Mitchell Overdrive Installation Overview

by Tom Endy 2022

Many people have asked about the pinion gear assembly puller tool I have. The tool was designed and built about 30 years ago. The design is such that it does not disturb the pinon gear bearing pre-load. This is important if the task is to install a Mitchell overdrive. The pion gear assembly can them be removed from the Model A drive shaft and transferred to the Mitchell stub shaft without having to re-set the pinion gear bearing pre-load.

This article is an overview of the process for removing the Model A torque tube, drive shaft, and pinion gear assembly, and installing the Mitchell stub shaft and the overdrive.

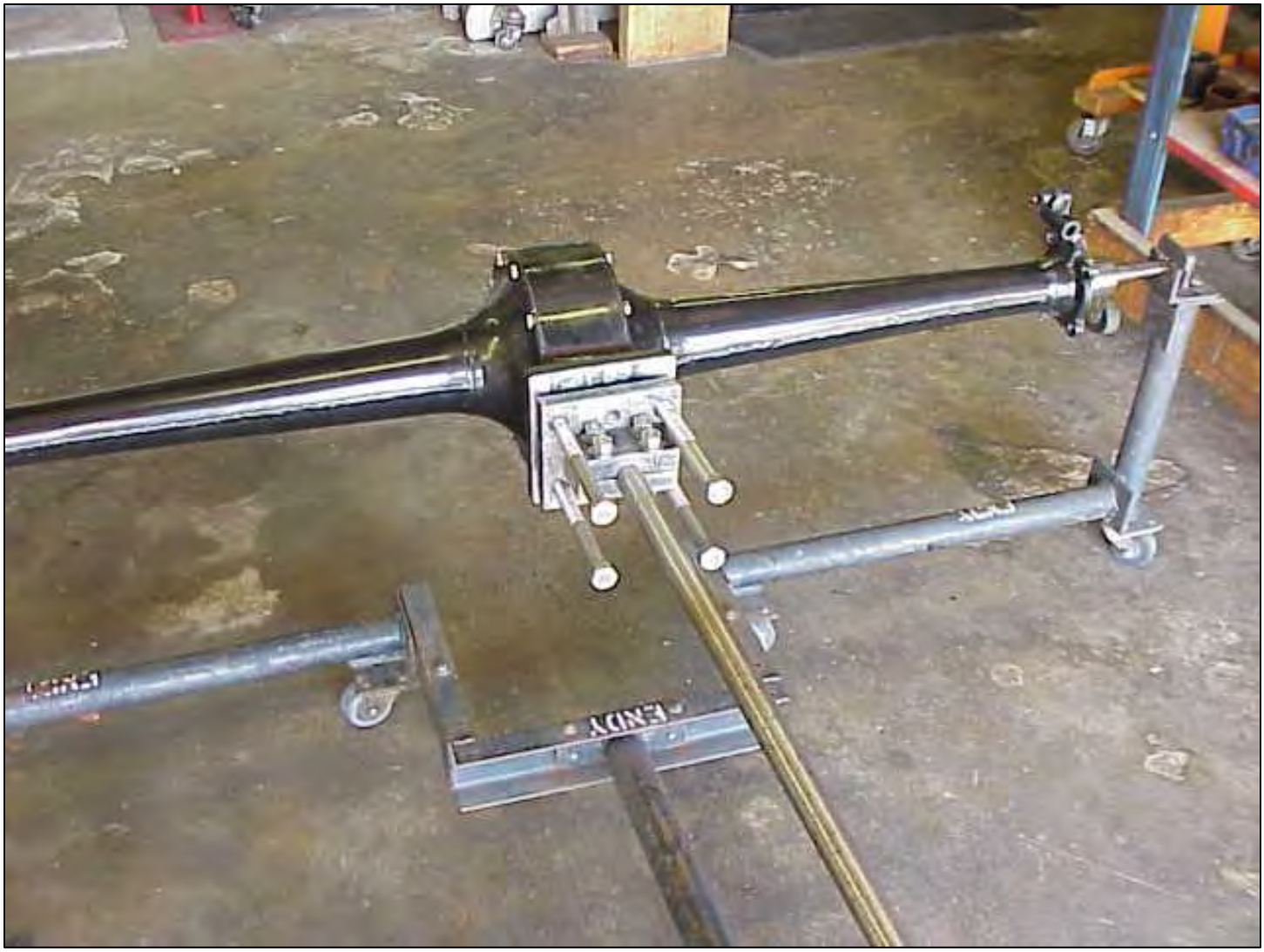
The Model A rear axle assembly seen here is the candidate for the installation of a Mitchell overdrive. The radius rods and the brake drums have been removed. However, this is not necessary as the overdrive installation can be accomplished with the radius rods and the brake drums left installed.

The first task is to remove the torque tube. This is done by removing the six bolts at the banjo flange and removing the speedometer assembly at the front end. A snap ring is removed from the front end of the drive shaft and the speedometer drive gear, thrust washer, and the roller bearing are slid off. The torque tube can then be slid off.

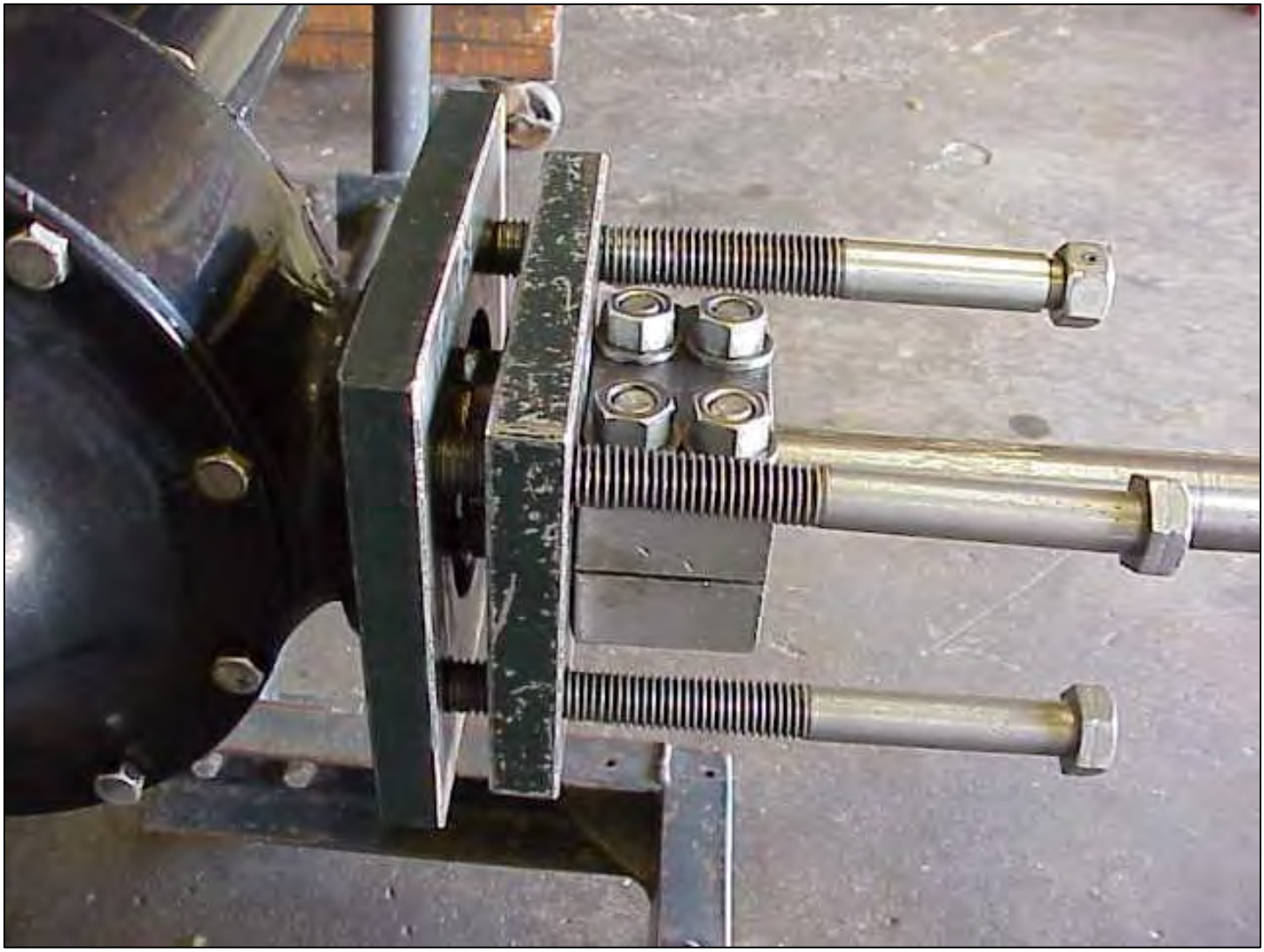
None of these parts will be used with the overdrive installation.

The torque tube has been removed exposing the drive shaft. The rear axle assembly is ready to have the pinion gear assembly puller tool attached.

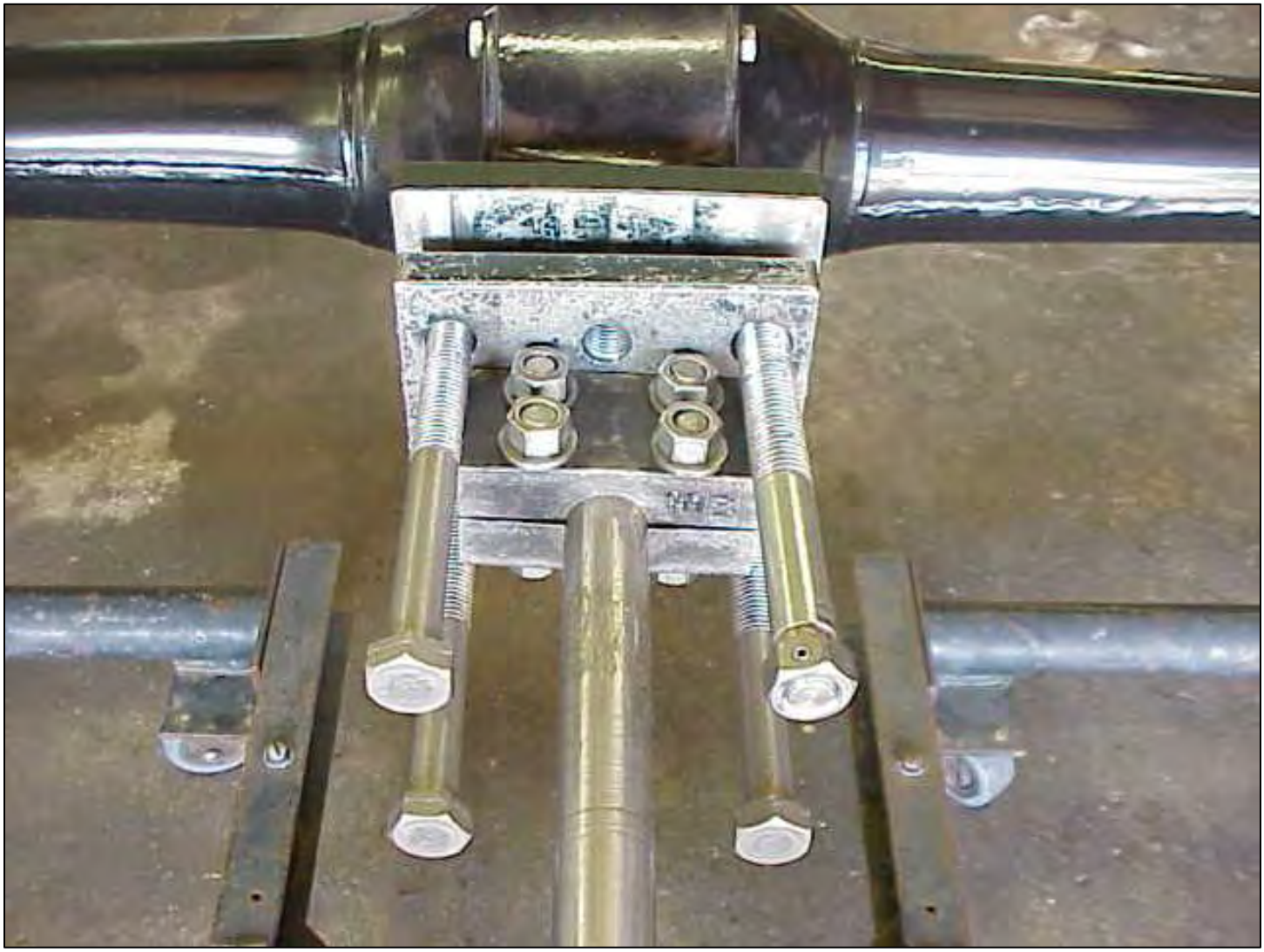
The pinion gear puller tool will be attached up close to the two large nuts on the pinion gear assembly. It is important to not disturb the two Large nuts as this is what adjusts and maintains the pinion gear bearing pre-load.



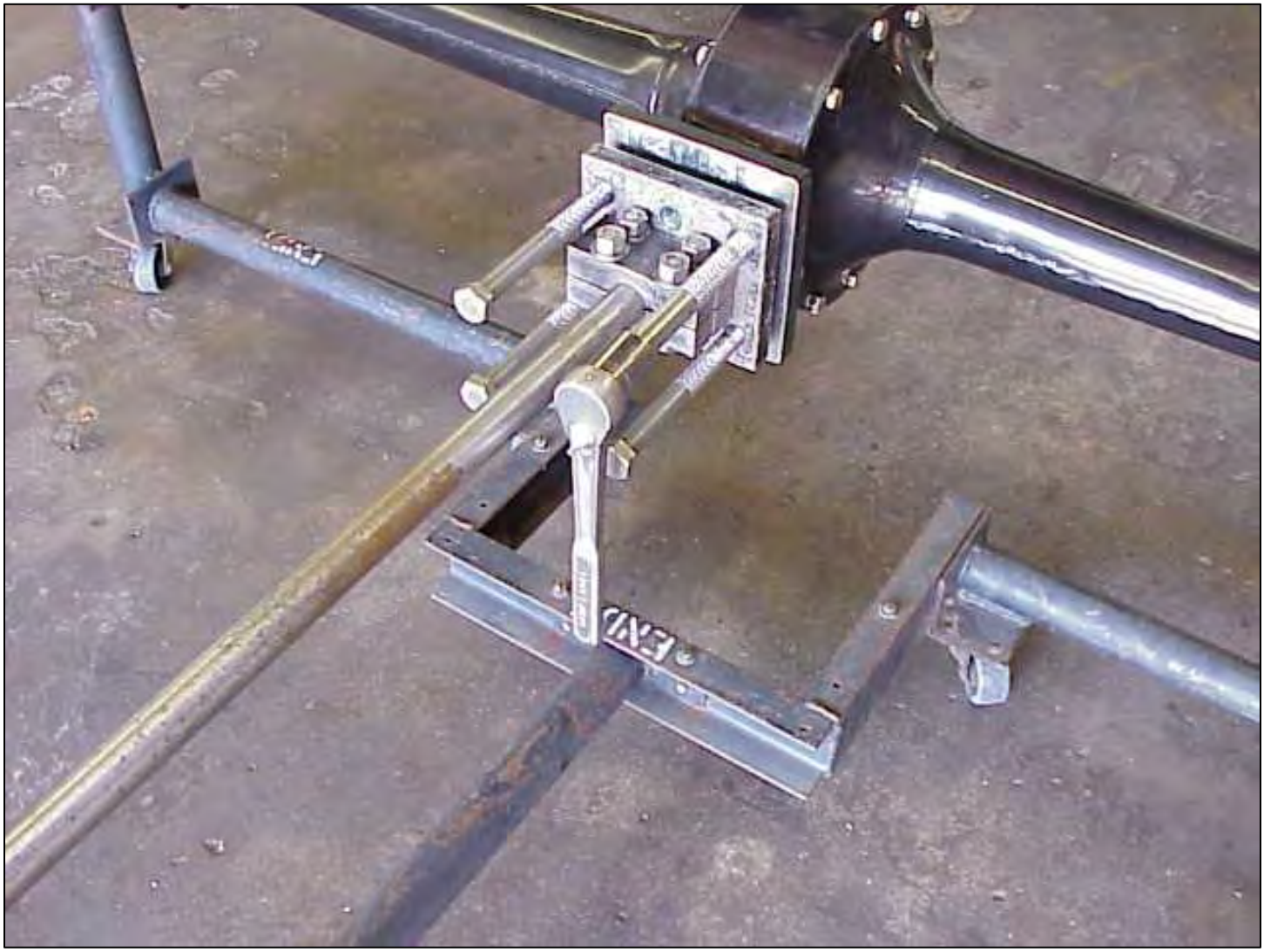
The pinon gear assembly puller tool has been attached onto the drive shaft.



The pinion gear assembly puller tool consists of the front and rear plates, the clamp that grips the drive shaft, and the four long bolts that pulls the pinion gear assembly out of the banjo.



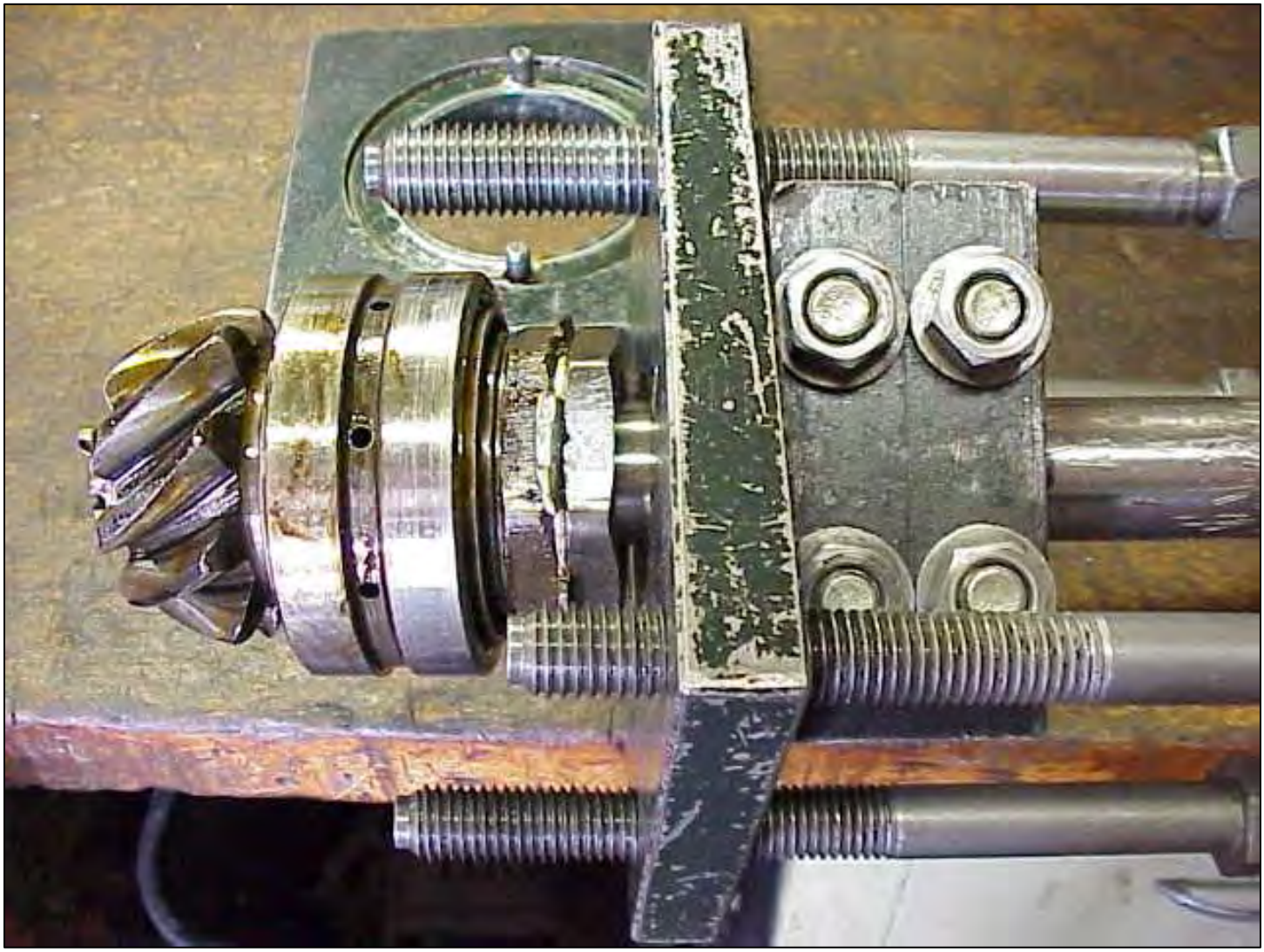
The two-piece clamp that grips the drive shaft has a hole that is slightly smaller than the drive shaft. Four 3\4” hex bolts tighten to grip the drive shaft. It is important that the clamp be extremely tight. A chalk mark is placed on the drive shaft in front of the clamp and is monitored to make sure the clamp is not slipping as the four long bolts are tightened.



The four long bolts are tightened evenly to pull the pinion gear assembly out of the banjo.

The pinion gear assembly has been removed from the banjo.

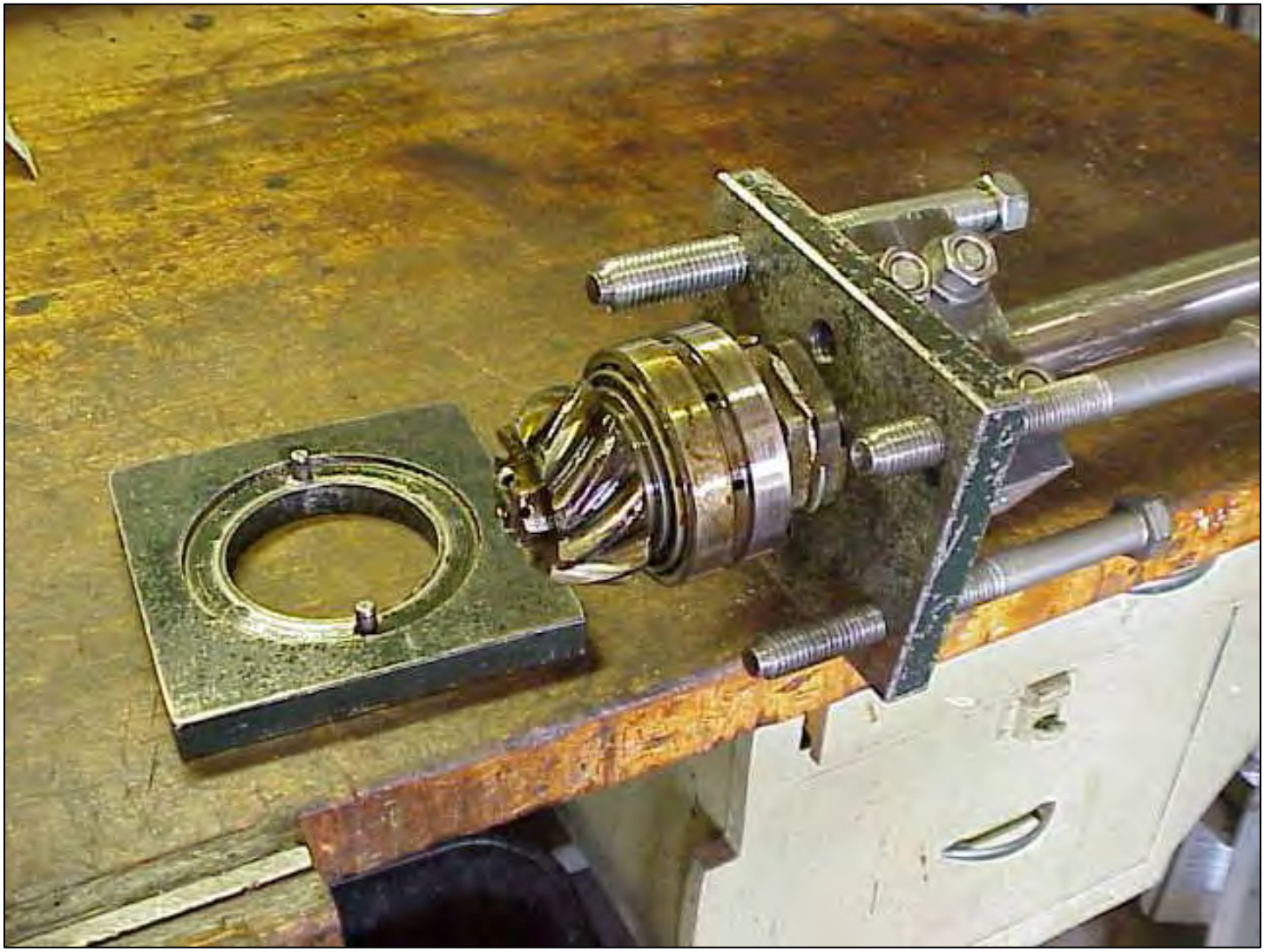
A close up view of where the pinion gear assembly was removed from the banjo. The double race that is part of the pinion gear bearing assembly presses into the opening in the flange.



This is the pinion gear assembly after it was removed from the banjo. It is still captured by the pinion gear assembly puller tool.

There are two bearings, one on each side of the double race. The three parts are mounted onto the pinion gear sleeve and held in place with the two large nuts. There is a thrust washer between the front bearing and the rear large nut and there is a locking washer between the two large nuts.

The two large nuts adjust the pinion bearing pre-load and lock it in place. Two ears on the locking washer are bent over in opposite directions to lock the nuts in place after the adjustment is made and the outer nut tightened.



Another view of the pinion gear assembly still in the pinion gear assembly puller tool.

The pinion gear assembly puller tool has been removed from the pinion gear assembly.

The plate in the upper right goes up against the banjo flange with the two pins inserted into two banjo mounting bolt holes to hold it in place.

The pinion gear assembly is still attached to the Model A drive shaft and will have to be removed.

The nut on the end of the drive shaft is a 15\16” hex and is torqued to a nominal 100 ft. lbs. and secured with a cotter pin**. Note that the cotter pin is installed incorrectly.** The cotter pin should never be bent over the end of the drive shaft as it may contact the rotating ring gear carrier assembly that is in very close proximity. The two legs of the cotter pin should always be bent down along the side of the nut.

This shows the correct method of installing the cotter pin, with the cotter pin legs bent down the side of the nut. Torque the nut to 90 ft. lbs., then observe where the cotter pin hole is. If it is lined up, leave it. If not, tighten until it is.

To remove the pinion gear assembly from the drive shaft place the drive shaft in a vice, remove the cotter pin and loosen the nut and back it off about 1\16”, but do not remove it. Place a steel block or a bearing puller on the drive shaft in front of the pinion gear assembly. Place a small engine flywheel puller on the end of the drive shaft with the arms around the steel block.

Tighten the flywheel puller as tight as you can get it and hit the end of the puller up to four times with a heavy hammer. If the pinion gear assembly does not come loose, tighten again and repeat the process until it does. You will need a pipe wrench to hold the drive shaft to prevent it from rotating in the vice while tightening the puller.

The reason the nut is left in place is to prevent the pinion gear assembly from flying across the room when it breaks loose from the drive shaft.

Once the pinion gear assembly comes loose remove the nut and slide it off the drive shaft.

The pinion gear assembly is shown removed from the Model A drive shaft. The drive shaft will be discarded and the pinion gear assembly will be installed on the Mitchell stub shaft.

It is prudent to check the condition of the pinion gear assembly bearings by rotating them by hand while still on the drive shaft. They should rotate freely and smoothly with a slight amount of drag. There should be no thrust clearance.

If there is thrust clearance the pre-load should be re-adjusted by tightening the two large nuts. If the bearings feel rough they should be replaced. They are available from all Model A suppliers and some bearing suppliers. The bearings are made by Timken and are of good quality.

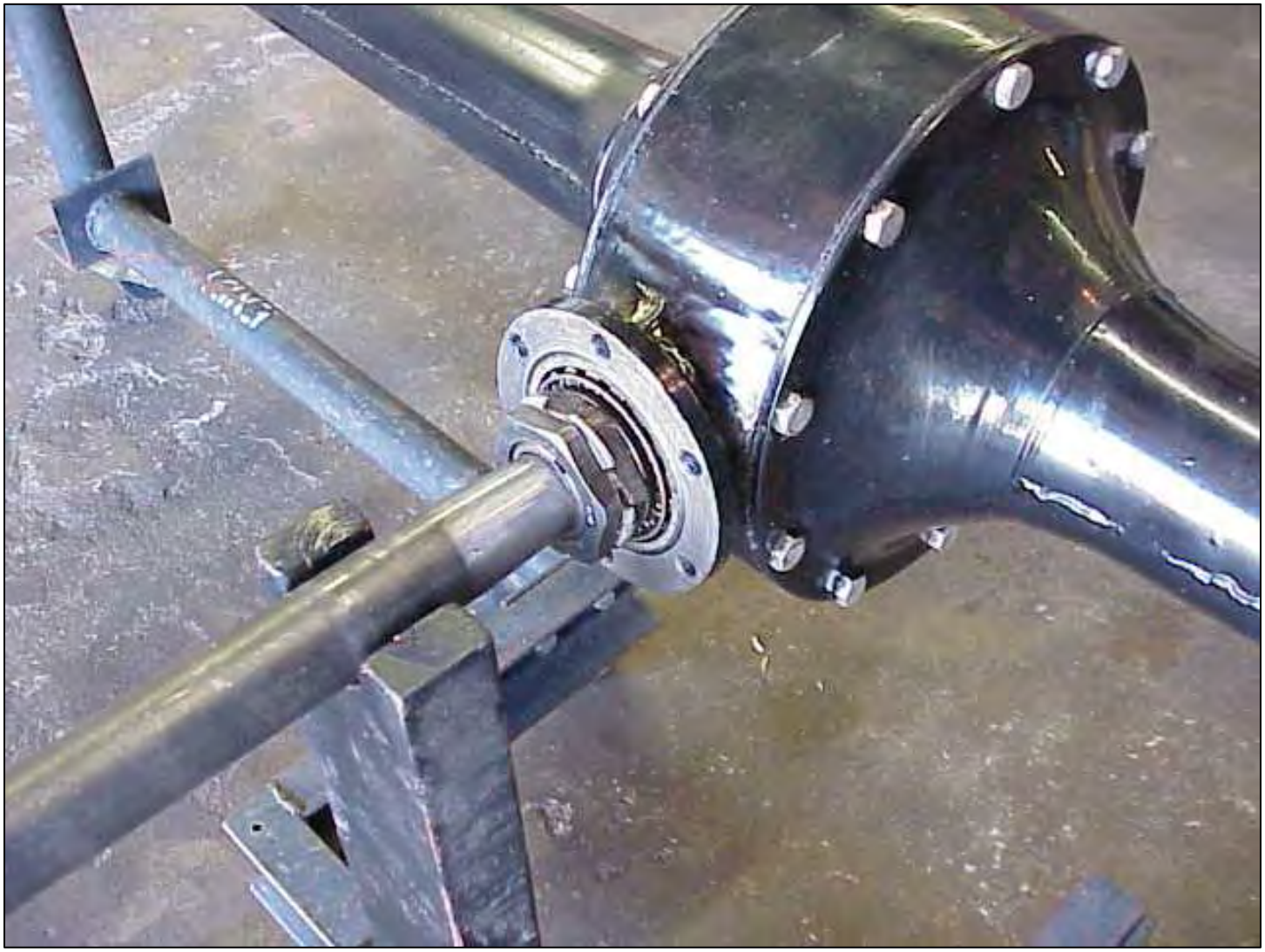
Tapered roller bearing, Timken part number 28156 (Ford p\n A4221) Need two.
Double pinion race, Timken part number 28314XD (Ford p\n A4616) Need one.

The pinion bearing pre-load adjustment is made after installation on the Mitchell stub shaft, and after the 15\16” hex nut has been torqued to a nominal 100 ft. lbs. New bearings should be adjusted to a pre-load of 20 inch lbs. as measured on a dial indicator torque wrench while rotating the assembly. They can also be set by feel. Rotate the assembly by hand and feel for a slight drag on the bearings. Securely tighten the two large nuts and secure with the lock washer by bending over two ears in an opposite direction. Make sure the bearings turn freely after the two nuts are tight.

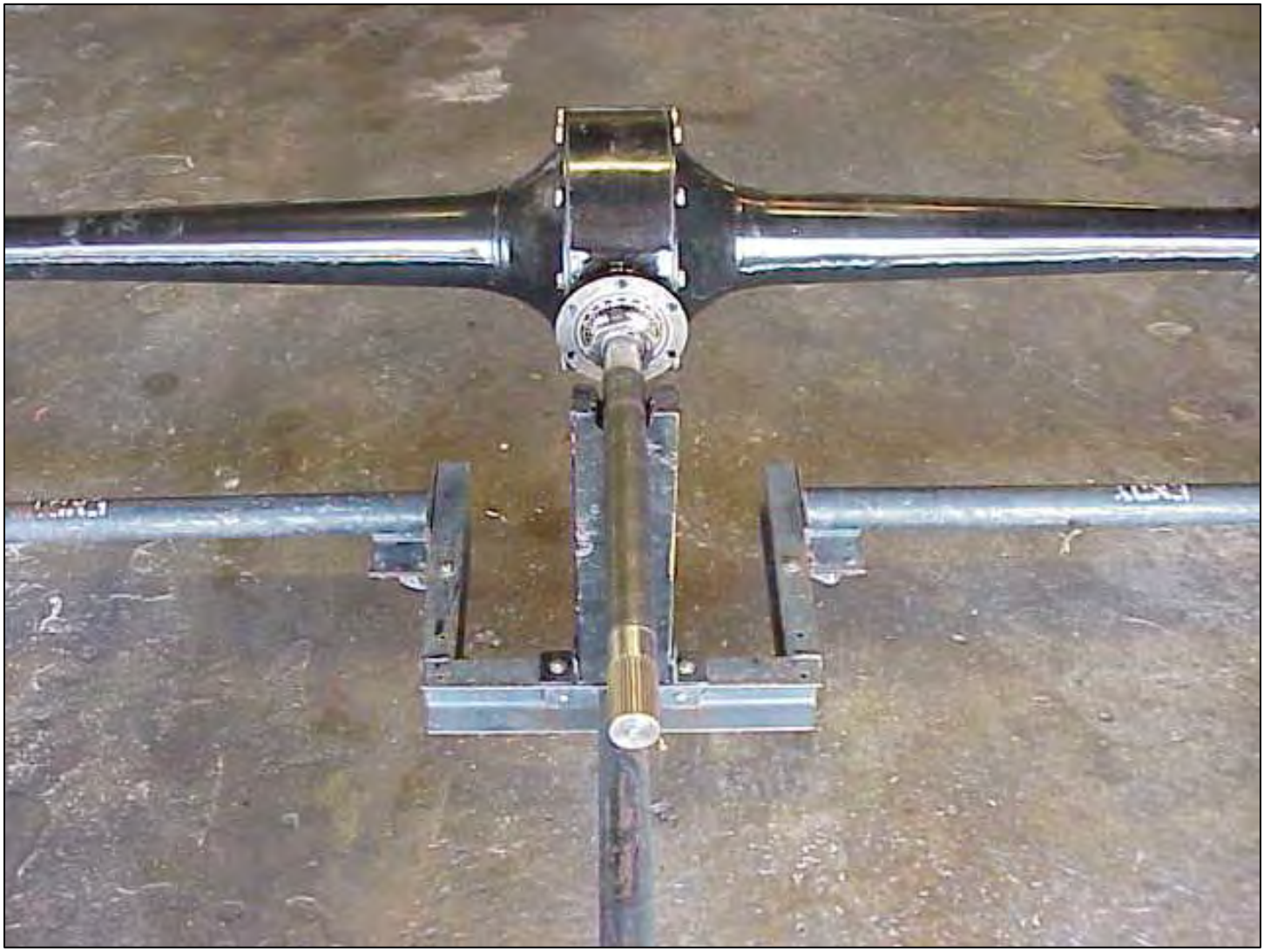
The pinion gear assembly will be installed on the Mitchell stub shaft and the 15\16” hex nut tightened to a nominal 100 ft. lbs. and secured with a cotter pin.

The pinion gear assembly with the Mitchell stub shaft is reinstalled in the banjo using a tool made from the back end of a discarded torque tube. Six long bolts and nuts are used to pull the pinion gear assembly into the banjo. A 9\16” hex deep socked is used.

As the bolts are tightened evenly the pinion gear assembly will slide in. As it does, rotate the Mitchell stub shaft to align the teeth on the pinion gear with the teeth on the ring gear.



The pinion gear assembly and the Mitchell stub shaft are shown here installed in the banjo and is ready to have the overdrive installed.



A spline coupler supplied with the overdrive is installed on the end of the Mitchell stub shaft. **It is extremely important to not forget to install it**. Grease it thoroughly before installing.

The rear axle assembly is rotated into a vertical position on the cradle and the overdrive is slid down over it. Make sure the overdrive is in gear. There is a neutral position between in and out of overdrive. Use a 1&1\16, six point, deep socket to rotate the spline on the front of the overdrive.

It will take several people to lift and align the overdrive as it is slid down over the Mitchell stub shaft. Rotate the shaft on the front of the overdrive until the spine coupler aligns and the overdrive drops into place. Keep fingers away from the connecting flange on the overdrive.

Install the six retaining bolts on the banjo.

The task is complete and the Mitchell overdrive is shown here ready to be installed in the car.

Be sure to put oil in the overdrive transmission. Add the oil after the overdrive has been installed in the car and after the speedometer extension cable has been installed.

If oil is added before the speedometer extension cable is installed it will run out the cable extension hole. The extension cable is secured with a set screw. Put sealer on the set screw, otherwise there will be an oil leak there.