

LIST OF PARTS—Type “E-3”

No.	NAME OF PART	Pieces Per Gear	No.	NAME OF PART	Pieces Per Gear	No.	NAME OF PART	Pieces Per Gear
1	Cylinder	1	14	Reverse Cylinder Valve	1	28	Reverse Lever Quadrant Support	1
2	Guides and Cylinder Head—front	1	15	Reverse Cylinder Valve Body	1	29	Reverse Lever Latch	1
3	Cylinder Head—back	1	16	Reverse Cylinder Valve Body Cap	1	30	Reverse Lever Latch Guide	1
4	Piston Head	1	17	Reverse Cylinder Valve Follower	1	31	Reverse Lever Latch Handle	1
5	Piston Packing Rings (3 pieces)	1 set	18	Reverse Cylinder Valve Spring	1	32	Reverse Lever Latch Link	1
6	Piston Rod	1	19	Reverse Cylinder Valve Stem	1	33	Reverse Lever Latch Handle Pin	1
7	Stuffing Box Ring	1	20	Reverse Cylinder Valve Arm	1	34	Reverse Lever Latch Link Pin	1
8	Stuffing Box Gland	1	21	Reverse Cylinder Valve Arm Pin	1	35	Reverse Lever Latch Pin	1
9	Crosshead	1	22	Reverse Cylinder Valve Arm Pin	1	36	Reverse Lever Fulcrum Pin	1
10	Crosshead Arm	1	23	Floating Lever Rod Complete	1	37	Reverse Gear Oil Cup	1
11	Crosshead Wrist Pin	1	24	Rod Jaw with Lock Nut	2	38	Reverse Gear Drain Cocks	3
12	Crosshead Key	1	25	Rod Jaw Pin	4	39	Rod Ends for Rod to Cab	2
13	Reverse Cylinder Valve, Complete with Arm No. 20	1	26	Reverse Lever Style No. 1	1	40	Cylinder Jacket	1
			27	Reverse Lever Quadrant	1	41	Reverse Lever Style No. 2	1

Repair parts are carried in stock. When ordering, state the type and serial number of gear if possible, also name and number of part.

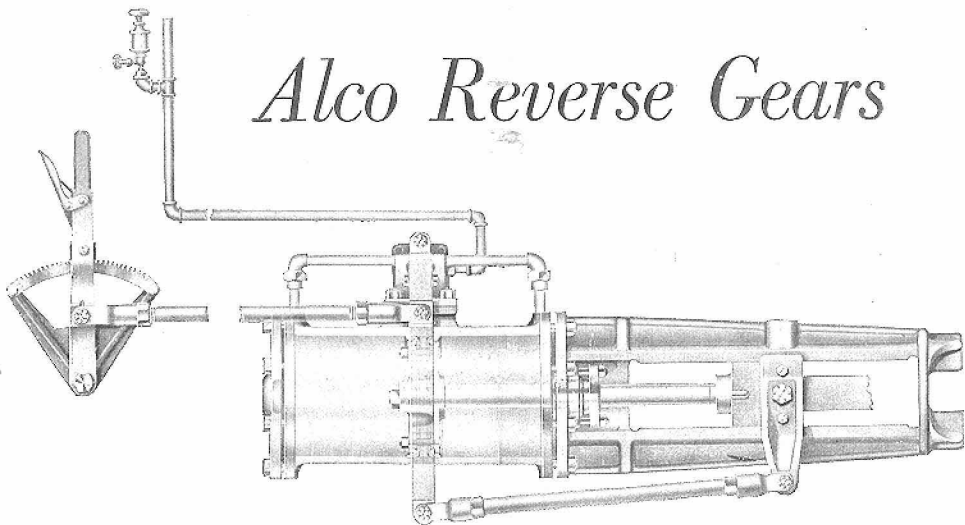
AMERICAN LOCOMOTIVE COMPANY

January 1921

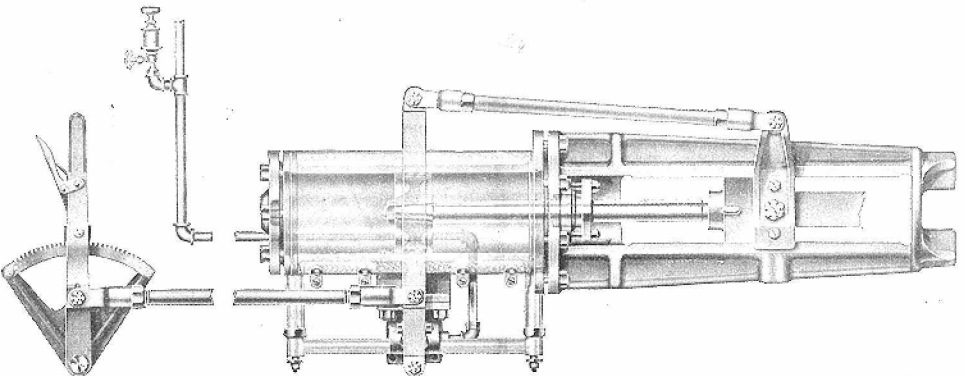
NEW YORK CITY

Bulletin No. 1020-A

Alco Reverse Gears



ALCO REVERSE GEAR TYPE “E” FOR AIR OPERATION



ALCO REVERSE GEAR TYPE “E-3” FOR STEAM OPERATION

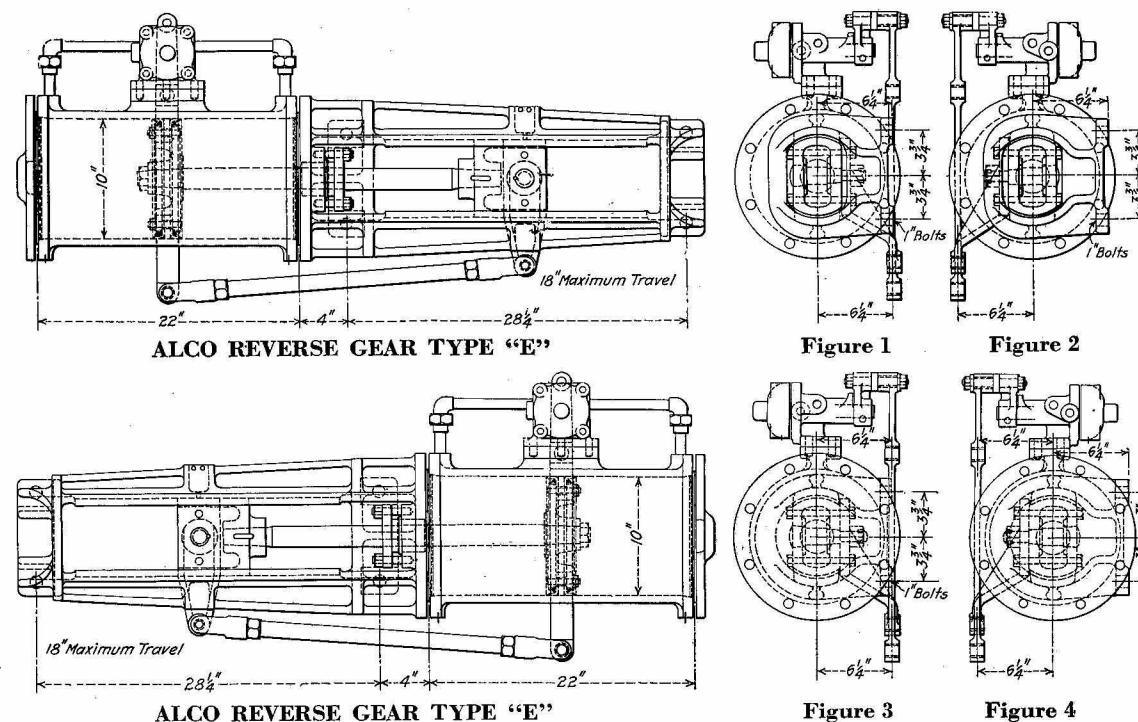
*Adapted to all classes of service. Easily operated.
Controlled by a flat rotating type valve.*

A SUITABLE crosshead supported by very rigid guides assures minimum piston rod packing maintenance.

Responds quickly to any slight movement of the reverse lever.

The desired cut off is maintained under all conditions of service and is accurately indicated by the position of the reverse lever.

ALCO REVERSE GEAR TYPE "E"



THIS gear was designed and is recommended for air operation, but also may be operated by steam. Figure 1 illustrates the standard assembly (floating lever behind and operating valve above cylinder). This assembly, with cup packing and standard reverse lever (see page 8) is furnished unless otherwise specified.

Our type "E" gear has been designed so that it can also be arranged in the various assemblies as shown in Figures 2, 3, and 4. With these assemblies, straight line operating connections can be obtained for almost every application.

Figure 2 shows operating valve above and floating lever in front of cylinder.

The simplicity of this change in assembly is readily seen by comparing Figures 1 and 2. To change from Figure 1 to Figure 2 the cylinder is disconnected from guide and turned end for end, the crosshead

turned over, and the crosshead arm bolted in front of cylinder.

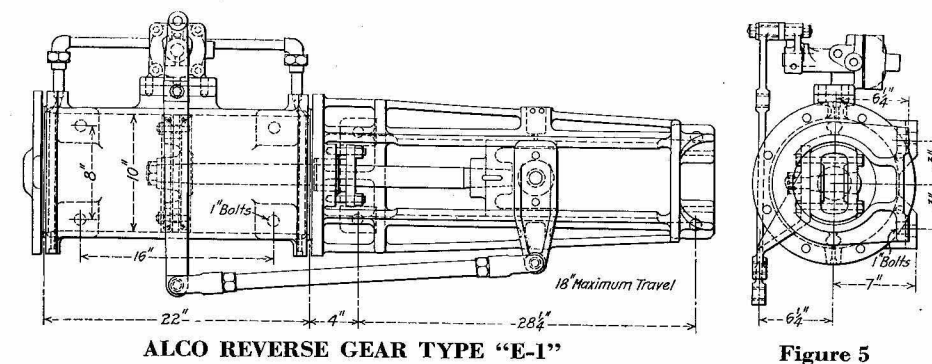
Figure 3 shows operating valve above and floating lever behind cylinder, and the gear assembled for backward operation (cylinder end of gear towards smoke-box).

Figure 4 shows gear assembled for operation same as Figure 3 but with floating lever in front of cylinder.

All type "E" gears as shown in Figures 1, 2, 3, and 4 can be assembled with operating valve below cylinder. This change in assembly requires a change in the oil hole drilling of the floating lever, and the operating-valve cap must be turned in order to have the drain cock below the valve. However, these applications should only be used when the angle of the rod to cab is not too severe.

All type "E" gears have guide bolting only.

ALCO REVERSE GEAR TYPE "E-1"



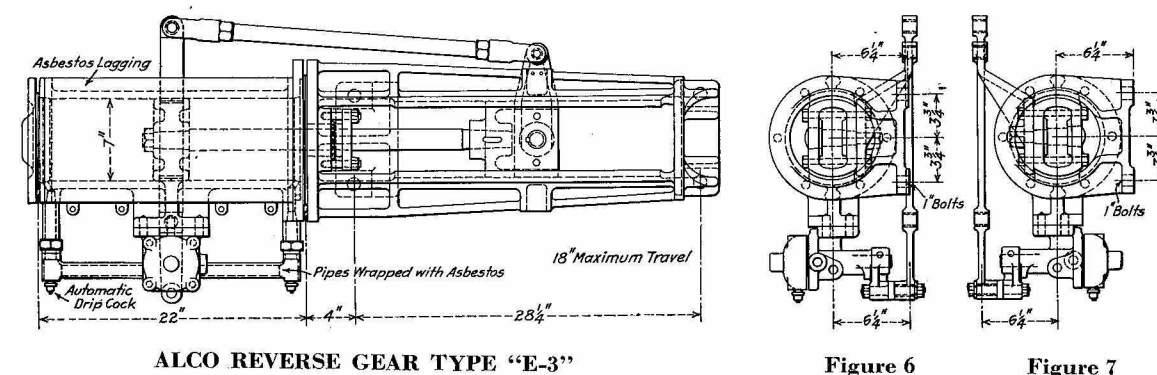
THIS gear was designed and is recommended for air operation, but also may be operated by steam.

Type "E-1" gear is similar to type "E" gear except that it is provided with both cylinder and guide bolting. Figure 5 illustrates the standard arrangement (floating lever in front and operating valve above cylinder), and unless otherwise specified

this is the arrangement of this type of gear which is furnished.

Because of the cylinder bolting the floating lever must always be in front of cylinder, but similar to the type "E" gear it can be assembled with the operating valve below cylinder. Type "E-1" gear is our type "E" gear in every detail except cylinder.

ALCO REVERSE GEAR TYPE "E-3"



THIS gear was designed and is recommended for steam operation, but also may be operated by air.

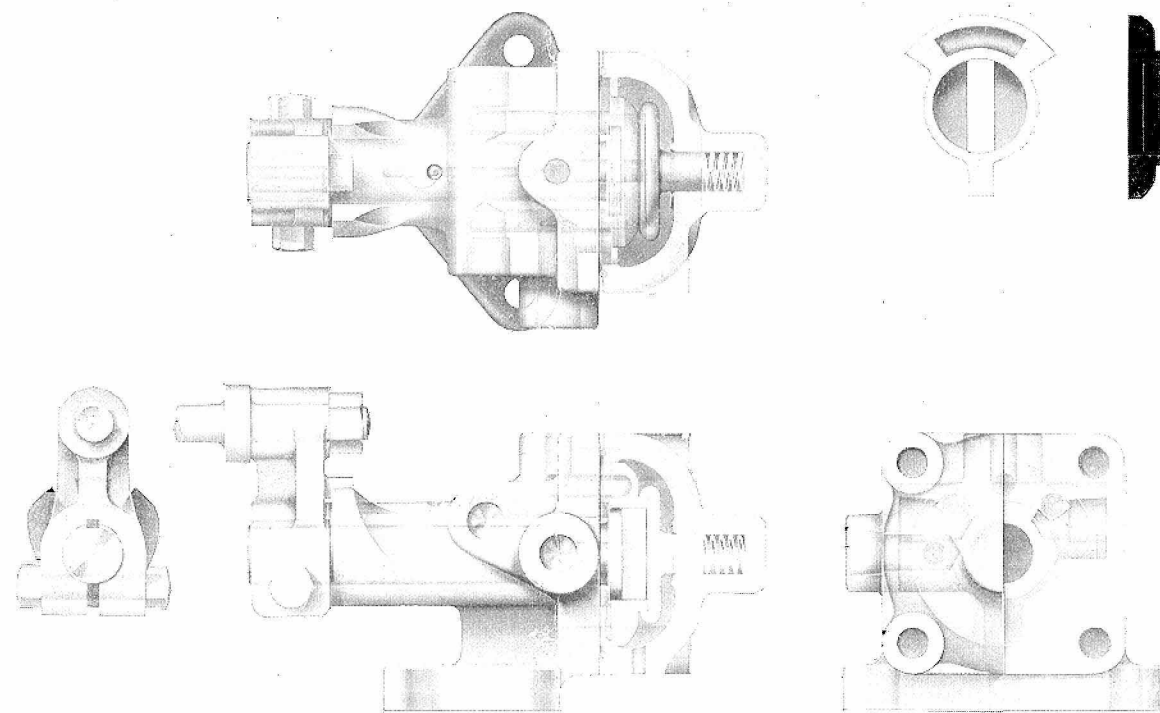
Figure 6 illustrates the standard arrangement of this type of gear (floating lever behind and operating valve below cylinder). This arrangement with metallic packing and standard reverse lever is furnished unless otherwise specified.

In a similar manner to type "E" gears

this gear can be assembled with the floating lever in front of cylinder. See Figure 7.

With steam operation there will necessarily be a certain amount of condensation which will all drain to the cylinder. Therefore, this gear is only furnished with the operating valve below cylinder, thereby permitting each movement of the gear to exhaust any condensation that may have collected.

REVERSE CYLINDER VALVE



ALL ALCO gears are controlled by a flat rotary type valve. The efficiency of this type of valve has long been demonstrated in air brake operation. It is very sensitive to slight movement of the reverse lever or crosshead, is easy to operate, and eliminates the necessity of a stuffing box on the valve stem. The entire valve may be easily and quickly removed for grinding or repairs.

This valve is not rigidly connected to the valve stem, and therefore, seating properly at all times, there is no tendency toward faulty action of the gear through the valve lifting from its seat.

Speed of the gear is determined by the exhaust outlet. If gear is too fast, bush the exhaust outlet; if too slow, drill exhaust outlet larger.

PIPING DIAGRAMS

FIGURES 8 and 9 show typical methods of piping ALCO reverse gears. Air operated gears should be provided with an auxiliary steam line for emergency use as shown in Figure 8.

To avoid damage to operating valve, blow out all scale and dirt from piping before connecting up gear.

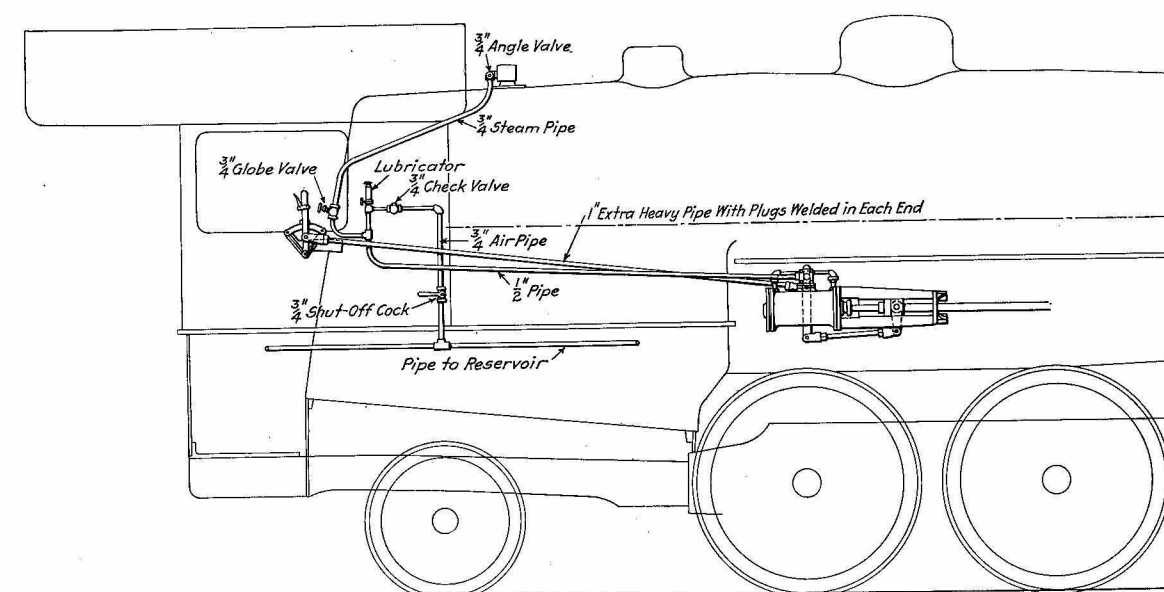


Figure 3—PIPING DIAGRAM—TYPE "E" and "E-1"

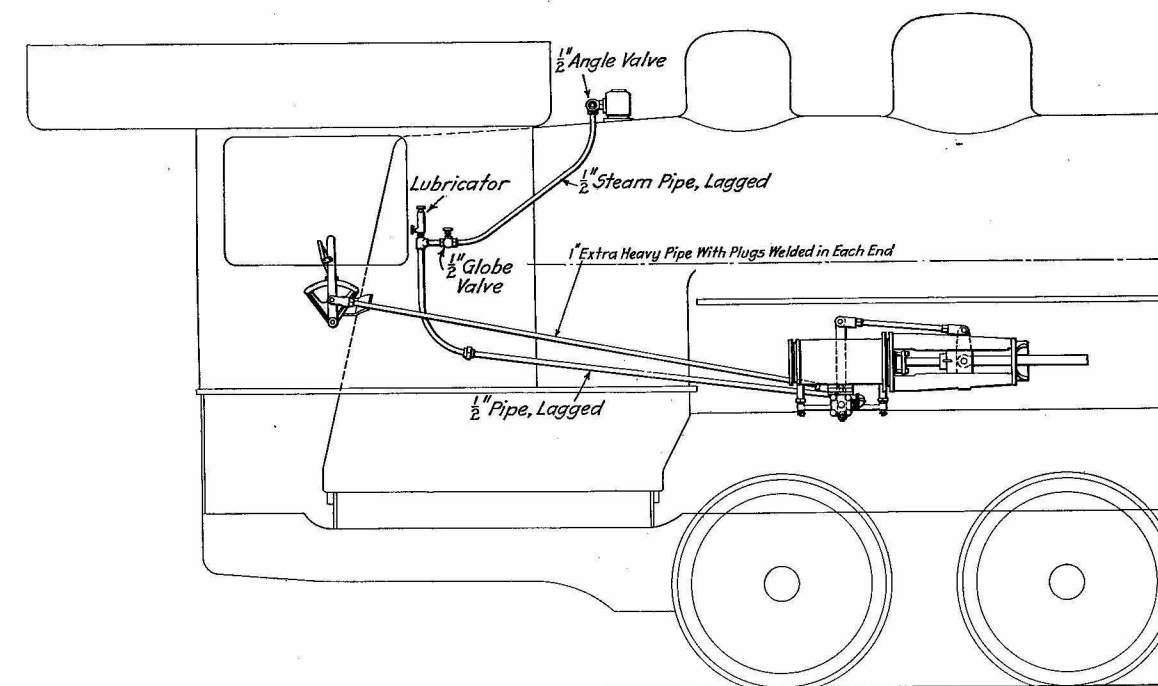


Figure 9—PIPING DIAGRAM—TYPE "E-3"

Operation

THE ALCO Reverse Gear is a pressure operated gear. It is operated by a small hand lever in the cab connected with an auxiliary or floating lever mounted on the gear. This floating lever is so connected to the control valve as to automatically insure a cut-off position of the valve motion corresponding to the position indicated by the hand lever.

All ALCO gears operate in the same manner except that types "E" and "E-1" gears are ordinarily operated by air pressure and type "E-3" gear by steam pressure. Both sides of the piston are constantly under pressure when gear is at rest. Operation of the gear is obtained by exhausting the required amount of air or steam from one side of the piston. In this

way the air or steam consumption is kept at a minimum, as the only air or steam required is the equivalent of the amount exhausted.

To reverse the engine or change the cut-off, the reverse lever is shifted in the required direction. This movement opens the valve, thereby exhausting the air or steam from one end of the cylinder, and admitting air or steam to the opposite end of the cylinder. The crosshead will then move to the desired position. This move-

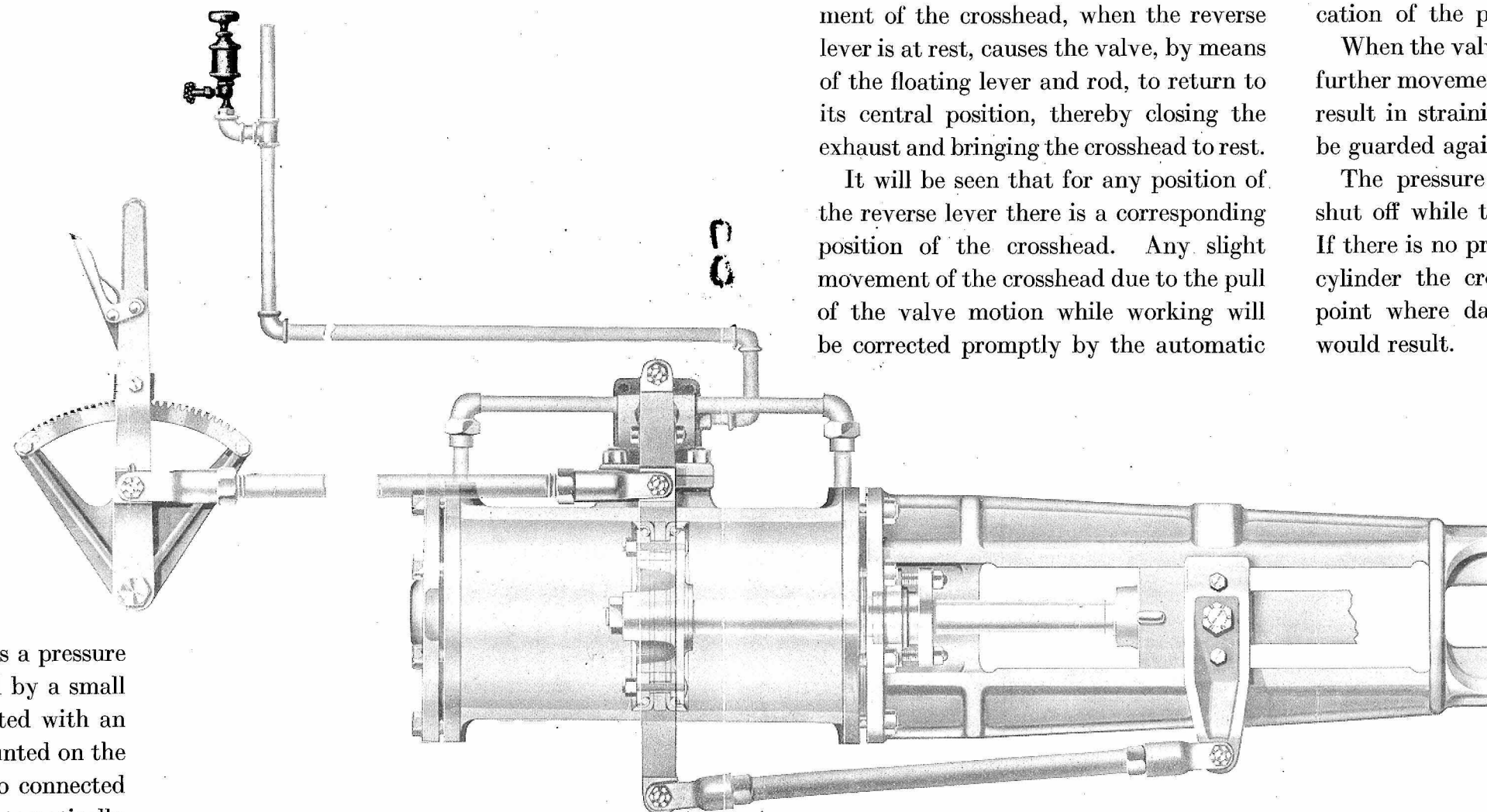
ment of the crosshead, when the reverse lever is at rest, causes the valve, by means of the floating lever and rod, to return to its central position, thereby closing the exhaust and bringing the crosshead to rest.

It will be seen that for any position of the reverse lever there is a corresponding position of the crosshead. Any slight movement of the crosshead due to the pull of the valve motion while working will be corrected promptly by the automatic

cation of the position of the crosshead.

When the valve arm is against the stop, further movement of the reverse lever will result in straining the parts, and should be guarded against.

The pressure supply should never be shut off while the locomotive is moving. If there is no pressure in the reverse gear cylinder the crosshead may move to a point where damage to the locomotive would result.



opening and closing of the rotary valve through the floating lever.

The movement of the rotary valve is limited by stops on the valve body. When the reverse lever is shifted sufficiently to bring the valve arm against the stop, any further travel of the reverse lever is delayed until the movement of the crosshead starts the valve towards its central position. These stops limit the travel of the reverse lever when there is no pressure in the cylinder, and prevent a false indi-

The type "E-3" gear is arranged with rotary valve at bottom of cylinder, thereby allowing each operation of the gear to exhaust any condensation that may be in cylinder. This gear is also supplied with automatic drain cocks which relieve the cylinder of condensation when pressure is shut off.

The type "E" and "E-1" gears are drained by hand operated cocks located under rotary valve and at both ends of cylinder.

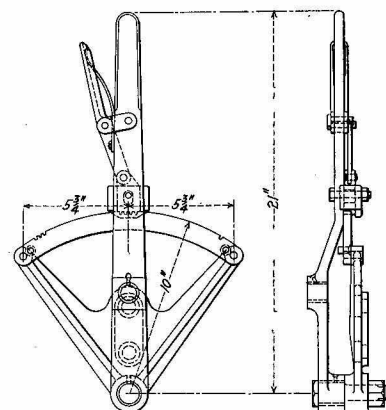


Figure 10—STANDARD REVERSE LEVER—Style 1

FIGURE 10 illustrates the standard reverse lever. This lever will be furnished with all gears unless otherwise specified.

PISTON PACKING

ALCO Reverse Gears may be equipped with either metallic or cup packing. The metallic packing is recommended for steam operation, and the cup packing for air operation.

The cup packing was developed especially for ALCO gears, and, because of its ease of maintenance and satisfactory operation, has been adopted by the American Locomotive Company as standard for air operated gears. Cup packing will be furnished with type "E" and "E-1" gears unless otherwise specified.

Metallic packing will be furnished with all steam operated type "E-3" gears, or when specified for other types of gears.

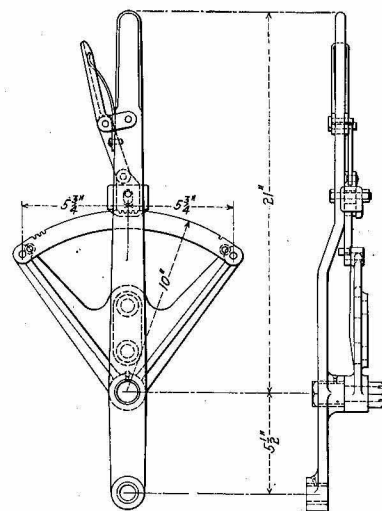
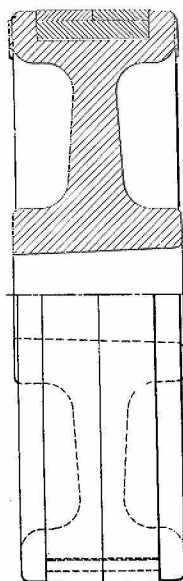
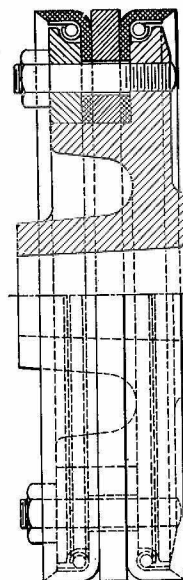


Figure 11—SPECIAL REVERSE LEVER—Style 2

FIGURE 11 illustrates a special reverse lever used to obtain a movement of the crosshead in a direction opposite to that obtained with the standard reverse lever.



DIRECTIONS FOR ORDERING

WHEN ordering, specify type of gear and the arrangement desired. State whether style one or style two reverse lever is required. Also specify whether metallic or cup packing is desired.

APPLICATION

ALL ALCO Gears should be securely fastened to the boiler shell by a suitable bracket in such a position that the reach rod will be practically in line with the center of the reverse gear.

Adjust the reach rod so that the travel of the reverse gear piston (18" maximum) will be equally divided on each side of the center of the cylinder.

When the engine is hot (in order to take care of the expansion) adjust the rod connecting the reverse lever with the floating lever so that the reverse lever, valve arm, and floating lever will all be vertical when the crosshead is in central position.

Locate stop pins (approximately $\frac{3}{8}$ "

diameter) in the reverse lever quadrant in order to limit movement of the reverse lever and gear crosshead to the amount necessary to provide for the engine valve travel.

The cylinder and piping of type "E-3" gear must be thoroughly lagged in order to reduce condensation to a minimum.

Locate oil cup at an accessible place in the cab.

Locate reverse lever in a position convenient for the engineer.

All ALCO gears should be secured to bracket by 1" finished bolts.

For piping follow instructions as illustrated on page five.

GENERAL OVERHAULING

WHEN engine is given general repairs, the reverse gear and quadrant should be removed and thoroughly inspected; piston rod and piston packing renewed; rotary

valve ground; lost motion taken up in all connections by replacing pins and bushings; and gear tested under air pressure before it is again applied to locomotive.

CARE OF GEAR

ALCO gears should be regularly inspected and defects, if any, corrected.

If gear is not operating properly and not maintaining cut-off, examine all connections for lost motion, and piston packing for tightness.

One of the principal causes of faulty action is lost motion in the connections. The lost motion may be determined by shutting off the air or steam supply and attempting to move either end of the floating lever by hand. If air escapes at the exhaust outlet when the valve arm is vertical, the rotary valve requires grinding.

To test the piston packing for tightness, securely block crosshead near center of guide, and move reverse lever forward until valve arm is against stop. If air or steam continues to escape from exhaust outlet when valve arm is in this position, the piston packing is leaking from one side of piston. To determine if packing is leaking from opposite side of piston, move reverse lever backward until valve arm is

against stop and note whether air or steam continues to escape from exhaust port. The piston should then be examined to determine whether the leakage is caused by faulty packing or by loose follower bolts.

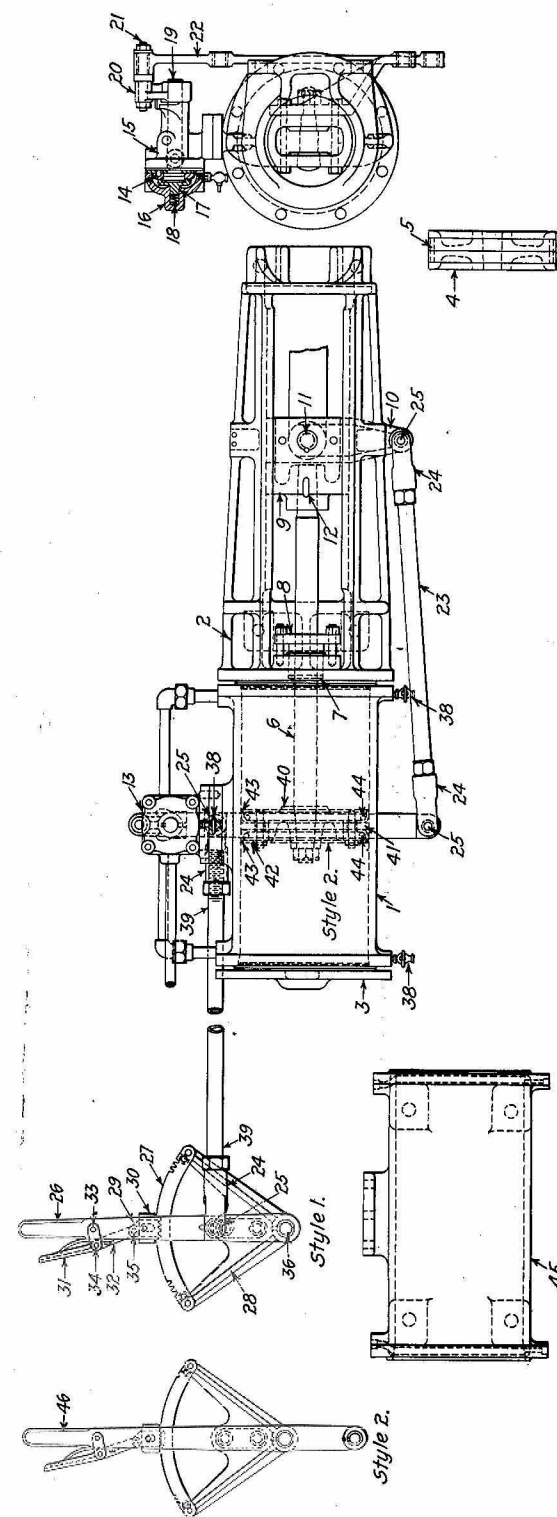
Whenever the cylinder head is removed to examine or renew packing, the cylinder walls should be coated with air brake compound for air operated gears, and cylinder oil for steam operated gears.

Oil regularly all connections and guides. On all air pressure gears fill oil cup before each trip with engine oil. On steam operated gears use valve oil.

To avoid leakage keep piston rod stuffing box properly packed.

If, for any reason, air has been shut off from gear, care must be given to slowly reopen the air cocks in order to avoid damage to operating lever latch.

The lagging on cylinder and piping of the type "E-3" gear must be kept in good condition.



LIST OF PARTS—Type "E" and Type "E-1"

No.	NAME OF PART	Pieces Per Gear	No.	NAME OF PART	Pieces Per Gear	No.	NAME OF PART	Pieces Per Gear
1	Cylinder—Type E (guide bolting).	1	16	Reverse Cylinder Valve Body Cap.	1	33	Reverse Lever Latch Handle Pin.	1
2	Guides and Cylinder Head—front.	1	17	Reverse Cylinder Valve Follower.	1	34	Reverse Lever Latch Link Pin.	1
3	Cylinder Head—back.	1	18	Reverse Cylinder Valve Spring.	1	35	Reverse Lever Latch Pin.	1
4	Piston Head—Style No. 1.	1	19	Reverse Cylinder Valve Stem.	1	36	Reverse Lever Fulcrum Pin.	1
5	Piston Packing Rings (3 pieces) Style No. 1.	1 set	20	Reverse Cylinder Valve Arm Pin.	1	37	Reverse Gear Oil Cup.	1
6	Piston Rod.	1	21	Reverse Cylinder Valve Arm Pin.	1	38	Reverse Gear Drain Cocks.	3
7	Stuffing Box Ring.	1	22	Floating Lever.	1	39	Rod Ends for Rod to Cab.	2
8	Stuffing Box Gland.	1	23	Rod Jaw with Lock Nut.	1	40	Piston Head Style No. 2.	1
9	Crosshead.	1	24	Reverse Lever Style No. 1.	2	41	Piston Filler Plate Style No. 2.	1
10	Crosshead Arm.	1	25	Reverse Lever Style No. 2.	4	42	Piston Follower Style No. 2.	1
11	Crosshead Wrist Pin.	1	26	Reverse Lever Quadrant.	1	43	Piston Packing Cups Style No. 2.	2
12	Crosshead Key.	1	27	Reverse Lever Quadrant Support.	1	44	Piston Packing Expander Rings Style No. 2.	2
13	Reverse Cylinder Valve, Complete with Arm No. 20.	1	28	Reverse Lever Latch.	1	45	Cylinder—Type E-1 (cylinder bolting).	1
14	Reverse Cylinder Valve.	1	29	Reverse Lever Latch Guide.	1	46	Reverse Lever Style No. 2.	1
15	Reverse Cylinder Valve Body.	1	30	Reverse Lever Latch Link.	1			
			31	Reverse Lever Latch Link.	1			
			32	Reverse Lever Latch Link.	1			

Repair parts are carried in stock. When ordering, state the type and serial number of gear if possible, also name and number of part.