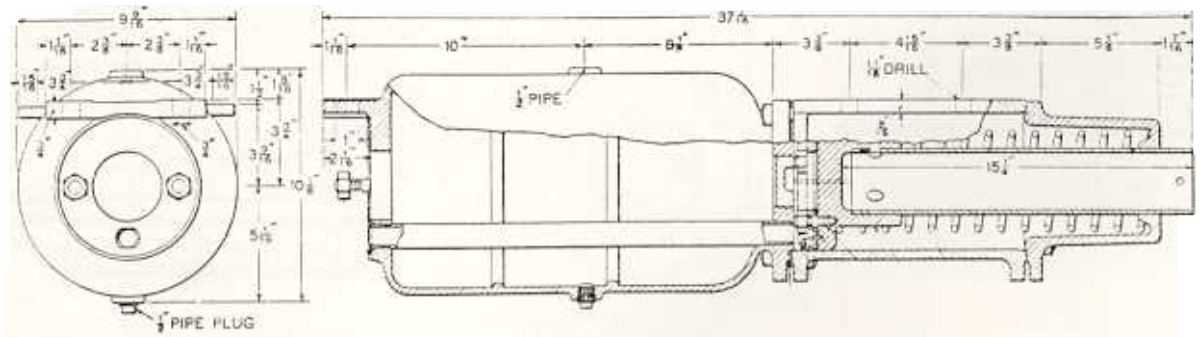
1. Triple valve
2. Auxillary reservoir
3. Brake cylinder
4. Release valve
5. Angle cock and hose (on each end of car)
6. Retaining valve
7. Piping
8. Foundation brake rigging (the levers, rods and brakeshoes to apply the braking force)
9. A hand brake (usually on both ends on cabooses)

The old standard was HC and HD equipment introduced in 1887 using type-H triple valves, which was superseded by KC and KD equipment using type-K triple valves about 1906. The K triples are in use to this very day on Colorado narrow gauges and other operations, but were banned from ICC interchange right after World War II. As modelers we don't need to worry about the differences, as the H and K triples were visually identical, except for the cast-in letters on the valve body.

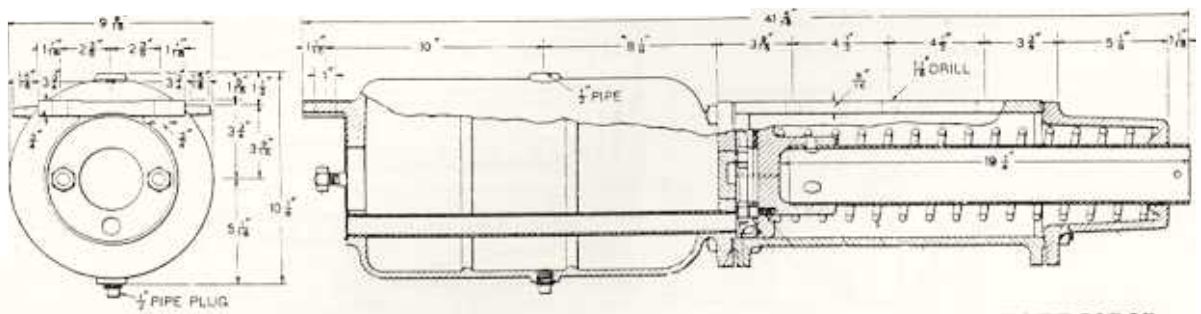
The HC and KC systems were built around the combined brake cylinder and cast iron auxillary reservoir with the triple valve bolted on the reservoir end and the release valve screwed into the reservoir body. Thus all major air-operated parts were in one unit. Five brake cylinder sizes covered all sizes of rolling stock. These were 6" × 8", 6" × 12", 8" × 8", 8" × 12", and 10" × 12".

For cars (mainly hopper and ore cars) which had obstructions preventing use of the HC or KC types the HD (and later KD) detached type was available. This had a cast iron reservoir with the triple valve bolted on, but the brake cylinder was a separate piece to allow more convenient positioning of the parts.

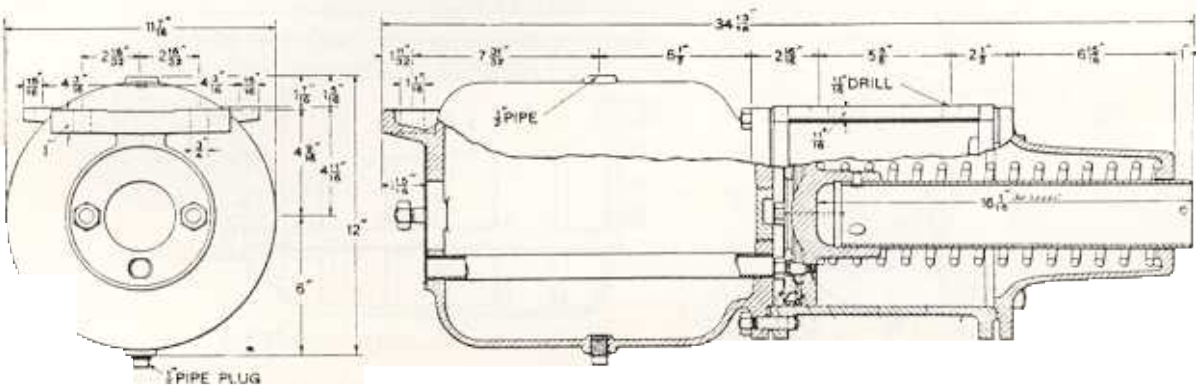
TYPE C (Combined) 6"x8" FREIGHT BRAKE CYLINDER AND RESERVOIR



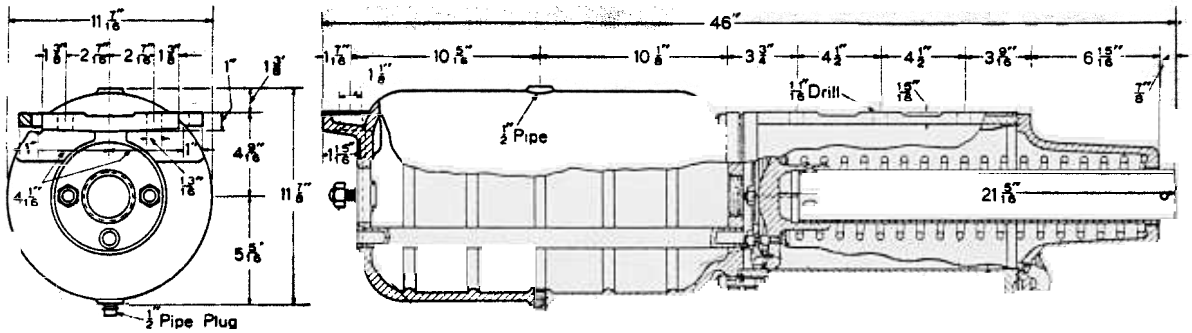

TYPE C (Combined) 6"x12" FREIGHT BRAKE CYLINDER AND RESERVOIR




TYPE C (Combined) 8"x8" FREIGHT BRAKE CYLINDER AND RESERVOIR

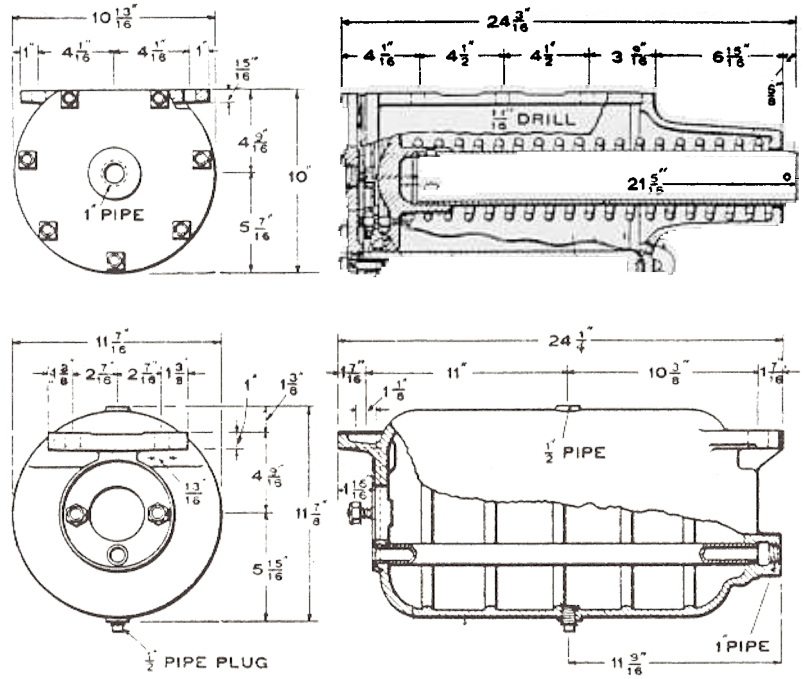


## TYPE C (Combined) 8"x12" FREIGHT BRAKE CYLINDER AND RESERVOIR

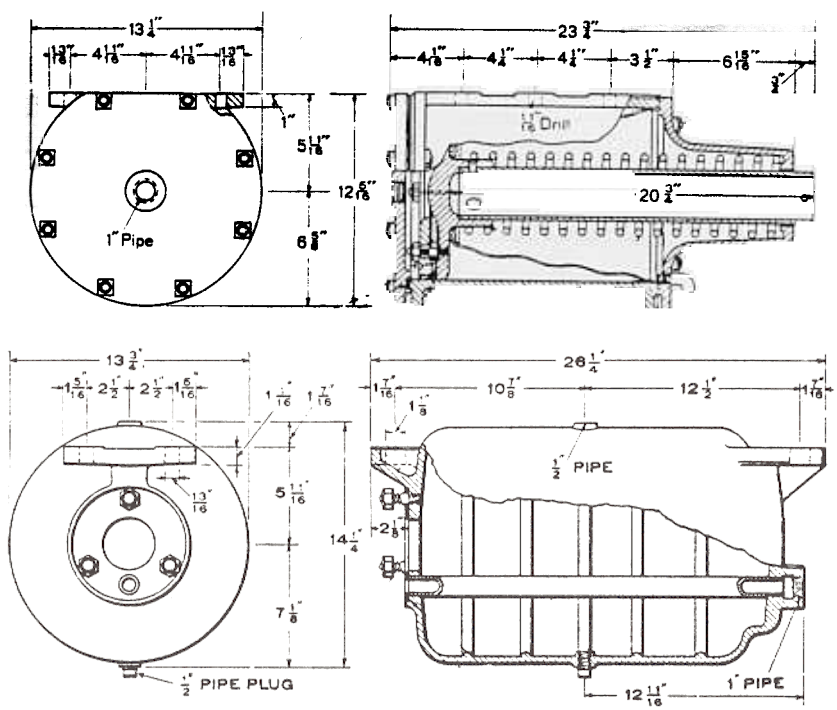



## TYPE D (Detached) 8"x12" FREIGHT BRAKE CYLINDER AND RESERVOIR

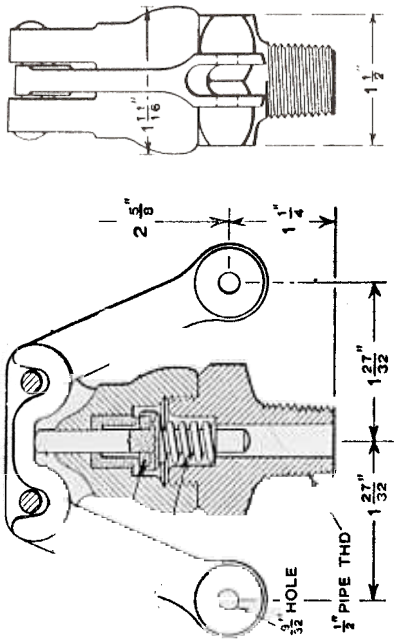
Illustrated here are four sizes of combined brake cylinder reservoirs and two sizes of detached brake cylinder reservoirs. Also presented are enlarged views of a triple valve and a reservoir release valve. Both triple valves and reservoir release valves are shown in place on each of the drawings of reservoirs; triple valves are attached to the left of the reservoirs, reservoir release valves are screwed into the bottom of each reservoir.



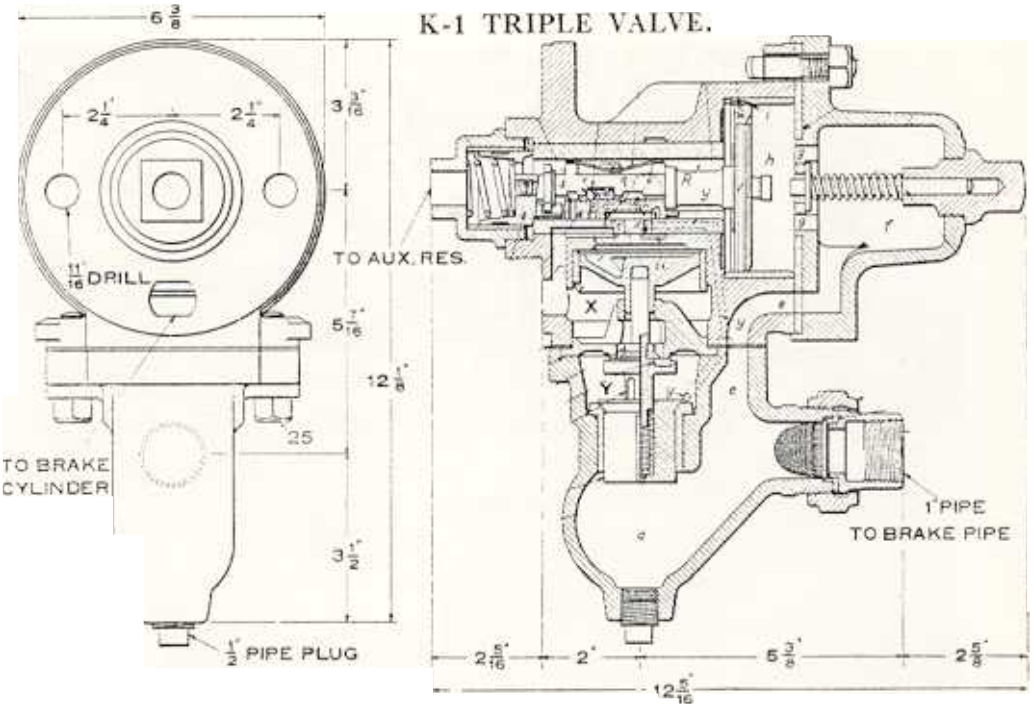

## TYPE D (Detached) 10"x12" FREIGHT BRAKE CYLINDER AND RESERVOIR



RESERVOIR RELEASE VALVE.




K-1 TRIPLE VALVE.

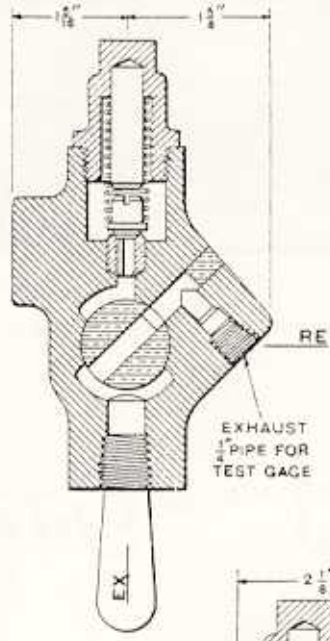


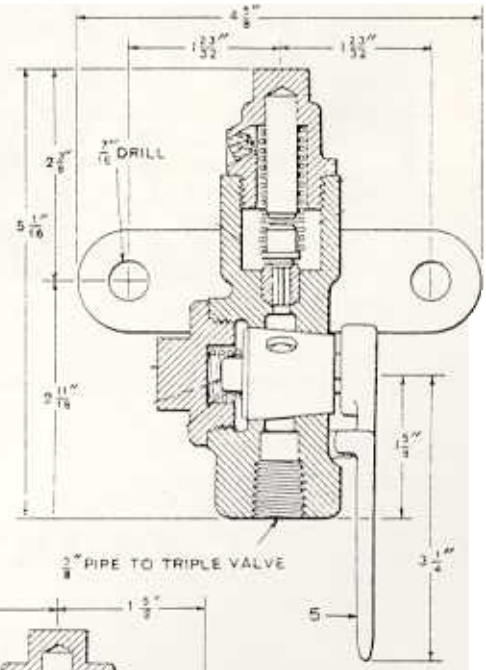

## PRESSURE RETAINING VALVES

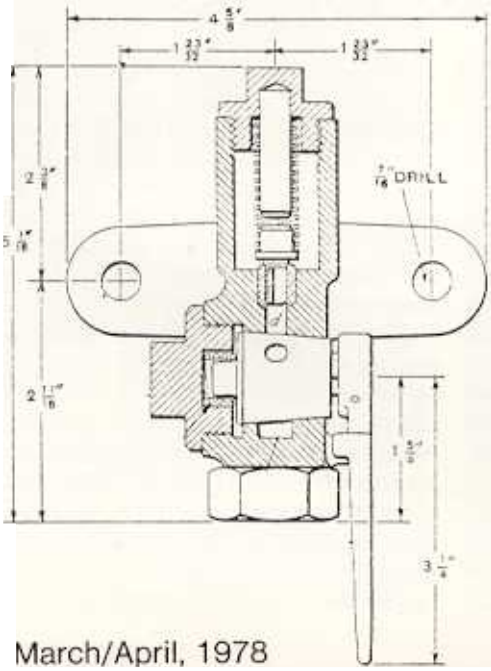
SINGLE PRESSURE SPRING TYPE

The retaining valve was always near the hand brake and many styles have been used over the years. This is one item that did change its visual shape several times. First came weight types, single and double pressure, followed by spring types, also single and double pressure types in several external appearances. Two types of pressure retaining valves are illustrated.

Air brakes on passenger cars will be discussed another time.

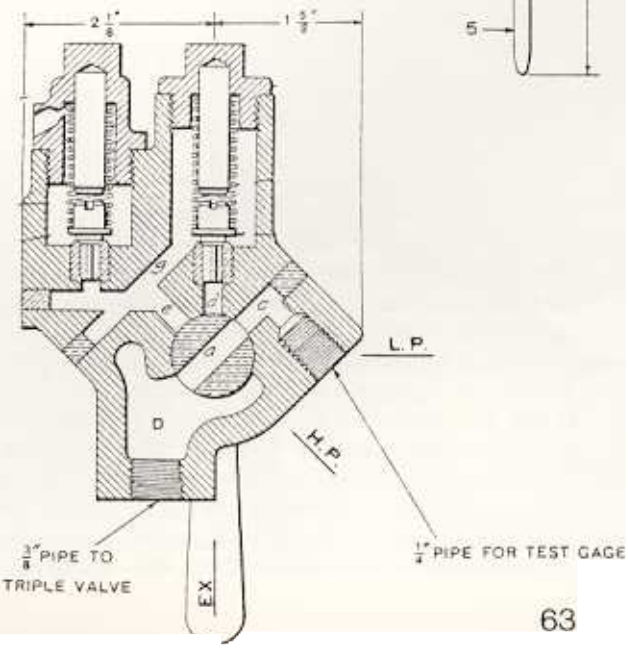



PRESSURE RETAINING VALVES

DOUBLE PRESSURE SPRING TYPE



# Straight Talk About Air Pipes

**by Charles H. Givens**

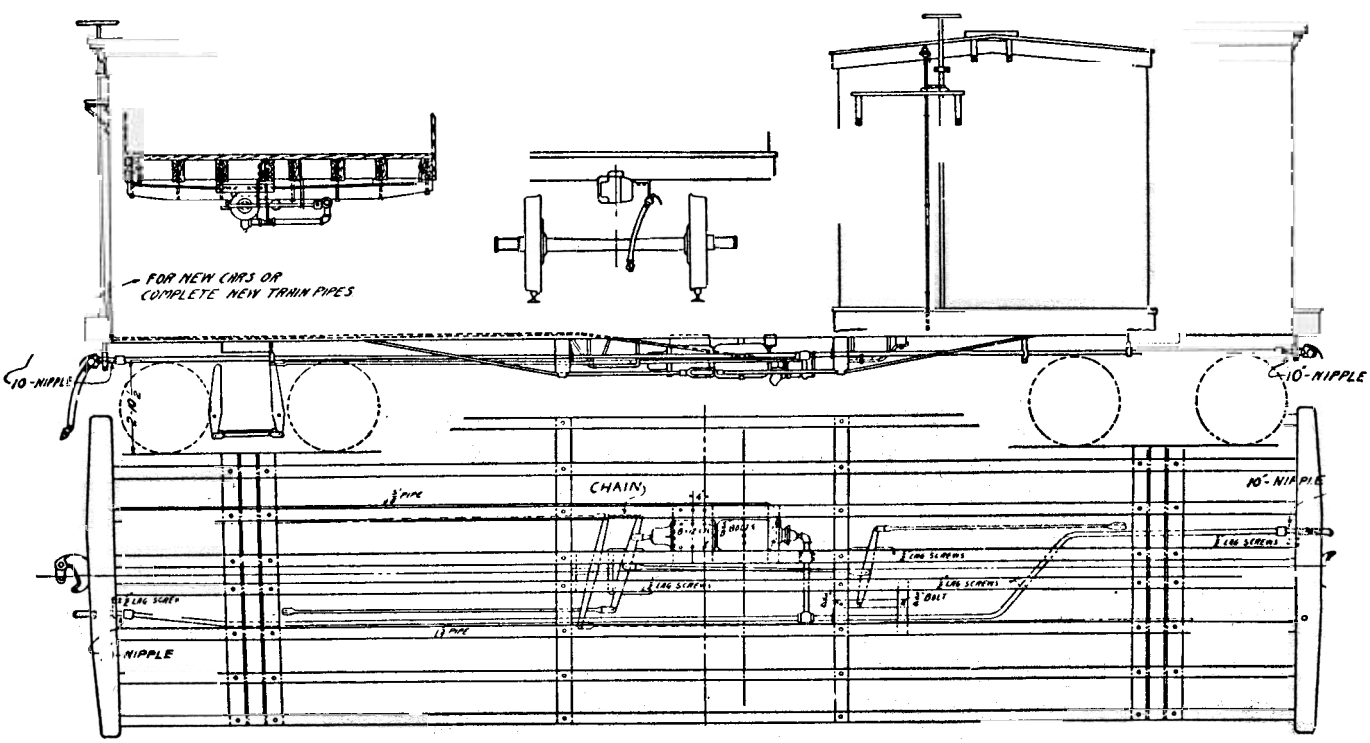
In the March/April **GAZETTE** I described freight car brake cylinders, reservoirs and retaining valves. In this issue I will provide some diagrams that show KC equipment installations and a hopper with KD (separate) equipment.

The only new brake system part introduced is the hand brake. The old standard brake wheel on a vertical shaft simply wound a chain on the bottom of the shaft to pull the rods tight and apply the brakes. A ratchet and a pawl kept the brakes applied when desired.

The newer Ajax and Minor geared brakes are self-contained with a vertical brake wheel. When applied, the rod below is raised and works the rigging through a bell crank.

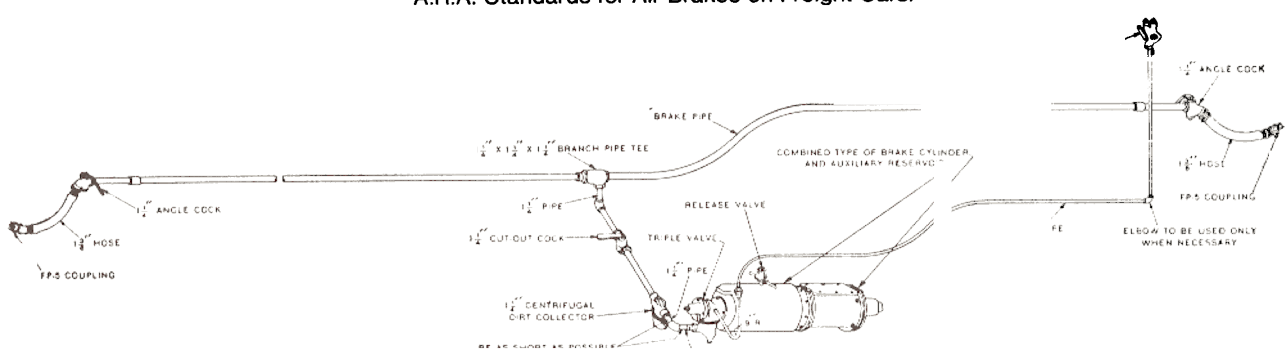
Note that the retaining valve is always near the handbrake wheel.

The next issue will have more detail on foundation brake rigging.

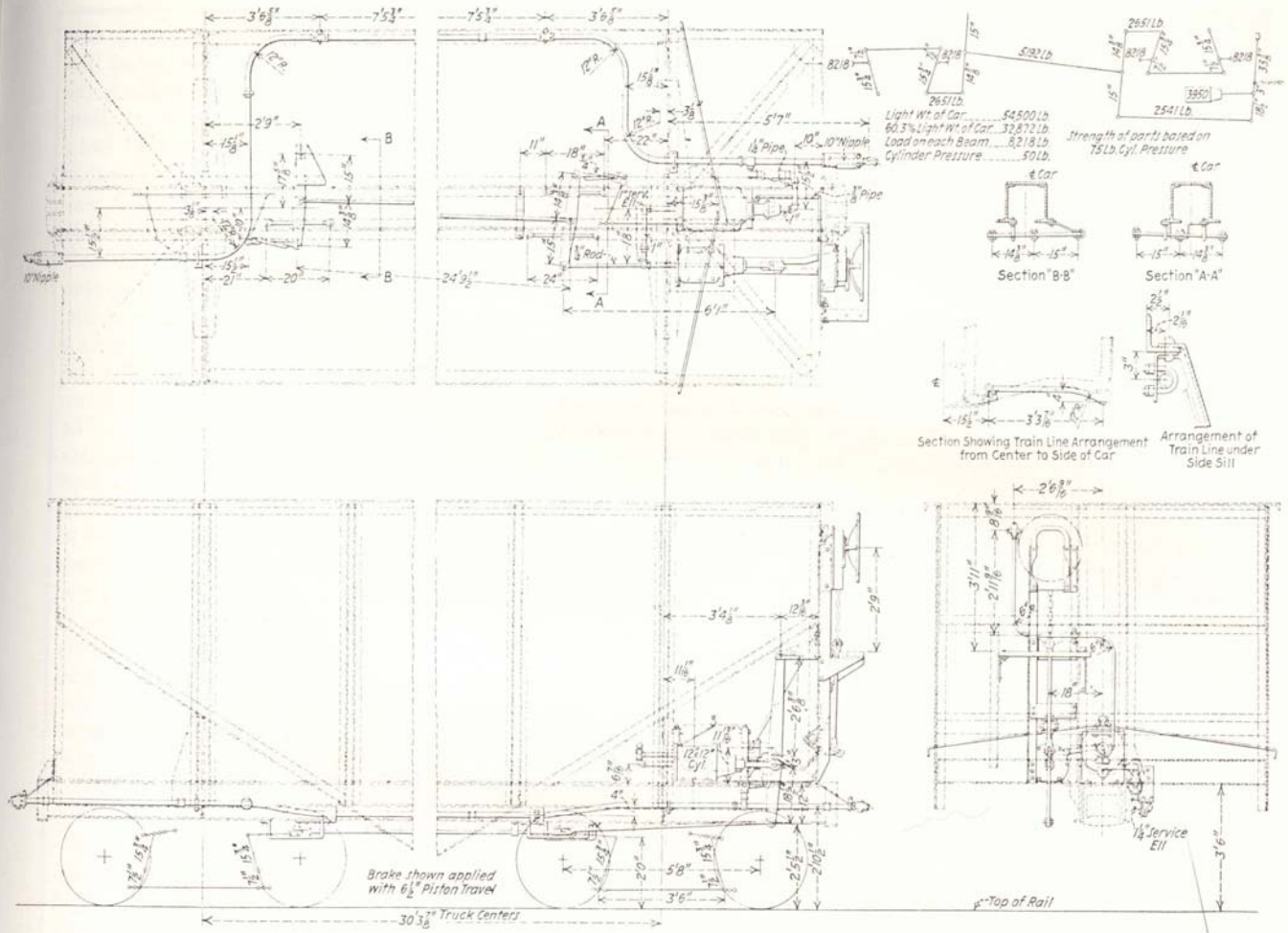



GENERAL ARRANGEMENT

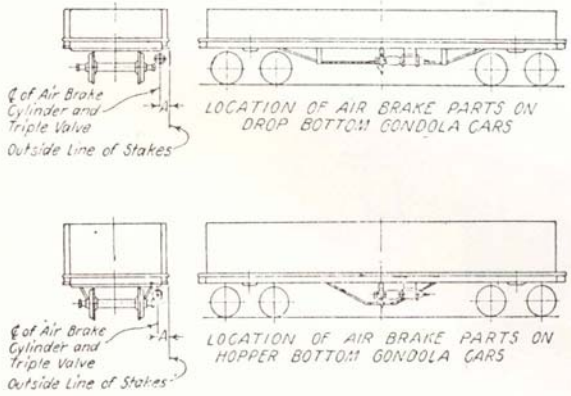
A.R.A. Standards for Air Brakes on Freight Cars.




Westinghouse KC Single Capacity Brake Equipment for Freight Cars.



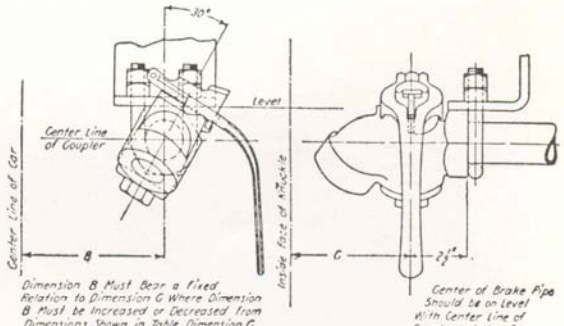

General Arrangement of Brake Mechanism on Chicago & North Western 70-Ton Capacity Quadruple Hopper Car. Builder, Pressed Steel Car Company.




NOTE.— Dimension "A" From Center of Air Brake Cylinder and Triple Valve to Outside Line of Stakes Should be Made to Suit Construction of Car, Locating the Air Brake Cylinder and Triple Valve as Near to the Outside Line of Stakes as Practicable for Safety and Convenience in Cleaning and Repairs.

Bolts Securing Brake Cylinders, Auxiliary Reservoirs and Pipe Clamps to Have Double Nuts or Lock Nuts, Preferably the Latter.

General Arrangement of Air Brakes on Drop Bottom and Hopper Cars.




| | B | C |
|---|---|---|
| Wooden Underframe Cars | 13" | 13" |
| Steel Underframe Cars Built after 1916 | 15" | 9" |
| For new cars or cars having "D" Couplers | 15½" | 8" |

Location of Main Air Pipe and Angle Cock.

# Straight Talk About Brake Pipes

**by Charles H. Givens**

The foundation brake rigging consists of the brake shoes and all of the brakebeams, rods, and levers that connect the shoes to the brake cylinder (or cylinder) and to the handbrake wheel.

Let's start at the brake shoes. On most old equipment the brake beams and shoes were body hung outside the truck frames. The brake beams were generally made of wood, and the brake shoes came in many patterns. Most equipment after about 1900 used inside truck hung metal brake beams. Figure 1 shows a typical brake beam and a standard brake shoe. Figure 2 shows the differing positions of the brake shoes on typical freight car trucks when the brakes were hung either outside or inside the truck frames.

A series of levers and rods connects the brake beams to the brake cylinder. A couple of general design factors should be kept in mind. First, the rods are *always* in tension ready to apply the brakes. Next, a "floating fulcrum" design is almost always used which equalizes the force at each brake shoe (Figure 3). The levers are attached to the car body at a minimum number of points. Usually one connection is made at each truck and one end of each lever is pinned to the car body.

The one exception to the "tension-only" rule is the brake cylinder push rod. The brakes are applied when the piston/piston rod/push rod assembly is forced out by air pressure. This arrangement eliminates piston rod packing and leakage. All brake cylinders for cars and most for locomotives work this way.

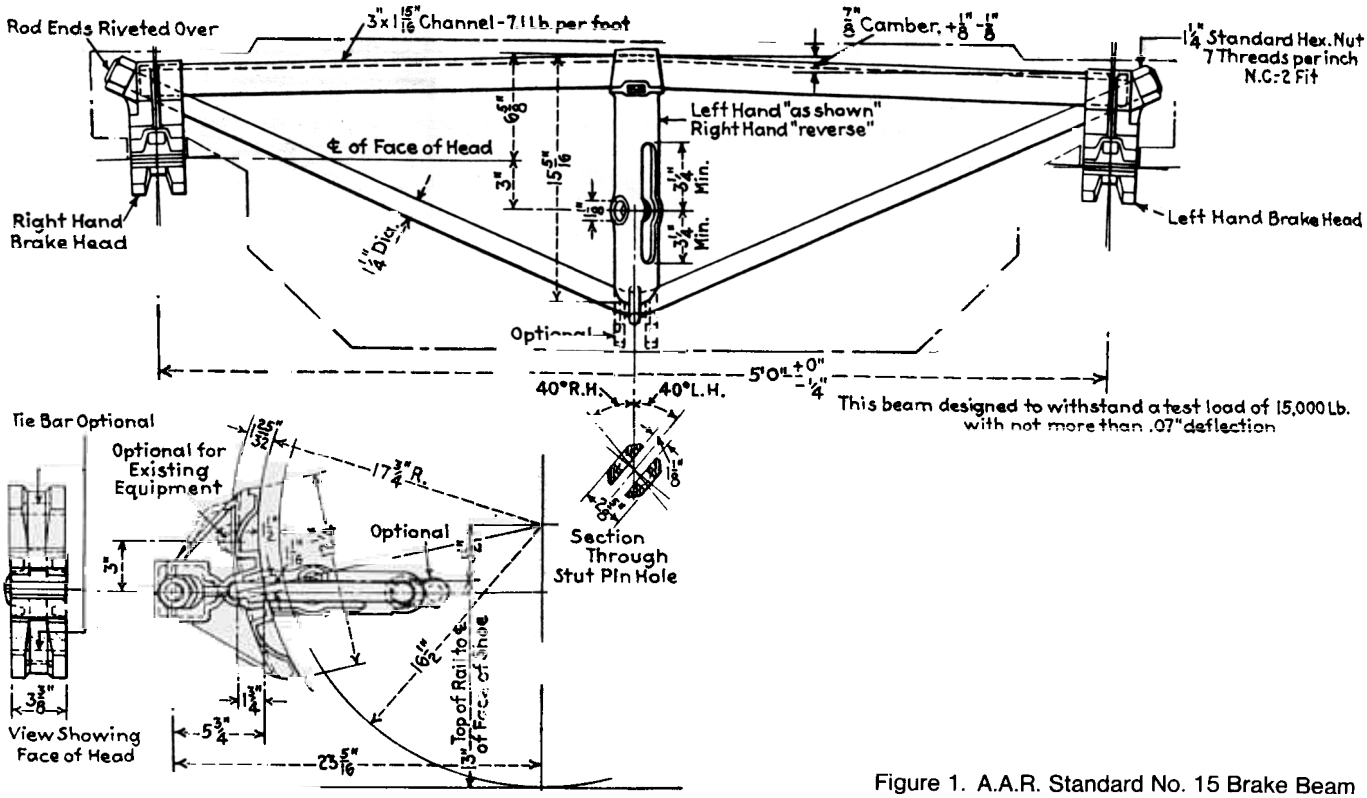
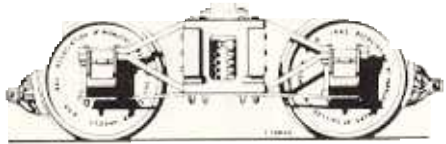
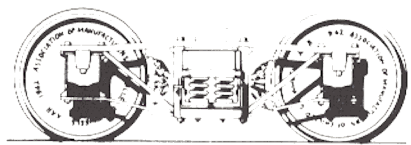



Figure 1. A.A.R. Standard No. 15 Brake Beam

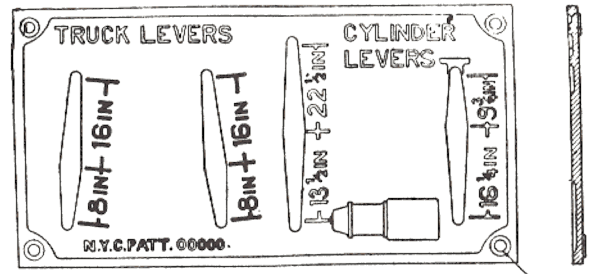


OUTSIDE HUNG BRAKES



INSIDE HUNG BRAKES

Figure 2. Truck drawings modified from Cooch Enterprises.



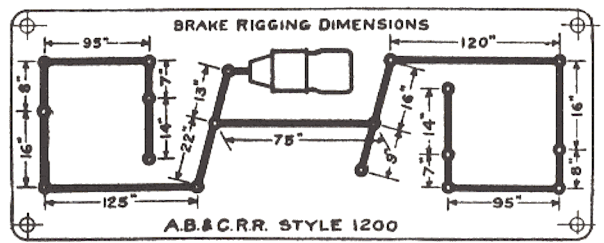




Figure 3. Typical A.A.R. Brake Lever Badge and Dimension plates.

# Straight Talk About Bent Pipes

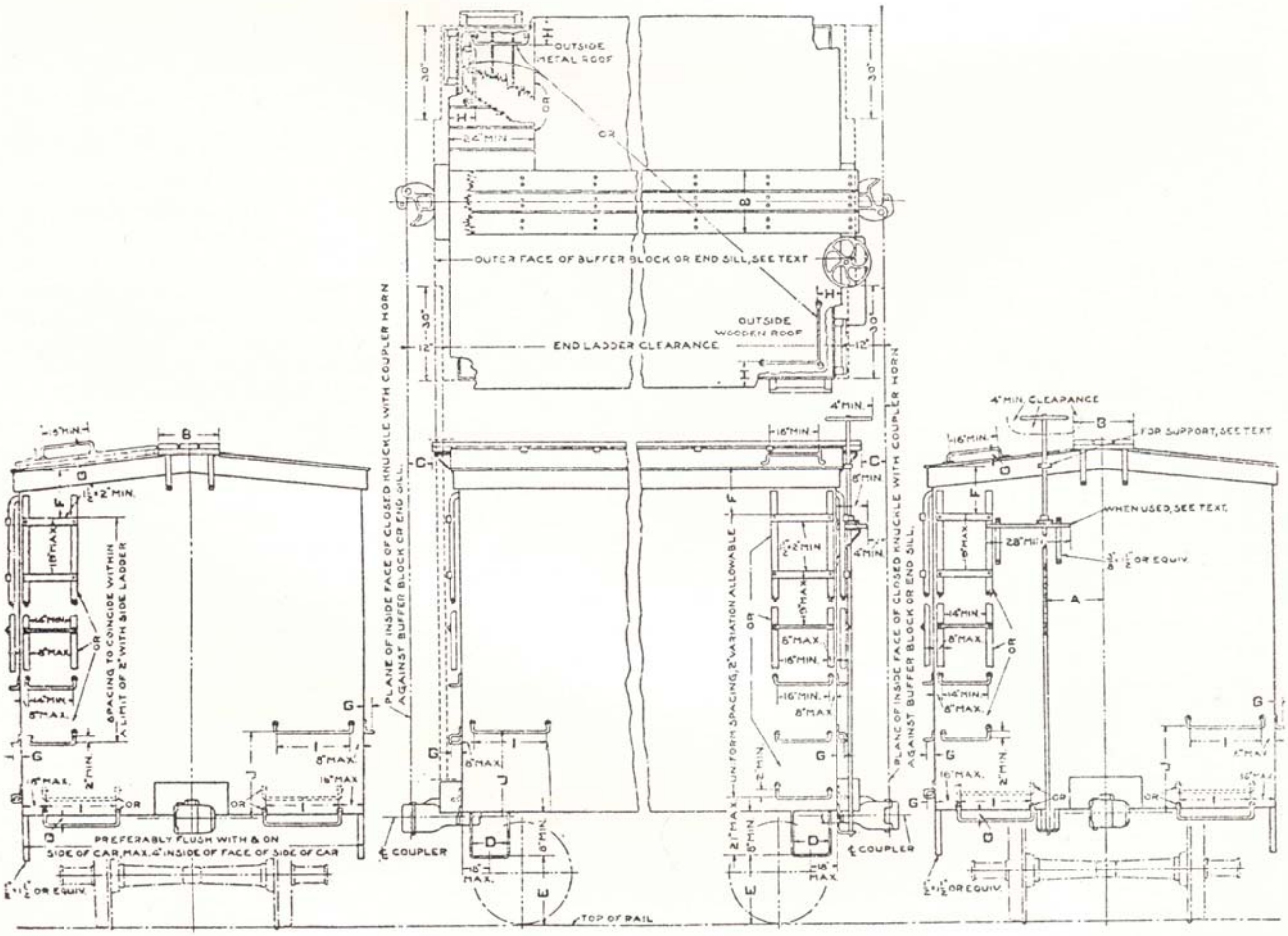
by Charles H. Givens

## Box and Refrigerator Car Safety Appliances

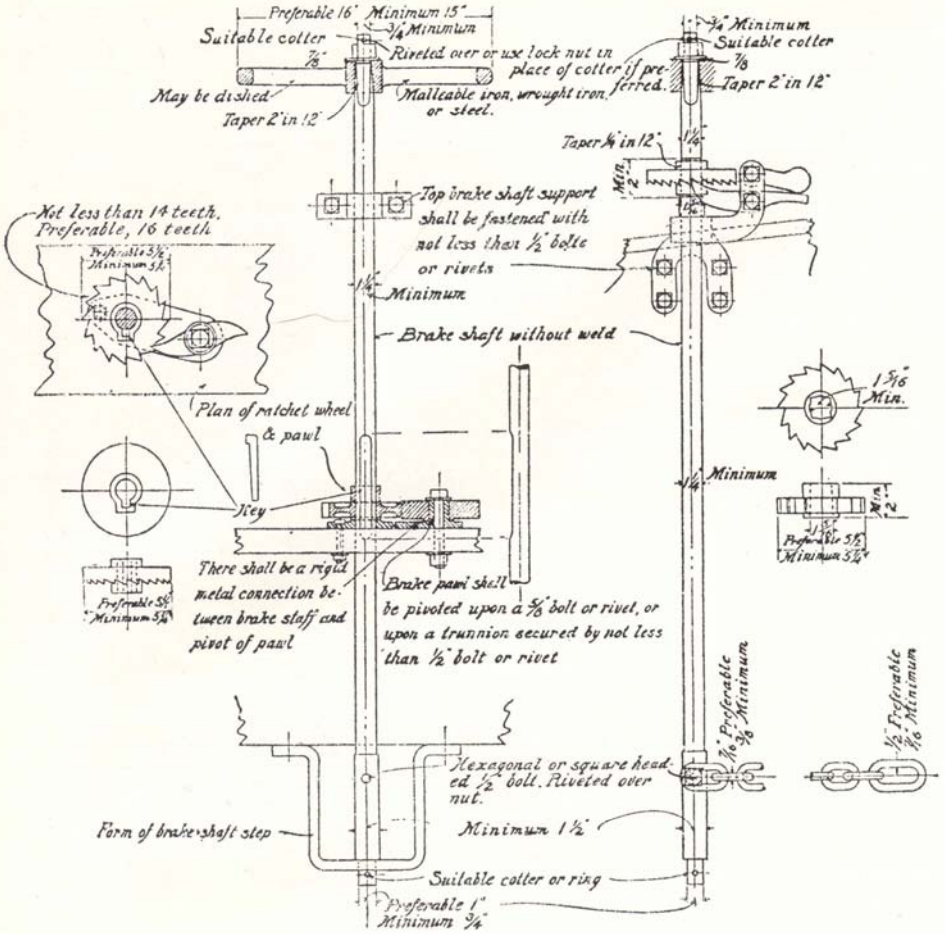
From December 9, 1911, until well after the steam era few changes were made in safety appliances and their location. In fact, the only really big change was the use of geared handbrakes such as Ajax, Minor and Klasing. These geared handbrakes started being applied in the 1930's and were mandatory on ICC interchange cars in the late 1940's. The biggest change was eliminating running boards and access to car tops in the late 1960's through 1970's.

All ICC common carrier railroads must follow ICC rules, whether they are standard or narrow gauge. Many logging and industrial lines also follow these rules: some are required by state law, others must follow these rules because of trackage rights over common carriers. For example, the Pickering Lumber Company operated over Sierra RR rails from Fassler to Relph and was thus subject to all ICC safety rules.

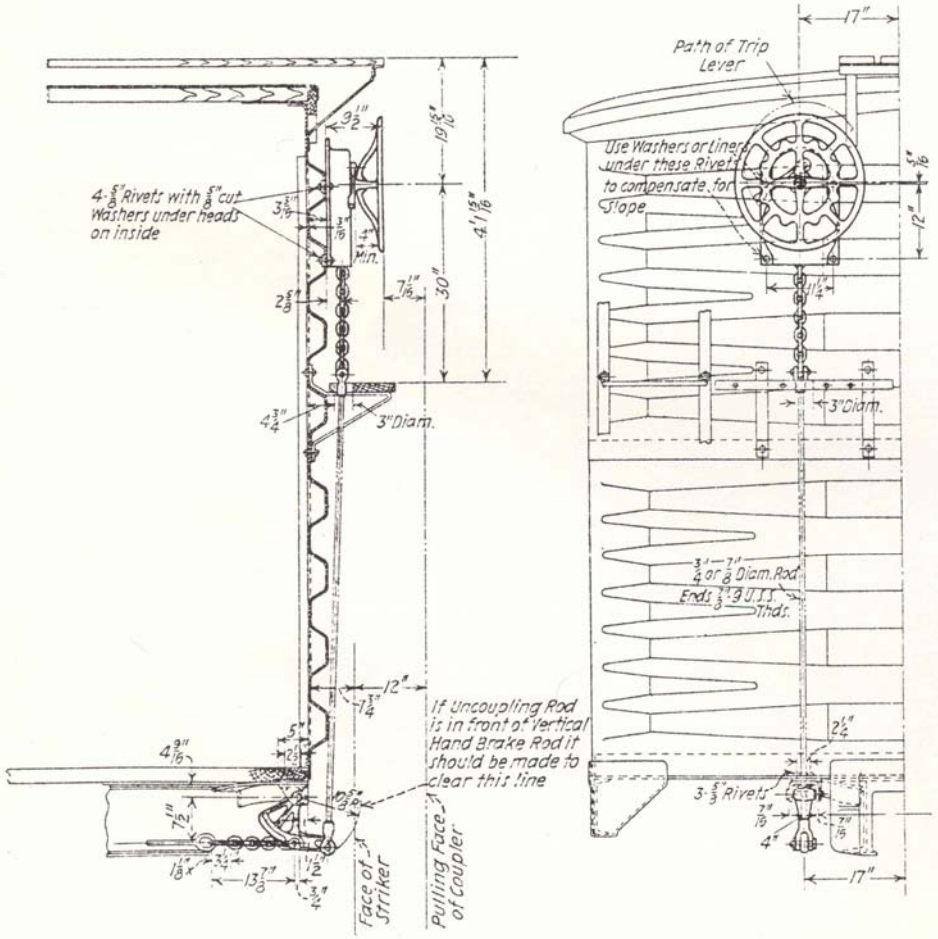
The diagrams this month show the application of safety appliances on box and refrigerator cars.




Standard Safety Appliances for Box and Other House Cars.




Standard and Safety Appliances for Brake Wheel, Shaft, Etc.



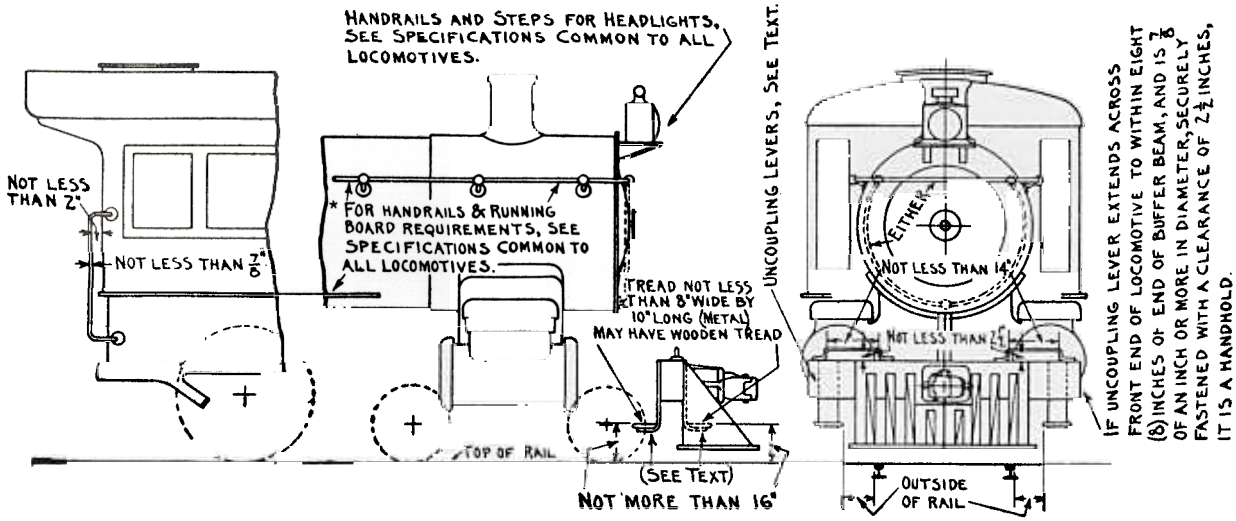

Application of Ajax Hand Brake to Box Cars. Ajax Hand Brake Company.

# Straight Talk About Bent Pipes

**by Charles H. Givens**

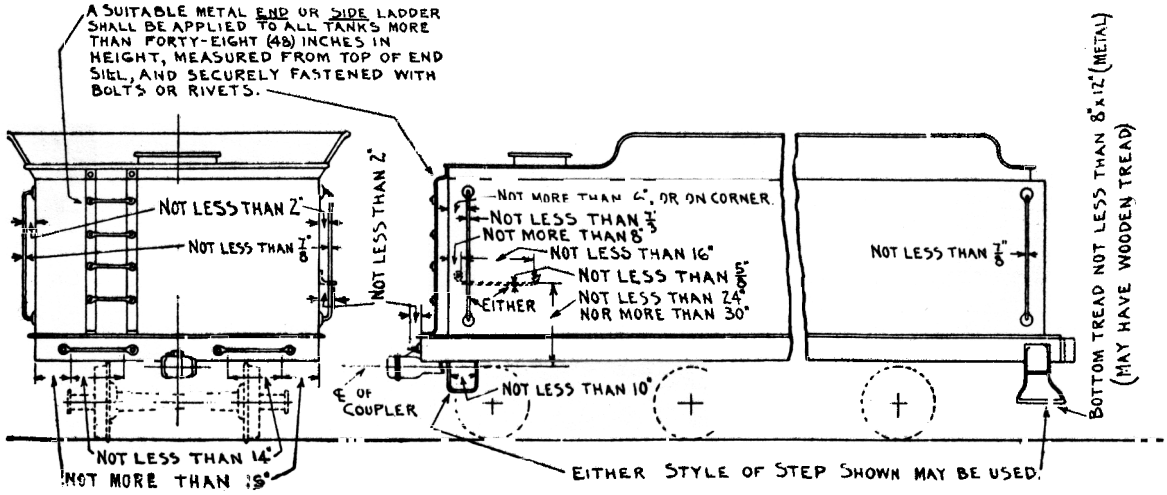
If you model most any American railroad from 1915 to 1955 or so, your steam motive power should conform to the standards presented here and in the next Bent Pipes in January. These standards were mandatory on all ICC roads and were followed by most industrial and logging lines as well. Many states had industrial safety laws before OSHA. State standards were similar to the ICC standards.

Only very specialized service, such as some steel mill or mine switching service might have had other standards. Very decrepit operations might knock off some parts and not replace them, but in general, equip your motive power as illustrated and your road will be legal!

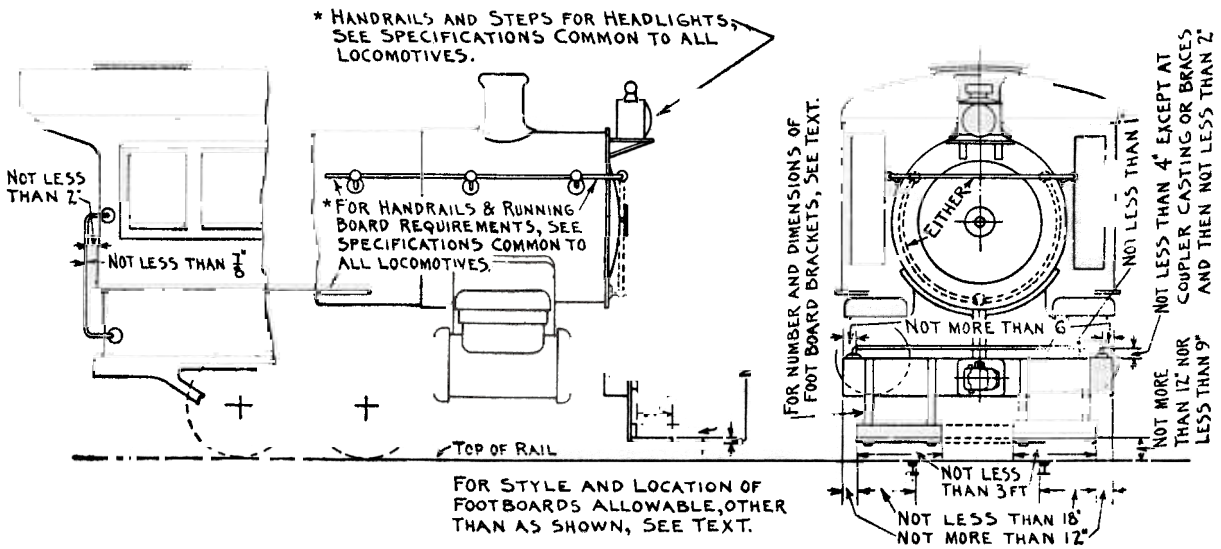



Application of Safety Appliances on Steam Locomotives Used in Road Service.

*These specifications will appear in the January issue.

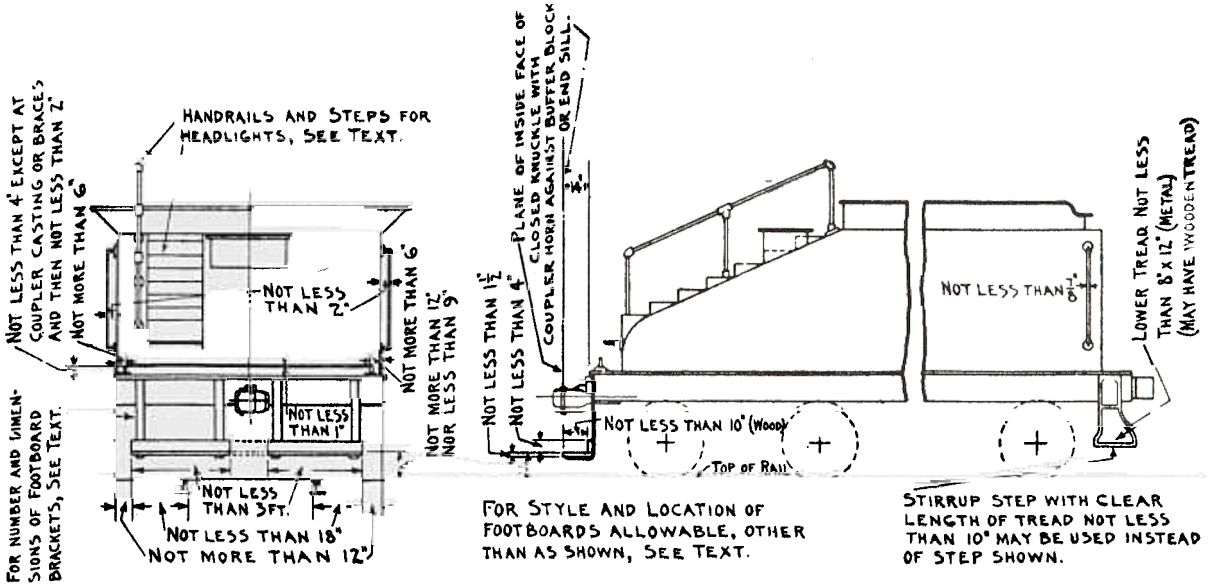



Application of Safety Applicances on Tender of Steam Locomotive Used in Road Service.




Application of Safety Appliances on Engine of Steam Locomotive Used in Switching Service.

*These specifications will appear in the January issue.

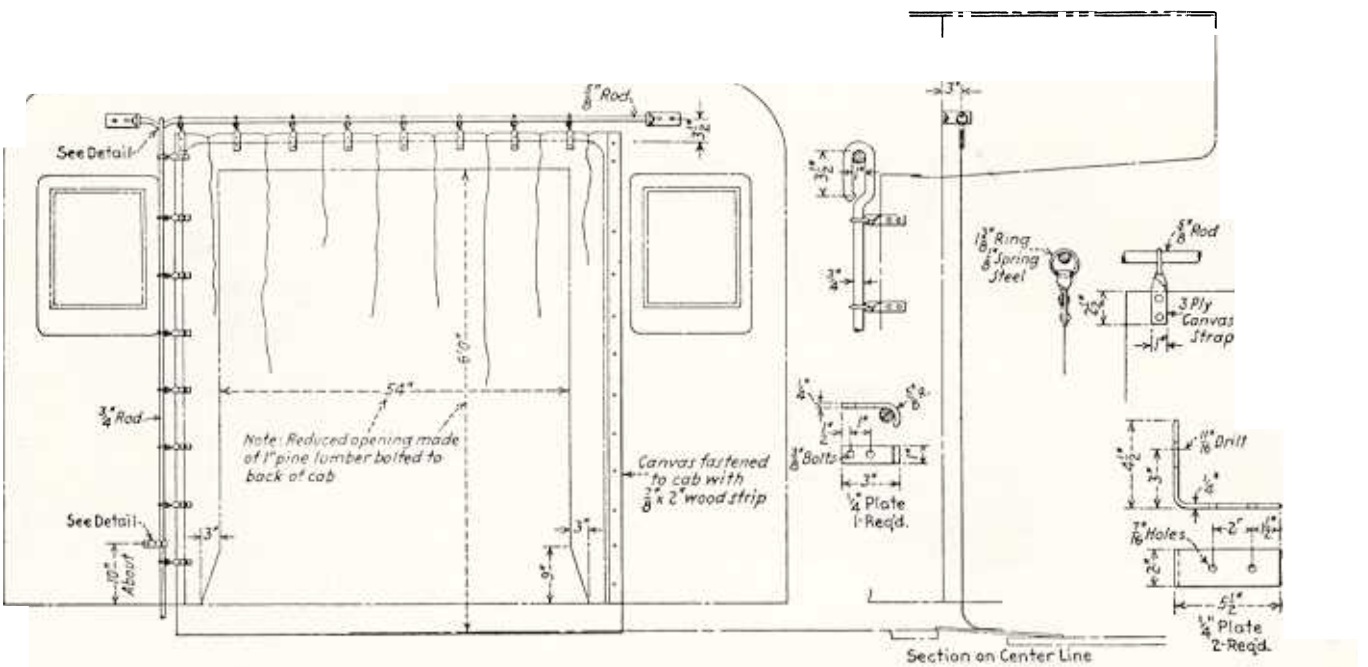



Application of Safety Appliances of Tender of Steam Locomotive Used in Switching Service.

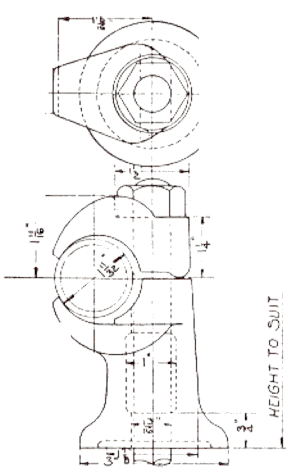
# Straight Talk About Sand Pipes

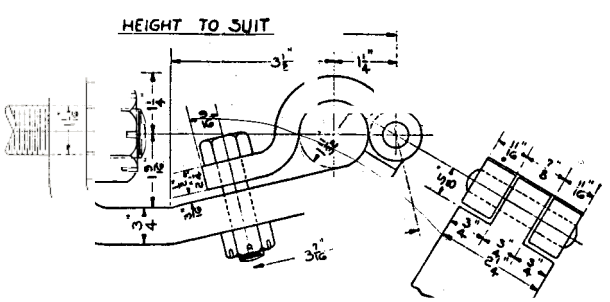
**by Charles H. Givens**

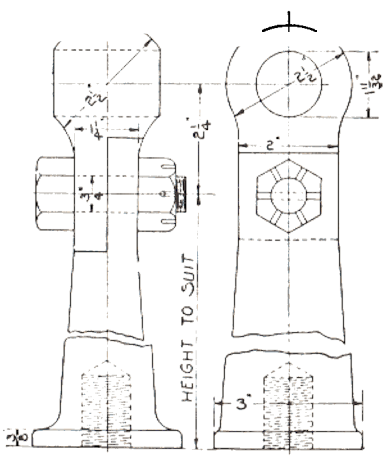
Here is the balance of the steam locomotive safety appliance data started in the Nov/Dec issue. A few notes are in order. First, note that hand brakes were not required on locomotives or tenders. As a practical matter most were equipped with handbrakes on the tender only. This was usually on the front of the tender and operated from the gangway. Location could be either engineer's or fireman's side and operated by horizontal wheel, vertical wheel, or lever, A few tank engines had handbrakes. I have never seen handbrakes




Cab Back Curtain Arrangement which Meets I.C.C. Requirements for Winter Protection. Chicago, Milwaukee, St. Paul & Pacific




Designs of Hand Rail Columns Submitted in 1925 Report of A.A.R. Committee on Locomotive Design and Construction.

on a geared engine. When left unattended locomotives were usually left chained to the rail, rather than depend on brakes. On some large engines, such as the SP, the handbrake lever was on the back of the oil tank and operated from the top of the water tank. On the other hand, recent research indicates that most SP 0-6-0's had no handbrakes. Absence or presence of the handbrake can be hard to determine from photos unless you are lucky enough to have a clear shot of the front of the tender. Sometimes you just have to guess.

The standards did not take oil burners into account. Some more grab irons usually appeared on the front of the oil tank and often on top of the oil tank as well.

Sometimes but not regularly handrails were used inside the cab, across the backhead being about the only such use I have noted.

Not exactly safety appliances but also covered by ICC regulations was the cab curtain. Usually made of canvas, this often rolled up like a window curtain and was held up over the rear cab opening with leather straps. Other designs opened sideways. Cab curtains were not always found on cabs in southern climates.

Last for now — handrails and grab-irons were usually of the minimum required diameter. Also, steps were placed on the side of the boiler to allow access to sand dome covers, whistle and pop valves and dynamo. These are easily placed from photos.

The following excerpt from a locomotive cyclopedia explains the safety standards common to all steam locomotives.

### Hand-Brakes

Hand-brakes will not be required on locomotives nor on tenders when attached to locomotives.

If tenders are detached from locomotives and used in special service, they shall be equipped with efficient hand-brakes.

### Running Boards

*Number* – Two (2).

*Dimensions* – Not less than ten (10) inches wide. If of wood, not less than one and one-half (1½) inches in thickness; if of metal not less than three-sixteenths (3/16) of an inch, properly supported.

*Location* – One (1) on each side of boiler extending from cab to front end near pilot-beam. *(Running-boards may be in sections. Flat-top steam-chests may form section of running-board.)*

*Manner of application* – Running-boards shall be securely fastened with bolts, rivets or studs. Locomotives having Wootten type boilers with cab located on top of boiler more than twelve (12) inches from boiler-head shall have suitable running-boards running from cab to rear of locomotive, with handrailings not less than twenty (20) nor more than forty-eight (48) inches above outside edge of running-boards, securely fastened with bolts, rivets or studs.

### Handrails

*Number* – Two (2) or more.

*Dimensions* – Not less than one (1) inch in diameter, wrought iron or steel.

*Location* – One on each side of boiler extending from near cab to near front end of boiler, and extending across not less than twenty-four (24) nor more than sixty-six (66) inches above running board.

*Manner of application* – Handrails shall be securely fastened to boiler.

### Tenders of Vanderbilt Type

Tenders known as the Vanderbilt type shall be equipped with running-boards; one (1) on each side of tender not less than ten (10) inches in width and one on top of tender not less than forty-eight (48) inches in width, extending from coal space to rear of tender.

There shall be a handrail on each side of top running-board, extending from coal space to rear of tank, not less than one (1) inch in diameter and not less than twenty (20) inches in height above running-board from coal space to manhole.

There shall be a handrail extending from coal space to within twelve (12) inches of rear of tank, attached to each side of tank above side running-board, not less than thirty (30) nor more than sixty-six (66) inches above running-board.

There shall be one (1) vertical end handhold on each side of Vanderbilt type of tender, located within eight (8) inches of rear of tank extending from within eight (8) inches of top of end-sill to within eight (8) inches of side handrail. Post supporting rear end of side running-board if not more than two (2) inches in diameter and properly located, may form section of handhold.

An additional horizontal end handhold shall be applied on rear end of all Vanderbilt type of tenders which are not equipped with vestibules. Handholds to be located not less than thirty (30) nor more than sixty-six (66) inches above top of end-sill. Clear length of handhold to be not less than forty-eight (48) inches.

Ladders shall be applied at forward ends of side running-boards.

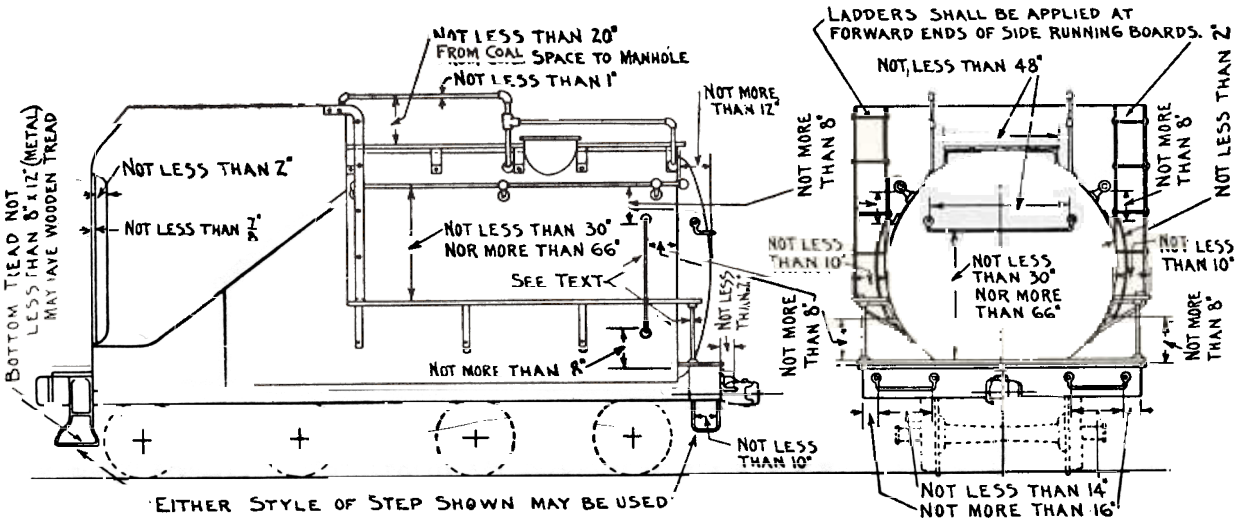
### Handrails and Steps for Headlights

Locomotives having headlights which can not be safely and conveniently reached from pilot-beam or steam-chests shall be equipped with secure handrails and steps suitable for the use of men in getting to and from such headlights.

A suitable metal end or side ladder shall be applied to all tanks more than forty-eight (48) inches in height, measured from the top of end-sill, and securely fastened with bolts or rivets.

### Couplers

Locomotives shall be equipped with automatic couplers at rear of tender and front of locomotive.




Application of Safety Appliances on Steam Locomotive Tenders of the Vanderbilt Type.
Courtesy of Gibson, Pribble & Company.