

1940 Hudson

**SERVICING THE FRONT SUSPENSION
SYSTEM**

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SERVICING THE FRONT SUSPENSION SYSTEM

No set rule can be given for the sequence of operations in checking and correcting front wheel alignment. Neither can the exact cause for any form of misalignment always be given without a complete check-up, as much depends upon the age of the car and consequently the condition of the parts.

Because of location, the parts of the front wheel suspension are subject to damage by accident more than any other part of the chassis. Front wheel suspension service, therefore, necessitates the inspection of parts for alignment as well as for possible straightening.

Heat treated parts should not be straightened if they are sprung more than 5° , while parts which are not heat treated may be straightened cold if not sprung out of alignment more than 10° . If an attempt is made to straighten parts cold which are bent more than this, strains and cracks which may be visible to the naked eye will result. Straightening hot may result in overheating and destroy the effects of heat treating, making the parts unfit for further use.

Front wheel alignment is the mechanics of keeping all interrelated parts affecting steering in proper adjustment. Correct alignment is essential to keep the front wheels in their true running position for easy and efficient steering and the prevention of abnormal tire tread wear.

The elements involved in front wheel alignment are caster, camber, toe-in, and toe-out on turns. These elements are all related and dependent upon each other. In addition to these major elements, there are several other factors that affect the alignment of the wheels; namely, tire inflation, wheel wobble, wheel and tire balance, straightness of wheel suspension parts and the frame, alignment of wheels with frame, adjustment of wheel bearings, steering gear and connections, shock absorbers and their proper lubrication.

In checking caster, camber or toe-in it is very important that the car should first be rocked sidewise several times and allowed to settle. This rocking motion relieves any tension which may be in the various parts or in the tires.

Caster should be set first, preferably to 0° with $1/4^\circ$ positive to $1/4^\circ$ negative permissible and a total variation between the two front wheels of not more than $1/2^\circ$.

NOTE:

1. By turning the eccentric bushing into the support we decrease the caster.
1. By turning the eccentric bushing out of the support we increase caster.
3. One complete turn of the eccentric bushing will give a caster change of $1A^\circ$.

Camber should be adjusted after correct caster is obtained and should be made with the least possible caster change. Camber should be set to $1/4^\circ$ to $3/4^\circ$ with the total variation between the two front wheels of not more than M° .

Normally it should never be necessary to turn the eccentric bushing more than M of a complete revolution to obtain maximum camber adjustment. Limiting the bushing to this movement insures a minimum caster change.

If camber or caster cannot be corrected by means of the eccentric bushing a thorough inspection of all related parts must be made. In case of camber the inclination of the pivot pin should be checked. The inclination of the pivot pin should be $4-1/2^\circ$ with $1/2^\circ$

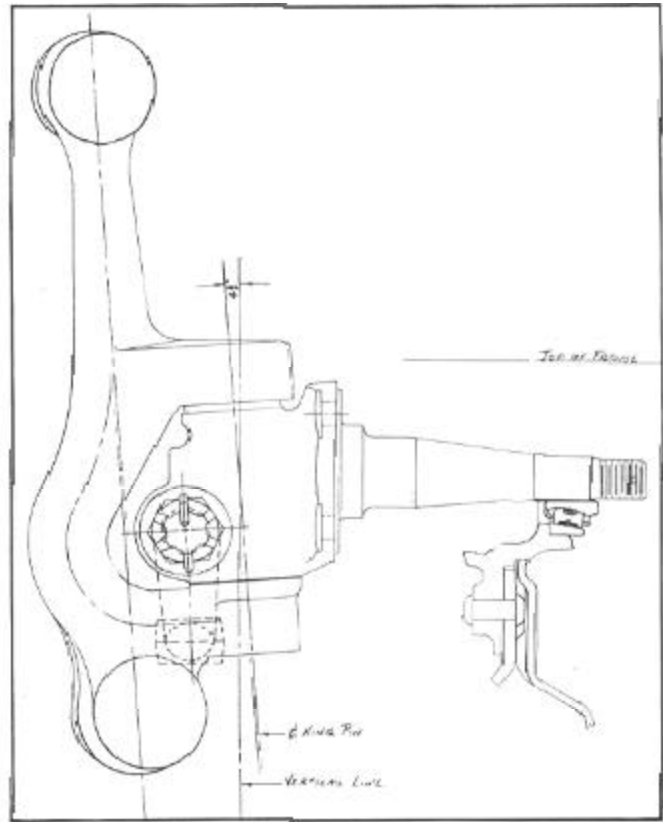


Figure 1

of camber, see Figure 1, and if an error in this reading is observed it is a very good indication that the support arms, steering spindle or spindle support is bent.

If the camber and pivot pin inclination are found to differ from specifications by approximately the same amount it is an indication that the steering spindle is in accordance with specifications and that the error is due to either bent support arms or a bent spindle support. These parts should then be disassembled and checked against specifications, see Figures 2, 3 and 4. If upon checking these parts you find that they are not sprung beyond the point where straightening will destroy their characteristics they may be straightened to conform to the specified dimensions. Should these parts be sprung beyond the limitations for straightening they should be replaced with new ones.

If caster cannot be corrected by means of the eccentric bushing it is advisable to check the installation of the eccentric bushing, the lower support arm outer pivot, the lower support arm inner pivot and the upper support arm and pivot assembly to make certain the adjustments are in accordance with specifications. If these adjustments are correct it will be necessary to disassemble and check all parts against specifications.

Toe-in, accurately adjusted, is of great importance in obtaining the maximum of tire life and must always be maintained within definite limits of $0-1/16''$ measured on the complete car at the wheel rim.

The weight of the car must be on the wheels and the wheels and tires made to run as true as possible regardless of the method to be used in measuring the toe-in.

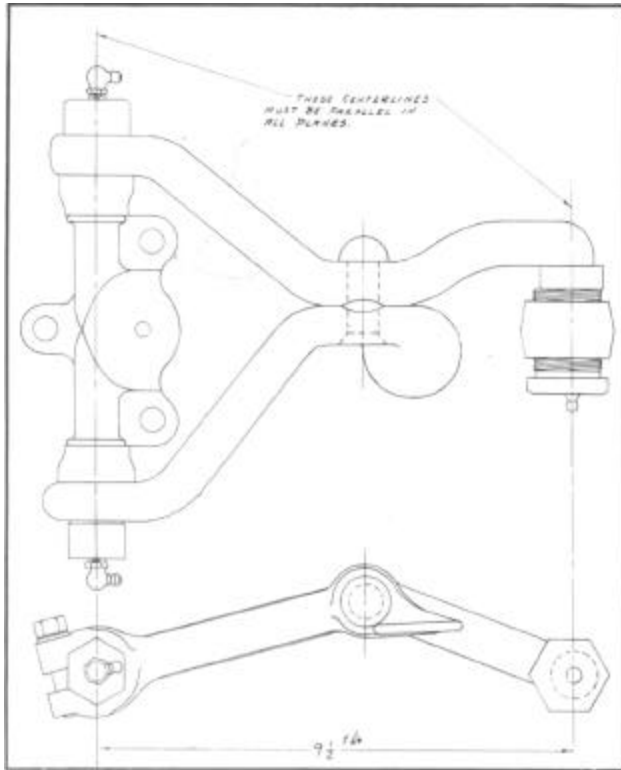


Figure 2

When making the adjustment or check the rear end of the center steering arm should be exactly at the center of the car. A tool J 1442 has been developed which attaches to the underside of the frame cross member and is used to centralize this arm in relation to the exact center line of the car. This tool is also used to adjust toe-in and makes possible the setting of the steering gear on the high point for the straight ahead position. (See Figure 5.)

To install this tool it is only necessary to remove the center steering arm retaining nut, after which the tool may be mounted underneath the cross member by means of a threaded bushing which screws on to the center steering arm bolt in place of the retainer nut just removed. The tool is located in relation to dead

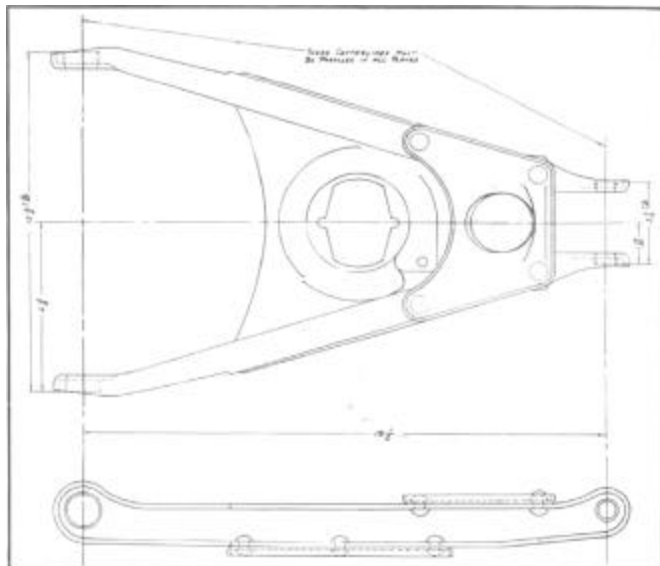


Figure 3

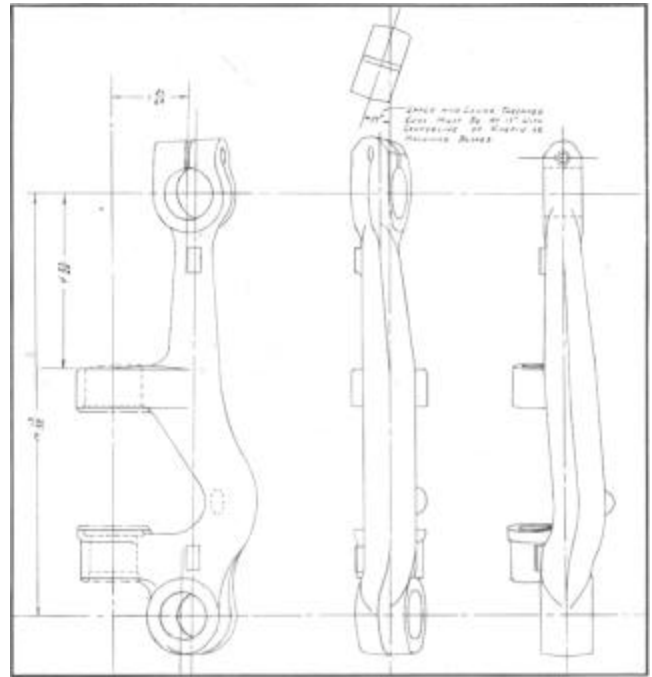


Figure 4

center of the car by a pin at the front end which is entered in a hole provided for it in the cross member. The clip on the tool snaps around the center steering arm and holds it in line with the center line of the car. With the tool in this position and the arms bearing against the sides of the tires a check may be made on the toe-in. If the toe-in is in error it is only necessary to loosen the tie rod clamps and turn the tie rod in the direction of wheel travel to increase toe-in and turn the tie rod in opposite direction to decrease toe-in. After proper toe-in has been obtained, (must be the same on each wheel,) tighten tie rod clamps. If, with the tool in position, it is necessary to set the steering on the high point remove the drag link from the pitman arm and set steering and then replace drag link to pitman arm without any movement of wheels or steering gear.

When making a check of toe-in or an adjustment the wheels should be in the straight ahead position as described above and where measurements are taken from the sides of the tire the wheels must be turned so that the high spot or that portion of the tire with the greatest amount of run-out is at either the top or bottom of the wheel. Also it will be helpful to scribe a chalk mark around the inside face of the tire to enable setting both arms of tool in same relative position.

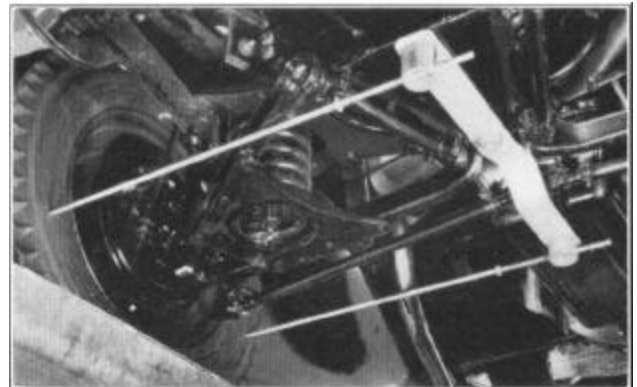


Figure 5

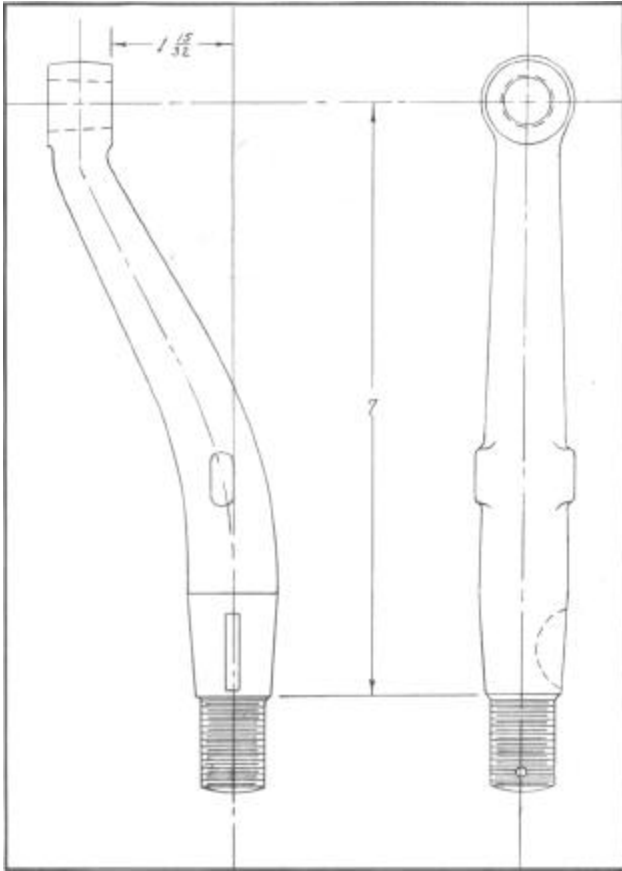


Figure 6

If the toe-in is seriously out it will indicate a possible bent steering arm. See Figure 6, and if bent beyond limits of straightening, replace with new parts.

When the front wheels are turned to the right or left they separate slightly at the front depending upon the amount of deflection from the straight ahead position. The wheel making the inside circle turns at a greater angle than the outer wheel and this condition is called toe-out. The amount of toe-out increases as the angle of turn is increased.

This factor of toe-out is obtained by means of the steering tie rods which are set at an angle with one another and also in relation to the center line of the car.

Toe-out is checked by turning the wheels to the right or left, locating the inside wheel of the turn at a definite position and then reading the angle of the outside wheel. Using the following prescribed angles a check can be made which will give the proper toe-out variation.

Left Turn		Right Turn	
Left Wheel	Right Wheel	Right Wheel	Left Wheel
30°	25°	30°	25°

Errors in the setting of the outside wheel are due to bent steering arms. When the steering arms are bent, the wheels will not turn in their proper relation on curves. This condition will affect the toe-out and result in excessive tire wear. Straight ahead driving, however, will not be affected.

In cases where a large error in toe-out is evident a check of the steering arms is suggested and if these parts are beyond limits for straightening they should be replaced. However, before these parts are replaced a thorough check should be made to ascertain whether

to limitations on both sides and that the front and rear wheels are parallel and are tracking.

Riding Height or Spring Sag

In cases where the car does not appear to be resting level, a check of the front spring height should be made.

The car should be placed on a level spot and then rocked several times sidewise to eliminate all binding in the system which may be causing this dimensional difference in height.

The height should be measured at each side as shown in Figure 7. If these two dimensions are found to vary, spacers are available to be used only when there is a variation at this point. However, in installing these spacers, not more than two spacers under any circumstances should be installed. If it is found that more than two spacers are required to equalize this height it will be necessary to replace the coil spring.

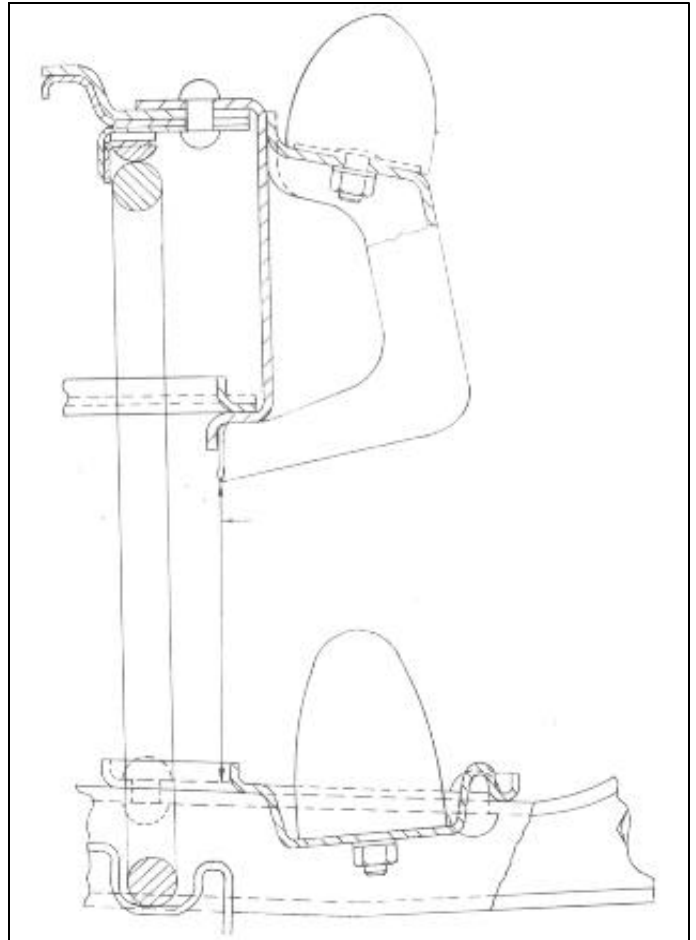


Figure 7

Coil Spring Data

All coil springs are identified after inspection according to their load, rate and models. Brinell marks, part number and limit marks are shown on the flat end of each spring. A light limit spring will have one grind mark and a heavy limit spring will have two grind marks.

In replacing coil springs for any reason the following chart should be referred to and springs ordered accordingly.

Part No.	Color Identification	Load at Pass. Height	Rate	Models
160510	Light Blue	1396	290	40-41
160511	Yellow	1456	326	43
160512	White	1630	326	44
160512	White	1630	326	47 Right Side
160513	Green	1735	326	47 Left Side

Service Procedure

Service operations are comparatively simple and if the steps outlined are followed and adjustments are made properly no difficulty should be experienced.

Should the entire front end assembly be removed for inspection for bent parts or for any other reason the following procedure should be observed:

1. Raise car and place stand jacks under inner ends of lower support arms.
2. Remove wheel and hub assembly.
3. Remove brake backing plate and place in a position which will not be injurious to the brake hose.
4. Remove steering arm with tool J 1373.
5. Remove shock absorber.
6. Remove lower support arm pivot to frame bolts.
7. Raise car slowly, allowing coil spring to expand and remove spring.
8. Remove upper support arm pivot to frame retaining bolt nuts.
9. Remove front suspension assembly as a unit.
10. Replace assembly and fasten upper support arm pivot to frame cross member securely.
11. Replace spring making sure flat end is to the top and rests in the frame cross member. Also be sure open end of spring rests in the stamped recess in the lower support arm.
12. Lower car which will compress spring and replace lower support arm pivot to frame bolts and tighten securely.
13. Replace shock absorber.
14. Replace steering arm.
15. Replace backing plate.
16. Replace wheel and hub assembly.
17. Remove car from stand jack and lower car to floor.
18. Adjust caster, camber and toe-in.

Spring Removal and Installation

1. Raise car and place stand jacks under inner ends of lower support arms.
2. Remove wheel and hub assembly.
3. Remove shock absorber.
4. Remove lower support arm pivot to frame bolts.
5. Raise car slowly, allowing spring to expand and remove spring.
NOTE: This spring is under heavy tension and care must be exercised in raising car and relieving this pressure.
6. In replacing spring make sure flat end of spring is at top and rests in the frame cross member. Also be sure open end of spring is located in the stamped recess in the lower support arm.
7. Lower car which will compress the spring and replace lower support arm pivot to frame bolts and tighten securely.
8. Replace shock absorber.
9. Replace wheel and hub assembly.
10. Remove stand jacks and lower car to floor.

Lower Support Arm Removal and Installation

1. Raise car and place stand jacks under inner ends of lower support arms.
2. Remove wheel and hub assembly.
3. Remove shock absorber.
4. Remove lower support arm pivot to frame bolts.
5. Raise car slowly, allowing spring to expand and remove spring.
NOTE: This spring is under heavy tension and care must be exercised in raising car and relieving this pressure.
6. Remove lower support arm outer pivot bolt and remove lower support arm.
7. In replacing lower support arm install outer pivot pin and index pin so that spindle support is centralized between inner faces of outer end of lower support arm.
8. In replacing spring make sure flat end of spring is at top and rests in the frame cross member. Also be sure open end of spring is located in the stamped recess in the lower support arm.
9. Lower car which will compress the spring and replace lower support arm pivot to frame bolts and tighten securely.
10. Replace shock absorber.
11. Replace wheel and hub assembly.
12. Remove stand jacks and lower car to floor.
13. Adjust caster, camber and toe-in.

Spindle Support Removal and Installation

1. Raise car and place stand jacks under outer ends of the lower support arms.
2. Remove wheel and hub assembly.
3. Remove backing plate and place in a position which will not be injurious to the brake hose.
4. Remove steering arm with tool J 1373.
5. Remove grease fitting at top of spindle and drive out spindle pivot and remove spindle.
6. Remove lower support arm outer pivot bolt.
7. Loosen eccentric bushing locking bolt and remove eccentric bushing.
8. Remove spindle support.
9. In replacing spindle support hold support on upper support arm at a distance of 9/32" measured between back face of the spindle support and the boss on the upper support arm. See Figure 8.
10. Thread eccentric bushing onto the upper support arm until it starts to enter spindle support.
11. Continue threading eccentric bushing onto the upper support arm and into the spindle support until a distance of 7/8" is obtained between back face of the spindle support and the boss on the upper support arm. See Figure 8.
12. In replacing lower end of spindle support to lower support arm replace pivot bolt indexing bolt so that spindle support is centrally located between inside faces of the outer end of the lower support arm.
13. Replace steering spindle, thrust balls and pivot pin.
14. Replace steering arm.
15. Replace backing plate and wheel and hub assembly.
16. Remove car from stand jacks and lower car to floor.
17. Adjust caster, camber and toe-in.

Upper Support Arm and Pivot

Removal and Installation

1. Raise car and place stand jacks under outer ends of the lower support arms
2. Remove wheel and hub assembly.
3. Remove backing plate and place in a position which will not be injurious to the brake hose.
4. Loosen eccentric bushing locking bolt and remove eccentric bushing.
5. Fasten upper end of spindle support to frame bumper bracket.
6. Remove upper shock absorber retainer and pal nut.
7. Remove upper support arm to frame retaining bolt nuts and remove upper support arm and pivot assembly.
8. In replacing upper support arm and pivot assembly place support arm in upper end of spindle support at a distance of $9/32$ " measured between the back face of the spindle support and the boss on the support arm. See Figure 8.
9. Thread eccentric bushing onto upper support arm until it starts to enter the spindle support.
10. Continue threading eccentric bushing onto the upper support arm and into the spindle support until a distance of $7/8$ " is obtained between the back face of the spindle support and the boss on the upper support arm. See Figure 8.
11. Place upper pivot over retaining bolts and tighten securely.
12. Replace upper shock absorber retaining and palnuts.
13. Replace backing plate, wheel and hub assembly.
14. Remove car from stand jacks and lower car to floor.
15. Adjust caster, camber and toe-in.

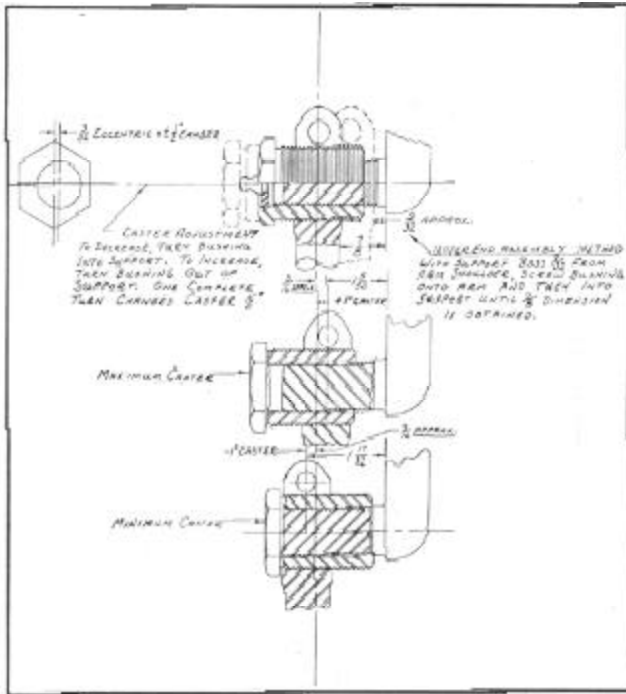


Figure 8

Bushing Removal and Installation

In replacing bushings extreme care must be exercised when adjusting in that proper limits and specifications must be observed to insure free and unrestricted movements of related parts.

Lower Support Arm Pivot Bushings—Front or Rear:

1. Raise car and place on stand jacks.
2. Remove either front or rear bushings or both.
3. Install bushings and adjust with tool J 1052 so that a dimension of 11" is obtained between inner faces of the control arm. See Figure 9. A dimension of 11-1/2" must also be obtained between inner face of the support arm and the center line of the bolts holding the pivot to the cross member.

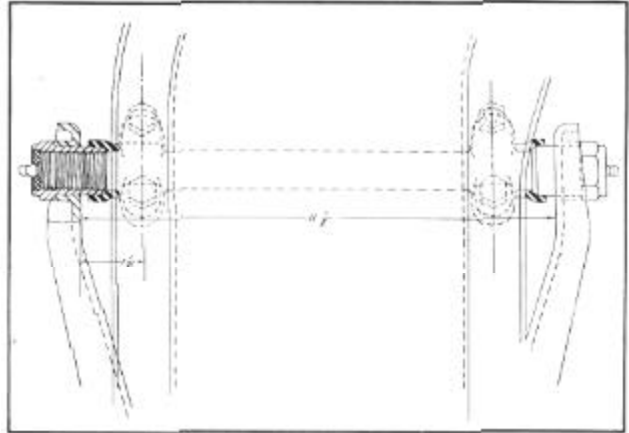


Figure 9

Upper Support Arm and Pivot Assembly Bushings:

Front

1. Raise car and place on stand jack.
2. Remove wheel and hub assembly.
3. Remove front bushing locking bolt.
4. Remove bushing.
5. Install bushing and adjust with tool J 1360.
6. These bushings should be adjusted with tool J 1360 placed on rear retaining stud so that bushings are centralized between inner faces of tool.
7. Replace bushing locking bolt.
8. Replace wheel and hub assembly.
9. Remove car from stand jacks and lower to floor.

Rear

1. Raise car and place on stand jack.
2. Remove wheel and hub assembly.
3. Remove bushing.
4. Install bushing and adjust with tool J 1360.
5. These bushing should be adjusted with tool J 1360 placed on rear retaining stud so that bushings are centralized between inner faces of tool
6. Replace wheel and hub assembly.
7. Remove car from stand jacks and lower car to floor.

Spindle Support Lower Bushing:

1. Raise car and place stand jacks under outer ends of lower support arm.
2. Remove lower support arm outer pivot bolt.
3. Remove bushing from spindle support.
4. Replace bushing in spindle support, drawing up tight.
5. Install pivot bolt, indexing bolt so that spindle support is centrally located between outer faces of lower support arm.
6. Remove stand jacks and lower car to floor.
7. Adjust caster, camber and toe-in.

Eccentric Bushings:

1. Raise car and place on stand jacks.
2. Remove wheel and hub assembly.
3. Remove eccentric locking bolt.
4. Remove eccentric bushing.
5. Replace bushing, hold spindle support on upper support arm at a distance of $9/32$ " measured between back face of spindle support and boss on upper support arm. See Figure 8.
6. Thread eccentric bushing onto upper support arm until it starts to enter spindle support.
7. Continue threading bushing until a distance of $7/8$ " is obtained between back face of spindle support and boss on upper support arm. See Figure 8.
8. Adjust for caster and camber and tighten eccentric locking bolt.
9. Replace wheel and hub assembly
10. Remove car from stand jacks and lower car to floor.

Alignment Check Necessary:

In all cases where correlated parts are removed or replaced it will be necessary to check caster, camber and toe-in. In performing these operations either for a simple check-up or a major operation it is necessary that the following factors be taken into consideration:

1. Tire inflation—This check should be the first one made in any wheel alignment job.
2. Running of wheels out of true, out of balance or not tracking.
3. Adjustment of front wheel bearings.
4. Condition of front shock absorbers.
5. Adjustment of steering gear and connections.