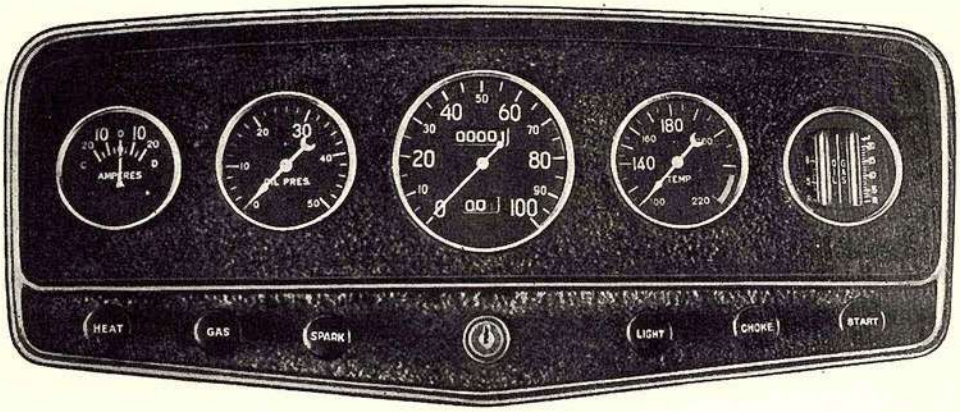
MANUAL

FOR AUBURN SERVICE MECHANICS

Models 8-98 and 8-98A

AUBURN AUTOMOBILE COMPANY, AUBURN, INDIANA

Printed in U.S.A.



"BREAKING-IN" THE 8-98 AND 8-98A MODELS

This car has been thoroughly checked and adjusted, and is in good running order as it leaves the factory.

It should be carefully handled during the "wearing-in" period.

Care in operation until all parts are thoroughly adjusted and worn to a proper fit, will result in much longer life to the car, and more satisfactory performance.

Handle the car carefully in the first 500 miles of driving and do not speed it to exceed 25 miles per hour during this period.

LICENSE DATA

Number of Cylinders	8
Cylinder Bore	3"
Stroke	4¾"
SAE Horse Power Rating	28.8
Developed Horse Power	98
Piston Displacement	268.64 cu. in.
Firing Order	1, 6, 2, 5, 8, 3, 7, 4
Capacity of Crankcase	8 qts.
Capacity of Cooling System	21 qts.
Capacity of Gasoline Tank	20 gal.
Wheel Base	127"

OPERATING INSTRUCTIONS

Starting the Engine:

Be sure you have proper amount of oil in crankcase, gasoline in tank, and radiator filled with water. See that gear shift lever is in neutral position.

For most satisfactory operation, use the manifold heat control in starting, as instructed below:

Cold Weather Operation:

Draw heat control out to extreme position, thus closing the damper valve in exhaust outlet.

Turn on ignition switch by unlocking Electrolock, turning key one quarter turn to right. Depress clutch pedal, draw carburetor choke control out to extreme position, and pull start control switch. As soon as engine starts firing, release start control, and push choke control half way in. When engine becomes warm, push choke control entirely in to the off position. Do not use it longer than necessary.

As soon as engine warms to operating temperature, push heat control half way in, and for cold weather city driving it should be kept in this position. For high speed cross-country driving, the heat control should be in to the dash, or not over one third of the way out.

Hot Weather Operation:

When first starting the engine in the morning, follow same method described above. The heat control should be used only for fast warming of engine, and should then be pushed in to the dash, or "off" position for both city and cross country driving.

After engine is warm, do not use choke or heat controls. If the warm engine does not start readily, open the heat control about half way, but do not use the choke.

Starting the Car:

See that the emergency brake lever is in extreme forward position, thus disengaging the brake.

Push the clutch pedal clear down. Move gear shift lever to the left and backward into first speed position. If it does not enter smoothly and easily, release and depress clutch pedal once or twice, and the lever will easily slip into gear.

The pressure on clutch pedal should then be released, gradually, at same time increasing engine speed slightly with the foot accelerator, and the car will begin moving forward.

The shift to second speed is made preferably at a speed of six to eight miles. Depress the clutch pedal and move shift lever forward to neutral, then to the right and forward again to second speed position.

Be careful not to move shift lever straight forward through neutral into reverse.

The instant the lever is in gear, re-engage the clutch slowly, at same time accelerating engine slightly.

The shift to third or high speed should be made at from ten to fifteen miles per hour under ordinary conditions. This shift is made in same way, except that the lever is moved straight back into right rear position.

If you have not had experience in driving, you should become thoroughly familiar with the operation of car at low speed before attempting to drive the higher speeds. Practice gear shifting, starting, stopping, steering, turning and backing at a low rate of speed.

To Stop the Car:

Slow down; break car speed gradually with right foot pedal, slowly bringing car to a stop. When car is nearly stopped, disengage clutch, and move shift lever to neutral position.

Always have gear shift lever in neutral position before re-engaging the clutch.

Set the emergency brake by drawing hand brake lever back as far as possible.

To Stop the Engine:

Shut off the ignition by turning locking cylinder back so the keyway is in vertical position.

To Back the Car:

Do not reverse the direction of car until it has been brought to a complete stop.

When car is at rest and shift lever in neutral position, release the clutch, move shift lever to left, then forward into reverse; engage the clutch. Carefully watch the steering, do not back rapidly, and be ready to operate clutch and brake pedals instantly.

Free Wheeling:

Should the car be equipped with a Free Wheeling Unit, it will be automatically locked when the car is reversed, and if Free Wheeling is desired when transmission shift is again placed for forward running, it will be necessary to re-engage the Free Wheel Unit by drawing the floorboard lever back to free wheel position.

Shifting the free wheel lever forward locks it, and backward engages it so it is ready for use. In making these shifts, depress clutch pedal.

When Free Wheeling is engaged, the transmission lever may be moved from first to second, and second to third speed positions without depressing clutch pedal.

Lighting System:

The bright head lights are turned on by drawing the light control switch on instrument panel half way out. To turn on the cowl lights for parking, draw the control out as far as it will go.

The dimmer lights are operated by depressing the floor board switch, to left of clutch pedal, with the foot. By depressing it again the lights will be changed from dim to bright.

The instrument panel light is controlled by a switch under edge of instrument board.

COOLING SYSTEM

The capacity of the cooling system is 21 quarts. The system should be inspected and the water drained out occasionally, running engine at moderate speed to permit clean water to enter filler neck of radiator while the drain cock is open at bottom. It is advisable to flush out the system every 3000 miles of use.

Anti-Freeze Solutions should be used during freezing weather. Denatured Alcohol is a practical Anti-freeze solution, but on account of its tendency to evaporate, the strength of the mixture should be frequently tested with a hydrometer, and alcohol added when needed to maintain proper gravity. When putting alcohol into the radiator be careful to see that none is spilled on the hood, as the lacquer finish would be destroyed unless the alcohol is immediately wiped off.

The protection afforded by a denatured alcohol solution is shown below:

Denatured Alcohol (by volume)	Water (by volume)	Begins freezing at (Deg. Fahr.)	Specific Gravity Readings
20 percent	80 percent	19° above zero	.978
30 percent	70 percent	10° above zero	.968
40 percent	60 percent	2° below zero	.957
50 percent	50 percent	18° below zero	.943

On arrival of warm weather, drain out the mixture and refill with clear water. The system can be quickly drained by opening drain cock on outlet pipe at lower part of radiator, which is reached with a screw driver by lifting up the side of hood.

GPA Radiator Glycerine is a satisfactory anti-freeze fluid. The initial cost is higher than alcohol, but it evaporates very slowly and may be drained off in the spring and stored away for use again in cold weather. In using it see that hose connections and pump packings are water tight. This solution, ready for use, can be supplied by our Parts Department.

The water pump on engine, which forces circulation of water through the cooling system, is fitted with a grease cup for lubrication. Use only Kasson's Waterproof Grease in this cup.

Fan:

The fan is equipped with an oil reservoir with a special pumping device, which supplies constant lubrication to the bearing. Remove plug in fan hub and pour engine oil into the reservoir. Turn the hub so filler hole is at

bottom and all superfluous oil will drain out to a fixed level. One filling should be enough for 10,000 miles.

NOTE: Cold water should not be poured into an empty or partly emptied radiator while engine is hot. It might cause serious damage.

ENGINE

Cylinders and Crankcase:

The integral cylinders and crankcase are close grain chromium gray iron, which gives smooth hard cylinder walls, highly resistant to wear. The integral water jacket extending around the barrels provides large water passages around all valves. Crankcase is heavily ribbed for strength and rigidity. The one-piece fly-wheel housing is amply ribbed to resist strains. All cylinders and crankcases are tested with a high water pressure to guard against leaks.

There are many factors which may cause premature piston and cylinder wall wear if engine is carelessly operated. Oil dilution, due to excessive use of choke, or failure to change oil at regular intervals, lack of oil and insufficient pressure, will cause premature wear. Pistons and cylinders will become worn in time from normal use.

If the engine is not abused, and proper precautions are taken concerning oil pressure, oil supply, and water supply, there will be no danger of piston seizure and scored cylinders. However, cylinders if not too deeply scored can be rebored oversize, after which oversize pistons must be installed.

Cylinder Head:

The detachable cylinder head of close grain gray iron is thoroughly water jacketed, and permits easy access to valves and pistons. Combustion chamber shape is of special design allowing a high compression pressure to be used without detonation.

To remove cylinder head proceed as follows:

1. Drain water.
2. Disconnect upper hose.
3. Disconnect spark plug wires.
4. Disconnect cable tube brackets from cylinder head.
5. Loosen distributor set screw.
6. Lift the distributor together with cable tube and brackets off cylinder head out of the way.
7. Remove cylinder head and gasket; be careful not to damage the gasket.

In replacing, place gasket in position and press it down on cylinder face. Cylinder head bolts should be tightened gradually in a way to insure equal distribution of pressure throughout the head. After tightening the bolts partially, those in center should be finally drawn tight, working both ways toward the ends. This insures freedom from strains in the casting. If, after tightening all bolts, there is a leak between cylinder head and gasket, replace gasket with new one.

Carbon:

When cylinder head is removed the carbon can be easily removed with a scraper. Do this on one cylinder at a time with its valves closed. Before replacing cylinder head, see that all surfaces, including cylinder bores, are clean and free from loose carbon or other substance.

Pistons:

The aluminum alloy (Bohnalite) pistons are accurately ground and hand fitted to each cylinder for proper clearance. Two oil regulating and two compression rings are used on each piston.

In installing new pistons, be careful to not fit them too tightly or seizure will doubtless result.

To remove pistons, drain the oil from oil pan. Remove all cap screws and bolts holding oil pan to crankcase. Turn crankshaft with hand crank until a connecting rod is pointed straight down. Remove the cotter pins, nuts and connecting rod cap. Turn crankshaft until piston slides by the shaft. Then assemble, at once, the cap and nuts on connecting rod in original position. When fitting new pistons the clearance must be such that a feeler shim. .0015″ thick and ½″ wide placed in the bore on a line at right angles to piston pin opposite saw slot can be easily pulled out, while one .0025″ in thickness cannot be withdrawn. In pulling the shim, use only the bare fingers, unaided by friction tape. Piston clearance, top .016″ to .019″; bottom .0015″ to .002″. Piston length 3¾″.

Piston Pins:

The pins are case-hardened on the exterior, ground and lapped to highest possible degree of accuracy. They are drilled to relieve internal stresses and secure light weight. The pin is held in connecting rod by a bolt passing through the slotted end and engaging in a notch in the pin, clamping pin tightly and preventing its turning on the rod.

When connecting rod has been removed, test the pin for looseness in piston bosses. When fitting in new pins, be sure bearing surfaces in piston are reamed smoothly and in perfect alignment. The pin should be fitted tightly enough so when the assembly is held by the piston, the free end of rod will, when slightly pushed, drop of its own weight. Check the pins to see that they are parallel and lie in same plane with the large end bearing. Pins are .875″ to .8747″ diameter, with clearance .0003″ selective fit.

Piston Rings:

Immediate replacement of rings should be made when they become worn to any extent. In fitting new rings the compression rings should have .0015″ to .003″, and the oil rings .0015″ to .003″ side clearance between ring and grooves in piston. End gaps should be .006″ to .012″ on compression rings, .010″ to .018″ on the 3/16″ oil ring, and .007″ to .015″ on the 1/8″ oil ring. Clean the grooves before fitting new rings.

Connecting Rods:

Are drop-forged of high carbon double heat-treated steel with "I" section shank, giving maximum strength, toughness and light weight, together with rigid backing for the bearing. The babbitt lining is centrifugally cast into large end of rod, insuring proper refinement of bearing metal and perfect heat conductivity from bearing to rod. Rods are hand fitted to crankshaft with clearance between bearing and shaft of .0015″ to .003″. Side clearance should be from .004″ to .008″.

The connecting rod cap must be reassembled to rod in its exact original position. For instance, No. 1 connecting rod and cap have a "1" stamped on side of rod and also on the cap. These numbers must be on same side. The pistons and rods must be returned to their original cylinders, which have corresponding numbers. The cylinders are numbered from front to rear, No. 1 being in front. The large end of rod is offset 1/4″. In replacing rods, be careful to replace them with offset on same side as originally. The short side of rod is assembled nearest to main bearing in every case. The rods are assembled correctly when oil jet holes in large end of rods are all on camshaft side of engine.

When wear of .004″ or more has taken place, adjustment should be made by filing off face of cap, being careful in filing to see that the surface is kept straight. If thin, laminated shims are found in the rod, adjust by peeling off the required number of shims. When reassembling the nuts on large end, draw them very tight with a socket wrench having a 10″ handle.

Main Bearings:

The five large shimless type crankshaft bearings are bronze backed, babbitt lined, and are rigidly supported in upper portion of crankcase and doweled to the caps.

Adjustment is made by filing off faces of caps the same as on connecting rod caps. The proper clearance between crankshaft and main bearings is .002″ to .00325″. The clearance can be checked by inserting a feeler gauge of proper thickness between shaft and bearing and drawing the cap nuts up tightly. Adjust bearings after wear of .003″ or more has taken place. Never fit them so tight that the shaft cannot be turned by hand with a .002″ feeler 1/2″ wide, assembled between bearing and shaft. End clearance of center or thrust bearing should be from .003″ to .008″.

Crankshaft:

The crankshaft is drop-forged of high carbon, double heat-treated steel. It is accurately balanced, statically and dynamically, which with a vibration damper securely keyed to front end, effectually eliminates torsional vibration of shaft. Bearing surfaces are ground to perfect roundness, and polished.

Camshaft:

The drop-forged hardened steel camshaft is supported by six large bearings. The front bearing is a removable bronze bushing. The bearing and cam surfaces are carefully inspected for hardness, finish, and accuracy of

timing. End play is taken up by a plunger in front end of shaft.

Under normal conditions these bearings will not need replacement during life of engine. When fitting new camshaft bearings allow .002″ to .003″ clearance between shaft and front bearing, and .0017″ to .0047″ on all others.

Valves and Tappets:

The exhaust valves are of diachrome, an alloy steel developed especially for exhaust valves, as it resists warping and burning, insures freedom from valve leaks and renders frequent regrinding unnecessary. Intake valves are of special chrome nickel alloy steel specially adapted for this use. Seats and stems of all valves are given proper degree of hardness by a special heat treatment to resist wear.

Tappets have hardened steel stems, and heads are faced with chilled cast iron which is most satisfactory in resisting abrasion and wear. Adjusting screws and nuts are case hardened. Tappets are fitted four in each cluster, which are attached to block by 8 dowels, 4 lockwires, and 8 bolts. To remove the clusters, take off tappet covers, remove bolts and lockwires, and lift them out. Tappets are easily removed from the clusters.

Valve Guides:

When guides become worn so valve is not properly guided into its seat, they should be replaced. To replace valve guides, remove cylinder head, detach tappet covers and remove valves, springs, seat supports, etc., as described under *Valve Grinding*. Remove tappet clusters as described above. The valve guides can now be driven down into valve chamber with a punch. New guides can be driven into place in same way. After new guides are in position they must be reamed to size for the valve stem, due to any reduction of inside diameter resulting from the driving operation.

Valve Grinding:

When valves become pitted and scored enough to cause loss of compression, they should be reground in their respective seats.

To remove valves, drain the water and remove cylinder head. Remove valve cover plates from side of engine, and with valve lifter raise the valve springs and take out the split taper type valve spring supports. (Be careful that they do not drop through into crankcase.) Lift out the valves. When grinding, place under the head a spring of sufficient tension to hold valve from its seat when not under pressure from the valve tool. Place a little coarse grinding compound on valve and work it into the seat with an oscillating movement of valve, always bearing lightly on valve and making not more than one half revolution of valve before reversing the direction of motion, to prevent grooves in facing. When all pits and black spots have disappeared and valve has a dull, silvery appearance, finish grinding with a fine compound.

The valve face should have a surface free from grooves and pits, but need not be polished. It will acquire this in use.

Each valve must be ground in its own seat. To test for a perfect seat, mark lines across face of head about ⅛″ apart with a soft pencil. Then replace valve and make a quarter rotation backward and forward. All pencil lines should be broken. If not, continue grinding until all lines are broken, indicating that valve is seating all around. After grinding, wash valves and seat with kerosene to remove all traces of compound and allow none of it to get into cylinder.

If any valves are badly warped or burned, replace with new ones. Badly damaged valve seats can be reamed with a seating tool more quickly and to better advantage than by grinding. The angle of intake valve is 30 degrees, and of the exhaust 45 degrees.

Valve Adjustment:

Sufficient clearance must be given between end of valve and head of adjusting screw on valve tappet, so valve will seat properly under all conditions of temperature and wear. The clearance should not be less than .006″ nor more than .008″ when engine is warm. Set the adjusting screws one cylinder at a time with piston on top dead center at end of compression stroke. Too much clearance will cause excessive wear of cams and tappets. The clearance is adjusted by removing valve cover plates and adjusting screw on top of tappet with suitable wrenches. The lock nut must be tight. Allow .0015″ to .0025″ valve stem clearance in valve guides.

Valve Timing:

Firing order is 1, 6, 2, 5, 8, 3, 7, 4. Valve timing is as follows: Intake open 5 degrees before upper dead center. Intake close 40 degrees past lower dead center. Exhaust open 50 degrees before lower dead center. Exhaust close 10 degrees after upper dead center. When checking valve timing, the clearance between valve stem and tappet must be exactly .010". This clearance should then be reset to .006" to .008" for quietness with engine hot. A change in valve timing is possible only by removing front end chain. In resetting camshaft, the sprockets on camshaft and on crankshaft should be lined up so there are 12 chain links on lower side of chain between punch marks on the two sprockets. With sprockets in this position, the top dead center mark for No. 1 and No. 8 cylinders will be in line with dead center mark on crankcase.

Ignition Timing:

The ignition is semi-automatic advance, the distributor head rotating in order to advance the ignition manually.

To secure correct timing set the flywheel so No. 1 cylinder is 3½ teeth, or 13 degrees, ahead of top dead center on firing stroke when manual control is fully advanced.

Front End Chain:

The camshaft is driven from crankshaft by a silent chain, 1¼" wide, with fixed centers between sprockets. To remove chain, take out camshaft sprocket bolt and pull off sprocket. In replacing chain, first line the timing marks on crankshaft and camshaft sprockets, as described under *Valve Timing*, wrap chain over sprockets, then fasten camshaft sprocket in place with dowel properly lined up. The free sections of chain are short enough to eliminate all tendency to whip.

Fan Belt:

The fan belt should be examined periodically. If loose, release adjusting screw lock nut and spindle nut, and draw down adjusting screw to give belt proper tension. Then tighten spindle nut and lock nut in order given.

Compression:

Test for uniform compression in all cylinders by rocking the engine against compression of each cylinder by means of the hand crank, or by checking with a suitable compression pressure gauge. All cylinders should have equal compression. Weakness or loss of compression may be due to imperfectly seated valves, caused by insufficient clearance between valve stems and tappets, or by sticky valve stems and tappets. Insufficient tappet clearance causes valves to burn and pound, damaging the seats and causing leakage, which makes engine hard to start, and creates preignition. Poor grade of oil, or too rich a fuel mixture causes carbon deposits to collect on valve seats or gumming valve stems, preventing proper seating.

LUBRICATION

Full force feed system, all contained in upper half of crankcase. The oil is drawn from reservoir through strainer and pumped to main bearings. The main bearings are supplied by holes drilled through crankcase connecting oil pump and bearings. Oil is forced to connecting rod lower bearings through drilled passages leading through crankshaft from main bearings. The front end chain is supplied through a special lead from front camshaft bearing to which oil pressure is supplied. The surplus oil from front end drains back into reservoir. Cylinder walls, piston valve stems are oiled by spray thrown from connecting rod bearings.
pin bearings, valve operating mechanism, and

About 8 quarts are required to fill to high level, but oil should not be carried above the high mark, nor should it be allowed to drop below low mark on bayonet gauge. The oil should be drained from reservoir and replaced with a fresh supply every 500 miles, unless a test shows it has lost its viscosity before this time, in which case it should be changed oftener.

The oil is drained by removing plug in bottom of reservoir.

To clean the strainer, drain the oil, remove oil pan, and detach the screen.

During the operation of car, the oil level and pressure gauges should be glanced at frequently.

Oil Pump:

The gear type pump is held in place by a set screw from outside of case, and is located in oil reservoir about even in height with normal oil level. It is operated by a shaft driven by a spiral gear on camshaft. The pump can be removed for cleaning or inspection by taking off oil pan and loosening set screw in crankcase.

Oil Pressure:

The pressure will vary somewhat, depending on viscosity of the oil. With engine idling and oil in good condition the pressure should be at least 5 pounds. When engine is cold, the pressure will be high until oil thins down. The maximum pressure should be 40 to 60 pounds at car speed of 40 miles per hour. During extreme cold weather the pressure will be excessive due to congealing of oil in the drilled oil passages, preventing free circulation. Running engine slowly a few minutes will warm the oil.

Oil Pressure Regulator:

The regulator which controls the pressure is located on valve side of engine toward rear end of crankcase. The pressure is controlled by a spring with tension on a piston valve. Any excess pressure causes the valve to lower. The excess oil goes through regulator body into crankcase, and is returned to oil reservoir. The pressure of spring on valve regulating oil pressure is controlled by small washers under the spring.

To adjust the pressure, loosen the nut at bottom and add washers in hole in nut under spring to increase the oil pressure and remove washers to decrease it.

Oil Filter:

The Purolator removes from the oil all sedimentary deposits which would be injurious to wearing parts of engine.

The instrument should function properly for 8000 to 12000 miles. Check the operation by turning test valve on regulator while engine is running at about 20 miles car speed. If oil flows from test valve, the Purolator is performing correctly. If oil does not flow from test valve the cartridge should be changed. To change cartridges, detach the two bolts in mounting brackets and loosen the tightening nut which attaches regulator to top of Purolator. Remove cartridge and insert a new one.

LUBRICATION RECOMMENDATIONS

In selecting the correct grade of engine oil, all factors in connection with design and operation of engine under all conditions have been given consideration.

Our Engineers recommend a high quality oil of the body and character of Gargoyle Mobiloil "BB" for temperatures down to 32 degrees Fahrenheit. For temperatures below 32 degrees Fahrenheit we recommend Gargoyle Mobiloil Arctic. These recommendations come within the range of S. A. E. Viscosity Number 40 down to 32 degrees Fahrenheit, S. A. E. Viscosity Number 20 for 32 degrees Fahrenheit and lower.

When doing considerable high speed driving for long distances at temperatures between 15 and 32 degrees Fahrenheit, we recommend an oil such as Mobiloil A, or an equivalent coming in range of S. A. E. Viscosity Number 30.

In specifying these viscosity numbers, however, it does not necessarily imply that every oil bearing these numbers would have our specific approval.

If correct lubricant is used and careful attention given to draining instructions, the engine should operate perfectly.

SUGGESTED PERIODIC INSPECTIONS

A. Tighten all loose nuts.
B. Examine spark plugs.
C. Look for water leaks.
D. Adjust fan belt to proper tension.
E. Change the oil.
F. Check tappet clearance.
G. Inspect ignition wiring for corroded terminals, worn insulation, dirty or oil saturated wires.

TROUBLE CHART

Trouble	*Possible Cause*
Engine hard to start.	Defective Distributor: a. Breaker points worn. b. Oil or water soaked. c. Coils broken or soaked. d. Breaker arm or brushes sticking. Spark Plugs fouled or cracked. Loose or defective wiring. Improper timing. Gasoline flow obstructed. Valve seats bad. Valve tappets improperly adjusted. Intake manifold leaking. Water in fuel supply.
Engine missing.	Spark plugs fouled or cracked. Spark plug gap wrong. Should be .026″ to .028″. Defective wiring. Manifold or head gasket leaking. Valves warped or burned. Valves or tappets stuck. Valve tappets improperly adjusted.
Engine Overheating.	Lack of oil. Oil badly diluted. Lack of water. Valves leaking. Fan belt slipping. Improper timing.
Engine lacks power.	Valves not seating. Piston rings weak or stuck. Improper timing. Oil badly diluted. Poor compression.
Engine knocks.	Carbon in cylinders. Loose main bearing — (heavy pound). Loose rod bearing — (sharp knock). Worn pistons and cylinders. Loose push rods. Engine overheated. Tight pistons. Loose flywheel. Lack of water.
Faulty carburetion.	Valves leaking. Intake manifold leaking. Water in fuel. Sediment in fuel. Carburetor improperly adjusted.
Excessive smoke from Exhaust.	Too much oil in crankcase. Lubricating oil thin, not lubricating pistons.
Explosion in muffler.	Exhaust valves warped or holding open. Timing too late.
Explosion in carburetor or intake manifold.	Intake valve sticking, warped or broken. Intake tappets sticking or set too close. Intake manifold leaking.
Poor Compression.	Valves not seating. Valves sticking. Valve tappets sticking or set too close. Piston rings weak, broken or stuck. Loose or cracked spark plugs. Cylinder head loose. Cylinder head gasket leaking. Oil too thin, not sealing pistons. Scored cylinders. Worn pistons and cylinders.

STEWART-WARNER FUEL PUMP

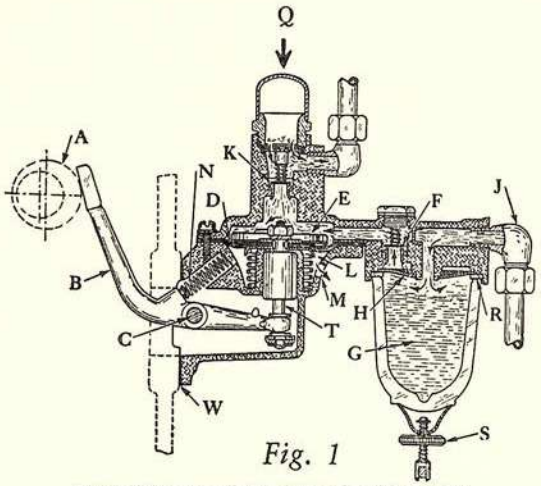


Fig. 1

SERVICE INSTRUCTIONS

Test on Engine:

Should gasoline fail to reach carburetor, do not remove pump until you have checked as follows:

1. See if there is gasoline in rear supply tank.

2. See if gasoline is coming out of breather hole (M). This indicates a leak due to fractured diaphragm or a leak at piston (T).

3. Examine sediment bowl (G) and screen (H). The bowl may be full of gasoline, yet the pump will fail, or not operate properly if screen (H) is dirty, or inlet valve (F) is clogged. Clean sediment bowl and screen. If any water particles on screen, remove by blowing through it. This can happen only when bowl is filled with water. When replacing bowl be sure cork gasket is not broken and that when nut (S) is drawn up the bowl rests flat on its seat: A leak at the gasket will cause erratic action of pump and retard delivery. When using a new gasket, first soak it in lubricating oil.

4. Check for loose connections or broken lines.

5. Disconnect pump at the line to carburetor.

6. While having someone use the starter, observe whether gasoline spurts out of pump outlet. If gas spurts out and carburetor float bowl is empty it indicates that the line to carburetor, or carburetor float needle valve, is clogged.

7. Disconnect gasoline supply line at both ends and blow through it to see if it is clogged.

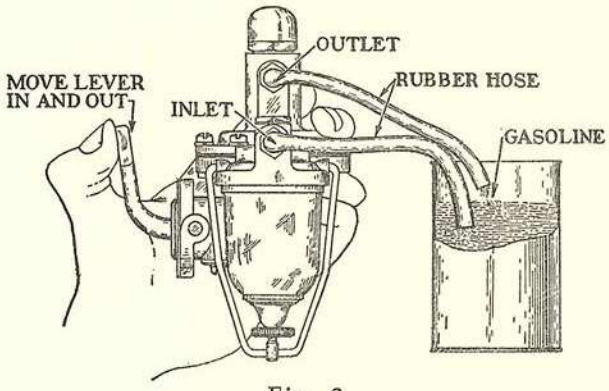


Fig. 2

Test of Pump Off the Engine:

If previous test fails to show the trouble, removev the pump for test and examination at work bench.

1. Attach two pieces of rubber hose to the inlet and outlet openings of pump, and while holding as shown in Fig. 2, move pump lever (B) in and out. Gasoline should spurt out of the hose attached to outlet opening in approximately 15 strokes of lever. If no gas spurts out, proceed as follows:

2. Examine check valves F and K, Fig. 1. A gummy substance sometimes found in gasoline may cause valve or springs to stick, or grit adhering to them may prevent seating. Any foreign matter on valve seats will cause failure. Clean the valve seat and springs, and replace the disc valves, glossy side down. Be careful not to scratch or mar valve seats while cleaning them.

Use new gaskets under valve retaining nut (U) and air dome (Q) and be sure to draw them tight.

3. Examine vent hole (M), and clean out if restricted by dirt.

4. Test the pump with two pieces of hose and a pail of gasoline as previously described; also by holding a wet finger alternately on the inlet and delivery openings while working the lever.

The Diaphragm:

If pump does not operate properly after making above tests, take it apart and examine diaphragm (D), diaphragm spring (0), and clamping nut. See that the nut is tight. A weak or broken diaphragm spring, or a crack-

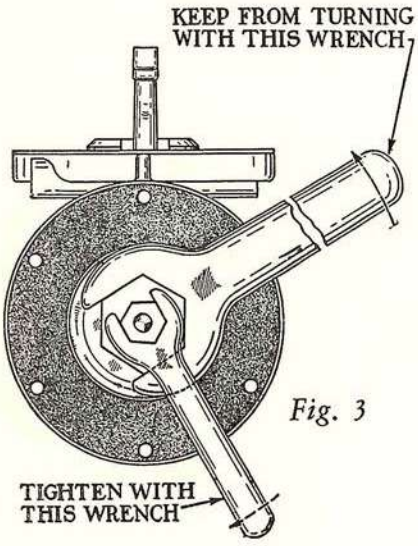


Fig. 3

ed or torn diaphragm will cause complete pump failure.

The diaphragm or spring must be carefully replaced, and the following instructions must be adhered to to insure operation of the new diaphragm.

Replacing Diaphragm:

1. Remove pump cover. The nut that clamps diaphragm on pump plunger is now accessible.

2. Unscrew the nut with two wrenches as shown in Fig 3.

3. Clamp pump body in a vise, as shown in Fig. 4. Lay four pieces of diaphragm material on top of spring retainer as shown. Insert 2 screws through the holes in diaphragm material to line up the holes. Lay the two washers on top of the diaphragm material as shown.

These parts have two keyways in center hole. Turn the parts so keyways are in line with each other and the key on the connecting plunger stud. Then press down on the retaining plate and push these parts over the stud (see Fig. 4). Be sure the key enters keyway. Then while holding diaphragm in this position, screw on the retaining nut first by hand, then tighten with two wrenches, as shown in Fig. 3.

Replacement of Cover:

Cover must be replaced as explained below.

1. Set cover on top of diaphragm and push it down just far enough to allow entering the screws for about three threads, as shown in Fig. 5. Then pull diaphragm down by pushing the lever in as far as it will go. Hold it there until all screws are tightened securely.

The pump should now be tested as previously explained and if it functions properly, should be replaced on engine.

In remounting pump, be sure to put gasket (W) between pump flange and its seat on engine pad. Fasten the mounting screws securely. To prevent leaks, place white lead on threads of all fittings and securely tighten all connections.

The pump, when empty, will prime itself in approximately 20 seconds at cranking speed.

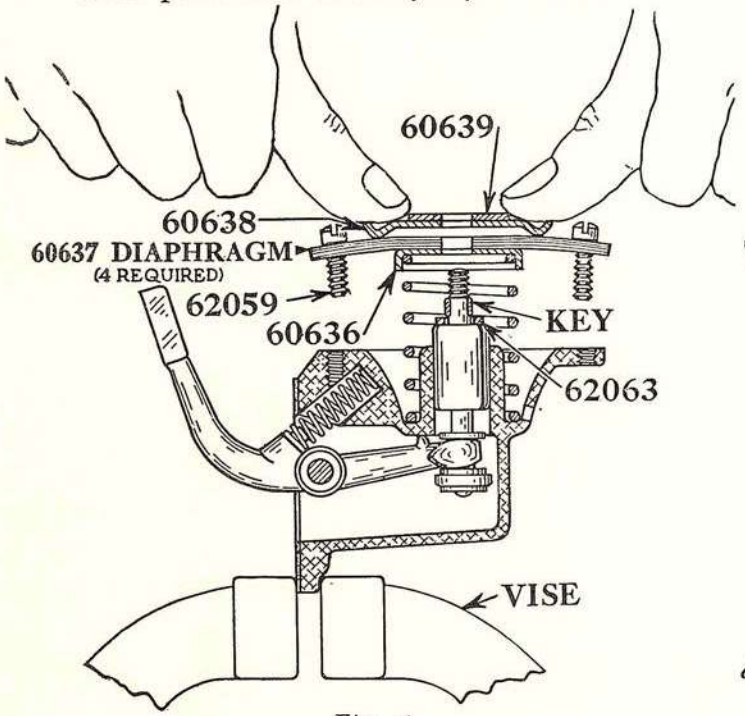


Fig. 4

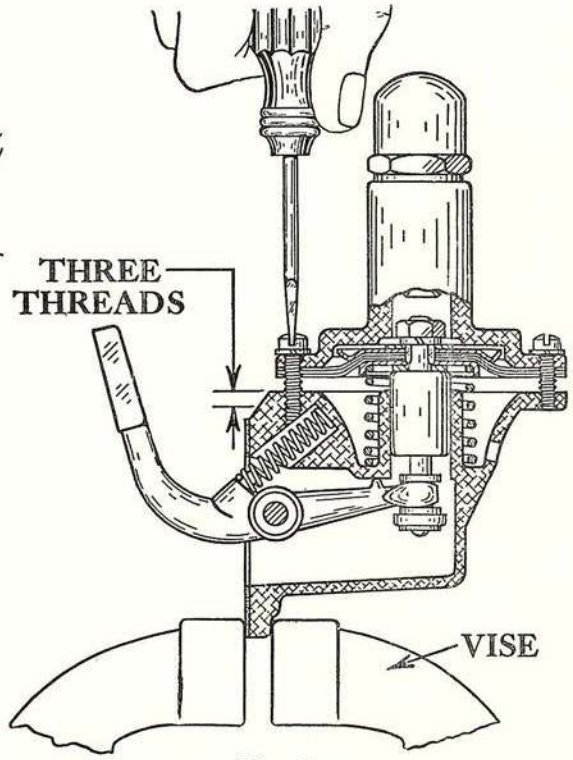
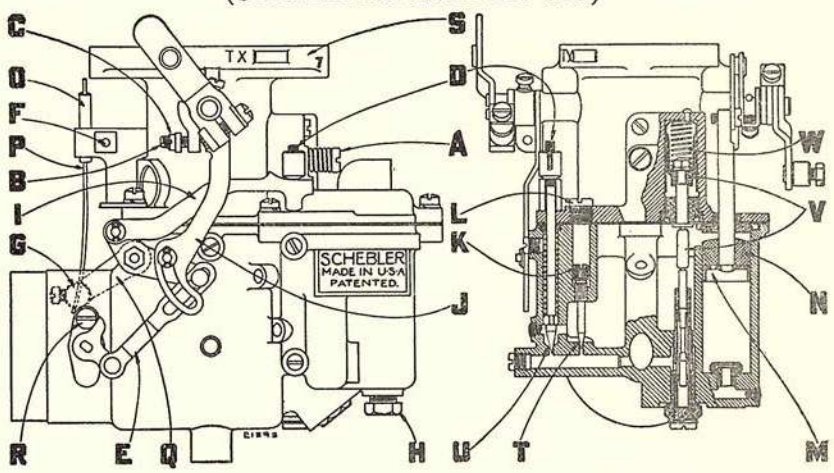


Fig. 5

CARBURETOR
(SCHEBLER MODEL TX)



Before attempting adjustments see that gasoline tank, supply system and lines are free from sediment. Dirt will stop the flow of gasoline or cause carburetor to flood. Water will rust the parts, cause hard starting and freeze in the lines in cold weather.

See that the ignition is properly timed and working. Check breaker point spacing, which must be .018″ to .024″. Check spark plugs for cleanliness and correct spacing of gaps, which should be .026″ to .028″.

Try the engine for compression. If an idle adjustment cannot be obtained check the system for a possible flow of gas through suction line. Examine intake manifold gaskets for leaks by pouring a little gasoline over each gasket. Should there be a leak, the engine will speed up and run smoothly for an instant. Worn intake valve stems and guides will also cause trouble at idle speed.

Control Hook-up:

The dash control is hooked up by clamping the dash control tubing (0) in clamp (F) with end of tubing extending about 1/16″ through the clamp. The dash control wire (P) is clamped in the binding post (G) so the dash control when pushed in is about 1/16″ away from the panel. The dash control (Q) is shown in position against its stop (R) which is the "Run Position."

Starting and Warming Up:

The choke control should be pulled all the way out for starting, and as soon as engine starts should be pushed in about ¼″, and gradually pushed entirely in as engine warms and runs smoothly. The control should not be used when engine is hot.

If instructions for operation of manifold heat control are carefully followed, it will not be necessary to use carburetor choke more than a few moments, even when the weather is extremely cold. See page 3.

Excessive use of choke dilutes the engine oil and causes rapid wear to pistons, piston pins, cylinders and bearings.

Low Speed (Idle Adjustment):

The engine must be hot when the idle adjustment is checked. Close the throttle, and with spark retarded, adjust idle stop screw (B) until engine will not idle less than 5 miles per hour on level road. Lock clamp screw (C), (the one with the head), after adjusting screw (B). After you have the proper engine idling speed, check the idle adjustment. The idle is made leaner by turning valve screw (A) out (counter-clockwise) and made richer by turning it in (clockwise). With idle screw (A) screwed all the way in, the idle should be rich and engine should roll. Turn screw (A) out, a little at a time, until engine no longer rolls, but runs smoothly. This will give a good idle adjustment. In cold weather carry the idle mixture just under a slightly leaner than the rolling point, and in warm weather just over or slightly richer than the lean, faltering point.

NOTE: Do not attempt to set the engine idle speed adjustment at (B) before a reasonable idle adjustment (A) is made. Also be sure dash control is in all the way.

High Speed Adjustment:

The high speed adjustment (K) is located inside the carburetor. A small body plug (L) in upper body is removed and then a small screw driver can be inserted through this hole into the slot of high speed Adjustment Screw (K), and in this way the High Speed can be made rich or lean. Turning screw (K) to the left, or counter-clockwise, gives a richer mixture, and to the right, or clockwise, gives a leaner mixture. This adjustment should only be changed for altitude conditions or when some peculiar condition arises where engine might require a leaner or richer mixture for high speed. A number such as 5 or 7 or 10 is stamped on end of carburetor flange at (S) when the carburetor goes over the factory flow meter, which indicates that the factory setting for the High Speed Adjustment (K) is that number of clicks off the seat at (T). That setting is for that particular carburetor and other carburetors of same type may be different.

Bowl Drain:

Water and sediment can be flushed out of bowl by removing the bowl drain plug. In replacing it, see that it is screwed tight to prevent leakage.

KING-SEELEY OIL LEVEL TELEGAGE

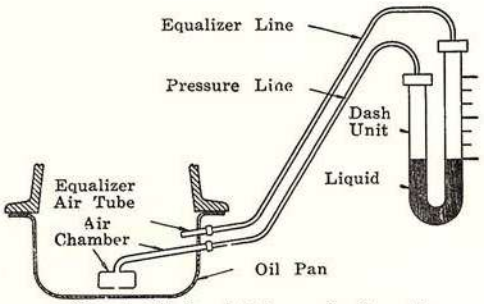


Fig. 1—Oil Level Telegage in Operation Oil Pan Empty.

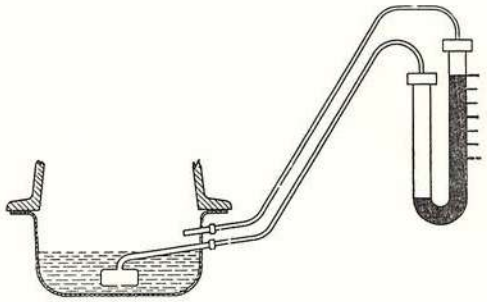


Fig. 2—Oil Level Telegage in Operation Oil Pan Full.

This instrument consists of four units—the Dash Unit, Pan Unit, Pressure Line and Equalizer Line. In operation the Pan Unit, Pressure Line and Equalizer Line are filled with air.

When the oil pan is filled, the oil attempts to rise to same level in the Pan Unit as it is in oil pan, but cannot because of the air trapped between bottom of Pan Unit and the liquid in Dash Unit. The oil in attempting to enter the Pan Unit presses on the trapped air, the pressure being transmitted through Pan Unit and Pressure Line to Dash Unit, where it presses the liquid up in the glass tube.

High or low pressures may exist in oil pan at different times. These different pressures will be transmitted through the Pressure Line and would cause high or low readings but for the Equalizer Line which transmits these pressures to the side of U-tube opposite where Pressure Line connects, equalizing them so they do not register on Dash Unit.

Figure 2 shows that operation of Gauge depends upon air being securely trapped in Pan Unit, Pressure and Equalizer Lines. A loose connection on Pressure Line would permit the trapped air to escape and oil would rise to same level in Pan Unit as in oil pan. There would then be no pressure and the Dash Unit would register incorrectly. If both Pressure and Equalizer Lines were loose, the liquid would fall to bottom mark on dial regardless of amount of oil in pan. The same condition might exist with only a loose Pressure Line connection. The connection can be tightened but Dash Unit will not register correctly until Pan Unit has been cleared of oil and filled with air. This is done by the splash of oil as described under Pan Unit.

The Pan Unit:

Fig. 3 shows the Air Tube and Air Chamber which must always be filled with air. The oil tries to enter through hole (C) and thus presses on the trapped air. The oil in pan below hole (C) does not register, but above this point the gauge registers quart for quart the amount of oil in pan. The Drip Cup and Air

Delivery Tube act only as a means of supplying air to Air Chamber. This is to overcome contraction of air due to a drop in temperature.

When oil is splashed onto Drip Cup it drips through the hole in the Cup into Air Delivery Tube, trapping air bubbles as it drips. The weight of this oil forces the air down through Air Delivery Tube into the Air Chamber where it displaces any oil which may be there. When the air Chamber is full of air the excess air bubbles pass off and are not used.

The Dash Unit:

Fig. 4, is simply a U-tube containing a special liquid. The front half is a glass tube at top of which the Equalizer Line is connected. The back half is a brass tube to which the Pressure Line connects. The Pressure and Equalizer Lines are hollow tubes connecting Pan Unit to Dash Unit. Their purpose is only to transmit pressures as described above.

To have Gauge read correctly, three conditions are necessary:

1. The liquid in Dash Unit must be set at bottom line of dial when both Lines are disconnected at Dash Unit. (Disconnect Lines at Pan Unit first, then at Dash Unit).

2. The Pressure and Equalizer Lines must provide air tight passages between Dash Unit and Pan Unit, and must be free from obstructions. The most common obstruction is oil which can only get into Lines when there is a leak or when connections are not properly made. Oil in Lines will prevent proper operation of Gauge.

3. The Drip Cup must supply air by splashing of oil.

When these conditions are fulfilled, the Dash Unit will immediately record the oil poured into an empty pan, or if there is oil in the pan before the Lines are connected, the liquid in Dash Unit will rise as car is driven until true reading is reached. Stopping, starting, and turning corners will speed this action.

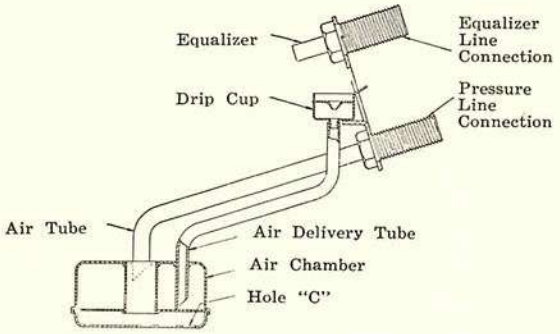


Fig. 3—Pan Unit

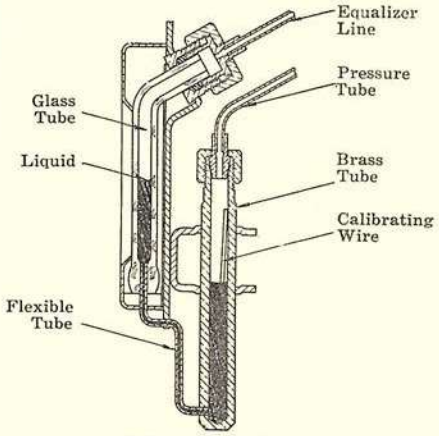


Fig. 4—Dash Unit

SERVICE INSTRUCTIONS

In servicing the Oil Telegage be careful to follow these instructions exactly.

WARNING: Do not remove Dash Unit from instrument panel or start putting on new units until following adjustments have been made.

1. Disconnect both Pressure and Equalizer Lines at Pan Unit. Then at Dash Unit. Examine cone and cone seats on all connections for dirt or flaws.

2. Set liquid in Dash Unit even with bottom line of dial by adding or removing liquid at brass tube where Pressure Line was disconnected. Use only Telegage Liquid of same color as originally in Dash Unit.

3. Clean out both Lines by forcing a cup full of gasoline through each line.

4. Dry both Lines, exactly as follows:

(a) Use a hand tire pump (nothing else will do).

(b) Cut metal tip from tire pump hose and push hose over end of line.

(c) Give at least 25 continuous strokes.

5. Test both Lines for air leaks. Hold a finger over one end and suck with mouth on the other. If the suction holds the tongue for one minute the line is O.K.

6. If either Line leaks, change it.

7. Reconnect Lines at both ends, making tight joints.

TO TEST THE GAUGE

Drive car until liquid registers amount of oil in pan. Stopping, starting, and turning corners will speed this action.

If gauge reads correctly while car is being driven and holds the reading 30 minutes with engine dead, the repair is completed.

But—if after test has been made the gauge does not register, or the reading does not hold with engine dead, then the Pan Unit must be examined. This is a rare condition, therefore, inspect carefully the Dash Unit, Lines and all connections before removing Pan Unit.

CAUTION: Disconnect both Lines at Pan Unit before draining oil.

1. Drain Oil.
2. Remove oil pan.
3. Remove Pan Unit and look for broken joints or signs of damage.
4. If Pan Unit appears O.K., rinse thoroughly in gasoline and dry with air. See that small hole in bottom of Pan Unit is open.
5. Clean oil pan.
6. Replace Pan Unit, making sure that lip of Drip Cup is tight against side of oil pan.
7. Replace oil pan and reconnect both Lines.
8. Pour oil back in pan and check gauge for registration as above.

GASOLINE TELEGAGE

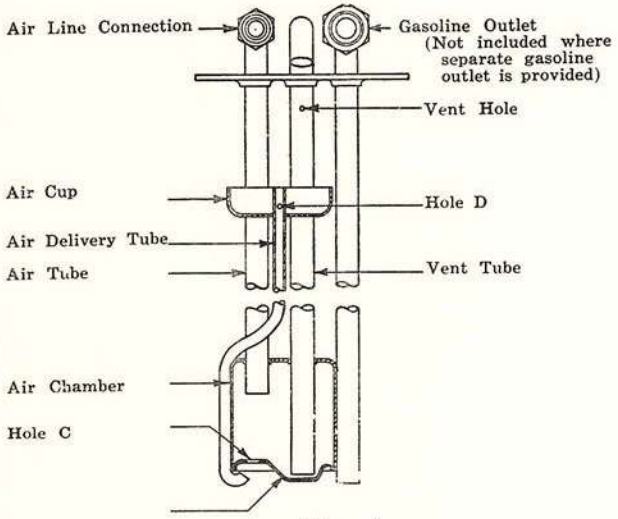


Fig. 1

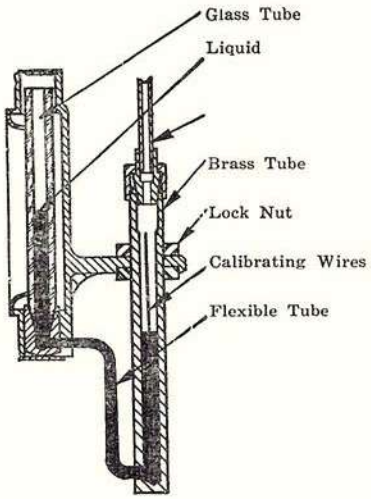


Fig. 2

The Gasoline Gauge on Instrument Panel indicates amount of gasoline in rear tank, allowing a reserve of about one gallon. It is operated by the weight of the gasoline pressing on a column of air, causing the red liquid in gauge head to rise or fall.

The Gauge consists of three units, the Tank Unit (Fig. 1), the Head (Fig. 2), and the Air Line.

The Tank Unit shows the air tube and air chamber which must always be filled with air. The gasoline tries to enter through hole (C) and thus presses on the trapped air. This is the only part of Tank Unit that has anything to do with the Gauge reading. The Vent Tube, open at top, is a Safety device protecting gauge against high pressure and not affecting its operation.

The Air Cup and Air Delivery Tube supply fresh air to Air Chamber. This is to overcome loss of air due to absorption in the gasoline and contraction due to a sudden drop in temperature.

The Head is mounted on Instrument

Panel in combination with the Oil Telegage. It is simply a U tube containing the red liquid. The front half of the U tube is a glass tube open at top. The back half of a brass tube to which the air line from Tank Unit is connected at top. Pressure coming through Air Line presses the liquid downward in the brass tube and upward in the glass tube.

Three things are necessary to have Gauge read correctly:

1. The red liquid in head must be set at bottom line of dial when air line is disconnected, and must hold this setting. If Head leaks and will not hold setting, it should be replaced.
2. The Air System must be free from leaks or obstructions. The most common obstruction is gasoline which can only be driven into the line when there is a leak, or improper connections. Gasoline in the line will cause an erratic reading of the gauge.
3. The Tank Unit must supply air by the splashing of the gasoline.

When you have these conditions and the gauge is reconnected, the liquid in Head will rise when car is being driven and will continue rising until it records true contents of tank. Stopping, starting, and turning corners will hasten the action, and gauge will hold its reading unless disconnected.

Do not remove Gauge Head from Instrument Panel or change any Unit until after checking as follows:

1. Remove tank filler cap. The vent holes in cap should be free from dirt, and open. Do not replace filler cap or drain gas tank.
2. Try Tank Unit connection to be sure it is tight, using a second wrench to prevent tube from twisting.
3. Disconnect Air Line at front end only. Red Liquid must now read even with bottom line of dial. Add or remove liquid as required at top of brass tube where air line was disconnected. Use a medicine dropper to add liquid; use a match to absorb some. Be careful that match does not pull out any shims (small wires). Never loosen lock nuts to move brass tube up or down. If Dial or Paper Reflector back of glass tube is stained at bottom, install a complete new Head.
4. Dry Air Line. Follow exactly or get no results.

A. Use a good hand tire pump (never use compressed air).

B. Cut metal tip from tire pump hose.

C. Push hose securely over front end of Line.

D. Give at least 50 good full strokes continuously.

5. Reconnect Air Line, making tight joint.
6. Replace tank filler cap.

The gauge will then read zero until car is driven a few blocks. Start, stop and turn corners several times to bring reading up quickly. The reading should stay set when car is left standing, indicating that the job is completed.

However, if the reading comes up, but does not hold for an hour with car standing, a defective unit is indicated, and you should follow instructions below to determine whether failure is in Air Line or Tank Unit.

1. Disconnect the Air Line front and rear.
2. Inspect cones and seats for dirt or flaws.
3. Blow out Air Line (see check 4 above), and test for a leak. Hold finger over one end and suck on the other end. If the suction created will hold the tongue *for one minute* the Line is O.K.
4. If Air Line shows a leak, or is plugged, change it.
5. If the Air Line and connections check O.K., the defect is in the Tank Unit, which should be changed.

CAUTION: Defective Tank Units are very rare; therefore, inspect carefully the Gauge Head, Air Line and connections as the trouble is more likely to be in one of these places than in Tank Unit.

Warning:

All Air Lines for the combination Oil and Gasoline Gauge Heads are run through the same conduit. The Air Line fittings for pressure side of Oil Gauge are the same as those for the connecting part of Gasoline Gauge. Should they become crossed, neither gauge would read correctly and in all probability the liquid in Oil Level Gauge would be forced into the Equalizer Line. To distinguish between the two lines the gasoline Pressure Line is painted red, and the Oil Level Pressure Line

is painted Green at the end where they connect to the brass Adjust Tube.

Be careful to avoid a mix-up in these lines.

The special liquid used in Gasoline Gauge Head is colored red, and that used in Oil Gauge Head is green. You should carry enough of these liquids in stock to supply your trade. Our Parts Department can supply it in 1/8 ounce and 1 ounce bottles.

ELECTRICAL EQUIPMENT

The Electrical System is one wire, meaning that one side of the circuit is completed through the insulated wires, the other side through car frame.

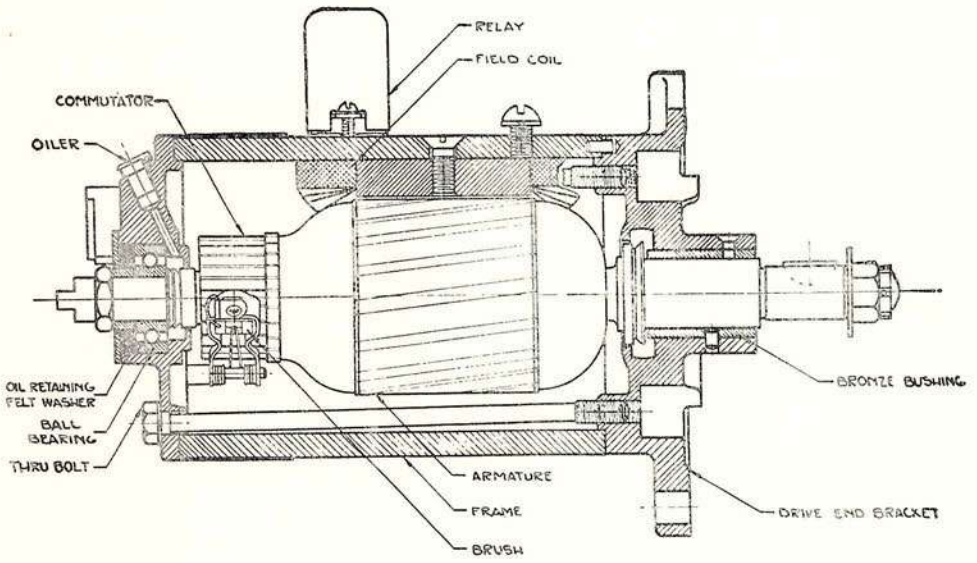
Examine wiring system at intervals for loose or corroded connections and worn insulation.

The electrical units are guaranteed by the manufacturer, Delco-Remy Corporation of Anderson, Indiana, and warranty service can be obtained at any United Motors Service Station, a directory of which can be obtained from United Motors Service, Inc., Detroit, Michigan.

The following equipment is used:

Generator Model 955-H.
Relay Model 265-B.
Starting Motor Model 722-F.
Distributor Model 660-Z.

GENERATOR



The Generator supplies current for ignition and lights at normal driving speed. The excess current supplied by generator keeps the storage battery properly charged.

The Generator delivers its maximum output at a car speed of 18 to 25 miles per hour, and at higher speeds the charging rate slightly decreases.

The Generator is third brush control and the charging rate is governed by position of third brush. It is mounted on an adjustable arm between the main brushes.

When Generator leaves factory the output is adjusted to average driving conditions. The charging rate should not be changed except by one who fully understands the work. To change the output, loosen the round head screw outside of commutator end bracket and move the third brush in direction of armature rotation to increase, and in opposite direction to decrease the charging rate.

The third brush control is supplemented by a Thermostat, operated by heat inside generator. When inside of generator reaches about 162° F., the thermal blade of thermostat bends down, opening the contact points, and

this inserts in series with the generator field a resistance unit and as a result the generator output is decreased.

This permits a higher charging rate on short drives and for a longer period in winter time, which helps restore into the battery current taken out by starting motor, and helps protect battery from overcharge on long drives.

If generator suddenly ceases to charge, the thermostat resistance may be burned in two. If so, examine charging circuit for loose or high resistance connections.

Do not attempt to adjust the thermostat. It should be replaced if points are burned or out of adjustment.

Generator rotation is clockwise viewing drive end. Brush spring tension is 14 to 18 ounces. Maximum cold output (thermostat closed) 19 to 21 ounces, 8.3 to 8.5 volts at 1450 RPM. Maximum hot output (thermostat open) 9 to 12 amperes, 7.3 to 7.6 volts at 1800 to 2000 RPM.

Add 8 to 10 drops of engine oil in the hinge cap oilers on front and rear of generator every 1000 miles. Be careful not to overlubricate the generator, as excess oil may get into commutator and interfere with generation of current. If commutator is oily or gummy, clean with fine sandpaper (not emery cloth).

When generator stops charging, first clean the commutator if dirty. Connect lead between the two relay terminals and if generator charges the relay is at fault. Examine the circuit from generator to battery, and if all right the trouble is in generator and it should be taken to an authorized Delco-Remy Service Station.

CUT-OUT RELAY

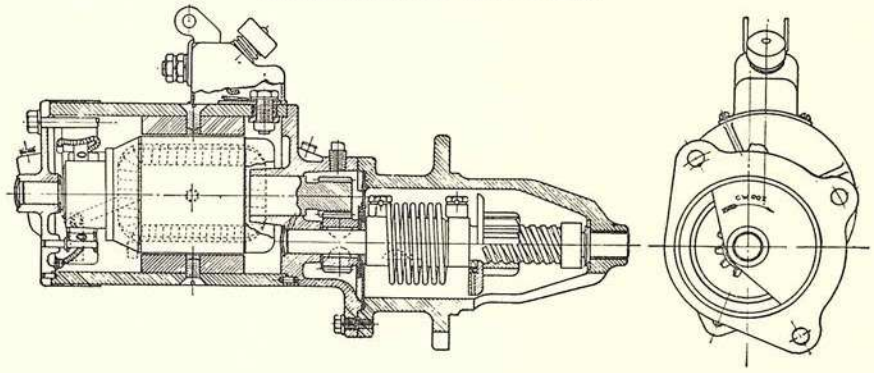
The Generator Cut-out Relay is mounted on outside of generator body and is used as a protection to prevent generator windings from overheating at low engine speeds when the current flow from battery would go through the windings of generator.

It automatically connects and disconnects generator and battery. When generator voltage exceeds battery terminal voltage, the relay points close and connect generator with battery. When generator voltage becomes less than battery voltage, the relay points open, disconnecting and preventing battery from continuing to discharge into generator.

Adjustment:

The relay should cut in at 6.75 to 7.5 volts and cut out at 0 to 2.5 amperes.

STARTING MOTOR



The Starting Motor, in Cranking the engine, draws its current from the battery. As the current required is many times the range of dash ammeter, the current does not go through ammeter and discharge is not registered while starting motor is operating. It requires no adjustments.

The Bendix drive operates automatically. Upon closing starting switch the armature begins to revolve and with it the Bendix screw-shaft, carrying Bendix gear forward and engaging it with flywheel. When flywheel turns

faster than armature the Bendix gear is disengaged from flywheel and threads back on the shaft. If the gear does not travel along the screwshaft, clean the drive thoroughly but do not oil the shaft.

If Bendix gear becomes locked with flywheel, place gear shift lever in high with ignition off, and rock car backward and forward.

Rotation of starting motor, viewing drive end of motor, is clockwise. Brush spring tension 24 to 28 ounces.

Add 8 to 10 drops light engine oil in hinged cap oilers every 1000 miles.

If starting motor is sluggish it may be due to low battery, poor battery connections, burned or partly grounded starting switch, or trouble in starting motor.

Connect a heavy cable between starting switch terminals and if starting motor performs properly the trouble is in switch.

If starting motor fails to start, close starting switch, touch the motor terminal and any part of motor frame free from paint and dirt with screw driver, and if a spark is obtained the circuit to motor is all right but trouble is in motor and it should be taken to a Delco-Remy authorized Service Station for repairs.

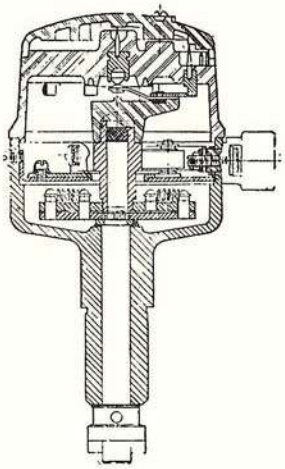
IGNITION DISTRIBUTOR

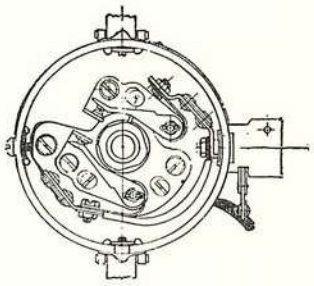
The Distributor interrupts the circuit through the coil, distributes the high tension current to spark plugs in proper time and correct firing order, and advances and retards the spark.

The spark advance is semi-automatic, part of the advance being automatic and part manual. The manual advance is 15 engine degrees and the automatic advance starts at 500 RPM of engine, and is 24 engine degrees maximum at 2600 RPM.

Distributor rotation is counter-clockwise, viewing the top.

Contact arm spring tension is 17 to 21 ounces. Contact point separation .018″ to .024″. Adjust by loosening the screw back of points which holds the crescent-shaped contact plate. Then turn the offset screw which is in the plate and near breaker arm post.

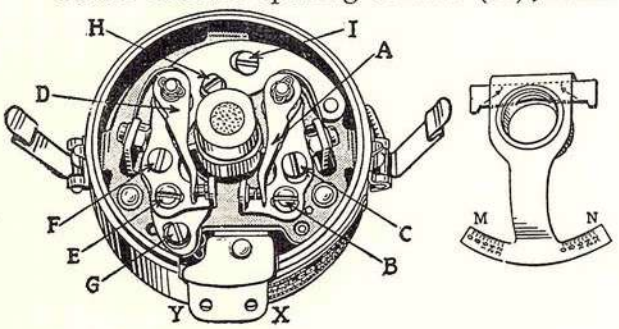




TO SYNCHRONIZE BREAKER ARMS

One set of contact points is stationary and the other set is movable. Adjust stationary set first and complete the synchronizing by adjusting the movable set.

To set contact opening of arm (A), turn distributor shaft in its direction of rotation until rubbing block of arm (A) is on lobe of cam. Loosen screw (B) and turn screw (C) to get contact opening, which is .018″ to .024″, and preferably .022″. Tighten screw (B).



Again turn the shaft until rubbing block of arm (D) is on lobe of cam. Loosen screw (E), turn screw (F) until points open between .018″ and .024″, (preferably .022″), and tighten screw (E).

Put synchronizing tool over cam, locking it with the slide pushed through showing the arrow that points in direction shaft rotates as

viewed from top.

As rotation is counter-clockwise, viewed from top, turn shaft in that direction until arm (A) breaks contact. Note marking on N side of synchronizing tool that is in line with point X, which is edge of slot in distributor base rim. Continue turning shaft until same marking on M side of tool is in line with point X. Loosen screws (G) and (H) and turn screw (I) until arm (D) breaks contact. Check by rotating shaft again. Tighten screws (G) and (H). Also check contact opening of breaker arm (D) and if it was set before at .022" it should still be within the limits. If outside these limits, reset the point opening and synchronize arms again. Confine the adjustment to arm (D) to complete synchronizing.

The graduations on the tool represent engine degrees and breaker arm must not be more than two engine degrees out of synchronism.

The eye cannot detect the moment the points open, and to get an accurate synchronizing adjustment connect an ammeter in ignition circuit at distributor terminal. If on the car, make sure ignition switch is "on." The instant the ammeter needle drops back to zero, the points open.

If points become dirty or rough dress them with a fine grade hone. Under normal operation they will acquire a grey finish.

Condenser:

The condenser prevents arcing and burning at contact points, and is connected across them. If the points burn and pit, causing engine to miss, first tighten condenser connections and clean the points. If the action continues, replace condenser.

Lubrication:

Give grease cup cap several turns every 1000 miles and refill with a good grade of medium cup grease.

IGNITION COIL

The battery voltage is too low to jump the spark plug gap, and the coil acting as a transformer, converts the low voltage battery current to a high voltage current that will jump the gap in spark plugs.

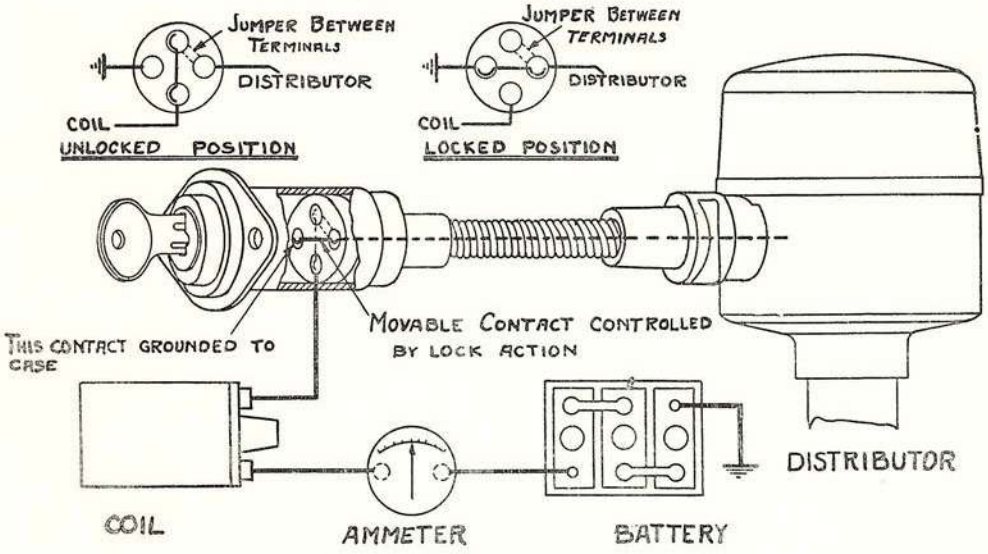
TESTING IGNITION

If ammeter shows about 4 amperes discharge when ignition switch is on and contact points are closed, the ignition circuit is complete. If not, trace the open by touching a wire from some grounded part of car, such as the engine, to successive connections in ignition circuit and a flash means the circuit is complete to that point.

To test the coil, turn on ignition switch, and with contact points closed, remove the high tension lead from distributor cap that comes from coil and hold the end about 1/8" from a place on engine free from paint and dirt. Take off distributor cap and pull back contact arm with the thumb. If coil is all right, the spark will jump the 1/8" gap.

ELECTROLOCK

Operation and Service:



This is a coincidental Ignition Switch Lock, approved by the Underwriters Laboratories.

When keyway is in vertical position the ignition is shut off and car is locked. To unlock, turn key ¼ turn to right, which closes ignition switch. To lock Electrolock turn cylinder back so keyway is in vertical position.

When cylinder is in locked position the Ignition Circuit is broken and grounded. The wire between Electrolock and distributor is protected by enclosure in a steel cable which is attached to distributor in such a way that it is difficult to remove.

The ignition switch is grounded both through the casing and through attachment at distributor.

Should ignition trouble develop, make following tests to see if it is in Electrolock. First, disconnect the wire from terminal on lock case. Then test the switch in following manner by using a six-volt circuit and the conventional insulated handle test points.

The lock has one terminal only on side of lock case. In making the tests the breaker points should be open.

First Test:

Place one test point on primary terminal inside distributor and the other test point on lock terminal. With switch unlocked the lamp should burn. With switch locked the lamp should not burn.

Second Test:

Place one test point on primary terminal inside distributor as in first test, and the other point on lock casing. With switch locked the lamp should burn. With switch unlocked the lamp should not burn. If the lamp burns, either there is a ground in Electrolock or the distributor condenser is shorted or grounded. Disconnect condenser from distributor to determine whether trouble is in Electrolock or condenser.

If tests show up satisfactorily and ignition trouble still exists, the trouble must be located elsewhere in ignition circuit.

Should tests indicate trouble in Electrolock, it will be necessary to replace the complete Electrolock, less lock cylinder and keys.

To remove Electrolock, first remove screws that fasten mounting flange to instrument board, disconnect condenser from condenser terminal assembly, then back off nut on inside of distributor that fastens terminal post to distributor. The Electrolock can then be removed from distributor.

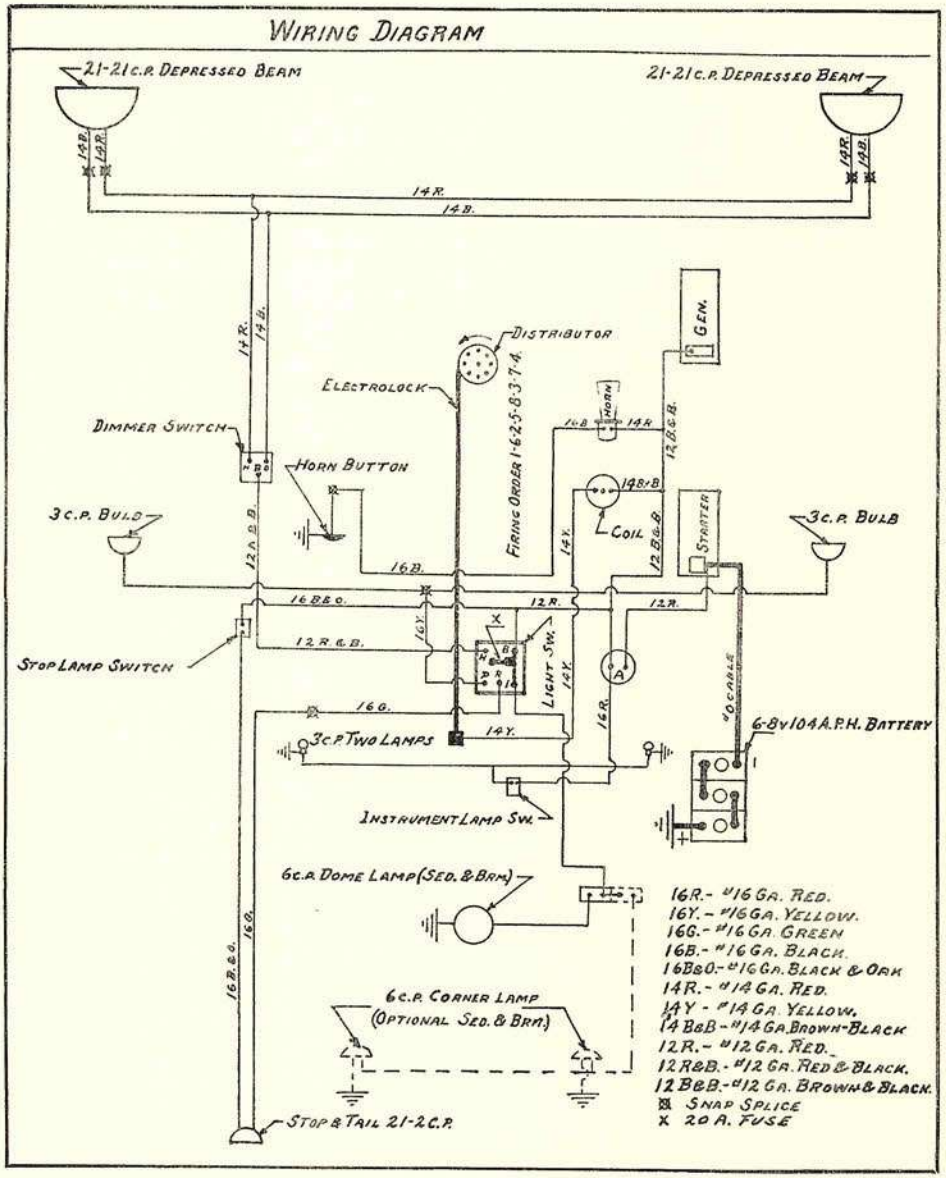
Remove lock cylinder from Electrolock by turning it to the unlocked position and inserting a 1/16″ wire in hole in side of lock case, and press down on wire.

To make distributor repairs which cannot be done on the car, the Electrolock can be removed from instrument board and the distributor taken to the bench with Electrolock attached.

Should lock cylinder not work freely on account of dirt or foreign matter getting into lock case, the cylinder should be removed and cleaned so it will work freely.

Never put grease or oil in lock cylinder. If tumblers seem to stick, use graphite.

All wire terminals should be insulated down to screw head to eliminate possibility of shorting by touching one another or nearby metal parts.



LUBRICATION

This model is equipped with the Bijur System of Automatic Chassis Lubrication, which feeds oil to nine important chassis points, as explained on pages 25 to 27.

Note below data on additional lubrication points not serviced by the automatic system, which are also treated under their respective headings.

It is of utmost importance to use correct quality lubricants at proper intervals. Dealers should urge owners to come to their Service Stations for this important service.

Engine:

The crankcase should be drained and refilled every 500 miles or oftener if necessary. Capacity about 8 quarts. See page 9.

Water Pump:

The grease cup on waterpump must be kept filled with Kasson's Waterproof Grease only, and the cup should be given a full turn frequently. Our Parts Department can supply it and we suggest that you carry it in stock for your trade. One half ounce is enough for one filling.

Fan:

Use engine oil in fan hub as indicated on page 4.

Generator:

Every 1000 miles add 8 to 10 drops of good grade light engine oil in hinge cap oilers mounted on front and rear.

Starting Motor:

Every 1000 miles add 8 to 10 drops of good grade light engine oil in hinge cap oilers.

Distributor:

Keep grease cup filled with good clean medium cup grease and give the cap several turns every 1000 miles.

Universal Joint:

Pack both joints with high grade, fibrous non-fluid grease whenever needed. We recommend that lubricant in joints be checked every 5000 miles. See page 34.

Steering Gear:

Keep the housing filled with one of the approved lubricants listed on page 38.

Drag Link and Front Axle Tie Rod:

Fill the Alemite fittings with good clean cup grease every 500 miles, or oftener if necessary.

Wheel Bearings:

Clean and pack with good clean cup grease at least twice a year.

Transmission and Free Wheel Unit:

Any good grade of transmission fluid oil is recommended for use in these units. However, a lubricant having a viscosity of 90 to 110 at 210 degrees Fahrenheit for winter use, and one with a viscosity of 160 to 180 at 210 degrees Fahrenheit for summer use, will give satisfactory service.

Differential:

Any good differential fluid oil is recommended for use in this unit. However, a high grade lead soap base lubricant which prolongs the life of gear teeth may be used if desired.

The oil must always be kept up to the level of the oil filler ports in Transmission, Free Wheeling Unit and Differential Housings. The oil level in these housings should be checked every three months, and oil added if necessary. Any Auburn Distributor or Dealer can supply you with the proper lubricant for these units.

In addition to above, oil all Brake Rod Connections, Yokes and Levers with hand oil can once every 1000 miles.

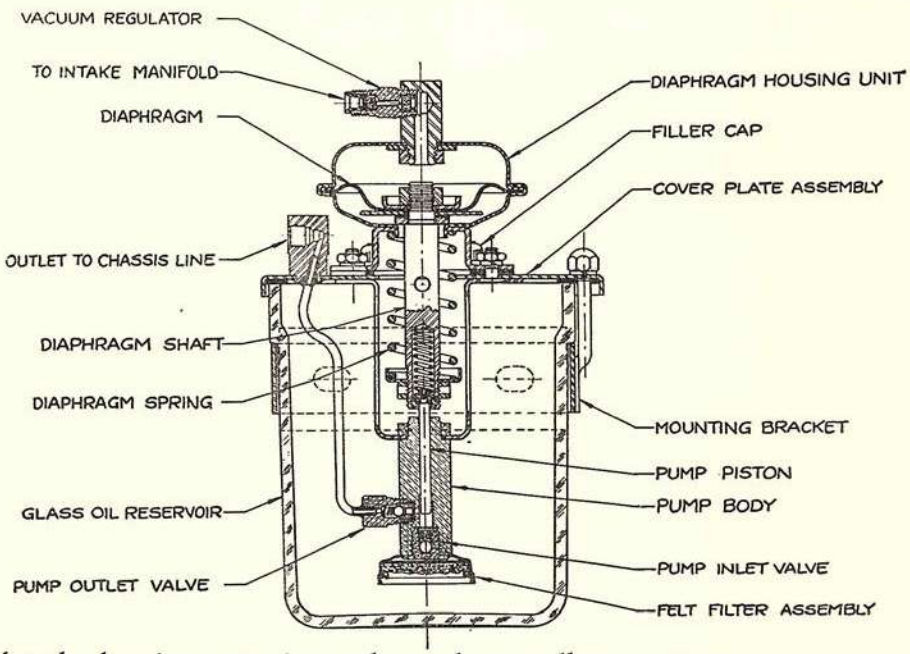
Occasionally use penetrating oil on Door Locks, Hinges, Strikers and Dove Tails.

AUTOMATIC CHASSIS LUBRICATING SYSTEM

The Bijur System of Automatic Chassis Lubrication operates constantly while car is running, and supplies proper amount of oil to each bearing under all driving conditions. With continuous feed, the total requirement of all chassis bearings is only a few drops per mile, and the pump is made small enough to deliver this amount.

The quantity of oil fed into chassis lines is determined by the pump output, and this is controlled automatically by the vacuum in intake manifold of engine. The requirements of each bearing are predetermined and proper flow rates apportioned to each point by correctly designed drip plugs. Thus the division of oil is accomplished without the use of moving parts.

The distance of drip plugs from central pump has no effect upon bearing lubrication, nor does the tightness of the bearing produce any variation. The relative quantities received by the bearings remain unchanged, regardless of temperature, as the drip plug alone determines the flow rate. All parts are protected by adequate filters, so dirt cannot enter lines or bearings and prevent correct operation.



The Lubricator is a self-contained, non-adjustable unit, mounted on right side of engine, and consists of a glass oil reservoir in which the automatic pump mechanism is mounted. A diaphram unit is fastened on top of cover plate directly over pump and this is connected directly to the pump piston by a rod provided with a universal joint. The diaphram is contained in a sealed cover, the upper chamber of which is connected to engine intake manifold by suitable tubing.

When car is running steadily on a smooth road, there is a nearly steady vacuum in intake manifold. This vacuum is transmitted through the connecting pipe to vacuum chamber. The vacuum pulling the diaphram up is resisted by a spring pulling it down, causing it to assume an intermediate position, depending on the relative strength of the spring and vacuum pull. When engine is accelerated, the vacuum immediately decreases in proportion with throttle opening, but it gradually increases as engine picks up speed.

This decrease in vacuum lets diaphram down under the spring pressure and the pump will discharge. The increase in vacuum gradually lifts the diaphram, also the piston, drawing in a new charge of oil ready for the next discharge. If car is running along at good speed, and accelerator is let up, the vacuum is increased and piston is drawn still higher on intake stroke ready for discharge when the vacuum becomes lower due to lower car speed, or the next throttle opening.

While the pumping consists of a great number of short strokes combined with a few more complete ones, these continual motions average to a constant number per minute, considering all variations of driving conditions. As a result the pump size is designed to provide correct quantity of oil under all conditions

To avoid the irregular pumping effect of violent changes of vacuum in intake manifold, a regulator is used at the vacuum line connection in top of tank. This vacuum regulator is much like a drip plug without a valve, having

a restriction pin protected at each end by a filter, since air flows through it in each direction alternately. Regulators of different rates than standard may be substituted to obtain either more or less oil for special conditions. However, except in unusual cases, the regulator provided will be satisfactory.

The regulator requires that any change in vacuum remain in effect several seconds before the entire pump stroke is completed, and that effect is usually obtained with engine pulling car on the road as it requires time either to pick up speed or to slow car down. However, with car standing still, changes in manifold vacuum due to operation of throttle or engine "rolling" do not have enough time to work through the regulator and cause more than very small pump strokes. Therefore, it is unsatisfactory to try to work the pump fast merely by racing the engine in the shop.

This system differs from the foot operated system, both in construction and performance, and a different method of testing and servicing must be used. In the foot-operated system, one operation of pump discharges into the lines enough oil to lubricate chassis for 100 miles of car travel. The automatic pump feeds oil continuously to following points while car is running:

Front Axle King Pins	2 Points
Front Spring Front Eye	2 Points
Rear Spring Front End	2 Points
Rear Spring Shackles	2 Points
Clutch Throwout Bearing	1 Point

Inspecting and Testing:

Because of the very slow speed by the automatic pump, this system cannot be so easily checked for proper operation. With the foot-operated system a few quick strokes of pump would force plenty of oil to drip plugs while the automatic system will require 15 minutes or more of driving in order to form a single drop of oil at a given drip plug. Therefore, closer attention must be given to inspection.

To test the entire system, use one of following described methods, after which examine each oiling point to be sure oil is delivered to it. To test the lubricator, first follow Method B, disconnecting outlet pipe to see if pump is delivering oil.

METHOD "A"—Drive car on the road at 20 M.P.H. and then accelerate fully while three (3) seconds are counted off, then allow car to coast for three (3) seconds, then accelerate again, and so on for several miles, or until oil is seen at the shackles.

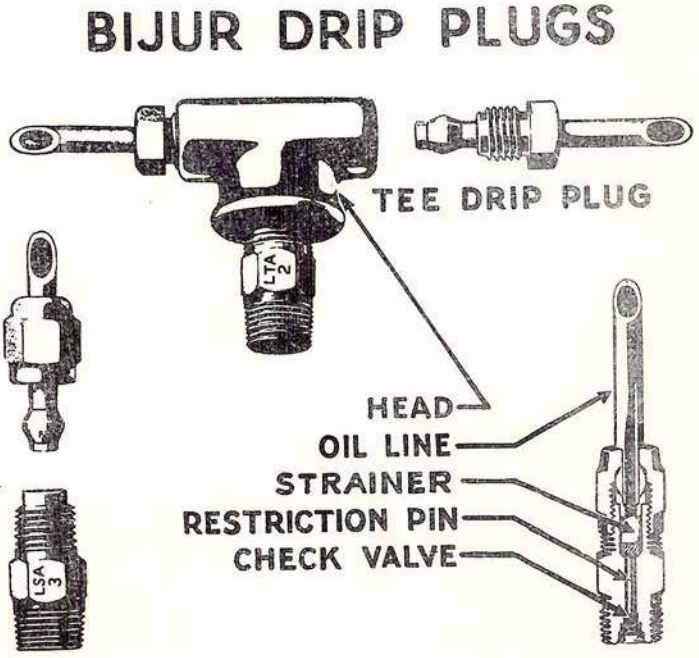
METHOD "B"—To quickly check the operation of system in the shop, remove the vacuum regulator and substitute for it an open testing fitting, which we can supply. Leave the line disconnected, and with engine idling, merely touch the line to the testing fitting to make a quick suction, take it away, touch it again, and so on. The pump can be heard to thump strongly when doing this, although it will not do so in normal operation.

When through testing, be sure to replace original regulator or pump will not operate, and no oil will reach the bearings.

In replacing regulator, make the joint air tight by coating pipe thread on plain end with a sealing material. Be careful not to get paint on ends of regulator or the system will be clogged. Use asphaltum paint or white lead paint. Never use any form of lacquer for this purpose.

If a particular bearing runs dry, due perhaps to the drip plug, always be sure the line is full of oil. A partly empty line fills slowly with normal operation, and it may be necessary to resort to fast pumping to get the air out of line before oil can show at a bearing.

METHOD "C"—A method for filling the lines is to disconnect the automatic lubricator



and connect a foot-operated lubricator to the lines. A few strokes of this pump should fill the lines, after which the automatic lubricator should be reconnected. On cars where considerable lengths of piping have been replaced, or the system disturbed in servicing other parts, this method of filling the lines is especially efficient.

The drip plugs used with the continuous system differ from those used with the "Shot" system, and are not interchangeable. In replacing drip plugs, use only the type which must be used on the continuous automatic system, and be sure the new ones bear identical markings.

Priming a New Lubricator Tank:

Whenever a new lubricator is mounted on a chassis, it must be primed before connecting to chassis lines. Bolt the lubricator in place on engine, but do not connect vacuum line or chassis line. Fill reservoir with oil. Attach a piece of rubbing tubing to end of vacuum line, and with engine idling, hold the open end of this tube to the lubricator outlet (the one to which the chassis lines connect). Permit suction to exist for a half minute or so, or until oil shows at lubricator outlet. Now connect vacuum line in place.

Having primed the pump, make certain that chassis lines are full, and free from air. Method "C" is best for this purpose.

Service Assemblies and Parts:

The servicing of this system has been kept quite simple by the arrangement of sub-assemblies.

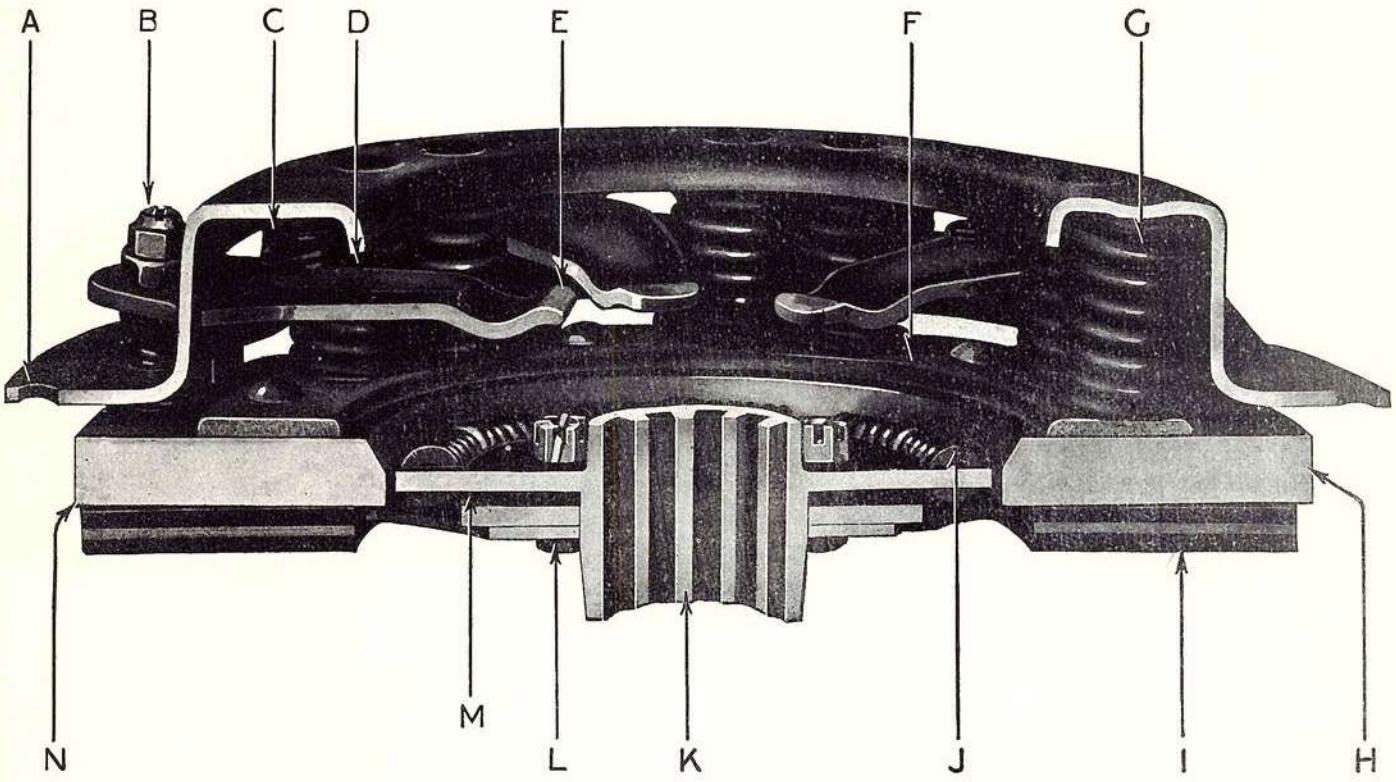
These units and their relationship to each other are shown in the illustrations.

Important: As chassis bearings are exposed to water, snow, mud, etc., the lubricating oil must have the necessary penetrating and water-excluding properties, and be thick enough to remain in the bearings for considerable periods. It must be anti-corrosive, free from gumming, have high lubricating value, etc., and must remain fluid in cold weather. Engine oils are far too thin and will not give satisfactory service.

We carry in stock a special oil, particularly adapted for this system and bearing our label — AUBURN CHASSIS LUBRICANT — which we can supply in 1-quart and 1-gallon cans. You should carry it in stock so you can promptly supply your car owners.

NOTE: The automatic tank has a capacity of one pint of oil.

MODEL 8-98 CLUTCH



A. Capscrew Holes (12).
B. Release Lever Nuts (6).
Not Adjustable.
C. Release Lever Return Springs (6).
D. Release Lever Clearance for Future Wear.
E. Release Levers (6).
F. Pressure Spring Heat Insulator Mat (1).
G. Pressure Springs (12).
H. Pressure Plate (1).
I. Friction Facings (2).
J. Mechanical Damper Cushioning Springs (12).
K. Splined Hub.
L. Mechanical Damper Friction Bolts, Nuts and Springs (3).
M. Mechanical Damper Friction Mat (1).
N. Natural Cone of Driven Disc when Released.

This is a single plate clutch, composed of two major units—the cover plate and driven member assemblies.

The cover plate assembly consists of a cast iron driving plate and the stamped steel cover in which are mounted 12 pressure springs and 6 release levers. The springs exert a combined pressure of approximately 40 percent over actual requirements. They are in direct action against the pressure plate and automatically compensate for all wear of friction facings. The six release levers are properly set in a parallel plane and permanently locked so they should require no future attention.

Frictional heat has been well taken care of as an asbestos heat insulator is provided, enabling each pressure spring to retain its full strength indefinitely.

The driven member is single plate type and has incorporated in it a mechanical vibration dampener. This unit, aside from being an important operating part, eliminates high speed transmission gear noise caused by engine vibrational periods.

Service Information:

As this clutch is self-compensating for facing wear, do not attempt to adjust release

levers. The lever nuts (B) are set and permanently locked after the levers are brought into a parallel plane when assembled, and should not be disturbed. As facings wear, the release levers travel outwardly until they contact with cover plate rim (D). At that time full wear of facings will have taken place and they should be replaced.

When reassembling clutch to flywheel use a dummy splined shaft to correctly align the splined hub with flywheel pilot bearing. Do this before the 12 cover plate cap screws are tightened. Be sure the clutch cover plate rim or flange fits freely and evenly into turned shoulder of flywheel. Unless this assembly is made correctly the release levers will not be parallel.

When new clutch cover plate screws are used they must be 5/16" - 18 SAE Standard, not more than 3/4" long and the threaded section extending within 3/16" of the shoulder.

Grease on friction facings will cause clutch to chatter and grab when engaged, or slip at higher speeds. Grease or oil permeates the facing material and, unless there is very little of it, cannot be satisfactorily removed.

If the facings are not oil soaked try cleaning with a cloth saturated with Naphtha. Afterwards they should be lightly scrubbed with a fine grade of sandpaper.

When excessive lubricant is found on friction facings they should be replaced by new ones of same type.

In installing new facings be sure to use only the moulded type which can be procured from our Parts Department. This type of moulded asbestos-friction facing is used because of its long wearing quality, and substitutes should not be used. Woven facings are unsuited for this type of clutch and will not give satisfactory service. Use three hand clamps to bring facings and disc tightly together for the riveting operation. Use tubular drilled rivets for best results. After riveting is completed the facings must fit snugly against driven disc.

High temperatures due to abusive service may cause small heat checks in face of pressure plate. While this will not interfere with proper operation of clutch, plates in this condition should be polished and cleaned with sandpaper or emery cloth.

There must, at all times, be at least one inch free movement between clutch pedal and floor board. As normal wear occurs this amount decreases, and if adjustment is neglected the clutch will be ruined by slippage.

The clutch pedal and all its release linkage must be kept well lubricated to insure free operation.

Clutch Service Policy:

To save the dealer the expense of procuring special assembly fixtures and tools for replacement of worn clutch parts, the following service policy has been adopted:

For a reasonable flat charge, the cover plate assembly and driven member assembly may be returned to Auburn Automobile Company for reconditioning. All worn parts will be replaced so these units will appear and operate the same as when new.

TRANSMISSION

Silent-Mesh Synchronized Gear Type:

When Transmission is removed or dis-assembled, all bearings and closely fitted parts must be carefully handled to prevent burring or injuring them. All facings must be cleaned, and bolts must be carefully and securely tightened, as the least misalignment will cause noisy gears and interfere with operation. When assembling ball bearings to drive gear or main shaft where a press or tap fit is desired, always use a pipe or any hollow tool that bears on the full surface of inner race.

To Dis-assemble Transmission:

The sectional drawing of Transmission with Free Wheel Unit attached has most of the important parts indicated by correct part numbers, which are referred to in following instructions:

1. Remove Transmission from car. In removing transmission case (B2-59) it is not necessary to remove clutch housing. Unbolt the universal flange at rear of transmission case, remove the four bolts holding to clutch housing, and move transmission case to rear. The splined shaft of main drive gear (B1-171) will slide out of clutch assembly, leaving clutch an entirely separate unit.

Until transmission is replaced be careful not to disturb the clutch, (if it is not to be removed), as depressing clutch pedal will misalign the clutch throwout bearing and clutch plates, making it difficult to work the splined shaft to place in reassembling transmission to clutch housing. If clutch alignment becomes disturbed, use our special clutch alignment arbor No. AU-7B (cost $3.50) to realign clutch so main drive shaft will easily slip into place. The shaft must not be forced into clutch.

On models which are equipped with the Free Wheeling Unit, should it be necessary to disassemble transmission, the Free Wheel Unit, which is bolted to transmission case, will have to be removed.

2. Remove control lever base (B5-134).
3. Remove countershaft locking plate and rear bearing retainer (B4-71).
4. Pull main drive shaft (B3-68) out as far as possible and tilt it up so plunger pin (PE-403) can be pressed down with a screw driver to permit removal of the serrated second gear thrust washer (B1-162) which fits over main drive shaft. The helical cut second speed gear (B1-200) and synchronizer gear (B1-165) can now be removed.
5. Remove main drive shaft (B3-68).
6. Remove main drive gear bearing cap (B4-70).
7. Drive out countershaft (B3-67) from the front end, allowing countershaft gear (B1-155) to drop.
8. Remove main drive gear (B1-171) and bearing assembly (5S-53).
9. Lift countershaft gear (B1-155) out in horizontal position. Great care should be used in doing this so as not to damage thrust washers (B1-157, B1-158 and B1-159), and when reassembling great care must be used to make sure the washers are assembled in their original positions.
10. Remove cotter pins from idler gear shaft (B3-66) and drive shaft forward in case to remove idler gear (B1-154).

To Assemble Transmission:

1. Make sure that main drive shaft bearing retainer ring (B4-63) and main drive gear bearing retainer ring (B4-62) are in place in transmission case.
2. Place transmission case on bench, front end down. Start idler gear shaft (B3-66), then place idler gear (B1-154) in transmission case, making sure that holes in case and idler gear are in alignment before driving idler gear shaft home. See that the milled flats are in proper relation whether for standard or free wheeling equipment. Place cotter key in idler gear shaft.
3. Place countershaft gear rotating thrust washer (B1-158) in position on small end of countershaft gear (B1-155). Slide countershaft gear into position in transmission case, then insert the two bronze stationary thrust washers (B1-157 and B1-159). Be sure idler gear shaft lock plate (B3-69) is in place.
4. Assemble main drive gear (B1-171), using a driver against inner race on main drive gear bearing (5S-53) then lift up counter-

shaft gear (B1-155) and drive countershaft (B3-67) home.

5. Assemble main drive gear bearing cap (B4-70) making sure that necessary main drive gear bearing shims (B4-68) are used to eliminate any end play in main drive gear bearing, as a pinch fit is necessary due to end thrust in the helical gears.

6. Assemble main drive shaft assembly (B3-68) using a driver against inner race of main drive shaft bearing (5S-52).

7. Assemble main drive shaft bearing retainer (B4-73) or (B4-71) using main drive shaft bearing shims (B4-67) necessary, or in other words, the same procedure as in fitting main drive gear bearing retainer (B4-70).

8. Assemble control lever base assembly (B5-134).

Lubrication:

The oil filler port is on left side of transmission case below center at rear. Keep the oil up to filler port level, but not above it. Use any good grade of transmission fluid oil, and check the level at least every three months.

The transmission capacity is 3 pints for a complete refilling.

See page 24 for viscosity numbers.

FREE WHEELING UNIT

The Free Wheeling device is mounted on rear of transmission and engages with it. It has three outstanding features:

Simplicity of construction and operation.

Positive action under varying temperatures.

A small number of parts.

It is operated by a single spring which performs the same in any temperature. The small lever in front of driver's seat engages or disengages the action with finger-tip touch at the will of the driver. When the lever is moved to forward position the action is locked "out" and will remain out until "Free Wheeling" is desired, when the lever should be drawn to rear position. This will permit "Free Wheeling" in all three speeds forward, and transmission gears can be shifted from first to second, and second to third, without disengaging the clutch.

In order that the owner may enjoy the full benefit of Free Wheeling it is important that you caution him to observe the following instructions for shifting from Positive Drive to Free Wheeling, and vice versa, as improper shifting may result in serious damage to parts and burring of gears with consequent hard shifting and engagement. When the driver once understands how to make a smooth, noiseless engagement, he will soon learn to properly handle the car.

To shift from Positive Drive locked position to Free Wheel Position, let up momentarily on accelerator pedal, thus relieving the load on the driving side of the gear, then draw free wheel unit lever back and the sleeve will easily slip into the Free Wheeling position.

To shift from Free Wheeling to Positive Drive, it is important that the speeds of driving and driven members be approximately the same. Step on the accelerator until the engine is brought up to a speed at which it will drive the car, and the shift can then be made easily and quietly. It is impossible to shift the sleeve without clashing gears when engine is idling with the car traveling at a higher speed. This condition is exactly the same as attempting to shift gears in a conventional transmission without throwing out the clutch.

To Disassemble Free Wheel Unit:

1. Disconnect brackets only at each end of brake cross shaft. Slip brackets off ends of cross shaft without disconnecting any clevis pins or rods, and drop cross shaft to lower edge of holes in frame side rails.

2. Disconnect both ends of propellor shaft assembly and remove propellor shaft.

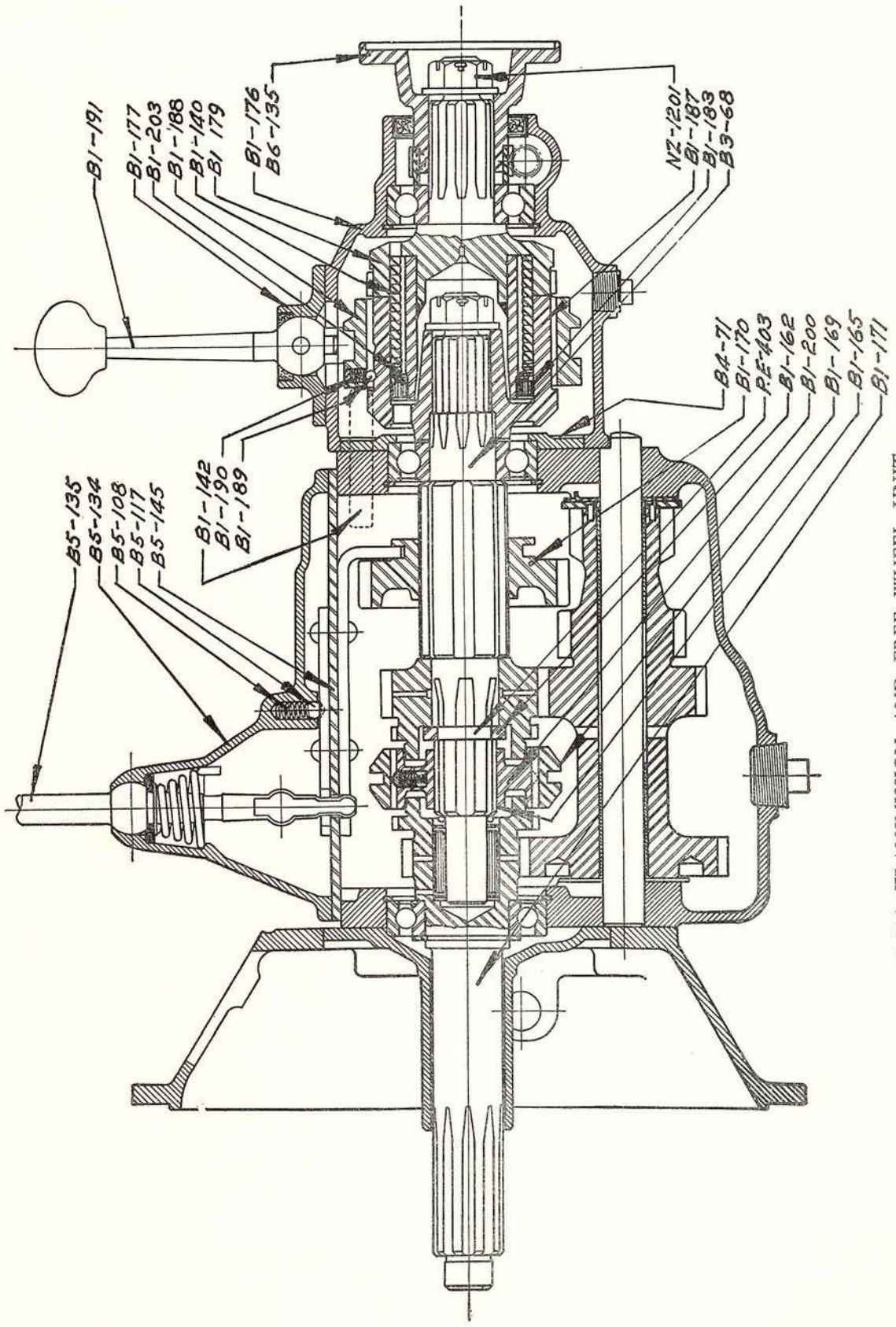
3. Drain lubricant out of Free Wheel housing by means of drain plug in bottom.

4. The Free Wheel Unit case cover (B1-177) should next be removed, carrying with it control lever and fork assembly (B1-191).

5. Remove six cap screws attaching Free Wheel Unit case to transmission.

6. Disconnect speedometer cable at Free Wheel housing.

7. Place transmission in any gear position, thus locking transmission main drive shaft (B3-68).



8-98A TRANSMISSION AND FREE WHEEL UNIT

8. The Free Wheel Case (B1-176) can now be pulled back approximately eight inches or far enough to remove the driving flange (B1-187). This flange must be removed to allow Free Wheel Case to pass between transmission and frame.

9 The foregoing operations will separate the Free Wheel unit spline shaft assembly (B1-179) and Free Wheel unit driving flange (B1-187) from each other, the Free Wheel unit spring (B1-140) remaining in one or the other of these parts. If the spring remains in the pocket of driving flange it can be removed by rotating it in the direction in which it will freely rotate.

10. Remove Free Wheel unit sliding gear (B1-188) from driving flange (B1-187) by merely pulling it rearward. This will release the sliding gear lock spring (B1-190) and sliding gear lock ball (B1-189) which hold sliding gear in position.

After performing these operations, the Free Wheel Unit is entirely disassembled for cleaning or inspection.

To Assemble Free Wheel Unit:

Before assembling the free wheel unit all parts should be carefully cleaned. Dirt or foreign matter in the free wheel unit could prevent satisfactory operation and cause bearings to become noisy.

1. Insert free wheel unit push out plunger (B1-142) in position shown in drawing.

2. Insert free wheel unit spring (B1-140) in the spline shaft assembly (B1-179) making sure the pilot (outward turned toe) on the spring is inserted in the hole at base of pocket inside of spline shaft assembly. *This is very important.*

3. Fit free wheel unit flange pilot bearing (B1-183) to its position in driving flange (B1-187). Slip washer (B1-203) into driving flange behind flange pilot bearing.

4. With free wheel unit case (B1-176), transmission main drive shaft (B3-68) and universal joint flange (B6-135) assembled as one unit, the protruding end of free wheel unit spring (B1-140) should be inserted into free wheel unit driving flange (B1-187) by again rotating the unit in same direction as when disassembling.

Rotating the free wheel unit spring in one direction has a tendency to wind it or make it smaller in diameter, and in the opposite direction to unwind it or make it larger in diameter.

5. When foregoing operations are completed and all parts in proper position, there should be a separation between free wheel unit driving flange and spline shaft assembly of between .005″ and .010″. These two parts should not be abutted against each other.

6. The necessary clearance is obtained by placing shims of required thickness between back of driving flange (B1-187) and transmission main drive shaft bearing (5S-52). A paper gasket (B1-141) which fits between transmission case and free wheel unit case must be in place when checking the clearance. To check the clearance, assemble free wheel unit to transmission, using two cap screws only, and with a spacing shim .025″ to .030″ assembled in the unit take measurements between the driving flange and free wheel unit spline shaft assembly (B1-179), using feeler gauges. When the clearance is determined, a spacing shim should be installed which will give the specified .005″ to .010″ clearance. *This is very important.*

The free wheel unit driving flange is removed to fit shims by removing nut (NZ-1201) on end of transmission main drive shaft. There should be no necessity for adding or removing spacing shims on assembling unless some part has been replaced.

Spacing shims of following sizes can be obtained from our Parts Department:

B1-143	.060″	B1-146	.010″
B1-144	.030″	B1-147	.005″
B1-145	.015″	B1-148	.003″

7. When proper clearance has been obtained between driving flange and spline shaft assembly, the free wheel unit should again be disassembled and free wheel unit sliding gear (B1-188) fitted in position.

8. Fit small ball (B1-189) and spring (B1-190) in free wheel unit sliding gear, locking spring in place with cotter pin. Be careful in fitting this cotter pin to make sure that the locking end does not scrape against shifter fork.

NOTE: Unless new parts have been installed in a unit which would alter the clearance between driving flange (B1-187) and

spline shaft assembly (B1-179), free wheel sliding gear (B1-188) should be installed before operation No. 4.

9. Replace all cap screws anchoring free wheel unit case to transmission case, but do not draw them tight.

10. Free wheel unit case cover (B1-177) can then be installed and bolted in place, making sure that control lever and fork assembly (B1-191) fits into groove of sliding gear collar (B1-188).

IMPORTANT NOTE: To determine definitely whether the free wheel unit has been properly reassembled, proceed as follows:

Shift transmission into low or second gear. Shift the lever (B1-191) rearward which places the free wheel unit into "Free Wheeling" position. Grasp universal joint flange (B6-135) and endeavor to rotate it in both directions. If the unit is properly assembled the universal joint flange will be positively locked against rotation in one direction but will rotate quite freely in opposite direction.

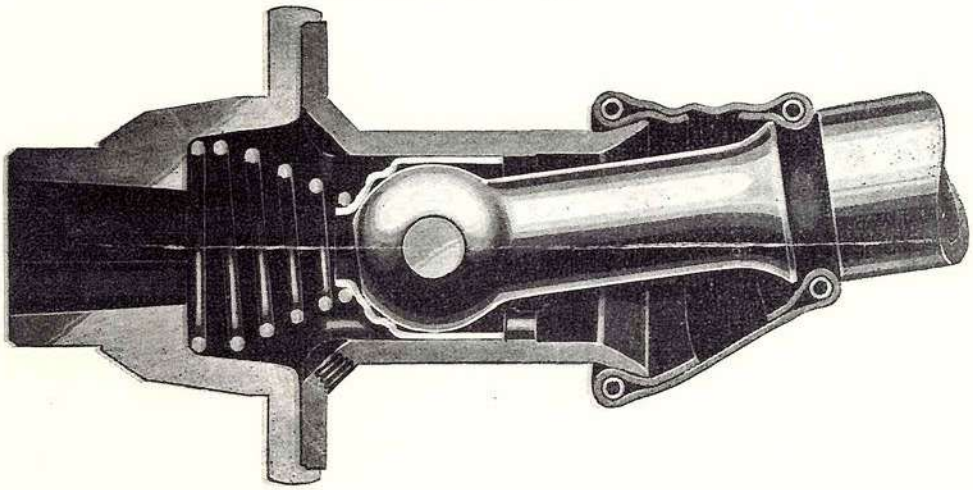
11. Replace brake cross shaft brackets.
12. Replace propellor shaft assembly.
13. Replace speedometer drive cable.
14. Raise rear wheels off floor. Start engine. Place car in gear, allowing it to run a few moments at slow speed. This operation will assist in securing correct alignment. Stop engine, and tighten all cap screws which fasten free wheel unit to transmission.

Lubrication:

An oil filler plug (PF-8) is provided in left side of free wheel unit case. Use same lubricants recommended for use in transmission. Keep the lubricant level up to the filler port, no higher. The level should be checked every three months and oil added if needed.

The Free Wheel Unit has a capacity of one pint of oil.

UNIVERSAL JOINT



The ball-bearing universal joints require very little attention, aside from lubrication which is vitally important.

The correct lubricant is a fibrous non-fluid grease, especially developed for this purpose. A list of recommended lubricants is shown below.

Do not over-grease as this will cause failure of dust covers. If cover is filled, or overloaded, the grease will be thrown to one side, breaking down the cover and throwing drive-shaft out of balance.

One to one and one-half ounce of grease is correct quantity for a joint when first assembled on car, and should enable it to run many thousand miles.

If dust cover is destroyed through over-greasing, the joint must be disassembled and thoroughly cleaned before replacing cover.

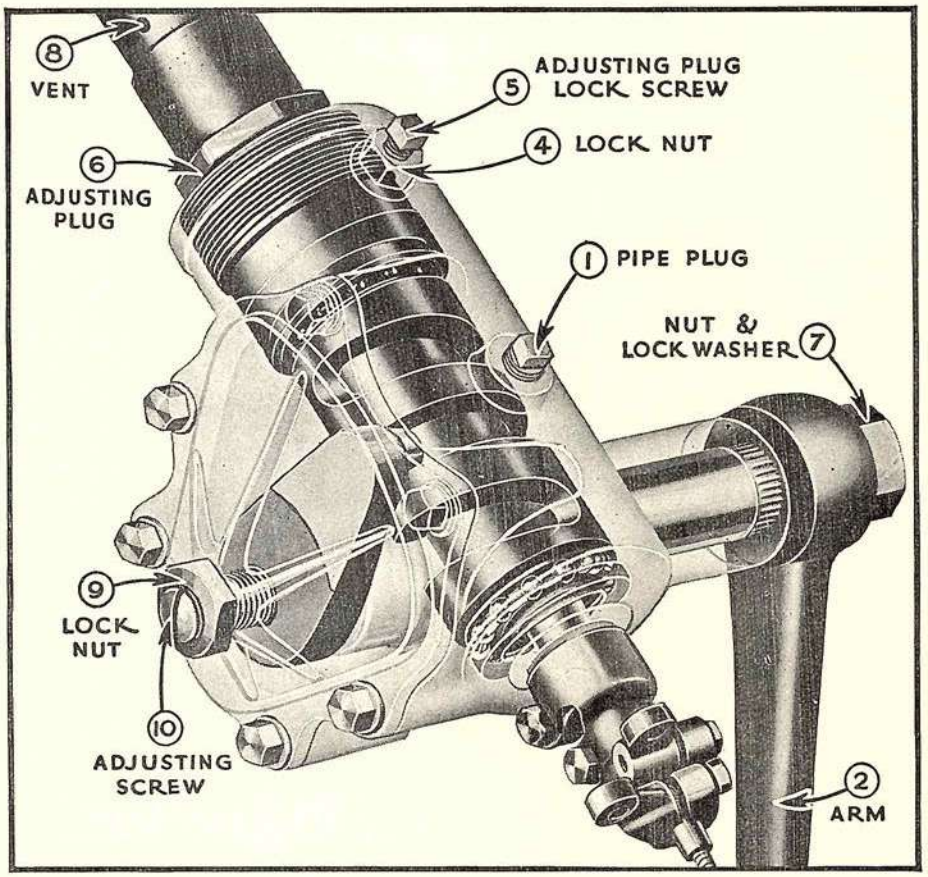
The bolts attaching housing to flange must be kept tight to keep grease from being thrown out.

Inspect the joints at least twice a year and in regreasing do not use more than one half to one ounce per joint if dust cover is in good condition.

APPROVED LUBRICANTS

American Oil Corp., Jackson, Mich.	Their No. 854
Acheson Graphite Co., Niagara Falls, N. Y.	Their No. 344
Whitmore Mfg. Company, Cleveland, Ohio	Their No. 5
L. Sonneborn Sons, Inc., New York City.	Universal Joint Grease
Texas Company, New York City.	Universal Joint Grease
Sinclair Refining Co., Chicago, Ill.	Their No. 3
Standard Oil Co.	Their No. 5-5193
Fiske Bros. Refining Co., New York City	Their No. 113
Frank Harris Floyd, Detroit, Mich.	Their MS 233
Vacuum Oil Co., Rochester, N. Y.	Their Voco
Indian Refining Co., Lawrenceville, Ill.	Havoline Universal Joint Grease
Shell Petroleum Corp., St. Louis, Ma.	Shell Auto Gun Grease
Tidewater Oil Co., New York City.	Veedol Heavy Duty Gear Lubricant

ROSS CAM AND LEVER STEERING GEAR



Adjustments:

To make adjustments properly, the construction of steering gear must be understood. The steering mechanism consists of two parts —the cam and the lever shaft.

Since most driving is done while traveling approximately straight ahead, the most wear occurs within about ¼ wheel turn either side of center position. For that reason the cam groove is narrower within that range than elsewhere, so the gear can be adjusted without binding in the extremes. Note that the gear must be adjusted at the place where width of groove is narrowest; also that the position of this adjustment point is not important, providing it falls within the straight ahead driving range of ½ wheel turn.

Make adjustments exactly as noted below and in order given. Each adjustment is made independently of the others.

1. Disconnect drag link at rear ball socket and drop it from steering gear ball arm.
2. Loosen housing side plate adjusting screw lock nut (9) and turn adjusting screw (10).
3. If outer tube is pressed into the adjusting nut, loosen the dash bracket. If outer tube is held in adjusting nut by means of a

clamp bolt, loosen this bolt.

4. Loosen lock nut (4) and back off lock screw (5). Turn adjusting plug (6) until the combined radial and load thrust ball bearings drag. Then back off the nut just enough to eliminate the drag so steering wheel can be turned freely, yet so there is no up and down play in thrust bearings. Tighten lock screw (5) and lock nut (4).
5. Tighten side plate adjusting screw (10) and turn wheel slowly until the point is reached where there is a minimum of .003" in and out movement of lever shaft on which steering ball arm is mounted. *Test the gear in all positions to make sure there is no binding action.* Tighten the lock nut to lock adjusting screw. Test the gear to make sure the adjustment was not changed in tightening lock nut (9).
   There must be clearance between tapered pin and cam groove for the necessary oil film.
6. Make sure steering gear ball arm (2) is tight on the splined shaft, and that lock washer and nut (7) are tight.
7. Turn steering wheel as far to right as possible, then in opposite direction as far as possible, counting the number of turns. Turn wheel back just one half of this total movement, which will place cam lever in midposition. Place front wheels in position for straight ahead driving. It should then be possible to connect drag link to ball on steering gear arm without moving gear to any extent. In most cases the steering arm will hang vertically.
   If this cannot be done, remove the arm from steering gear and place it on splined shaft in proper position. This is extremely important where the ratio is variable as any other position of arm will change the effective ratio of the gear. It is also important in order to obtain full throw of front wheels equally to the left and right.
8. Refill steering gear housing with approved lubricant.

In this model steering gear the cam stud is mounted on special Timken roller bearings, cupless type. This provides a rolling instead of sliding action of stud in the groove, and practically eliminates adjustment due to wear. If adjustment should be required, follow instructions carefully but do not disturb the factory adjustment unless absolutely necessary.

Important:

Keep all parts clean—this is vital.

Do not nick or burr finished surfaces.

Do not grip finished surfaces in a vise without protecting with sheet copper or brass.

Keep all parts oiled. The slightest corrosion will shorten the life of bearings.

Parts:

The stud and cone are serviced only together.

The nut and D washer are furnished with stud and cone, but can be purchased separately.

The rollers are serviced in complete rows.

The outer races are machined integrally in the lever shaft, so the outer races can only be replaced by replacement of the lever shaft.

I Adjustment:

A. IF TOO LOOSE (End Play in Stud):
   1. Grip straight cylindrical part of stud in vise with nut up.
   2. Straighten out prongs of D washer.
   3. Tighten nut carefully until a slight drag is felt when turning stud with the fingers. A new bearing should be set a trifle tighter than one that has been used.
   4. Tap each end of stud lightly and test adjustment.
   5. When adjusted properly select the prong of lock washer (D) which is at right angles to a side of the nut and bend it up against the side so nut cannot move. If one is bent up that is not at right angles to side of nut, the adjustment may change due to nut not being properly fastened. If possible bend up two prongs to guard against movement should one prong give.
      Do not use a washer twice unless the prongs used the first time have been removed.
   6. Test adjustment.
   7. Wash bearings in clean gasoline and dry with compressed air.

B. IF TOO TIGHT (Stud Sticks):
   1. Tap each end of stud lightly and

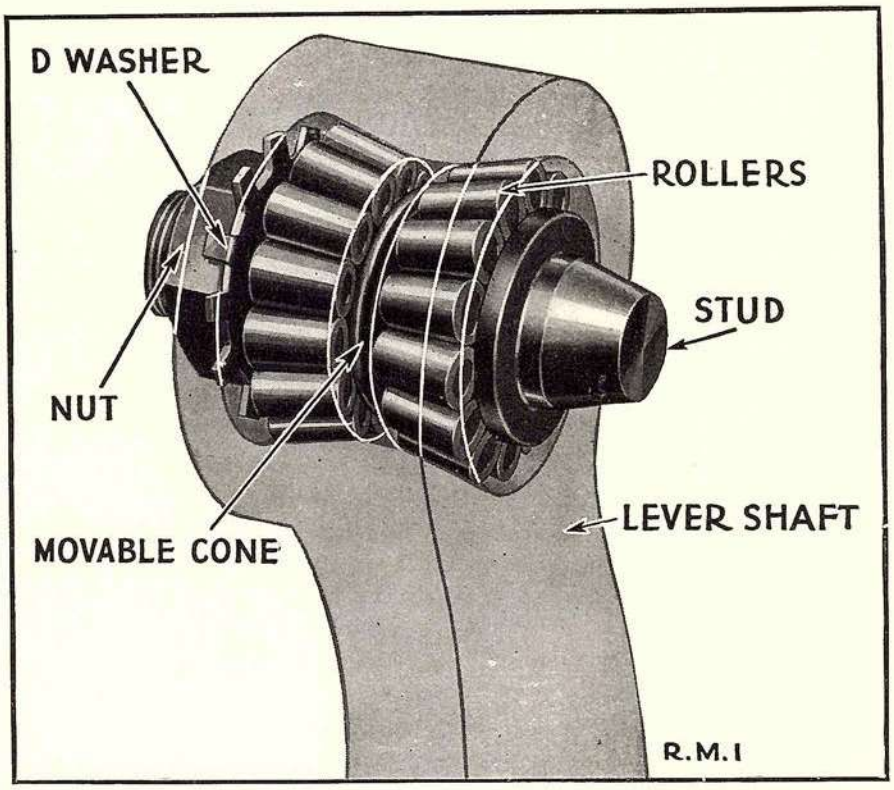


Fig. 2

then test. If still tight proceed as in A, except that nut is of course loosened until proper adjustment is secured.

II Install a New Bearing:

A. TO DISASSEMBLE:

1. Grip straight cylindrical part of stud in vise with nut up.
2. Straighten out prongs of D washer.
3. Remove nut.
4. Place tapered end of stud in left hand.
5. With a soft hammer drive threaded end of stud down until rollers fall out, or can be shaken out.

B. TO ASSEMBLE:

1. Clean all parts by washing in gasoline and wiping dry on a clean cloth.
2. Apply soft cup grease or vaseline to the races (integral cups) in lever shaft.
3. Place the rollers, large end out, on each of these races. The grease will hold rollers in place if they are pressed against races.
4. Carefully place tapered stud in position (tapered end toward threaded end of shaft).
5. Carefully assemble moveable cone on stud and push in as far as possible with the fingers.
6. Rest cone end on vise with the jaws open enough to pass the threaded end of stud.
7. Tap it into position with soft hammer.
8. Assemble washer and nut and adjust as in 1-A-(3 to 7 inclusive).

Lubrication:

(A heavy transmission grease of a fibrous nature is required.)

To prevent wear and rattle, the steering gear housing should be kept completely filled at all times with approved lubricants, and the amount should be checked every thousand miles.

Remove pipe plug (1) in housing and fill

housing slowly to allow air to escape through vent hole (8). When lubricant runs out of vent the housing is full. Replace pipe plug.

APPROVED LUBRICANTS

Mobilgrease.	Vacuum Oil Co., New York, N. Y.
Sunoco Special Steering Gear Lubricant.	Sun Oil Co., Philadelphia, Pa.
Whitmore's No. 70.	Whitmore Mfg. Co., Cleveland, O.
Special Steering Gear Grease No. 20 (For temperatures down to 5° below zero).	Standard Oil Co. of Indiana.
Special Steering Gear Grease No. 25 (For use in hot weather and temperatures down to 15° above zero)	Standard Oil Co.
Ross Special Steering Gear Lubricant.	Ross Gear and Tool Co., Lafayette, Ind.
Elco No. 10	Elco Grease & Oil Co., Cleveland, Ohio.

FRONT AXLE ASSEMBLY

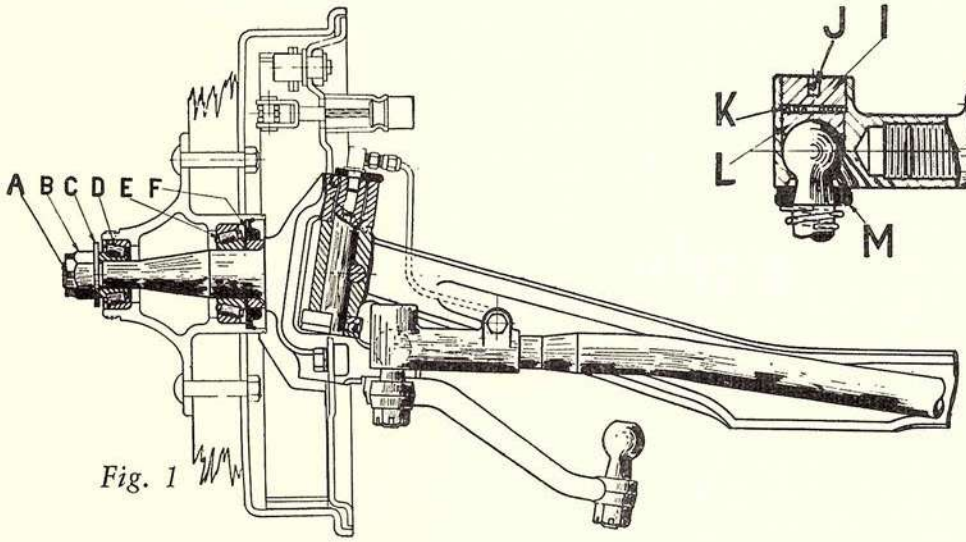


Fig. 1

Fig. 2

The king pins, bushings, thrust bearings, steering balls and sockets are wearing parts of front axle steering assembly.

The thorough and constant lubrication of these parts is of great importance. Lack of proper lubrication means excessive wear and consequent looseness of parts, which will result in frequent and often expensive replacements.

If the I-beam is accidentally bent, do not attempt to straighten it even if heating facilities are available. Return it to the factory for alignment and re-heat treatment.

Correct caster of front axle, and front wheel alignment, must be maintained. These should be checked at intervals with proper equipment.

Correct "caster" of front axle is 1° minimum and 2° maximum inclination toward rear. In gauging caster, measurements must be taken on each spindle and compared with each other, and if too much or too little, it must be promptly corrected. If there is too little "caster," adjust by inserting a metal wedge between axle and springs at rear side of axle. If too much "caster, drive wedge between front axle and springs from the front.

In "toe-in" the wheel rims are nearer to each other at the extreme forward extremities. The correct "toe-in" is 1/8" to 3/16". Correction is made in the tie rod.

To adjust "toe-in," loosen clamp bolt (H) on each end of tie rod and turn tie rod (G) as required. Turning forward toward front of car decreases "toe-in"; the reverse turn increases it.

NOTE: As tie rod is bowed in center, it is necessary to always turn the rod one full turn to maintain it in correct position.

After adjusting, be sure to tighten clamp bolts (H).

To adjust for wear of balls and sockets, tighten adjusting plug (I) by first removing cotter (J). Be sure to replace and properly lock cotter (J) after making this adjustment.

Front wheel "camber," in which the wheel rims are nearer together at the ground than at highest point directly above, is built in the spindles when the parts are machined and can not be altered or adjusted without new parts. The correct camber is 2 degrees.

If the front wheel develops "shake," the wheel bearings may need adjustment, or excessive wear may make it necessary to replace king pins, bushings, washer cups, or may require the addition of steel shims between spindle and I-beam.

In testing for shake or wear, grasp the front wheel on a vertical plane and note whether the play or shake takes place at wheel bearings or between king pin and I-beam.

Front Hub Assembly and Bearing Adjustment:

The front hub, wood wheel and drum, are held together as one assembly by the spoke bolts, the bearing cups being pressed securely into the hub.

The wheel bearings should be removed, cleaned, greased and re-adjusted every six months in ordinary service, or oftener in continuous service. Remove bearings as follows:

1. Jack wheel up free of the ground. Block car up alongside of jack.

2. Remove cotter pin (A), then nut (B), and washer (C).

3. Remove wheel with hub, being careful that outer bearing does not fall to the ground causing damage to cage or allowing dirt to get into it.

4. After removing outer bearing (D), lift wheel off the spindle. This permits removal of inner bearing (E) and felt retainer (F) from the hub.

With a stiff brush and gasoline clean all old grease from the bearings, spindle, and inside of hub. When bearings are thoroughly cleaned and dried, replace bearing (E) in hub. Using a new felt, replace felt retainer in hub and lock with wire lock ring. Pack the bearing with good grade cup grease and assemble to spindle, making sure bearing (E) fits back against shoulder of spindle.

Cover bearing (D) with cup grease, assemble to spindle and press lightly by hand into position.

Draw nut (B) tightly against washer (C), at same time revolving the wheel to insure proper seating of bearings. Now back off on nut (B) to a point where wheel rotates freely but with no noticeable end play.

CAUTION: Make sure that nut (B) is properly locked with cotter (A). Front brakes must be free before adjusting bearings.

REAR AXLE

Rear Wheel Bearing Adjustment:

The bearings should be removed, cleaned, greased, and readjusted at least once a year, or oftener if the service is severe.

To remove bearings, jack up both wheels clear of floor, remove hub cap, drive shaft cotter and hub retaining nut, then pull wheel from drive shaft with a wheel puller.

Next, remove nuts from bolts (G). This will permit removal of drive shaft and bearing assembly. Remove cap screws (E), then remove shim plate (H) and adjusting shims (D). Use an arbor press, and by supporting bearing cage on flange end, press on shaft at the threaded end, forcing shaft (with bearings assembled to it) from bearing cage.

NOTE: Do not support the bearing cup as it must be free to move.

Thoroughly clean all bearings and cages with a stiff brush and gasoline, also clean out end of housing, removing all old grease. Boil the bearings in washing soda and water at least once a year. When all parts are thoroughly cleaned and dried, cover bearings with good clean cup grease free from acid or solid particles. Pack bearing cage with grease, then assemble shaft and bearing to cage.

First support the cage on small end, insert shaft (which has the two bearings assembled to it), into bearing cage. Then press or tap the outer bearing cup into bearing cage until it is in position on bearing and no end play of shaft is noticeable. Next, assemble shims (D) and shim flange (H), and draw cap screws (E) tight. *Be sure lock washer is in place back of head of these cap screws.*

IMPORTANT: Now check to make sure bearing adjustment is correct. This is made

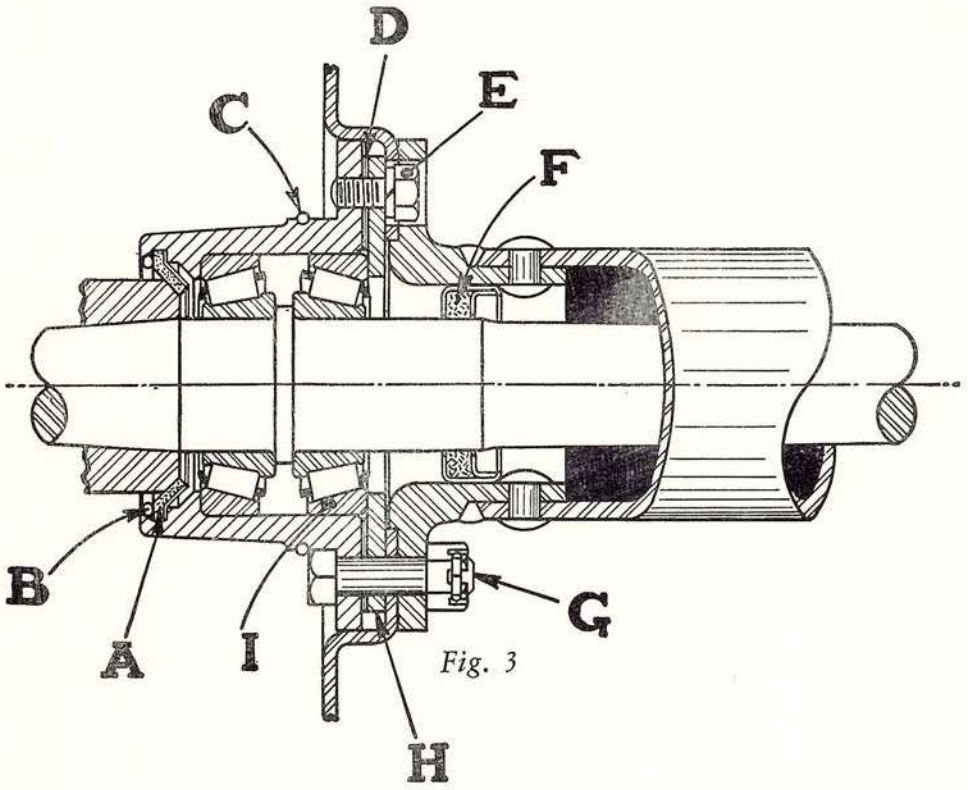


Fig. 3

by adding or removing shims at (D). Shims vary in thickness. As wear takes place, looseness of bearings will develop. This is overcome by removal of shim or shims at (D) as required.

CAUTION: Avoid a too tight adjustment of bearings or failure will occur.

With shaft and bearing assembly properly adjusted and assembled, they may now be assembled to axle. When in position, replace bolts and nuts (G), making sure they are cottered. See that lock ring (C) is in place in slot on bearing cage, as this is a safety lock for bolts (G).

The felt oil retainer (F) should be replaced once a year, or oftener in severe service. The leather oil seal (A) is held in place by retainer (B). It should last indefinitely.

DIFFERENTIAL ASSEMBLY

Any pair of gears running in mesh will vibrate, due to the blows or concussion of the contacting teeth. The amount of vibration and resultant sound will vary. A slight hum may exist in some cases, and this should be expected.

All gears are carefully tested, adjusted, and locked in their quietest running position before leaving factory, therefore make no adjustments unless unusual noise develops.

Unusual noise signifies that the axle needs attention such as:

1. Lubrication.
2. Adjustment of pinion or differential side bearings.

First, check the lubrication in differential housing by removing oil level plug (I, Fig. 4). The lubricant must always be kept to this level.

The differential is of the two pinion type as shown in Figures 5 and 6. In this type the thrust is taken care of by two Timken taper roller bearings at outer ends of axle.

To remove differential gears, take out locking pin (H) and remove pin (I), as shown in Fig. 5. Gears are then removed by revolving the side gears.

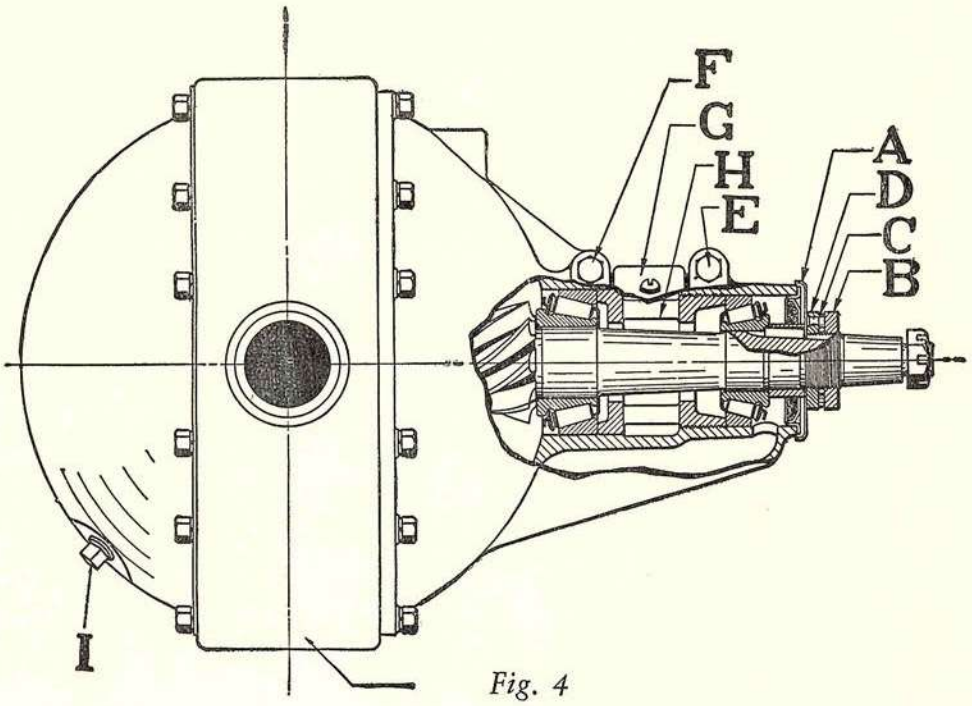


Fig. 4

PINION BEARING ADJUSTMENT

End play in pinion bearings will cause unusual noise and if allowed to run in this condition for only a short time, may cause gear or bearing failure. It is of *utmost importance* to watch this point and check at the first sign of unusual noise.

We recommend a check-up for end play in pinion bearings after the first 300 to 500 miles of service.

To Check and Adjust for End Play:

1. Take hold of washer (A-Fig. 4) which is locked by a tongue fitting into keyway in pinion shaft. If the washer shows slightest movement when turned back and forth by hand, there is end play in pinion bearings.

2. Loosen nut (B) and back it off far enough to allow removal of lock washer (C) from the dowel in nut (D). This will permit adjustment to be made with adjusting nut (D).

3. Draw up on nut (D) until all bearing play is taken up and no movement of washer (A) is noticeable; then replace lock washer (C) in position, making sure that it fits properly over the dowel in nut (D); finally draw up on outer nut (B) until snug, but not to a strained position.

CAUTION: Avoid a too tight adjustment of bearings or bearing failure will result.

Lock outer nut (B) by center punching it on one of the flat sides so as to throw the metal into one of the slots on outer edge of washer (C). Make no further adjustment, but test for noise.

This adjustment alone should eliminate unusual noise to within commercial limits in practically all cases, and further adjustment should not be necessary. If, after making this pinion bearing adjustment, satisfactory results are not obtained, proceed cautiously as follows:

Loosen clamp bolts (E) and (F), and strike head of bolts several blows with a hammer to make sure bearing cups are free. Next, remove pinion adjuster lock (G) by removing the two small cap screws. Adjustment of pinion is then made by placing a bar in one of the slots of adjuster (H) and turning either to right or left as required.

If coast noise is present, move adjuster to the *left* (looking toward rear of car). If drive noise is present, move adjuster to the *right*.

CAUTION: Move adjuster only one notch or slot (not one turn) at a time, then test for noise. If the noise is reduced, move same way one notch at a time until the quiet-

est point is obtained. If, after moving adjuster in one direction, results are not obtained, try moving in opposite direction. When quietest point is obtained tighten nuts on clamp bolts (E) and (F) and replace adjuster lock (G).

CAUTION: Never run the car without first tightening clamp bolts (E) and (F), and locking adjuster (H) with lock (G). *This is important.* Be sure that dirt, grit, or hard substances are excluded as these particles will destroy bearings and gears.

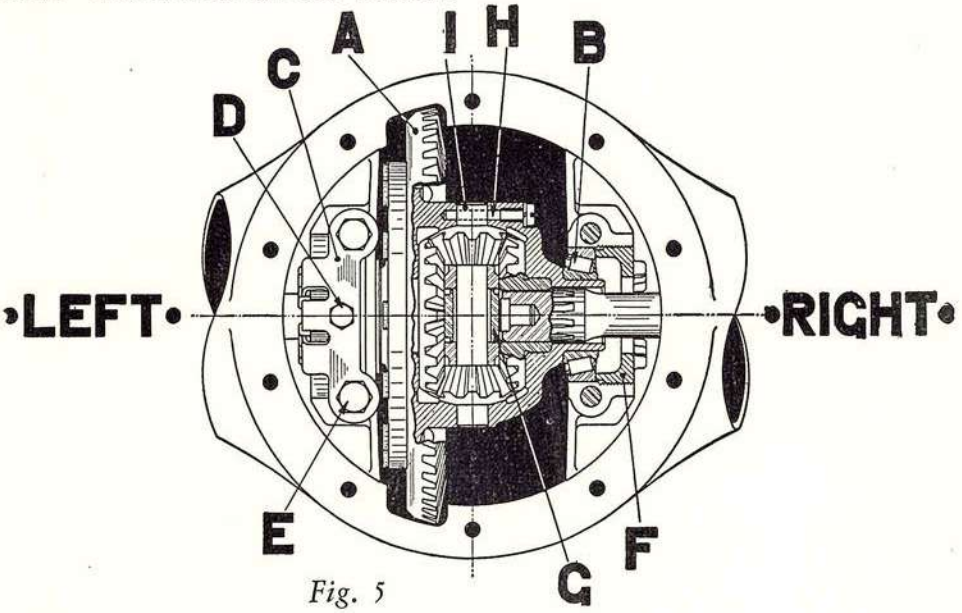


Fig. 5

RING GEAR AND DIFFERENTIAL BEARINGS

The Ring Gear (A) and Differential Bearings (B) are tested and adjusted, then locked in quietest running position; therefore the only adjustment necessary is the adjustment of left differential bearing to compensate for wear due to the bearing taking the thrust, and is the one that will require attention when looseness or play develops.

Looseness or play of these bearings will allow differential and ring gear to shift from original position; therefore, when pinion bearing or pinion gear adjustment does not alliminate unusual noise to within reasonable limits, proceed cautiously with following check and adjustment:

Remove rear axle housing cover. Remove lock screw (D) and lock (C) on left side only. Next loosen cap screws (E) on left side slightly. Do not disturb right side at this time. Place a small bar in one of the slots at edge of differential bearing adjuster (F).

If play exists in bearings you will be able to move adjuster (F) by turning to the right or downward. (This is right hand thread). Move adjuster one notch only at a time until all movement or play in bearings is taken up. *Check carefully and avoid a too tight adjustment.*

Now check for back lash between ring and pinion, making sure that this adjustment has not taken up all backlash, as there must be a slight lash, just enough to be felt, an average of from .005″ to .010″. If all back lash has been

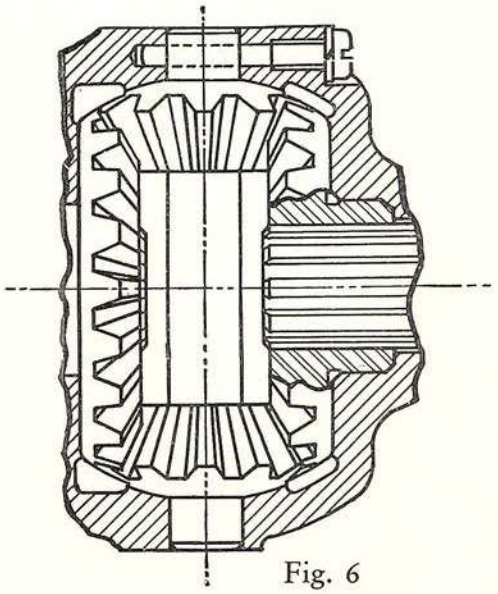


Fig. 6

removed, back off on adjuster (F)—left side, and take up on adjuster (F)—right side, moving each one notch at a time until the desired back lash is obtained.

NOTE: Lash or looseness of the inside differential gears will develop with wear. In such case, replacement of parts is the only remedy.

CAUTION: In checking for backlash, be careful and do not confuse inside differential lash with lash between ring and pinion gears.

The above adjustments, if carefully made, should bring the gears to their original position and therefore reduce any unusual noises to within reasonable limits.

Lubrication:

The pinion bearings, as well as differential, differential bearings, also ring and pinion gears, are lubricated from the supply in rear axle housing, therefore the life of these parts depends on the kind and quality of lubrication they receive.

Gear noises, also gear and bearing failure, result from a lack of proper lubrication; therefore, it is of *utmost importance* to check the lubricant in rear axle housing regularly, *keeping the lubricant up to the oil level at all times.* Do not fill housing above oil level hole in cover, or leakage into brakes, etc., will occur.

The quality of lubricant is of special importance. While any good differential fluid oil is recommended for use in this unit, a good grade lead soap base lubricant which prolongs the life of gear teeth may be used if desired. Inspect the level every three months and add oil if needed.

AUBURN STEELDRAULIC BRAKES

The Auburn Steeldraulic Four Wheel Brake is a self-energizing brake which obtains practically 50% of its operating force from the rotating drum.

The brake has a one-piece steel band to which the lining is attached. The band or shoe is flexible for about 5/8 of its circumference; the remaining 3/8 ribbed to form a rigid T-section. The flexible part of shoe is always on the forward side toward which the drum rotates when car is going forward. This flexible part conforms to the drum when brake is applied, the generated friction forcing the rigid section of shoe into contact with the rotating drum, thus multiplying the effort applied at brake pedal. This additional braking force is self-energizing, a feature also present when brake is applied with car going backward.

As brake pedal is depressed the pressure is transmitted through the rods and cables to the toggles which are spread by the pull on cable. In doing so they spread the ends of shoe out against the rotating drum. If car is going forward when brake is applied, the forward or flexible end of shoe is forced out against drum, while the rigid end is held firmly against the anchor pin by rotation of drum. If brake is applied while car is going backward, the forward or flexible end of shoe is held against anchor pin, and the rigid portion is forced away from anchor pin against the drum. When brake is released the shoe is returned to its original position by retract springs within the brake. The adjustable cam, which is mounted in the apron and bears against rigid section of shoe, holds the shoe in a central position in drum when brake is released.

Brake Adjustment:

While brakes should be in correct adjustment when received from factory, the adjustment should be carefully checked when preparing car for service, owing to the possibility of adjustment alteration in shipment. After the first adjustment before delivery of car, the brake adjustment should again be checked when car has had about 1000 miles of service. This is to take up any slack in rods developed through the wearing-in process.

Brake adjustments should be made in three separate stages:

1. Take up slack in rods.
2. Centralize brake shoes in drums at adjustment cam.
3. Adjust brakes for equalization at adjusting nut.

Before attempting brake adjustment, first jack up the car so all four wheels clear the ground.

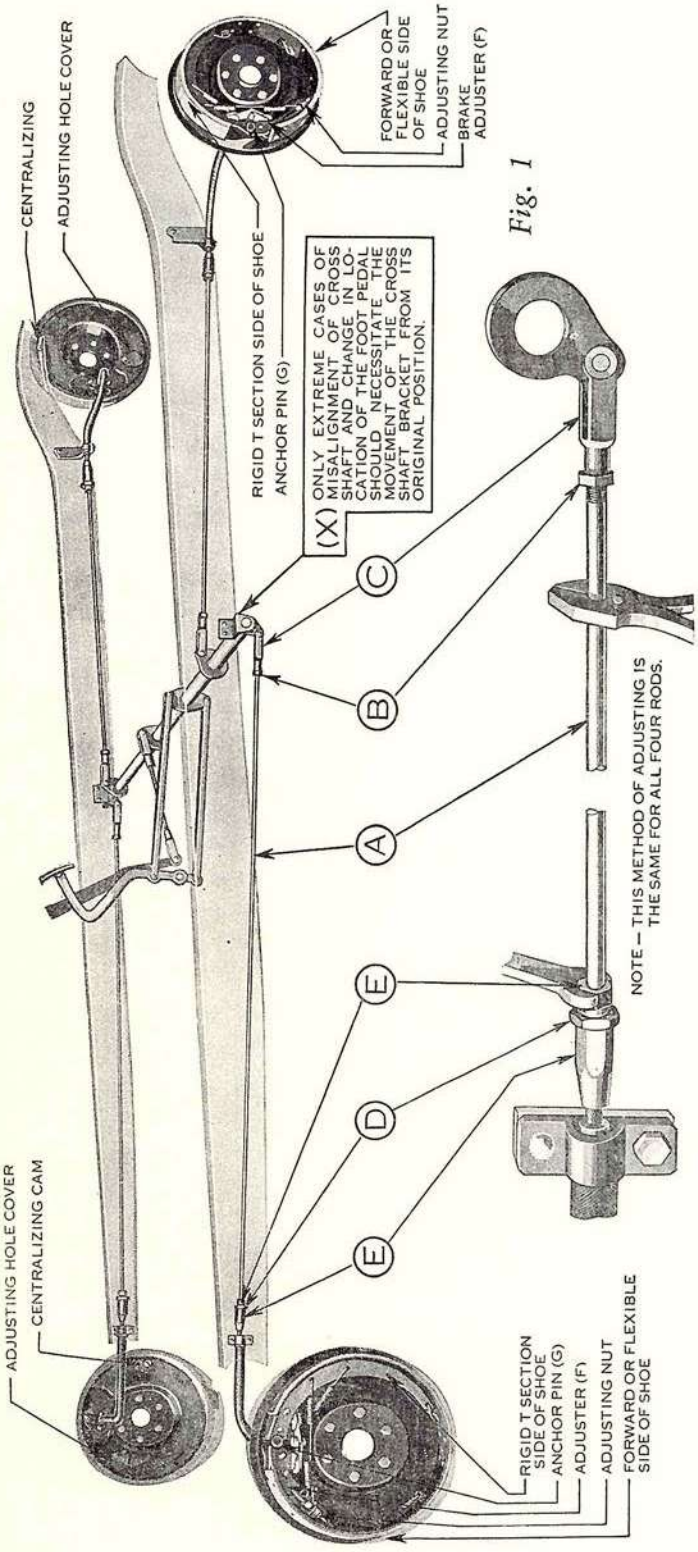


Fig. 1

See that all spring U-bolts are tight.

Go over all movable parts of the brake hook-up with oil.

See that tires are properly inflated.

Check for looseness in front wheel bearings, and if bearings are loose, readjust them.

1. *Adjustment of Brake Rods:*

Check brake rod adjustment. If there is backlash in foot pedal and slack in the rods, readjust the rods running to each of the brakes.

To make this adjustment, first block the pedal back against pedal stop. Remove inspection hole cover from drum.

Loosen jam nuts (B) and (D), and retainer nut (E). The rod (A) threads into yoke (C) and swivels freely in retainer nut (E). Turn rod (A) either into or out of yoke (C), as required, until front part of shoe or the adjuster marked (F) just pulls away from anchor pin (G). Clearance between anchor pin (G) and adjuster (F) on flexible side of shoe should be from 1/32″ to 1/16″.

Check this clearance with a feeler gauge through inspection hole in brake drum. After the adjustment is made, tighten the large and small retainer nuts and locking nut; also the jam nut at yoke end of rod.

Set all four brake rods alike, gaging by the clearance of the different shoes as shown between (G) and (F).

Remove pedal block.

NOTE:— After removing pedal block, if brake pedal returns snugly to the pedal stop when brake is released it indicates that all four brake rods are in proper adjustment.

2. *Centralizing Brake Shoes in Drums:*

Turn the wheel until inspection hole is directly over brake shoe centralizing cam. This cam is located on brake carrier plate 90 degrees from the anchor pin on rigid side of shoe. Insert a .025″ to .032″ feeler between brake shoe and drum at this point. Back off the centralizing cam lock nut on back of brake carrier plate until the tension is released. Turn centralizer cam until brake shoe is forced over toward brake drum enough to tighten the feeler between shoe and drum. Hold cam in this position and tighten the lock nut. This operation should be done on all four wheels.

3. *Adjusting Brake Shoes for Equalization:*

With car still on jacks and using a pedal

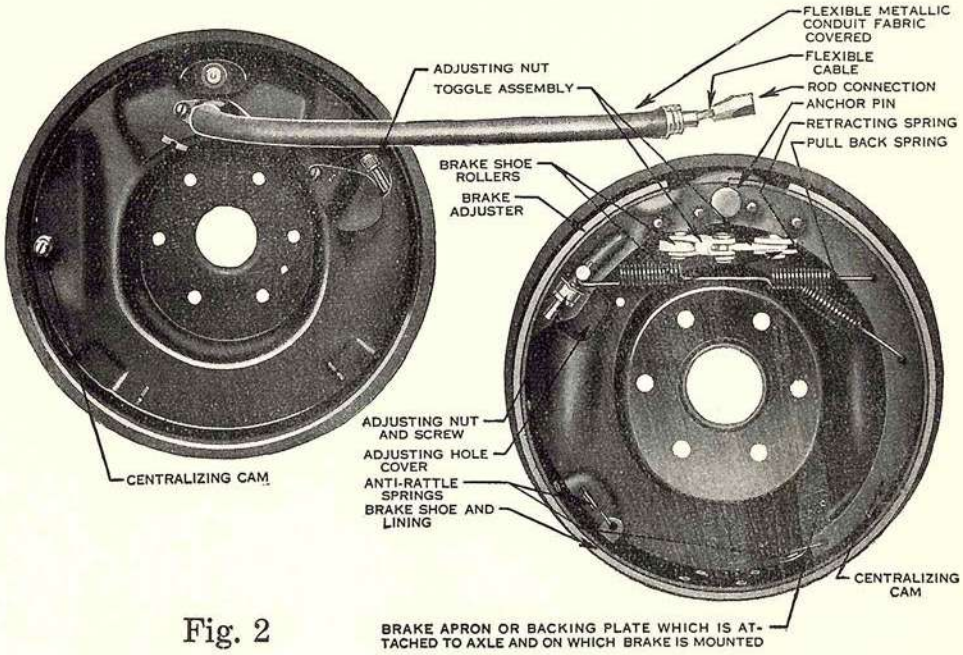


Fig. 2

jack (our part LAU-103) depress the brake pedal until a block of wood 3″ high is just held between brake pedal and floor board. Remove the adjusting hole cover on brake carrier plate. Using the special Auburn Steeldraulic Brake Adjusting Tool, (part AU-88 shown in cut Fig. 3), turn the brake adjusting nut, (located on fin on which shoe moves in adjuster), on each of the four brakes until wheels can just be turned by hand forward against the brake action. Turn the adjusting nut down, or clockwise (as seen from the anchor pin) to tighten the shoe, and up (or counter-clockwise) to loosen it. The drag on the front wheels should be slightly more than on the rear.

The wheels should turn freely when brake pedal is released.

Take car off jacks and test brakes on dry pavement to make sure they are equalized.

When adjustments are completed, replace inspection hole covers.

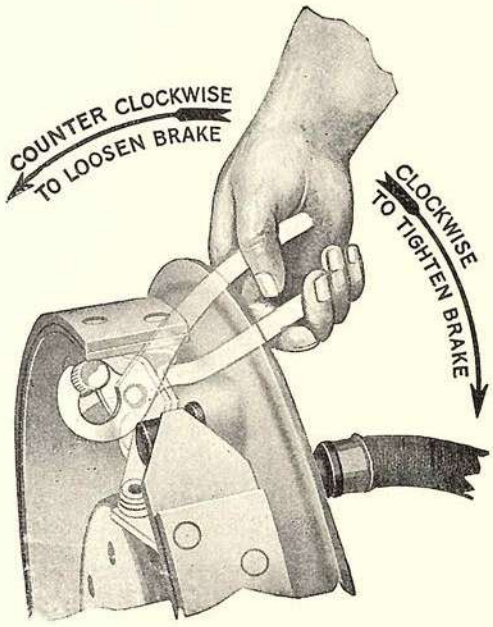


Fig. 3

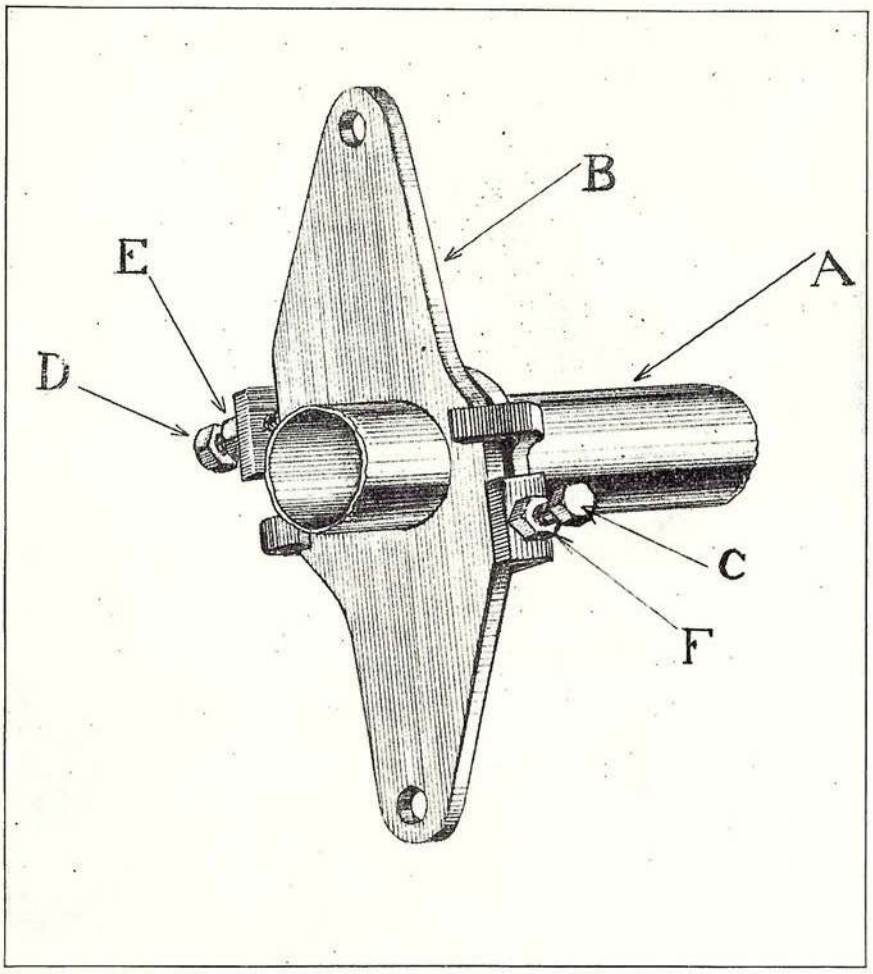


Fig. 4

BRAKE CROSS SHAFT AND OPERATING LEVER

A — Cross Shaft.
B — Operating Lever.
C and D — Set Screws.
E and F. — Locking Nuts.

The lever for left rear brake rod is keyed to the Cross Shaft. If necessary to remove cross shaft, first remove the outside levers. Loosen left rear brake rod lever. The cross shaft can then be moved to the left far enough to allow right end to drop down past the right hand lower frame flange.

Care should be taken in reassembling cross shaft to avoid changing the angularity of the operating lever.

Set screws (C) and (D) are correctly placed at factory and automatically establish the angularity of the component levers.

The faces of the cross shaft operating lever brackets, in which set screws are mounted, must be parallel with the flat edge of operating lever (B).

General Care of Brakes:

Improper functioning of brakes may be due to one or more of three conditions; improper clearance between lining and drum, grease or oil on lining, or too small amount of pedal reserve. (Pedal reserve is amount of pedal travel left after brakes begin to operate).

Insufficient clearance between drum and lining requires a high pedal pressure to operate brakes. Proper adjustment of shoes, as described above, will restore the brakes to proper working conditions with normal pedal pressure. Grease or oil on linings causes high pedal pressure and nearly total loss of brakes. When grease or oil is found on the lining, it should be washed off with clean gasoline, using a stiff wire brush to remove any heavy particles.

Blow with air to clean and dry. After the surface of lining is thoroughly dry remove a small amount of the surface of lining with a coarse file or coarse sandpaper, which exposes the lining in its original condition. If this is done before reinstalling the drums it is not necessary to burn the brakes in so much, thereby eliminating the danger of damaging the paint on outside of drums. The lack of proper pedal reserve can be corrected as explained heretofore.

Minor troubles and their remedy are explained below:

Brake Rattles:

There is little or no chance for rattles to occur in the brakes, but if such should develop they are almost invariably due to broken retracting or anti-rattle springs, or loose brake rods.

Toggles:

It is impossible for toggles to go by center, due to stop in the toggles. The toggle stop is designed for safety, but it should not be necessary for a well adjusted set of brakes to use this safety device. The stop becomes necessary when brake rods are shortened beyond their correct length. When, for any reason, brake bands have been removed, be careful when reassembling bands to see that toggles are in correct positions.

Lining and Service Replacement:

The lining to be used is a special moulded type, having a uniform low co-efficient of friction and long life. It is not affected by change in atmospheric conditions and greatly resists absorption of grease or oil. Dealers are especially cautioned to use only the factory recommended lining. Any other type will cause braking action to be harsh or very rough.

The moulded linings are applied to the shoes under special heat treatment and ground to exact diameter, and the linings therefore cannot be satisfactorily installed in the field without special equipment. For that reason, when necessary to renew linings on account of wear or damage, the complete shoe and lining assembly should be changed in accordance with our Special Service Policy on this item.

Scored Drums:

The moulded lining used causes little or no scoring, but when small parts of foreign matter find their way into the brake chamber and get getween drum and lining during brake application, they may cut both drum and lining to a certain extent. Except in very rare instances, it will not be necessary to change either the drum or lining. Sand paper the drum. Wipe off the lining with a dry cloth and pick out any foreign substance imbedded in face of lining. The drum face may appear rough, but close examination will show that scoring, if any, is in broad shallow bands, which will not affect performance in any way after removal of the foreign matter from lining. If drums appear to be scored by rivets, set the rivets below the surface. Any such scoring would not be caused by rivets, but by steel imbedded in rivet head.

The brake is so designed that considerable drum run-out may exist without affecting brake performance.

Lubrication:

The mechanical joints throughout the brake hook-up should be given a small amount of grease at intervals, and the anti-rattle brackets on pull rods should be cleaned and greased whenever brakes are adjusted. This will eliminate slight squeaks that might develop after considerable service. Be careful that no grease comes in contact with bearing surface of lining.

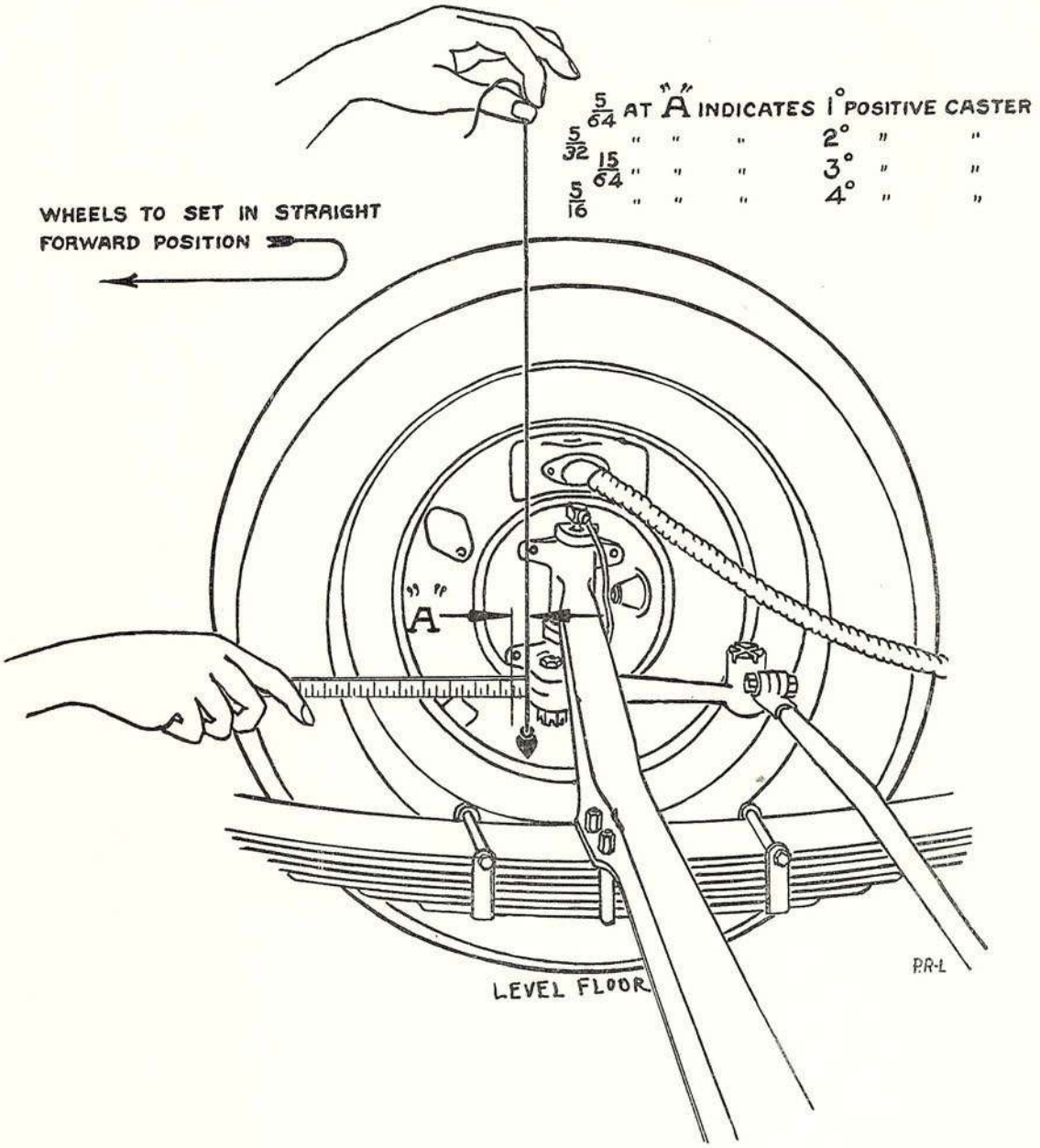
Emergency Brake:

The emergency brake is connected to and actuates the Steeldraulic Brakes on all four wheels, and is intended for use should the foot brake pedal, for any reason, be inoperative.

After adjustment of service brakes, see that the emergency brake has one notch travel from its extreme forward position before it starts depressing foot pedal.

When properly set in this position by adjustment on the hand brake pull rod, it should require no further attention.

INSTRUCTIONS COVERING CORRECTION OF STEERING WHEEL FIGHT AND FRONT WHEEL SHIMMY



1. *Tire Pressure*

Check front and rear tires to see that pressure is up to recommended 35 lbs.

2. *Caster:*

Front axle caster has considerable influence on wheel shimmy particularly at lower speeds. The correct caster setting is 1° minimum and 2° maximum—positive,—that is, the lower end of the king pin should incline forward. A positive and accurate method of checking the caster (see illustration) is with the use of a plumb bob—using the brake backing plate bolts which are parallel with center line of king pin as a guide. The car should be setting on a level floor with wheels in straight ahead position when this check is made. Each 5/64" on the scale indicated as "A" at the lower bolt is equivalent to 1° caster—in other words with a reading of 15/64" incline a 2° shim should be used to bring the caster within the specified limits of 1° to 2°. If the reading shows 20/64"

a 3° shim will bring the caster within the limits, etc. The variance between right and left hand caster should not exceed 1°. In assembling the shim between the axle and spring, the heavy end is to be assembled to the rear which tends to rotate the axle, and bring the king pin closer to a vertical position. Only in remote cases will the caster be found negative necessitating reversing the shim.

3. *Shock Absorbers:*

An out of balance condition on front shock absorbers or lack of proper tension has considerable bearing on wheel fight at both low and high speeds. To check shock absorbers detach lower end of connecting link, raising the arm to top end of a stroke, grip the arm firmly and push down—if the resistance is such that an average man can only move the arm down slowly the shock absorber can be considered in adjustment for the down stroke. The upward or rebound stroke which will offer considerably less resistance should also be tested. Repeat this operation with the opposite shock absorber and if both are not uniform in resistance on both the up and down strokes try adjustment located on shock absorber body which when turned to the right or clockwise offers more resistance and to the left less resistance. If the shocks cannot be properly balanced by adjusting, inspect for fluid. Follow same procedure on rear. If any further work or replacement of parts is necessary to insure proper functioning of this equipment, call on your local authorized United Motors Service Station who are equipped to give you prompt service.

4. *Tire and Tube Balance:*

Each casing is marked with a small black or red square located just above the rim bead and to insure proper balance it is extremely important that the inner tube is assembled so the valve stem is adjacent and in line with this mark.

5. *Toe-in:*

Correct toe-in is from 1/8 to 3/16".

6. *Brakes:*

Dragging brakes—have the same effect as an out of balance wheel and it is therefore very important that the brakes are adjusted free.

7. *General:*

It is also important that king pins, wheel bearings, front axle tie rod, drag link and steering gears are checked for excessive play and adjusted wherever necessary.

Be sure and allow at least .003" end float in steering gear lever shaft, as a closer adjustment may result in bearing failure.

CAUTION: It is absolutely necessary to check every operation as outlined above. Caster must be gauged with plumb bob or with the special caster gauge which we have developed for this model. The regular commercial caster gauges will not answer the purpose.

LOVEJOY DUODRAULIC DOUBLE ACTING SHOCK ABSORBERS

These absorbers are really two in one, each absorber acting independently of the other, with a common oil supply. One absorber eases the car spring compression, the other dampens the spring rebound.

Relief Valve adjustments for the compression and rebound cylinders are entirely separate, insuring exact valving adjustment for all car spring rebound and compression movements.

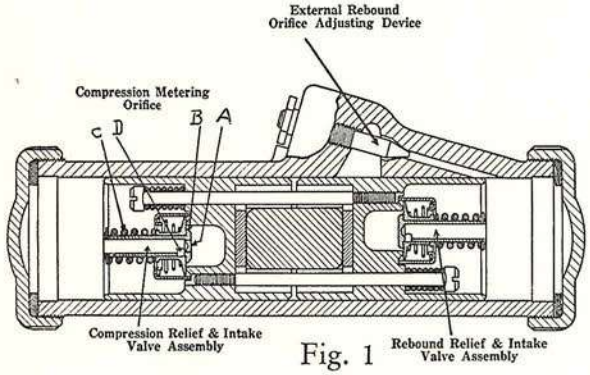


Fig. 1

For slow or small absorber arm movements upward, due to compression of car springs, oil pressure created in the compression cylinder of absorber, forces oil through a variable metering orifice (A) to the oil reservoir. For extremely rapid compression movements, sufficient oil pressure is built up on the absorber compression cylinder to raise Valve (B) from its seat by compressing the heavy spring (C). This allows the oil to pass to oil reservoir

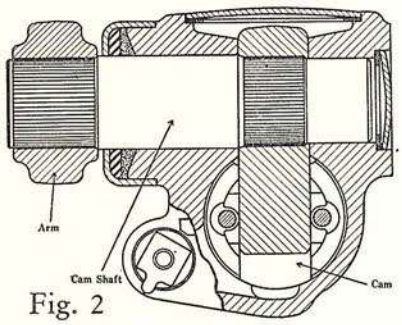


Fig. 2

through valve opening (D), thus limiting the maximum compression pressure, and the maximum compression resistance of absorber.

For slow or small absorber arm movements due to rebound of car springs, the arm moves downward in relation to the absorber body. Oil pressure created in the rebound cylinder forces oil through the external metering adjustment to the oil reservoir. This adjustment can be varied by turning to right or left. Under conditions of maximum rebound control, sufficient pressure is built up in the rebound cylinder to open the Rebound Relief Valve by compressing the rebound relief valve spring, allowing the oil to pass to reservoir.

If Car Rides Hard, before touching the absorber valves, check the freeness of car sus-

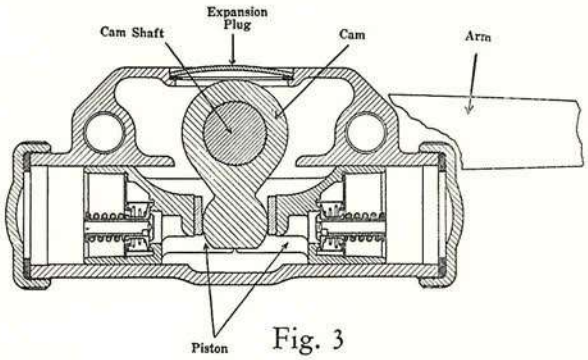


Fig. 3

pension by bouncing, special gauges, etc. Also see that tire pressure does not exceed the recommended maximum.

Noise may occur from a loose installation or within the absorber itself. In checking for noise, make certain that the absorber is bolted tightly to frame. See that the link is fastened tightly to the absorber arm and anchor bracket tight to the axle.

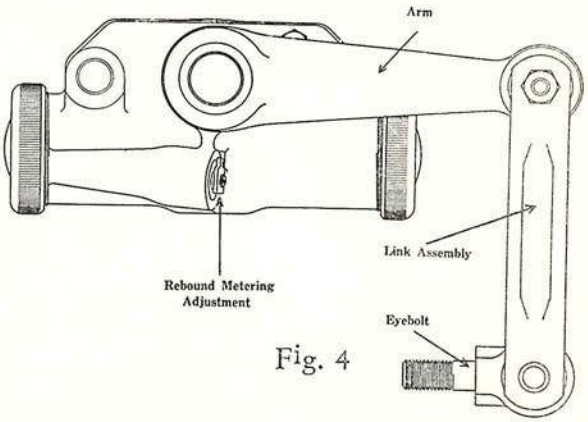


Fig. 4

Oil Leaks: All Shock Absorbers are filled with oil and sealed before they are shipped. The oil used has a very low viscosity and temperature changes will have little effect on its fluidity. This oil, *only,* should be used and it can be supplied by our Parts Department, or

any United Motors Service Station. All cork packing washers are treated before using, in order to counteract oil leaks. An oil leak will cause a shortage of oil in the absorber, which can be determined by disconnecting the Link Rod from car axle and pulling down the absorber arm. If the arm goes down easily a part of the stroke, then comes to a stop and goes down slowly the rest of the way, there is a shortage of oil, and oil should be added by removing the oil plug screw and filling with the recommended shock absorber oil. Move the arm up and down when filling to be certain the cylinders as well as oil reservoir are completely filled. If, after wiping the oil off and driving car a few days, the absorber continues to leak, gaskets or packing washers should be replace where necessary. Inspect and securely tighten end caps so absorber is perfectly sealed at both ends.

Valves: Changing of relief valves and springs is not recommended. The proper combination of relief valves and springs for best riding qualities has been determined after thorough tests under all conditions. This combination is the best for general use, and should not be changed.

TOPS

Our Phaeton and Cabriolet Top Frames are an exclusive Auburn feature, and can easily be folded and unfolded by one person.

The following instructions will enable you to convert these models into open or closed cars easily and quickly.

PHAETON

To Fold Phaeton Top:

1. Loosen the snap fasteners all the way around.
2. Remove the two acorn head screws (one on each side) on top of removable center body pillar.
3. Remove the two acorn head screws (one on each side) at base of top folding hinge on No. 3 bow.
4. Open both rear doors. Loosen the lock nuts and wing screws attaching front bow to windshield.
5. Lift up the front end of top, and No. 2 bow, push it back and fold it.
6. Pull out all top material from between the slat irons to avoid chafing; fasten top down with the hold-down straps, running them through the footman loop on each side rail, and draw on the boot over the folded top and fasten in place.
7. After top is down, take off the center pillars by removing acorn screws at base, and store the pillars under front seat where boot is carried when not in use.

To Unfold Phaeton Top:

First replace the center pillars and bolt them firmly to the body.

Take off the boot, and loosen the hold-down straps.

Stand in rear compartment—take hold of No. 3 bow and lift up and forward, raising both sides simultaneously.

Sit down in compartment and move top forward to its place, after which refasten all lock nuts and wing and acorn head screws that were loosened and removed.

CABRIOLET

To Fold Cabriolet Top:

1. Loosen the snap fasteners all the way around.
2. Remove the acorn head screw from No. 2 bow hinge on each side.
3. Break the joints of prop irons on each side.
4. First loosen the lock nuts, then the wing screws that hold top to windshield.
5. Break back the top and lay it back in position. Pull out all top material from between slat irons. Fasten top in place with the hold-down straps.
6. Fit the boot over the folded top and strap it down.

To Unfold Cabriolet Top:

Remove the boot, loosen hold-down straps, and lift the top up.

Get inside, take hold of front header, lift up and draw top forward in place and close the joints.

Refasten top in place with acorn head screws and clamp it fast to windshield.

NOTE: Special care must be taken in

folding tops down to see that no top material is left between any part of the slat iron, as the weight of top will press on it and injure the fabric, and will eventually cut through it.

General Care of Phaeton and Cabriolet Tops:

Never fold the top back while damp. Dust or dirt on the top can be removed with a sponge and soapsuds, using pure linseed oil soap, rinsing off with clean water when done, and drying with a chamois. Do not allow suds to remain on the top or finish of the car.

If top is badly soiled with dirt or grease, it can be cleaned with art gum, French Chalk, or a weak Oakite Solution.

Do not use cleaning fluids which are similar in nature and of same action as gasoline. They would remove the dirt and grease, but would be injurious to the combining compound of the top material, causing separation of fabrics and destroying the protection of the top.

CHROMIUM PLATING

Our Chromium finish undergoes constant durability tests. It does not tarnish, but it should be kept clean and should have a careful washing and drying whenever car is washed.

The calcium chloride treatment used on streets and highways for melting snow and laying dust, is especially harmful to chromium. If your car is driven over roads which have undergone this treatment, you should carefully wash the chromium promptly afterward to prevent harmful chemical action.

MAINTAIN AIR PRESSURE IN TIRES

Check the air pressure in tires every week. Air pressure recommendations are always minimum and proper inflation must be maintained to prevent tire troubles and reduced mileage.

If a valve-inside leaks, replace it with a new one.

After inflation, apply the small valve cap, screwing it down tightly with fingers. It protects the inside valve and serves as a double seat to prevent air leakage.

Recommended inflation for this model is 32 pounds, front and rear, and never to exceed 35 pounds.

SPEEDOMETER

The speedometer head (on instrument panel requires no attention and should operate throughout the life of the car. It is properly lubricated when assembled and under no circumstances, should be taken apart.

If repairs become necessary, before sending the speedometer to the nearest Stewart-Warner Seedometer Service Station, examine the driving equipment very carefully.

Failure to register speed and mileage may be caused by one of the following reasons:

1. Loose connection between speedometer and flexible shaft.
2. Loose connection at transmission drive end of flexible shaft.
3. Gears in speedometer drive housing (at transmission) may be stripped.
4. Flexible shaft may be broken.

The flexible shaft consists of a series of links which drive the speedometer by revolving inside a steel casing. This casing is filled with a special grease when shipped and should be taken to a Stewart-Warner branch or service station *at least once every 3,000 miles for* greasing. This is very important for if allowed to run dry, the shaft will break, causing added expense and delay.

If the flexible shaft is replaced at any time, be sure that it is the same length as originally furnished. The shaft should make a sweeping curve from transmission to the speedometer, avoiding any sharp bends. Be careful that the shaft does not lie against wiring or metal surface as chafing and noise will result.

Shaft Lubrication:

Disconnect the upper end tip at instrument board and also transmission end; then pull chain out of casing from lower end. Cover the links liberally with graphite grease or Stewart lubricant and insert chain in casing.

Do not use a fluid oil or hard grease, for oil will work through the casing and grease will cause excessive friction and will not lubricate properly.

We recommend the use of *Special Stewart Lubricant* and it can be procured from any Stewart Distributor or repair station.

A worm gear is fastened to front universal joint flange, and is lubricated from transmission or free wheeling unit.

At the right of speedometer is a small knob that can be pulled out. By turning the knob you can reset the figures to any tenth of a mile desired or back to zero. Be sure that after resetting the speedometer, you again push the knob to its original position; if you do not, it will fail to record.

GENERAL SUGGESTIONS

In order to facilitate the disassembling, repairing and assembling of Auburn and Cord Automobiles, many special tools have been designed. We strongly urge their use in the interest of correct and satisfactory service. Parts which do not disassemble readily can easily be removed without danger of damage if correct methods and proper tools are used.

Before disassembling parts, note carefully how they are assembled. It will aid you in taking apart and reassembling them. Carefully clean and inspect all parts and see that relubricating is properly done, where needed, before restoring them to place. New gaskets and cotter pins should be used in place of the old ones.

Check carefully everything that is removed from an assembly and see that it gets back in its proper place.

In making replacements, use only genuine Auburn parts.

Careful and efficient service will increase car sales.

Ordering Parts:

In ordering parts for some particular car, be sure to give model number and complete serial number of car, also the correct number of part wanted. If, for any reason, the part cannot be identified, carefully describe it and its location in car, send a sketch, or return the old part as a sample.

Never Leave Anything to Guesswork:

Remember that right or left side of car is considered when sitting in the car facing forward.

If parts are wanted in finished lacquer, state correct color and describe the striping. Otherwise parts will be shipped unfinished.

State whether we shall ship by Parcel Post, Express, or Freight. If directions are not given we will use our judgment.

Write your name and address carefully and plainly. Use our regular forms if possible.

All prices on parts are quoted F.O.B. Auburn, Indiana, and are subject to change without notice.

Returning Parts:

When parts are returned for any purpose, follow these instructions:

Pack carefully to prevent damage in shipment.

Carefully address the package. Write your name and address on it, so we will know who sent it to us. Each article must be carefully tagged.

Fill out a regular Return Goods Notice in triplicate, retaining one copy yourself, packing one copy in with the parts, and mailing the original to us.

The R. G. N. must be filled out completely, stating why parts are returned, and fully explaining all circumstances in the case.

Prepay transportation charges, otherwise parts will not be accepted.

STANDARD WARRANTY

Should the parts of any new automobile manufactured by us prove defective in workmanship or material, under normal use, within ninety days after the shipment thereof from our factory, and such defective part be returned to us at our factory in Auburn, Indiana, within said time, transportation charges paid, we will deliver to the purchaser, f.o.b. Auburn, Indiana, a new part in lieu of such returned part, providing the returned part be determined by us to have been defective in material and workmanship.

We make no warranty with respect to tires, rims, ignition apparatus, horns or other signaling devices, starting devices, generators, batteries, speedometers or other accessories, or with respect to used or second hand cars, nor are we responsible for any warranties or agreements made by our dealers. In no case will we pay any bills for repairs made outside our factory, nor shall the above agreements apply to any automobile which may be in any way altered or repaired outside our factory, nor to any defects developed by misuse, negligence or accident.

Except as above expressly provided, no warranty or guarantee of the quality of any automobile manufactured by us, or the parts thereof, or any parts, accessories or repairs, or of the other materials or workmanship therein, or of the suitableness thereof for the purpose intended, or the freedom thereof from defects, latent or patent, is made or given, nor shall any such warranty or guaranty ever arise by implication of law or otherwise.

AUBURN AUTOMOBILE COMPANY
Auburn, Indiana, U. S. A.

AUBURN APPROVED SERVICE STATION TOOLS

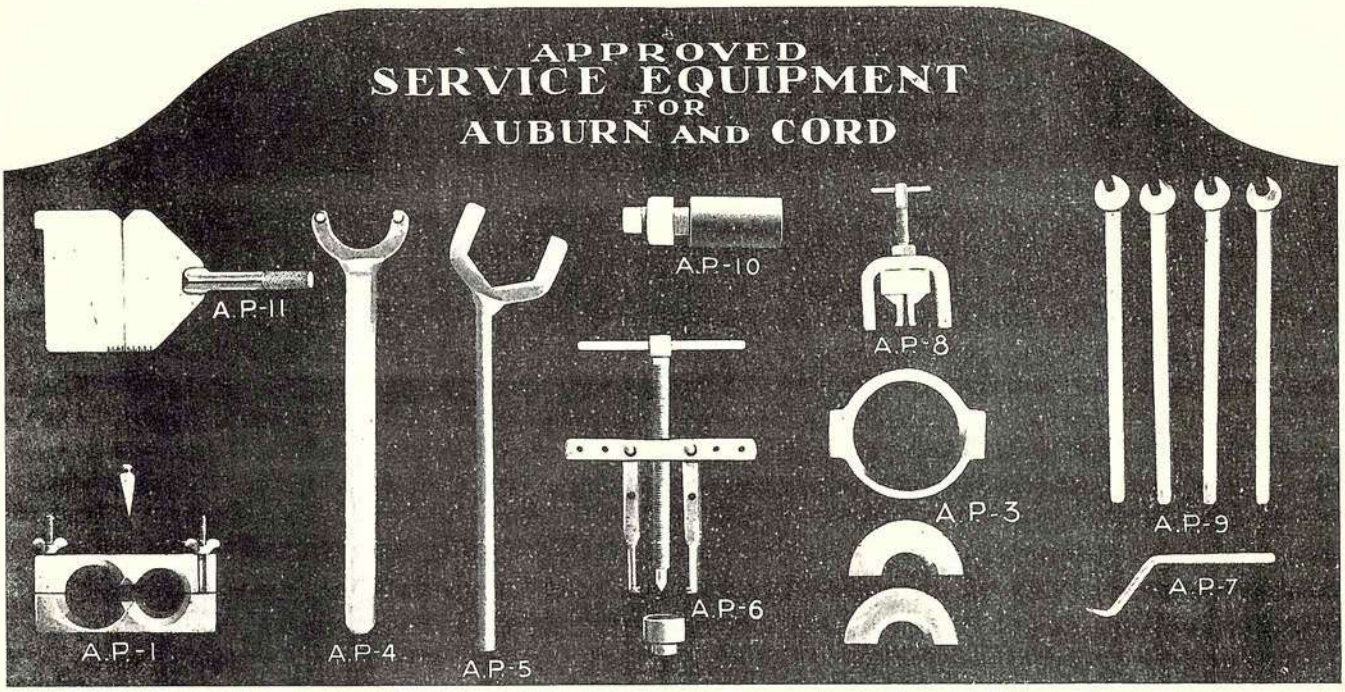
The tools described below have been carefully designed for important service operations, and the use of them will contribute materially to the profits of the Distributors and Dealers Service Stations in rendering more efficient and economical Service. Prompt and efficient Service is an important consideration in new car sales.

These tools are purchased in large quantities in order that we may pass on to the Field Service Organizations the benefit of minimum costs. Prices are net, F.O.B. Auburn, Indiana, and are subject to revision, if necessary, without notice.

AU-1	Broken Axle Shaft removing Tool (With this tool a broken shaft can be removed without removing differential cover or carrier assembly.)	$7.95
AU-2	Adjustable Spanner Wrench (For use in adjusting ring gears.)	1.85
AU-3	Valve Lifting Tool	2.50
LAU-4	Clutch Aligning Arbor	3.90
AU-5 AU-6 AU-7 AU-8 AU-9	Special Arbors, each (For use as clutch alignment pilots, bushing removers, etc.)	3.50
AU-10	Valve Lifting Tool (To faciliate valve grinding. Will raise valve to practically any desired height and will lock spring in that position. Has an attachment for holding valve spring after it is compressed to insert in block.)	7.50
AU-11	Hub Cap Wrench (For removing wood wheel hub caps.)	1.75

LAU-12	Pitman Arm Puller	4.50
AU-13	Wire Wheel Remover (for 8-98 Models)	5.00
AU-14	Special Feeler Gauge (The thickness etched on each blade and its use stamped on handle.)	.90
AU-15	Motor Lifter,per pair	2.50
LAU-16	Valve Guide Inserting Tool (Use in connection with LAU-37.) (Almost impossible to insert a valve guide without this tool, without damaging the new guide.)	5.15
AU-17	Differential Adjusting Tool, each (Used for spacing ring gear adjustment; also in driving front wheel bearing cups from hub.)	1.50
AU-18	Spark Plug and Lug Nut Wrench (Used on No. 1 Champion Plugs.)	1.00
AU-19	Spark Plug and Lug Nut Wrench (Used on No. 4 Champion Plugs.)	1.00
AU-20	Wood Wheel Remover (For rear wheels.)	9.50
AU-21	Wire Wheel Remover (for 125 Models)	4.00
AU-22	Spring Eye Bushing Press (An essential tool for replacing spring bushings.)	5.50
LAU-23	Steering Wheel Remover	7.75
AU-24	Pinion Adjusting Wrenches, per pair (Needed to properly adjust pinion gear setting.)	6.50
AU-25	Pinion Adjujsting Wrench (Needed to complete operation of adjusting pinion gears.)	2.75
AU-26	Waterpump Packing Nut Adjusting Wrench	1.75
LAU-27	Piston Holding Tongs (For holding piston when honing block and fitting in new pistons.)	2.50
LAU-28	Wire Wheel Spoke Nipple Wrench (Used for removing broken spokes and inserting new ones in wire wheels.)	.15
AU-29	Bushing Remover	11.00
AU-32	Utility Puller (For general purposes.)	3.75
LAU-33	Thickness Gauge Stock Holder	.50
AU-34 AU-35	Holders—(Furnished with Valve Lifter No. AU-10.)	No Charge
LAU-37	Valve Guide Removing Tool (Used in removing worn and broken valve guides.)	.75
AU-38	Cylinder Head Lifter, per pair	.50
LAU-39	Set of Three Valve Tappet Wrenches, per set	6.25
AU-40	Hub Cap Wrench (For use installing and removing wire wheel hub caps.)	3.40
AU-41	Universal Joint Flange Puller	3.25
AU-42	King Pin Reamers (for Model 125) (Box includes two reamers—one for upper and one for lower King Pin Bushings.)	13.50
AU-43	King Pin Reamers (for Model 8-98) (Two reamers in box—one each for upper and lower bearings.)	12.50
AU-44	Brake Adjusting Wrench (For mechanical brakes—previous models.)	.50

LAU-45 LAU-46	Cylinder Block Wrenches, each (Used with LAU-47 and LAU-48 to reach inaccessible cylinder block nuts.)	1.50
LAU-47 LAU-48	Socket Wrenches, each (To use on cylinder bolts and with LAU-45 and LAU-46.)	1.90
AU-49	Rear Hub Nut Socket Wrench	3.75
AU-50	Wood Wheel Remover (Used on Model 125.)	10.00
AU-51	Brake Bleeder Wrench (Use on Auburn Models with Hydraulic Brakes.)	1.00
AU-73	Hydraulic Brake Shoe Adjusting Gauge (Use on 125 Models, etc.)	13.00
AU-74	Hydraulic Brake Shoe Adjusting Gauge (Used on 8-95 and 6-85, etc.)	9.50
AU-75	Bear Axle Gauge (For gauging caster angle on Auburn Models, wood or wire wheels.)	25.00
AU-87	Guide Pins, per pair (For installing clutch housing.)	1.20
AU-88	Brake Shoe Equalizing Wrench (For 8-98 Models)	.50
LAU-98	Synchronizing Tool (Used in synchronizing breaker points.)	.25
LAU-99	Ignition Test Light	1.25
LAU-101	Imperial Tube Cutter (Used in cutting copper line from vacuum tank to intake manifold without removing tubing.)	2.50
LAU-102	Imperial Tube Flaring Tool For flaring all sizes copper tubing.)	4.00
LAU103	Pedal Jack (For brake adjustments on 8-98. Described on Page 27-F in Special Tool Catalog.)	2.50
AU-30	Special 8-98 Caster Gauge (Made to special order only. Price not established.)	



NEW TOOLS

1931

AP- 1 Universal Joint Cover Clamp Tool—A necessity if a good job is to be done. Clamps the boot to the universal joint firmly so that no grease can escape. Saves much time. See Service Bulletin No. 58. Material: Cold rolled steel, heat treated. Weight: 3 lbs. **$3.50**

AP- 3 Combination Rear Axle Bearing and Speedometer Drive Gear Puller—For use in a press. Quickly removes tight rear axle bearings or speedometer drive gears without damage to parts. Material: Cast steel with alloy steel plates. Weight: 4 lbs. **$3.20**

AP- 4 Companion Flange Wrench — Holds the companion flange firmly while propeller shaft nut is being removed or replaced. Long handle for convenience to operator. Material: Cold rolled steel with hardened pins. Weight: 2¾ lbs... **$1.75**

AP- 5 Crankshaft Turning Iron—Solidly made to turn the tightest crankshaft while fitting bearings, etc. Materials: Cold rolled steel. Weight: 3 lbs. **$1.70**

AP- 6 Speedometer Drive Gear Puller—For use when a press is not available. Does the job quickly and easily. Will also perform many other pulling operations. Materials: Drop forgings and cold rolled steel. Weight: 6 lbs. **$3.50**

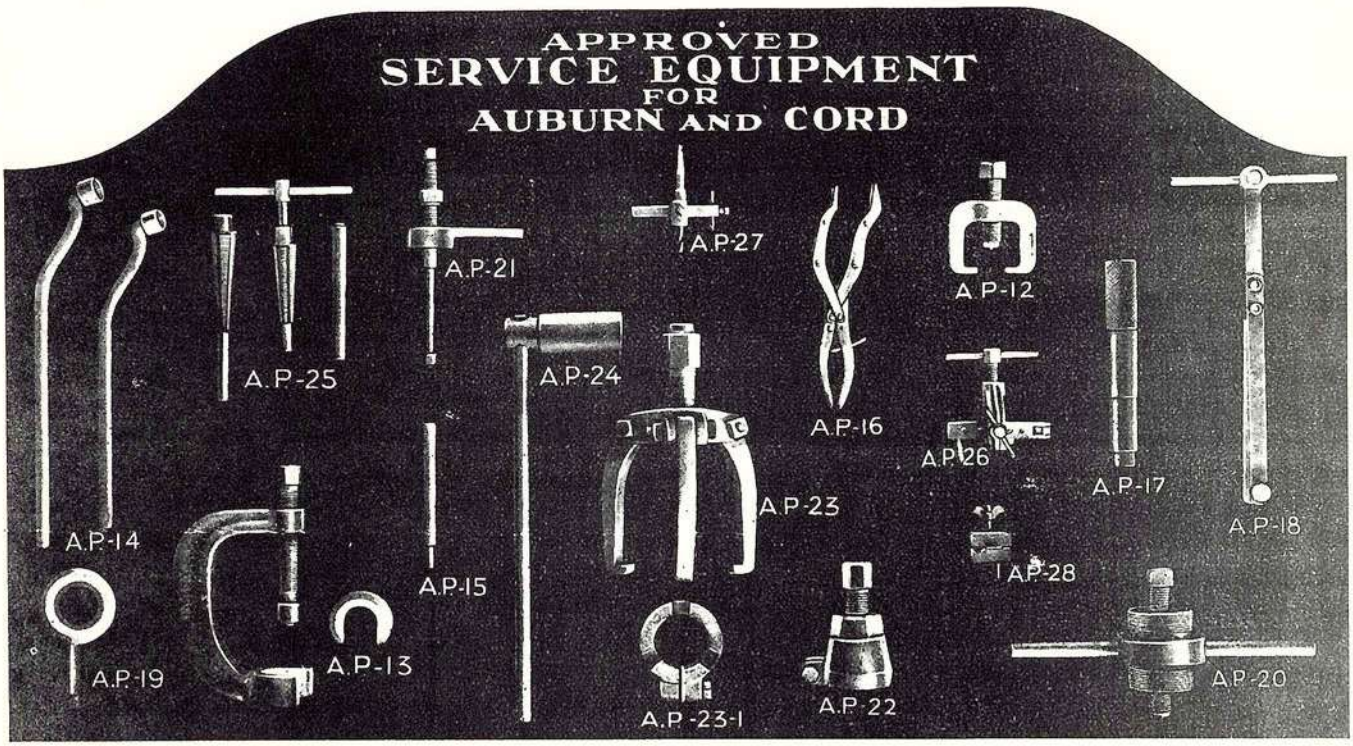
AP- 7 Bijur Pump Primer—Especially angled to save time. Material: Cold rolled steel. Weight: ½ lb. **$1.10**

AP- 8 Clutch Pilot Bearing Puller—Turning the puller screw expands the finger ends so that they catch back of bearing. Turning nut on screw against puller body now pulls bearings. Materials: Drop forgings and cold rolled steel. Weight: 1¾ lbs. **$4.80**

AP- 9 Tappet Wrenches — $\frac{7}{16}$", ½", $\frac{9}{16}$", ⅝". Fitted with extra long handles to spare mechanic painful burns. Materials: Chrome Vanadium steel. Weight: (4) 2 lbs. Complete set of four **$5.00**

AP-10 Timing Gear Pusher—Pushes the timing gear on the crankshaft without danger of damaging parts. Material: Cold rolled steel. Weight: 3¾ lb... **$3.80**

AP-11 Caster Gauge—Place wall against two pins on front axle. Gauge reads exact amount of caster. Be sure floor is level. Material: Aluminum casting. Weight: 2¼ lbs. **$3.20**



AP-12 Pitman Arm Puller—Jaws grip securely back of arm and a few turns of the screw quickly remove it. Material: Drop forging and manganese steel. Weight: 2½ lbs. $2.75

AP-13 Steering Wheel Puller—Constructed so that the tightest steering wheel may be pulled without injuring the parts. Material: Cold rolled and cast steel. Weight: 7 lbs. $6.75

AP-14 Cylinder Head Bolt Wrenches — Of such a size and shape to be easily used. Material: Chrome Molybdenum steel. Weight: (2) 2½ lbs. Each $1.30

AP-15 Valve Guide Remover—A special driver to remove valve guides. Material: Cold rolled steel, heat treated. Weight: ½ lb. $0.60

AP-16 Valve Spring Compressor—A valuable aid to the removal and replacement of valve springs. Material: Steel stamping. Weight: 1½ lbs...$2.50

AP-17 Clutch Aligning Arbor—An aid to clutch assembly. Lines up clutch disc so that drive shaft passes through correctly. Material: Cold rolled steel, heat treated. Weight: 3¼ lbs.....$1.25

AP-18 Piston Tongs—Speeds up the job of fitting pistons and rings. Material: Cast iron, cold rolled and spring steel. Weight: 2¼ lbs.....$2.25

AP-19 Motor Lifting Eyebolt—For removing or replacing motor in chassis. Eyebolt fits spark plug hole. Material: Drop forging. Weight: 2 lbs. $1.25

AP-20 Wire Wheel Hub Remover—Does the job quickly and easily. Material: Cold rolled steel, heat treated. Weight: 8 lbs. $4.50

AP-21 Valve Guide Inserting Tool—Inserts the valve guide in the proper place without damage to parts. Material: Cast iron and alloy steel. Weight: 1¾ lbs. $4.00

AP-22 Wheel Pullers—AP-22 is for AUBURN size exclusively. Adapters are obtainable for No. AP-23 to fit any size or type of wheel. Adapter No. AP-23-1 is shown and is for AUBURN. The operation for either type is simple and effective. Materials: Drop forgings and manganese steel.
No. AP-22 Weight: 4½ lbs. $2.50
No. AP-23 Weight: 12 lbs. $7.50
No. AP-23-1 Adapter Weight: 2¾ lbs.....$1.60

AP-24 Axle Nut Wrench—A large heavy wrench to stand the abuse. Material: Chrome Vanadium steel. Weight: 5 lbs.....$3.05

AP-25 Bushing Remover—Combination driver and puller to remove various sized bushings. Material: Cold rolled and manganese steel, heat treated. Weight: 2½ lbs. $7.50

AP-26 Tube Flaring Tool—To make perfectly flared connections on oil and gas lines a tool of this sort is necessary. Material: Manganese bronze and cold rolled steel. Weight: 2¾ lbs. $3.00

AP-27 Hole Maker—For installing clocks, meters, etc., in the dash. Makes any size hole from 1" to 6". Material: Tool and cold rolled steel. Weight: ¾ lbs. $2.50

AP-28 Tube Cutter—Place tubing in slot, revolve cutter around tubing, turning down wing nut all the time, until tubing is severed. Pointed burr remover cleans end after operation is completed. Material: Tool and cold rolled steel, heat treated. Weight: ½ lb. $2.25

Special Auburn Tools can be purchased only from Auburn Automobile Company.