

# MODIFICATION INSTRUCTION

## ALTERATION TO EXHAUST MANIFOLDS ON F2, F3, BL, F7, AND GP7 LOCOMOTIVES

**PURPOSE:** To prevent excessive exhaust manifold stud breakage and exhaust manifold cracking. This is accomplished by:

1. Splitting the manifold in half to allow for alternate expansion and contraction.
2. Using high strength alloy heat treated studs.
3. Removing the cooling water discharge piping from the manifold to prevent end sheet cracking.

**APPLICATION:** All F2, F3, and BL locomotives. All F7, FP7 and GP7 locomotives equipped with two one-piece manifolds having water pipe through the rear manifold.

**REFERENCES:** No reference drawings necessary. Refer to Figs. 1 thru 7.

**NEW MATERIAL REQUIRED:** The bill of material required to modify one unit is as follows:

<u>Part No.</u>	<u>Quantity</u>	<u>Description</u>
8055261	2	Gasket
8069042	8	Exhaust gasket
8070513	2	Water gasket
8135183	1	Water discharge elbow
8135201	1	Water discharge pipe
8137334	56	Flat washer
8146488	1	Flanged elbow
8146490	2	Gasket
8146492	1	"Y" Fitting
8147681	1	Support bracket assembly
*8155843	56	Standard stud
8157186	2	Stainless steel clamp
8159859	2	Asbestos tape 4" x 50"
8159860	2	Split ring
103323	16	Lockwasher
103343	8	Flat washer
114609	56	Star washer
173685	8	Nut
173829	8	Bolt
173836	8	Bolt
189069	1	Reducing bushing 1-1/4"-3/4"
190871	56	Nut
**8159911	1	5/8-18 NF .015" oversize tap
**8160162	5#	Blue seal pipe compound

\* See Item 2 under "Procedure" for part numbers of oversized studs.

\*\* These items can be ordered as necessary, depending on number of units to be reworked.

April, 1950

The following parts are required on "A" units, only:

<u>Part No.</u>	<u>Quantity</u>	<u>Description</u>
8027428	1	Connector
8108115	1	Pipe clamp assembly
8131020	1	Hose assembly
8146852	1	Tube assembly

### PROCEDURE

The instructions for reworking the exhaust manifolds are as follows:

1. Remove the roof hatch and exhaust manifolds.
2. Remove all exhaust manifold studs and replace them with high-strength alloy heat treated undercut stud #8155843. The new stud is available in oversizes as follows:
 

<u>Part No.</u>	<u>Description</u>
8155844	.002" O.S.
8155845	.004" O.S.
8155846	.015" O.S.
8155847	.017" O.S.
8155848	.019" O.S.
3. Make hydrostatic test of the engine, using warm water at 40 PSI, after blanking off radiators and water pumps. Replace any leaking stud with the next oversize stud until all leaking studs are replaced.
4. Cut or grind smooth the exhaust manifold longitudinal weld bead 2" to either side of the center line.
5. Cut the manifold in half as per Fig. 1. The drain hole in the bottom of the manifold may be used to establish the center line for making the cut. Fabricate a suitable guide-clamp to clamp around the manifold to guide the cutting torch. Mark the mating halves as these halves will not be interchangeable with other manifold halves.
6. Grind all cut surfaces reasonably smooth.
7. Bolt the rear section of the rear manifold to a 1" thick stiffening plate before performing any outside cutting or welding operations to hold distortion to a minimum.
8. On the rear section of manifolds equipped with an internal water pipe, remove this pipe as follows:
  - a. Cut off flange on discharge side.
  - b. Cut pipe loose from end sheet and from manifold mounting flange.
  - c. Remove pipe.
  - d. Weld 3/16" thick patches over cooling discharge openings and repair any cracks in the end sheet. Use A.W.S. 6012 welding electrode for all repairs.
9. Notch out the two rear legs by flame cutting, as per Fig. 2. To prevent excessive distortion it is suggested that the legs be wrapped with wet rags below the notches.
10. Fabricate two exhaust tube plates as per Fig. 3.

11. Weld these plates to the notched out portion of the rear legs, as shown in Fig. 4 to form a gas tight joint.
12. Flame cut the mounting flange as shown in Fig. 5, and grind edges clean.
13. Weld a 3/16" x 1" x 1" stop at the top of each half, 2-1/4" from cut as per Fig. 1. These stops are to prevent side slippage of the 4" stainless steel clamp.
14. Trim split ring #8159860 at assembly and weld to either half of the cut manifold as per Fig. 1. Weld the gap in the split ring solid.
15. Remove all weld slag and spatter. Peen all welds generously to hold distortion at a minimum.
16. After all welding is complete, check the mounting flange surfaces. These surfaces must be finished flat, both lengthwise and crosswise, to within  $\pm .015"$ .
17. With the rear section of the rear manifold resting on its mounting surfaces, place the water discharge elbow #8135183 in its proper position as shown in Fig. 6. Apply pipe joint compound to the threaded portion of water discharge pipe #8135201. Insert it between the rear legs and thread it tightly into the discharge elbow, making sure that the flange is square when tight.
18. Using standard exhaust gasket #8069042 and water gasket #8070513, reinstall manifolds with the two mating halves kept together.
19. Install asbestos lining #8159859 around the gap between manifold halves. Draw tightly and trim the end of the asbestos lining so as to form a butt joint. Add stainless steel clamp #8157186 to provide a gas-tight joint.
20. Reinstall flat washer #8137334, star washer #114609, and nut #190871 on manifold hold down studs. Tighten all nuts to 90 foot-pounds torque.
21. Install cooling piping as shown in Fig. 6. The flange holes in flanged elbow #8146488 are elongated to provide movement in both directions. Remove upper center engine gear train housing bolts and install the support bracket assembly.
22. On "A" units, it will be necessary to alter the cab heater drain pipe, as shown on Fig. 7. Connector #8027428 is installed in the flanged elbow #8146488 after removing the pipe plug.
23. To insure that the nuts remain tight without blowing gaskets, it is necessary to torque the nuts to 90 foot-pounds at each 2500 mile inspection in freight service, or 5000 mile inspection in passenger service until the 90 foot-pound setting holds, indicating that the gaskets have taken a permanent set.

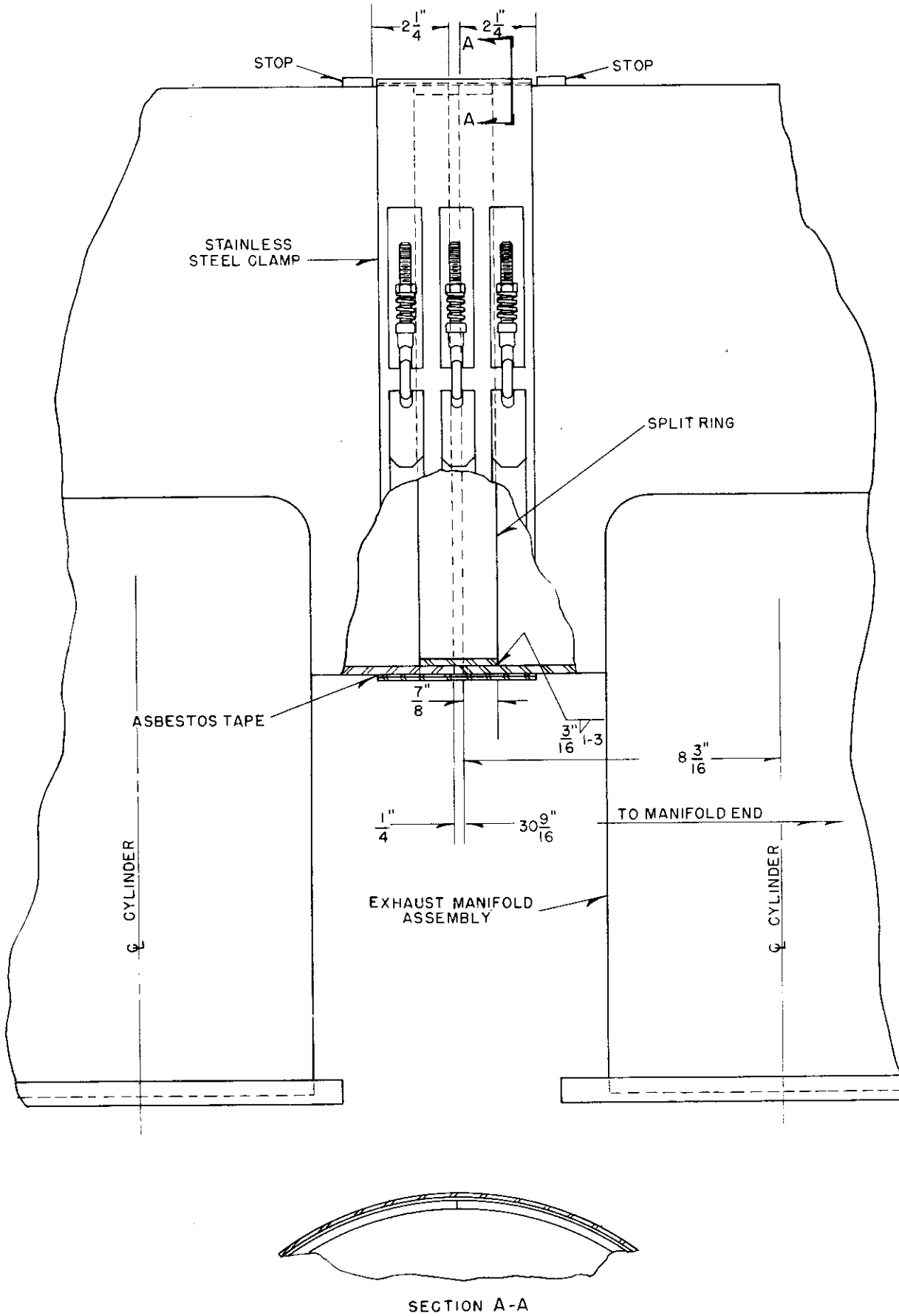


Fig. 1 - Rework Drawing For Splitting Of Manifold

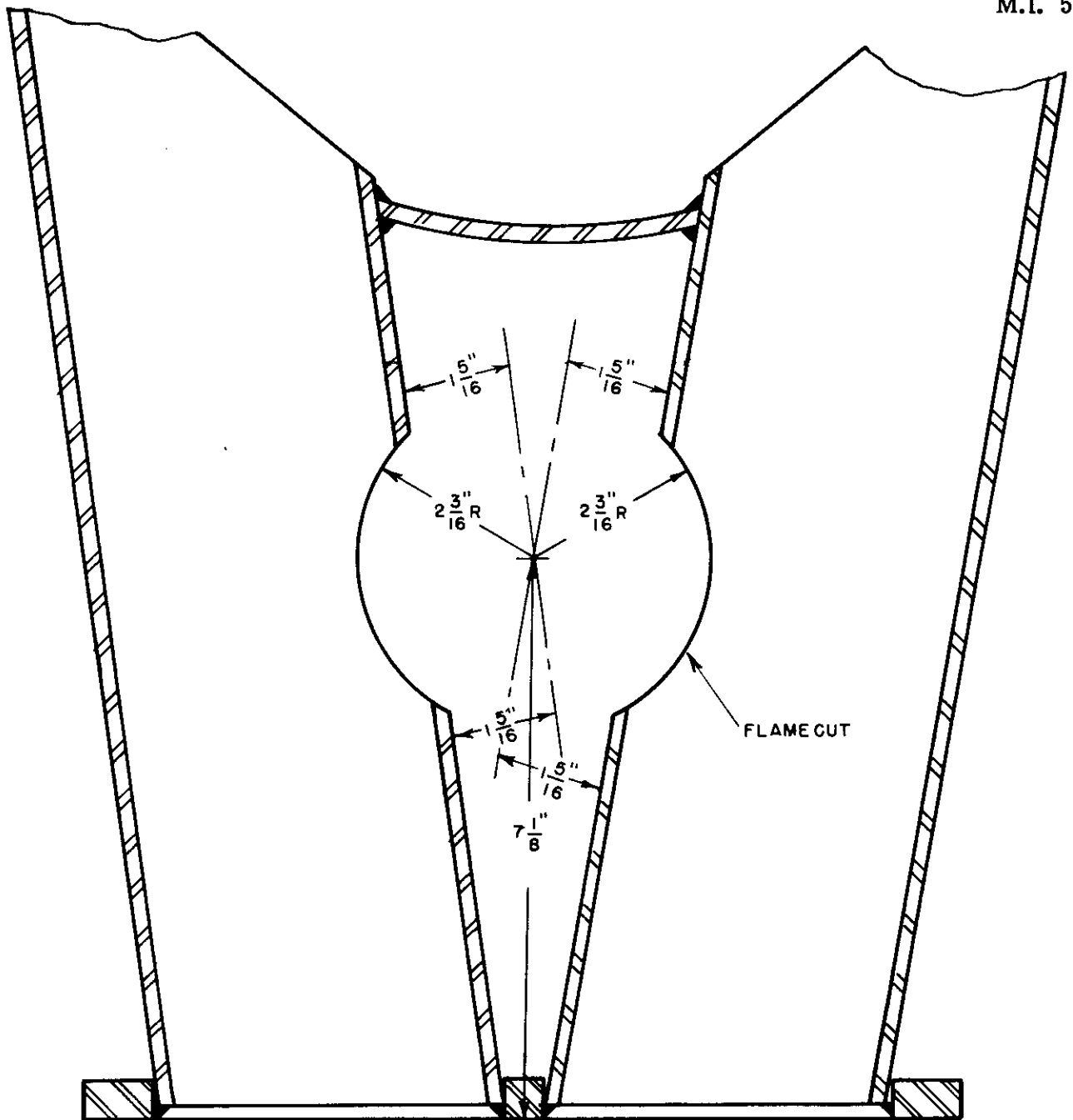


Fig. 2 - Alteration To Rear Manifold Legs

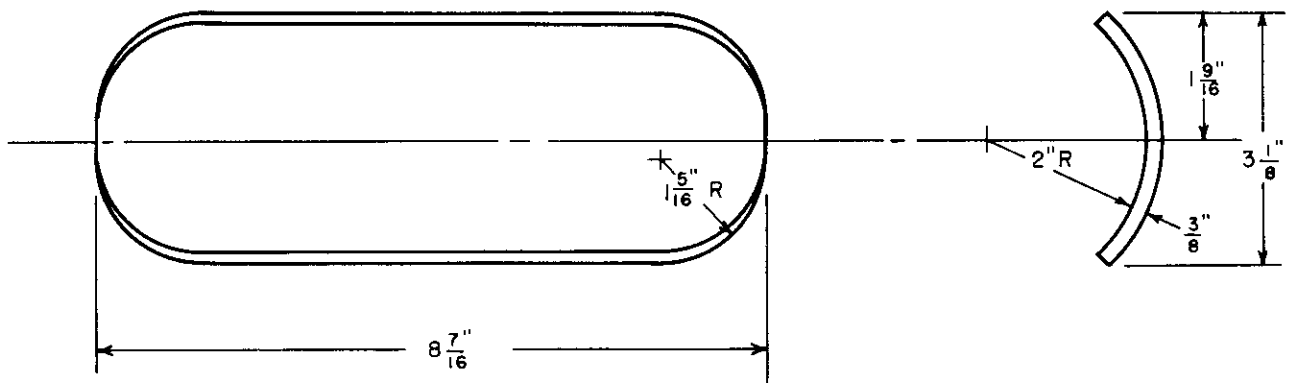


Fig. 3 - Exhaust Tube Plate

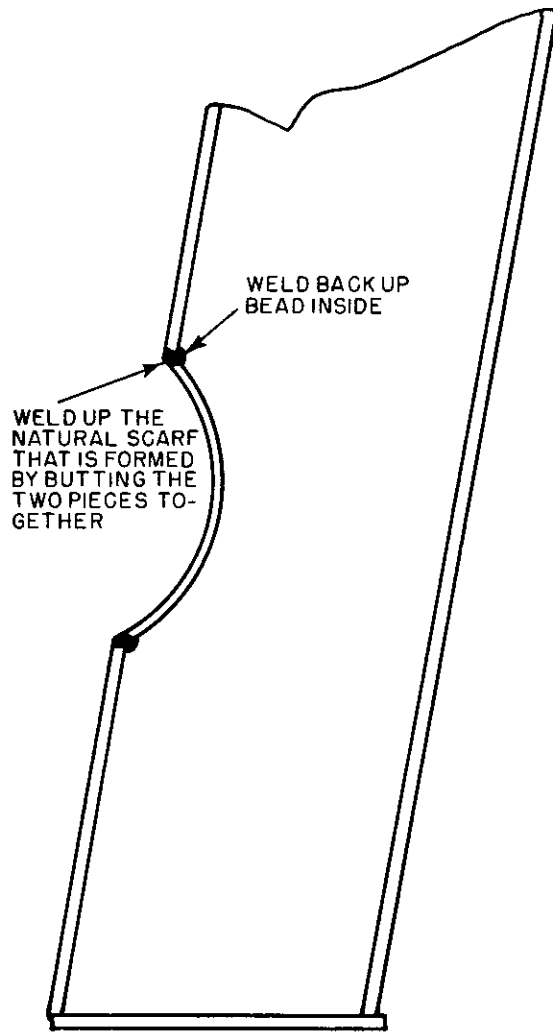


Fig. 4 - Application At Exhaust Tube Plate

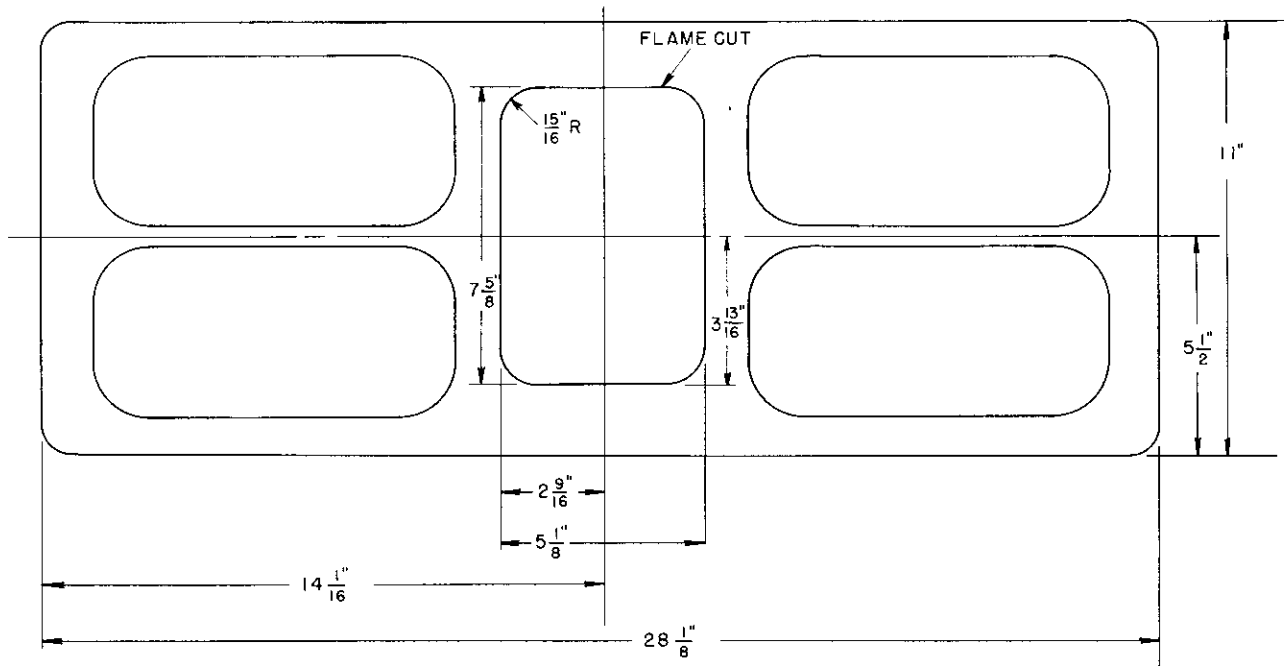
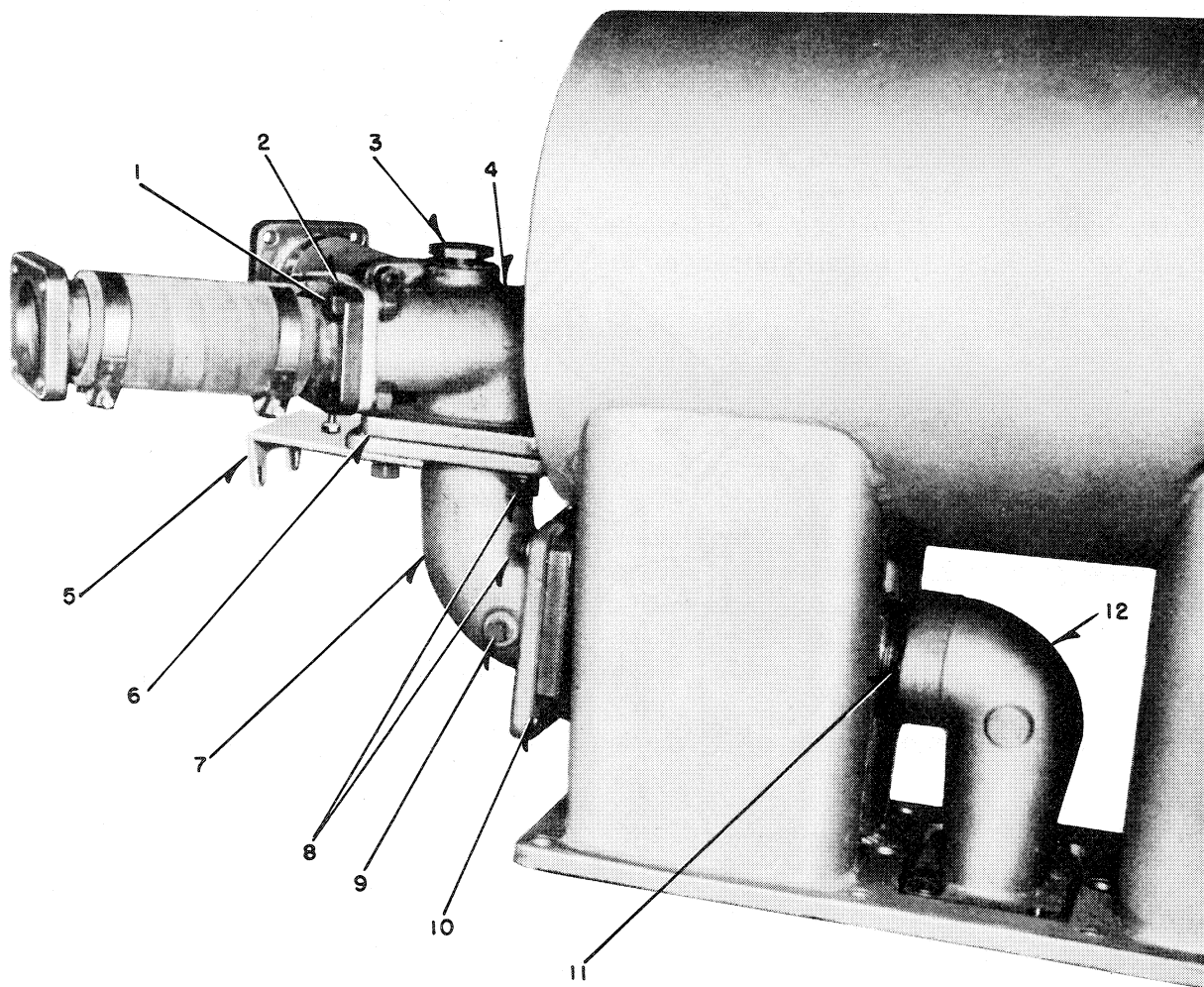
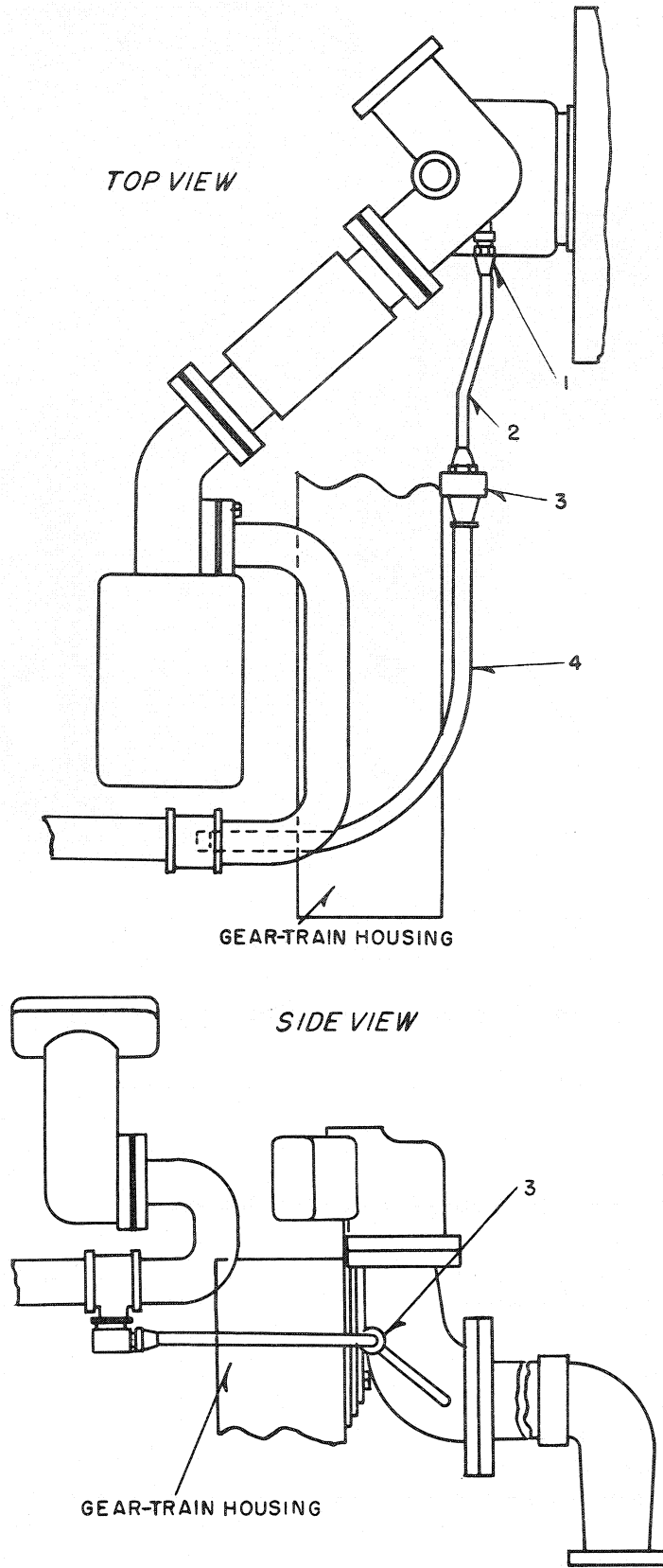


Fig. 5 - Alteration To Mounting Flange



DESCRIPTION	PART NO.
1. LOCKWASHER	103323
NUT	173685
BOLT	173836
2. GASKET	8055261
3. RED BUSHING $1\frac{1}{4}$ "- $\frac{3}{4}$ " FOR INSTALLATION OF HOT ENGINE	189069
ALARM BULB	
4. "Y" FITTING	8146492
5. SUPPORT BRACKET ASSEMBLY	8147681
6. GASKET	8146490
7. FLANGED ELBOW	8146488
8. LOCKWASHER	103323
BOLT $\frac{1}{2}$ " 13 HEX HD.	173829
FLAT WASHER $\frac{1}{2}$ "	103343
9. PLUG REMOVED AND DRAIN LINE INSTALLED ON "A" UNITS ONLY	
10. GASKET	8146490
11. WATER DISCHARGE PIPE	8135201
12. WATER DISCHARGE ELBOW	8135183

Fig. 6 - Application Of Engine Cooling Water Discharge Piping



- |                  |         |                        |         |
|------------------|---------|------------------------|---------|
| 1. CONNECTOR     | 8027428 | 3. PIPE CLAMP ASSEMBLY | 8108115 |
| 2. TUBE ASSEMBLY | 8146852 | 4. HOSE ASSEMBLY       | 8131020 |

Fig. 7 - "A" Unit Heater Drain Piping