PENNSYLVANIA RAILROAD SYSTEM

Locomotive Maintenance Instructions No. L-11-D

(Superseding Instructions No. L-11-C, Dated December 23, 1921.)

ISSUED ALTOONA, PA.
JULY 20, 1925.

Instructions for Adjusting and Repairing Safety Valves Used on Locomotive and Other Boilers

The various parts of all safety valves must conform to standard tracings showing these details.

SETTING SAFETY VALVES

Adjusting Opening Pressure: To set valve at desired pressure (See Figure 1, on page 2) slack off locknut and adjust spring bolt by use of special wrenches for this purpose. For more pressure screw down on spring bolt, and for less pressure unscrew spring bolt. When setting safety valves, two steam gauges must be used, and valves set to pressures as required by Circular No. 106 and Locomotive Maintenance Instructions L-19. After spring bolt is adjusted, lock nut must be tightened.

Adjusting Closing Pressure: To regulate the pressure at which valve closes (blow back), remove adjusting ring retaining bolt and by means of any pointed instrument move adjusting ring. Valves should be adjusted to give a blow back of five (5) pounds. If the valve closes with too great a drop in boiler pressure, move the adjusting ring to the left a notch or two at a time; if the valve closes with too small a drop in boiler pressure, move ring to the right. After adjustment, replace adjusting ring retaining bolt, being careful that it enters one of the notches in adjusting ring, and then screw it firmly into place. Its omission or improper application may seriously affect the operation of the valve.

To Examine Inside of Valve: To examine inside of valve, unscrew locknut and slack-off spring bolt to relieve tension on spring, then unscrew dome and spring case when the internal arrangement of the valve will be exposed.

Removing Safety Valve from Boiler: **Do not** use hammer, set, pipe or alligator wrench to remove safety valve from its fitting on the boiler. Use special solid wrenches for this purpose. as shown on standard tracings.

COALE MUFFLED SAFETY VALVE—LOCOMOTIVE TYPE

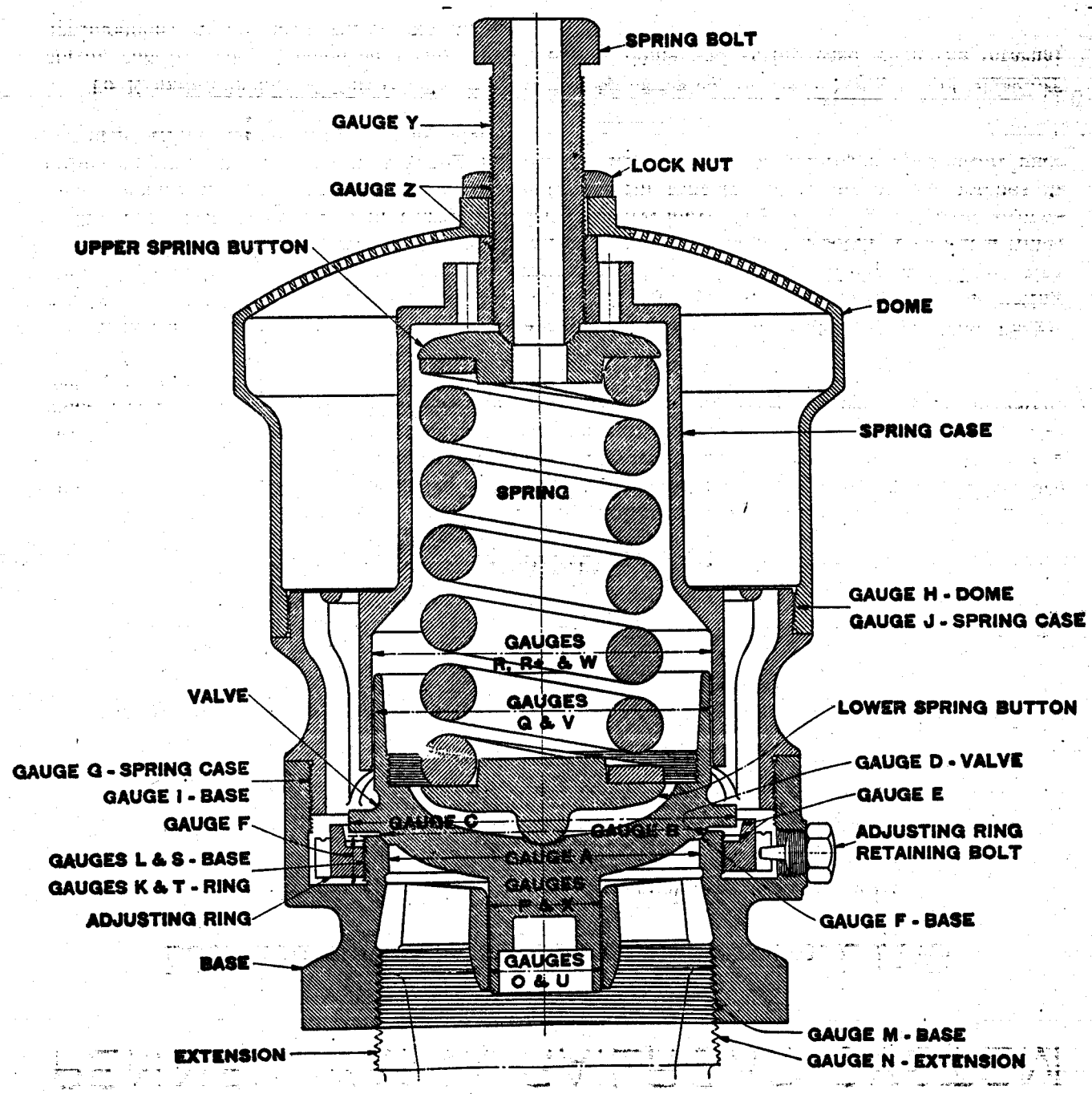


FIGURE 1

COALE SAFETY VALVE—STATIONARY BOILER TYPE

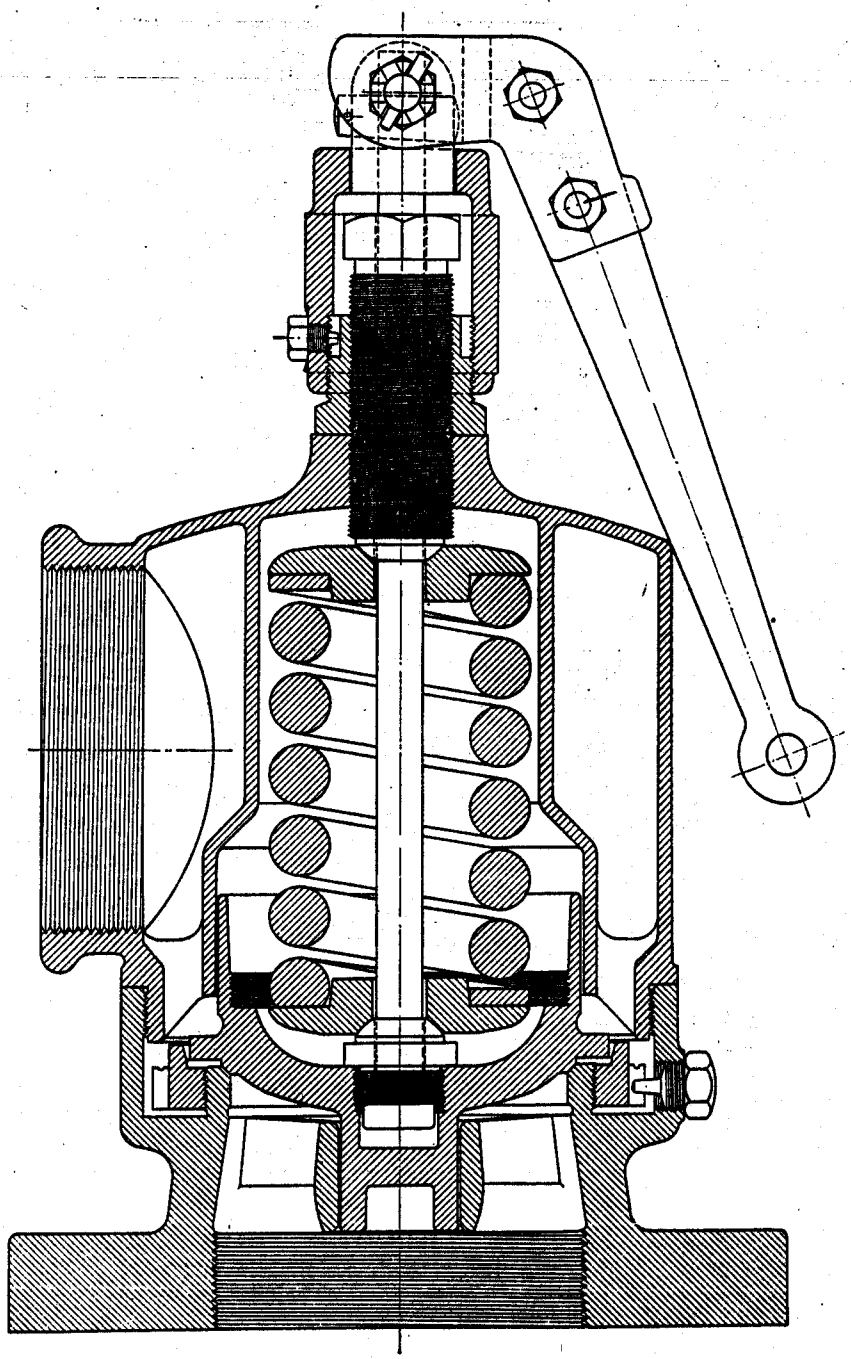


FIGURE 2

COALE MUFFLED SAFETY VALVE—LOCOMOTIVE TYPE

APPLICATION OF SPECIAL TOOL FOR HYDROSTATIC BOILER TESTS

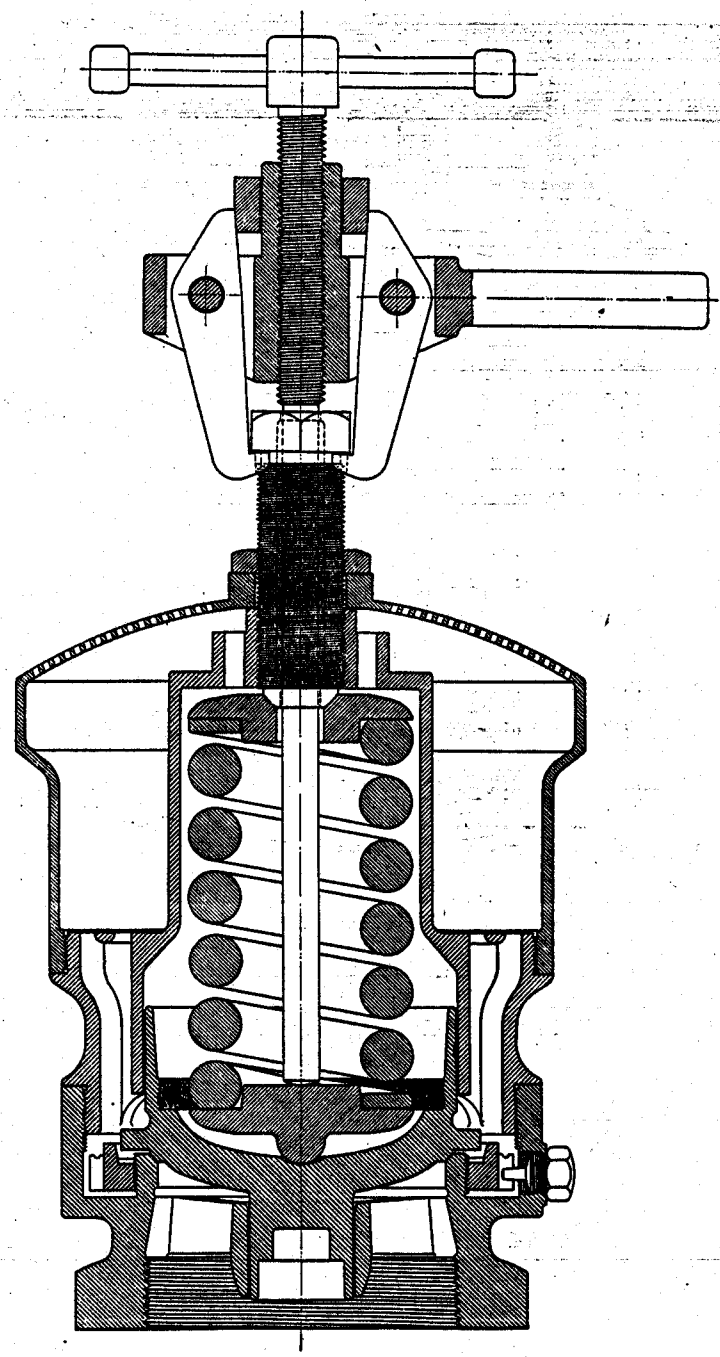


FIGURE 3

COALE SAFETY VALVE—STATIONARY BOILER TYPE

APPLICATION OF SPECIAL TOOL FOR HYDROSTATIC BOILER TESTS

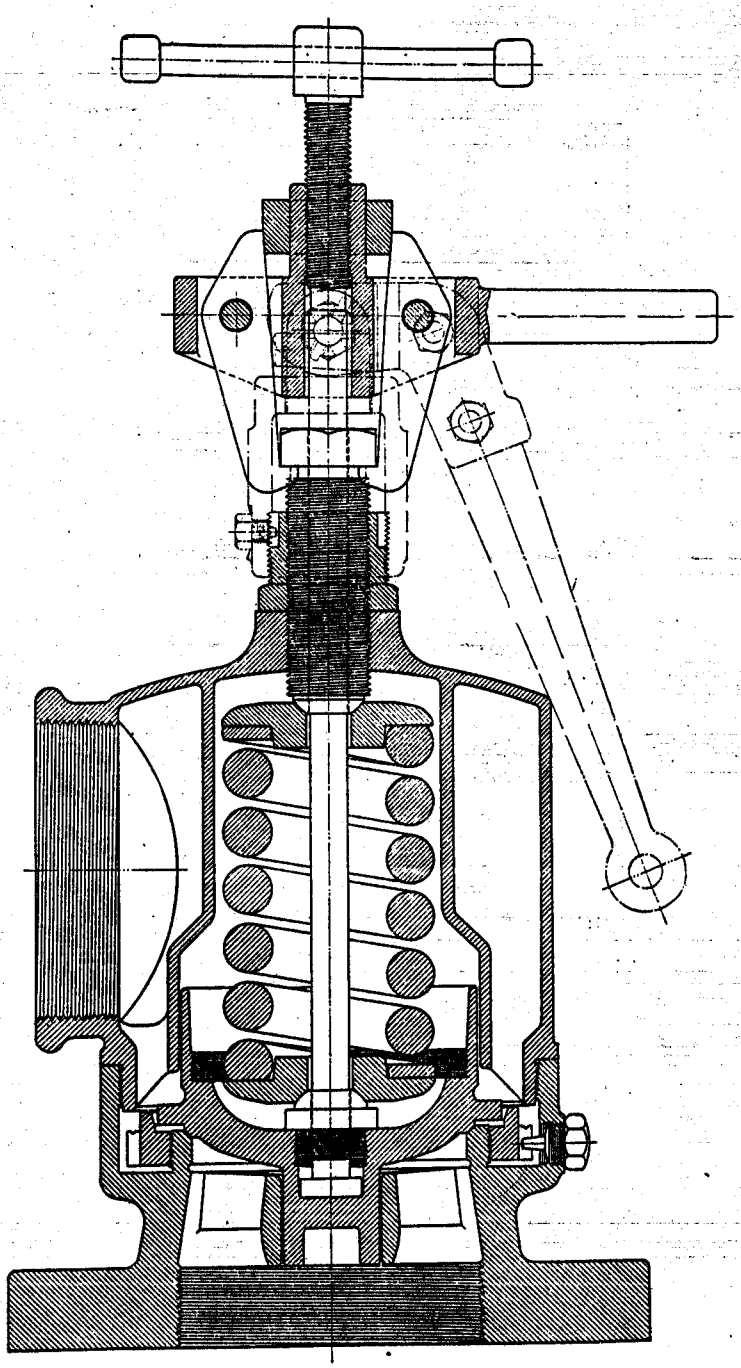


FIGURE 4

Application of Special Tool for Hydrostatic Boiler Test: When making hydrostatic test, the valve must not be removed or the adjustment altered. The valves must be held closed by special tool, as shown in **Figs. 3 and 4.** In no case must the valve be held closed by screwing down the spring bolt on the spring.

One of these tools shall be applied to each safety valve, and the setting of the valve allowed to remain the same as when the boiler is in service. The spindle of the tool which projects down through the hollow spring bolt should be screwed down by HAND ONLY, which is sufficient to secure the valve for test.

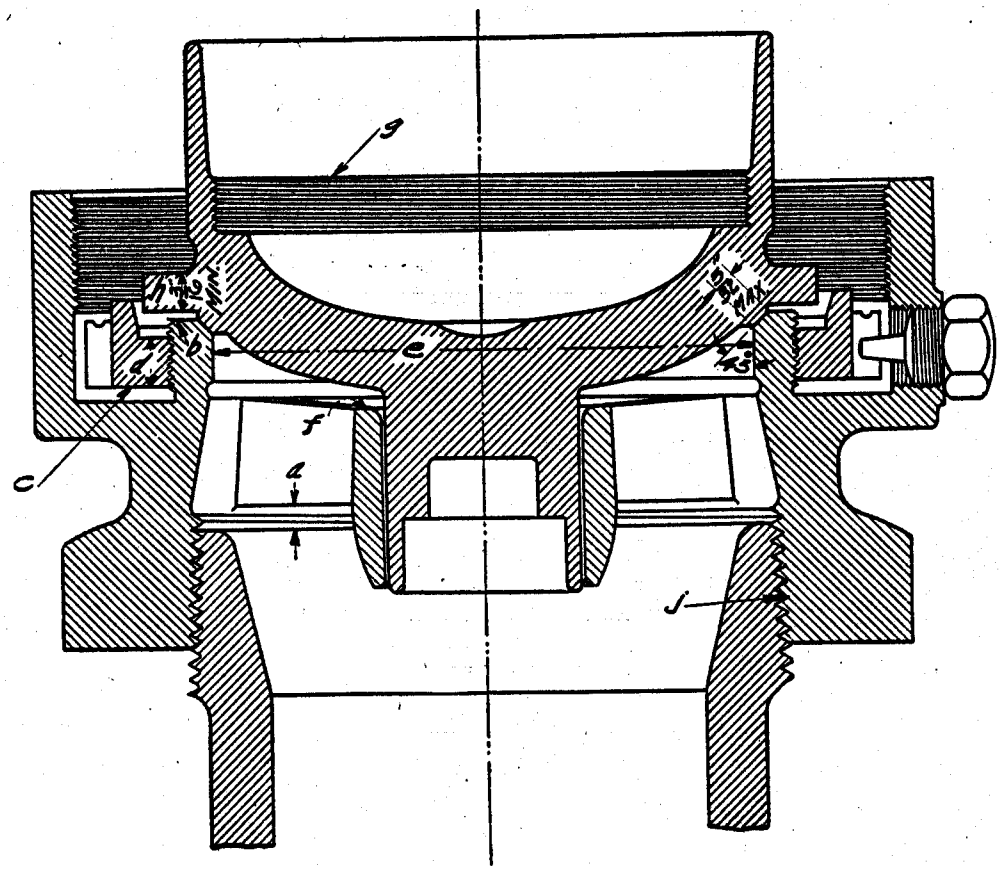


FIGURE 5

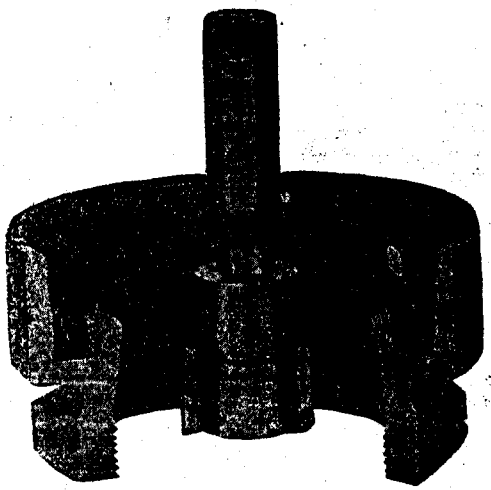


FIGURE 6

APPLICATION OF GAUGE A

FIGURE 23

APPLICATION OF GAUGES C AND U

FIGURE 7

APPLICATION OF GAUGE B

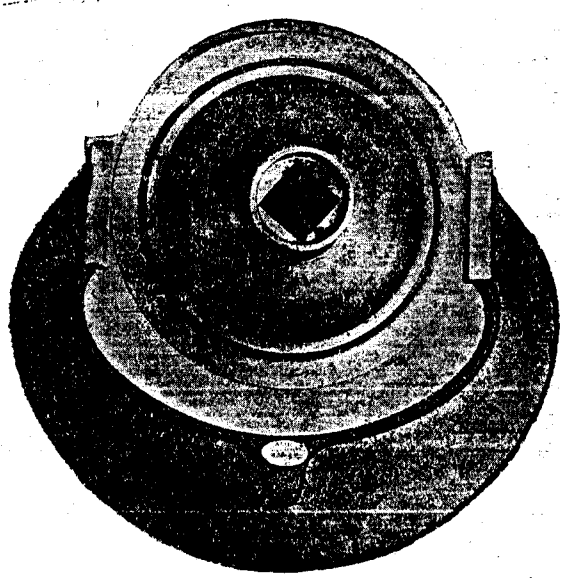


FIGURE 8

APPLICATION OF GAUGE C

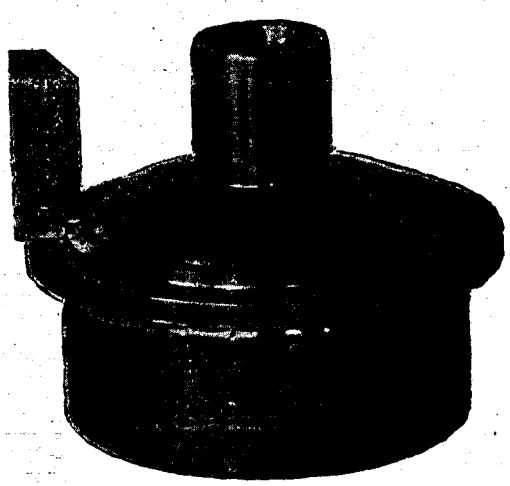


FIGURE 9

APPLICATION OF GAUGE D
VALVE SEAT HEIGHT

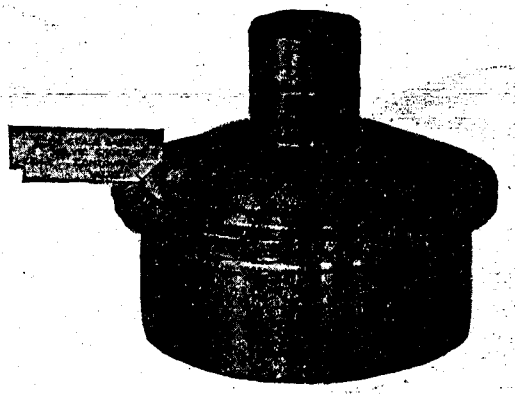


FIGURE 10
APPLICATION OF GAUGE D—VALVE SEAT ANGLE

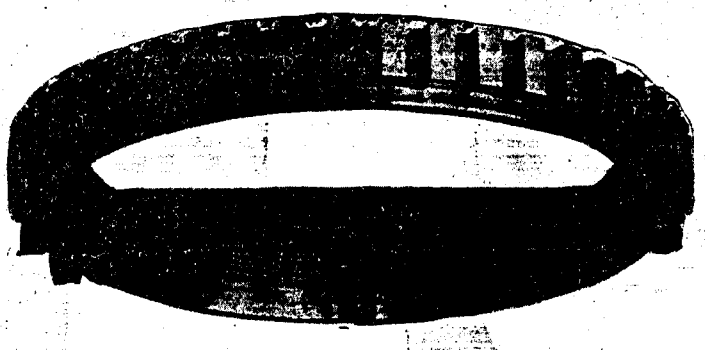
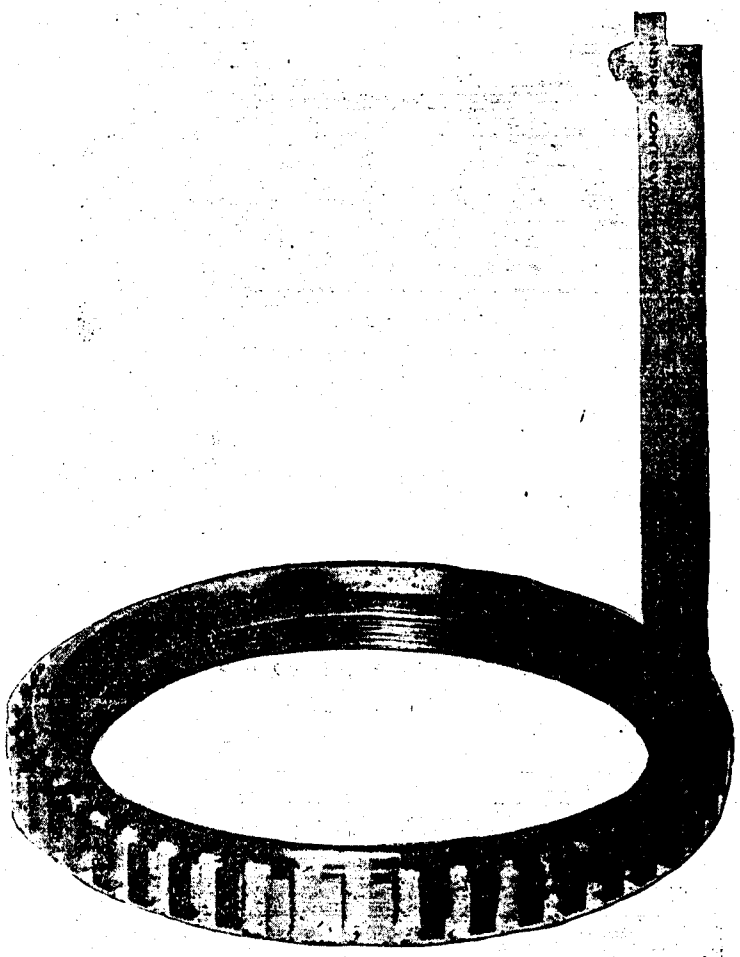
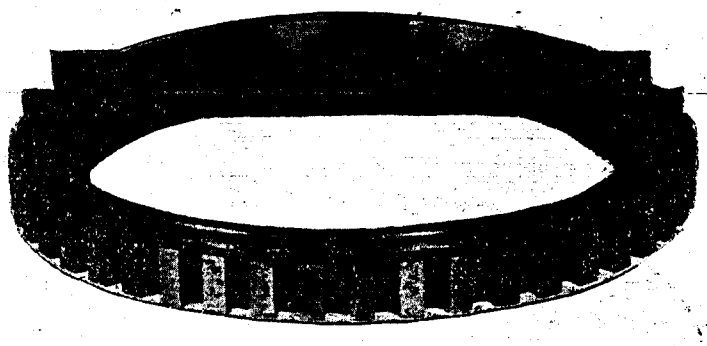


FIGURE 11
APPLICATION OF GAUGE E—INSIDE DIAMETER



FIGU RE 12

APPLICATION OF GAUGE E—RING DEPTH



FIGU RE 13
APPLICATION OF GAUG E E—INSIDE CONTOUR

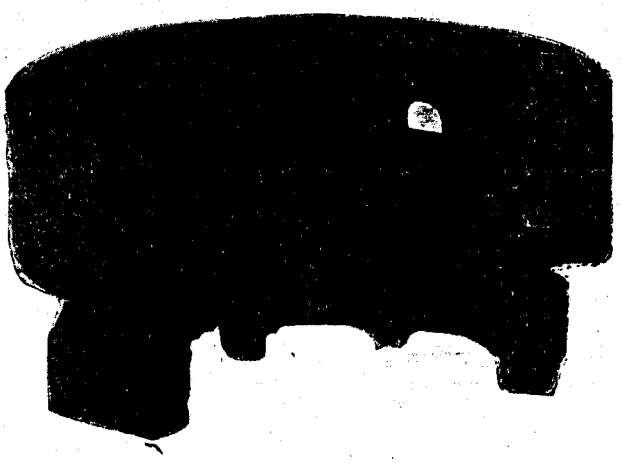


FIGURE 14
APPLICATION OF GAUGE F—VALVE SEAT HEIGHT

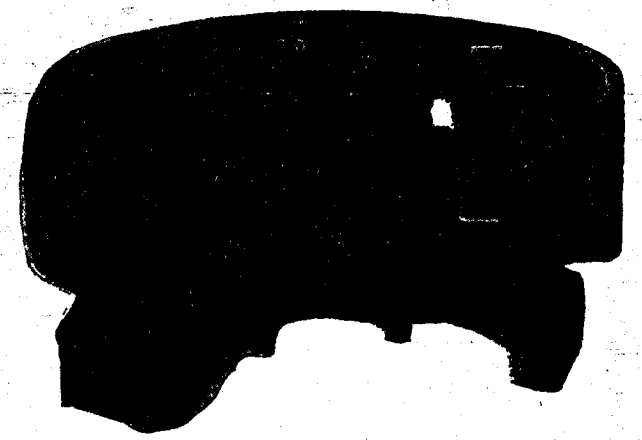


FIGURE 15
APPLICATION OF GAUGE F—VALVE SEAT ANGLE

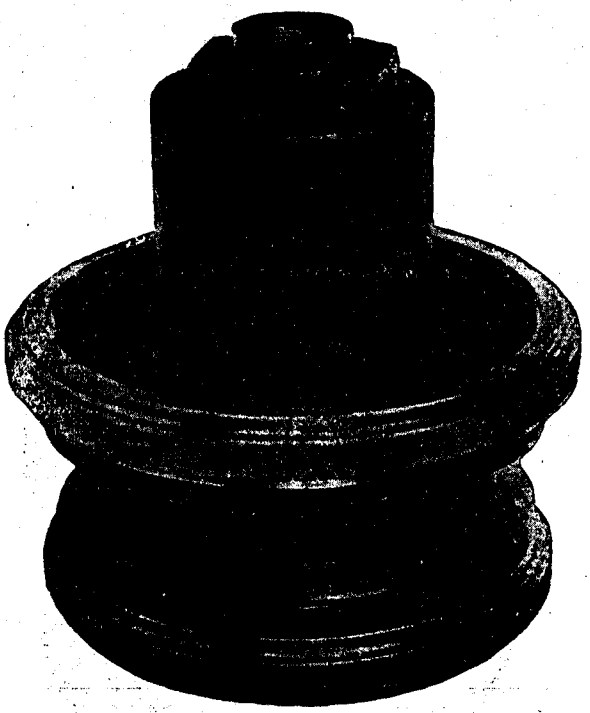


FIGURE 16
APPLICATION OF GAUGES G AND H

FIGURE 17
APPLICATION OF GAUGE I

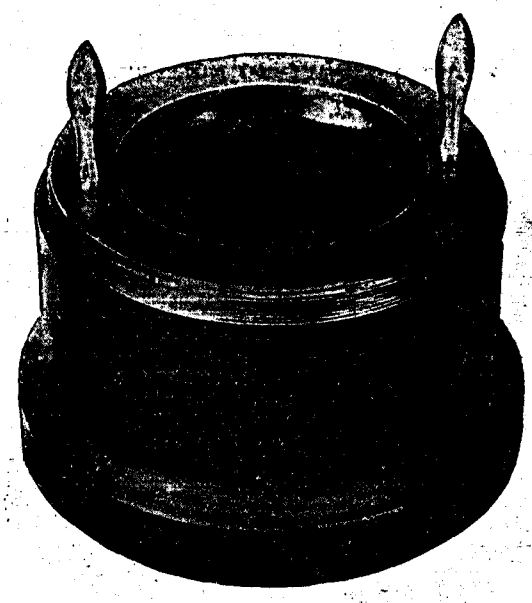


FIGURE 18
APPLICATION OF GAUGE J

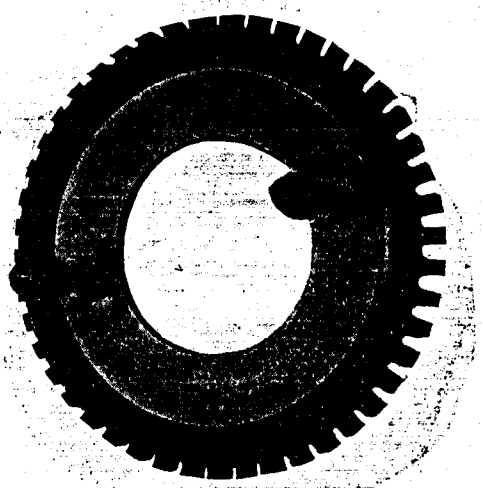


FIGURE 19
APPLICATION OF GAUGES K AND T

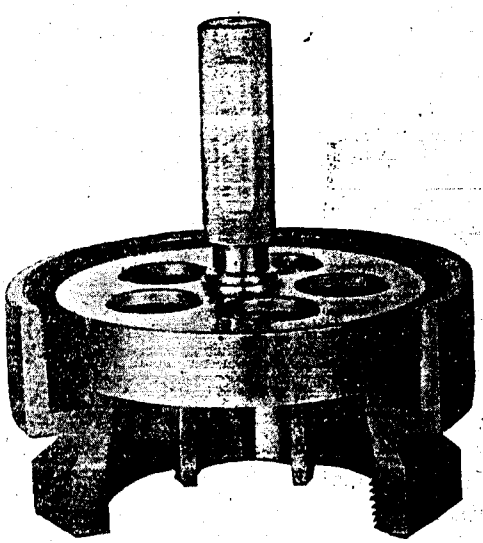


FIGURE 20
APPLICATION OF GAUGES L AND S

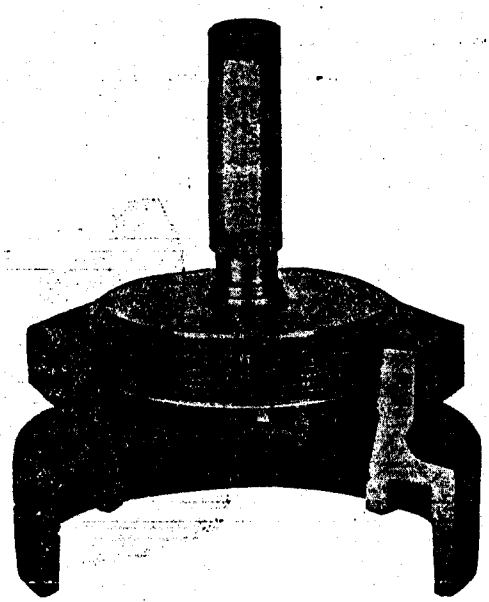


FIGURE 21
APPLICATION OF GAUGE M

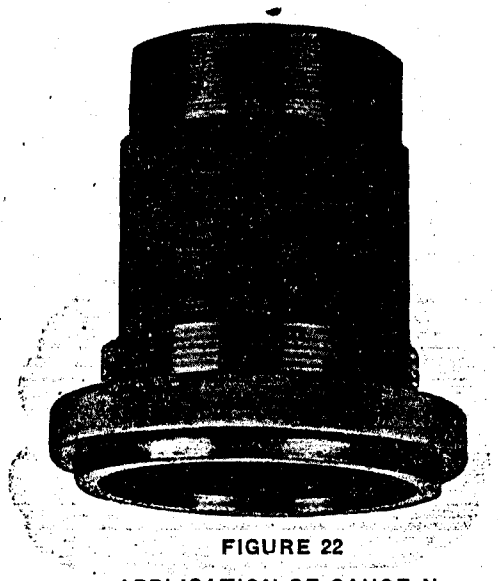
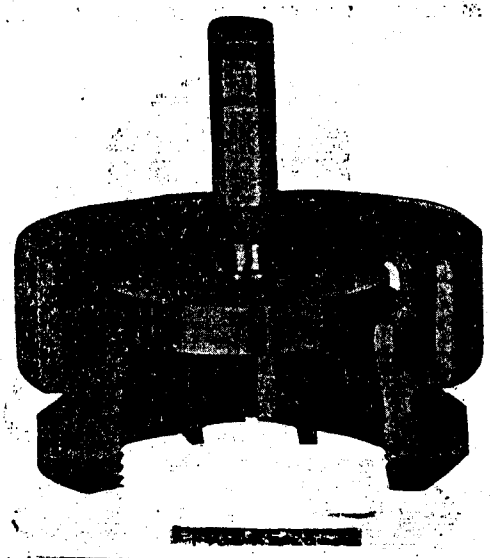


FIGURE 22
APPLICATION OF GAUGE N



APPLICATION OF GAUGES O AND U

FIGURE 6
APPLICATION OF GAUGE A

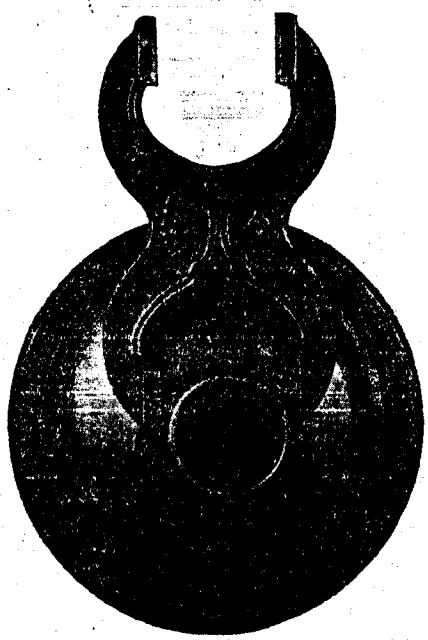


FIGURE 24
APPLICATION OF GAUGES P AND X

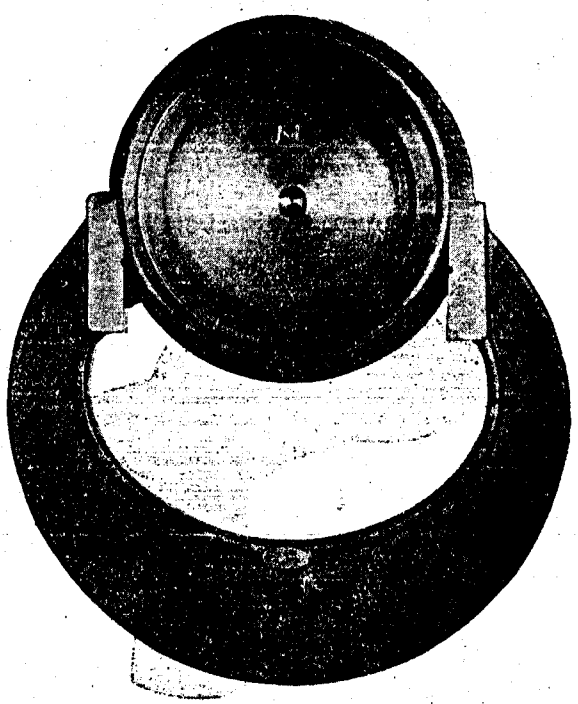


FIGURE 25
APPLICATION OF GAUGES Q AND V

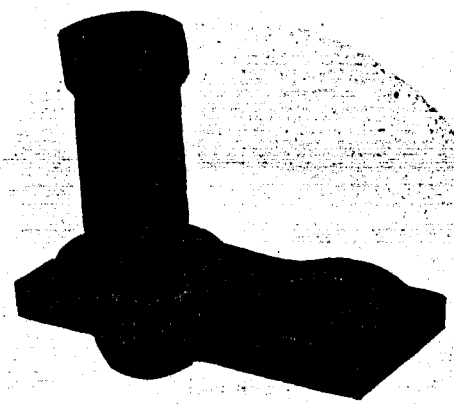


FIGURE 26
APPLICATION OF GAUGE Y

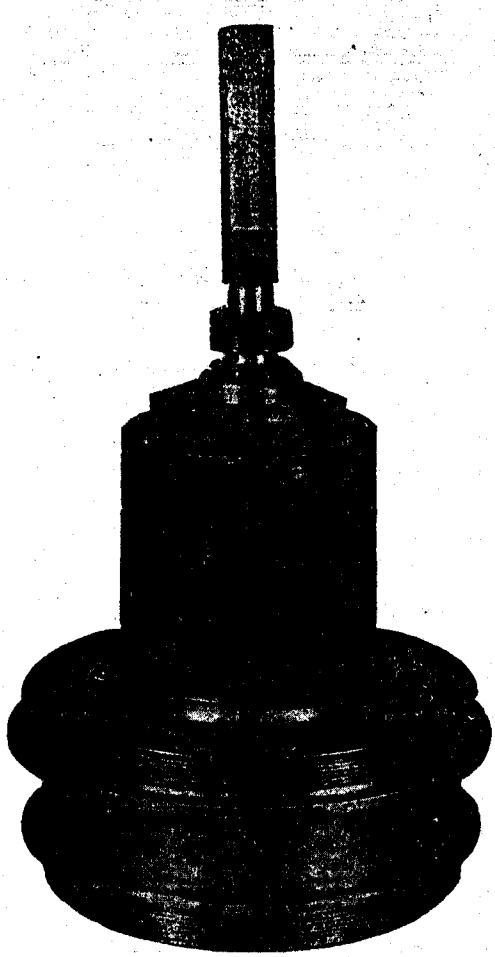


FIGURE 27
APPLICATION OF GAUGE Z

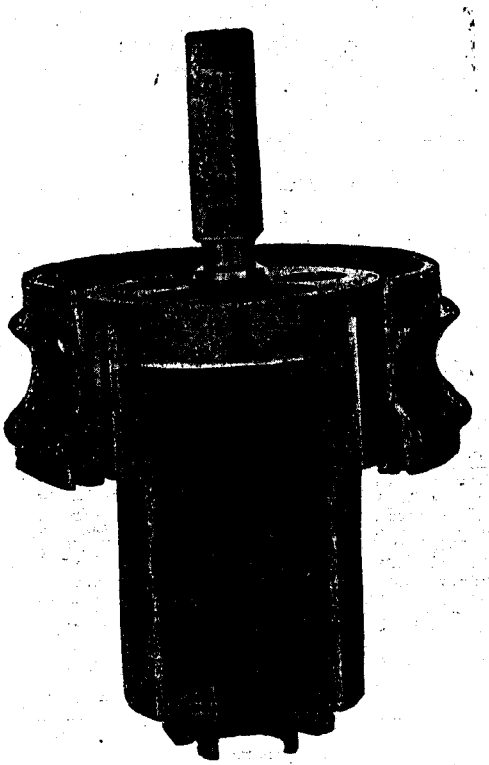


FIGURE 28
APPLICATION OF GAUGES R, R+ AND W

MANUFACTURE

All new valves and repair parts furnished by manufacturers must conform to gauges shown on standard tracings and as illustrated in application by the following figures:

Fig.	6,	Gauge A	—Valve Opening in Base.
"	7,	" B	—Outside Diameter of Valve Seat.
"	8,	" C	—Outside Diameter of Valve.
"	9,	" D	—Height of Valve Seat.
"	10,	" D	—Valve Seat Angle.
"	11,	" E	—Inside Diameter of Adjusting Ring.
"	12,	" E	—Adjusting Ring Depth.
"	13,	" E	—Contour of Inside of Adjusting Ring.
"	14,	" F	—Height of Valve Seat.
"	15,	" F	—Valve Seat Angle.
"	16,*.	" G	—Connection of Spring Case to Base.
"	16,*	" H	—Connection of Spring Case to Dome.
"	17,*	" I	—Connection of Base to Spring Case.
"	18,*	" J	—Connection of Dome to Spring Case.
"	19,	" K	—Conection of Adjusting Ring to Base.
"	20,	" L	—Connection of Base to Adjusting Ring.
"	21,	" M	—Base Fit to Extension.
"	22,	" N	—Extension Fit to Base.
"	23,	" O	—Bottom Guide in Base—Limit Gauge.
"	24,	" P	—Bottom Guide on Valve—Limit Gauge.
"	25,	" Q	—Valve Guide—Limit Gauge.
"	26,	" Y	—Spring Bolt in Spring Case—Limit Gauge.
"	27,	" Z	—Spring Case and Spring Bolt Lock Nut to Spring Bolt—Limit Gauge.
"	28,	" R	—Valve Guide in Spring Case.
"	28,	" R+	—Valve Guide in Spring Case—Limit Gauge.

*For the 5" valve, gauges G and H and I and J, being of the same size, have been combined and known as gauges G-H and I-J.

RENEWALS AND REPAIRS

Each shop, where repairs are made to Safety Valves, must be provided with repair gauges as shown on Standard Tracings and indicated below:

Fig.	9,	Gauge	D—Height of Valve Seat.
"	10,	"	D—Valve Seat Angle.
"	11,	"	E—Inside Diameter of Adjusting Ring.
"	12,	"	E—Adjusting Ring Depth.
"	13,	"	E—Contour of Inside of Adjusting Ring.
"	14,	"	F—Height of Valve Seat (Maximum and Minimum).
"	15,	"	F—Valve Seat Angle.
"	21,	"	M—Base fit to Extension.
"	22,	"	N—Extension fit to Base.

In addition to the above the following condemning gauges should be provided; these condemning gauges indicate the maximum and minimum sizes to which valve parts may be finished and valve parts exceeding these gauges must be scrapped:

Fig. 14, Gauge F—Minimum Height of Valve Seat.
" 20, " S—Connection of Base to Adjusting Ring.
" 19, " T—Connection of Adjusting Ring to Base.
" 23, " U—Bottom Guide in Base.
" 25, " V—Valve Top Guide.
" 28, " W—Valve Guide in Spring Case.
" 24, " X—Valve Bottom Guide.
" 26, " Y—Spring Bolt in Spring Case.
" 27, " Z—Spring Case and Spring Bolt Lock Nut to Spring Bolt.

Care should be taken when repairing safety valves not to finish worn parts to condemning gauge size. When not necessary to true worn part, any size between standard and condemning size is permissible.

Relation Between Base and Bushing: A clearance between webs at "a" (Fig. 5) and top of extension must always be maintained after base has been secured to bushing in order to prevent seat becoming distorted when screwing on base due to bushing engaging the guide webs.

Reseating of Valve and Valve Seat: When reseating valve, contour of valve and valve seat must be maintained in accordance with gauges "D" and "F", Figs. 9, 10, 14 and 15. The seat on valve and base must be maintained at 45° in accordance with gauges "D" and "F", the same as for all new valves and not exceed $\frac{5}{32}$" in width as shown in Fig. 5. The top of base at "b" (Fig. 5) should be faced off when reseating valve seat and should not be reduced below minimum height determined by gauge "F" (Fig.14). When facing valve the thickness of head of valve should never be less than $\frac{3}{16}$", as shown at "h" (Fig. 5).

In order to maintain proper alignment and to avoid leakage due to distortion, valve parts should be chucked by means of threads "g" or "j" (Fig. 5).

Adjusting Ring: The adjusting ring at "c" (Fig. 5) must also be faced off to maintain proper clearance for the valve, otherwise the ring cannot be run down sufficiently for proper adjustment. Adjusting ring should not be reduced in thickness at "d" more than $\frac{1}{8}$" below that shown on Standard Tracing covering this detail. When an adjusting ring is found to stick, do not use chisel to loosen it, but have parts checked and made to conform to proper gauges.

In no case should diameter "e" (Fig. 5) be changed. (This diameter is the size of valve.)
Attention is also called to top edge of guide in base at "f" (Fig. 5). This should be faced off when facing valve seat to maintain proper clearance for bottom of the valve.

Never use gauges on surfaces while in motion as this produces excessive wear of gauges.

Springs: It is very important, in ordering springs for safety valves, to specify the pressure with which they are to be used, and safety valve springs should be used only for valves and pressures shown in the spring table.

When a safety valve spring is found to have taken a permanent set of $\frac{1}{4}$", that is to say, when its free height is $\frac{1}{4}$" less than that given in the table, it must be scrapped and a new spring applied.

The table given below shows the springs to be used with the various sizes of Coale safety valves, for different pressures. The springs are stamped near the end as shown under column headed "Marking".

SPRINGS FOR COALE SAFETY VALVES

Size of Valve	Pressure From	Pressure To	Free Height	Marking
2½"	60	110	4¼"	2½-A
	110	160		2½-B
	160	200		2½-C
	200	240		2½-D
3¼"	110	160	4⅝"	3¼-B
	160	200		3¼-C
3½"	100	160	5⅛"	3½-B
	160	200		3½-C
	200	240		3½-D
4"	110	160	5½"	4-B
	160	200		4-C
	200	240		4-D
4½"	160	200	6⅛"	4½-C
	200	245		4½-D
5"	200	240	5⅝"	5-D
	240	280	5 7/16"	5-E

J. T. WALLIS.
Chief of Motive Power.

THE PENNSYLVANIA RAILROAD

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Locomotive Maintenance Instructions No. L-11-D.

Supplement No. 1.
Issued Altoona, Pa.
April 26, 1930.

Instructions for Adjusting and Repairing Safety Valves used on Locomotives and other Boilers.

All safety valves as they go through shops for repairs, as well as safety valves purchased new, shall be marked by steel stamp on the rim of the muffle dome to indicate the pressure range corresponding to the spring installed in valve for which the valve is suited.

EXAMPLE: A 5" Coale Muffle safety valve equipped with 5-E spring shall be stamped "Pressure range 240-280 lbs."

It will not be necessary to indicate the actual working pressure for which the valve is set, such pressure being controlled by the locomotive in question and corresponding to pressure shown on boiler washout cards.

F. W. HANKINS,

Chief of Motive Power.

THE PENNSYLVANIA RAILROAD

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Locomotive Maintenance Instructions No. L-11-D.

Supplement No. 1-B.
Issued Philadelphia, Pa.
February 10, 1943.
(Superseding Supplement No. 1-A, Dated January 8, 1943.)

Instructions for Adjusting and Repairing Safety Valves Used on Locomotives and Other Boilers.

All safety valves as they go through shops for repairs, as well as safety valves purchased new, shall be marked by steel stamp on the rim of the muffler dome to indicate the pressure range corresponding to the spring installed in valve for which the valve is suited.

EXAMPLE: A 5" Coale Muffler safety valve equipped with 5-E spring shall be stamped "Pressure range 230-250 lbs."

It will not be necessary to indicate the actual working pressure for which the valve is set, such pressure being controlled by the locomotive in question and corresponding to pressure shown on boiler washout cards.

When safety valves are not equipped with muffler domes, stenciling for pressure range and spring size shall be applied at side of spring case hub.

H. W. Jones,

Chief of Motive Power.