

C O N T E N T S

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DESCRIPTION

a. STEERING GEAR AND MOUNTING. The worm and roller type steering gear is mounted on the frame left side rail (Fig. 277), and is supported at the lower edge of the instrument panel. A tubular jacket, which extends from the steering gear housing to the steering wheel and incloses the steering column, provides a mounting for the gearshift mechanism.

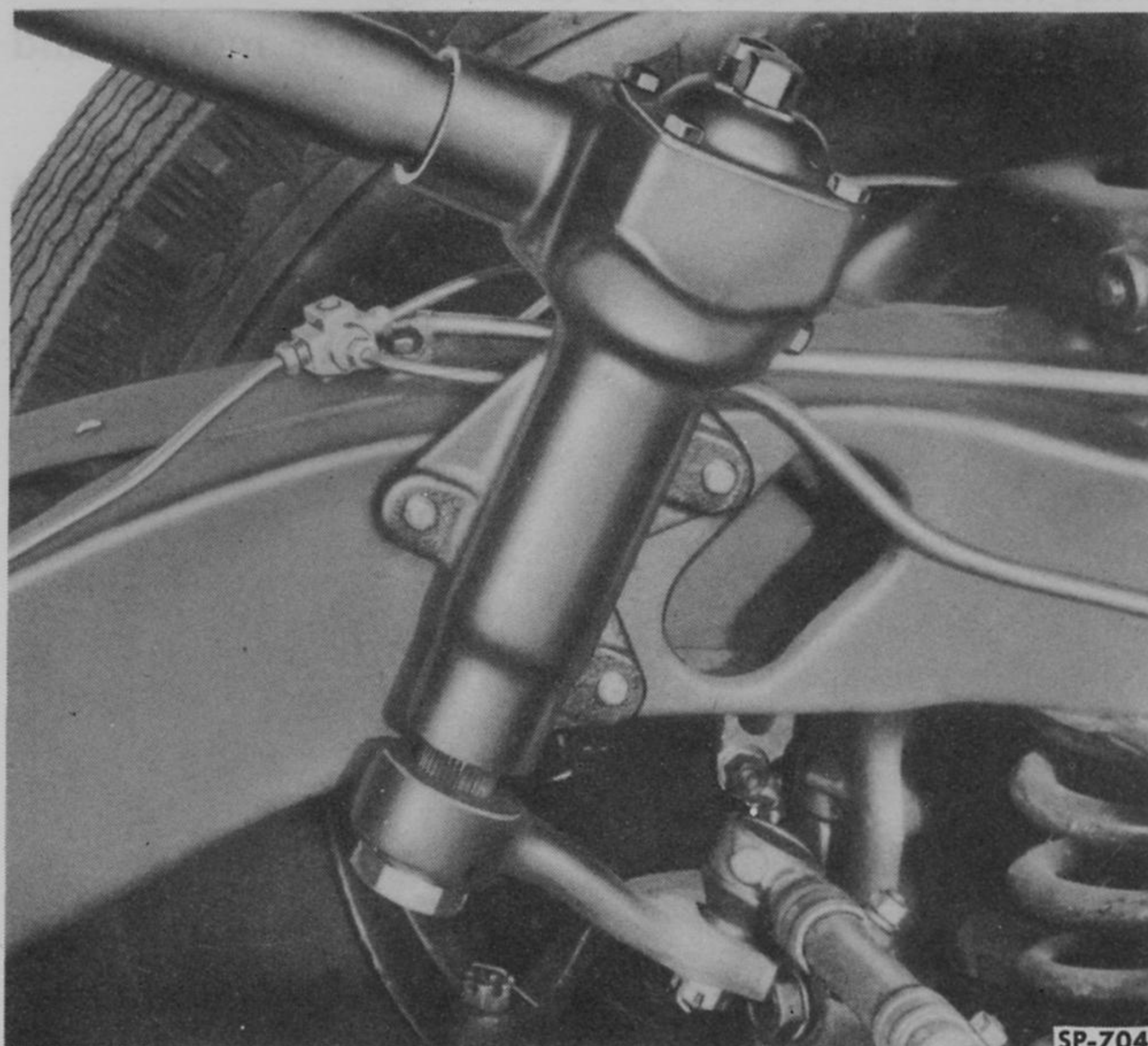


Fig. 277—Steering Gear Mounting—Kaiser

Inside the steering gear housing (Fig. 278) is the worm which is pressed onto the steering column or shaft. Machined surfaces at the ends of the worm form the inner races or cones for the two opposed

roller bearings in which the worm is supported. The lower bearing is adjustable toward the upper bearing by use of shims between the housing and the end cover which bolts to the housing.

The shaft and roller assembly mounts in two bushings in the housing, perpendicular to the worm, with the gear teeth of the roller meshing with the worm teeth. Turning of the steering column and worm rotates the roller shaft, and moves the pitman arm which is installed on the bottom end of the roller shaft.

Gear lash between the worm and roller is adjustable by means of a screw, threaded through the shaft and roller cover and engaged in a slot in the shaft, providing endwise movement of the shaft and roller when the adjuster screw is turned in or out. An oil seal, pressed into the housing, is used to prevent lubricant leakage around the lower end of the roller shaft.

b. STEERING LINKAGE. (Fig. 279 and 280). The steering gear linkage consists of the pitman lever arm on the lower end of the roller shaft, a drag link, two tie rods and the idler lever. The drag link is connected to the pitman lever arm at the left end and to the idler lever, mounted in the front crossmember, at the right end. The idler lever is mounted in the frame front crossmember with a threaded bolt and two special bearings (Fig. 281) pressed into the frame crossmember. The lower bearing has a smooth bore, however, the upper bearing is threaded. A lock plate is provided at the underside of the front crossmember to lock the hex head of the bolt which is threaded into the upper bearing, as shown in Fig. 282.

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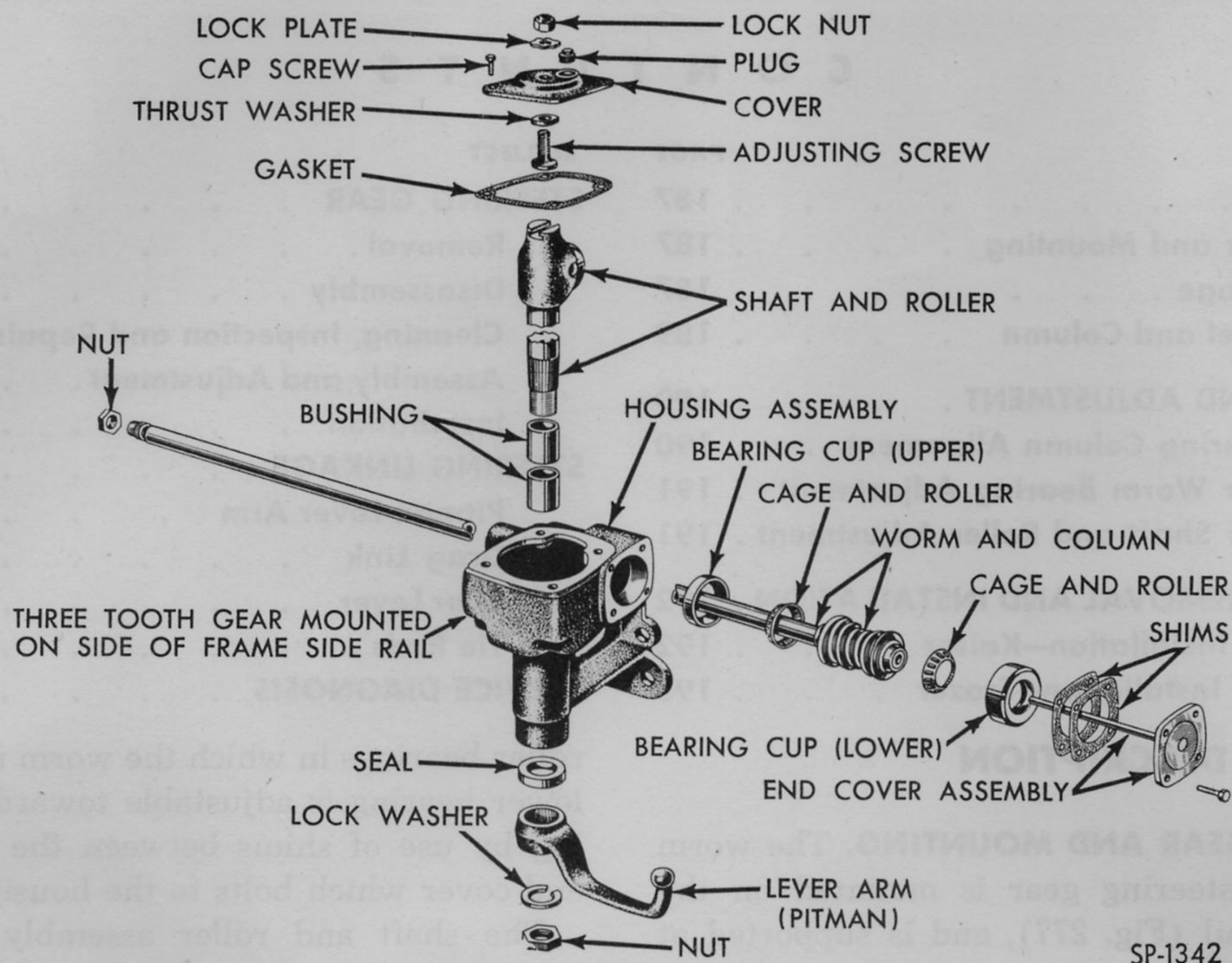


Fig. 278—Steering Gear Assembly—Exploded View

A tie rod connects the steering arm at each front wheel to the idler lever. This type of linkage provides a "center point" at the idler lever which permits each front wheel to move up and down without

affecting the opposite wheel through the linkage. Also, less shock is transmitted to the steering gear and wheel with this type of linkage.

The end of the drag link on Frazer models and

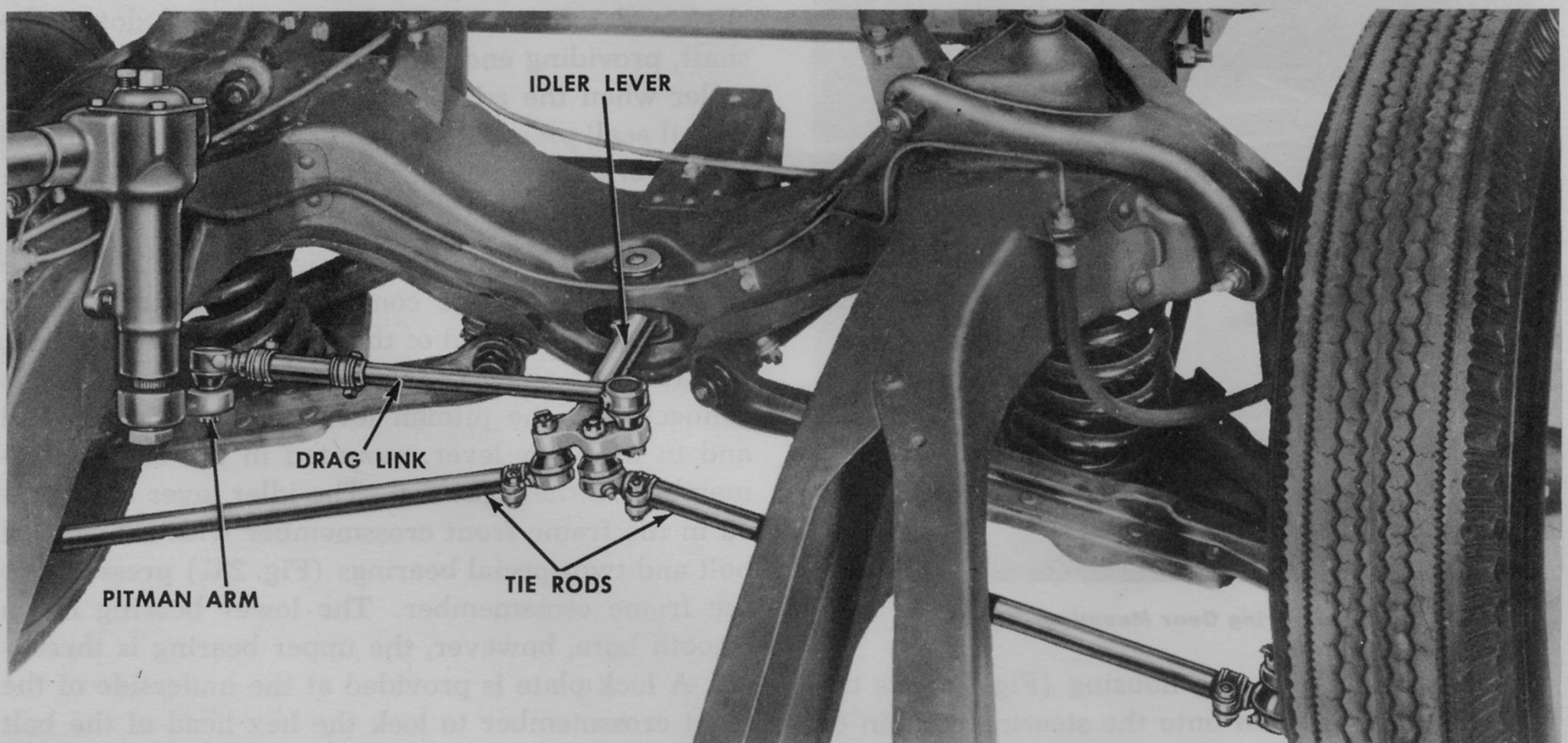


Fig. 279—Steering Gear Linkage Installed—Kaiser

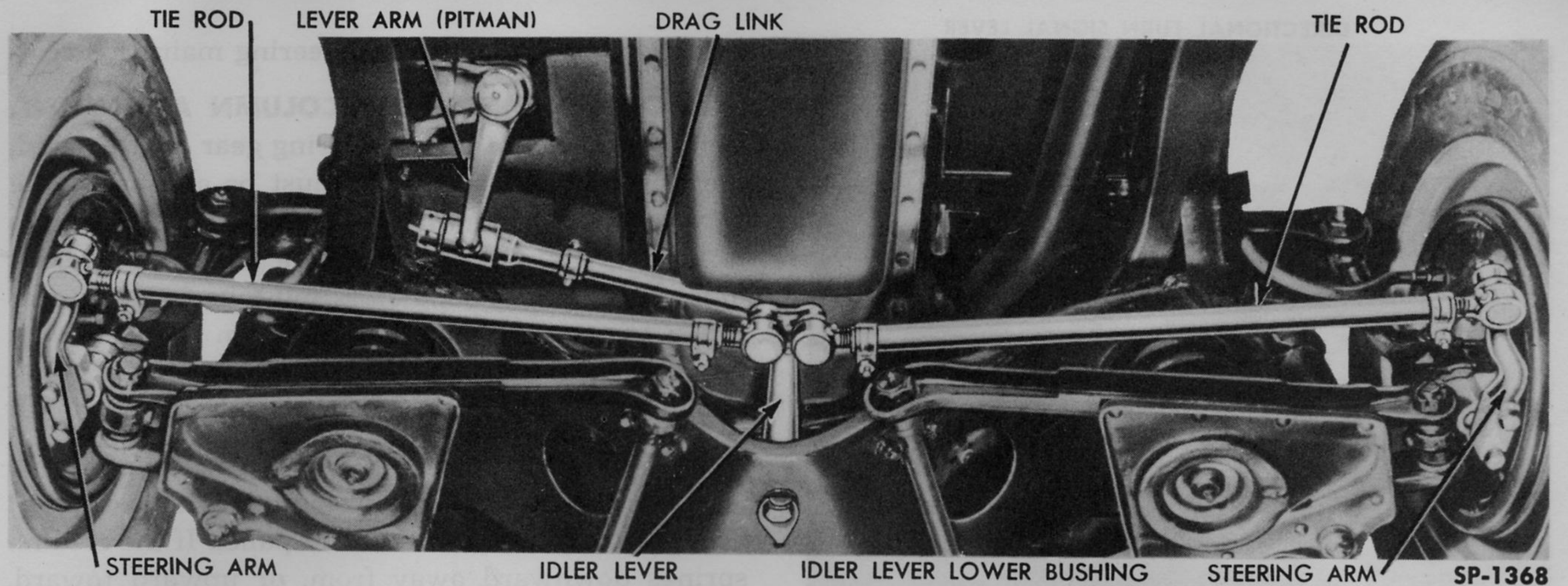


Fig. 280—Steering Gear Linkage Installed—Frazer

late Kaiser vehicles, which connects to the pitman lever arm, is a spring loaded ball socket which is adjustable for wear (Fig. 280 and 283). Early Kaiser vehicles have a drag link with self-adjusting ball joints at both ends (Fig. 279). The drag link is also adjustable for length to provide a horizontal position of the steering wheel spoke and to locate the steering gear at the center of its travel when the front wheels are in a straight-ahead position. The tie rods are both adjustable for length, providing a means of obtaining the proper toe-in of the front wheels.

Linkage parts as used in Kaiser and Frazer models, although similar, are not all the same and,

therefore, are not all interchangeable. It is important that the proper parts be used for replacements when overhauling the steering linkage.

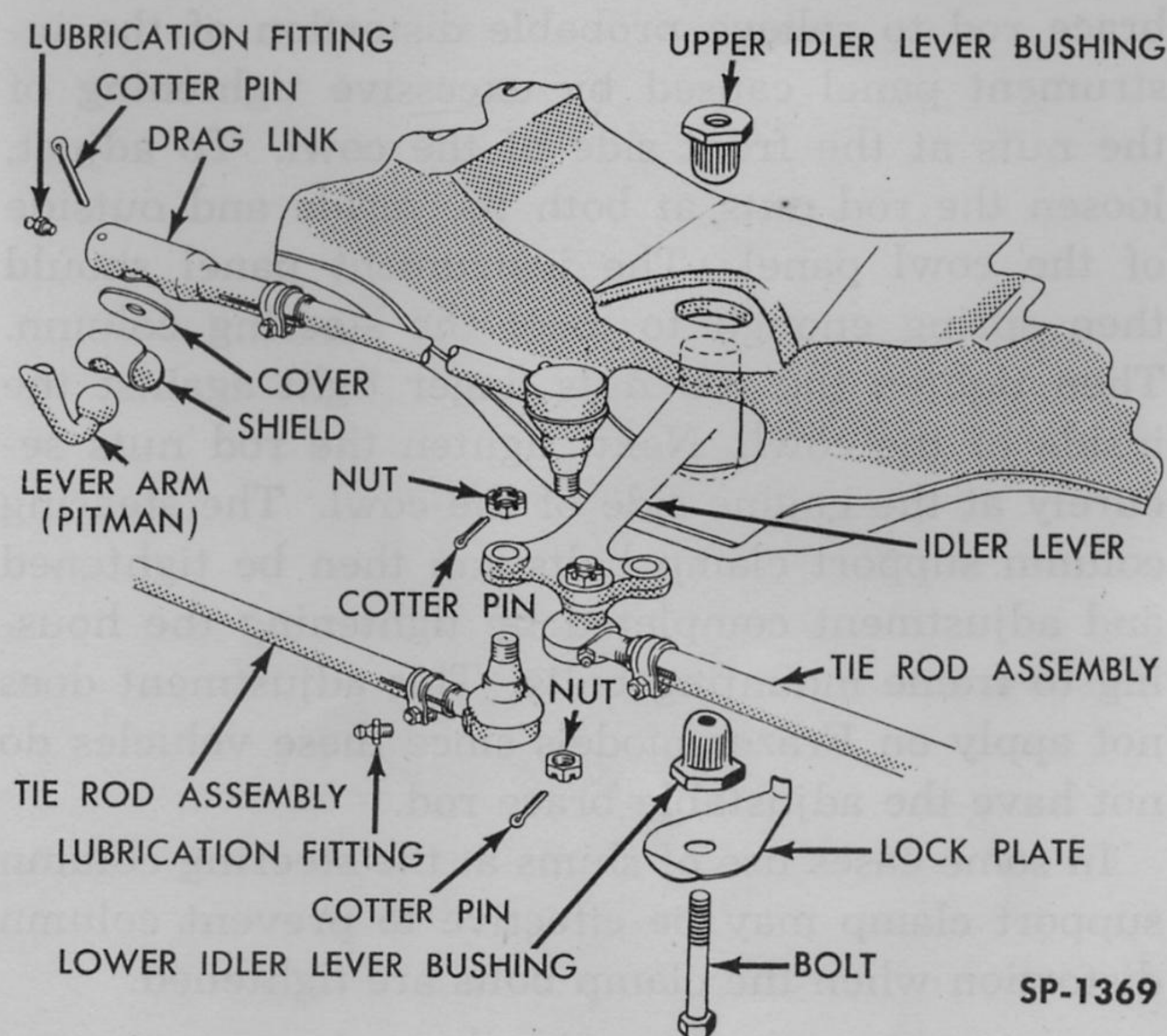


Fig. 281—Steering Linkage Components at Idler Lever—Exploded View—Frazer

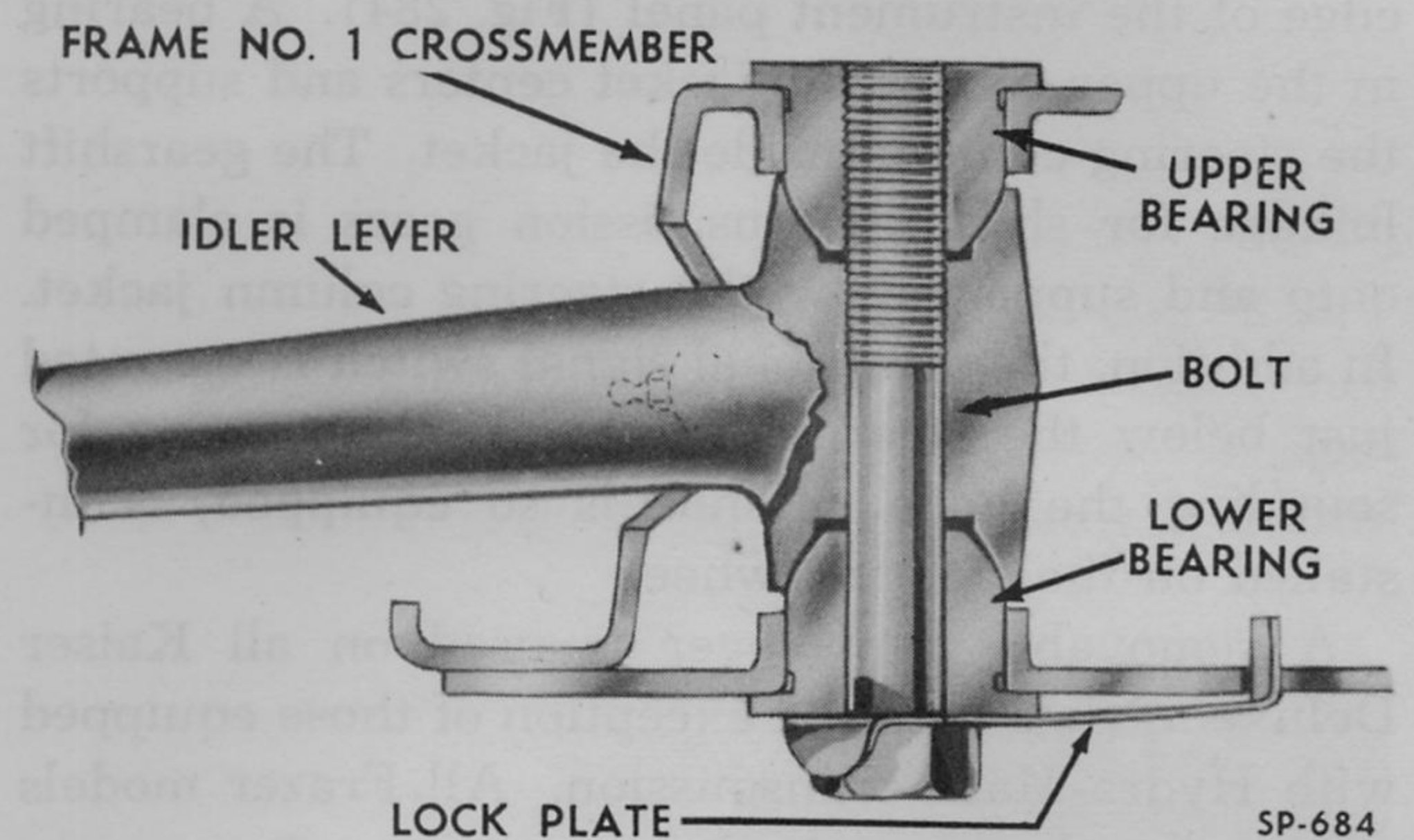


Fig. 282—Sectional View of Steering Idler Lever

c. STEERING WHEEL AND COLUMN. The steering column, extending upward from the steering gear housing, has the steering wheel mounted on the top end. The column from the housing to the wheel, is enclosed in a tubular steel jacket which is pressed into or clamped onto the steering gear housing at the lower end and is supported at the lower

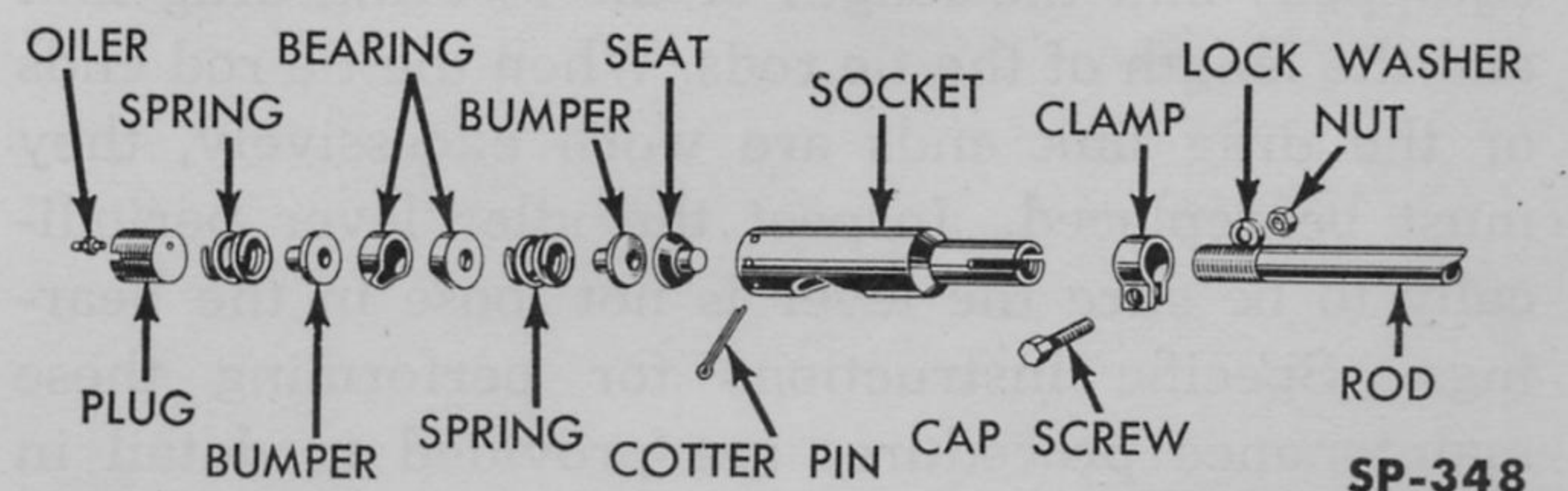
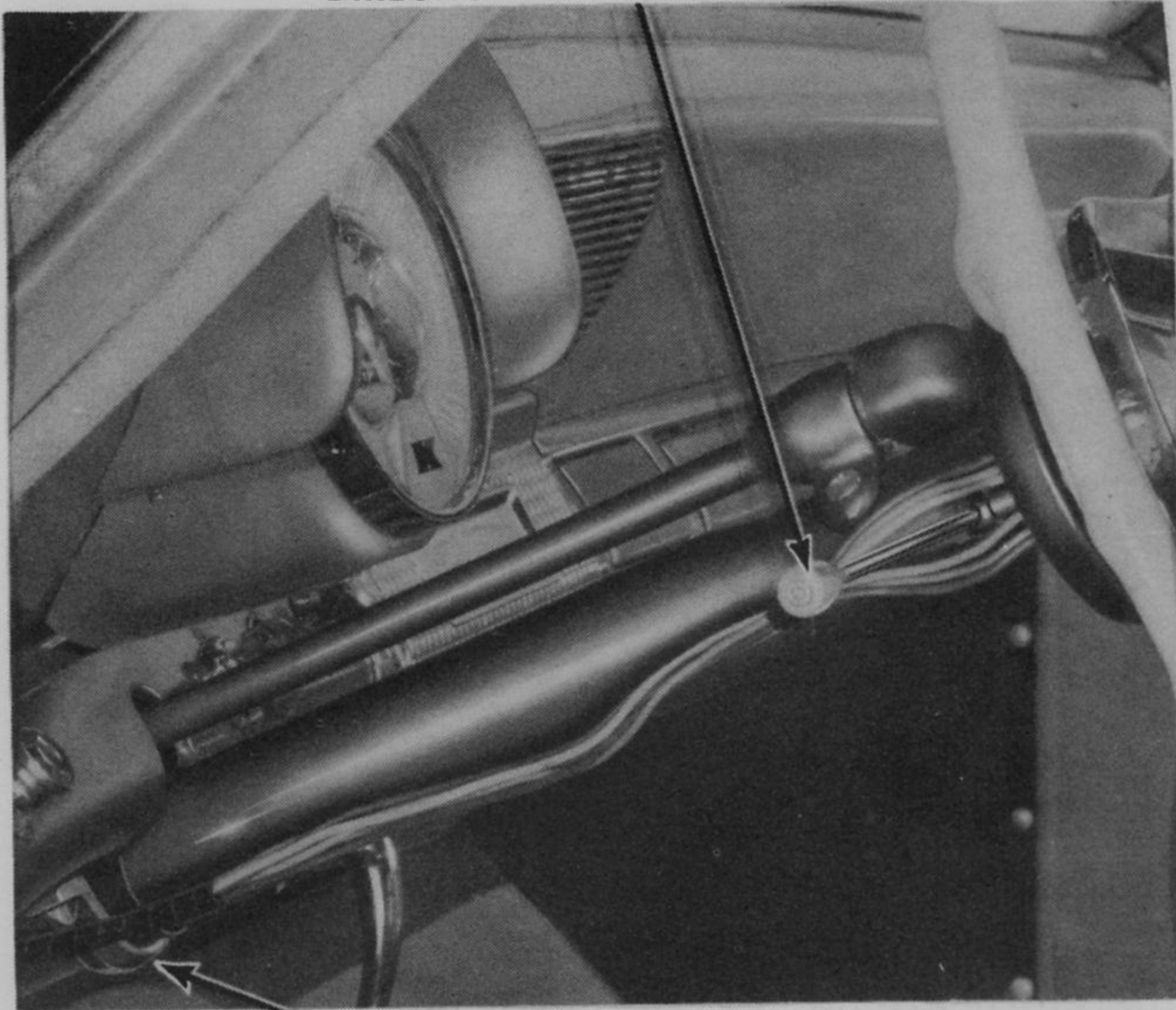


Fig. 283—Steering Drag Link Adjustable Socket End—Exploded View

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DIRECTIONAL TURN SIGNAL LEVER



STEERING COLUMN SUPPORT BRACKET

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Fig. 284—Kaiser Steering Column Mounting

edge of the instrument panel (Fig. 284). A bearing in the upper end of the jacket centers and supports the steering column inside the jacket. The gearshift linkage for shifting transmission gears is clamped onto and supported by the steering column jacket. In addition, the directional signal switch is mounted just below the steering wheel. The horn ring for sounding the horn on models so equipped, is installed on the steering wheel.

A removable trim cover is used on all Kaiser Deluxe models with the exception of those equipped with Hydra-Matic transmission. All Frazer models are equipped with a similar type trim cover.

MAINTENANCE AND ADJUSTMENT

a. MAINTENANCE. At regular intervals check and tighten, if necessary, the following: Mounting bolts for the steering gear and the column support; pitman lever arm nut; and, bolts for the steering gear housing covers. Check periodically and when necessary adjust the socket fit (on models so equipped) and the length of the steering drag link and the length of the tie rods. When the tie rod ends or the drag link ends are worn excessively, they must be replaced. Inspect the idler lever periodically to be sure the lever is not loose in the bearings. Specific instructions for performing these maintenance procedures are provided in detail in this Section. Lubrication of the steering gear and linkage as instructed in Section 17, "Lubrication,"

is also an important part of steering maintenance.

b. CHECKING STEERING COLUMN ALIGNMENT.

Before adjustment of the steering gear is attempted, the steering gear mounting must be checked to be sure there is no binding in the steering column due to misalignment. Body to frame and bracket bolts must be tight and insulators must be in good condition to properly locate the body on the frame before checking the steering column alignment.

The following procedure is recommended for checking and correcting steering column alignment:

1. Loosen the bolts at the steering column support clamp located at the instrument panel. If the column springs downward away from, or upward toward, the upper clamp, loosen the steering gear housing to frame mounting bolts. If the steering column can then be moved into position against the upper clamp without springing either up or down, correct alignment has been achieved through the limited adjustment allowed by the slotted steering gear mounting holes in the frame. The steering column support clamp bolts should then be tightened, followed by tightening the steering gear housing to frame mounting bolts to 25-30 foot pounds torque.

2. On Kaiser models, if correct alignment cannot be attained because the column will fit against the instrument panel only by springing (after the steering gear housing to frame mounting bolts are loosened), the brace rod between the instrument panel and the cowl must be adjusted. Lengthen the brace rod to relieve probable distortion of the instrument panel caused by excessive tightening of the nuts at the front side of the cowl. To adjust, loosen the rod nuts at both the inside and outside of the cowl panel. The instrument panel should then spring enough to meet the steering column. Then tighten the rod nuts finger tight against the inside of the cowl. Next, tighten the rod nuts securely at the engine side of the cowl. The steering column support clamp bolts can then be tightened and adjustment completed by tightening the housing to frame mounting bolts. This adjustment does not apply on Frazer models since these vehicles do not have the adjustable brace rod.

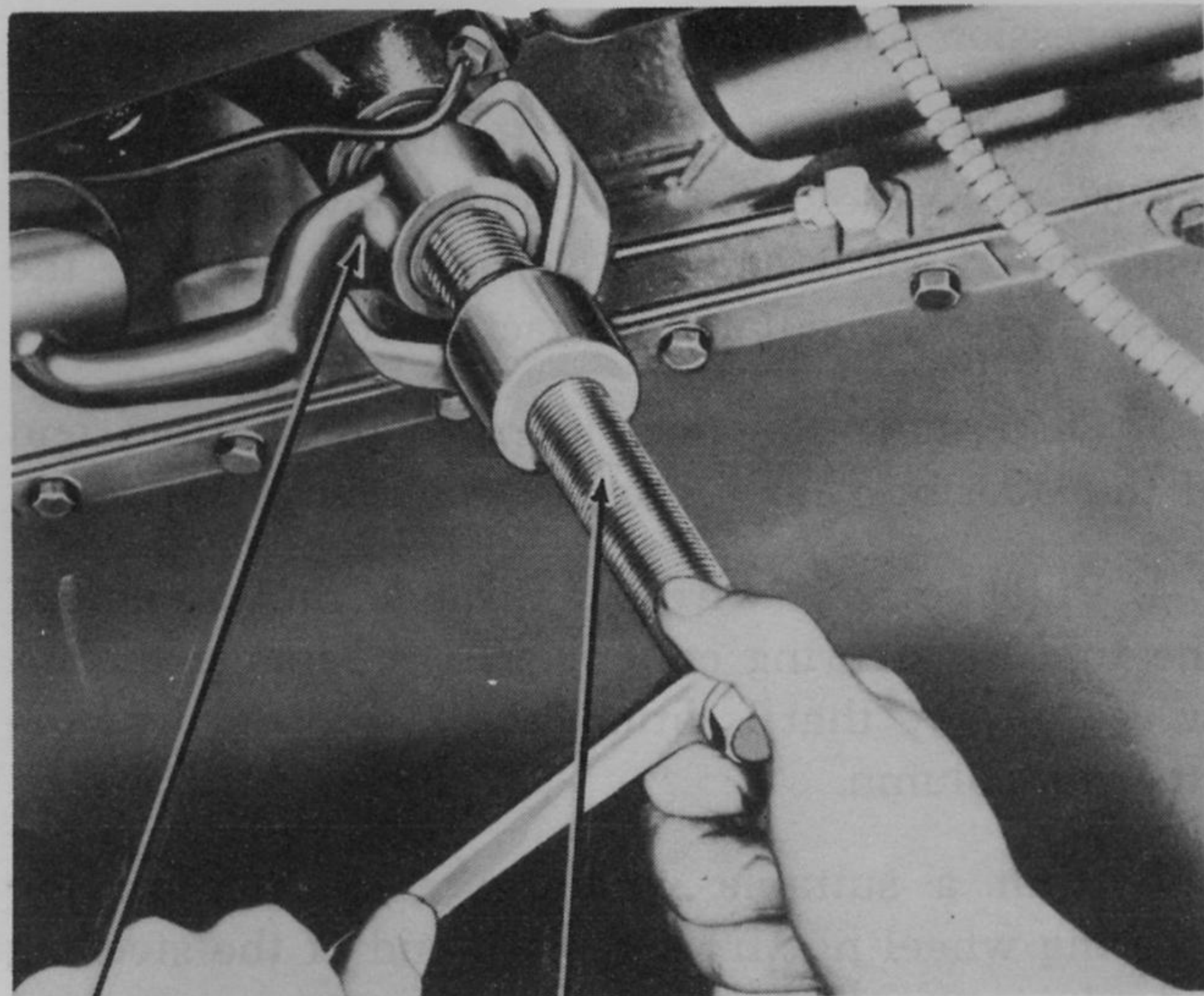
In some cases use of shims at the steering column support clamp may be effective to prevent column distortion when the clamp bolts are tightened.

3. The above conditions will correct up-and-down misalignment but have no effect on sidewise mis-

alignment. If upon loosening the steering column support clamp, the column springs to either the right or the left, shims can be installed between the steering gear housing and frame side rail as required to eliminate the misalignment. Shims installed at the rear mounting bolt will move the upper end of the steering column to the right and shims installed at the two front mounting bolts will move the column to the left. Be sure to tighten the column support clamp bolts before tightening the housing to frame mounting bolts.

c. STEERING GEAR WORM BEARING ADJUSTMENT. The following procedure is for adjustment with the steering gear installed in the vehicle:

1. On Frazer models remove the splash pan from beneath the pitman lever arm. Remove the lever arm nut and lock washer. Using Steering Arm Puller KF-2, remove the lever arm from the steering gear shaft to disconnect the drag link (Fig. 285). On Kaiser models there is no splash pan to remove but the pitman lever arm removal is the same.



LEVER ARM (PITMAN) Puller—KF-2

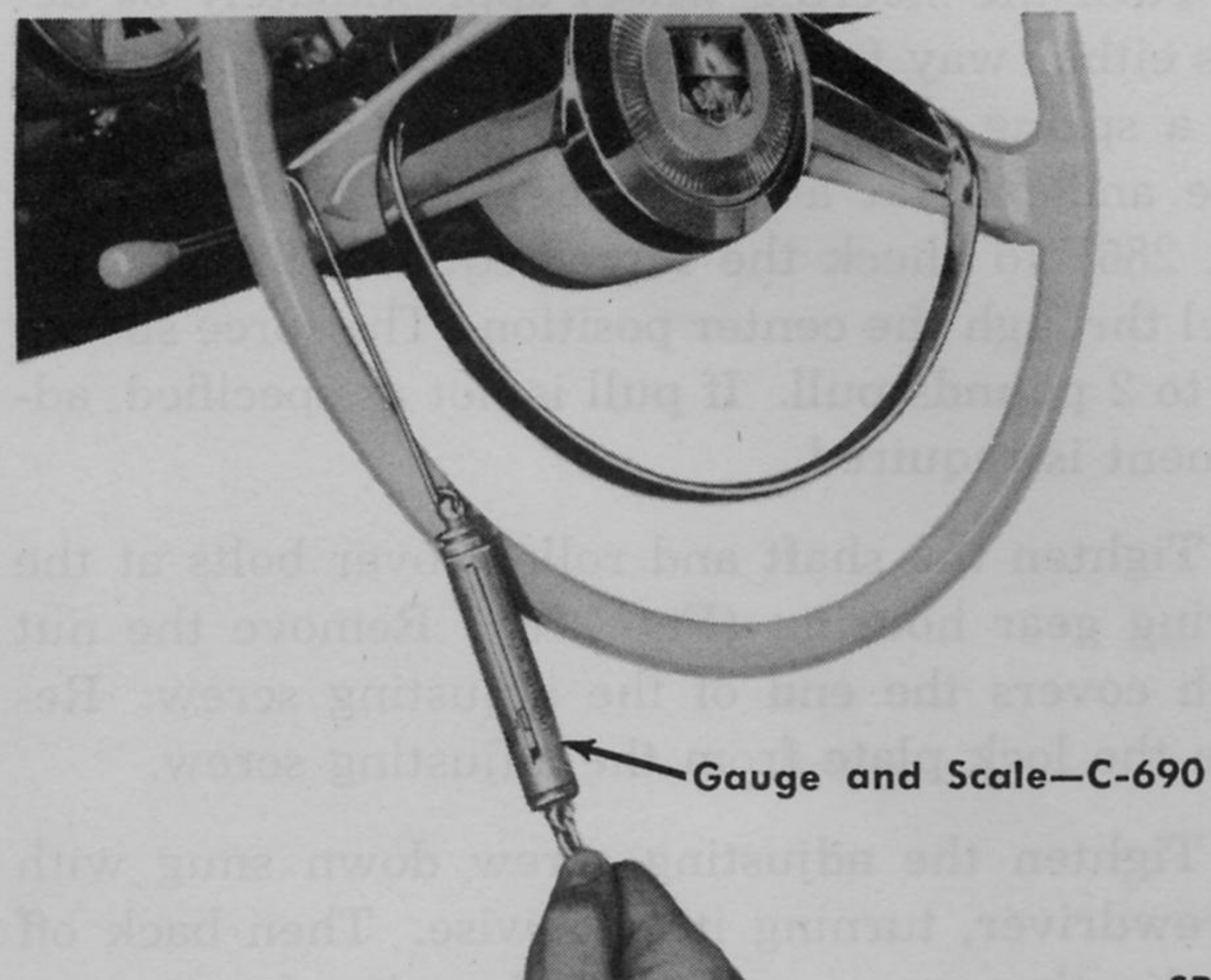
SP-323

Fig. 285—Removing Pitman Lever Arm—Frazer

2. Turn the steering wheel all the way to the right or left. Turn the wheel back about $\frac{1}{8}$ of a turn. At this position there is full backlash between the worm and the roller teeth to permit free turning of the worm.

3. Attach a spring scale to the outer end of the steering wheel spoke and, pulling at a 90 degree angle to the spoke (Fig. 286), check the force required to turn the wheel. If the worm bearings are

properly adjusted the pull should be $\frac{1}{4}$ to $\frac{3}{4}$ of a pound. If roughness is noted while turning the wheel, worm bearings are probably damaged and should be replaced.



SP-1255

Fig. 286—Checking Steering Gear Adjustment With a Spring Scale

4. If the pull is not as specified, worm bearings need adjustment. Remove the four bolts and the end cover, draining the lubricant from the housing, and add or remove shims (Fig. 278) from between the cover and housing as necessary to adjust. Add shims to decrease the pull and remove shims to increase the pull. Shims are available in .002, .005 and .010 of an inch thicknesses.

5. With the end cover installed and cover bolts tightened, again check, with a spring scale, the force required to turn the wheel.

d. STEERING GEAR SHAFT AND ROLLER ADJUSTMENT. This adjustment is for proper mesh of the roller to the worm to eliminate lost motion or play with the steering gear at the mid-point of movement. Never check or make this adjustment until after steering column alignment and worm bearing adjustment has been checked and corrected. In the steering gear housing, the position of the roller contact with the worm is offset from the centerline of the worm; therefore, when the adjusting screw is tightened the roller is moved into closer contact with the worm. Proceed as follows:

1. With the pitman lever arm still removed, disconnecting the drag link, turn the steering wheel all the way from right to left extreme positions counting the number of turns. Turn the wheel back

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exactly half way and mark the position with a piece of tape or note the position of the wheel spokes which should be horizontal.

2. Turn the steering wheel approximately 30 degrees either way from the center position. Then attach a spring scale to the outer end of the wheel spoke and pull at a 90 degree angle to the spoke (Fig. 286) to check the force required to turn the wheel through the center position. The force should be 1 to 2 pounds pull. If pull is not as specified, adjustment is required.

3. Tighten the shaft and roller cover bolts at the steering gear housing (Fig. 278). Remove the nut which covers the end of the adjusting screw. Remove the lock plate from the adjusting screw.

4. Tighten the adjusting screw down snug with a screwdriver, turning it clockwise. Then back off the adjusting screw not more than $\frac{1}{8}$ of a turn as necessary to install the lockplate (Fig. 287). Install the lock plate and the nut on the adjusting screw.

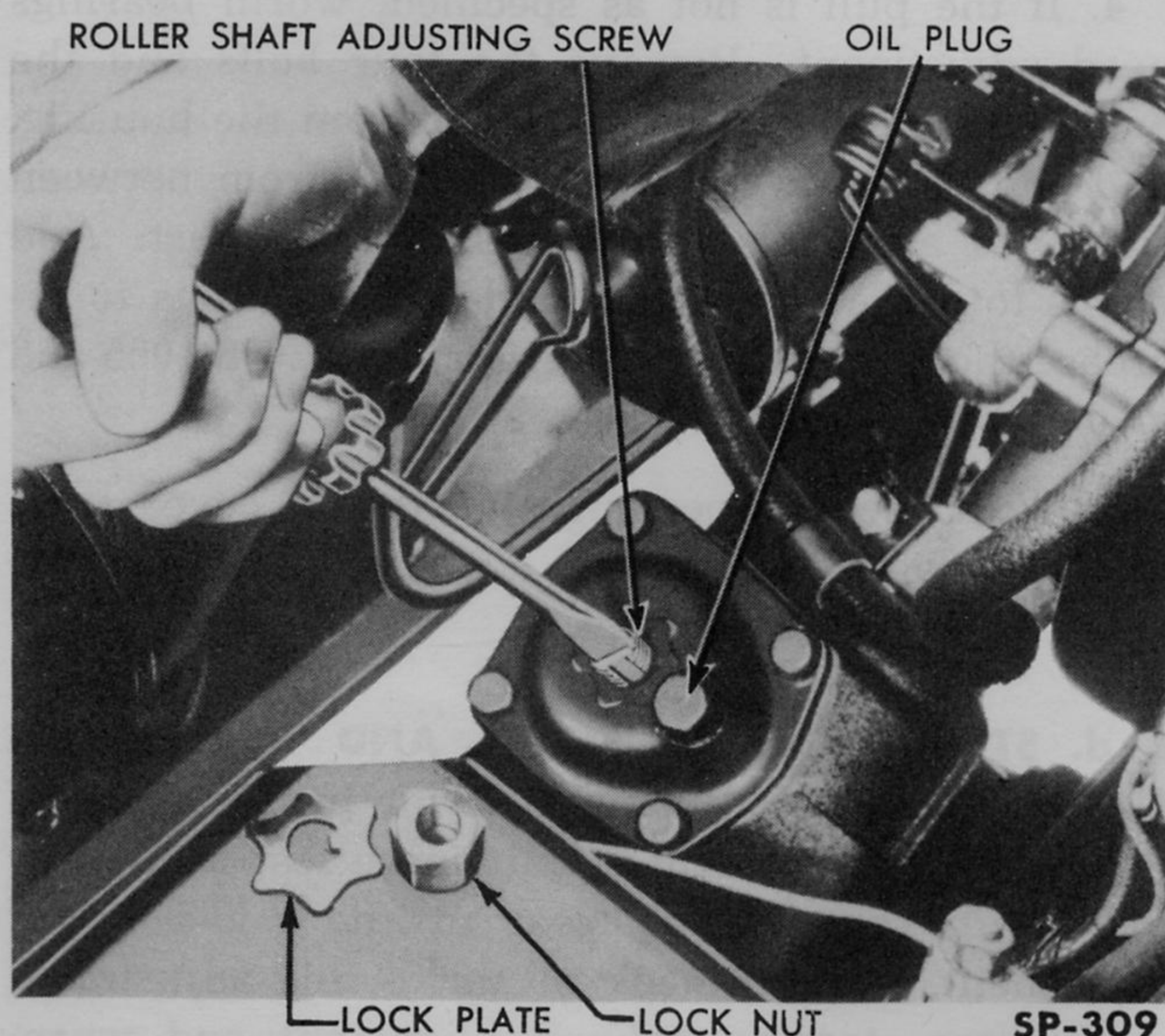


Fig. 287—Adjusting Steering Gear Shaft and Roller

5. After adjustment has been made, again check with a spring scale and readjust if necessary. If adjustment is too tight, loosen the adjusting screw two or three turns and turn the steering wheel sufficiently to be sure that the roller is loosened in the worm before readjusting.

6. Be sure that the steering gear housing is properly filled with lubricant and then install the pit-

man lever arm on the lower end of the roller shaft. Front wheels must be in a straight ahead position and the steering wheel turned to the center point. The flats in the serrations of the arm and the shaft will then align properly. Install the lock washer and the arm nut, tightening to a minimum of 110 foot pounds torque. Install the splash pan on Frazer models.

STEERING WHEEL REMOVAL AND INSTALLATION

a. STEERING WHEEL REMOVAL — KAISER (Fig. 288). Access to the nut that fastens the steering wheel to the steering column on the Kaiser models requires partial disassembly of the horn operating mechanism. Steering wheel removal is as follows:

1. Press down firmly with the palm of the hand, or Horn Button Remover and Installer KF-101, on the medallion in the center of the steering wheel and turn counter-clockwise to loosen the medallion. Remove the medallion and the medallion rubber compression pad from the wheel.

2. With Horn Switch Ring Remover and Installer KF-68, press down on the horn blowing terminal plate and turn it counter-clockwise to remove the plate from the insulated contact assembly.

3. Disconnect the horn wire at the bottom end of the steering gear inside the engine compartment.

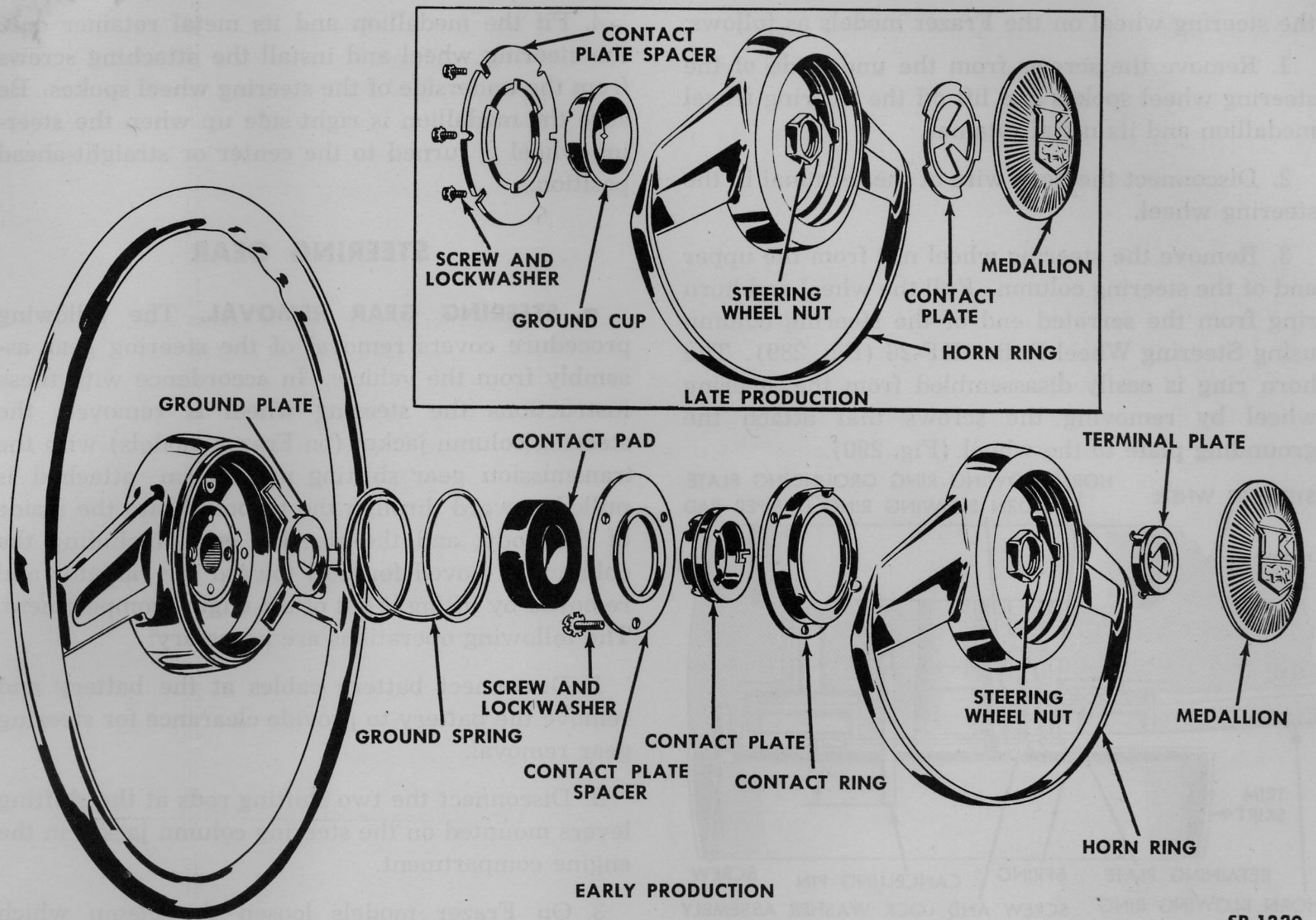
4. Pull the horn wire out through the top end of the tubular steering column. Then remove the insulator sleeve that is fitted into the top end of the steering column.

5. With a suitable socket wrench, remove the steering wheel nut from the top end of the steering column.

6. Remove the horn button bezel, or horn ring, if used, by lifting it off the steering wheel. Remove the rubber contact pad (and ground spring and plate used on some vehicles) from inside the hub of the steering wheel.

7. Pull the steering wheel from the top end of the steering column using Steering Wheel Puller KF-26 (Fig. 289).

8. The horn blowing mechanism parts assembled to the horn button bezel, or horn ring, are easily



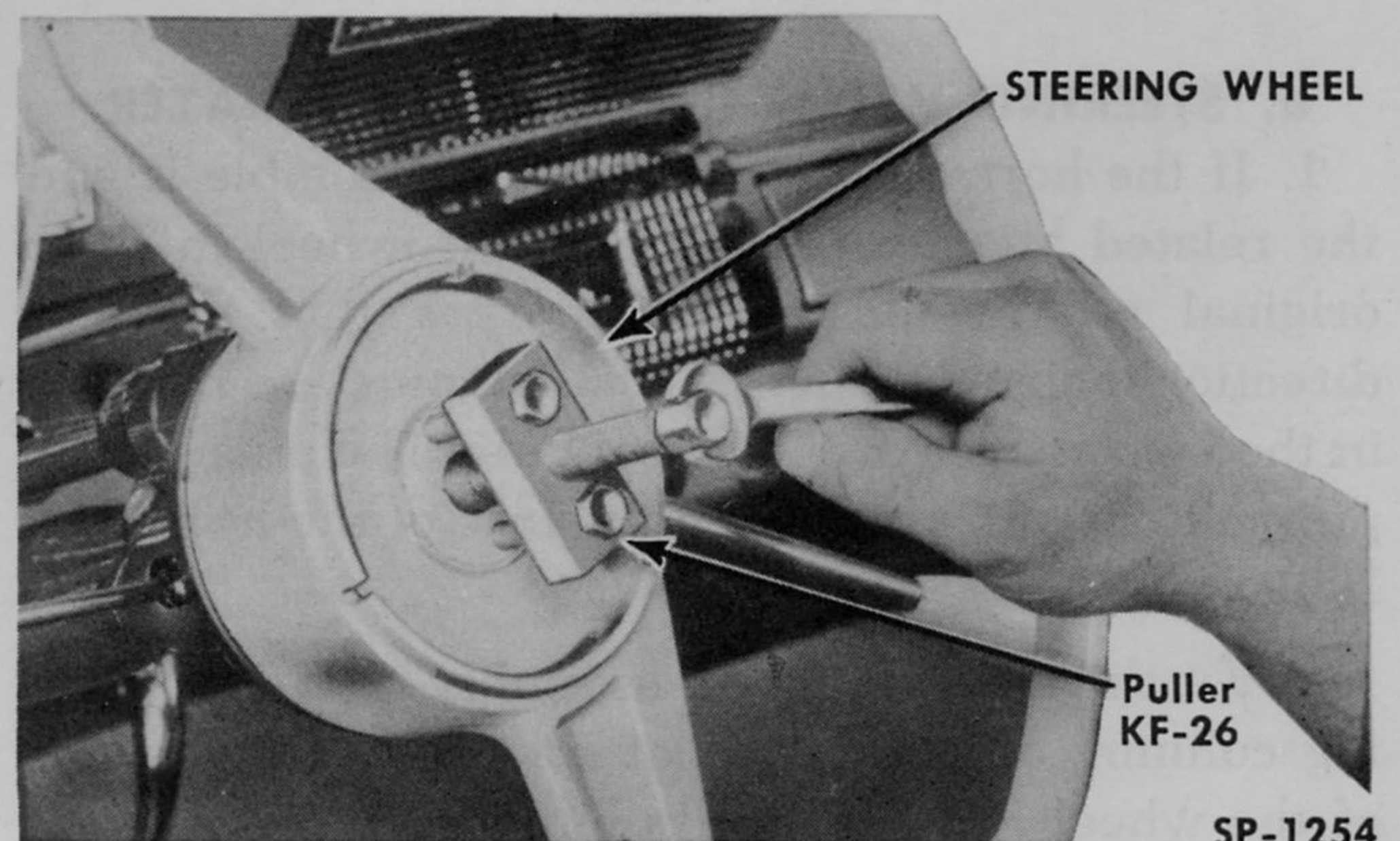
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Fig. 288—Steering Wheel Components—Exploded View—Kaiser

removed by removing the screws that attach the contact plate spacer.

NOTE: Be careful when disassembling the horn blowing mechanism parts and removing the steering wheel to note the relationship of parts so they can be put back in the same relative positions.

b. STEERING WHEEL INSTALLATION—KAISER (Fig. 288). Install the steering wheel and horn blowing parts in the reverse order of removal. Be sure the flat spot in the serrations of the steering wheel hub and the steering column match when putting the wheel onto the column. Push the wheel onto the column as far as possible before installing the nut. With the horn blowing parts—insulator sleeve, horn wire and terminal, ground plate and spring (used in some vehicles), contact pad, and bezel or horn ring assembly—in place tighten the steering wheel nut to 10–15 foot pounds torque. Install the horn blowing terminal plate using Horn



SP-1254

Fig. 289—Pulling Steering Wheel—Kaiser

Switch Ring Remover and Installer KF-68. Finally, install the compression pad and medallion, using Horn Button Remover and Installer KF-101, and connect the horn wire at the lower end of the steering gear.

c. STEERING WHEEL REMOVAL—FRAZER. Remove

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the steering wheel on the Frazer models as follows:

1. Remove the screws from the underside of the steering wheel spokes and lift off the steering wheel medallion and its metal retainer.

2. Disconnect the horn wire at the terminal in the steering wheel.

3. Remove the steering wheel nut from the upper end of the steering column. Pull the wheel and horn ring from the serrated end of the steering column using Steering Wheel Puller KF-26 (Fig. 289). The horn ring is easily disassembled from the steering wheel by removing the screws that attach the grounding plate to the wheel (Fig. 290).

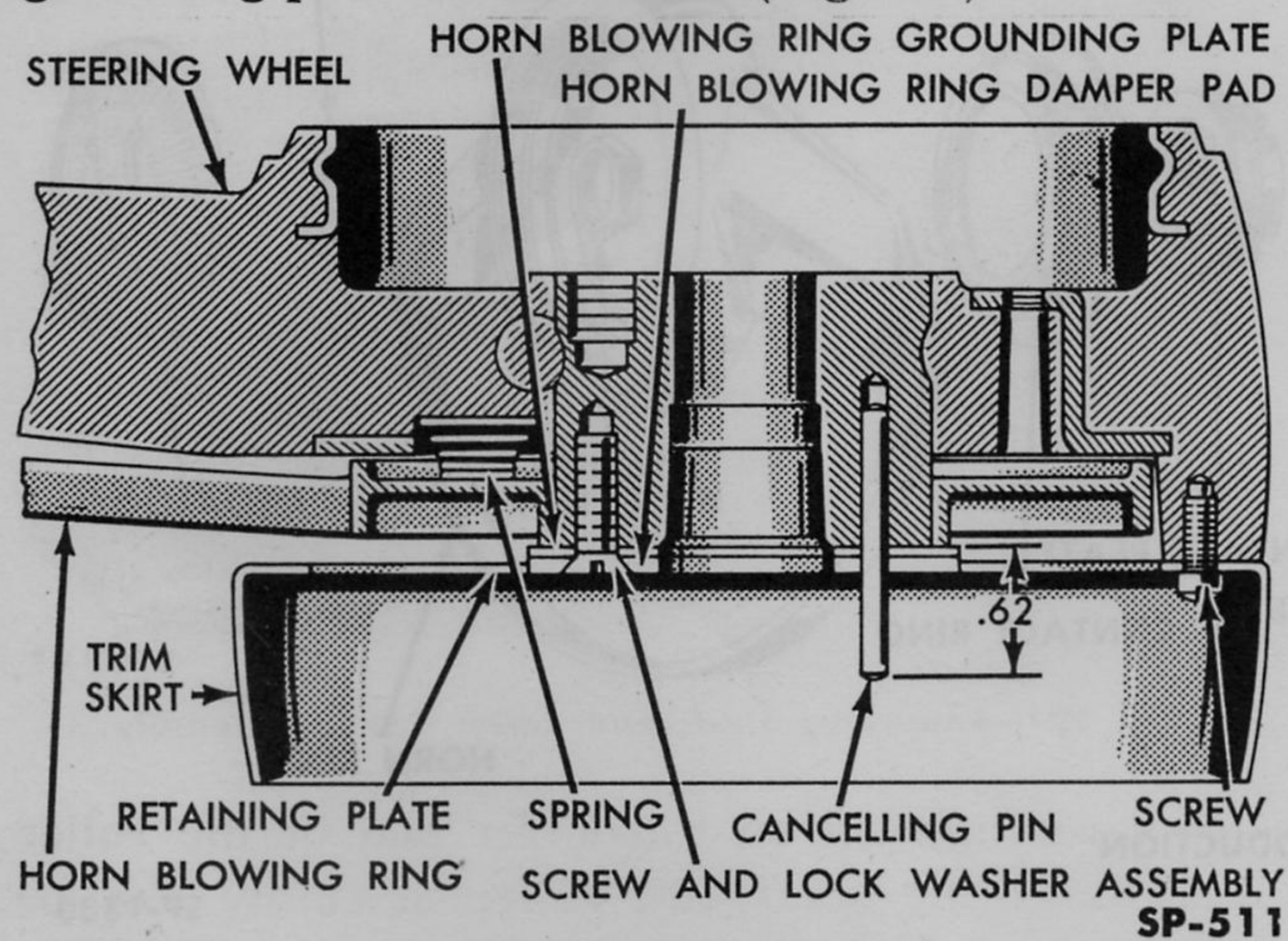


Fig. 290—Steering Wheel and Horn Ring Assy.—Sectional View—Frazer

d. STEERING WHEEL INSTALLATION—FRAZER.

1. If the horn ring was removed, assemble it and the related attaching parts onto the wheel in their original relative positions. Be sure that the two directional signal switch cancelling pins are in place in the bottom face of the wheel hub. The pins should protrude $\frac{5}{8}$ of an inch from the face of the hub (Fig. 290).

2. Fit the steering wheel assembly onto the steering column, aligning the flat spot in the serrations of the wheel hub and the column. With the wheel pushed onto the column as far as possible (wheel hub bottomed against the shoulder on the steering column), install the steering wheel nut and tighten to 10–15 foot pounds torque.

3. Connect the horn wire at the terminal in the steering wheel. Press the horn ring to be sure that the horn operates (ignition switch must be turned on).

4. Fit the medallion and its metal retainer onto the steering wheel and install the attaching screws from the underside of the steering wheel spokes. Be sure the medallion is right side up when the steering wheel is turned to the center or straight-ahead position.

STEERING GEAR

a. **STEERING GEAR REMOVAL.** The following procedure covers removal of the steering gear assembly from the vehicle. In accordance with these instructions the steering wheel is removed, the steering column jacket (on Frazer models) with the transmission gear shifting mechanism attached is pulled upward through the toeboard into the inside of the body, and the steering gear, including the column, is moved forward toward the radiator and removed by lifting it out of the engine compartment. The following operations are necessary:

1. Disconnect battery cables at the battery and remove the battery to provide clearance for steering gear removal.

2. Disconnect the two shifting rods at the shifting levers mounted on the steering column jacket in the engine compartment.

3. On Frazer models loosen the clamp which clamps the split lower end of the steering column jacket onto the steering gear housing.

On Kaiser models the steering column jacket is pressed into the steering gear housing so this operation does not apply.

4. Remove the steering wheel. Refer to STEERING WHEEL REMOVAL for applicable detailed procedure.

5. Remove the steering column jacket cover on those vehicles in which cover removal is necessary for access to the column support at the instrument panel. The cover is removable in two sections after attaching screws are removed.

6. Disconnect the horn wire at the connector, and the directional signal switch wiring at the instrument panel junction block.

7. Remove the front floor mat and the floor plate and gasket which fit around the pedals and steering column at the toeboard.

8. Remove the steering column support bracket

clamp and attaching bolts which support the column at the instrument panel.

9. Remove the spring and bearing spacer from around the steering column in the upper end of the steering column jacket. Leave the bearing in the steering column jacket.

10. On Frazer models work the lower end of the steering column jacket loose from the steering gear housing. Then pulling upward inside the body, slip the jacket, with the gear shifting mechanism still attached to it, from the upper end of the steering column. The shifting levers must be carefully manipulated through the opening in the toeboard as the jacket is pulled upward.

On Kaiser models, since the column jacket is pressed into the steering gear housing, the shifting mechanism must be detached from the steering column jacket and removed separately. The column jacket can be removed from the housing, when necessary, only after the steering gear is removed from the vehicle.

11. Remove the splash pan from beneath the pitman lever arm (Frazer only). Remove the lever arm nut and lock washer. Using Steering Arm Puller KF-2, remove the lever arm from the steering gear shaft (Fig. 285).

12. Remove the steering gear to frame mounting bolts and shims, if used between the housing flange and the frame. At this point remove the filler plug and turn the steering gear over allowing the lubricant to drain out. Then, while supporting the steering gear assembly, move it forward in the engine compartment and raise the housing end to clear adjacent units and the radiator shroud, at the same time pulling the steering column out through the opening in the toe-board. When the assembly is worked clear of all interference lift it out of the engine compartment and move it to a bench for disassembly.

b. STEERING GEAR DISASSEMBLY. Clean the outside surface of the steering gear assembly to remove road dirt and grease before starting to disassemble the unit. Then mount the assembly in a vise, clamping the housing so both the shaft and roller cover and the housing end cover are accessible. Parts are identified in Fig. 278 and the disassembly procedure is as follows:

1. Remove the shaft and roller adjusting screw lock nut and the lock plate. Remove the bolts which

attach the shaft and roller cover plate to the housing. Turn the adjusting screw clockwise to raise the cover away from the housing to allow the adjuster screw to slide out of the slotted end of the shaft and roller assembly. Remove the cover assembly (including the adjusting screw and the thrust washer) and the cover gasket (Fig. 291). Disassemble the adjusting screw and thrust washer from the cover.

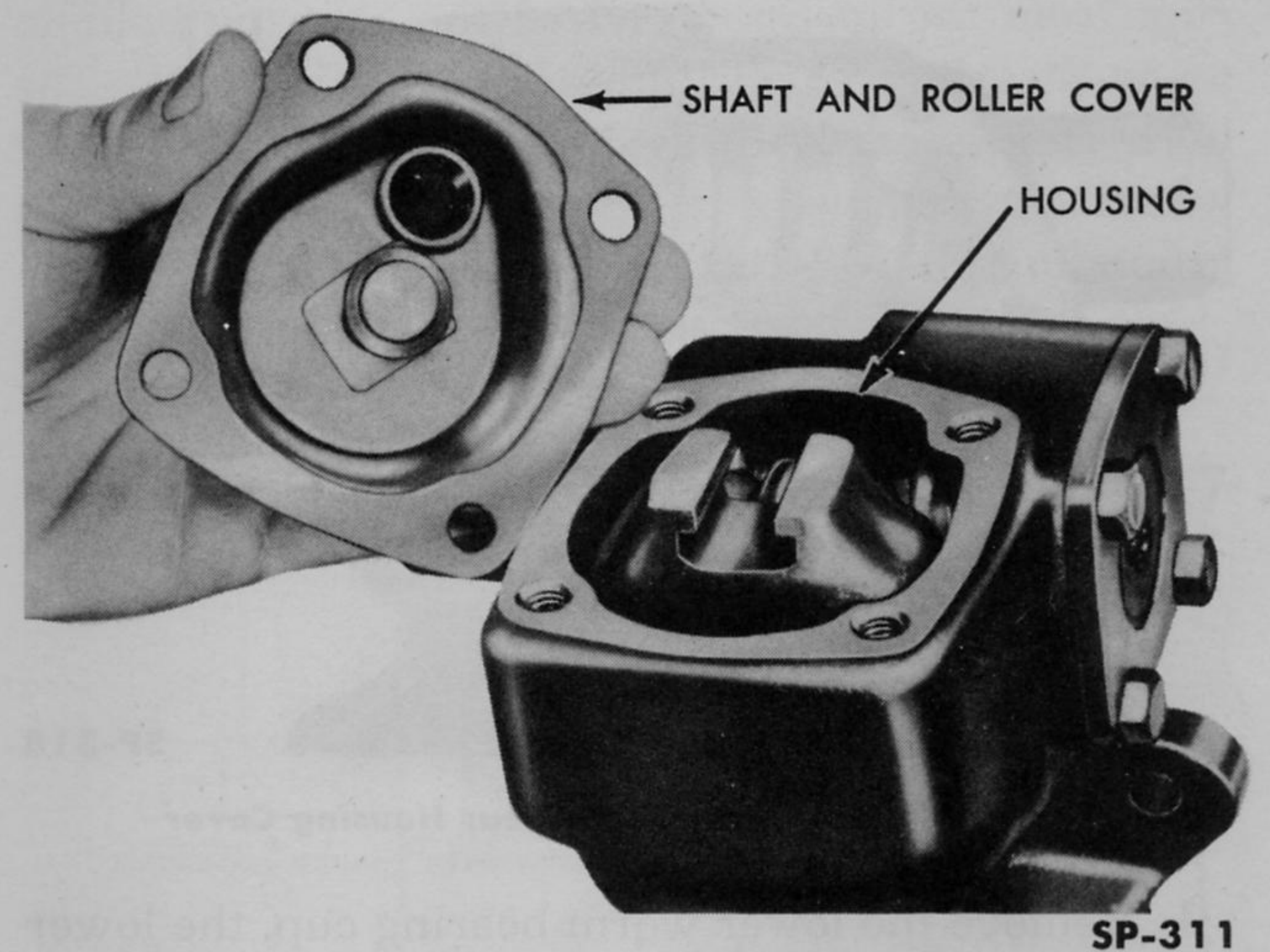


Fig. 291—Removing Shaft and Roller Cover Assembly

2. Push upward on the lower end of the roller shaft until the shaft and roller assembly can be lifted out of the housing as shown in Fig. 292. Do



Fig. 292—Removing Shaft and Roller Assembly

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not attempt to disassemble the roller from the shaft as these parts are replaceable only as an assembly.

3. Remove the cover attaching bolts, the housing cover, and the shims used to establish worm bearing adjustment (Fig. 293). Check the total thickness of the shims with a micrometer so it will be possible to use the same thickness when assembling the steering gear.

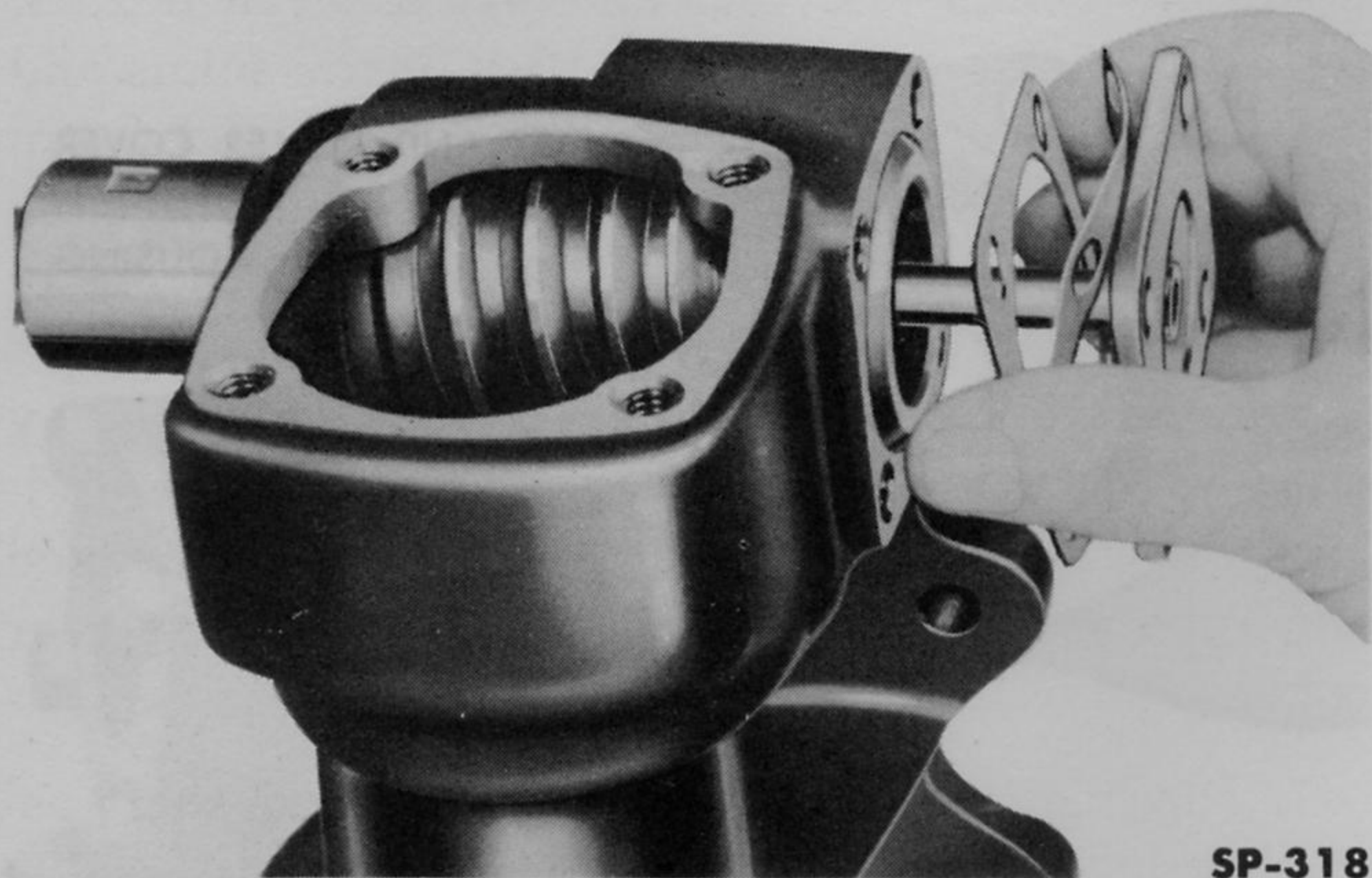


Fig. 293—Removing Steering Gear Housing Cover

4. Remove the lower worm bearing cup, the lower bearing, the worm and steering column assembly, and the upper bearing (Fig. 294). The lower bearing cup can be loosened, if necessary, by tapping lightly on the end of the steering column with a soft hammer.

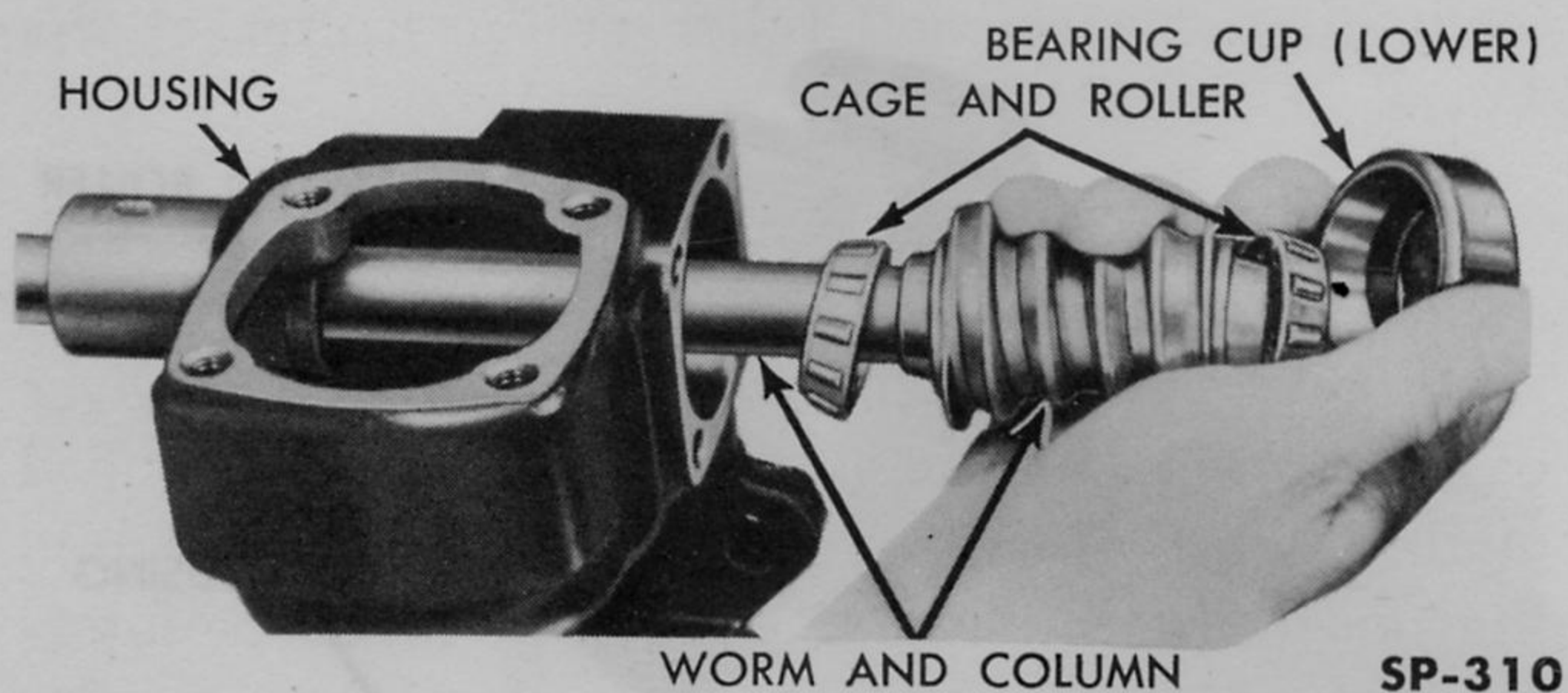


Fig. 294—Removing Steering Column and Worm

5. Remove the upper worm bearing cup from the housing by carefully driving it out using a brass drift.

6. Remove the roller shaft oil seal from the housing if it is worn and needs replacement or if the roller shaft bushings are to be replaced.

c. CLEANING, INSPECTION AND REPAIR.

1. Clean all lubricant from steering gear parts and

inside of housing using a suitable cleaning solvent. A stiff brush may be used to advantage to clean the bearings and the teeth of the worm and the roller.

2. Inspect the worm and the roller teeth for wear, pitting, chipping or scoring. Check the bearing surfaces which are an integral part of the worm—they must not be worn, pitted, chipped or otherwise damaged. Examine the bearing cups for the same conditions. Check the worm bearings carefully for damaged rollers. Replace parts as necessary if any of these conditions are discovered. The worm and steering column must be replaced as a unit.

3. Check the fit of the roller shaft in the housing bushings. The shaft should not be loose but it must not bind in the bushings. If the shaft does not fit properly, examine it for wear or roughness at the surfaces which fit in the bushings and replace as necessary.

If the bushings are worn and require replacement, press the old bushings out of the housing and install new bushings, pressing them into place in the same positions as the original bushings. Line ream the bushings after installation to 1.12475–1.12575 inches diameter. Check the fit of the roller shaft in the bushings again to be sure it is free. After installing new bushings, also install a new roller shaft oil seal, being careful to keep the correct side toward the outside of the housing and not to cock it in the housing.

4. Check the condition of the shaft and roller adjusting screw threads. With the adjusting screw and the thrust washer inserted in the slotted end of the roller shaft, check the clearance between the head of the screw and the bottom of the slot as shown in Fig. 295. Clearance must be not more than .002 of an inch. Replace thrust washer and/or the adjusting screw as required to obtain correct clearance.

5. The roller of the shaft and roller assembly is mounted on bearing rollers and must rotate freely. If rotation is rough, if the roller is loose or if there is end-play the roller and shaft assembly should be replaced as a unit. Be sure that there is no indication of twisting or other distortion in the roller shaft. Check the splines and threads to be sure that they are in good condition.

6. Check the steering column for bending or distortion. Column run-out at upper end should not exceed .250 of an inch total indicator reading.

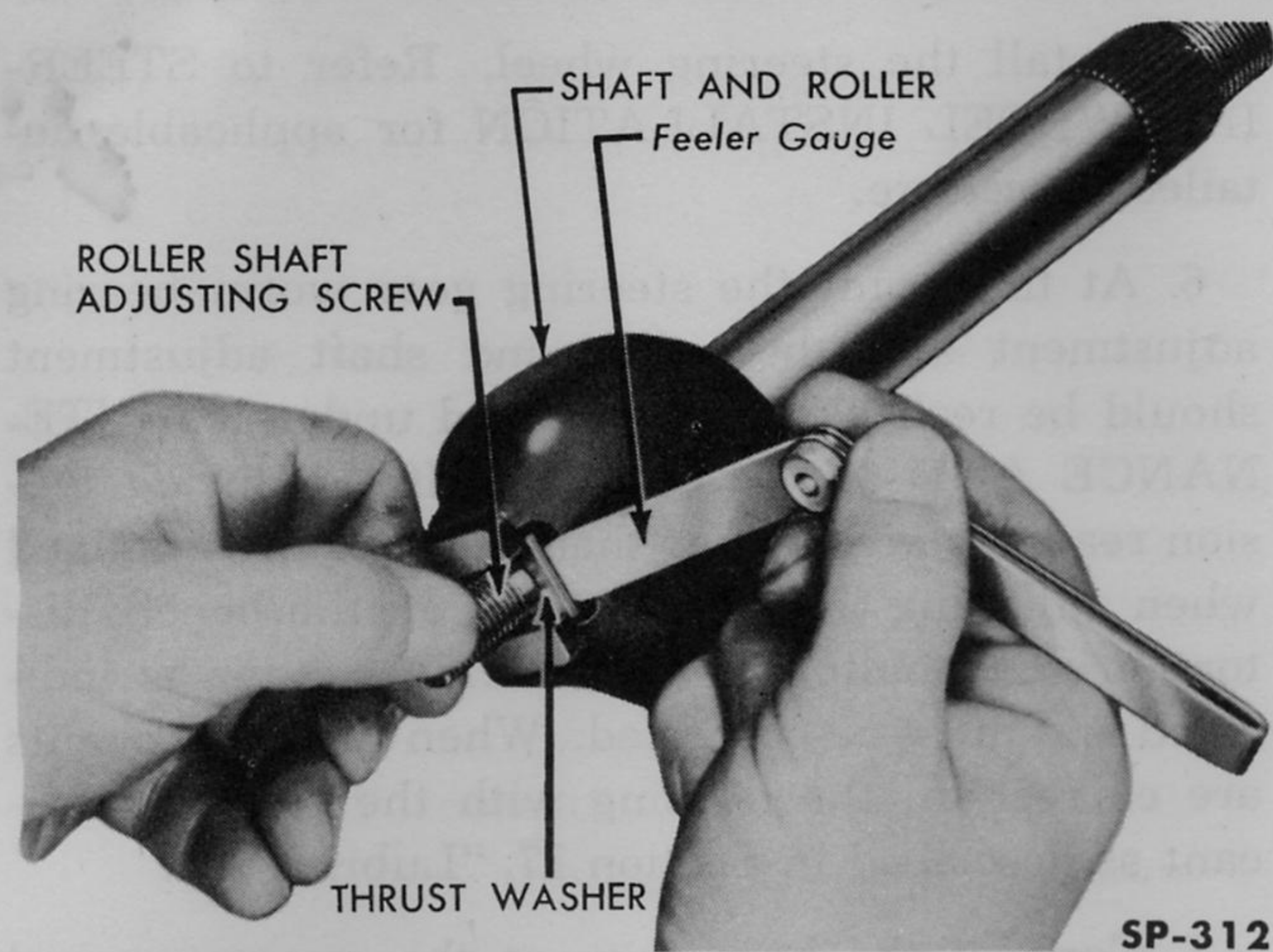


Fig. 295—Checking Roller Shaft Adjusting Screw Clearance

7. Check the condition of the bearing in the upper end of the steering column jacket. If it is rough, remove the bearing with a suitable pronged puller and replace with a new bearing, pressing it into place in the jacket. Pack the bearing with grease before installing it.

d. STEERING GEAR ASSEMBLY AND ADJUSTMENT (Fig. 278). The assembly operations which follow are, in general, the reverse of the disassembly procedure, but include additional information which is important. Clamp the housing in a vise the same as when disassembling the steering gear and proceed as follows:

1. Be sure the roller shaft bushings and oil seal are in place in the steering gear housing. If new bushings have been installed be sure that they have been properly reamed to fit the roller shaft.

2. Install the upper worm bearing cup, driving it carefully into the counterbore in the housing, wide face of the cup toward the bottom of the counterbore. Do not cock the cup in the counterbore and be sure that it is fully seated.

3. Apply steering gear lubricant (refer to Section 17, "Lubrication") on the worm bearings, on the bearing surfaces of the cups and the worm, and on the worm teeth or threads before installing the column and worm in the housing.

4. Fit the upper worm bearing into place over the end of the steering column and onto the bearing surface at the end of the worm. Install the column and worm in the housing so that the worm bearing

fits into the bearing cup in the housing. Refer to Fig. 278, for relative position of parts.

5. Fit the lower worm bearing onto the bearing surface on the lower end of the worm. Install the lower bearing cup in the housing, the tapered part of the cup bore toward the worm bearing.

6. Select shims totaling the same thickness as previously removed, or use the old shims if in good condition. Shims .002, .005 and .010 of an inch thick are available as service parts. Install the shims and the housing cover to complete the column and worm installation. The cover is attached to the housing with four bolts which should be tightened carefully to 10–15 foot pounds torque.

The steering column should rotate smoothly by hand without binding but there should be no end-play. Worm bearing adjustment should be checked and readjusted if necessary after the steering gear is completely assembled.

7. Dip the roller end of the roller and shaft assembly in steering gear lubricant (refer to Section 17, "Lubrication") to lubricate the needle bearings in the roller—also swab the roller shaft with steering gear lubricant to provide initial lubrication for the bushings in the housing.

Then install the assembly in the steering gear housing. Be careful not to damage the oil seal when passing the serrated end of the shaft through the seal. Turn the steering column by hand to mesh the teeth of the worm and roller at the center of the worm.

8. Assemble the thrust washer on the roller shaft adjusting screw and turn the screw into the roller shaft cover. Install this assembly and the cover gasket on the steering gear housing, fitting the head of the adjusting screw and the thrust washer into the slot in the roller shaft. Turn the screw counterclockwise to seat the cover against the housing. Install the cover bolts and tighten securely.

9. Rotate the steering column as far as possible one way and then in the opposite direction counting the total number of turns. Then rotate the column back exactly halfway to the center of the steering gear travel. Tighten the roller shaft adjusting screw down snug, turning it clockwise. Then back off the adjusting screw not more than $\frac{1}{8}$ of a turn as necessary to install the lock plate. Install the lock plate and nut on the adjusting screw.

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10. Temporarily install the steering wheel on the steering column so that the spring scale can be used and check and adjust, as may be necessary, the worm bearing adjustment and the shaft and roller adjustment as described earlier in this Section under MAINTENANCE AND ADJUSTMENT. **NOTE. Do not fill the steering gear housing with lubricant until after the steering gear is installed in the vehicle.**

e. STEERING GEAR INSTALLATION. The following procedure is for installation of the steering gear, assuming the gear shifting mechanism and steering wheel are to be installed after the steering gear is in the vehicle.

1. Fit the steering gear assembly into place in the engine compartment directing the steering column up into the body through the hole in the toeboard. Install the bolts which attach the steering gear to the frame side rail, but do not tighten.

2. On Frazer models install the steering column jacket, with the transmission gear shifting mechanism assembled on it, over the steering column. Start by fitting the lower end of the jacket over the upper end of the column inside the body. Then slide the jacket down on the column, manipulating the shifting levers, mounted on the jacket, through the opening in the toeboard. Fit the lower end of the jacket onto the steering gear housing sleeve, bottoming it against the shoulder on the housing. **NOTE: The slot in the jacket must align with the ridge on the surface of the housing sleeve.** Place the clamp in position and tighten the clamp bolt to fasten the jacket on the housing.

On Kaiser models the column jacket is already installed, so only the gearshift mechanism has to be fitted into position and attached to the column jacket.

3. Install the steering column jacket bearing spacer and spring over the upper end of the steering column, fitting the spacer into place between the bearing and the steering column.

4. Install the steering column support bracket clamp at instrument panel and tighten the support bolts and steering gear mounting bolts in such a way that the steering column is not distorted and does not bind. Refer to CHECKING STEERING COLUMN ALIGNMENT under MAINTENANCE AND ADJUSTMENT in this Section.

5. Install the steering wheel. Refer to STEERING WHEEL INSTALLATION for applicable detailed procedure.

6. At this point the steering gear worm bearing adjustment and the roller and shaft adjustment should be rechecked as described under MAINTENANCE AND ADJUSTMENT. If the spring tension readings are greater than the readings obtained when adjusting the steering gear on the bench, distortion and binding of the steering column is indicated and must be corrected. When the adjustments are correct fill the housing with the proper lubricant as described in Section 17, "Lubrication."

7. Connect the horn wire at the connector, and the directional signal switch wiring at the instrument panel junction block.

8. Install the floor plate and gasket which fit around the pedals and steering column at the toeboard. Install the floor mat.

9. Install the steering column jacket cover on those vehicles where the cover was removed for access to the steering column support at the instrument panel.

10. With the front wheels in the straight ahead position and the steering wheel turned to the center of its travel, to align the flats in the serrations of the pitman lever arm and the end of the roller shaft, install the arm on the roller shaft. Install the lock washer and the arm nut, tightening to a minimum of 110 foot pounds torque. Install the splash pan on Frazer models.

11. Install the battery and connect the battery cables. Connect the transmission shifting rods to their respective shift levers on the steering column in the engine compartment. Finally, check and adjust the shifting mechanism linkage as detailed in Section 6, "Transmission and Overdrive."

STEERING LINKAGE

a. GENERAL. As described previously under DESCRIPTION, steering linkage consists of the pitman lever arm, the drag link, an idler lever assembled to the front crossmember, and two tie rods connecting the steering arm at each front wheel to the idler lever (Fig. 279 and 280).

It is important that these parts when installed meet certain conditions to provide satisfactory steer-

ing and proper front end alignment. With the wheels in a straight ahead position, the idler lever must be positioned to point straight toward the rear of the vehicle and not to one side or the other, so that the two tie rod ends attached to the arm straddle or are the same distance from the centerline of the vehicle. This simply means that the tie rods must be the same length, the length to be that required to provide proper toe-in.

Also with the wheels in the straight-ahead position the drag link length must be correct to position the steering gear in the center of its travel (one-half the number of turns from extreme left to extreme right with the pitman arm removed). Detailed information on the steering linkage components is covered in the following paragraphs.

b. PITMAN LEVER ARM. When replacing the pitman lever arm for any reason, be sure to install the proper arm for the steering gear being used, as different arms are available. Do not hammer or pry the pitman arm off the roller shaft—use puller KF-2 as shown in Fig. 285. When installing the pitman lever arm the flat spots in the serrations in the arm and on the shaft must be aligned. However, since there are four flats equally spaced, the arm will fit in more than one position on the shaft splines. Therefore, be sure that the steering gear is in the center of its travel and then install the arm so that its position is correct for connecting the drag link. Be sure to tighten the arm nut to a minimum of 110 foot pounds torque.

c. DRAG LINK. The drag link on Frazer models and late Kaiser vehicles has two adjustments, one for length and the other to compensate for wear of the pitman arm ball and the socket in the drag link. On early 1951 Kaiser vehicles the drag link has self-adjusting ball joints at both ends and, therefore, the BALL SOCKET ADJUSTMENT procedure which follows does not apply.

1. Ball Socket Adjustment. Whenever there is end-play of the pitman lever arm ball in the drag link socket, adjustment or replacement is necessary. To adjust the ball seats remove the cotter pin from the end of the socket (Fig. 283) and tighten the end plug enough to remove all end-play. Back off the plug $\frac{1}{2}$ turn and install the cotter pin. Ball seats must be tight enough to prevent end-play and loose enough to permit free movement. Be sure that the socket is lubricated thoroughly (Refer to Section

17, "Lubrication"). If the socket is disassembled for any reason be sure that the parts are installed in their proper relative position as indicated in Fig. 283.

2. Length Adjustment (Fig. 279 and 280). Drag link length adjustment should not be necessary except when a new link is installed. If adjustment is necessary on Frazer models and late Kaiser vehicles, assemble the socket end on the pitman lever arm and adjust the ball socket as described above. Then with the steering gear turned to the center of its travel and the front wheels in the straight-ahead position the drag link end with the tapered stud should fit into the hole in the idler lever without changing the position of the front wheels or the steering gear.

To obtain this fit loosen the clamp and turn the link in the socket end as necessary to shorten or lengthen the link the required amount. Then insert the stud through the idler lever and install the retaining nut and cotter pin. Be sure that the socket end of the drag link is aligned in relation to the idler lever end to prevent binding on the pitman arm—then tighten the clamp to maintain the position.

On early 1951 Kaiser vehicles drag link length adjustment is similar to the above procedure but the two clamps that lock the connecting tube on the ball joint ends must be loosened and the tube turned as required. When the length is correct tighten the clamps, making sure the ball joints do not bind.

d. IDLER LEVER (Fig. 282). The idler lever is mounted on a bolt between two spherical bearings that are pressed into the front crossmember. The upper bearing is threaded to receive the threaded portion of the idler lever bolt. The upper and lower bearings are held from turning in the front crossmember by serrations around the outer circumference of the bearing. Loosening of the idler lever bolt is prevented by a lock plate under the bolt head. Proper adjustment of the idler lever is given as a part of the installation under IDLER LEVER INSTALLATION.

The idler lever and related parts are shown exploded in Fig. 281 and are replaceable as follows:

1. Idler Lever Removal. Disconnect the two tie rods and the drag link after removing the cotter pins and retaining nuts at the idler lever. Bend the lock plate away from the hex head of the bolt at the underside of the front crossmember.

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Turn the bolt counter-clockwise until approximately $\frac{1}{4}$ inch of the bolt is out of the lower bearing. Drive the bolt back in with a hammer to free the serrations on the upper bearing from the crossmember, then remove the bolt and the upper bearing.

Drive downward on the idler lever until a screwdriver can be inserted between the flange of the lower bearing and the crossmember. Pry the lower bearing out of the crossmember, then remove the idler lever.

2. Idler Lever Installation. To install the idler lever, position the lever in the crossmember. Lubricate the bearings and idler lever. Hold the upper bearing (threaded bearing) in place in the hole in the top of the crossmember.

Install the lock plate on the lower bearing and fit the bearing into the hole in the underside of the crossmember. Install the bolt through the bottom bearing and the idler lever and thread it into the upper bearing.

Attach a spring scale in the hole in the idler lever into which the drag link connects. Tighten the bolt to adjust the idler lever bearings until a pull of 8-16 ounces on the spring scale is required to move the lever.

Bend the lock plate up against the hex head of the bolt after the adjustment is completed. Connect the drag link and tie rods to the idler lever by inserting the end studs in the holes in the lever and installing the retaining nuts and cotter pins.

e. TIE RODS. There are two identical tie rods which are adjustable for length only. If the rod ends become worn and loose, either of the rod ends or both as necessary, or the complete rod assembly, must be replaced. Rod ends of each tie rod differ, one having a right hand thread while the opposite rod end has a left hand thread. To adjust the tie rod length, loosen the two clamps which lock the tie rod ends in the tie rod tube and turn the tube as required. When the length is correct tighten the clamps to lock the adjustment. Finally check to be sure that there is no binding at the rod ends caused by cocking of either ball seat in relation to the stud. **NOTE: The two tie rods should be adjusted to the same length,** the proper length to be established in accordance with information in Section 8, "Chassis Suspension," covering checking and adjustment of front wheel toe-in which is controlled by tie rod length.

SERVICE DIAGNOSIS

a. GENERAL. Whenever a diagnosis of steering difficulties is to be made it must be remembered that factors other than the steering mechanism must also be checked. Trouble symptoms indicating possible steering system deficiency may, instead, be due to trouble in front end alignment, front suspension, tire inflation, wheel and tire mounting, wheel bearings, frame alignment or brakes. Various symptoms are given in the following paragraphs and possible causes, including steering system and other sources of trouble, are listed.

b. HARD STEERING. Possible causes of hard steering as indicated by tightness or stiffness in the steering mechanism are as follows:

1. Improper steering gear worm bearing or roller shaft adjustment.
2. Drag link socket adjusted too tight and link or tie rod ends binding due to misalignment.
3. Under-inflation of front tires.
4. Lack of lubrication.
5. Bent steering gear linkage.
6. Steering column misalignment.
7. Frame bent or twisted.
8. Front suspension arm or steering knuckle bent or twisted.
9. Improper front end alignment—caster incorrect.

c. LOOSENESS IN STEERING SYSTEM. Looseness in steering as indicated by excessive free movement of the steering wheel may be caused by the following:

1. Steering gear worn or adjustments loose.
2. Drag link or tie rod ends worn or loose.
3. Steering pitman lever arm loose.
4. Steering knuckle bushings worn.
5. Steering arms loose.
6. Front wheel bearings worn or loose.
7. Steering gear mounting loose.

d. STEERING WANDER, ROAD WEAVE OR LACK OF CONTROL. Possible causes are:

1. Low or uneven tire pressure.
2. Steering gear worn or adjustments either too loose or too tight (the latter causing over-steering).
3. Drag link or tie rod ends worn or loose.
4. Drag link socket adjusted too tight.
5. Improper front end alignment—incorrect or unequal caster, camber or toe-out with loose steering linkage.
6. Front suspension arm or steering knuckle bent or twisted.
7. Frame misaligned or rear axle has shifted.
8. Sway eliminator defective.
9. Sagging springs, front or rear.
10. Steering knuckle bushings worn.
11. Type of road surface and cross winds.

e. ROAD SHOCK OR STEERING KICK-BACK TO STEERING WHEEL. The following are possible causes of the condition which is indicated by a sharp and sudden reaction of the steering wheel as a result of the front wheels hitting a bump or hole in the road.

1. Drag link socket adjusted incorrectly, the springs in the socket broken, or link ends misaligned.
2. Excessive tire pressure.
3. Improper adjustment of steering gear worm bearings or roller shaft.
4. Steering knuckle bent or bushings worn.
5. Worn or improperly adjusted front wheel bearings.

f. VEHICLE PULLS TO ONE SIDE: The following are possible causes:

1. Uneven or low tire pressure.
2. Rear wheels misaligned or not "tracking" with front wheels.
3. Brake dragging.
4. Incorrect or uneven caster or camber.
5. Sagging or broken springs.
6. Frame bent or twisted, causing misalignment.
7. Suspension arm bent or twisted.
8. Toe-in on one front wheel, toe-out on the other.

g. WHEEL SHIMMY OR TRAMP. This condition at slow speeds is evidenced by a shaking movement of the steering wheel. At high speeds the condition is indicated when the vehicle seems to gallop, as might be the case if the wheels were oval shaped instead of round. Possible causes are:

1. Wheels, tires or brake drums out-of-balance.
2. Uneven or under-inflation of front tires.
3. Wheel or tire not mounted true.
4. Worn or loose steering gear or linkage.
5. Improper front end alignment—*toe-in*, *caster* or *camber* incorrect.
6. Wheel bearings worn or loose.
7. Propeller shaft operating out-of-balance.
8. Shock absorbers not functioning properly.
9. Front springs weak or sagging.

h. UNEQUAL RIGHT AND LEFT TURNING RADII. If the vehicle can be turned more sharply one way than the other (Refer to Section 8, "Chassis Suspension" in this manual), the steering linkage is bent or striking other parts of the vehicle, limiting the travel.

