

Studebaker

SERVICE BULLETIN

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SHOP INFORMATION

COVERING

- FREE FRONT SUSPENSION
 - FRONT END ALIGNMENT
 - STEERING
 - DRIVING STABILITY

The information in this issue of the Service Bulletin summarizes the general service procedures in the recommended sequence to relieve conditions of insufficient front spring action, improper front end alignment causing premature tire wear and the resulting uneven riding characteristics, noises, shake, or kickback resulting from out-of-adjustment steering gear or linkage, and unstable ride qualities.

In this material frequent reference is made to the wall chart, "Shop Information Covering Maintenance Procedures Affecting Tire Life", and to Shop Manuals.

It is our recommendation that service salesmen and front end mechanics be given an opportunity to study the material in this issue of the Service Bulletin and at the same time to review the Tire Life chart; a shop meeting on this subject would provide a good "refresher course" of front suspension and steering in general.

Please record this Service Bulletin on page 111 of your 1947 Shop Manual.

FREE FRONT SUSPENSION SYSTEM

No adjustment or repair of front suspension or steering systems should be undertaken until the front suspension has been carefully inspected and tested as outlined below. A free acting front spring is one of the most important factors in satisfactory steering and riding and, in spite of this, front spring service is all too frequently neglected by the owner. Thus the first place to look for need of service on cars brought in for steering, or ride improvement, is the front suspension system.

Furthermore, repairs or adjustments made to other parts of the steering and suspension systems may be of no value if a galled or binding spring has not first been discovered and serviced.

The front suspension must rebound freely if front end alignment is to be maintained. Check front suspension rebound with the shock absorbers set to factory setting (adjusting pointers directly in line with the scribed mark). Jounce the car several times and, at the high point of the last jounce, hold the car momentarily, then let down slowly at the same time gradually removing hand pressure, and permit the car to settle. Select a point at the center of the bumper and measure the vertical distance from this point to the floor. Then jounce the car several times again and at the low point of the last jounce, hold the car momentarily, gradually remove hand pressure, and let the car return to its normal position. Using the same point as before, measure the vertical distance to the floor. The difference between the two measurements should not be more than 1-3/4".

If the difference is greater than 1-3/4", disconnect the shock absorbers to determine whether the bind or tightness is caused by improperly set or inoperative shock absorbers.

If the bind or tightness still exists, take the load off the front spring and check for

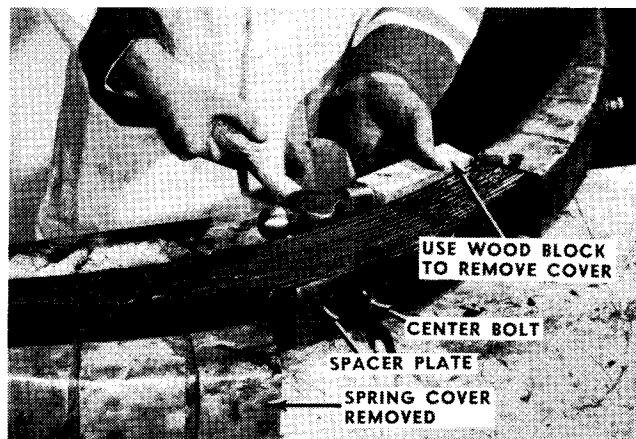


FIG. 1

bind or tightness at the control arm pivots. If the control arm assemblies pivot freely, the bind or tightness of the front suspension is probably caused by front spring leaf friction.

SHOT INSERT (6G,7G,8G;14A,15A,16A)

Install the shot insert kit, Part No. 525408 (6G,7G, and 8G), No. 525409 (14A,15A, and 16A), as outlined in the installation instructions below.

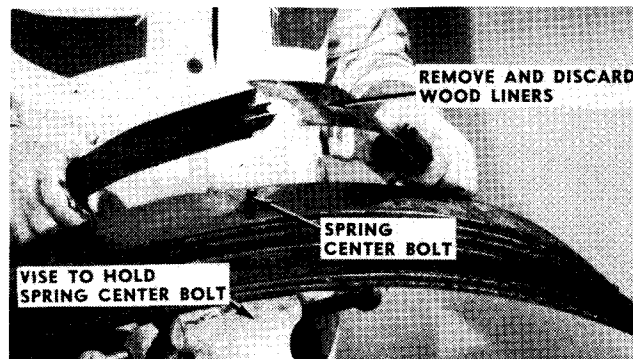


FIG. 2

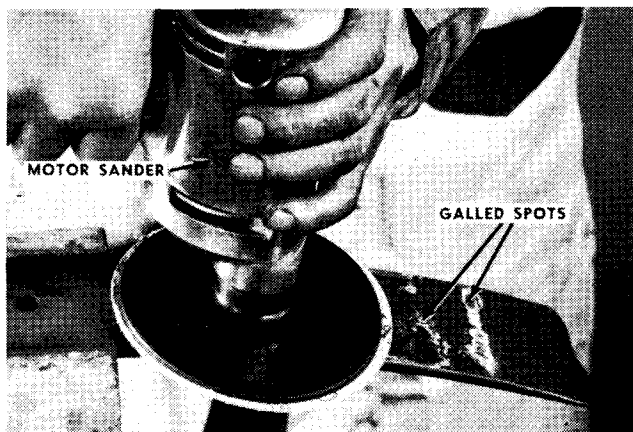


FIG. 3

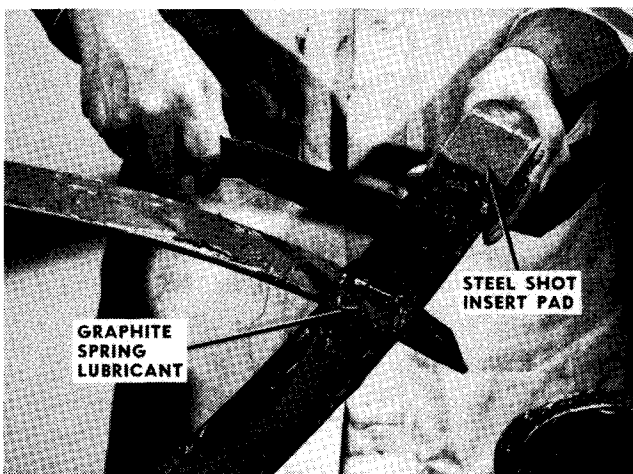


FIG. 4

Serial Numbers

6G, 7G, and 8G; 14A, 15A, and 16A - Shot inserts have been used in South Bend production since Serial No. G374479 (7G) and Serial No. 4338708 (15A); in Pacific Coast production since Serial No. 835852 (7G), Serial No. 4828525 (15A); and in Canadian production since Serial No. G700238 (HD front spring-7G), G700445 (Standard front spring-7G). All 8G Champion and 16A Commander models were originally equipped with shot inserts.

Installation Instructions

1. Remove front spring. (See 1947 Passenger Car Shop Manual, p. 97).
2. Remove spring covers. See Fig. 1.
3. Disassemble spring. Discard wood liner separators on cars so equipped. See Fig. 2.
4. Clean spring leaves; sand or grind off any galled spots. See Fig. 3.
5. Cut the Champion insert tape (Part No. 403XA16) into eight 2-inch pieces, or the Commander insert tape (Part No. 403XA20) into ten 2-inch pieces.
6. Cement the untreated side of one of the insert pieces to the underneath surface of each end of the 2nd, 3rd, 4th, and 5th spring leaves with Permatex No. 2. On the Commander, in addition to the aforementioned leaves, also cement an insert piece to the underneath surface of each end of the 6th spring leaf.
7. Thoroughly lubricate each leaf of the spring (including the shot insert) with graphite spring lubricant. See Fig. 4.
8. Assemble the spring leaves (on the Commander, a spring spacer, Part No. 519918, is also used). Install the new center bolt and peen over the end of the bolt.
9. Apply spring lubricant liberally around the outside of the spring. Reassemble the ori-

ginal or new canvas and metal spring covers on the spring, using the felt spacers (Part No. 525237 - Champion, or Part No. 525238 - Commander) to fill the gap between each cover and the top of the spring at the inner ends, made by the removal of the wood liners. See Fig. 5.

10. Reinstall the spring in the car. Be sure camber and toe-in are within latest specifications.

FRONT END ALIGNMENT

Various types of tire wear and their corrective procedures are fully explained in the chart, "Shop Information Covering Maintenance Procedures Affecting Tire Life".

Before checking alignment, correct any deficiencies in the following: (1) front suspension freeness; (2) tire inflation pressures; (3) front wheel bearing adjustment; (4) steering gear adjustment (5) king pins and bushings; (6) steering linkage.

The car must be level. Jounce the car at both front and rear several times. Be sure there is no bind in the front suspension parts.

Check wheel alignment equipment *daily* to insure accurate readings.

Camber: To change the camber, add or remove shims between the upper control arm brackets and the frame as required. Always add or remove the same number and thickness of shims at both the front and rear brackets. The camber should be set $\frac{1}{2}^{\circ}$ more on the driver's side than on the opposite side. The limits for camber are 0° to $+1^{\circ}$ and the ideal setting is approximately $+1/4^{\circ}$ on the opposite side.

Caster: The caster is predetermined as a part of the design and should not be changed. Attempts to change caster from factory specifications result in a bind or drag in the front suspension system. Incorrect caster indicates either that the king pin and its support are not properly centered in the control arms or that the frame, upper or lower support arms or knuckle assembly (including king pin, etc.) are bent.

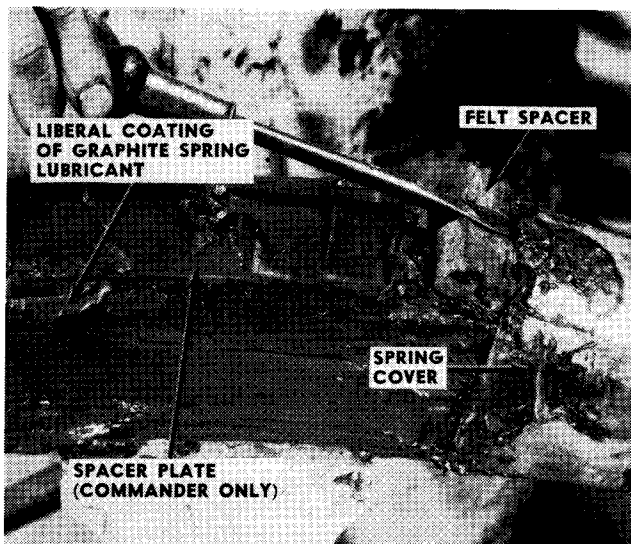


Fig. 5

CASTER	SER. NOS. 6G-7G-8G	SER. NOS. 14A-15A-16A
$+1/2^{\circ}$ to $+1 1/2^{\circ}$	All	Up to 14AY--4276053 Up to 14AS--4276102 All other 14A up to 14A-4276243
-2° to -3°	---	After 14A-4276243 and all 15A-16A

Toe-In: Set the steering gear on the center of the high spot. Reposition the steering wheel, if necessary, so that the spoke is straight across. The steering wheel must remain in this position during the balance of the adjustment procedure.

Following the procedure outlined on page 108 of the 1947 Passenger Car Shop Manual, adjust the left tie rod so that the left front wheel is in a straight ahead position. Measure the left tie rod and adjust the right tie rod to obtain the same measurements. On the Champion, measure the length of the rod between the Zerk lubrication fittings. See Figs. 6 and 7.

Then set the toe-in to 1/16" to 1/8" by adjusting the center (auxiliary) tie rod.

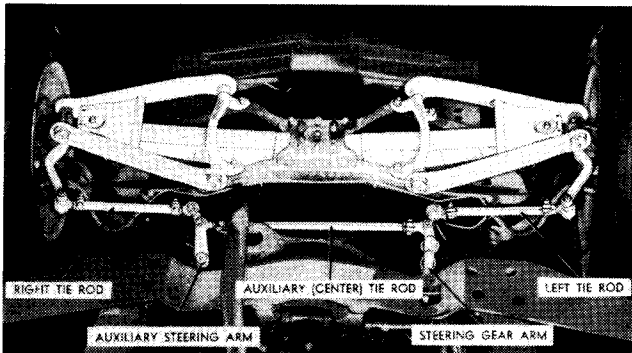


FIG. 6 - CHAMPION

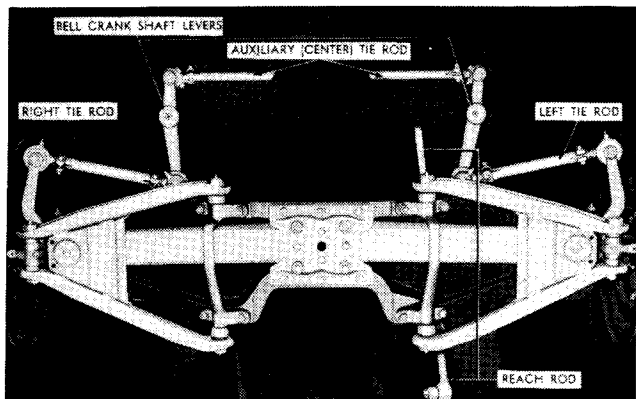


FIG. 7 - COMMANDER

STEERING

Steering gear adjustments and linkage checks should be made with the load of the car off the front wheels. Support the front end at the outer ends of the lower control arms.

Two adjustments are provided for the steering gear: (1) steering post end play and (2) cam gear-to-cam lever shaft stud clearance. See Fig. 8.

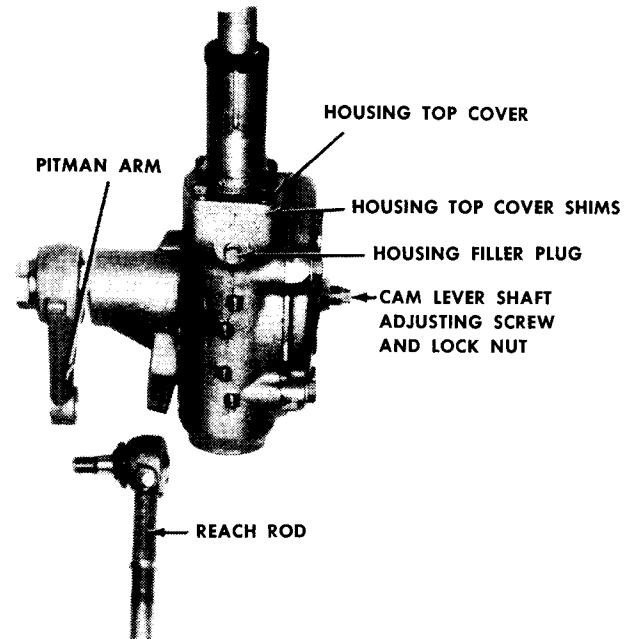


FIG. 8

Before proceeding with the adjustments in the following paragraphs, disconnect the steering gear from the remainder of the steering linkage.

First, check the steering gear end play. Then loosen the cam lever shaft adjusting screw lock nut and back off the adjusting screw. Hook a spring scale calibrated in ounces (such as a piston fitting scale) to the outer rim of the steering wheel and measure the amount of pull required to turn the steering wheel. A steady pull of 4 to 7 ounces, tangent to the rim of the wheel, should turn the gear assembly. If the pull is outside these limits, remove the top cover cap screws, lift the top cover, and add or remove shims to secure the proper scale reading. These limits refer to a steering gear which is filled with approved lubricant and the readings taken with the lubricant at room temperature.

With the steering gear end play adjustment correct, locate the center of travel (high spot) of the steering gear. While turning the steering wheel back and forth over the high spot, turn the lever shaft adjusting screw, keeping the lock nut snug, until a slight drag is felt; then tighten the lock nut. To recheck the adjustment, hook the spring scale to the outer rim of the steering wheel and measure the amount of pull required to turn the wheel in either direction through the high spot. The scale reading should be 16 to 24 ounces pull.

When adjustment is completed, locate the center of the high spot by turning the wheel through the high spot in both directions. The

steering wheel spoke should be straight across when the gear is in the center of the high spot.

With the steering gear on the high spot, the left front wheel should be in a straight ahead position with respect to the rest of the car. If it is not, adjust the left tie rod as outlined in the 1947 Passenger Car Shop Manual, p. 108.

Bell Cranks & Linkage: Check the bell cranks and linkage for looseness. To adjust the bell cranks properly, tighten the bell crank shaft nut until less than .003" end play is present and the shaft can be turned without drag or bind.

Check each section of the linkage individually and tighten or replace as necessary.

Chuckle with Steering Gear in Straight Ahead Position

Adjust the steering gear end play. Adjust the cam lever shaft so that there is a definite drag at the high spot of the gear. With the gear set on the high spot, the wheels should be in a straight ahead position. Adjust if necessary. Then readjust the cam lever shaft so that only a slight drag exists at the high spot. Turn the steering wheel back and forth through the entire range of travel to check whether the drag at the high spot is the same when approached from both sides.

If, when checking the drag, there is a variance from one side of the high spot to the other, or if the high spot is lost, it is an indication that the gear is not kept in alignment because the top bearing in the gear housing is floating or the gear housing bore is out of round. If this condition is found, replace the steering gear assembly.

Chuckle may be aggravated by abnormally loose steering connections. Check the bell cranks for excessive lateral play and up and down movement. If excessive lateral play is found, replace the bell crank assembly. If there is excessive up and down movement, adjust the end play of the bell crank shaft. Check steering linkage for excessive looseness and adjust or replace worn parts.

Chuckle When Turning to Right or Left

To reduce to a minimum any noise in the gear assembly when off the center to the right or left, be sure gear is properly centered and adjusted on the high spot. Install Kendall No. 400 Lubricant.

If the condition is severe and is not mate-

rially reduced by using Kendall No. 400 Lubricant, install Kendall No. 800 or Whitmore No. 65 Lubricant. These are heavier lubricants and should be changed to Kendall No. 400 for use in cold weather. Kendall 400 may be diluted by no more than 2 tablespoonfuls of kerosene for use in extremely cold climate. Do not attempt to dilute Kendall 800 or Whitmore 65 in such climates, but use Kendall 400.

Kickback

After making sure the front suspension is free, follow the procedure as outlined under "Chuckle with Steering Gear in Straight Ahead Position" and "Chuckle When Turning Right or Left", making a complete inspection of the steering system. On 14A and 15A Commanders after Serial No. 4276243, if the steering is normal and excessive kickback still exists, remove the needle bearing from the upper end of the steering knuckle on the driver's side and install a plain bronze bushing, Part No. 525175. All 16A Commanders are originally equipped with a bronze bushing at upper left knuckle. For disassembly and reassembly procedures of the steering knuckle, see 1947 Passenger Car Shop Manual, pp. 98-102.

If the car is being continually operated over rough pavement or unimproved roads, a bronze bushing may also be installed at the upper end of the steering knuckle on the passenger's side. Bushings in both steering knuckles tend to increase the steering effort. Before installing the bronze bushings in upper steering knuckles of both front wheels, the owner should be advised that increased steering effort may be required.

Steering Wheel Shake

This condition is aggravated by a stiff front spring, inoperative shock absorbers, and bind in control arm pivots. Check the freeness of the front suspension and make the necessary corrections. Follow the procedures under "Chuckle with Steering Gear in Straight Ahead Position", and adjust the steering gear and bell cranks. Check for looseness in the steering linkage.

On 15A Commanders, remove the needle bearing from the upper end of the steering knuckle on the driver's side and install a plain bronze bushing in its place (see section "Kickback"). Note.--All 16A Commanders were originally equipped with bronze bushing in upper left knuckle. Statically and dynamically balance the front wheel-tire-and-hub-and-drum assemblies. If tires are slightly cupped, criss-cross them prior to balancing. See chart, Shop Information Covering Maintenance Procedures

Affecting Tire Life. If cupping is the result of a high splice in the tires, take the tire to an authorized service station of the tire manufacturer for adjustment consideration.

DRIVING STABILITY

Below are given the procedures for eliminating four factors which may contribute to a lack of driving stability. Each of these conditions can be remedied only after the front suspension is determined to be free and that the front end is properly aligned and the steering gear and linkage are not in need of adjustment.

Stiff and Choppy Ride

Check freeness of front suspension. Eliminate any bind in suspension parts. Check shock absorbers for proper operation and adjust or replace as necessary (see 1947 Passenger Car Shop Manual, p. 159). If front spring has excessive leaf friction, install the shot insert kit as outlined on p. 2. Check front wheel alignment and adjust as necessary.

Low Speed Shake

Follow the procedure under "Stiff and Choppy Ride". Be sure the front suspension is free. Check for worn propeller shaft support rubber cushions and for undercoating material or other matter on the propeller shaft.

On 15A Commanders, install the bronze bushing in the upper end of the steering knuckle on the driver's side as outlined under "Kickback". All 16A Commanders were originally equipped with bronze bushing at upper end left knuckle.

Check the front wheel alignment and adjust as necessary. Inspect the tires and check for abnormal wheel or wheel and tire runout or tire cupping. Refer to section "Low Speed Tire Thump".

Low Speed Tire Thump

Follow the procedure under "Stiff and Choppy

Ride" making sure the front suspension is free. Inspect each tire for wear and replace any tires which are badly worn or cupped (see chart, Shop Information Covering Maintenance Procedures Affecting Tire Life).

Inflate tires to the recommended pressures and, using a dial test indicator, check the radial and lateral run-out of the tire and wheel assemblies. The maximum allowable radial run-out of tire and wheel assembly is .093". The maximum wheel radial run-out limits are: .062" front and .078" rear on the Commander, and .078" front and rear on the Champion. The maximum lateral run-out limit is .100" on the Commander and .125" on the Champion. If the wheel run-out, either radial or lateral, is excessive, replace the wheel.

If the radial wheel run-out is within limits, but the radial run-out of the wheel and tire assembly is above .093", reposition the tire on the wheel by placing the point of greatest tire run-out at the point of least wheel run-out. In this way, the lowest possible total run-out of the assembly is secured. If repositioning fails to bring the total radial run-out within limits, replace the tires.

If excessive radial run-out of the tire is a result of high tread splice cupping, take the tire to an authorized service station of the tire manufacturer for adjustment consideration.

Balance front wheel-tire-and-hub-and-drum assemblies statically and dynamically, and rear wheel assemblies statically. Check front wheel alignment and adjust as necessary.

High Speed Tramp and Shake

Make the wheel and tire inspections following the procedure outlined under "Low Speed Tire Thump". On the Convertible models, check the harmonic balancers for tightness in their supports. They must not shift. On models equipped with a stabilizer bar, be sure the bar is not damaged and is securely anchored.