EMD MAINTENANCE INSTRUCTION

# LOCOMOTIVE TRUCK ASSEMBLIES MECHANICAL DRIVE

## GENERAL DESCRIPTION

The truck assembly, Fig. 1, is one of the major components of the locomotive. Two truck assemblies support the entire weight of the locomotive and provide a means for the transmission of effort to the rails. They are designed to withstand the stress resulting from road shock due to variations in the road bed and other conditions encountered during operation. An important function of the truck assembly is to absorb and nullify these stresses so that they will not be transmitted to the locomotive underframe and the equipment mounted on the underframe.

The entire diesel locomotive electrical horsepower developed by the generator is supplied to the traction motor or motors which in turn, drive the mechanical gearing arrangement on each driving axle. The driven axles transmit the power to the driving wheels which contact the rail. The traction force then is transmitted through the journal boxes and adapters to the truck side frames, and through pressure areas on the truck frame to the mating areas on the truck bolster. The bolster then transmits the force through its center bearing to the center bearing of the mating carbody bolster to move the locomotive and supply the locomotive draw bar horsepower. The drawbar horsepower is the horsepower available for handling the train.

The speed control of the locomotive is applied through the truck assembly. The

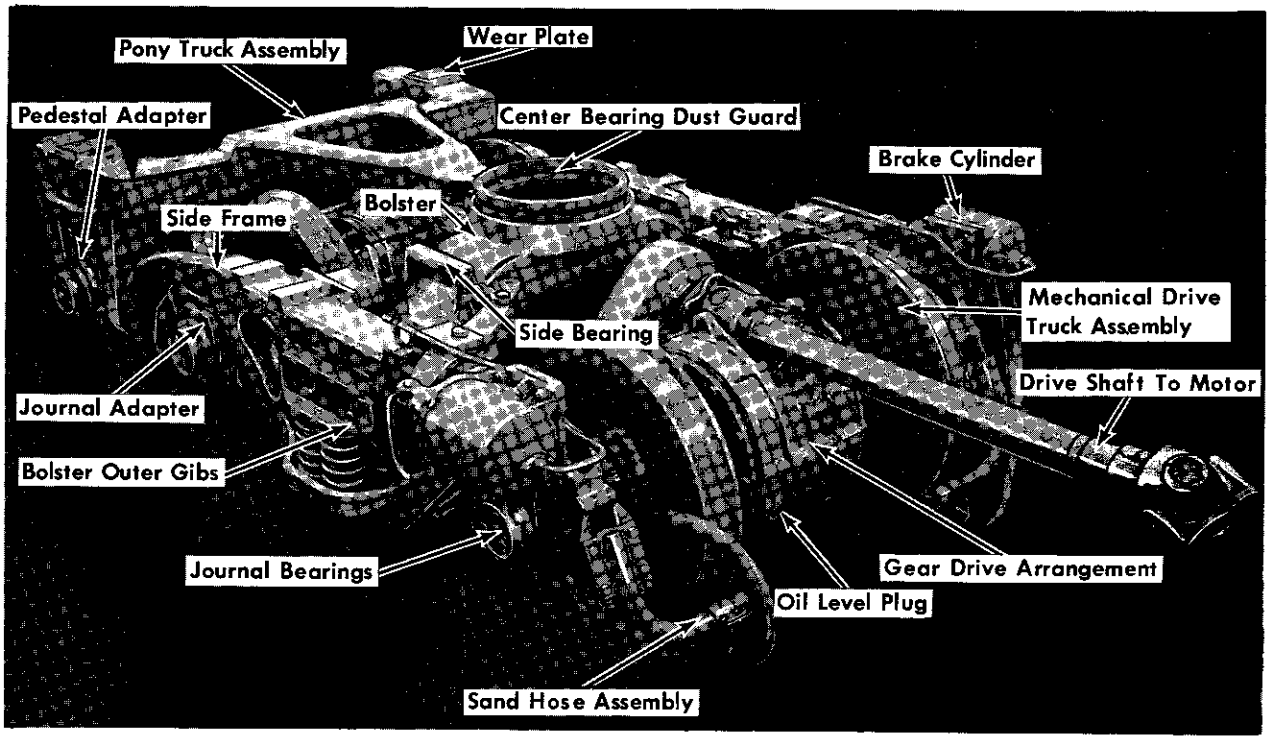


Fig. 1 — Mechanical Drive Truck And Pony Truck



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forward and reverse accelerating speed control is accomplished through the electric drive motor and the mechanical drive on the axle. Decelerating locomotive speed control may be obtained through reduction in power applied to the drive motor or by the application of friction type brakes.

The trucks are also equipped with brake cylinders, brake levers and links, and a sand delivery arrangement.

Mechanical drive trucks are equipped with axles that have splines machined in a raised section at the middle of the axle. A drive gear fits over the axle splines at right angles to the axle and is driven through a pinion and shaft connected to the electric drive motor. One motor is used to drive both pair of wheels on one truck or may drive the gear arrangement on each truck axle through a connecting drive shaft arrangement, depending on the model of locomotive.

## SWIVEL TRUCKS

One design of mechanical drive truck is shown in Fig. 1. This assembly is equipped with a "pony" truck which is added to the four-wheel mechanical drive truck. The pony truck is connected to the bolster of the main truck and is used to provide additional support for this locomotive model and reduce the axle loading.

A four wheel mechanical drive truck similar to the truck shown in Fig. 1, is used on the other locomotives without the pony truck. The four wheel truck consists of two side frames having pedestals at each end which fit over the journal bearings on the axle. A retaining plate bolted to the pedestal prevents the separation of the axle and frame. The bolster extends from one side frame to the other, entering the side frame at the center opening. The side frame is held between inside and outside gibs at the end of the bolster. Coil springs seated in an enlarged center base of the side frame support the end of the bolster. Spring loaded friction shoes bear against wear plates at the bolster opening in the side frame to dampen the bolster support spring movement as well as to help control lateral bolster movement. A center bearing having lubricated side and bottom wear plates, receives the carbody center bearing. Side bearings on the bolster at each side of the center bearing are opposite corresponding bearings on the underside of the carbody.

The mechanical drive arrangement used on this type of truck is shown in Fig. 2. An electrical motor supplies power to the drive housing on the axle through connecting drive shafts. The drive housing is assembled on the axle before the wheels are mounted on the axle. The middle portion of the axle is splined. A right angle bevel gear assembly contained within the drive housing has a splined hub to mate with the

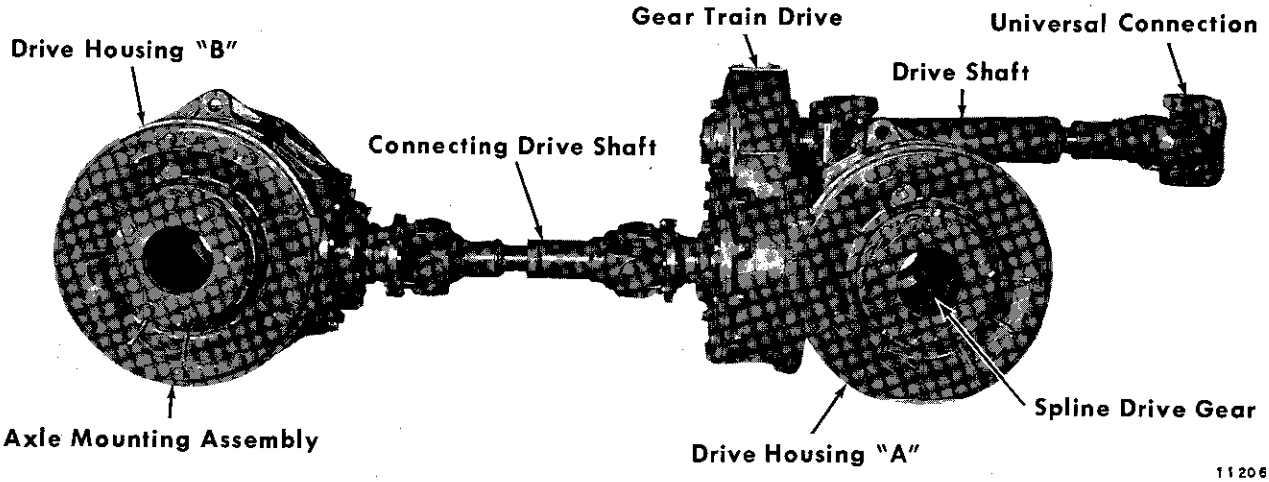



Fig. 2 — Mechanical Drive Arrangement

splined drive axle. The axle and wheels are driven through this right angle bevel gear. The right angle bevel gear is in turn driven through a spur gear train and bevel pinion in the drive housing "A". A connecting drive shaft transmits power to the bevel drive pinion in the housing "B". Some locomotives which have three pairs of wheels driven by one electric motor use three drive units "A", one on each axle. A torque arm as shown in Fig. 5 is connected between the housings to support the drive gear reaction. Since the mechanical drive assembly is a major component in itself it is covered separately in M.I. 1570.

### GM6W LOCOMOTIVE TRUCKS

The frame of the truck assembly shown in Fig. 3, used on the GM6W mechanical drive locomotive is an integral part of the locomotive underframe. A pedestal side frame assembly is located below the main carbody frame to allow room for the application of the journal springs. Each pedestal side frame is welded at each end to a downward extending part of the carbody underframe. In addition, the two pedestal side frames are joined together by two transverse beams, one on each side of the center axle, to add strength to the pedestal frame assembly.

The journal bearings at each end of the wheel and axle assembly are contained in adapter assemblies which are held between pedestals on the side frame. The adapter also provides a support for the two coil springs between the adapter and the locomotive underframe. Spring pockets are provided in the underside of the carbody to hold the top end of the journal springs. Two stops on each adapter contact the frame pedestal inboard surfaces to limit the lateral movement of the wheel and axle assembly. Wear plates on the pedestal and the adapter can be replaced when worn to their limit. A tie bar is bolted to the bottom end of the adapter. If the locomotive is raised, the tie bar will contact a hanger strap to keep the wheel, axle and journal assembly within the pedestal.

The mechanical drive on the truck is similar to the mechanical drive shown in Fig. 2, used with the conventional mechanical drive truck. The method of drive is the same, being through the right angle drive gear splined to the axle and contained in the drive housing mounted on the axle. All three mechanical drive housings are connected through drive shafts and all three are driven by an electric motor mounted on the underside of the carbody at the cab end of the locomotive.

## MAINTENANCE

### TRUCK CLEANING UNDER LOCOMOTIVE

The trucks should be cleaned as often as needed while under the locomotive to prevent any accumulation of oil and road dirt. The oily accumulation presents a fire hazard and tends to increase the wear of moving parts on the truck as well as detract from the general appearance of the trucks.

A wetting and an alkaline solution type cleaner can be used to clean the truck. Spray the wetting agent over the surface of the truck and let it remain for ten to fifteen minutes. Then using steam and alkaline solution with a spray gun, spray off the truck assembly. The truck may be rinsed using hot water if desired, however, rinsing is not generally required.

The engine should be running to supply air under pressure to the electric drive motors when the trucks are cleaned under the locomotive. Air discharged from the motors will help to prevent any liquid spray from entering. The spray also should be directed away from the motors so it will not enter any of the openings in the motors or vents in the gear box during cleaning.

## REMOVAL OF TRUCK FROM LOCOMOTIVE

The trucks or wheel and axle assemblies can be removed while the locomotive is raised using an overhead crane, or by the use of a jack. A drop pit arrangment may also be used to raise and support the locomotive to permit removal of the trucks and wheel and axle assemblies.

Safety interlocks, which are designed to prevent separation of the truck from the carbody, must be removed before any attempt is made to remove the trucks. The interlocks are bolted or hinged to the carbody so as to lift on the bolster if the carbody is raised. In the case of the GM6 locomotive, the adapter tie bar must be removed. Make certain that all other

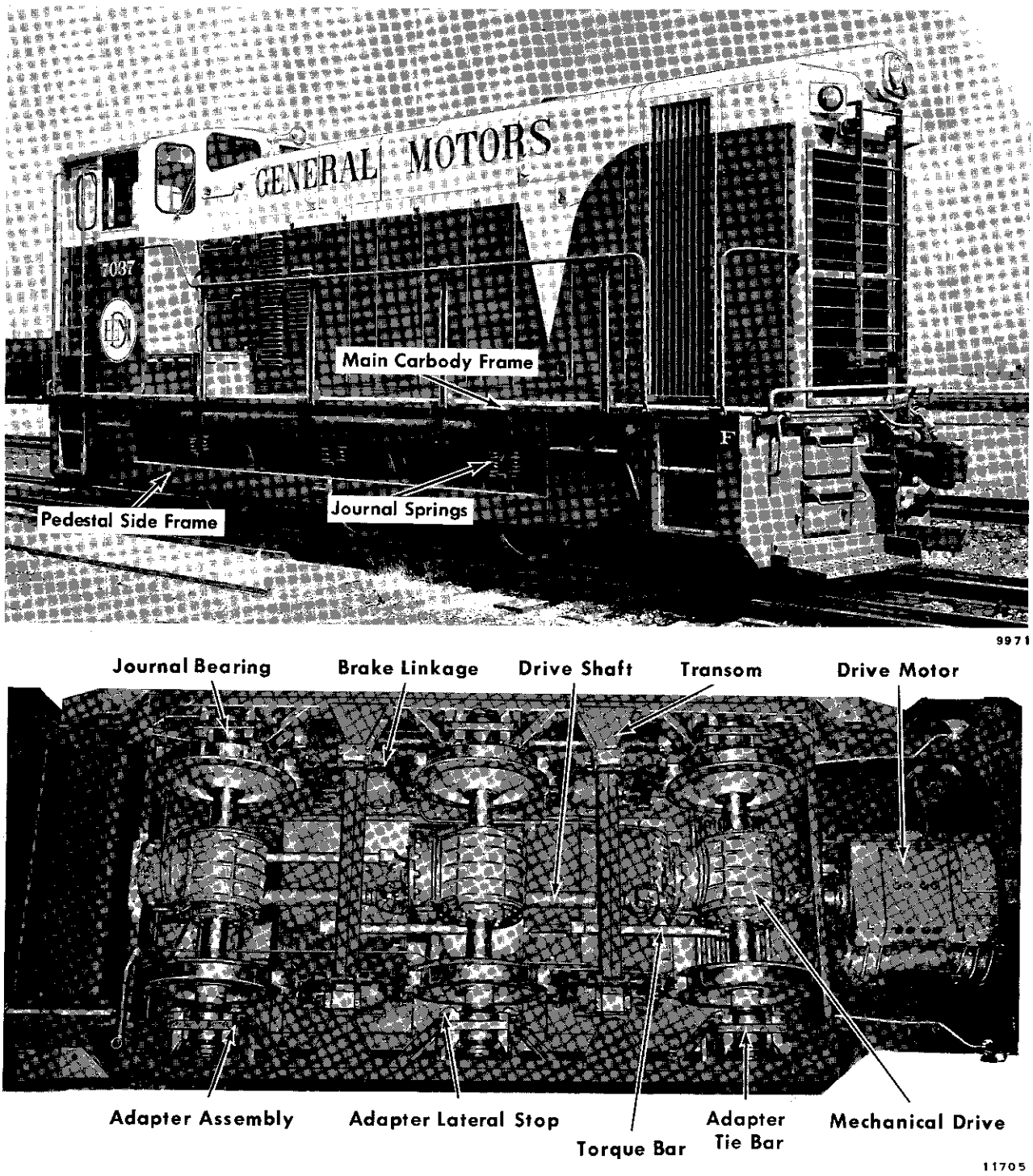



Fig. 3 — GM6W Locomotive And Bottom View Of Truck Frame

physical connections between the trucks or wheel and axle assemblies and the carbody are disconnected, such as the air brake equipment, hand brake and speed recorder connections.

Particular attention should be given to the GA12 locomotive truck assembly, Fig. 1, when either removing or applying the truck. The safety strap, which hangs from the bolster of the main truck and extends under the connecting drive shaft, can be applied or removed only when the bolster is in the loaded position. The strap must be removed before any attempt is made to raise the locomotive. Do not block the bolster to maintain clearance for the strap as this would result in excessive mis-alignment between the bolster and the pony frame at the pivot pin connection.

It should also be noted that the GA12 locomotive truck and pony truck assembly cannot be lifted as a complete unit unless a special crib is constructed to hold the pony axle in the same position relative to the driven axles as it is on the rails. It will be necessary to disconnect the pony truck from the main truck if this lifting crib is not provided.

If only one truck is to be removed, the locomotive should be raised at the opposite truck until the carbody center bearing clears the truck center bearing, so as to prevent damage to the truck bearing. The end of the locomotive at which the truck is being removed may then be raised as necessary to allow removal of the truck.

When jacks are used to raise the locomotive, care must be taken that the jacks on the opposite side of the locomotive are raised equal amounts. This will assure that each jack takes its share of the load, otherwise the carbody might be sprung out of shape. The locomotive should be supported on blocking if it is to be held in a raised position.

Various facility drawings are available covering items used in removing and handling of trucks. A listing of these blueprints and file drawing numbers are given in the tool catalog.

## TANK CLEANING OF SEPARATE TRUCKS

When the truck assembly is removed from under the locomotive, the frame can be cleaned by immersing it in a large cleaning tank containing an alkaline solution. The wheel and axle assembly with the mechanical drive applied should not be immersed in the tank as the cleaning solution would enter the drive housing and damage the enclosed parts. The brake cylinders should also be removed prior to immersing the truck. After a sufficient time to assure removal of the foreign material, remove the frame assemblies from the tank and rinse, using hot water.

## GENERAL PROCEDURE FOR TRUCK DISASSEMBLY

The current design of mechanical truck shown in Fig. 4 consists of two major assemblies, the drive gear and wheel and axle assembly and the side frames and bolster assembly. These assemblies are shown separately in Fig. 5. The truck can be disassembled as outlined in the following procedure.

A mechanical truck designated as Model C-1 may also be used on some locomotives. The Model C-1 truck is similar to the truck shown in Fig. 4, but it has a different friction control arrangement at the bolster pocket in the frame. The disassembly information particularly covering the friction arrangement on the Model C-1 truck is provided in a separate item titled, "Side Frame and Bolster Disassembly for Model C-1 Truck".

Separating The Two Major Assemblies

1. Remove the sander hose guide support and bracket from the side frame.
2. Remove the retainer plate from slot at each pedestal of both side frames.
3. Using a suitable hoist raise the bolster and side frames until they clear the

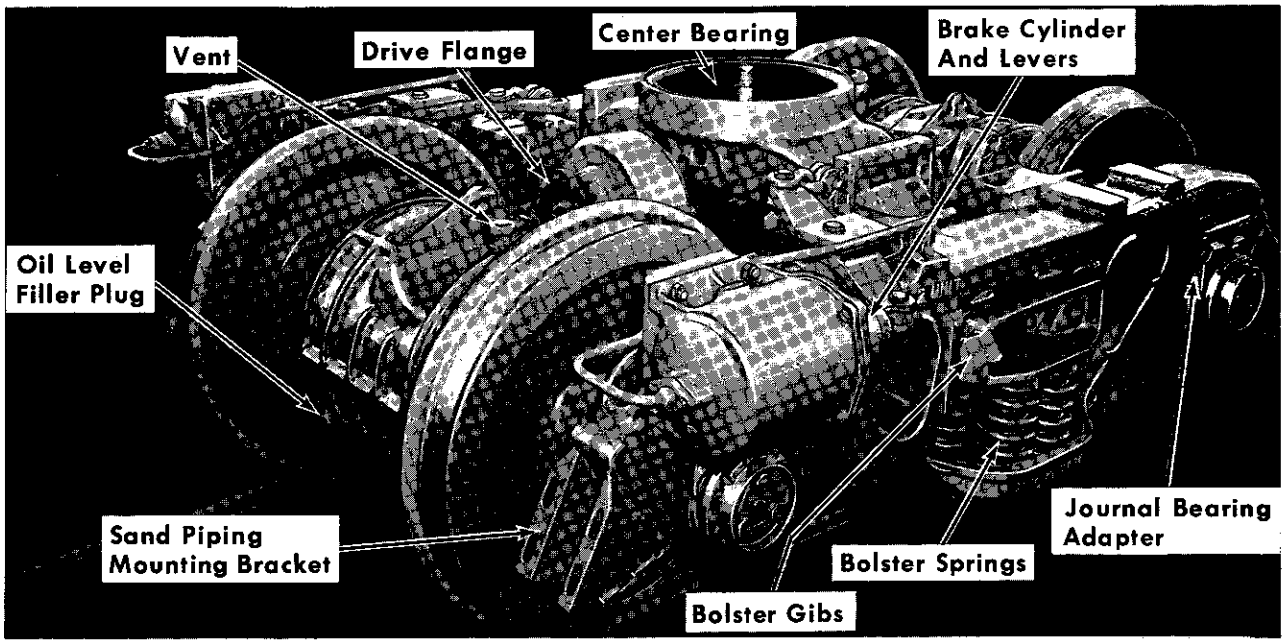



Fig. 4 — Mechanical Truck Assembly

drive gear and wheel and axle assembly.

Drive Gear and Wheel and Axle Disassembly

NOTE: Information covering disassembly of the drive gear and wheel and axle assembly may be found in M.I. 1570 covering axle drive gear units.

Side Frame and Bolster Disassembly (Except Model C-1 Truck)

1. Place a pry bar between the top member of the side frame and the top of a friction shoe. Raise the pry bar so as to position the friction shoe to permit insertion of a retainer pin through holes provided in the friction shoe and bolster to hold the shoes in place. The retaining pins should be at least 6" long and should not exceed 5/8" in diameter. Application of the retaining pins is shown in Fig. 6.

2. Insert two pipes through the holes provided in the bolster and place the bolster assembly on the metal supports as shown in Fig. 7 so that the side frames are supported completely by the bolster. The load carrying spring assemblies can now be removed from the side frames shown in Fig. 6.

3. With the friction shoe retainer pins still inserted the side frames can now be lifted off the bolster by using a suitable hoist.

4. With the side frames removed from the bolster the friction shoes may be removed from the bolster by applying a pressing fixture and a jack in place against the friction shoes as shown in Fig. 8. The friction shoe is forced into the bolster pockets making it possible to remove the retaining pins. As the jack pressure is reduced the friction shoes and friction shoe spring may be removed. The same procedure is followed for the removal of the friction shoes on the opposite end of the bolster. (The pressing fixture shown can be made using information given on File Drawing 646, which is available on request.)

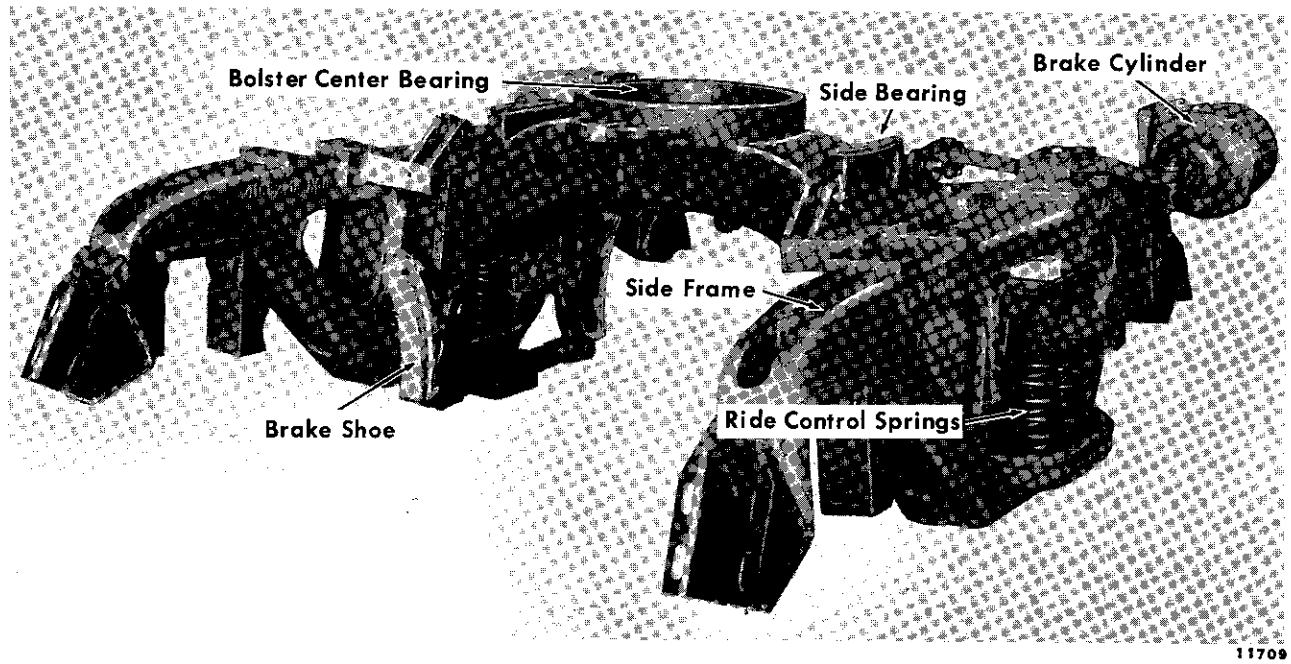
Side Frame And Bolster Disassembly For (Model C-1 Truck)

The assembly arrangement of the primary parts of the friction control at the bolster and side frame of the Model C-1 truck is

shown in Fig. 9. Other than these parts this truck is similar to the conventional model mechanical truck. The disassembly of these parts may be accomplished using the following procedures:

1. Insert a pry bar into hole "A", Fig. 10, and force the wedges upward into the sidedrawn pockets. When the lower holes of the wedges are visible through the holes "B" in the frame, insert a retaining pin to hold the wedges in position. (Construction of the retaining pin is shown in Fig. 11. Four pins are required for each truck.)

2. The bolster may then be lifted up so its weight is off the bolster support springs and both the bolster and springs removed from the side frames.



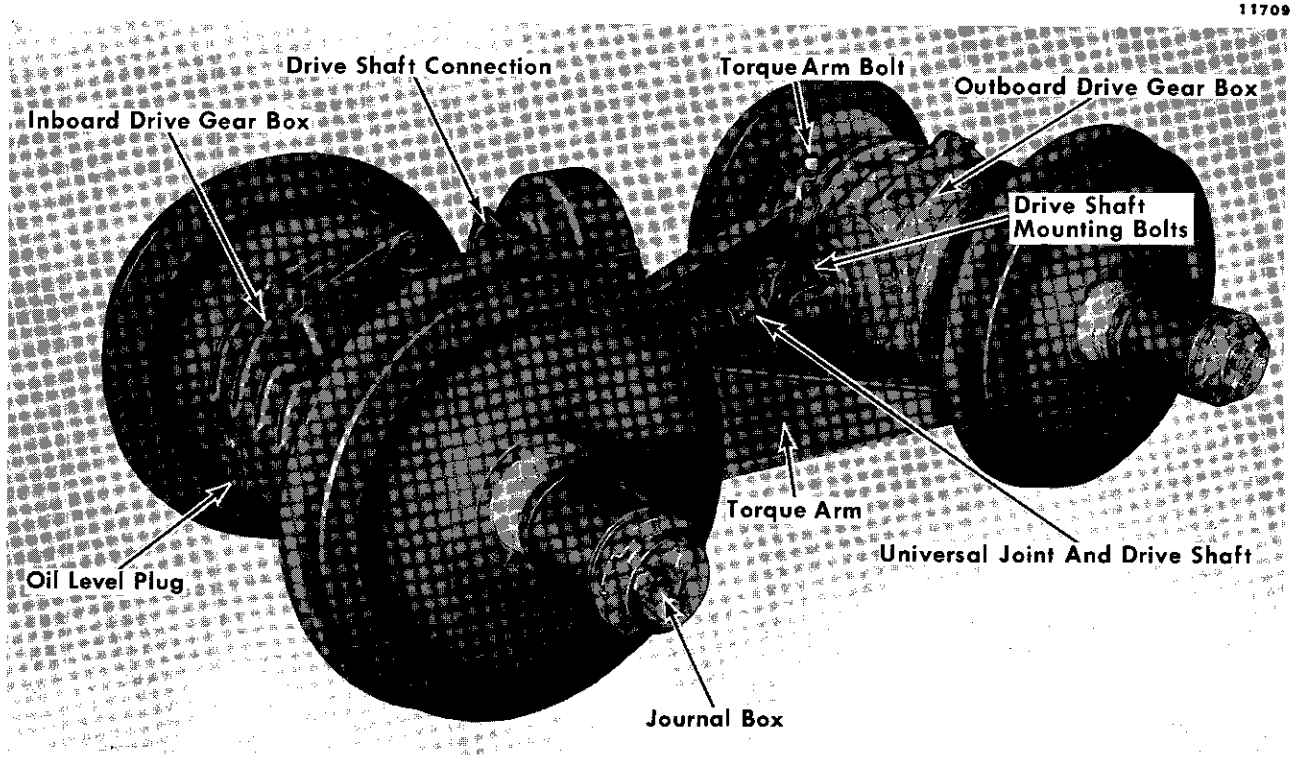




Fig. 5 — Major Mechanical Truck Assemblies

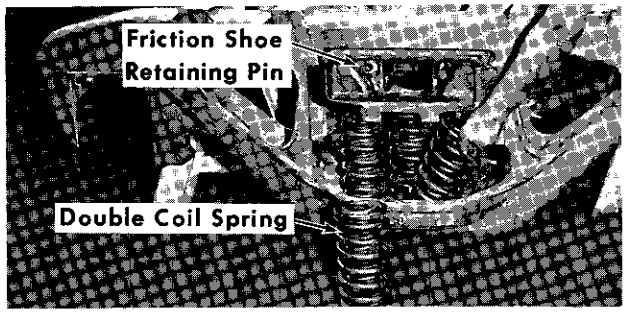



Fig. 6 — Removing Load Carrying Springs

3. Using a journal jack as shown in Fig. 10 apply a pressure against the friction wedges until the retaining pins are free. Remove the retaining pins and then reduce the jack pressure until the friction wedge and wedge springs can be removed.

## GENERAL INSPECTION AND REPAIR

Make a thorough inspection of the side frames and the bolster for the following items and repair as stated.

### Broken Or Cracked Members

Breaks or cracks must be repaired by welding with AWS E-7016 electrode. If the broken section can be removed or straightened, it is permissible to weld it back into place after preparing the joint so as to obtain a 100% section of weld with reinforcement. Broken cast sections may be duplicated with a like shape made from MS-4361 steel, and welded to the truck frame.

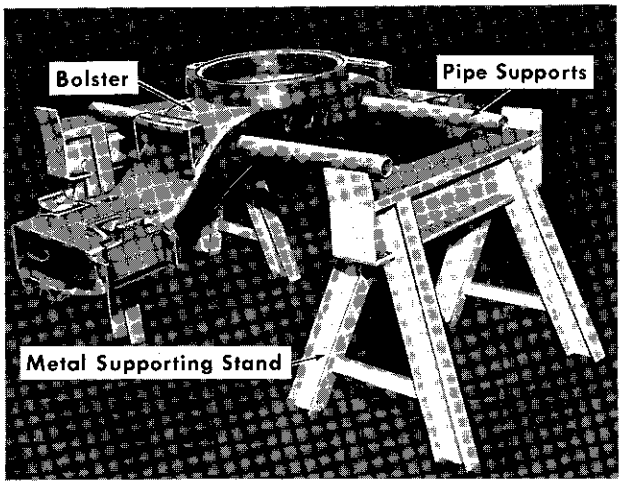


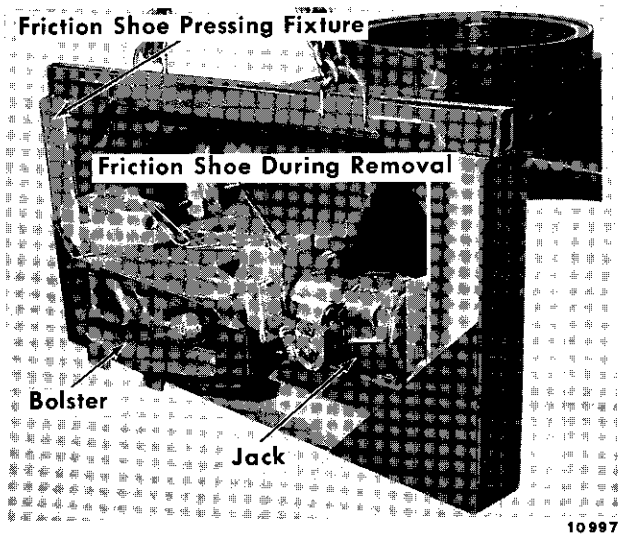

Fig. 7 — Bolster Assembly On Metal Support Stands

### Bent Sections

Bent sections may be straightened either cold or with the application of heat. Before straightening any bent section, determine what effect it will have on adjoining sections. Jacks, turnbuckles or fixtures designed for straightening members will expedite the straightening of bent sections.

### Worn Spots

The truck should be thoroughly checked for worn spots on other than normal



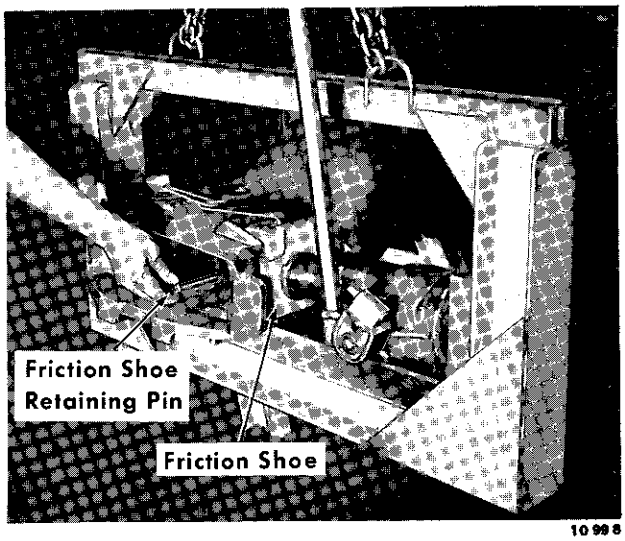




Fig. 8 — Removing Friction Shoe From Bolster Pocket

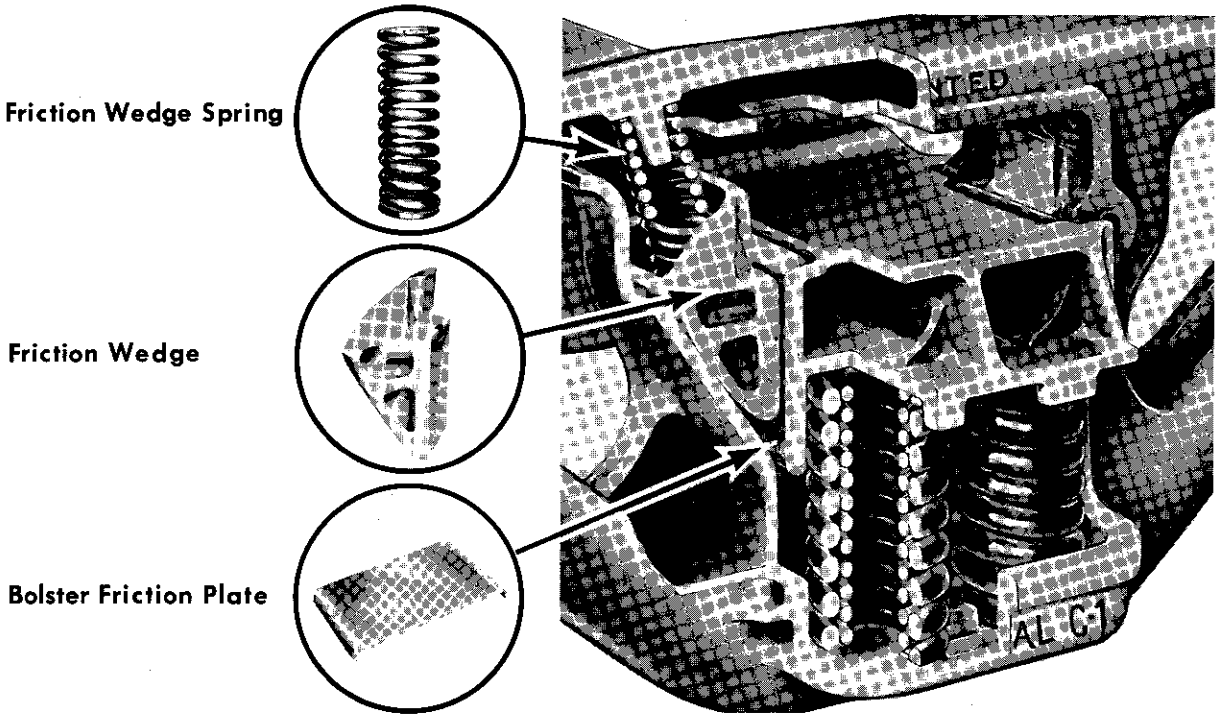



Fig. 9 — Friction Control Arrangement To Model C-1 Truck

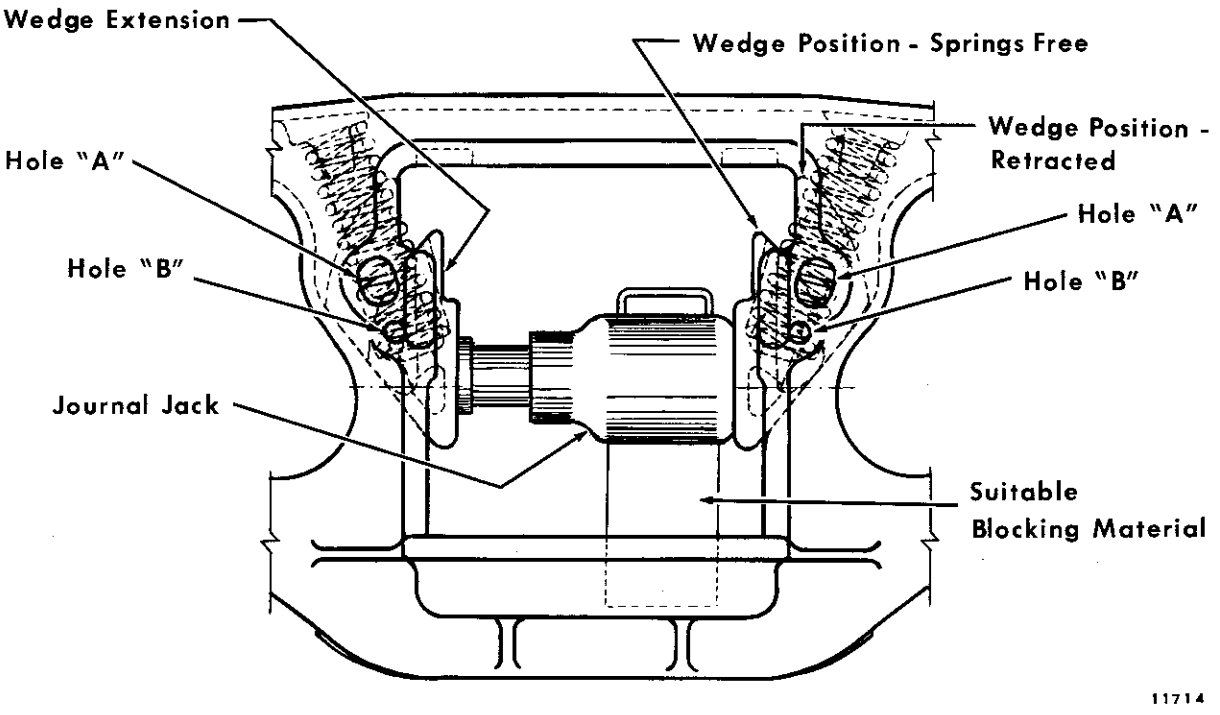



Fig. 10 — Removing Friction Wedge And Spring From Frame

wear surfaces. For example, loose brake levers often wear the clevis slots through which they are pinned. Also, excessive wear on the spring seats may necessitate their reconditioning or replacement.

Elongated or Oversize Holes

Drilled holes elongated by wear due to loose bolts, pins, sleeves or bushings, should be brought back to normal size

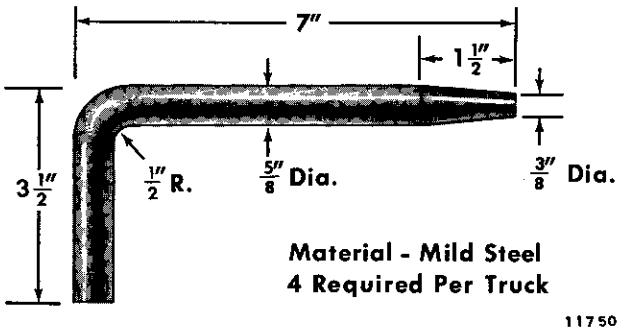



Fig. 11 — Wedge Retaining Pin Construction

as indicated by similar locations on a truck which is in good condition. The holes should not be worn more than 3/64" on the radius or 3/32" on the diameter.

Holes which are beyond these tolerances can be reconditioned by either ring or plug welding. Holes which are too small to permit proper manipulation of the welding electrode should be drilled oversize to permit electrode access. The hole should be re-drilled to proper size after completion of the welding.

Worn Bushings

Bushings worn 3/32" or more on the diameter should be replaced with new bushings. Where bushings are paired to carry a single load, both of the bushings should be replaced if one bushing is worn sufficiently to warrant its replacement.

Worn bushings can be pressed out. After the bushing is removed, inspect the drilled hole for wear and out of round condition. Holes found unsuitable for a new bushing can be reconditioned by ring welding and then drilled to accept the new bushing. Holes which are only slightly oversize may be shrunk by applying a band of heat parallel with the drilled hole.

Mutilated Threads

All threaded holes should be checked and retapped, if required. If the threaded holes cannot be reconditioned by retapping, they should be plug welded, redrilled and tapped. An alternate method of reclaiming unsatisfactory threaded holes is to retap them to accommodate oversize bolts.

Broken or Bent Studs

Replace any bent or broken studs with studs which are in satisfactory condition.

Missing Parts

Make a thorough inspection to see if all the necessary parts are intact. Special attention should be given to wear plates, cotter keys and washers.

Brake Rigging

Inspect the brake rigging to insure that brake pins, bushings and brake shoes are usable. The wear surfaces of the brake rigging are equipped with replaceable hardened bushings, pins and bolts. The condemning wear limit for these parts is 1/16" on the diameter. Cylinder levers, brake levers, brake rods and connection straps that are bent can be reused if they are restored to their original shape. Bolts and nuts that are not subject to wear can be reused if they are not damaged. New cotter pins should always be used. If any brake shoes are worn to 1/4" they must be replaced.

## REPAIR TRUCK FRAME WEAR PLATE

The friction wear plates on the truck frame and the friction shoe surfaces in the bolster wear as a result of the relative movement between their surfaces during the transfer of motive force to the bolster. When these parts have worn to the dimensional limit the truck should be disassembled to replace or recondition parts.

Satisfactory operation also requires that adequate pressure be maintained between the friction shoe and the friction plate on the truck frame. Periodic inspection of the height of the friction shoes above the bolster should be made as a guide to determine if the pressures are within recommended limits.

The friction shoe height can be checked as shown in Fig. 12. When the gauge does not touch the bolster at "X" with the ends resting on the friction shoes at Y and Z, the shoes are more than 1-11/16" above the bolster and the truck should be disassembled for reconditioning.

It may be necessary to replace the friction shoes, ride control springs, friction wear plates, or repair the sloped surfaces in the bolster pockets. If the faces of the friction shoes are worn beyond the "limit of wear indicator" (chamfer), shown in Fig. 12, these parts should be replaced.

Information necessary to construct the shoe height gauge is given in Fig. 13.

All Mechanical Trucks Except Model C-1

After the truck is disassembled the friction wear plates and the welds which hold them to the frame should be inspected for cracks. A magnetic particle method is recommended for this inspection. Any welds found to be cracked should be ground off and new weld applied. Plates found cracked should be removed. The thickness of the wear plates should be checked. Any plates worn to the minimum thickness of 3/32" should be removed and replaced by new friction wear plates. The plates can be removed by grinding or chipping off the fillet welds that hold them.

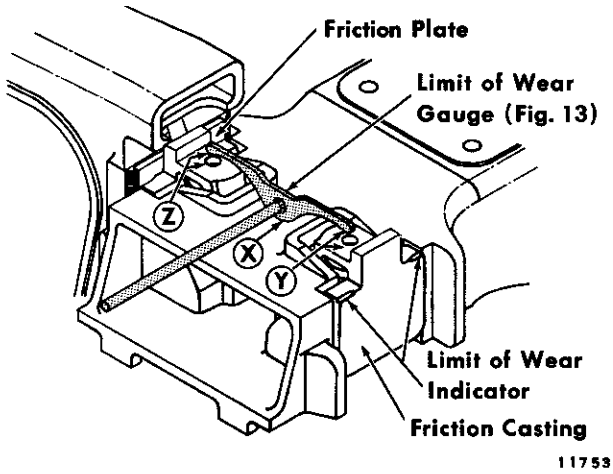



Fig. 12 — Checking Friction Shoe Height

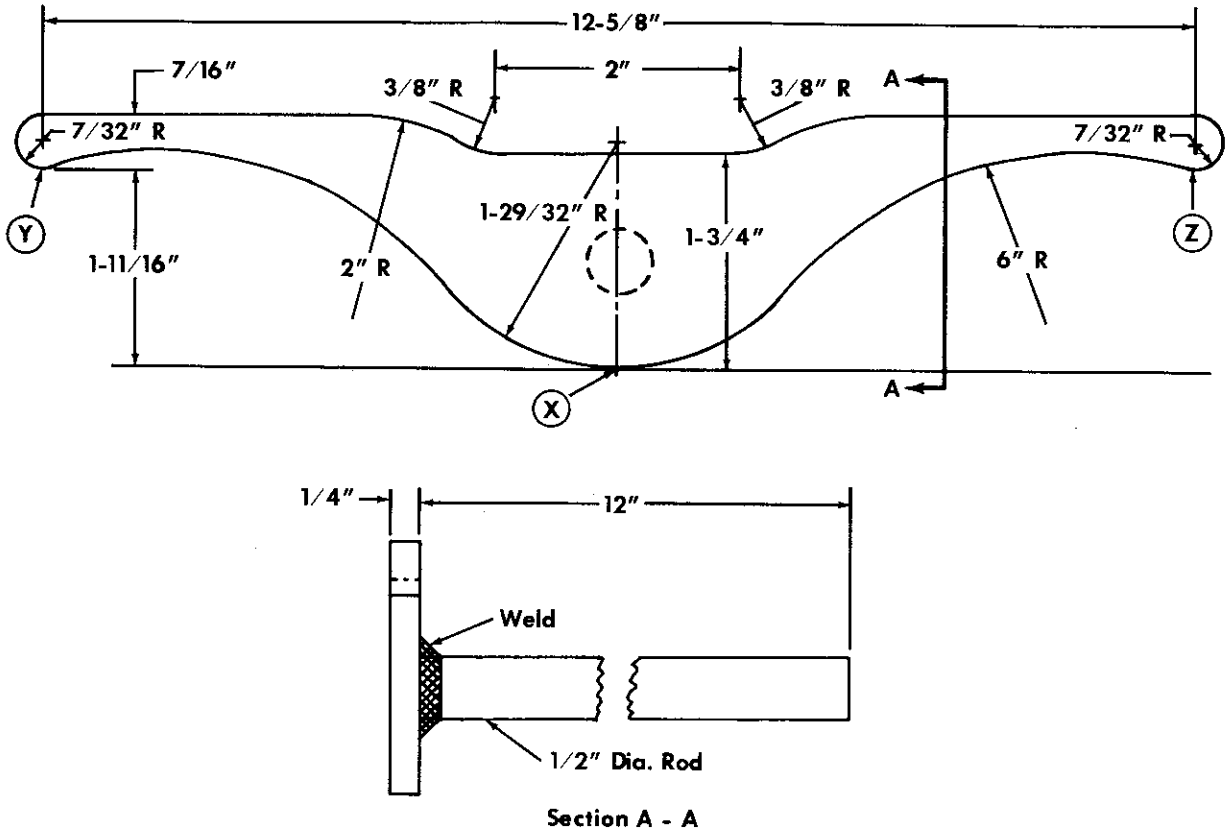



Fig. 13 — Friction Shoe Height Checking Gauge

The replacement friction wear plates should be made to the dimensions of the original plate. Plate dimension and other details of applications are shown in Fig. 14. It is recommended also that the replacement plate material conform to the Society of Automotive Engineers (SAE) 1095 material specifications, heat treated to 352-401 Brinell.

Application of the new plates should conform to the following recommendations and the information provided in Fig. 14.

1. Check the parts to see that the mating surfaces are clean, smooth and flat.
2. During welding the friction plate should be held tight against the side frame.
3. The frame should be positioned for down hand welding.
4. Use AWS E-6016 welding electrode. A 1/8" electrode is recommended. No preheat is required on the welded parts.

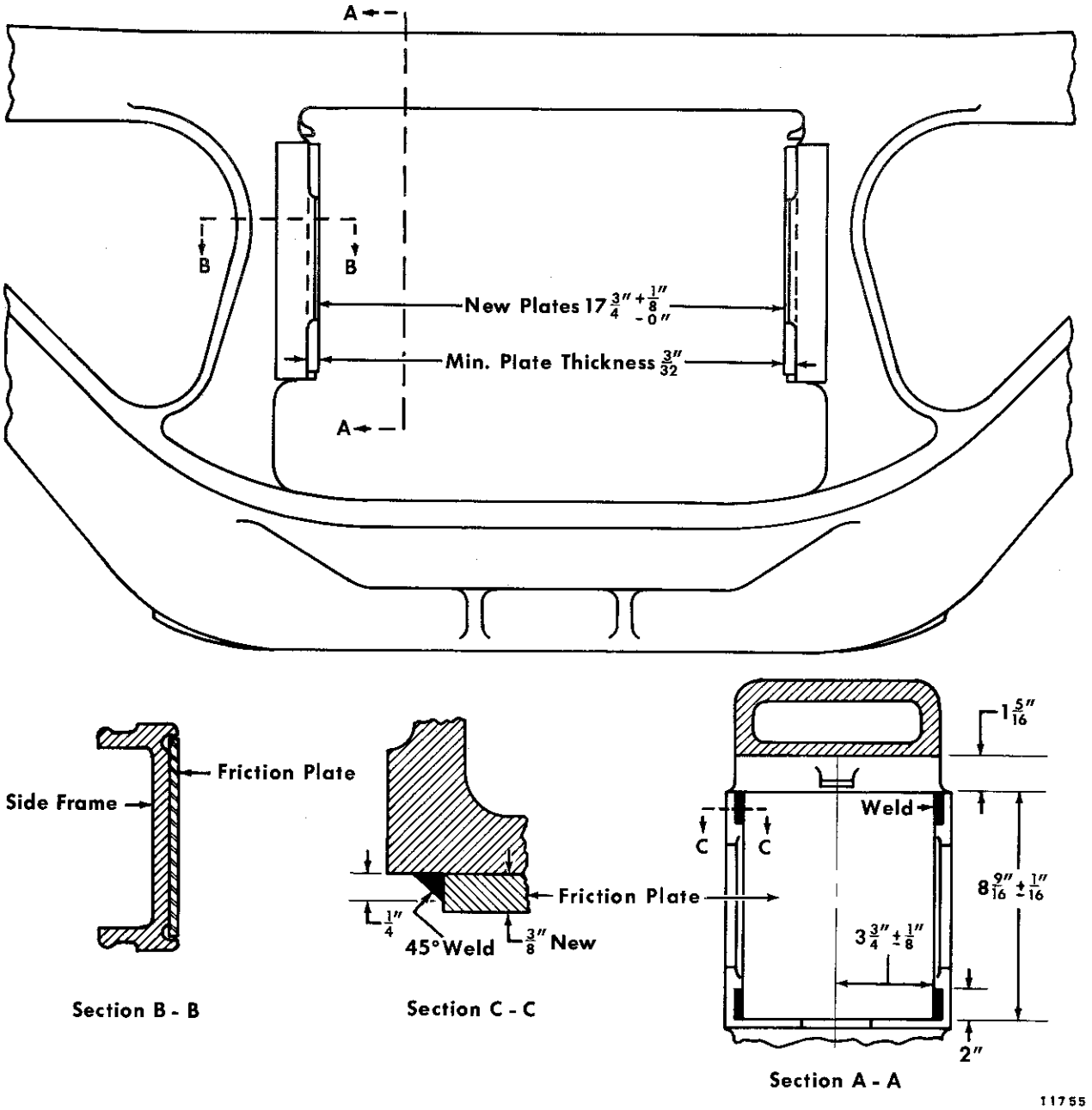



Fig. 14 — Mechanical Truck Frame Wear Plate Dimensions

5. Start the weld two (2) inches from the end of the friction wear plate as indicated in Fig. 14. Work toward the end of the plate, building up at the finishing end of each weld to eliminate the crater.

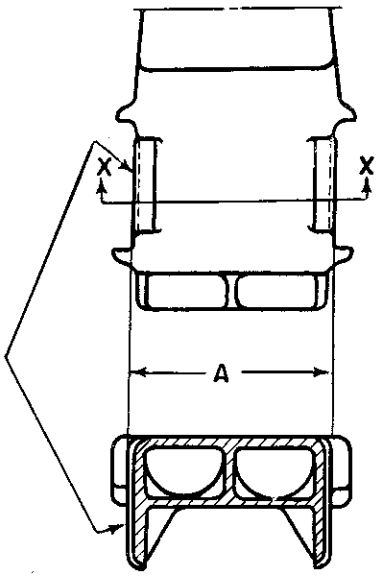
6. Welding should be performed so as to be homogeneous, free of gas and foreign material.

NOTE: In conjuction with the inspection and replacement of the friction wear plates, the side frame should also be checked for wear. If the frame has been worn by the bolster gibs, the frame should be built up by welding and ground off to the same contour as it had originally.

Model C-1 Trucks Only

Although the conventional mechanical truck assemblies covered under the preceding item are more commonly used, the Model C-1 truck is also used. The primary difference between these two trucks is in the frame and the application of the friction control. The friction control wedge and spring Fig. 9, are contained on the side frame of the Model C-1 truck, but these items are contained in the end of the bolster in the conventional mechanical truck. The bolster friction wear plate application is shown in Fig. 15. Wear plates are made of spring steel material and are 3/8" thick when new.

Complete inspection of the friction wear plate can be made when the side frame is removed from the bolster. The plates should be checked for wear and for cracks and broken welds along the top and bottom flanges. The amount of wear is determined by measuring the distance over both wear plates at the bolster end as shown by dimension "A", Fig. 15. Wear plates should be replaced with new ones when dimension "A" is reduced to 17-5/8" or less on 70-90 ton car truck bolsters

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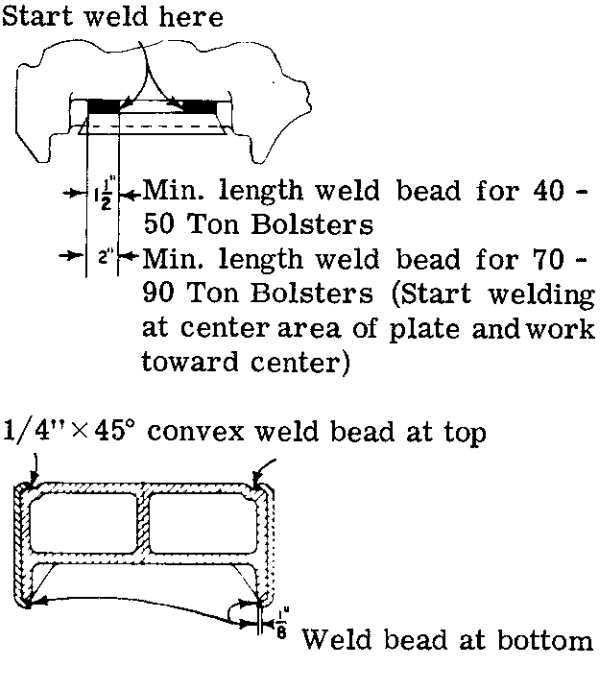


Fig. 15 — Friction Plate Weld Application Model C-1 Truck

and 13-1/8" or less on 40-50 ton car truck bolsters.

Welding rod, A.W.S. E-7015, 16 or 18 or an equivalent low hydrogen type welding rod should be used for the weld application of friction plates. The welding

should be done as shown on Fig. 15 and should be solid and free of cracks or porosity. Also, during the welding operation, care should be taken to avoid heating the plate to an extent that would impair the hardness and wearing quality of the plate.

1. Clamp the plate firmly and securely to the bolster and do not remove the clamps until all welding has been completed.
2. Apply the weld bead as shown on Fig. 15, only to the corners at the top and bottom of the plate.
3. No preheating is necessary on the bolster or friction plates before the welding operation.

**DIMENSIONAL LIMITS FOR MECHANICAL TRUCK FRICTION CONTROL COMPONENTS (EXCEPT MODEL C-1)**

Friction Shoes

The friction shoes should be inspected for wear at the face of the shoe and the angle surface at the back of the shoe, which contacts the angle surface in the bolster.

The friction shoe should be replaced if the face is worn to the extent that the "limit of wear indicator" (chamfer), Fig. 12, is gone. Also if the angle surface of the shoe is worn 1/16 of an inch concave the friction shoe should be replaced.

Bolster Slope Surfaces

The bolster slope surfaces are the mating inclined surfaces for the friction shoe. The friction shoe is caused to move outward and upward when the shoe spring presses the friction shoe against the bolster slopes.

It is necessary to check the bolster slopes using a "Filler and Backing Plate Application Fixture" to determine if the slopes need to be repaired. Construction details of the fixture are shown in Fig. 16. The checking fixture is positioned in the bolster pocket and the clearance between the fixture and slope surfaces in the bolster is checked. Repair of the bolster slope surfaces is necessary if a 3/16" thicker filler plate can be placed so as to be between the bolster and fixture slope surfaces while it is resting against the supporting shelf on the fixture.

A back up plate may also be required between the filler plate and the bolster slope as shown in Fig. 17. The required thickness of the filler plate and backing plate are determined with the fixture in place as shown in Fig. 16. After the thickness of both plates is determined, the backing plate should be welded to the filler plate as shown in Fig. 18 so that it will be securely held when the filler plate is applied.

The filler plate with its backing plate should be placed against the supporting shelf on the checking fixture. Both assemblies should then be correctly positioned in the bolster and the plates spot welded to the bolster so as to hold them in their correct position when the fixture is removed. The welding operation is then completed as shown in Fig. 17 with the fixture removed.

When the installation has been completed, it should be checked using an angle surface gauge. Construction of the surface gauge and method of checking the installation is shown in Fig. 19. In addition to providing a final check on the slope and location of the completed application, these gauges also provide a means to determine the wear on the bolster slopes before they are repaired.

Bolster Gibs

Check the bolster gibs where they make contact against the side frame. If the gibs are worn 1/8" or more they should be welded and ground so the wear surface at each gib is 4-1/2" from a traverse center line through the 3/4" core holes at the bottom end of the bolster.

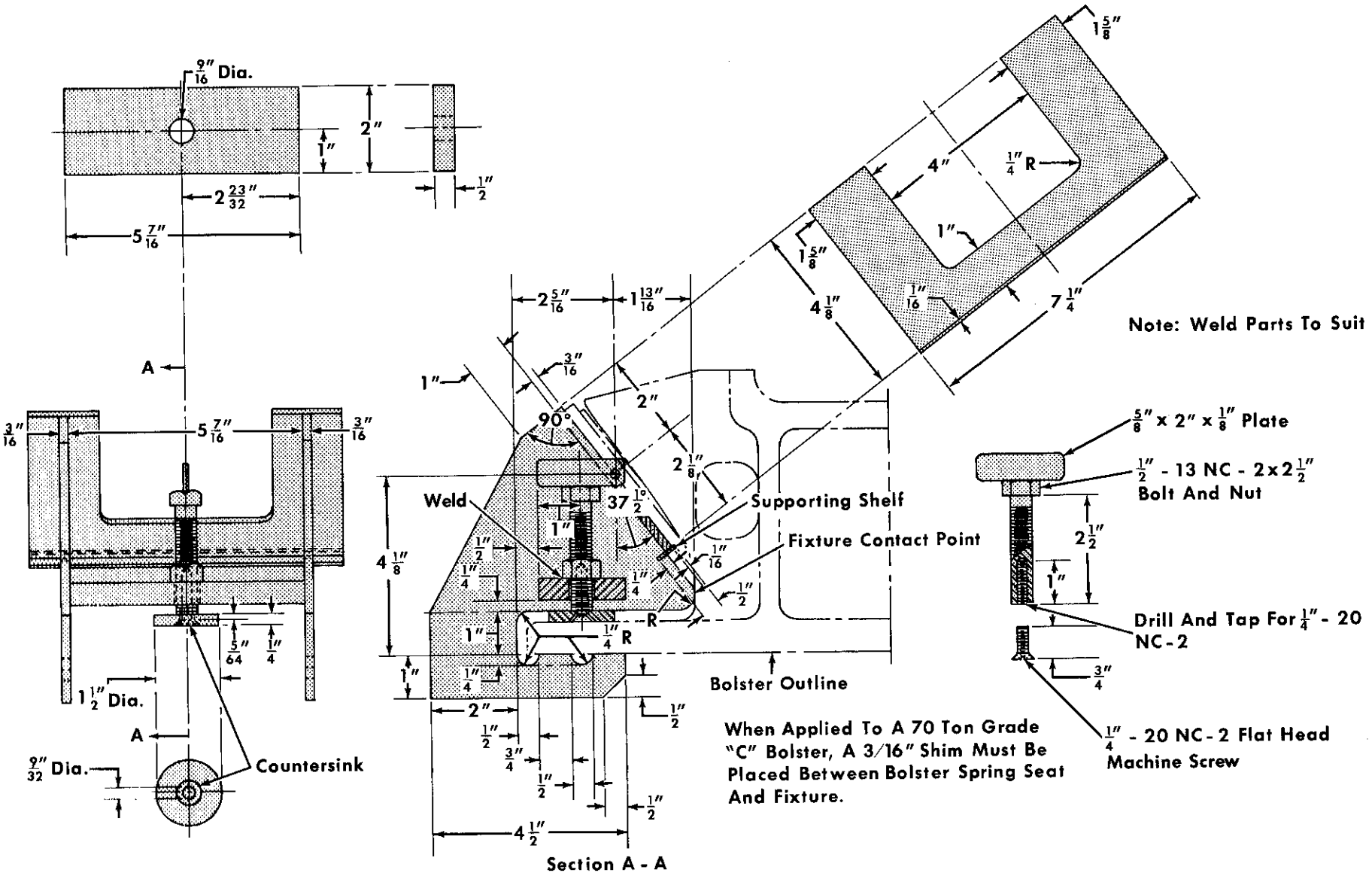


Fig. 16 — Bolster Slope Filler And Backing Plate Application Fixture

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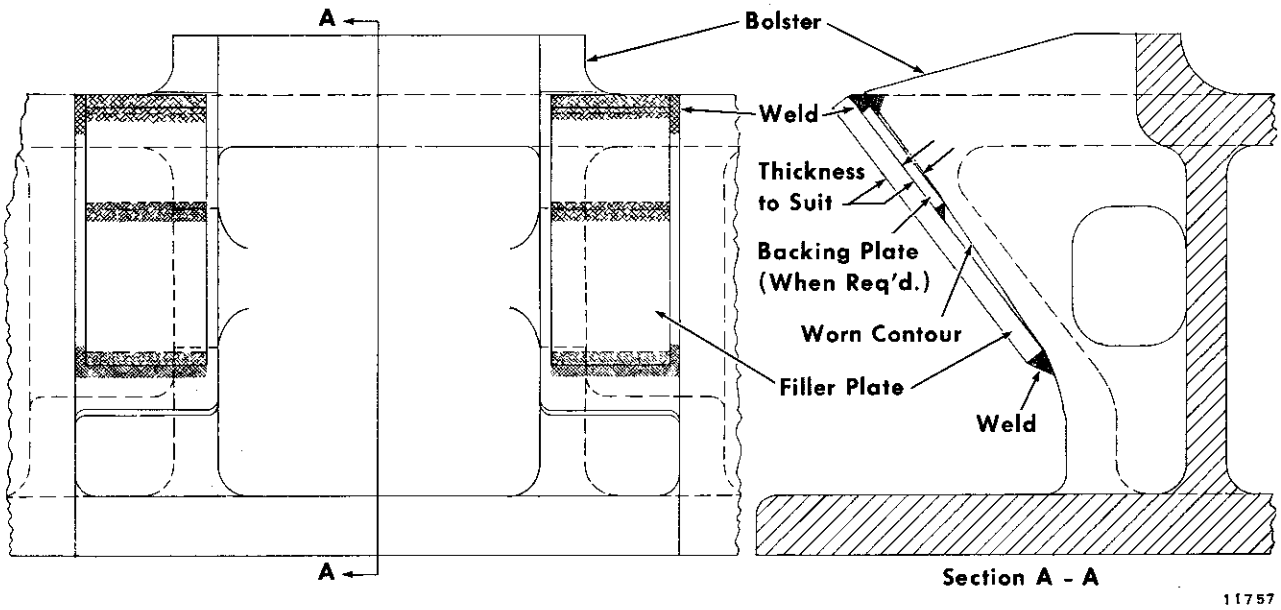



Fig. 17 — Application Of Filler And Backing Plate To Bolster Slope

## DIMENSIONAL LIMITS FOR MODEL C-1 FRICTION CONTROL COMPONENTS

The friction wear plates on the bolster and the friction wedge surfaces are caused to wear by the relative movement between these parts during operation. When these are worn to the recommended limit they should be replaced with new parts.

### Friction Wedge

The friction wedge used in all Model C-1 trucks has a "wear limit" notch at the top edge of the friction surface. Visual inspection can be made to determine if the wedge is sufficiently worn to require replacement. Wedges should be replaced when the remaining depth of the notch is 1/16" or less.

Inspection of the curved side of the wedge is not necessary because the limit of wear is governed entirely by the depth of the notch in the friction surface. The wedges are removed and new wedges installed as outlined in the truck disassembly and assembly procedures.

### Friction Wedge Spring

Replacement of the wedge spring is necessary only when the spring is found broken. Inspection of the spring does not require disassembly of the truck. However, if the side frame is removed for any other reason, further inspection of the spring may be made when the spring and wedge are in a retracted position. The reduced force required to retract a broken wedge spring plus visual inspection will serve to detect any spring failures.

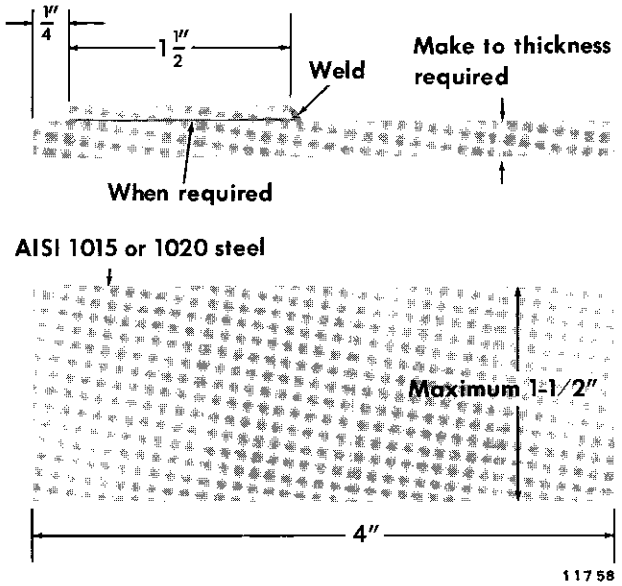



Fig. 18 — Filler And Backing Plate Details

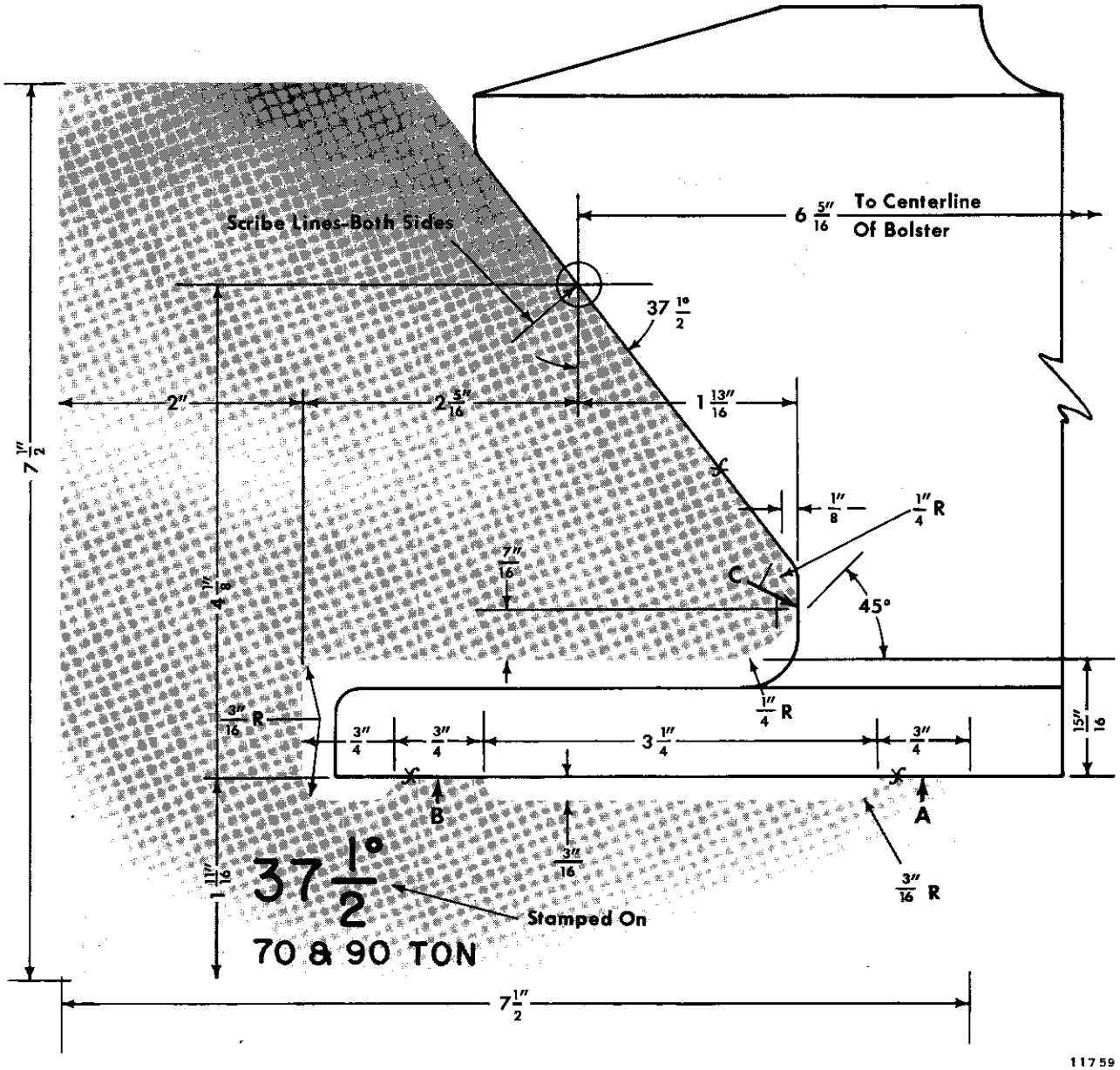
## DIMENSIONAL LIMITS FOR COMPONENTS COMMON TO ALL MECHANICAL TRUCKS

### Side Bearing Wear Surface

The side bearing wear surfaces on the bolster are opposite similar side bearings on the carbody as indicated in Fig. 20.

There is a clearance between the side bearings in normal operation. Side bearings are designed to prevent excessive tilting or leaning of the locomotive but are not designed to carry a continuous load.

Side bearing clearance on a new locomotive is 3/32" to a maximum of 1/4". The minimum side bearing clearance for rebuild is 1/16" and the condemning limit is 1/32". When the side bearing clearance approaches the minimum clearance the bolster center bearing wear plate should be checked for wear.




NOTE: Surfaces marked "f" and Dimensions underscored are important. Position gauge to contact bolster at A. B and C.

When gauge is applied to 70 ton grade "C" bolster a 3/16" shim must be placed between bolster spring seat and gauge at A and B.

Material: 1/8" cold rolled steel.

Fig. 19 — Slope Angle Surface Gauge Construction And Application

The bolster side bearing wear plate can be removed by grinding off the fillet welds around the plate. New plates should be of mild steel material 1/4" thick. The base of the plate is 9-5/8" long and 1-1/2" wide at its center line with the top curved by a 20-1/8" radius on the center line to the ends.

Secure the new plate to the bolster using 1/4" fillet weld 1-1/2" long at the center of each of the four sides of the plate. Before the application of the new wear plate be sure that the mating surfaces are clean and smooth.

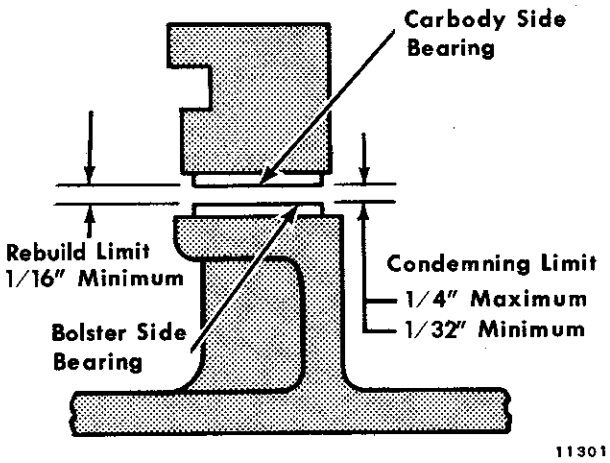



Fig. 20 — Side Bearings

Center Bearing Wear Plate

The bolster center bearing on each truck supports half the weight of the locomotive and serves to transfer motive force to the locomotive carbody. The load on these parts and the relative movement between them will cause the parts to wear.

As mentioned previously side bearing wear close to the limit is usually an indication of wear at the center bearing wear plate. The rebuild and condemning limits for the center bearing wear plate are shown in Fig. 21. The thickness of the plate should be checked whenever the plate is accessible. If the plate thickness is above the rebuild limit it may be used again. However, if the thickness is less than the rebuild limit, it is recommended that the plate be replaced. The purpose of the rebuild limit is to allow for wear until the next inspection without exceeding the condemning limit. If the thickness of the plate has reached the condemning limit, the plate must be replaced.

The outside diameter of the carbody center plate assembly and the inside diameter of the bolster center bearing should be compared or the clearance between these parts should be checked

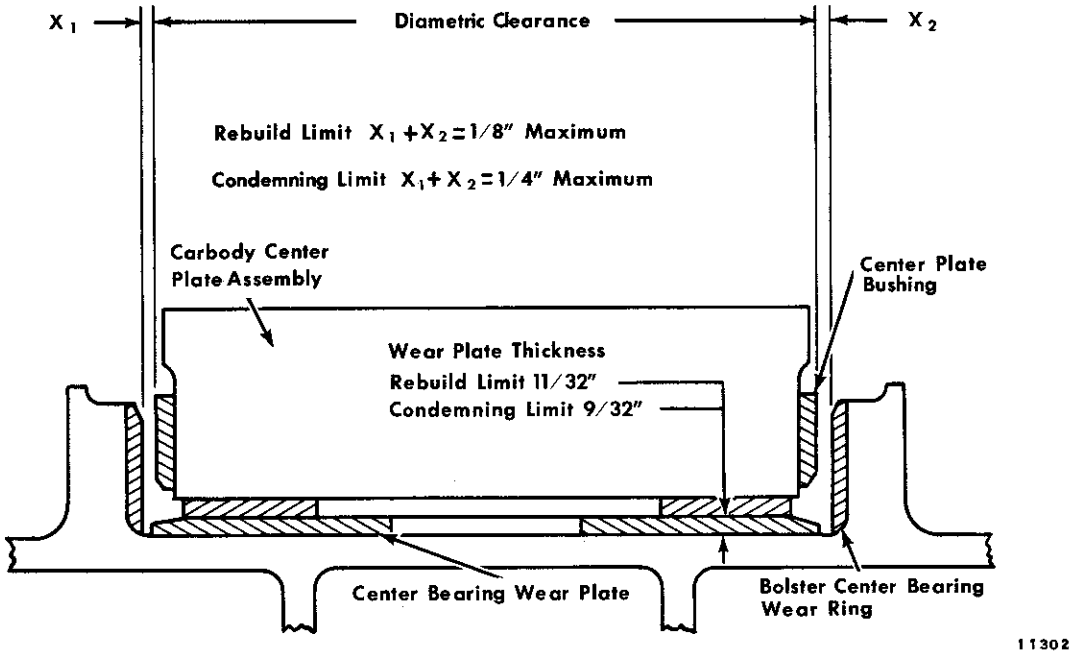



Fig. 21 — Bolster Center Bearing Allowable Clearance

to determine the total clearance between these parts. The recommended clearance is shown in Fig. 21. At the time of assembly it is recommended that the rebuild clearance limit of 1/8" between these parts should not be exceeded to allow for wear until the next inspection. The maximum or condemning limit between these parts is 1/4" as indicated in Fig. 21.

**TRUCK PEDESTAL LINERS AND ADAPTER WEAR PLATE LIMITS ON GA12 PONY TRUCK AND GM6 TRUCKS**

The basic mechanical truck side frame is not equipped with pedestal liners or wear plates. However, the pony truck used with the GA12 locomotive swivel truck and the GM6 locomotive integral truck are equipped with axle adapters which are confined between pedestals. Replaceable wear plates are applied to the pedestals and adapter to take the wear which occurs between these parts. The wear plates should be replaced when the limiting clearance between the parts has been reached or the plates have been worn to their minimum thickness.

During operation the clearance between these parts will increase as a result of normal wear. Rebuild wear limits are provided which will allow for wear in normal operation, between reconditioning periods on the truck. Condemning limits are given which define the safe maximum clearance between the adapter and pedestals and the parts should not be used when beyond these limits. Both of these limits are given later under sections covering their respective assemblies.

If it is found by inspection that the rebuild limits have been exceeded, the truck should be reconditioned, particularly if the clearance is near or at the condemning limit.

New wear plates must be applied to either the adapter or pedestal to bring the clearance within the allowable limits. However, the outside dimension over the wear plates on the adapter as well as the inside dimension between the wear plates on the pedestals should be maintained, as given in the respective Fig. 22 and Fig. 23 when the new wear plates are applied.

Wear Plate Removal and Application

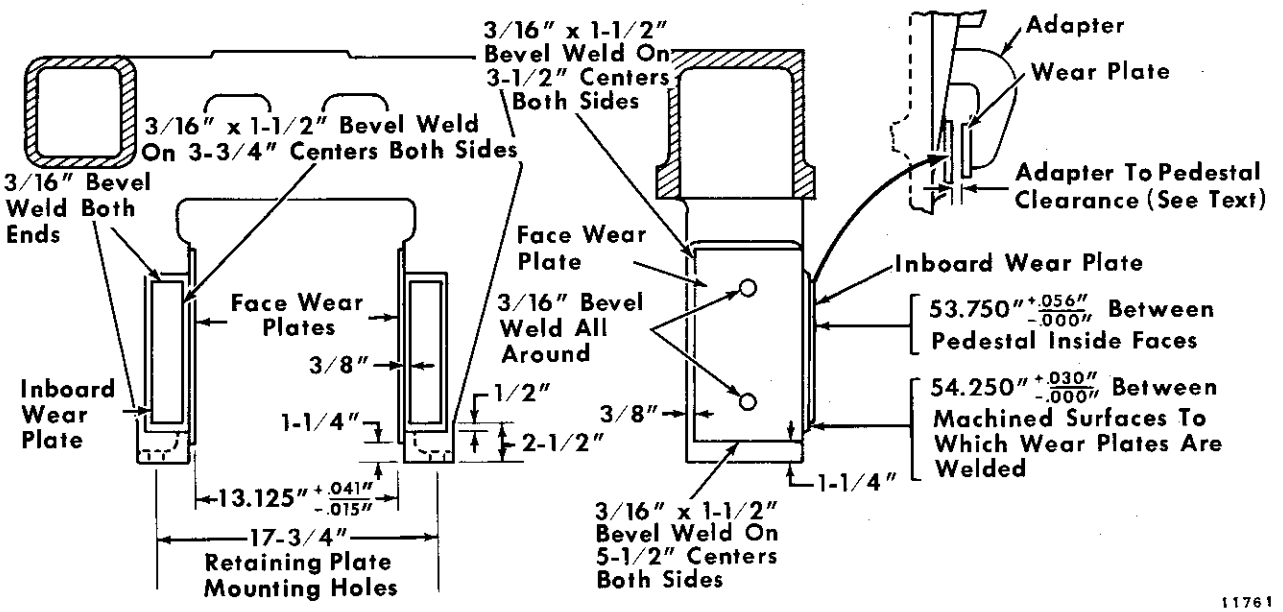
The old wear plates can be removed by grinding off the tack welds that hold the plates.

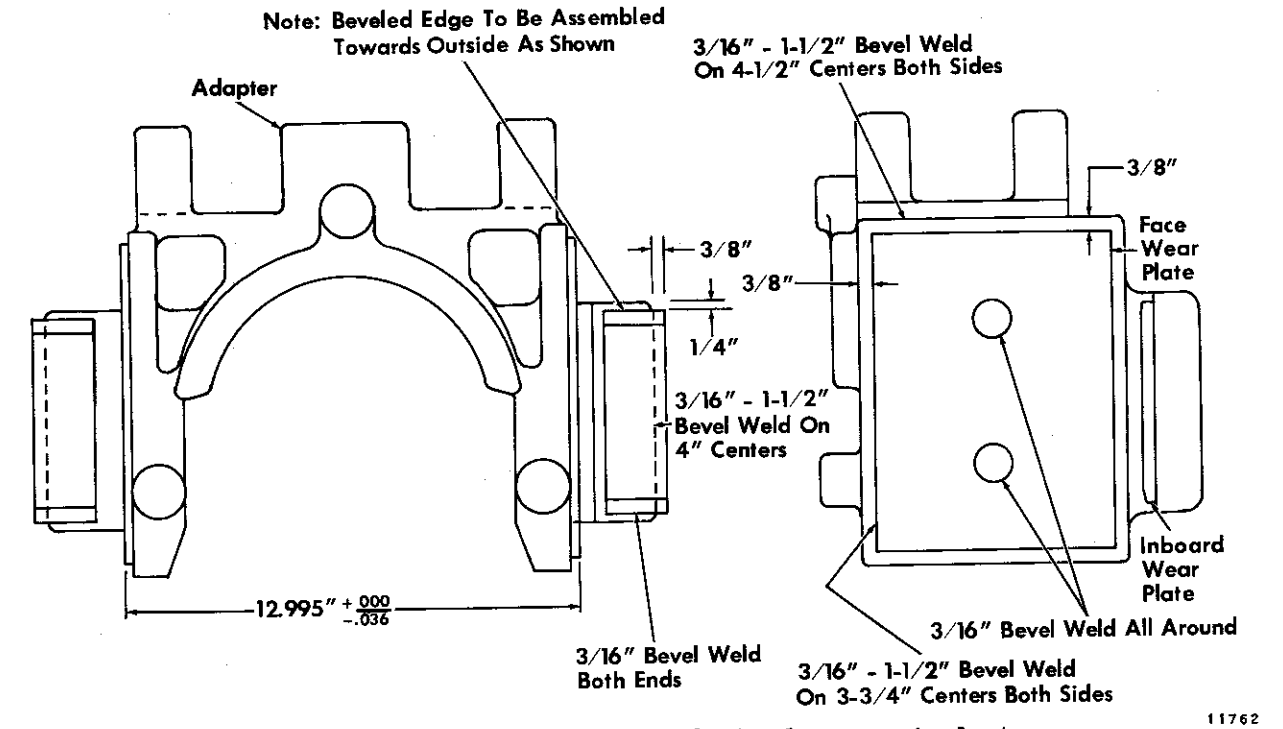
Before the new plates are applied check the mating surfaces of the parts to see that they are clean and smooth. Clamps should be used to hold the plates tightly against the surface to which they are being welded. All welding should be done with the journal bearing adapter submerged in water except for the area where the welds are to be applied. This procedure will tend to eliminate distortion of the adapter. Wear plates which have holes provided for welding should have the holes welded first as this will help insure contact at the center of the plate and also help to prevent warping of the plate. The weld should be made with sufficient current to obtain a weld slightly convex and without craters. Welds extending above the wear surfaces of the plate should be ground off so as to be flush with the plate to prevent contact with the opposite mating surfaces.

GA12 Pony Truck Pedestal Liner and Journal Bearing Adapter Wear Plate Limits

The dimensional and wear plate details of the pony truck pedestals and adapter used with the 8308454 pony truck are shown in Fig. 22.

The outside dimension across the adapter wear plates is 12.995" plus .000" or minus .036". The inside dimension between the face wear plates of the pedestals is 13.125" plus .041" or minus .015". These dimensions allow a maximum longitudinal clearance of .207" or a minimum clearance between these parts




NOTE: Use E-6016 welding electrode or equivalent.

Fig. 22 — Pony Truck 8308454 Pedestal And Adapter Clearance And Wear Plate Detail

of .115", when all the parts are new and unused. The rebuild clearance limit between these parts should not exceed .250". The condemning clearance limit is 5/16".

The nominal lateral clearance between the adapter lug and the inboard wear plate on the pedestal is 3/16" on each side or at each of the two adapters on one axle. The rebuild lateral clearance limit is 5/16" and the condemning limit is 3/8".

GM6 Integral Truck Pedestal Liner and Journal Bearing Adapter Wear Plate Limits

The dimensional details of the GM6 locomotive integral frame pedestal and adapter are shown in Fig. 23.

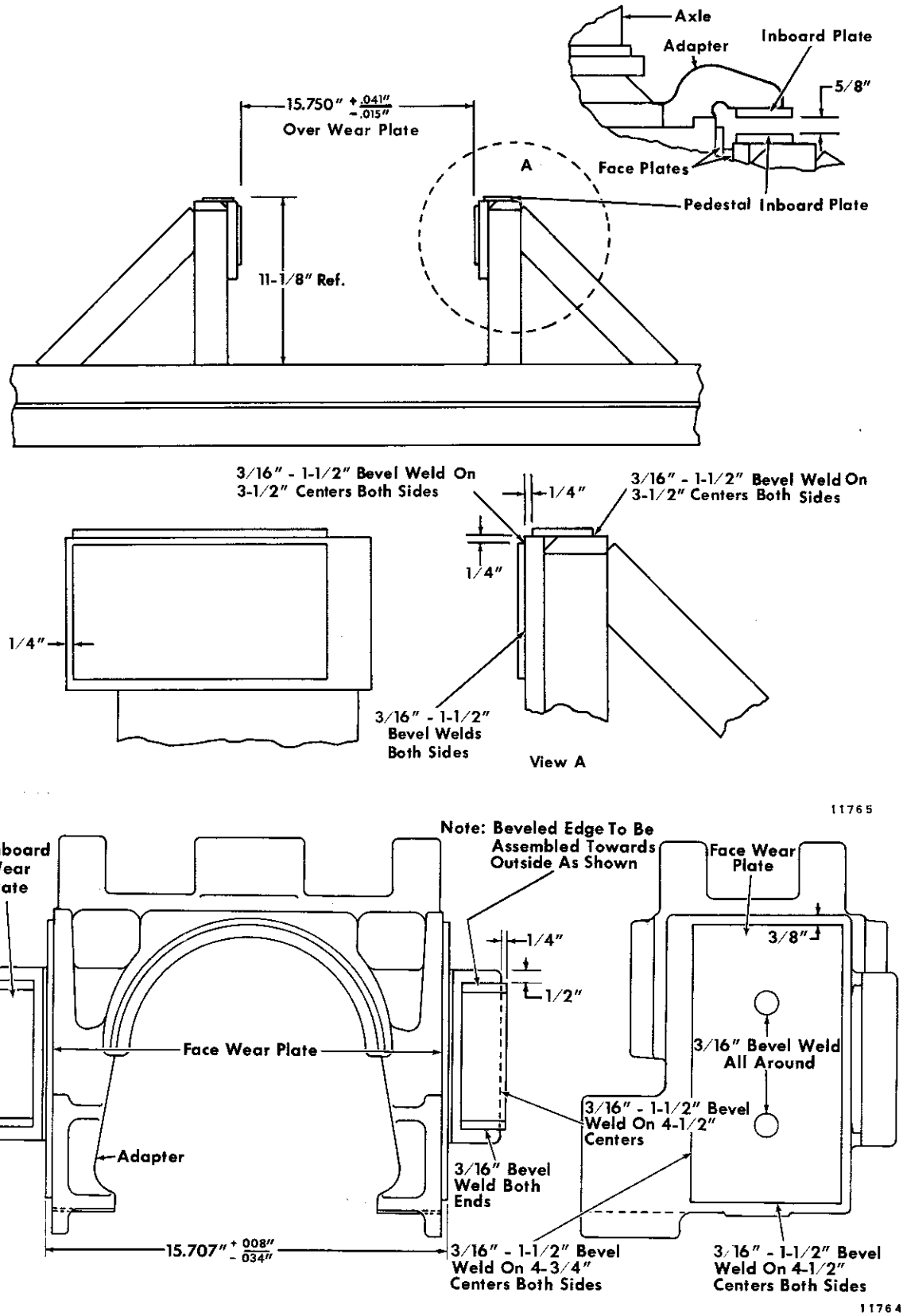



Fig. 23 — Locomotive Integral Truck Pedestal And Adapter Dimensions And Wear Plates

The outside dimension across the adapter wear plates is 15.707", plus .008" or minus .034". The inside dimension between the face wear plates of the pedestals is 15.750", plus .041" or minus .015". These dimensions allow a maximum longitudinal clearance of .118" or a minimum clearance of .020" between these parts when all the parts are new and unused. The rebuild clearance limit between these parts should not exceed .250". The condemning clearance limit between these parts is 5/16".

The nominal lateral clearance between the adapter lug and the inboard wear plate on the pedestal is 5/8" as indicated in Fig. 23, on each side or at each of the two adapters on one axle. The lateral rebuild clearance limit is 3/4" and the condemning clearance limit is 7/8".

All pedestal axle centerlines should be parallel within 1/32" new.

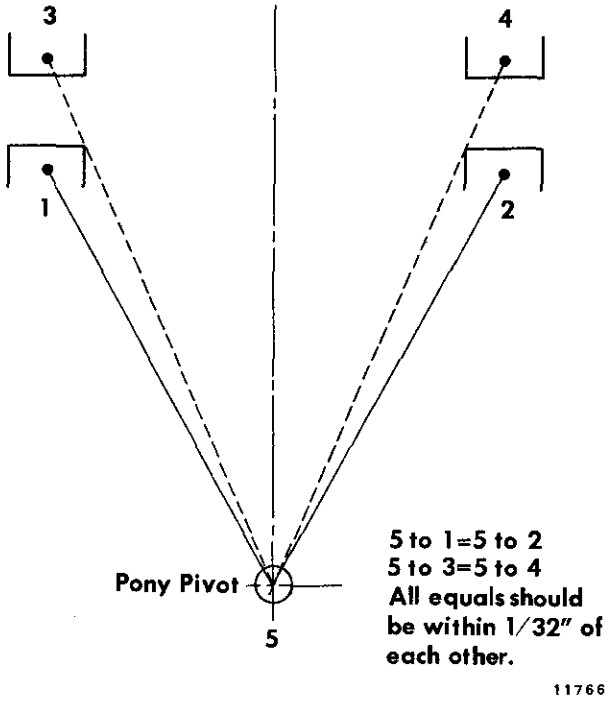



Fig. 24 — Pony Truck Tramming Diagram

### TRAMMING PONY TRUCK

The pony truck pedestals are trammed to determine if they are in correct alignment with each other, that is, to determine if the distance between the tram mark on the pedestal and the intersection of the pivot connection centerline of the truck, are equal or within the allowable limits. The tramming diagram, Fig. 24 shows which points should be equal and also the allowable variation of 1/32".

To enable the measurements to be made as indicated in Fig. 24, the intersecting point of the pivot centerlines must be raised so as to be in the same plane with the top of the pedestals when the truck is inverted. Insert and secure a 2" round bar in the pivot hole bushing so that the upper end of the bar is level with the top of the truck pedestals. Secure the bar so that it is perpendicular to the horizontal plane. Place a center punch mark in the center at the upper end. If the bar leans one way or another it will not give a correct comparative measurement. The measurement from the end of the bar to the respective pairs of pedestals can be made using a trammel beam equipped with trammel points or by careful use of a steel measure.

Tram marks are made on the end or bottom of each pedestal at the time of original manufacturing inspection of the truck frame. These marks which are small punch indentations are placed at identical locations on each pedestal so as to assure an accurate comparison. They may be 1-1/2" from each inside face of the pedestal or on the longitudinal centerline of the pedestal just inward from the retaining plate mounting hole. The important consideration is that the mark be made at an identical location on each pedestal.

A special tool, shown in Fig. 25, for marking the tram marks on the pedestal can be made according to information furnished in File Drawing #615. This drawing is available upon request from General Motors Overseas Operations.

The tool is used to make two scribe marks at right angles to each other at the 1-1/2" or other suitable dimension on the bottom of the pedestal. The hardened end of the scribe on the tool

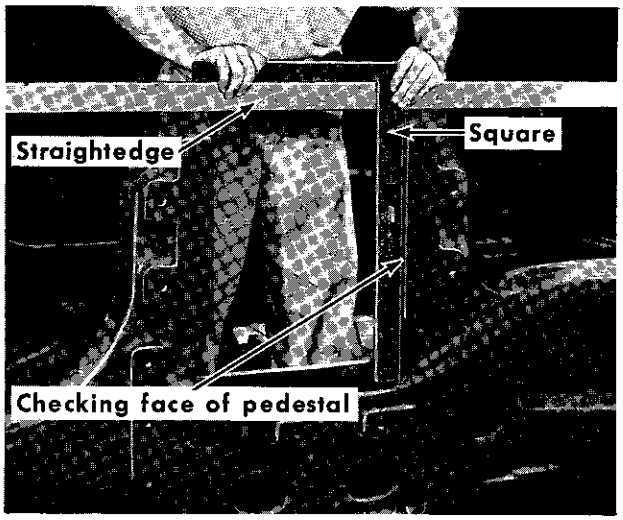
is placed at the intersection of the scribe lines and is lightly tapped with a hammer so as to make a small indentation in the metal for the tram measurement. The bottom of the pedestals should be clean before they are marked. Application of blue machinist dye to the area of the pedestal to be marked will also aid in locating the scribed lines and to locate the tram marks.

Tram dimension variation in excess of the allowable 1/32" indicates misalignment of the pedestals. The pedestals which are bent must be straightened either by cold bending or application of heat to the pedestal before bending and using a suitable jacking arrangement to force it to correct position. Each pedestal can be checked for straightness using a square and straight edge. Application of the square and straight edge to check each pedestal can be made as shown in Fig. 26. The pedestal locating dimensions shown in Fig. 27 should be maintained so as to bring the pedestals within alignment.

## PONY TRUCK PIVOT CONNECTION

The pony truck is connected to the bolster of the main truck as shown in Fig. 28 by a steel pivot pin. A steel washer is held against a shoulder of the pin at the nut end so as to provide a clearance between the washer and the outside of the pony truck frame. The surface of the pin which contacts the bushings is hardened so the wear will be taken on the inside diameter of the bushings. Washers made of phenolic material are used between the bolster and the truck frame to absorb the thrust wear.


Fig. 25 — Tram Marking Tool



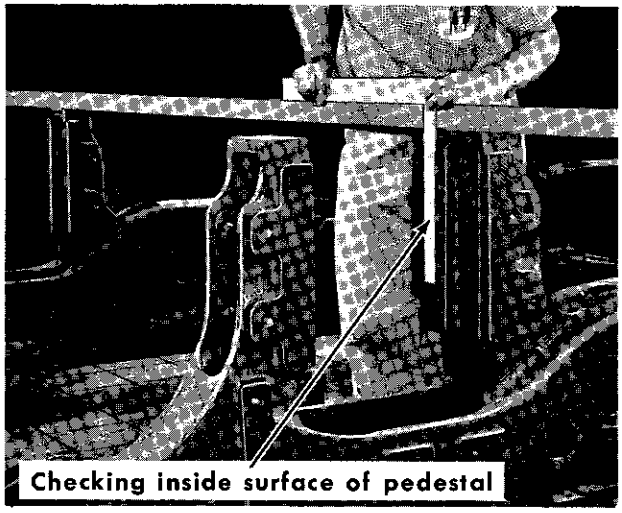




Fig. 26 — Checking Pedestal Wing Square And Straight Edge

Clearance is provided between the parts of the assembly to allow freedom of movement while maintaining an integral assembly. During operation these parts will wear. These individual parts should be inspected before assembly of the truck to see that wear on the pin and bushing between the truck bolster and pony truck frame does not allow movement between these parts in excess of 3/16".

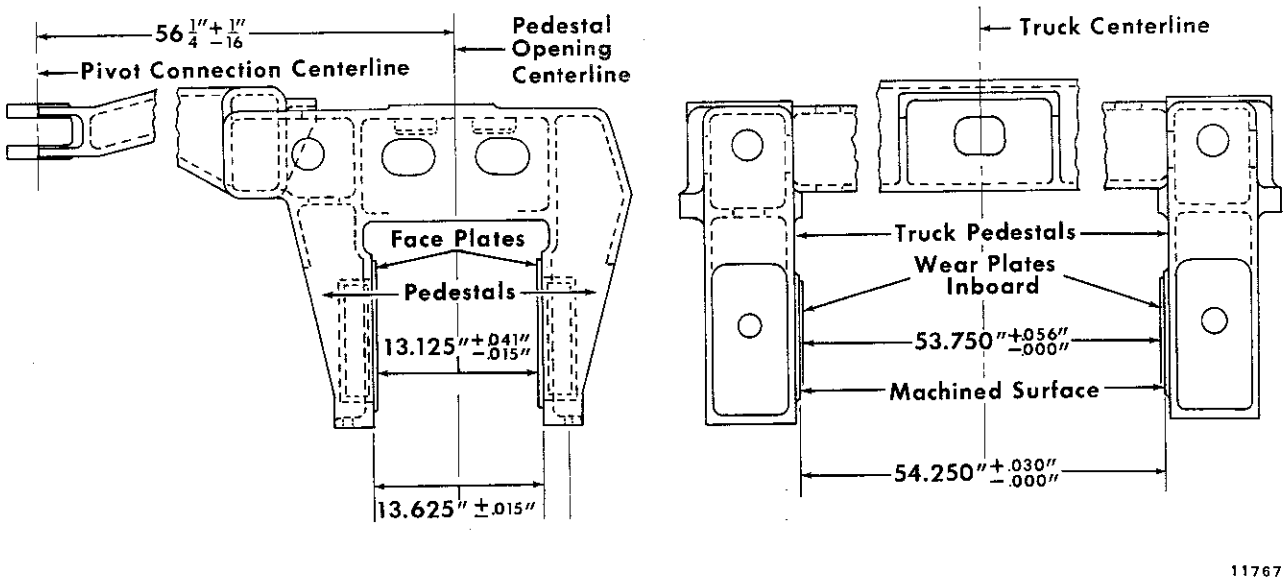



Fig. 27 — Pony Truck Pedestal Locating Dimensions

## COIL SPRING LIMITS

Various combinations of coil springs may be used at the truck bolster and pedestals because of variable loads which may be specified for the axles. Shim plates and shims of different thickness also may be used between the spring seat and spring so as to maintain correct height. The truck parts list provided with the customer's particular order outlines the spring assemblies and associated parts used on the truck. It is very important to identify each of the springs according to their part number in the parts list so as to test the spring at the proper load value as listed in the following Table A.

Check the part number of the spring or spring assembly used according to Table A. Determine if the springs are within the allowable limits as given for the static load placed on the spring. Spring assemblies consisting of more than one spring should be wired together until application so as to keep the correct assembly together.

A color code is used to indicate the loaded height of new springs. Brown paint is applied on springs or spring assemblies that are more than 1/16" and do not exceed the 3/16" limit above the nominal static height specified for the spring when under the specified static load. Nominal height is the spring height which is used for purposes of identification and as a base for the tolerance limits. Blue paint is applied on springs or spring assemblies that are 1/16" below to 1/16" above the nominal static height specified for the spring when under the specified static load. Green paint is applied on springs or spring assemblies that are more than 1/16" but do not exceed the 3/16" limit below the nominal static height specified when under the specified static load.

White paint is applied on springs that have been in service to identify springs

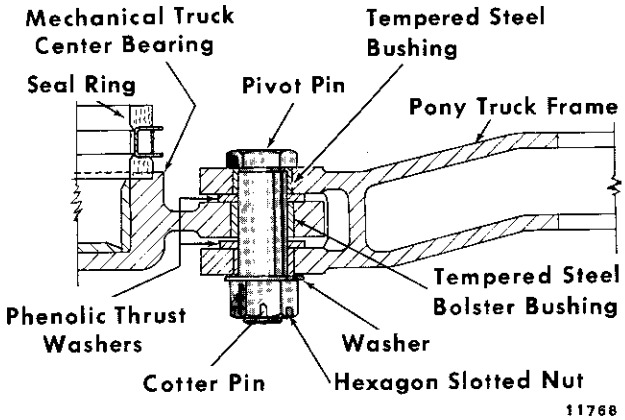



Fig. 28 — Pony Truck Pivot Connection Details

or spring assemblies that are 3/16" but do not exceed the condemning limit of 5/16" below the nominal static height specified for the spring when under the specified static load.

In freight car type trucks where color coded springs are specified, the bolster spring cluster should conform to the following recommendations. Blue and/or brown color code springs may be intermixed in each spring cluster in a truck assembly. In this event no green color coded springs should be used in the same truck assembly. Blue and/or green color coded springs may be intermixed in each spring cluster in any truck assembly. In this event, no brown color coded springs should be used in the same truck assembly.

Springs tested at the recommended load may be used provided they are within the following limits. Ride control bolster springs in the mechanical truck may be used provided their capacity loss is not more than twenty percent (20%) of their original value. The condemning limits of pedestal springs are 3/16" above the nominal loaded height and 5/16" below the nominal loaded height.

Springs may be tested on any reliable calibrated testing press or a spring testing fixture shown in Fig. 29 may be made as outlined in File Drawing 647 for checking the springs under proper load and height. This drawing is available on request from General Motors Overseas Operations. Safety wire mesh encloses the working parts of the fixture, Fig. 29, and two hinged doors at the front provide access to the exterior. When the doors are open a movable table within the fixture can be pulled out to facilitate the application of the spring assembly which is to be tested. The table with the spring to be tested is then pushed into place in the fixture and the eccentric rollers supporting the table are released so as to provide complete support for the spring. The protective front access doors are closed and locked in place before testing the spring. A hydraulic jack arrangement above the spring is actuated to apply force to bring the spring to the correct height for the test. A pressure gauge adjacent to the fixture shows the force in pounds applied to the spring and a pointer at the side of the fixture indicates the height of the spring under test.

To operate the spring tester, the directional valve, Fig. 29, is positioned so that the ram will cause the spring to be compressed when the force is applied. The pump operating valve is then opened to initiate the force required to bring the spring below the static height to be measured. The directional valve is then placed in its neutral or non-directional position. The relieving valve is then opened slightly to relieve pressure on the spring ram down to the static pressure under which the spring should be tested. The static height of the spring is then checked, and it should be within the limits as given in Table A.

Springs should be tested at the static height and static load values as provided in Table A, for the particular spring assembly. Compress the spring to one and one-half (1-1/2) times the specified static load. When compressing the spring take a reading at the specified static load and record the height of the spring. Continue to compress the spring to 1-1/2 times its static load. Then gradually release the load to the specified static load and record the height of the spring. Average the two height measurements. The static height of the spring should be within plus 3/16" above or 5/16" below the nominal static height given in Table A.

NOTE: The maximum load obtainable on the spring testing apparatus machine according to File Drawing 647, which is described later, is slightly more than 60,000 pounds. When 1-1/2 times the static load exceeds the 60,000 pounds, use 60,000 pounds as the applied load prior to the gradual release.

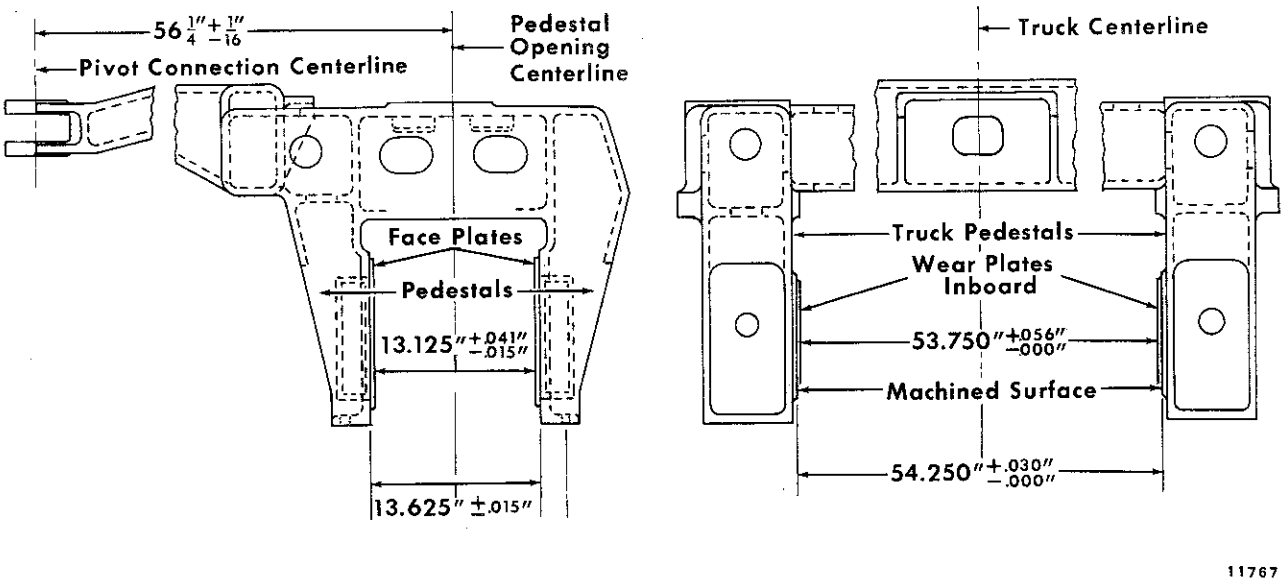



Fig. 27 — Pony Truck Pedestal Locating Dimensions

## COIL SPRING LIMITS

Various combinations of coil springs may be used at the truck bolster and pedestals because of variable loads which may be specified for the axles. Shim plates and shims of different thickness also may be used between the spring seat and spring so as to maintain correct height. The truck parts list provided with the customer's particular order outlines the spring assemblies and associated parts used on the truck. It is very important to identify each of the springs according to their part number in the parts list so as to test the spring at the proper load value as listed in the following Table A.

Check the part number of the spring or spring assembly used according to Table A. Determine if the springs are within the allowable limits as given for the static load placed on the spring. Spring assemblies consisting of more than one spring should be wired together until application so as to keep the correct assembly together.

A color code is used to indicate the loaded height of new springs. Brown paint is applied on springs or spring assemblies that are more than 1/16" and do not exceed the 3/16" limit above the nominal static height specified for the spring when under the specified static load. Nominal height is the spring height which is used for purposes of identification and as a base for the tolerance limits. Blue paint is applied on springs or spring assemblies that are 1/16" below to 1/16" above the nominal static height specified for the spring when under the specified static load. Green paint is applied on springs or spring assemblies that are more than 1/16" but do not exceed the 3/16" limit below the nominal static height specified when under the specified static load.

White paint is applied on springs that have been in service to identify springs

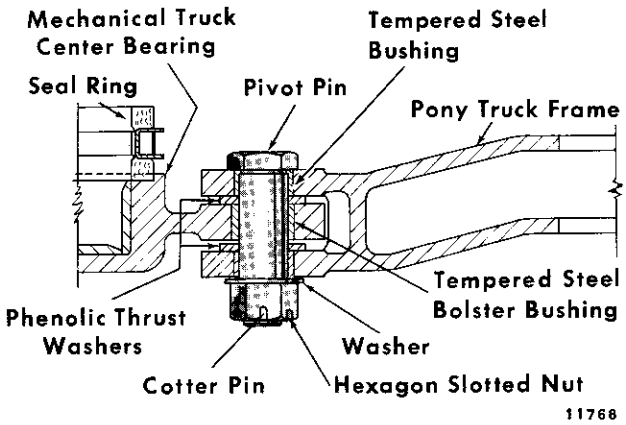



Fig. 28 — Pony Truck Pivot Connection Details

or spring assemblies that are 3/16" but do not exceed the condemning limit of 5/16" below the nominal static height specified for the spring when under the specified static load.

In freight car type trucks where color coded springs are specified, the bolster spring cluster should conform to the following recommendations. Blue and/or brown color code springs may be intermixed in each spring cluster in a truck assembly. In this event no green color coded springs should be used in the same truck assembly. Blue and/or green color coded springs may be intermixed in each spring cluster in any truck assembly. In this event, no brown color coded springs should be used in the same truck assembly.

Springs tested at the recommended load may be used provided they are within the following limits. Ride control bolster springs in the mechanical truck may be used provided their capacity loss is not more than twenty percent (20%) of their original value. The condemning limits of pedestal springs are 3/16" above the nominal loaded height and 5/16" below the nominal loaded height.

Springs may be tested on any reliable calibrated testing press or a spring testing fixture shown in Fig. 29 may be made as outlined in File Drawing 647 for checking the springs under proper load and height. This drawing is available on request from General Motors Overseas Operations. Safety wire mesh encloses the working parts of the fixture, Fig. 29, and two hinged doors at the front provide access to the exterior. When the doors are open a movable table within the fixture can be pulled out to facilitate the application of the spring assembly which is to be tested. The table with the spring to be tested is then pushed into place in the fixture and the eccentric rollers supporting the table are released so as to provide complete support for the spring. The protective front access doors are closed and locked in place before testing the spring. A hydraulic jack arrangement above the spring is actuated to apply force to bring the spring to the correct height for the test. A pressure gauge adjacent to the fixture shows the force in pounds applied to the spring and a pointer at the side of the fixture indicates the height of the spring under test.

To operate the spring tester, the directional valve, Fig. 29, is positioned so that the ram will cause the spring to be compressed when the force is applied. The pump operating valve is then opened to initiate the force required to bring the spring below the static height to be measured. The directional valve is then placed in its neutral or non-directional position. The relieving valve is then opened slightly to relieve pressure on the spring ram down to the static pressure under which the spring should be tested. The static height of the spring is then checked, and it should be within the limits as given in Table A.

Springs should be tested at the static height and static load values as provided in Table A, for the particular spring assembly. Compress the spring to one and one-half (1-1/2) times the specified static load. When compressing the spring take a reading at the specified static load and record the height of the spring. Continue to compress the spring to 1-1/2 times its static load. Then gradually release the load to the specified static load and record the height of the spring. Average the two height measurements. The static height of the spring should be within plus 3/16" above or 5/16" below the nominal static height given in Table A.

NOTE: The maximum load obtainable on the spring testing apparatus machine according to File Drawing 647, which is described later, is slightly more than 60,000 pounds. When 1-1/2 times the static load exceeds the 60,000 pounds, use 60,000 pounds as the applied load prior to the gradual release.

## TABLE A

SPRING TESTING

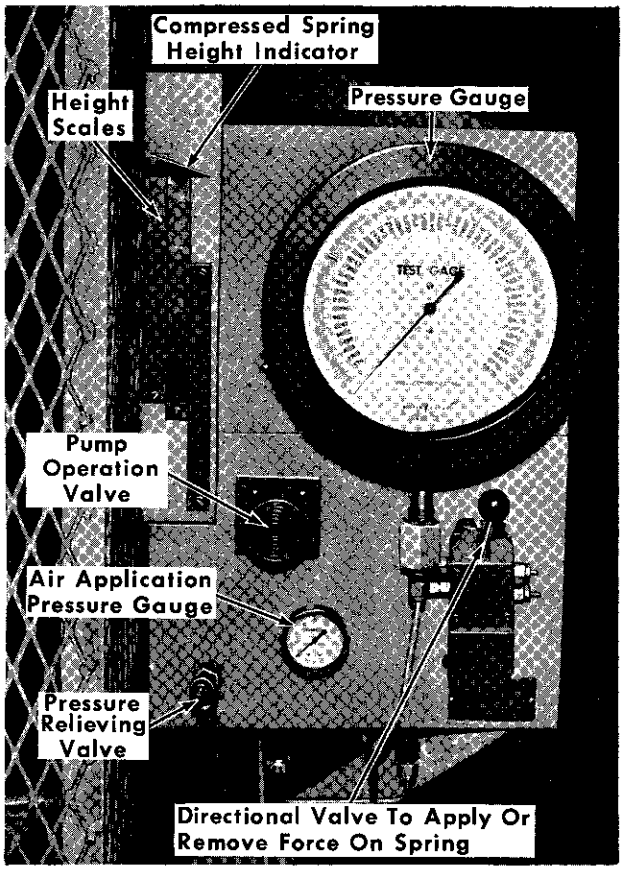
| Spring Part No. | Free Height | Nominal Static Height | Static Load Pounds |
|---|---|---|---|
| 6915450 | 12-1/4" | 9-7/8" | 5,240 |
| 8222477 | 14.889" | 12.377" | 11,967 |
| 8223561A | 12.092"-1<br>12.325"-2 | 9.644" | 6,434 |
| 8223562 | 14.899" | 12.564" | 4,435 |
| 8227587 | 20.30" | 18-1/16" | 13,200 |
| 8232136 | 5-13/16" | 4-5/8" | 2,000 |
| 8232617 | 14-1/4" | 11-1/4" | 6,260 |
| 8232618 | 22.22" | 18-1/2" | 8,850 |
| 8232619 | 21.94" | 18-1/2" | 3,925 |
| 8232620 | 22.40" | 18-1/2" | 18,200 |
| 8232621 | 14.35" | 11-1/4" | 2,510 |
| 8232622 | 13.64" | 11-1/4" | 1,230 |
| 8232623A | 22.40"-1<br>22.22"-2 | 18-1/2" | 27,050 |
| 8232624A | 22.40"-1<br>22.22"-2<br>21.94"-3 | 18-1/2" | 30,975 |
| 8232625A | 14.25"-1<br>14.35"-2<br>13.64"-3 | 11-1/4" | 10,000 |
| 8236348A | 15.31"-1<br>15.41"-2 | 13-1/8" | 5,850 |
| 8236349 | 15.41" | 13-1/8" | 1,310 |
| 8236350 | 15.35" | 13-1/8" | 4,540 |
| 8236351 | 21.00" | 17-7/8" | 12,000 |
| 8241800A | 14.250"-1<br>14.375"-2 | 11-1/4" | 8,790 |
| 8242299 | 15.35" | 12-3/4" | 3,000 |
| 8252022 | 9-1/16" | 7-1/8" | 2,120 |
| 8250524 | 13.65" | Solid Ht.<br>9.750" | Solid Load<br>1,927 |
| 8250525 | 13.64" | Solid Ht.<br>9.750" | Solid Load<br>2,003 |
| 8250526 | 15.35" | Solid Ht.<br>9.750" | 2,206 |
| 8252389 | 22.52" | 19.000" | 26,700 |
| 8252390 | 22.23" | 19.000" | 11,900 |
| 8252391 | 22.70" | 19.000" | 3,320 |
| 8252392A | 22.52"-1<br>22.23"-2<br>22.70"-3 | 19.000" | 41,750 |
| 8252510 | 13.78" | 11-9/16" | 8,160 |
| 8252511 | 13.77" | 11-9/16" | 3,280 |
| 8252512 | 13.31" | 11-9/16" | 1,300 |
| 8252513A | 13.78"-1<br>13.77"-2<br>13.31"-3 | 11-9/16" | 12,740 |
| 8253041 | 18-5/8" | 15-1/2" | 9,875 |
| 8261330A | 21.00"-1<br>20.69"-2 | 17-7/8" | 13,980 |
| 8264214 | 10-5/8" | 6-15/16" | 1,030 |
| 8264215 | 10-1/4" | 6-15/16" | 2,390 |
| 8268062A | 12-7/8"-1<br>13-3/16"-2 | 10.000" | 7,020 |
| 8307497 | 7.00" | Solid Ht.<br>6.000" | 5,700<br>at 6" |

NOTE: Springs may be used within 3/16" above and 5/16" below the nominal loaded height.

Springs should be color coded as described in text.

Numbers 1, 2 and 3 following free height refer to outer, middle and center springs in a set.

A = Spring set consisting of two or more springs.




After determining the static height, mark the spring assembly according to the color code given previously. Use white paint on spring assemblies which are 3/16" to 5/16" below the nominal loaded height.

Springs that have been tested, color coded and qualified for use should be stored in a protected area so as to avoid the formation of rust and pits. Pits can cause stress concentrations that may result in spring failure when under load. The springs should also be stored in groups corresponding to their color code so as to make their selection easier.

## GENERAL PROCEDURE FOR TRUCK ASSEMBLY

Although the assembly procedure is basically the reverse of the disassembly there are some differences so the explanation will be given in the following procedure.

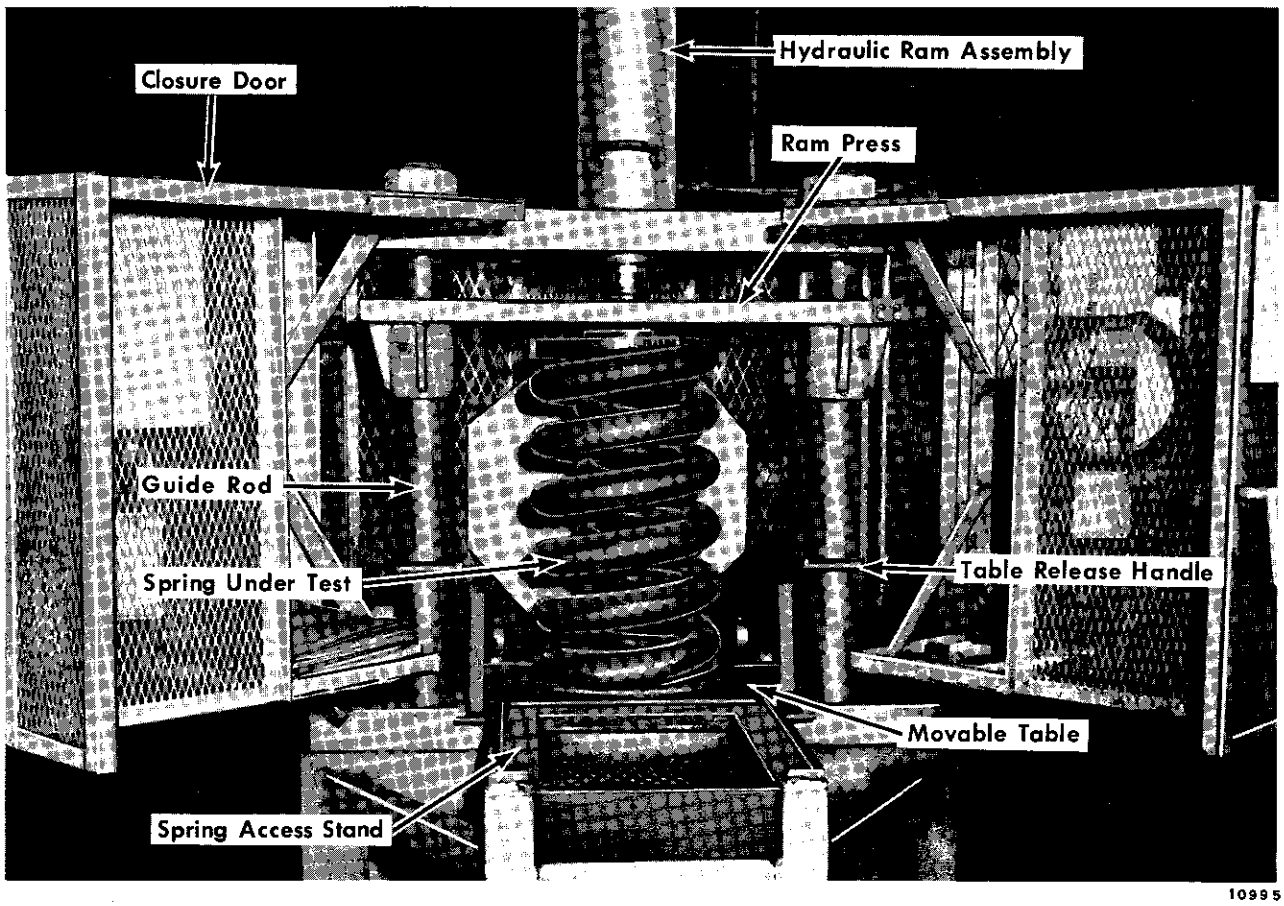



Fig. 29 — Spring Testing Fixture

Side Frame And Bolster Assembly
(Except Model C-1 Truck)

1. Using the same type of metal supports and pipes as in the disassembly procedure insert the pipes through the holes provided in the bolster and place the bolster assembly on the metal supports as shown in Fig. 7.

2. A friction shoe and spring are shown separately on the bolster in Fig. 30. Install each friction shoe and spring assembly in their respective pockets in the end of the bolster. Hold the assemblies in place temporarily by a small wire rod or other means so they will not fall out of the pocket.

3. Using the pressing fixture explained in the disassembly procedure apply fixture and a journal jack in place against the friction shoes as shown in Fig. 31, and force the friction shoes and springs into the bolster pockets. Care should be taken to see that the spring slides along its base and is not "cocked" or out of its proper position. The friction shoes must be held "in" to enable the bolster to be applied to the side frame. To do this the same retaining pin described in the disassembly procedure is inserted through holes provided in the friction shoe and bolster as shown in Fig. 31. These pins must be removed after the side frame is applied to the bolster.

   After the retaining pins have been applied the jack pressure on the friction shoes may be released and the jack and pressing fixture removed. The friction shoes and springs at the opposite end of the bolster should be installed using the same procedure.

   The dimensions across the faces of the friction shoes should not exceed 17-3/4" so as to facilitate application of the side frame on the bolster. This dimension can be checked by a gauge constructed as shown in Fig. 32.

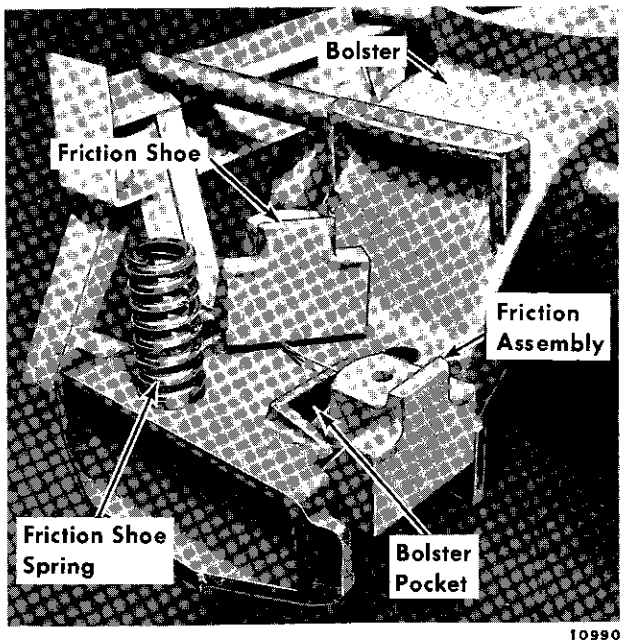



Fig. 30 — Bolster Friction Shoe And Spring

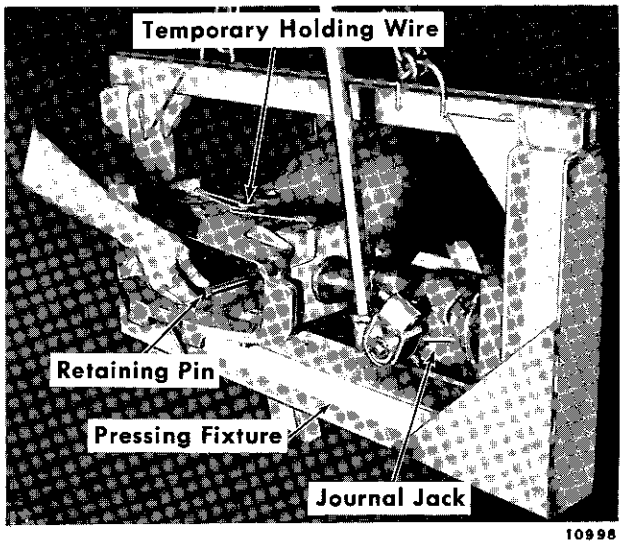



Fig. 31 — Pressing Friction Shoe In Bolster Pocket

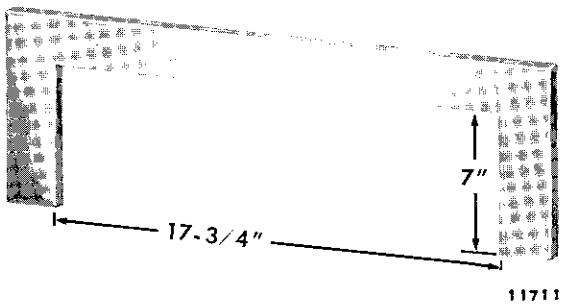



Fig. 32 — Construction Details Of Friction Shoe Gauge

4. Side frames to be used on the truck should be matched so that the wheelbase dimensions are equal or nearly equal as shown in Fig. 33. The wheelbase dimension is the spacing between the pedestal opening centerlines. The variation of the wheelbase dimensions may be plus or minus 3/16" from the nominal 68".

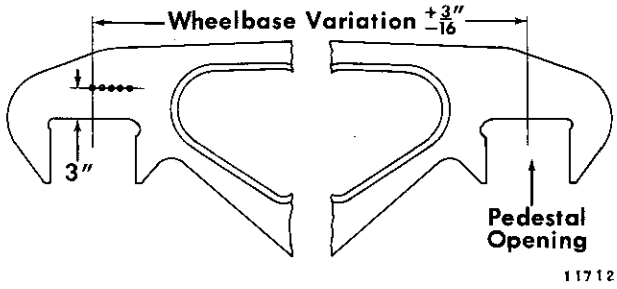
5. Using a suitable hoist, position a side frame so that the enlarged bolster opening under the wear plates is horizontal with the end of the bolster as shown in Fig. 34. Push the side frame onto the end of the bolster until the frame is equal distance from the front and back gibs of the bolster. (Install the opposite side frame using the same procedure.)

6. Lower the side frame until its weight is taken by the bolster as shown in Fig. 35, and apply the load carrying spring assemblies. (Repeat procedure on opposite end of the bolster.)

7. Raise the bolster and side frames assembly from the supporting fixtures and place the assembly so the load carrying springs support the bolster as shown in Fig. 36. Place a pry bar between the top member of the side frame and the top of a friction shoe. Raise the pry bar so as to position the friction shoe to permit removal of the retaining pin. Repeat this procedure on the remaining three friction shoes to remove all the retaining pins. After the retaining pins are removed, insert a hardwood wedge, as shown in Fig. 36 between the top of the bolster and bottom of the upper side frame member in order to lock the assembly temporarily together.

Side Frame And Bolster Assembly (Model C-1 Truck)

The assembly of the Model C-1 truck side frame and bolster is essentally the reverse of the disassembly previously explained.




1/4" Button heads 1/4" high cast on left end of frame indicate wheel base variation.

| | | | |
|---|---|---|---|
| Plus | + 3/16" | #5 | 5 Button Heads |
| | | #4 | 4 Button Heads |
| | Normal | #3 | 3 Button Heads |
| Minus | | #2 | 2 Button Heads |
| | -3/16" | #1 | 1 Button Head |

Variation Range Per Number

It is recommended that frames of like number be assembled in the same truck. However, frames one number apart may be mated, that is: 1 & 2 or 3 & 4 etc. may be paired, but 1 & 3 or 3 & 5 etc. must not be assembled in the same truck.

Fig. 33 — Pairing Of Mechanical Side Frames

1. Apply the wedge spring and wedge in in place in the frame as shown in Fig. 37. Using the same retaining pins and a journal jack as in the disassembly procedure force the wedge back into position and insert the retaining pins.

2. The bolster can be applied after the wedges are installed in the frame

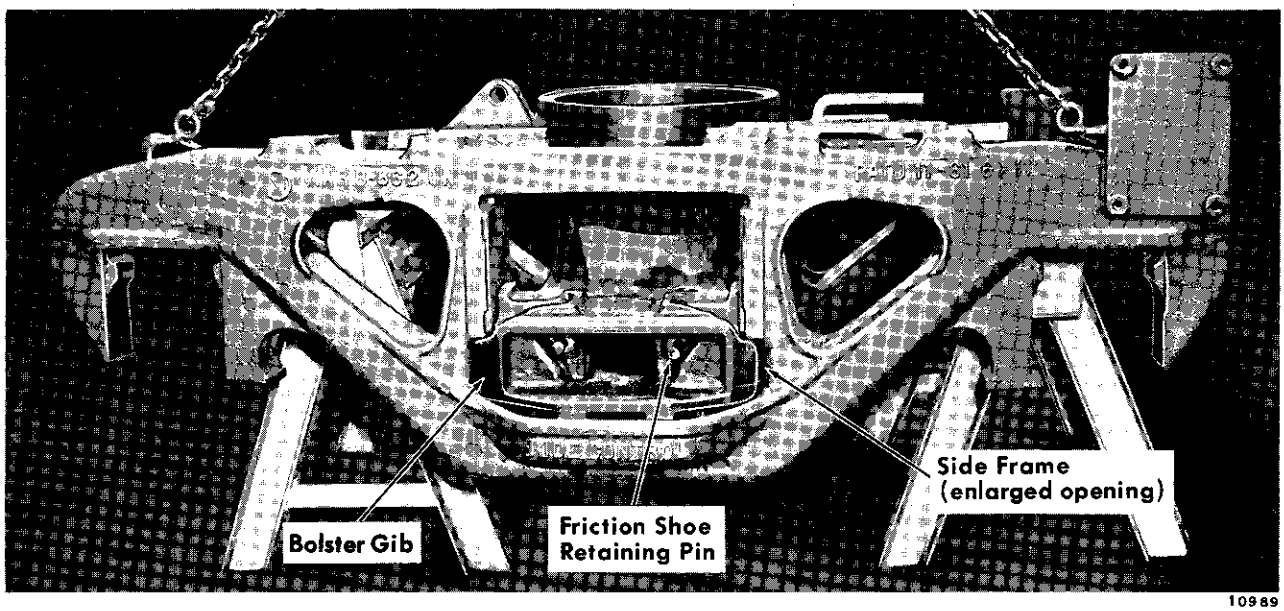



Fig. 34 — Installation Of Truck Side Frame

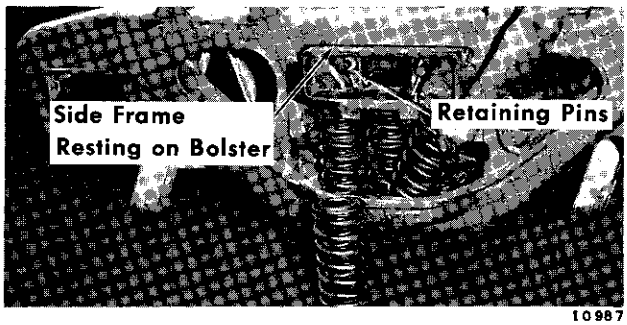



Fig. 35 — Applying Load Carrying Springs

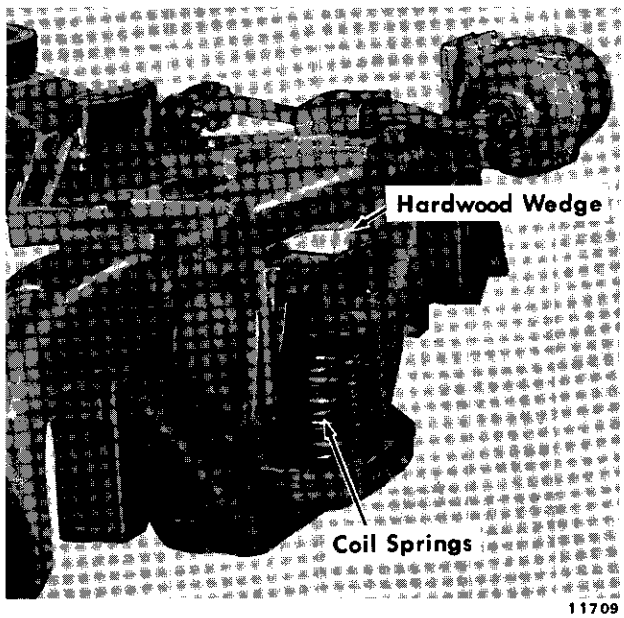



Fig. 36 — Locking Bolster And Side Frame

and held by the retaining pins. Before application of the bolster be sure that the wedge extension Fig. 37, will not interfere with the bolster application. After the bolster is in the proper position, apply the bolster support springs and allow the bolster to assume its normal position on the springs.

3. It is important to remove the friction wedge retaining pins after assembling the bolster. Insert a pry bar into hole "A", Fig. 37, and free the wedge sufficiently to permit the removal of the retaining pin. Remove all four retaining pins in this manner.

Drive Gear and Wheel and Axle Assembly

1. Position a gear box wheel and axle assembly so that the torque arm can be bolted to the torque arm bracket assembly on the gear box, as shown in Fig. 38. Be sure to install the metal bushings as shown in Fig. 38 before inserting the bolt through the bracket. Tighten the upper bolt and nut to 1500 foot pounds. (Two men, averaging 160 pounds each, tightening with a five foot extension will approximate 1500 foot pounds.)

   To make the lower bolt and nut accesible, rotate the torque arm 180 degrees

about the axle to bring the lower nut to the upper position. Hoist the gear assembly to position the arm to the opposite side. Tighten this bolt and nut assembly to 1500 foot pounds, then again raise the gear assembly, and reposition the gear box to its original position. Clean the end of the torque arm and remove any roughness. Repeat these operations on the mating gear box and axle assembly.

2. Support the double reduction gear box and axle assembly about eighteen

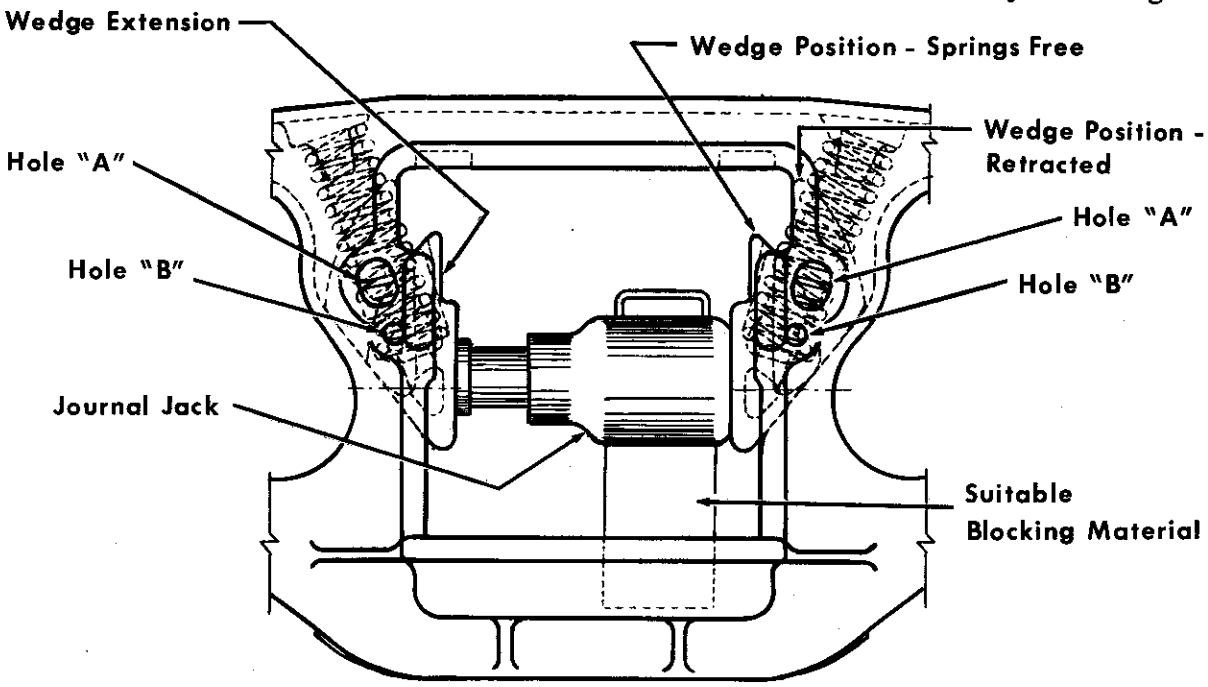



Fig. 37 — Installing Friction Wedge And Spring

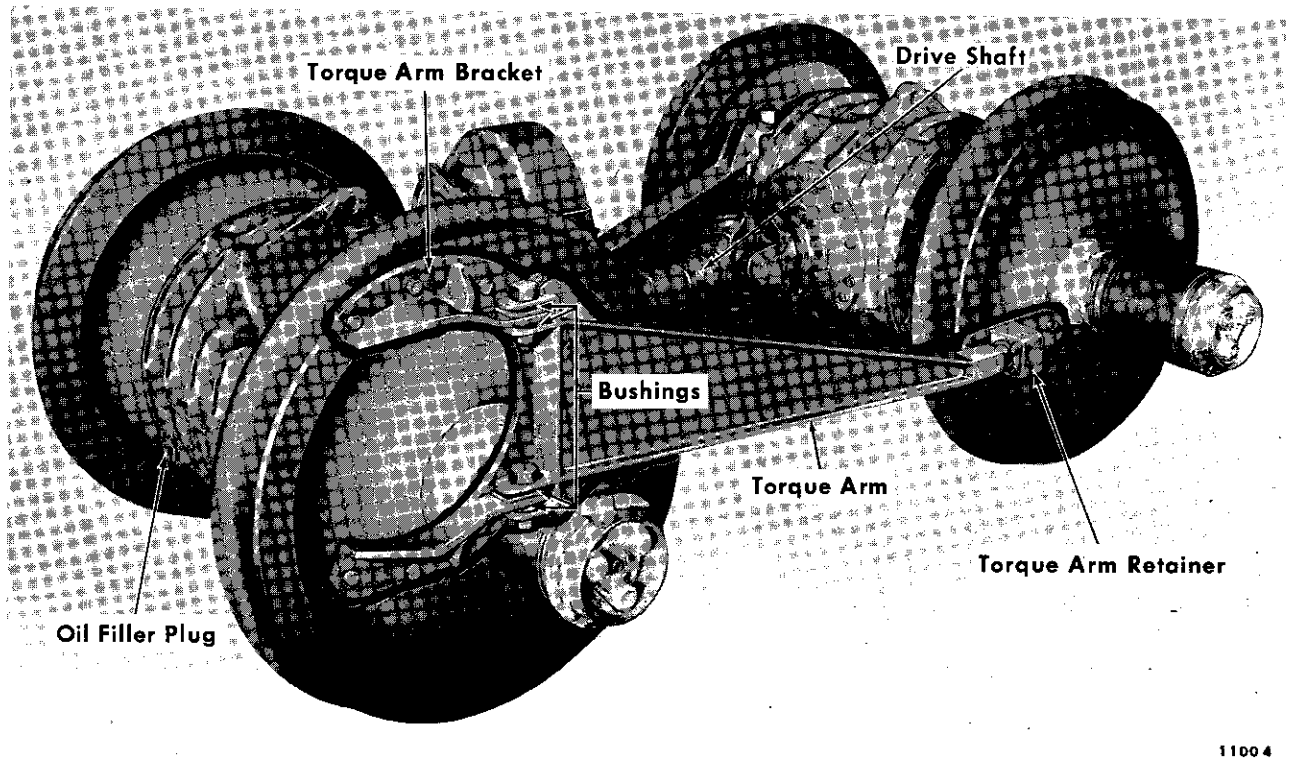



Fig. 38 — Photo Cutaway Showing Torque Arm And Installation

inches above the floor so that the wheels are free to turn. Place the gear box on the support so the drive flange is in a horizontal plane.

3. Provide a similar support for the remaining gear box and axle assembly, positioned so the two axles are parallel to each other and are 68" apart. (Truck wheelbase dimension.)

4. Using a suitable hoist, raise and move one gear box and axle assembly toward the mating assembly so that the torque shaft ends will enter their respective retainer assemblies. Position the assembly to obtain 68" between the horizontal centerlines of the axles. The wheelbase will be approximately correct when the torque shaft ends are fully seated in the retainers.

5. The drive shaft which connects the two gear boxes is shown in Fig. 39. Align the flanges of the drive shaft to the drive flanges of the gear boxes and apply the holding bolts, washers and nuts, as shown in Fig. 38. Make sure the buttons on each part of the drive shaft are in line as shown in Fig. 39. Torque the flange nuts to 240-260 foot pounds. Rotate the wheels to bring the bottom flange bolts around so they can be tightened.

Special tools are available to aid in bringing the flange bolts up to proper torque after their initial tightening. Two torque wrench adapter levers 8315703 and 8315704 are available.

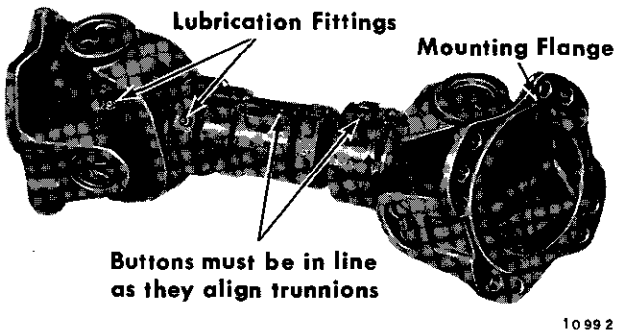



Fig. 39 — Universal Joint And Drive Shaft Assembly

These levers are used to apply torque in areas too cramped for the torque wrench end.

The adapters also increase the torque as applied on the wrench. Each one increases an indicated reading of 220 foot pounds to an actual 250 foot pounds. Adapter 8315703 has a square 1/2" socket drive at one end to fit a 1" x 1/2" drive socket and a 3/4" square opening for the torque wrench at the other end and is used on the drive shaft connecting the gear boxes. Adapter 8315704 has a twelve point 1" box wrench opening at one end and is used on the drive shaft flange to motor flange connecting bolts.

Drive Assembly Lubrication

The drive assembly can be more conveniently lubricated before being installed in the truck. See the scheduled maintenance program for the regular lubrication periods.

1. Gear Unit Lubrication

The oil used for lubrication in all gear drives should be SAE 90 extreme pressure (EP-Mild Type) oil or equivalent. Extreme caution should be taken not to operate the units without first filling with the proper kind and quantity of lubricating oil. Do not overfill the units or leakage will occur and the drive gear will overheat.

Oil is added to the "inboard" or double reduction gear unit after removing a filler plug to the left of the drive shaft coupling to the outboard gear box and the level plug under the serial number tag as shown in Fig. 38. Add lubricant through each filler opening until the oil just reaches the bottom of the opening. Approximately 26 quarts of lubricant are required.

The lubricant is added to the single reduction or "outboard" gear unit

through a plugged opening under the serial number tag in a location similar to the one on the other gear unit. Fill to the bottom of the plug opening. The single reduction unit requires approximately 20 quarts of lubricant.

2. Universal Joints and Drive Shaft Lubrication

The recommended lubricant for the universal joints and drive shafts is SAE 250 gear lubricant or equivalent. Do not use grease as it will clog the small oil passages, prevent proper lubrication and possibly result in a failure.

The drive shaft should be lubricated after the shaft is installed to its proper length and before it is placed in service.

There are three places where lubrication is applied to the drive shaft; at each of two universal joints and at the slip spline on the shaft, Fig. 39. a high pressure type of oil gun securely held to the oil fitting should be used to apply the lubricant. Pressure should be continued while lubricating the universal joints until oil is observed coming through the bearing seals, indicating that the four needle bearing reservoirs are full.

Apply lubricant to the spline on the shaft until the oil comes through the vent at the end of the shaft.

NOTE: If at any time a drive shaft is compressed to measure the length, the spline should be relubricated after the shaft is installed, as compressing the shaft forces the lubricant out the vent opening.

Final Truck Assembly

1. Position the journal bearing adapter in each pedestal opening as shown in Fig. 40.

2. Raise the bolster and side frames and position this assembly over the completed gear box and wheel and axle assembly. Position the side frames so that the pedestals straddle the journal bearings and carefully lower the assembly on to the bearings.

3. Install a retainer plate in its slot at each inside pedestal of both side frames.

4. Assemble the sander hose guide support bracket to the truck side frame. The end of the sander hose guide should be positioned 1-3/4" above the rail.

5. Clean the center bearing pocket. Apply center bearing half rings and center bearing wear plate. Add lubricating oil to the center bearing so the level is about 1/16" above the center plate. Apply a light coat of grease to the top of the center bearing felt dust guard and apply the guard to the center bearing.

6. The safety strap which is applied under the bolster with two pins, washers and cotter pins, cannot be installed until the load of the locomotive is on the bolster. This strap must also be removed before the load is removed from the bolster when the locomotive is untrucked.

7. The preceding maintenance information primarily covers the current design of mechanical trucks. However, as can be seen by the illustrations in Fig. 40, the previously used mechanical trucks are similar to the current design and the instruction can be adapted so as to apply to the prior used mechanical truck assemblies.

## APPLICATION OF FOUR-WHEEL SWIVEL TRUCK TO LOCOMOTIVE

Application of the truck to the locomotive is, in general, the reverse of the procedure used to remove the truck. However,

before application of the truck, check the following items.

1. Inspect the center bearing pocket to see that it is clean and that the wear ring and center plate are within the limits.
2. Apply a quantity of center bearing oil to the bearing to a depth of 1/16". The oil used should conform to the specification given in M.I. 1756 for all purpose lubricating oil. Do not over lubricate the center bearing.
3. Apply a clean dust guard seal ring so as to protect the center bearing after the truck is applied.

## APPLICATION OF PONY TRUCK ASSEMBLY TO GA12 LOCOMOTIVE

The GA12 locomotive is equipped with two leveling plates above each pony truck, which transfer part of the locomotive weight to the pony truck frame. One of these plates is shown in Fig. 41 as applied to the locomotive. Each of these plates is made so that the contact surface can be aligned with the mating surface on the pony truck frame.

### Application Of Leveling Plate Assembly

The leveling plate assembly must be applied to the locomotive underframe so

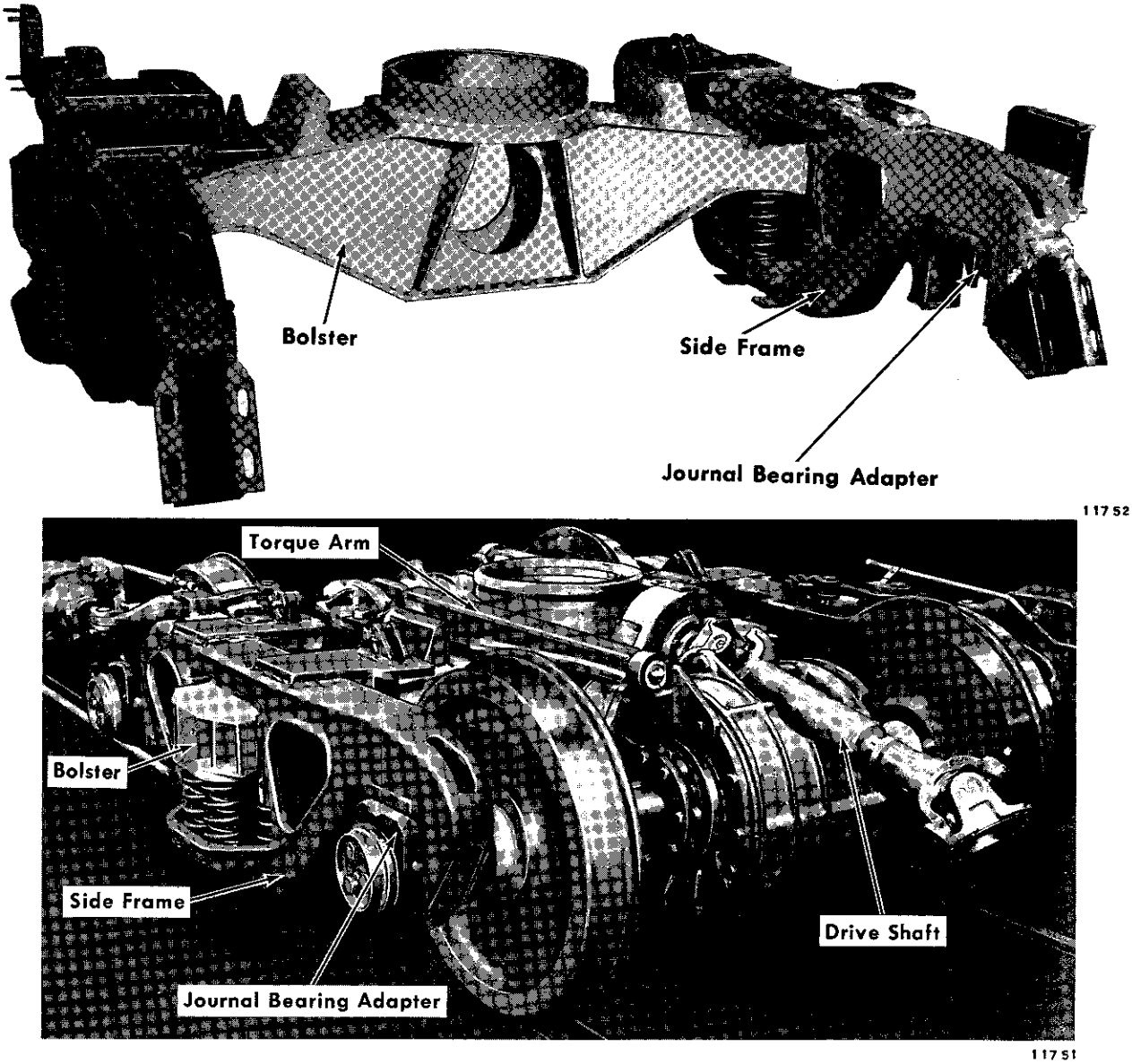



Fig. 40 — Prior Used Truck Assembly And Bolster

that a plane, reference plane "Y", which passes through each of the four leveling plate assemblies between the top surface of the pad and the bottom surface of the shim is within 1/8" of being parallel to reference plane "B" which is a plane passing through both center plate surfaces at the bolster centerlines.

The distance between these two planes, dimension "A" will vary depending on whether or not the underframe is in the loaded or unloaded condition. Dimension "A" should be 5-25/32" when the underframe is in the loaded condition and 5-17/32±1/4" when the leveling pads are applied to the underframe in the unloaded condition.

The leveling plate assembly may be applied as follows:

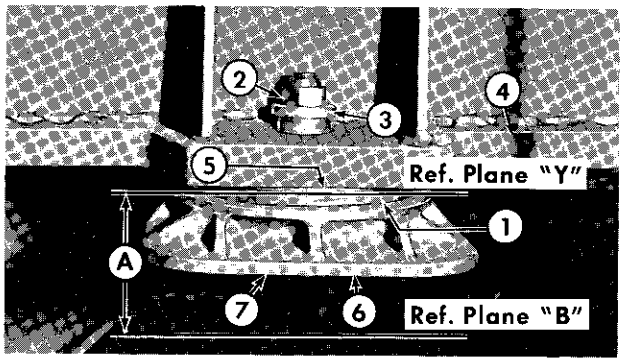
1. Weld a steel shim (9-1/2" diameter with a 3-1/2" diameter hole in the center) not more than 1/2" thick to the locomotive underframe as in Fig. 41. Use a 1/4" fillet weld 1" long every 5 inches. The thickness of the shim should be determined by the thickness needed to maintain the correct distance "A" between the bottom surfaces of the shim and reference plane "B".

2. The leveling pad is then put in place and welded to the shim using a 1/4" fillet weld 1" long every 5 inches.

3. The leveling plate can now be attached to the leveling pad using the spherical washer and the locknut as shown in Fig. 41. The locknut should be tightened only enough to hold the leveling plate in place until the truck is applied.

Mating Pony Truck To Leveling Pads

The following adjustments should be made to insure full contact of the mating surfaces whenever the trucks are applied to the locomotive or after any maintenance that might alter the relationship of the contact surfaces.

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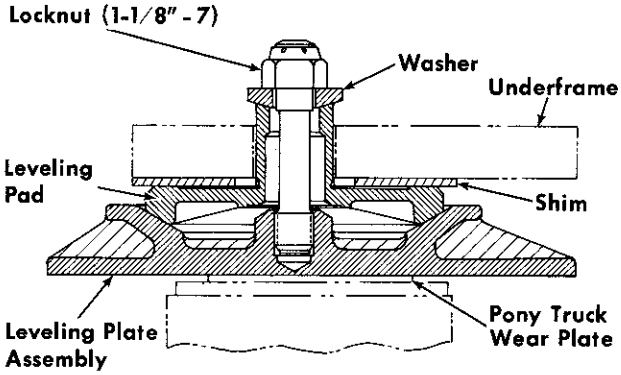


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1. Leveling Pad
2. Locknut
3. Spherical Washer
4. Underframe
5. Shim
6. Leveling Plate Assembly
7. Contact Surface

Fig. 41 — Pony Truck Leveling Plate

1. The 1-1/8"-7 locknut, should be tightened only enough to prevent the leveling plate from being loose during handling and to allow it to move freely on the leveling pad. It may be necessary to lubricate the surfaces between these two parts to insure freedom of movement.

2. The locomotive should be trucked after completion of the preceding item.

3. At the initial lowering of the locomotive on the trucks, it should be lowered only to the extent that a minimum load level is applied to the pony trucks through the leveling plates. In this position, if a leveling plate is not completely lined up with its mating wear pad, the leveling plate should be tapped so as to bring it into correct position.

4. When all four plates are aligned with their respective wear pads, the remainder of the locomotive weight may be applied.

5. After the application of the load, all four positions should be inspected to ascertain that the leveling plates are in full surface contact with the wear plates on the pony trucks.

6. The locknuts should be tightened to a torque value of 275-300 foot pounds after the full load is applied and the leveling plates are in full contact with the leveling pads.

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