What You Should Know About Your SUPER SIX

September 1921

Hudson Motor Car Co.
DETROIT, MICHIGAN, U. S. A.

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Hudson Motor Car Company

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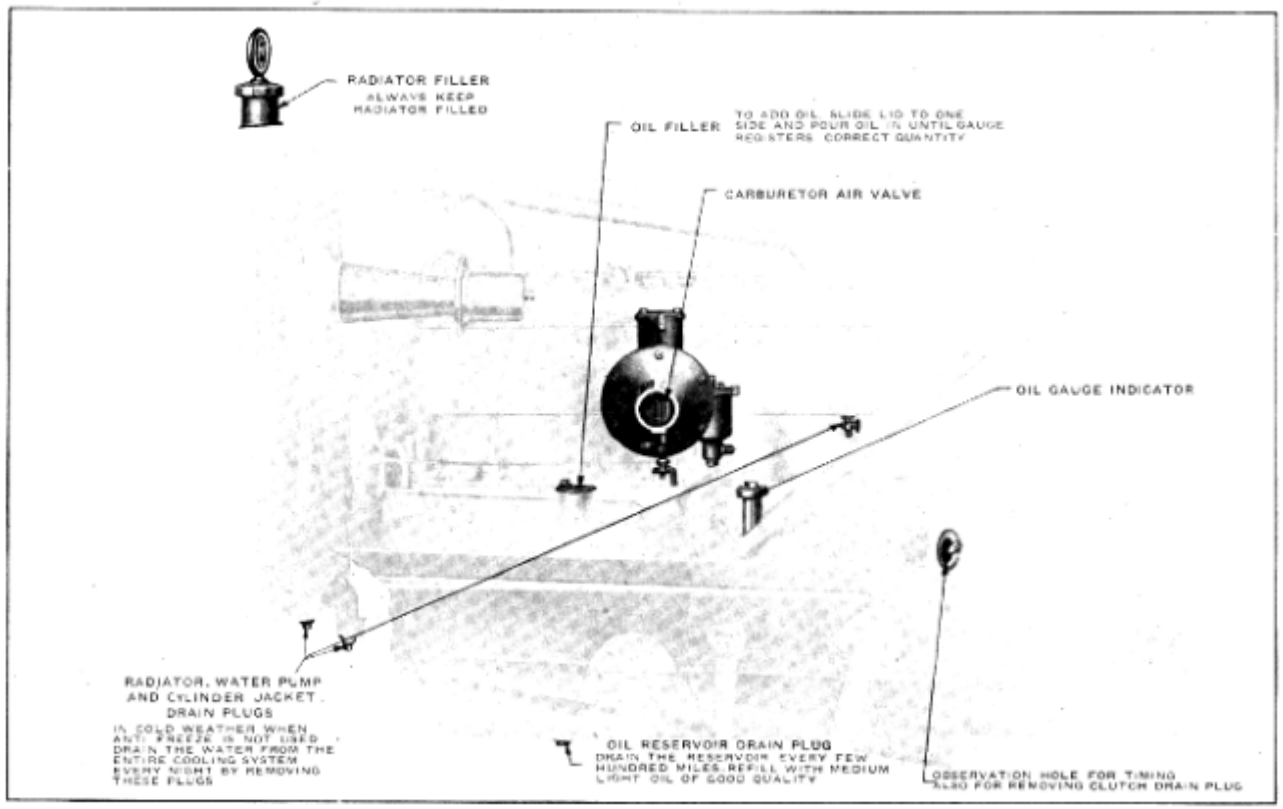
I N D E X

ILLUSTRATIONS

The instructions given herein are important. Please endeavor to follow them.


RADIATOR FILLER
ALWAYS KEEP RADIATOR FILLED
OIL FILLER
TO ADD OIL SLIDE LID TO ONE SIDE AND POUR OIL IN UNTIL GAUGE REGISTERS CORRECT QUANTITY
CARBURETOR AIR VALVE
OIL GAUGE INDICATOR
RADIATOR, WATER PUMP AND CYLINDER JACKET DRAIN PLUGS
IN COLD WEATHER WHEN ANTI FREEZE IS NOT USED DRAIN THE WATER FROM THE ENTIRE COOLING SYSTEM EVERY NIGHT BY REMOVING THESE PLUGS
OIL RESERVOIR DRAIN PLUG
DRAIN THE RESERVOIR EVERY FEW HUNDRED MILES REFILL WITH MEDIUM LIGHT OIL OF GOOD QUALITY
OBSERVATION HOLE FOR TIMING ALSO FOR REMOVING CLUTCH DRAIN PLUG

Preparation

Before putting the car into service make sure that the following details have been taken care of:

Radiator:

The cooling system holds approximately 17 quarts. In mild weather pure water, preferably soft, should be used. if climatic conditions necessitate the use of Anti-Freeze, use alcohol solution of the proper strength. See page 53.

Motor Lubrication:

The motor, being new, should contain two gallons of high grade oil, of correct body. Use medium light bodied oil in hot weather and light when the temperature is low. After 1000 miles of use 7 quarts will be sufficient to have In the motor at any time. Gauge the amount of oil by noting the relative position of the float in the oil gauge. On~ce a month completey change the oil in the reservoir. See page 18.

Gasoline:

The gasoline tank, holding approximately 20 gallons, should be filled and sufficient fuel poured in the vacuum tank to start the motor.

Clutch Shifting Sleeve Grease Cup:

See page 8. This cup should be given three full turns. Keep filled with soft grease and thereafter give one complete turn every day.

Tires:

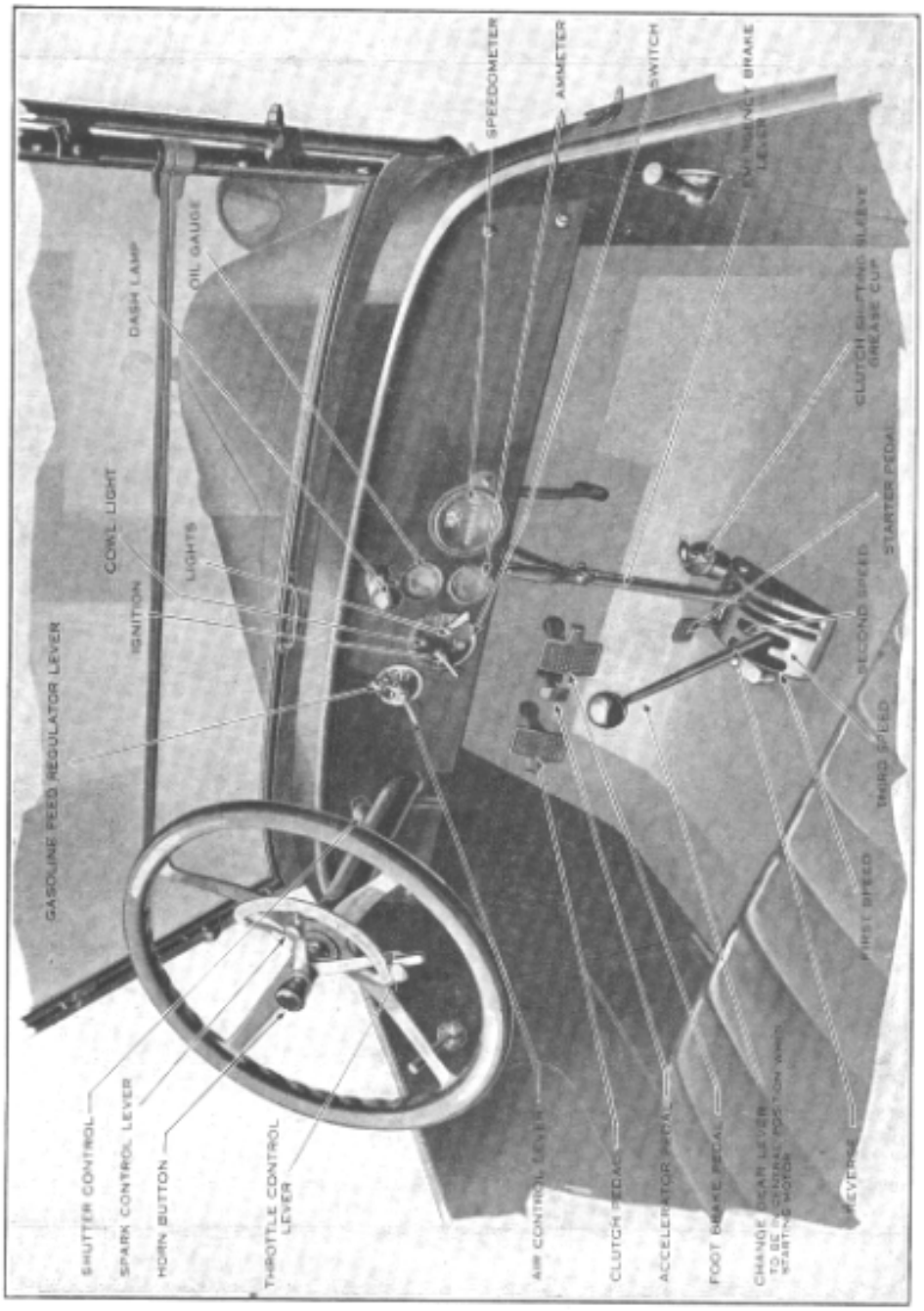
The tires should be inflated to the pressures recommended by the tire manufacturer.

Storage Battery:

The cells should be filled with distilled water to proper level. See page 31.

General Lubrication:

All details regarding lubrication of the various units have been taken care of at the factory and again ch6eked by the dealer delivering the car. Thorough lubrication will keep depreciation (your greatest expense) at a minimum and the chart and lubrication instructions on pages 11 to 15 merit your attention. Adherence to these instructions will insure adequate lubrication at all times.



Functions of Fittings in Driver's Compartment

Functions of Instruments and Controls

Ammeter:

Shows whether storage battery is discharging or being charged by the generator. Should always show charge when the car is traveling over 10 miles per hour with the lights out.

Oil Pressure Gauge:

Simply an indication as to whether the oil pump is delivering oil or not. It should always show pressure when the motor is running. It does NOT register the quantity of oil being delivered to the motor. That is governed by an adjustment of the pump itself. See Motor Oiling System.

Carburetor Control:

The upper lever adjusts the amount of fuel allowed to enter the motor. The lower one is a choke to facilitate starting in cold weather or when the motor has been idle for some time.

Starter Pedal:

Engages the starter gears with the flywheel and makes the electrical connection that energizes the starting motor.

Clutch Pedal:

Controls the clutch or connection between the motor and transmission. Clutch should always be disengaged when shifting gears.

Clutch Shift Sleeve Grease Cup:

This cup lubricates the clutch shifting sleeve and should be kept filled with light grease at all times. Give one or two complete turns daily.

Gear Shift Lever:

Controls the different transmission "speeds," including reverse.

Foot Brake:

Commonly called service brake. Operates the contracting bands on the rear wheels.

Emergency Brake:

Also known as hand brake. Used as an auxiliary with the foot brake when extra braking effort is needed. Also used to set the car on grades when not in motion. It is good policy to always set the emergency brake when the car is unoccupied.

Accelerator:

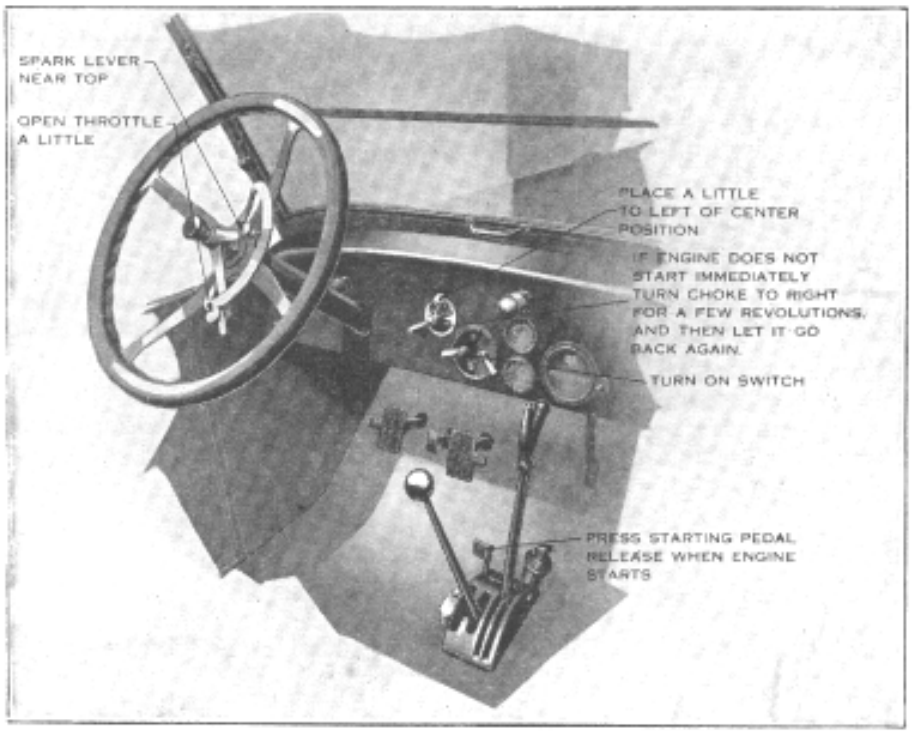
Operates the butterfly valve In the carburetor, thus controlling the speed and power of the motor. As soon as released the valve is again closed.

Hand Throttle:

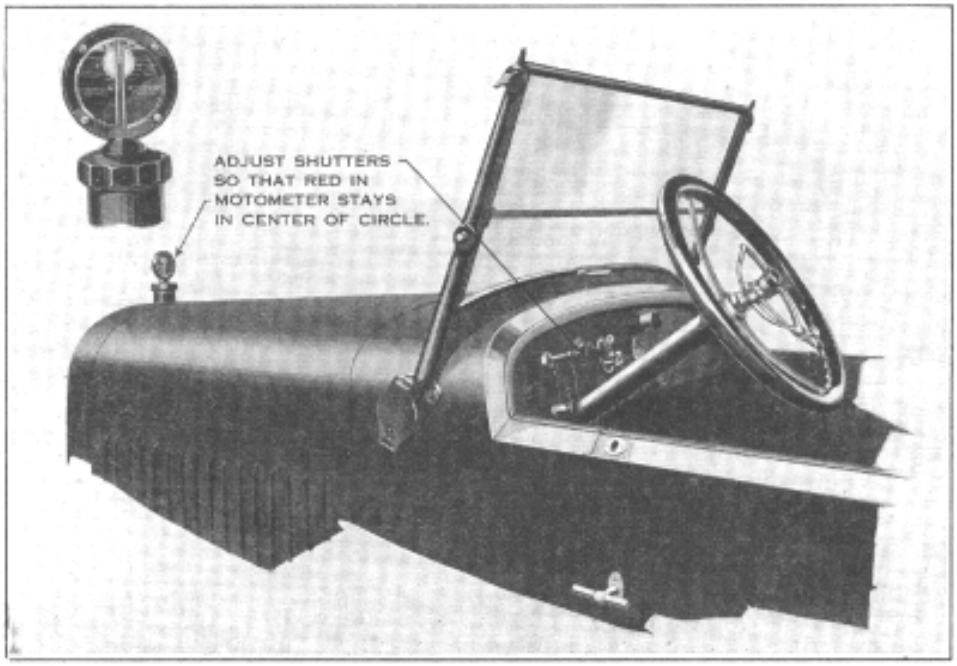
Performs the same function as the accelerator, but remains in any position set.

Spark Lever:

Controls the distributor and spark timing. The distributor is controlled by an automatic adjusting mechanism, but to obtain all around efficiency the spark must also be controlled manually to a certain extent. If the motor shows a tendency to knock on a heavy pull, gradually retard the spark until the knock ceases. It is a good rule to always carry the spark advanced as far as possible without the motor exhibiting any tendency to knock.



How to Start the Motor



Temperature Control

c—When Anti-Freeze is used red should be kept a little below Circle

What We Recommend for Super-Six Lubrication

Motor

Use light bodied oil in cold weather and medium light during the warm months. — Reservoir should contain 7 quarts.

We recommend any good standard brand of oil providing you use the body we specify and change it frequently.

Drain and refill reservoir every 500 to 700 miles. Full instructions will be found on Page 18.

Clutch

Regular Motor Oil, thoroughly mixed with Kerosene in equal proportions. — Requires 1/2 pint.

Transmission

High Grade Steam Cylinder Oil 600-W. — Fill until compound reaches overflow plug hole in right side of transmission case.

Universal Joints

Spicer Universal Joint Grease.
Fibre Grease may be used in emergency. — Keep joints filled, using grease gun.

Rear Axle

Steam Cylinder Oil 110-W, — Keep filled to lower level of overflow plug in rear cover.

Motor-Generator

3 In I Oil. — A few drops every 1000 miles. See page 13.

Horn

3 in 1 Oil. — See page 30

Water Pump Grease Cups — Keep filled. Turn down frequently

Hard Cup Grease.

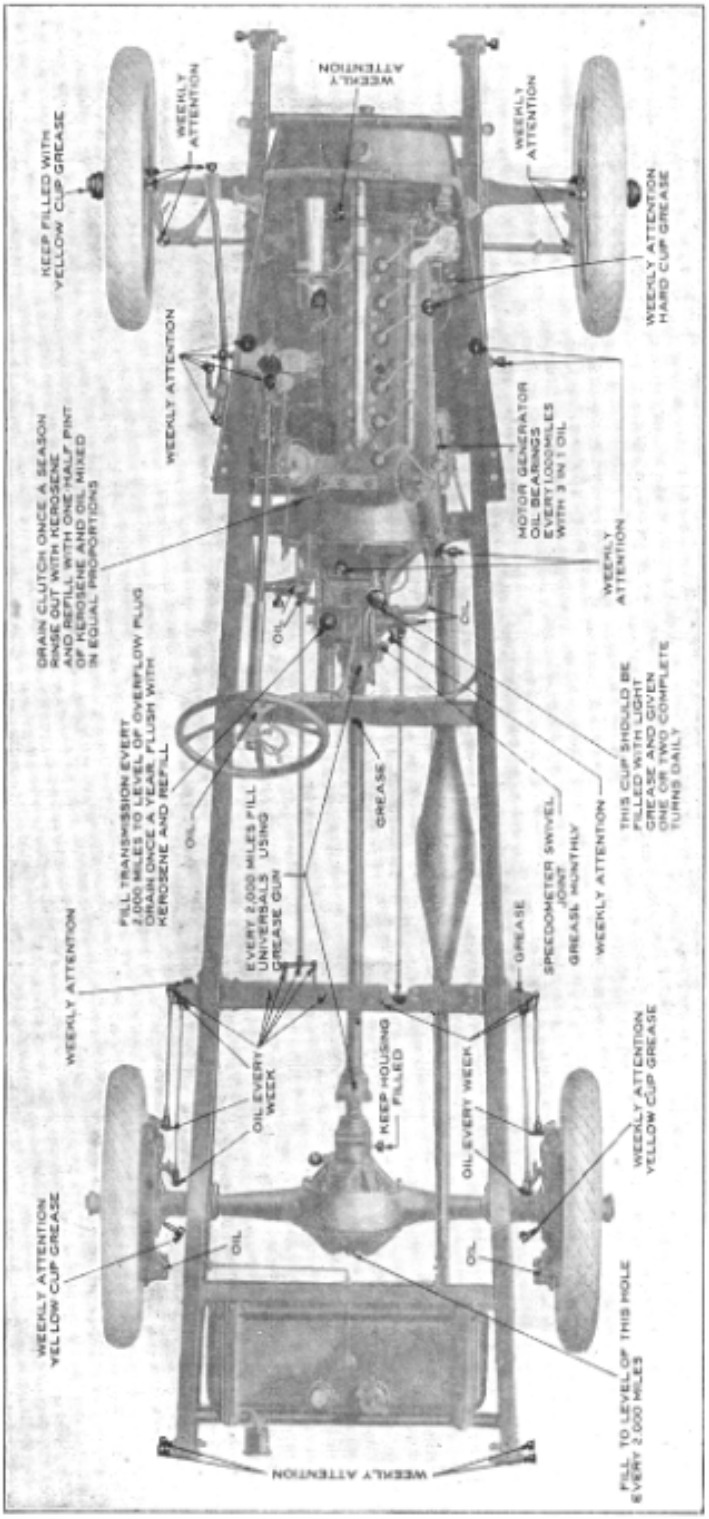
All Other Grease Cups

High Grade Cup Grease.

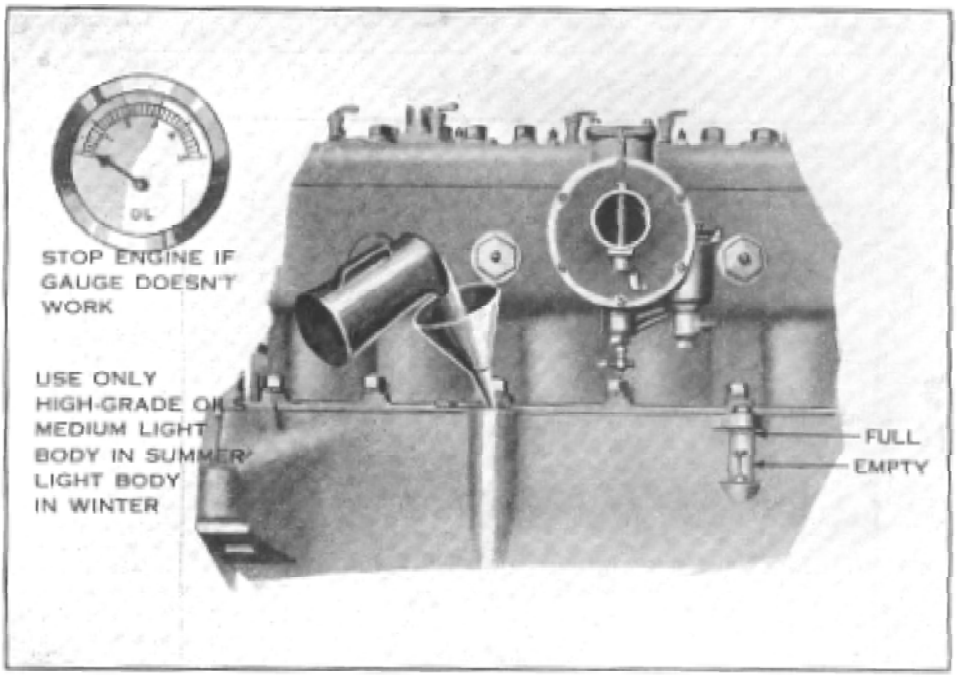
Oilers and Oil Cups

With the exceptions noted above, all oilers should be filled with ordinary motor oil. — Caution: Use in cold weather only light motor oil, that will flow at the Temperatures encountered.

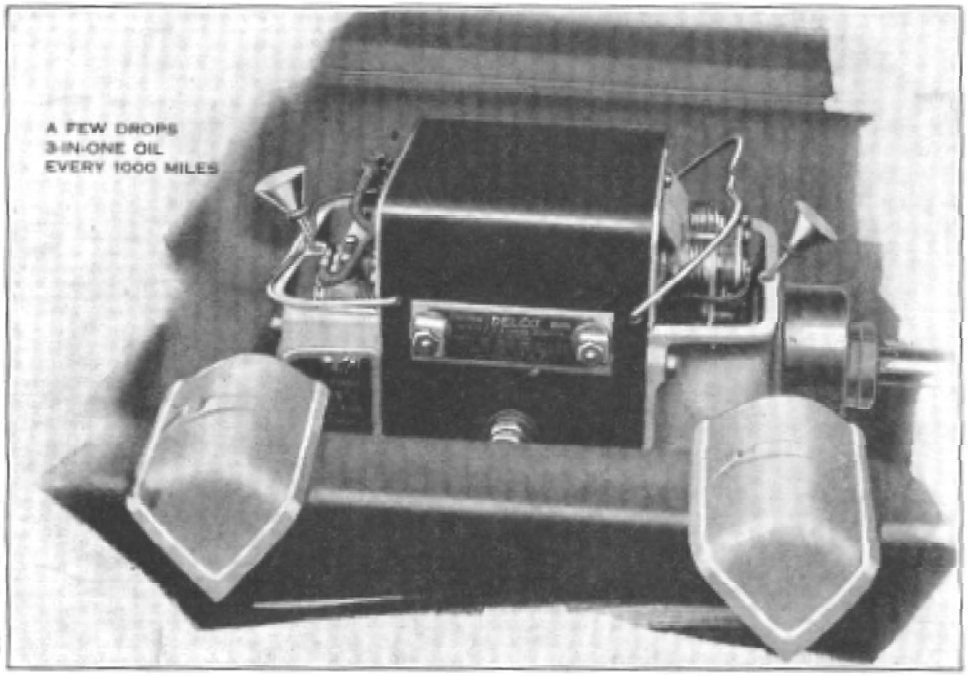
Note: Spicer Universal Joint Grease can be obtained from L. Sonneborn Sons, Inc., 262 Pearl St., New York City.



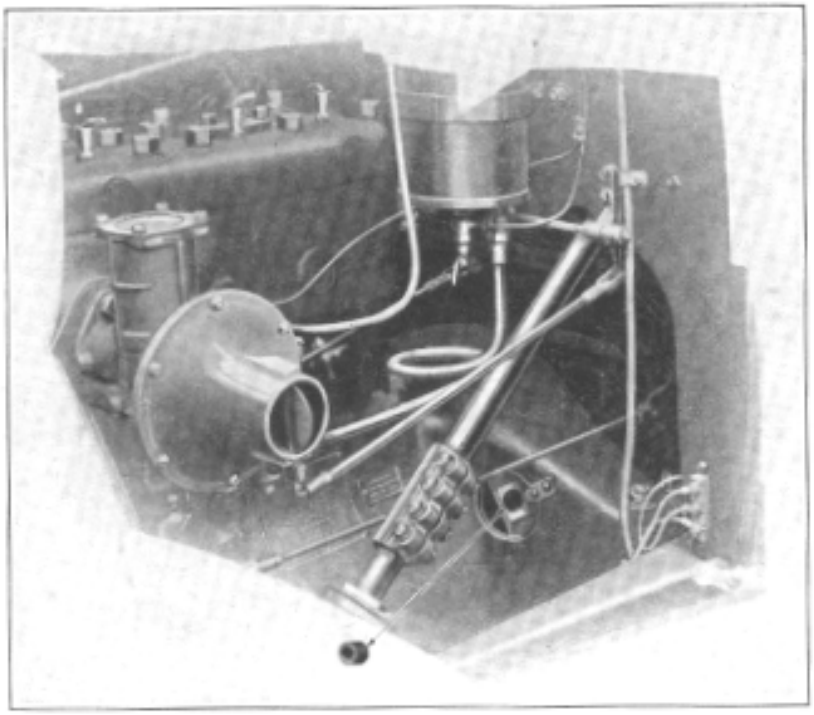
Lubrication Diagram



Motor Lubrication

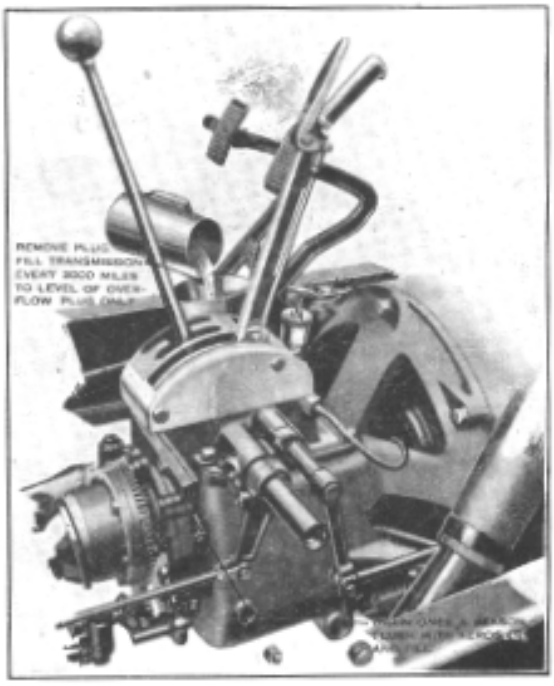


Generator Lubrication



Clutch Lubrication

Once a season remove plug in flywheel, drain, flush out with kerosene, drain again and refill with ½ pint of a mixture of kerosene and lubricating oil equal portions.

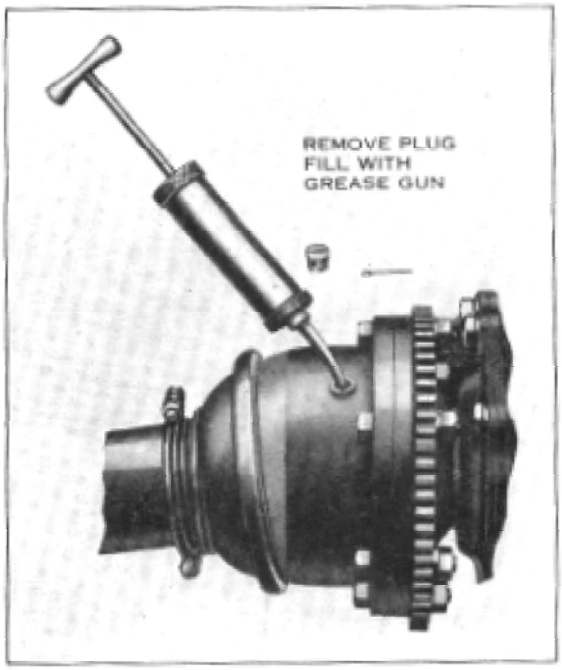


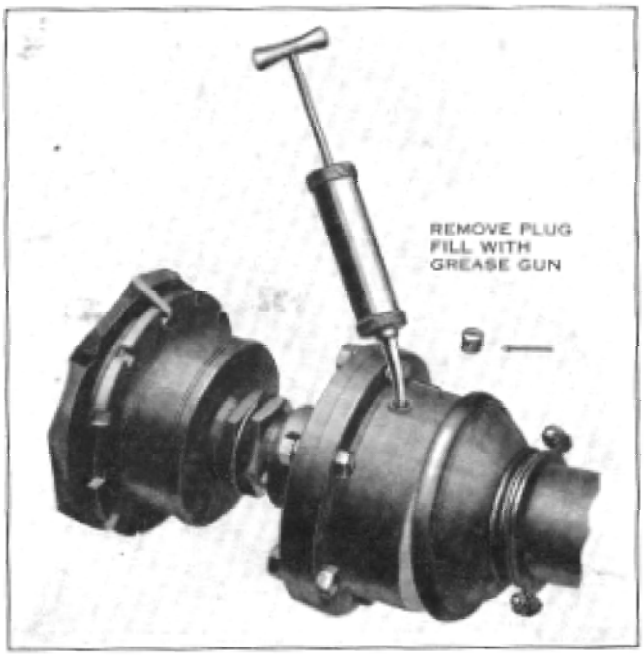
Transmission Lubrication

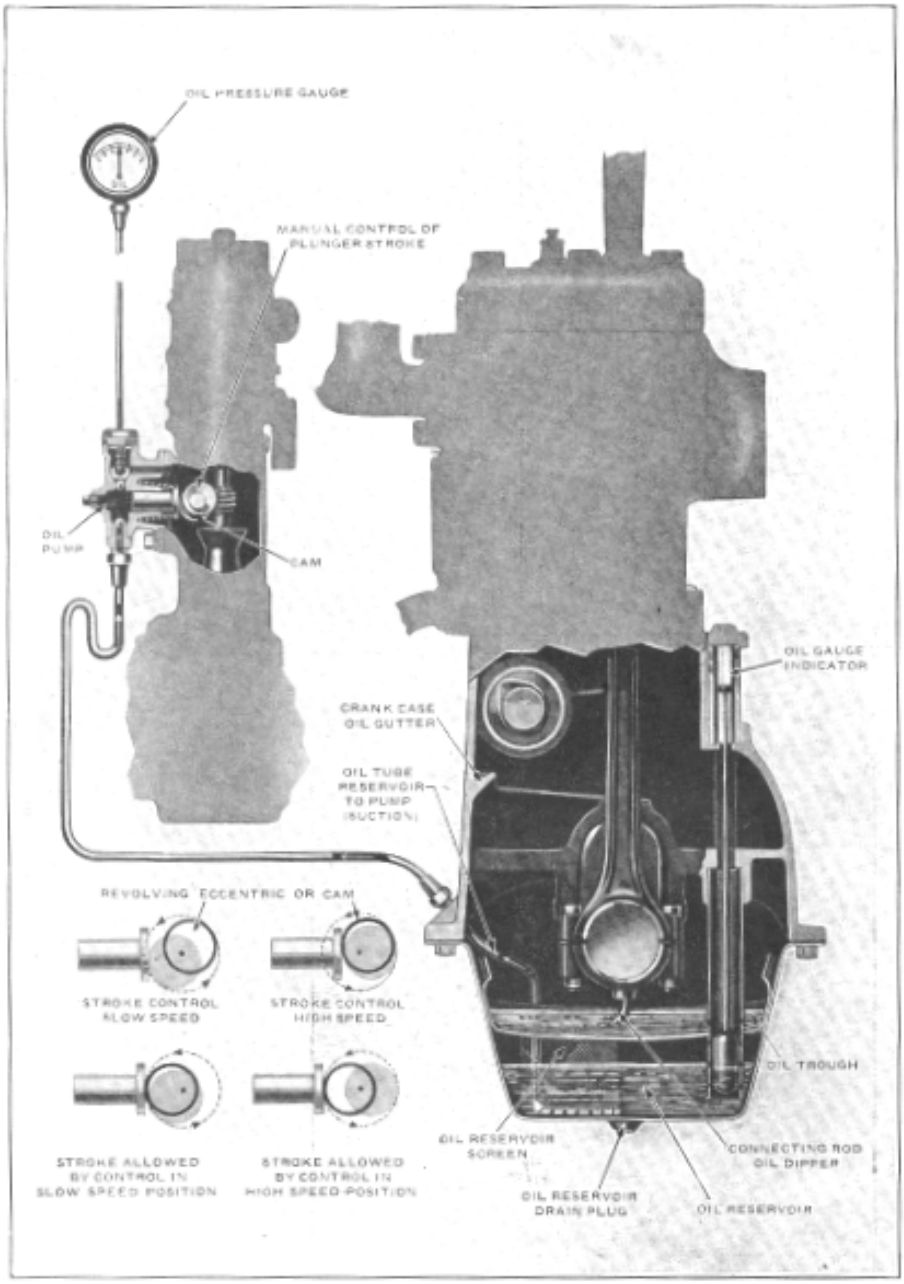
Follow instructions given. **See also page 11.**

Universal Joints

Front and Rear Universals Should Be Filled With Steam Cylinder Oil 600W or Fibre Grease.







Details of Oiling System

Motor Oiling System

The Super-Six motor employs the constant level circulating splash type of lubrication. The oil is lifted by a plunger pump and distributed to all bearings and moving parts. See illustration, page 16. The oil upon reaching the connecting rod troughs is splashed by the dippers attached to the connecting rod, and the spray serves to lubricate the pistons, cylinder walls, and all bearings. The oil is carried back by an arrangement of gutters and is finally returned to the reservoir, where it is cooled, ready for use again. The illustration, page 17, shows clearly the route of the oil in making the complete circuit.

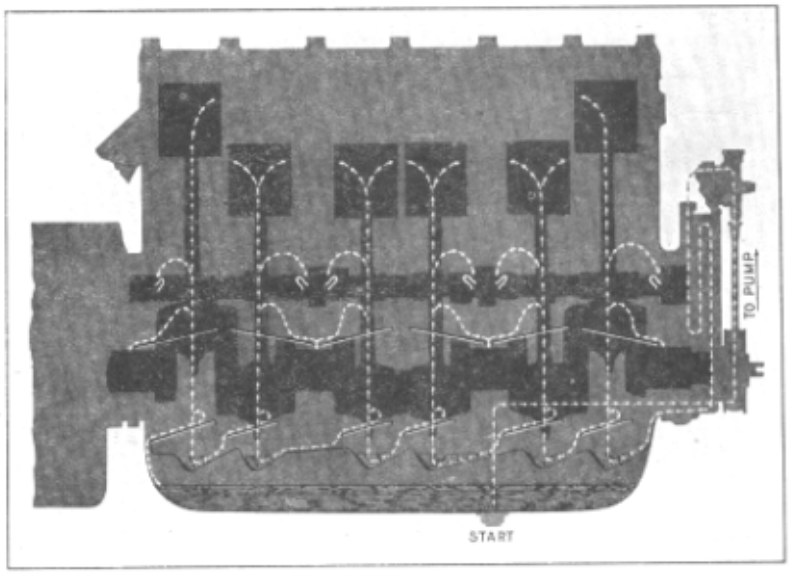


Diagram Showing Travel of Oil Through Motor

The oil pump employed differs from the conventional type. A glance at the illustration, page 16, will show that the stroke of the pump, and consequently the amount of oil pumped, is controlled by an eccentric. Through a simple arrangement of levers and rods this eccentric is governed by the FOOT ACCELERATOR AND THROTTLE CONTROL in a way that the quantity of oil pumped to the motor varies directly the demands being made upon it.

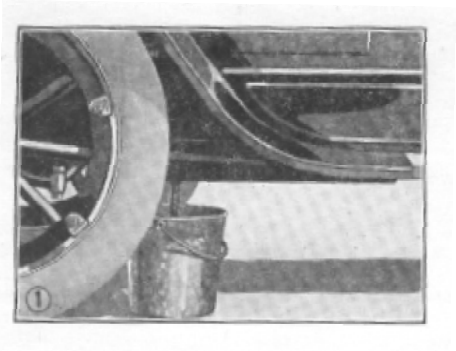
The oil pressure gauge on the instrument board indicates whether the oil pump is functioning or not. Failure of the gauge to register indicates one or more 6f the following conditions existing: Lack of oil in reservoir, dirty oil-preventing pump valves from working properly-air leak in one of the pipe lines, faulty adjustment or improper tension on spring located above the upper check valve. Very often irregularities are caused by small pieces of foreign material lodging under the valve seat, but the simple expedient of priming the pump will often dislodge them and restore the action.

Changing the Oil The efficiency of the oiling system. is dependent entirely upon having the necessary quantity of CLEAN HIGH GRADE OIL OF MEDIUM LIGHT BODY in the crank case.

After a few hundred miles of use, lubrication oil becomes contaminated with water and gasoline to such an extent that it is almost worthless as a lubricant. Adding new clean oil to dirty diluted oil is not economy, because the efficiency of the new oil is immediately reduced in proportion.

Experience has shown us that the average owner is very negligent in keeping the oil in proper condition, and we wish to point out the absolute necessity of frequently changing the entire contents of the reservoir. If this is done every 500 to 700 miles, the life of the engine will be Increased and its operation will be quieter and more satisfactory; the small outlay necessary will be many times repaid.

To insure proper lubrication, this old oil must be drained off and replaced entirely with new. To do this, proceed as follows:

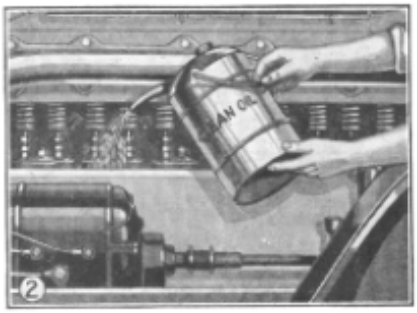


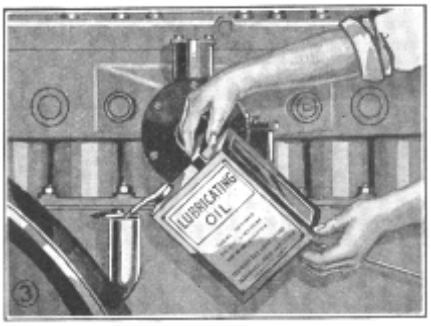
1. Remove the drain plug from the bottom of oil reservoir and drain off all oil. See illustration No. 1.

2. Remove the valve tappet cover plates and pour about one quart of clean oil into each tappet compartment. Then replace drain plug. See illustration No. 2.

3. Crank motor for about 30 seconds, but do not let it run on its own power.

4. Remove drain plug again and drain off all oil. Replace drain plug. See illustration No. 1.





5. Pour one quart of NEW, CLEAN OIL into each tappet compartment slowly. See illustration No. 2.

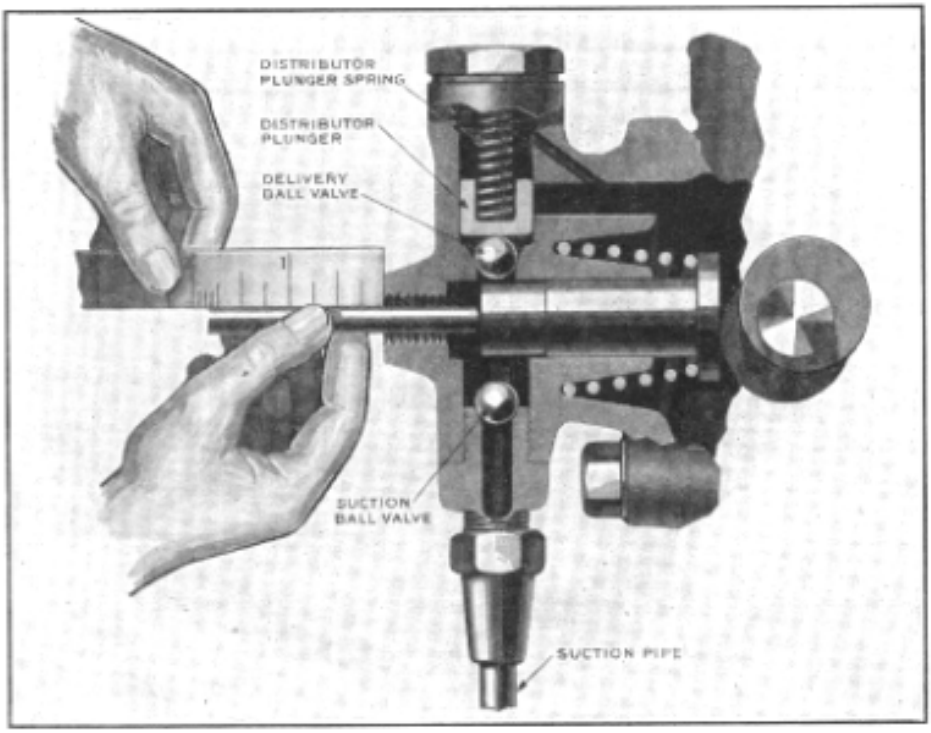
6. Pour five quarts of oil through filler pipe, making 7 quarts in all. See illustration No. 3.

Adjustment and Inspection The quantity of oil delivered by the pump is dependent upon the pump adjustment, not the reading of the pressure gauge. The initial setting of the stroke should be not less than 1/8", and 3/16" is allowable for cars which receive exceptionally fast driving. The stroke can be checked as follows:

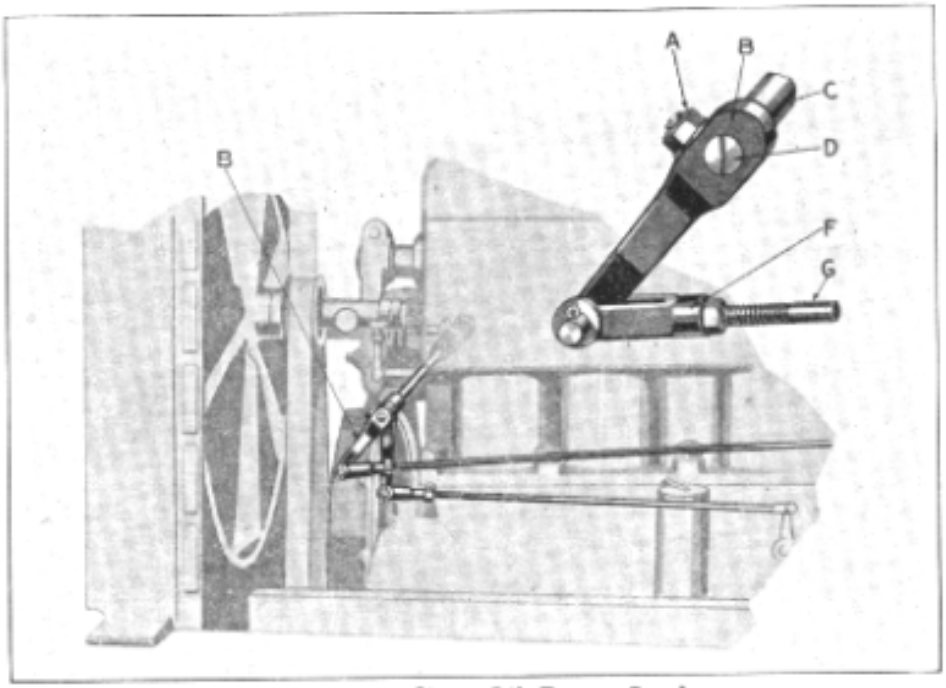
Remove the small pipe plug on the front of the pump. Start the motor and allow it to run at idling speed. Insert a straight piece of wire, so that it rests against the end of the plunger. The wire will now travel in and out with the plunger and the stroke can be accurately checked. See illustration page 20.

If the stroke is more or less than the proper setting, It can be readjusted as follows:

Loosen nut "A" on upper end of rocker shaft lever. See illustration page 20. The shaft "D" is now free to turn and., with the aid of a screw driver, adjustment can be made. Turning the shaft to the left reduces the stroke and turning to the right will increase it. With the match or wire against the plunger, keep checking the travel until the desired setting is secured, then lock the nut "A" securely. CAUTION: Do not allow the rocker shaft and cam to become inverted, or the



How to Measure Oil Pump Stroke



Where to Adjust Oil Pump Stroke

allow the rocker shaft and cam to become inverted, or the motor will receive the maximum oil at low speed and little, if any, when you need it most. After changing the setting, remove the clevis pin which connects the rod "F" to the lever and move the lever forward while the motor is running. If the stroke increases, as registered by the wire, the cam bears the proper relationship to the controls.

It is absolutely essential that no air or oil leaks exist In any of the lines. If they do, the pump will stop. Keep all pipe connections carefully tightened.

General Care of the Motor

Running a New Motor Do not run a new motor at high speed for any length of time. During the process of limbering up and running in, it is advisable not to exceed 30 miles per hour.

Loss of Power Loss of power may be due to dragging brakes, flat tires, improper lubrcation and similar irregularities. Be sure that these things are in order and that the car coasts or rolls easily before altering the motor adjustments in any way. The power of the motor is affected by: carburetion, loss of compression, carbon deposits, adjustment of tappets, valve and ignition timing and temperature.

Maintaining Compression Poor compression is usually caused by tappets riding because of insufficient clearance or carbonized and pitted valves. See that the inlet and exhaust valves show a clearance of .004 and .006 inches respectively, when warm.

To grind the valves, proceed as follows: Drain cooling system, then loosen upper radiator hose. The cylinder head can then be taken off by removing the stud nuts. Then remove valves and clean them thoroughly.

Spread some valve grinding compound on the valve and replace it in the seat from which it came. This is very important. The valves are numbered to facilitate their proper return. A light spring of just sufficient height to hold the valve off Its seat should be placed under the head before grinding. A screw driver or brace may be used for grinding, but if the tool is heavy, do not bear any additional pressure on the valve; otherwise, the seat may become grooved and ruined. The valve should be given about one-third of a turn back and forth for about one dozen times. Allow the spring to lift the valve off Its seat, move It around a little and then repeat. The operation is finished when all grooves and pits have been removed and the surface presents a frosty appearance. Before replacing cylinder head, remove all traces of carbon which has accumulated.

When removing and replacing the cylinder head gasket, it is a good plan to shellac the upper side of the gasket to the cylinder head. When the head is next removed, the gasket will remain attached to the cylinder head, thus making its removal easy.

Carbonized Cylinders Carbon deposits may be caused entirely by too much gasoline entering the combustion chamber. The carburetor adjustment on the dash enables the operator to control the amount of fuel and the gasoline regulating lever should always be carried to the right or lean side as far as possible. In order that all the fuel will be fully vaporized and consumed, the motor should be kept hot by the use of the radiator shutter. If the above does not prove effective, thoroughly inspect the carburetor. See that the packing gland nut is tight and that no dirt in the gasoline is holding the Inlet valve open, thus flooding the carburetor. See carburetor illustrations on pages 36 to 38.

Lubricating oil which has become diluted with gasoline will pass the pistons and cylinders easily, thus forming carbon deposits. Dilution of the oil can be minimized by running the motor hot with a lean mixture and changing the oil frequently as we recommend.

To remove carbon deposits, the head of the engine should be taken off as Instructed for grinding valves.

General The following inspection should be given the motor periodically:

Remove spark plugs, clean them and set the points at .025 to .028.

Examine the contact breaker points. If they look pitted or black, have them replaced or adjusted by a competent mechanic. See page 27.

Drain cooling system (when water is used) flush out and refill.

See that carburetor, radiator shutter and spark controls work freely.

See that all electrical connections are tight and clean. Check tappet clearances. Inlet, .004. Exhaust, .006.

Adjust fan belt tension if necessary.

Change oil in the motor. See page 18.

Drain sediment from vacuum tank.

Drain sediment from carburetor bowl.

Drain cooling system (when water is used) and flush out and refill.

See that the motor bolts are tight. Vibration In the motor will often be traced to loose motor bolts.

Lubricate generally. See page 12.

Clean the motor and carburetor thoroughly with a rag moistened in kerosene.

The Electrical System

The electrical equipment on the Super-Six consists of the Delco motor-generator, the ignition system, storage battery, the ignition-lighting switch, horn and the necessary connecting wires.

Motor-Generator The term "motor-generator" is used because the machine functions as both. As a generator It is revolved by an extension of the water pump shaft and delivers current for charging the six volt battery. When cranking the motor, current is delivered by the storage battery and the machine is geared to the flywheel. The action of pressing the starter pedal with foot first meshes the gears, then makes the electrical connection which energizes the starting motor, thus cranking the engine. When cranking an overrunning clutch at the front end of the unit allows the armature to turn faster than the shaft, which ordinarily drives the armature when the machine is functioning as a generator.

To facilitate the meshing of the starter gears, the armature starts to revolve slowly when the ignition switch is turned to "ON" position. The clicking sound heard when the switch is on emanates from the generator clutch referred to before. As soon as the generator drive shaft turns faster than the armature, the clutch becomes inoperative and the shaft drives the unit.

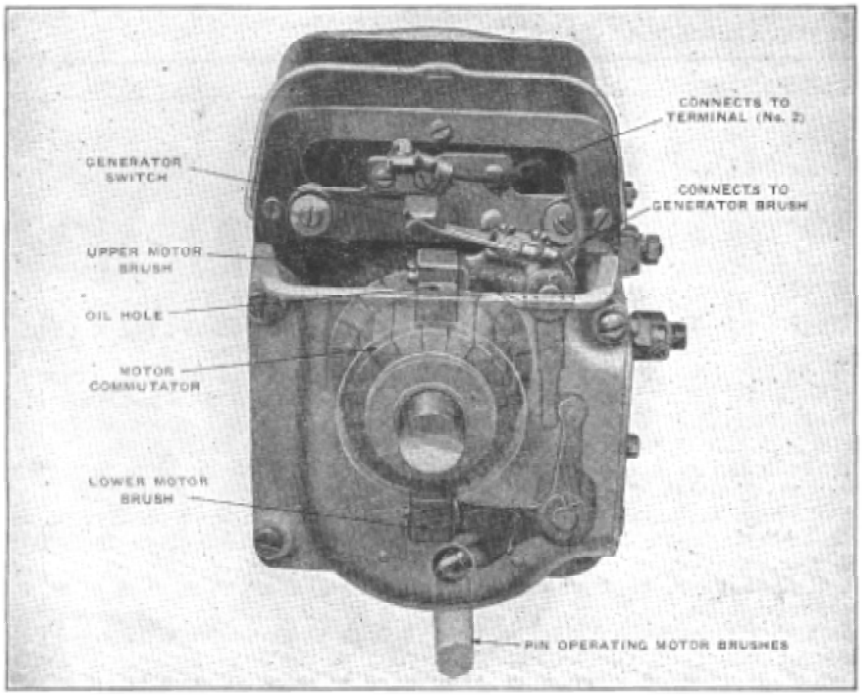
An automobile is driven at varying rates of speed, and as the current output of the generator would ordinarily increase to a point where serious damage would be done to the storage battery, some means must be provided for regulating the current. This is done by introducing a third brush on the generator commutator. Its action is such that the current rapidly increases up to about a car speed of 20 to 25 miles per hour and then starts to decrease proportionately. As motor cars, on an average, are driven at this rate of speed, it will be seen that under all ordinary conditions the generator will keep the battery properly charged at all times.

The output of the generator can be varied by adjusting this third brush. See page 25. Moving the brush to the left decreases the charging rate and moving it to the right increases it. The adjustment should be undertaken only by an experienced workman and the result carefully checked after the brush has been sanded in on the commutator. The maximum output of the generator should not be more than 16 amperes. The brush is carefully adjusted at the factory and should not be tampered with unless you are positive that the rate is not sufficient for the load on the battery.

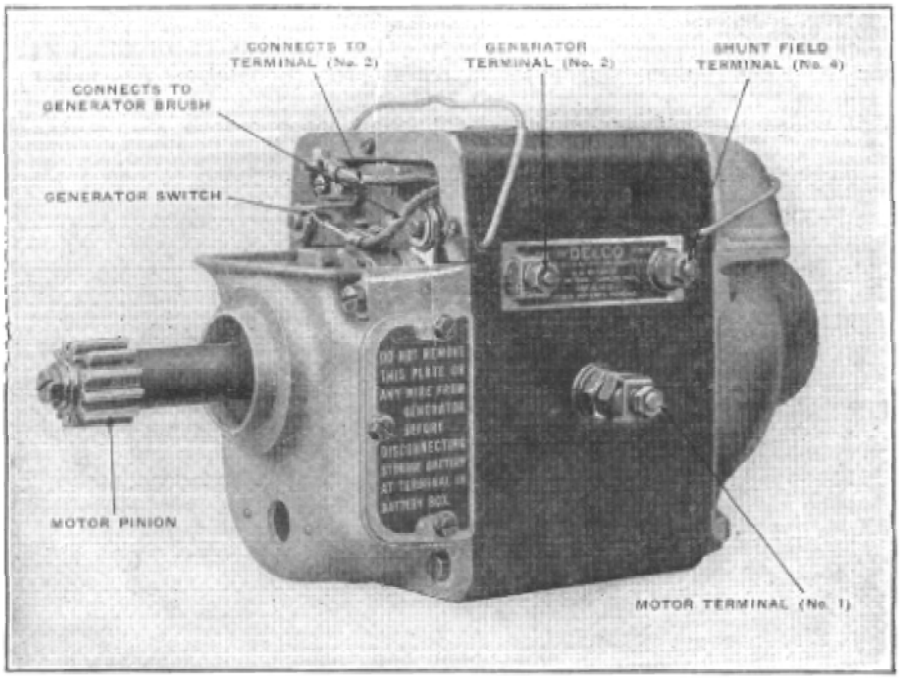
Lubrication and Inspection The oil holes in the front and rear end housing (see pages 13 and 24) should receive four or five drops of 3 in 1 oil every 1000 miles. Do not put oil on the commutator. The commutator may be cleaned by holding a piece of 00 or 000 sandpaper against It when it is revolving. Do not use emery cloth or coarse sandpaper.

Keep all connections clean and tight.

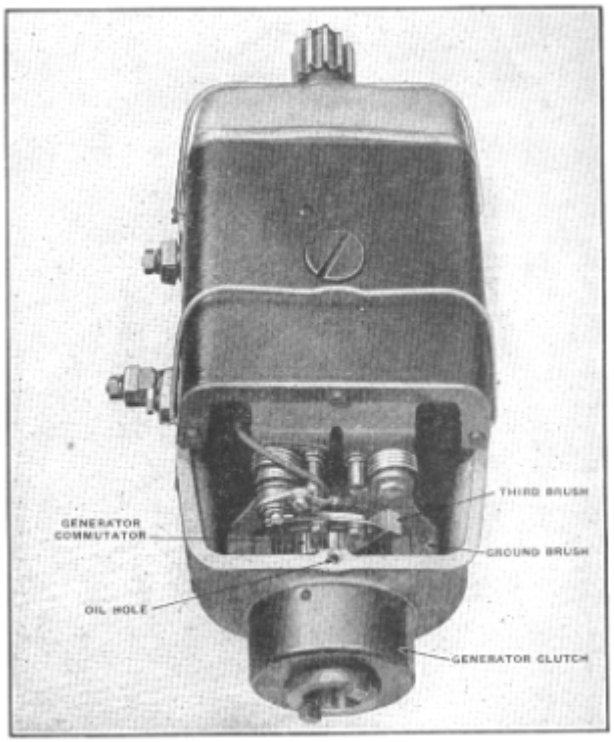
Keep generator clean.



Motor Brushes



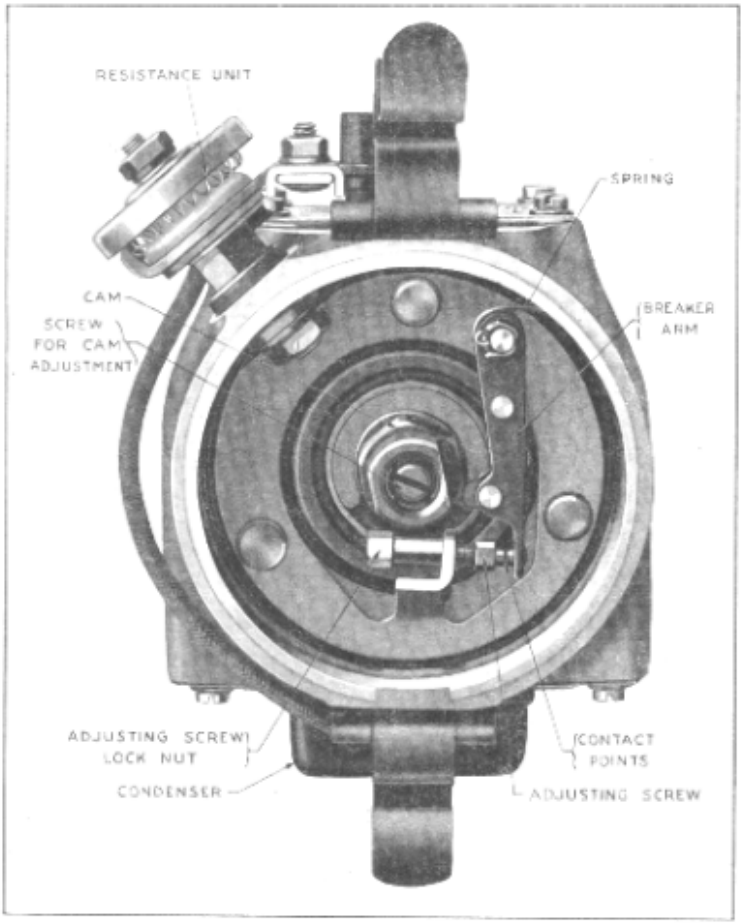
Side View of Generator



Location of Third Brush

The Ignition System The system consists of a distributor or timer, coil, condenser and a resistance unit.

The distributor-timer is driven by a vertical shaft and is located directly above the oil pump at the front end of the motor. On it Is mounted the condenser and the resistance unit. The condenser is for the purpose of increasing the voltage of the high tension current and protecting the contact points in the distributor against burning. The resistance unit limits the amount of current that can pass through the system, thus protecting the coil and the wiring. A spark control governor Is built in the distributor assembly, and by the action of centrifugal force it automatically advances or retards the Ignition, according to the motor speed. This relieves the driver of the majority of spark lever manipulations, It being only necessary to retard the spark lever on the steering wheel quadrant when necessary, as indicated by a knocking In the motor.



Where Ignition Is Timed

Timing the Ignition Referring to the diagram of the distributor, it will be seen that the cam which makes and breaks the contact points is adjustable. To move the cam it is necessary to loosen the screw in the center of the shaft. Before attempting to time the motor, see that the contact points are clean and

set at a clearance of .018 inches, when on the highest point of the cam or at their widest opening.

Turn motor over slowly with hand crank until No. 1 cylinder is on compression stroke. To determine this remove other spark plugs and turn until you feel the resistance of compression. Turn motor over very slowly, until the pointer on the observation hole on the flywheel case is directly over the mark "A" which is stamped on the flywheel. See that the button on the rotor is directly under the contact in the distributor cap which leads to No. 1 cylinder spark plug. Loosen set screw at center of cam and turn the cam until the contact points just start to separate. When checking the result the cam should be held on tension in the opposite direction to rotation and the back lash in the gears should then allow the points to start to separate when the cam is rocked back and forth. Then tighten the screw. Rub a very small quantity of vaseline on the track in the distributor cap, around which the contacts are spaced, and then rub off the free vaseline. Replace rotor and distributor cap.

Attention Keep contact points clean and set at a clearance of .018 inches. Use fine sandpaper for cleaning points. The small sandpaper discs used by dentists are excellent for this purpose.

Keep distributor cap track polished with vaseline. (Use sparingly.)

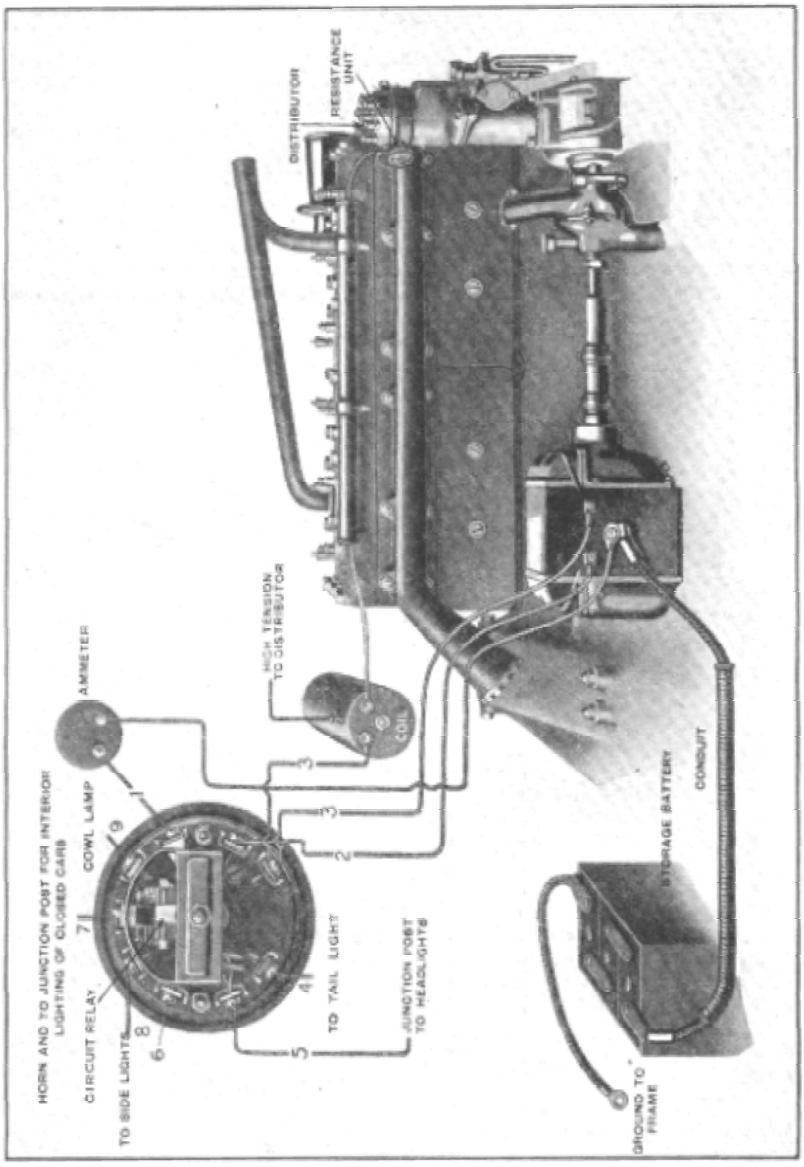
Do not allow oil or dirt to accumulate on the contact points.

The distributor cap and high tension wires should always be clean and dry.

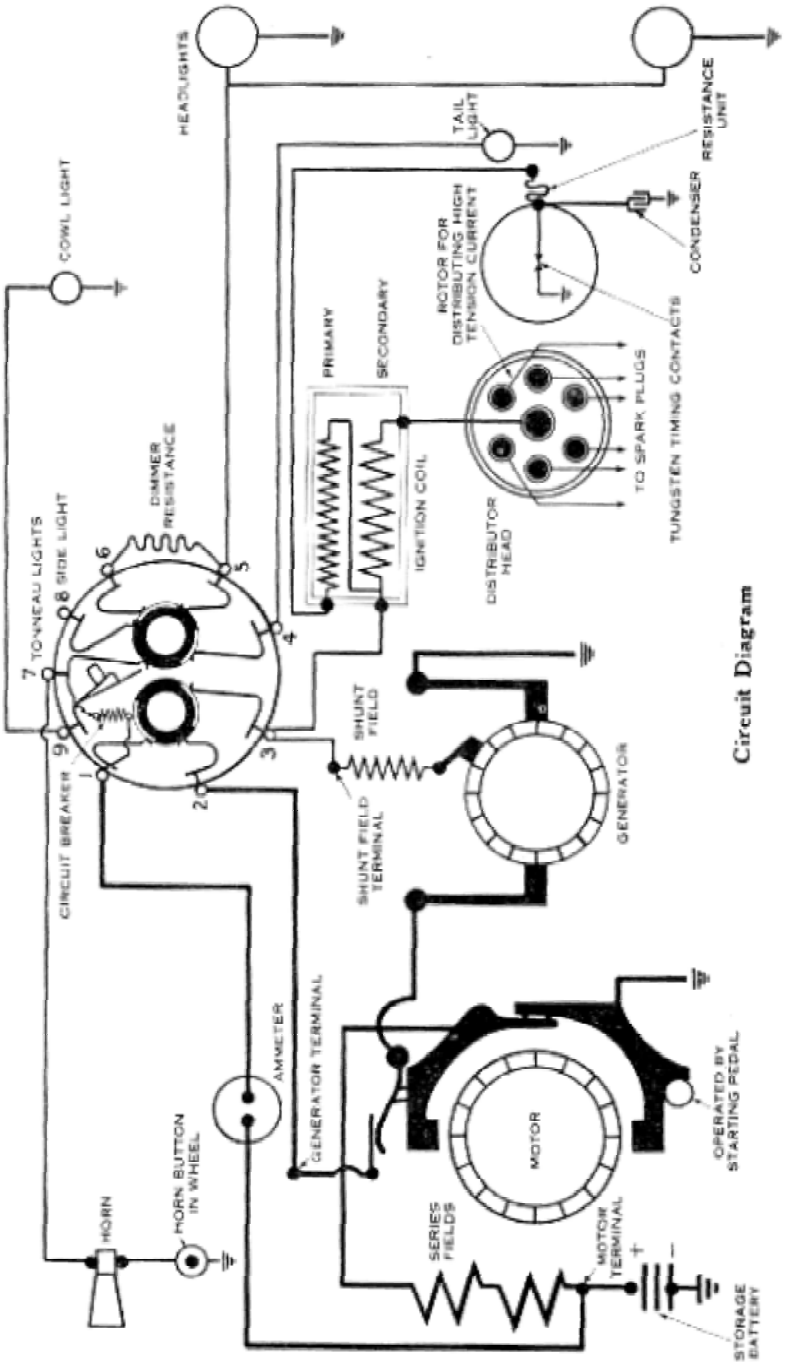
The resistance unit should be kept clean and all connections tightened.

The Switch The combination switch is located on the instrument board and controls all ignition and lighting circuits. On the back of the switch is located a circuit breaker and it serves as an alarm or signal should any short circuit develop in the wiring system. Trouble of this nature instantly manifests itself in a clicking or vibrating noise at the switch. When this occurs place both levers on switch in "off" position. Then place ignition lever in "on" position. If the circuit breaker does not vibrate, return ignition lever to "off" and turn lighting lever to the various positions. By the process of elimination, you can determine in which circuit the short or ground appears and it will then be necessary to follow the wire or wires out until the ignition, lights and horn function properly and the circuit breaker does not vibrate. In the Hudson Delco system there are no fuses and, consequently, after the source of the trouble has been remedied, there is nothing to replace.

The Wiring System The type of wiring employed Is known as the single wire or grounded wire or grounded return system. The frame and metallic portions of the car serve as wire or means of completing the circuit. This simplifies the wiring system considerably. A circuit diagram on Page 29 shows the path of the current on all the various leads or circuits and the conventional wiring diagram on page 28 shows how simple the wiring actually is.



Wiring Diagram

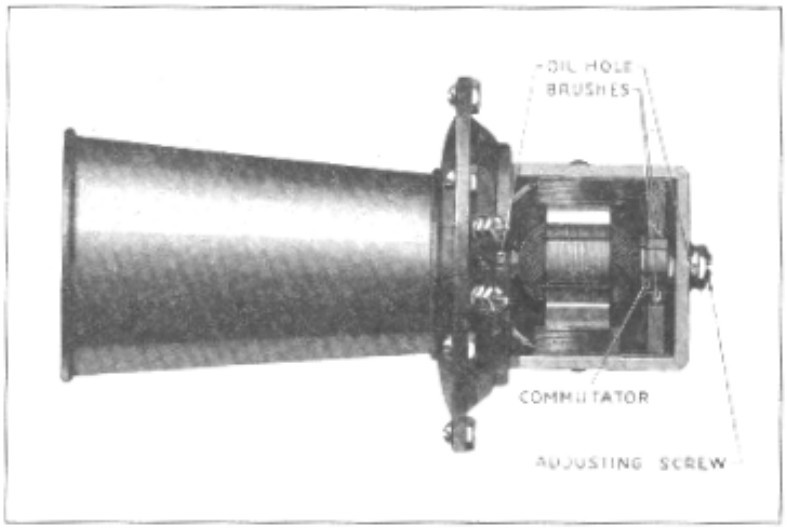

HEADLIGHTS
TAIL LIGHT
RESISTANCE UNIT
CONDENSER
COWL LIGHT
ROTOR FOR DISTRIBUTING HIGH TENSION CURRENT
PRIMARY
SECONDARY
TUNGSTEN TIMING CONTACTS
TO SPARK PLUGS
DIMMER RESISTANCE
TONNEAU LIGHTS
SIDE LIGHT
IGNITION COIL
DISTRIBUTOR HEAD
SHUNT FIELD
SHUNT FIELD TERMINAL
GENERATOR
CIRCUIT BREAKER
AMMETER
GENERATOR TERMINAL
OPERATED BY STARTING PEDAL
MOTOR
HORN BUTTON IN WHEEL
HORN
SERIES FIELDS
MOTOR TERMINAL
STORAGE BATTERY
Circuit Diagram

The Horn The horn contains a miniature electric motor, and when contact is made at the horn button, this motor revolves at a high rate of speed. A toothed disc is attached to the motor shaft and bears against a button on the horn diaphragm, thus producing the warning signal. The tone of the horn is dependent upon the speed at which the motor can revolve, and this is influenced by the care and attention given the device.

Lubrication Once a month remove the motor cover and drop a few drops of 3 in 1 oil (no other) in the oil holes. (See illustration).

Moisten a soft piece of cloth with 3 in I and hold it on the commutator while the armature is revolving. It will be necessary to have someone depress the horn button. See that the commutator is perfectly clean before returning the cover. Caution - Do not use sandpaper or any other abrasive on the commutator.

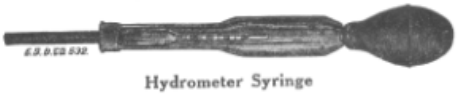
Adjustment The tone of the horn may be changed by turning the adjusting screw to the right or left until the desired tone has been attained. Then tighten the lock nut. Do not adjust too tightly. The armature should always turn easily (when turned by the fingers).



The Storage Battery

The normal life of a storage battery can be very much shortened by neglect or abuse. Care of the battery in service can be summed up in the following rules, which, if observed with reasonable care, will result in the best service being obtained:

1. Keep the plates in each cell covered by adding pure water when necessary.
2. Take frequent hydrometer readings in order to determine that the specific gravity of the electrolyte in each cell is correct.



Hydrometer Syringe

3. Should the hydrometer show that the gravity has fallen in the cells, then operate the car, using the lights and electric starter sparingly until the battery has become recharged. It this Is not convenient, have the battery recharged at the nearest Exide Battery Service Station.
4. Keep the filling plugs tight and the top of the battery clean.
5. Keep the battery connections tight and the terminals coated with vaseline in order to prevent corrosion.

Adding Water - When Necessary Water must be added often enough to keep the plates covered. It the plates are exposed for any length of time they may be seriously damaged. The length of time the battery can go without the addition of water will depend upon the season of the year, the battery requiring attention more frequently in summer than in winter.

In freezing weather when necessary to add water, always do it just before running the car. The reason for this is that water, being lighter than the electrolyte, will remain on the surface and will freeze if the temperature is low enough. It the engine is run immediately after, however, the effect of the charging current will be to thoroughly mix the water with the electrolyte and the tendency to freeze will be avoided.

The electrolyte in a fully charged battery, 1.270, freezes at 80 degrees below zero, while In normally discharged battery, gravity of 1.150, it freezes at about zero Fahrenheit. Therefore, It is especially important to have the battery well charged when the car is standing in a very cold place.

To Add Water Remove the filling plugs by turning to the left and if level of electrolyte is found to be below bottom of filling tube, add water by means of a hydometer syringe, or a very small pitcher, until the level begins to rise in the tube. After adding the water, be sure to replace the filling plugs and tighten by turning to the right. If the plugs are not tightened, the electrolyte will flow out of the battery.

Kind of Water To Use The water used must be of reasonable purity, as the use of impure water, if persisted in, will injure the plates. Distilled water, which can be purchased at any drug store, or rain water collected in clean non-metallic receptacles, is recommended.

Add Nothing But Water Nothing but water must be put in the cells. If acid of any kind, alcohol, or, in fact, anything but pure water is added to the cells, it may result in very serious injury to the plates and may ruin them.

The electrolyte consists of a mixture of pure sulphuric acid and water. Sulphuric acid does not evaporate - water does. Therefore, when the level in the battery becomes low, it means some of the water has been evaporated, and for this reason it is only necessary to add water in order to restore the mixture to its former condition.

Should the battery become spilled through accident, have it refilled and recharged by an experienced battery man.

Hydrometer Readings The hydrometer is an instrument used for quickly determining the specific gravity of the contents of the cells. A reading of 1.270 to 1.300 indicates that the battery is fully charged. A reading of 1.225 indicates that the battery is about one-half charged. The gravity below 1.200 indicates that the cells are nearing exhaustion.

Hydrometer readings should always be taken after the car has beer) run for some little time and before water is added to the battery. Unless this is done, a correct reading will not be obtained. Should the gravity be 1.225 or below, it is necessary to use the lights and the electric starter very sparingly until the battery has had an opportunity to build itself up again.

If you are unable to restore it by this procedure, have It examined immediately at the nearest Exide Battery Service Station and allow them to recharge it, if necessary.

If the hydrometer reading of one cell should be considerably lower than the reading of the other cells in the battery, and if this continues to increase from week to week, it is an indication of trouble in that cell and it will call for expert attention at the battery station.

If one cell continues to consume far more water than another, it may mean that the jar which holds the plates and solution is leaking, and the final result will be that the acid condition of the cell will become so low that the battery will refuse to function. This must also be corrected by an experienced battery man.

It is well to make it a practice to have your nearest Exide Battery Service Station frequently inspect the battery. You will find them willing to co-operate with you towards seeing that your battery is at all times maintained in perfect condition, and in this manner the expense of upkeep of the battery will be minimized.

If you intend to store the car, or have It inactive for some little time, the storage battery will require special attention. If the period of inactivity is not going to be more than one or two months, the battery should have distilled water added to it and should be charged until every cell reads 1.270 or higher. Disconnect the cables

leading to the battery and make sure that it is stored in a fairly warm building, free from dampness and dust. If the battery will be out of service for a longer period of time, it should be removed from the car, and stored with the nearest Exide Battery Service Station in order that it will receive proper care and attention necessary during the storage period.

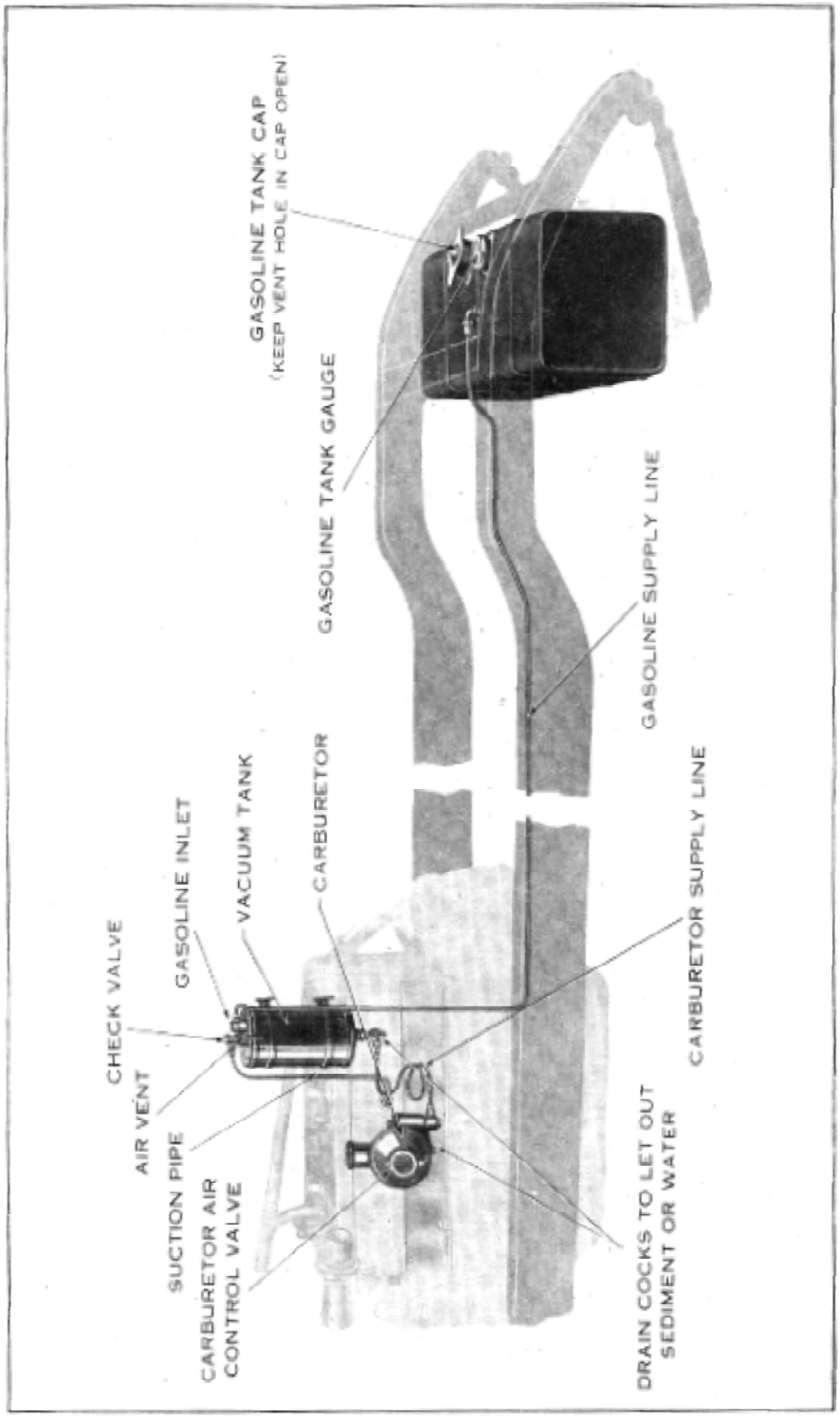
If this is not practical, then the battery must be fully charged before the period of storage and must thereafter receive a freshening charge at least every two months by running the motor until the hydrometer reading shows the specific gravity is up to the proper point. We earnestly recommend, however, to endeavor to store the battery with the service station if possible. They will place it on what Is known as a trickling charge, which means that the battery is subject continuously to a very low charging rate of current. Investigation shows that batteries may be kept practically indefinitely by this process, because the charging rate is so low that it is only sufficient to take care of the normal discharge of the battery which is continually going on whether the battery is in use or not.

The Gasoline System

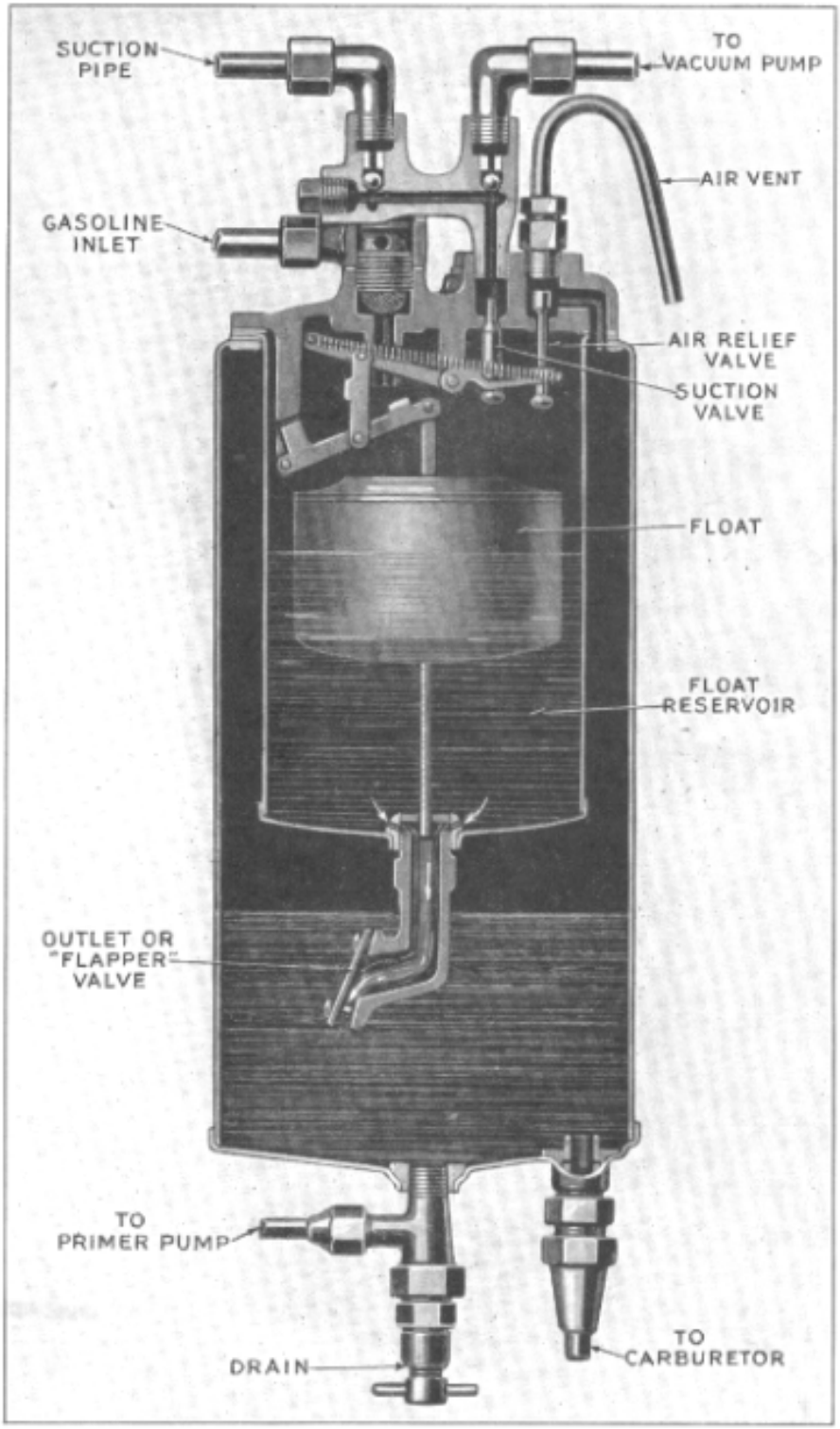
The gasoline tank holds approximately 20 gallons and is fitted with a gauge which shows the amount of fuel contained. See that no dirt gets into the tank when filling.

Frequently inspect the vent hole in the filler cap to see that it is not clogged. Should it become clogged, the vacuum tank will fall to work because of lack of pressure on the fuel.

When the vacuum tank is empty, it can be filled by removing the small pipe plug on top and pouring In sufficient fuel. It Is possible to start vacuum tank working by cranking motor with the carburetor choke closed. This however puts an added drain on the battery.



The Gasoline System



Sectional View of Vacuum Tank

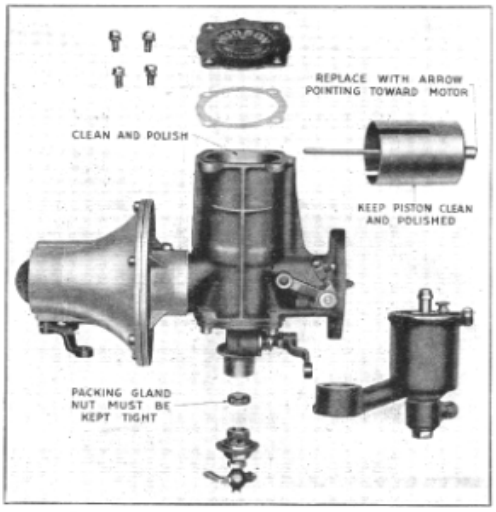
The Carburetor

The only attention the carburetor ever requires is to periodically examine the piston and to see that the packing gland nut in the base of the carburetor is holding the packing tight thereby preventing leakage at this point. Note the illustration and simplicity of the construction of the Hudson carburetor and the accessibility to parts which require attention.

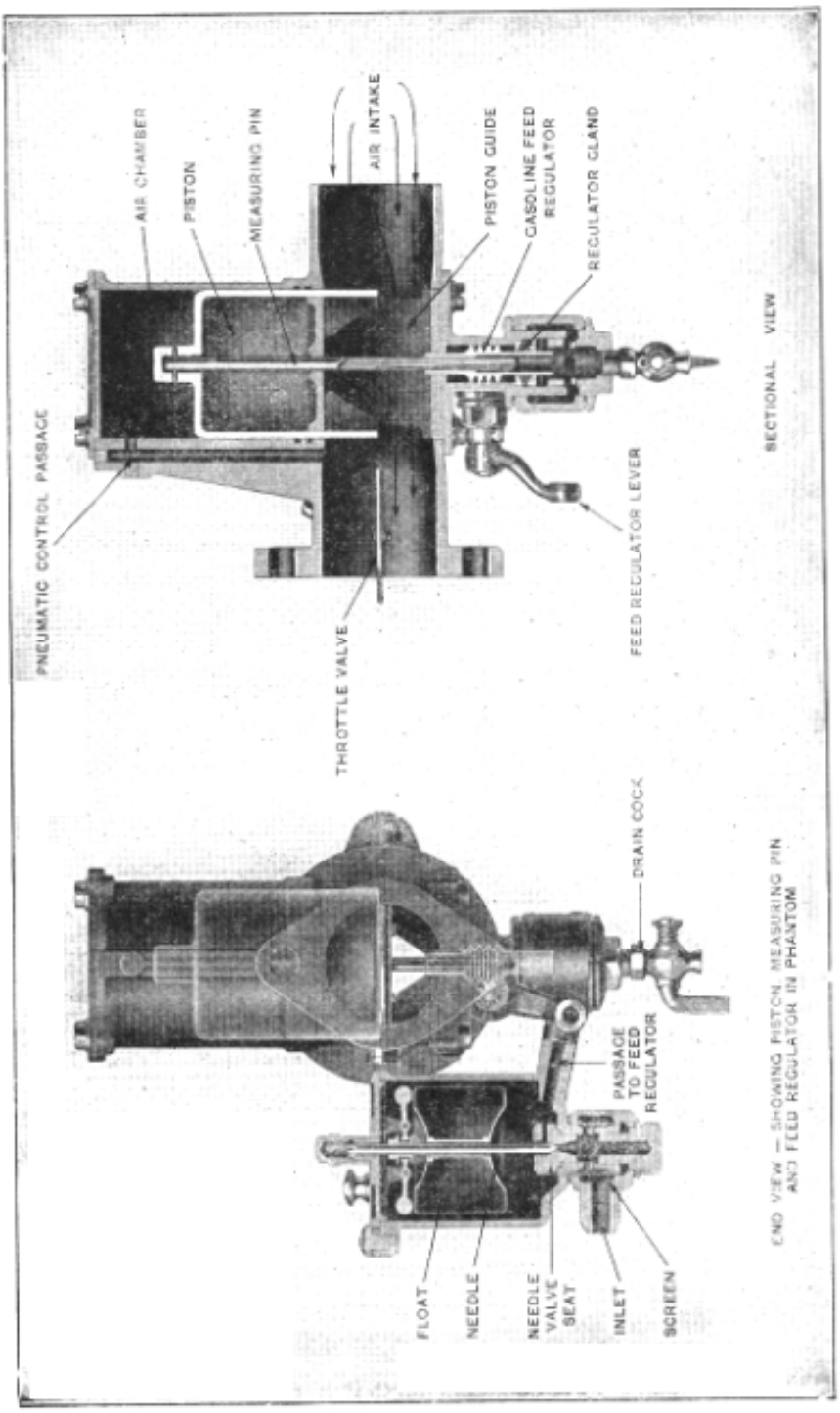
The piston should be removed and carefully cleaned with whitIng and oil, metal Polish, or jeweler's rouge until the surface is highly polished.

UNDER NO CONSIDERATION use crocus cloth, emery cloth, sandpaper, valve grinding compound or anything of this nature on the piston.

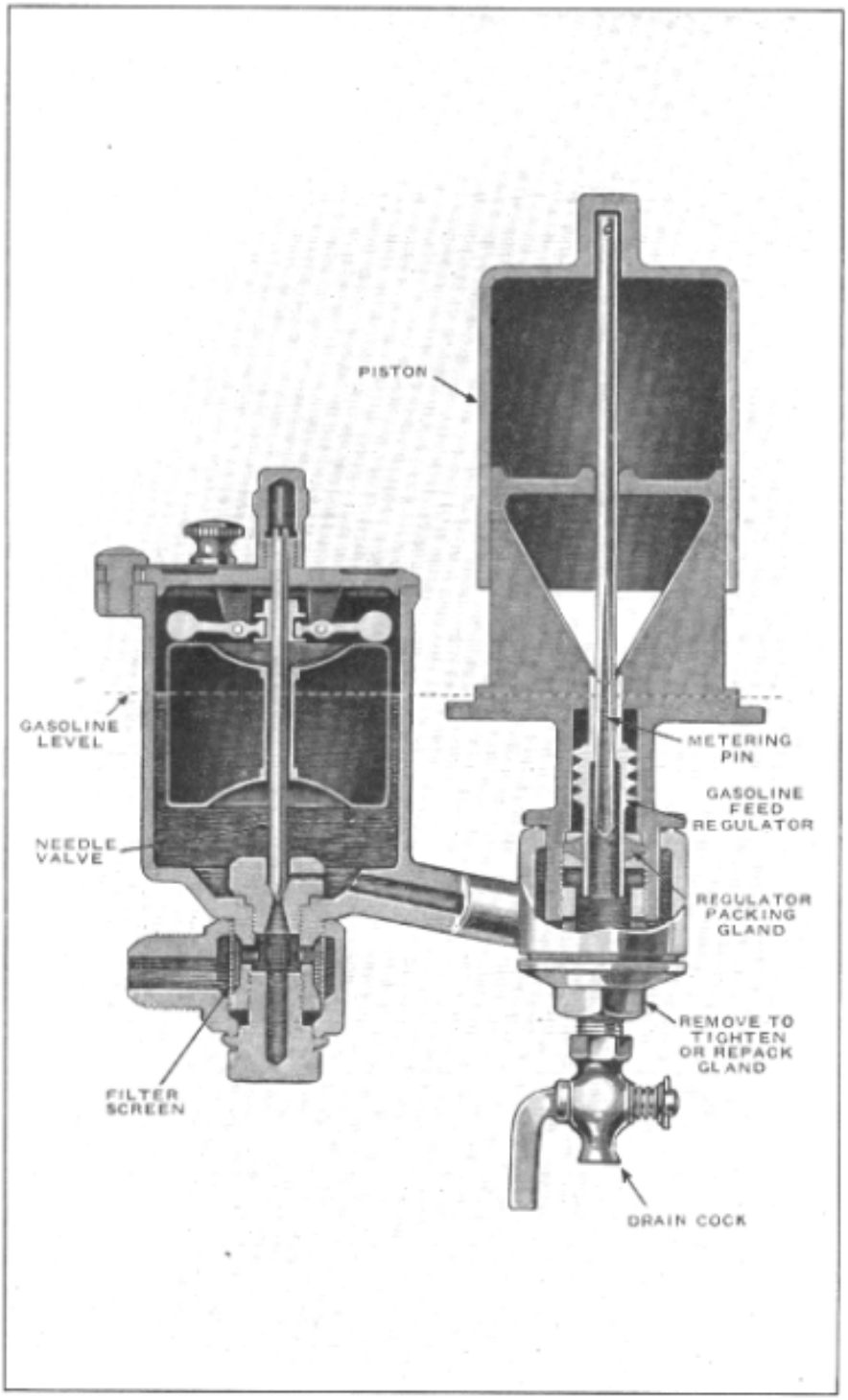
When returning it to the carburetor body, make sure that the arrow on top of the piston and the groove in the metering pin points toward the motor.



Should the packing gland nut become loose, it will not manifest itself in a leakage from the carburetor, but your gasoline mileage will be low and you will experience trouble due to diluted c r a n k case oil, fouled plugs, etc. To tighten this gland it is necessary to remove the petcock and float chamber as shown in illustration, then the gland nut which is here shown outside can be tightened with a broad screwdriver. It should be tightened until the regulating lever which raises and lowers the sleeve offers resistance. When necessary the gland should be repacked with soft candle wicking.



The Hudson Carburetor



Sectional View of Carburetor

The Cooling System

Care of the cooling system can be summed up as follows:

1. The cooling system must always be filled with clean water, preferably rain or soft water.

2. Drain, flush out and refill twice a year. See page 6.

3. See that the fan belt is not slipping, nor too tight. In very wet climates, keep fan belt looser than usual, as it is liable to shrink if soaked in water.

4. Once a season, especially in the spring after anti-freeze has been used, thoroughly clean the cooling system as follows:

Dissolve two pounds of Sal Soda (washing soda) In two quarts of hot water. Drain radiator and pour this solution in, adding sufficient water to fill the system. Allow the motor to run (or drive car) for about one-half hour with the shutter closed until the mixture is boiling; then drain radiator, flush with pure water and refill.

5. If the water pump stuffing nuts leak do not tighten them to excess or the water pump shaft will cut. If slight pressure does not stop the leak have the stuffing nuts repacked.

6. Use only the following Anti-Freeze solutions:

For 5º below zero:

Alcohol	15%
Glycerine	15%
Water	70%

or

Alcohol	30%
Water	70%

For 10º below zero:

Alcohol	18%
Glycerine	18%
Water	64%

Or

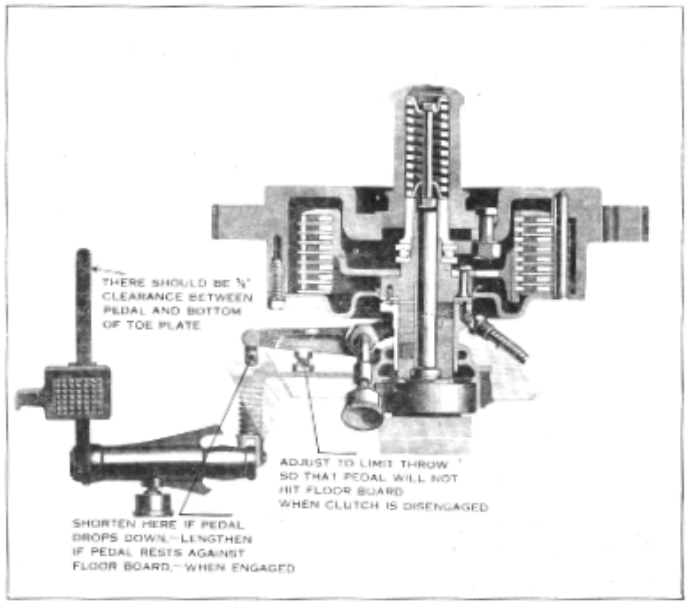
Alcohol	35%
Water	75%

When using Anti-Freeze, always adjust the shutter to maintain the motometer fluid at the arrow designated. See Page 10.

The Clutch

The clutch is of the multiple disc type with cork inserts. It is fully enclosed in the flywheel and runs in what is suitably termed clutch oil. The cork inserts become saturated with this oil, and maintain the velvety action so desirable, while the friction between the corks and steel discs is sufficiently great to prevent any tendency to slip. The only care necessary is to renew the clutch oil occasionally, or adjust pedal to allow for natural wear.

Adjusting Pedal When the clutch is fully engaged, there should be a clearance of 3/8" between the clutch pedal and the toe board. This is obtained by an adjustment shown fully in the accompanying illustration. Wear on the clutch parts is Indicated by the pedal stopping farther away from the toe board than usual. If the clutch is burnt or abused, so that the corks swell up, the pedal will come back farther-nearer to the toe board.



Showing Where Clutch Adjustments Are Made

Lubrication The clutch operates in one-half pint of kerosene and lubricating oil mixed in equal proportions. Once a season the old oil should be drained off by removing the plug in the flywheel. This plug is reached through the observation hole in the flywheel housing, shown in illustration on page 14. The clutch should be flushed with kerosene, again drained and filled with clutch oil of the proper proportions.

The clutch throwout sleeve is lubricated by the large grease cup beside the starter pedal and gear shift control in the driver's compartment. This cup should be filled with soft grease and given one or two complete turns every day to insure proper lubrication. Clashing of gears and hard shifting can usually be attributed to faulty lubrication at this point.

The Transmission

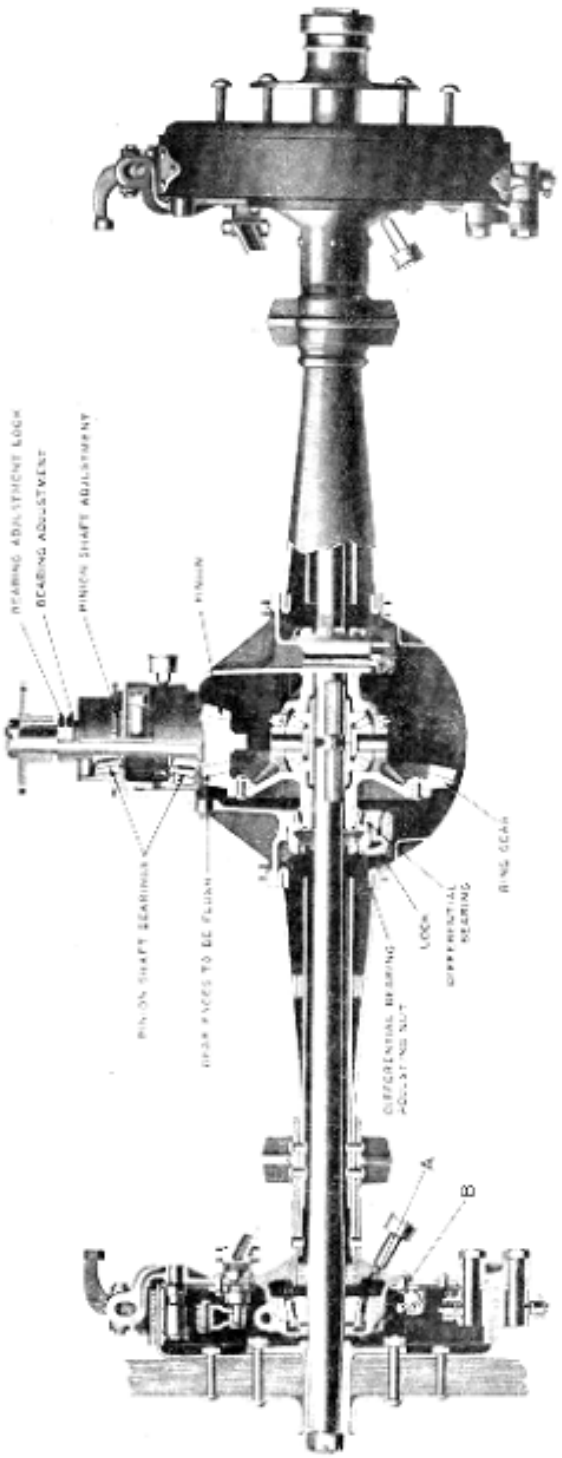
The Transmission Is provided with means of adjustment by which ordinary wear can be compensated for when necessary.

To Adjust Main Shaft Excessive end movement in the main shaft may cause the gears to slip of mesh when engaged and will make the transmission noisy. To remove this end movement, it is necessary to loosen the cap screws which hold the rear main shaft bearing cap In place and take out one or more of the shims. When the cap is tightened In place, there should be no more than from .004 to .007" end movement in the shaft. There should be less than .004", or the bearing will cut, through lack of lubrication.

To Adjust Countershaft When excessive end play develops in countershaft, It can be be removed by removing shims from behind the plate which covers the front bearing and the shaft. Never remove shims from the rear countershaft bearings.

Gears Jumping Out of Mesh This is caused by excessive end movement in shafts (see above) and can also be caused by the interlocks which engage on the notched shifting shafts failing to enter the notch and hold properly. The spring should be tested and replaced if weak, and the interlocks or plungers should be set so they fully engage with the notches.

Lubrication For Transmission Lubrication see page 14.



Rear Axle Diagram

Rear Axle

To make adjustments to bevel gears, proceed as follows:

1st - Adjust the pinion shaft bearings.

2nd - Adjust the pinion so that the back face of the teeth on the pinion and ring gear are flush.

3rd - Adjust ring gear to the left or right of the pinion, It necessary, in order to obtain the proper back lash of .006 to .008". (Approximately.)

See rear axle diagram.

To Adjust the Pinion Shaft Bearings First-loosen the lock nut, then turn the adjusting nut to the right until a slight friction is felt on the bearings when the pinion shaft is rotated by hand. Then back off the adjusting nut sufficiently to allow about .005" end play after the lock nut has been tightened against the adjusting nut. Extreme care should be taken in this adjustment, as too much end play in the pinion shaft bearings will cause noisy gears and too little play will damage the bearings.

Adjusting Pinion So That the Back Face of the Teeth on Both Ring Gear and Pinion Will Be Flush Remove pinion shaft adjustment, lock and screw pinion shaft adjustment in or out until the back face of the teeth are flush. Then lock this adjustment by returning lock to slot and replacing clamp bolt. The gears may be inspected while making this adjustment by removing inspection plug on the left side of the rear axle housing on top.

Adjusting Ring Gear To Obtain Proper Backlash Remove differential cover plate on the rear of the axle housing. Take off the differential bearing adjustment locks and loosen cap bolts sufficientlyto allow the differential bearing adjusting nuts to turn. If there is any side play In bearings, turn nuts up until this is removed, but do not bind. To move ring gear to left, loosen left side nut two notches and turn up right side nut the same. Repeat this operation until the required back lash is obtained. To move ring gear to right, reverse this operation. When completed, return locks and tighten bolts holding bearing nuts In place.

Adjustment of Wheel Bearings Through usage the wheel or axle shaft bearings shown at “A”in the rear axle diagram develop a certain amount of play, due to natural wear. The wheels are rigidly fastened to the shafts by being drawn up on the taper; therefore, the bearing wear will cause side play in the wheels. These bearings may be adjusted as follows:

Remove the wheels. This should always be done with a wheel puller, never by striking the end of the shaft with a hammer, as this may injure the bearing.

Remove adjusting nut lock and loosen locking bolt. Take up the adjusting nut "B" until the drive shafts show no end play, but are perfectly free and the bearings do not bind. In making adjustment do not take up all the play from one side. Equalize it by

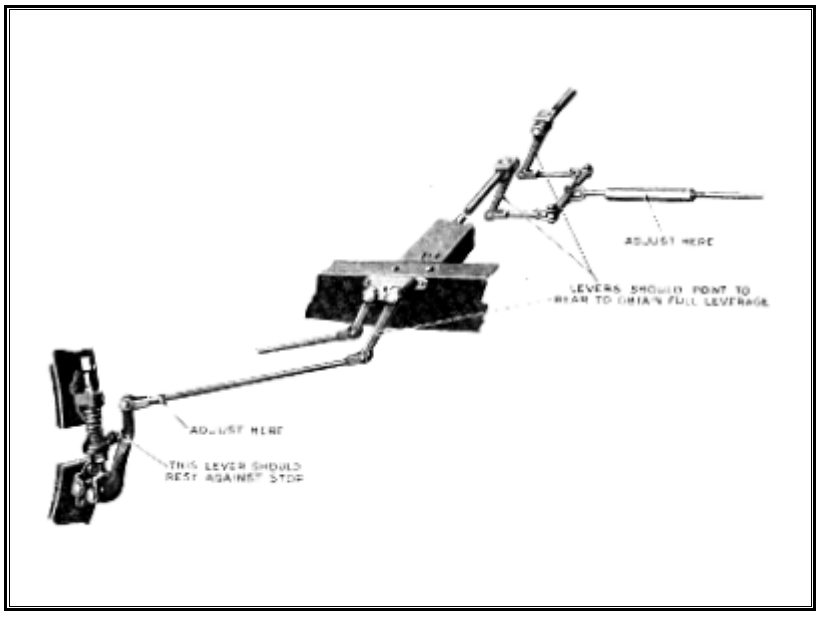
taking up the same amount on each side until the proper result has been obtained.

When returning lock, if the notches do not correspond, back the nuts off until the lock will engage. Do not tighten the nut any more to make lock engage, or too much pressure will be placed on the bearings.

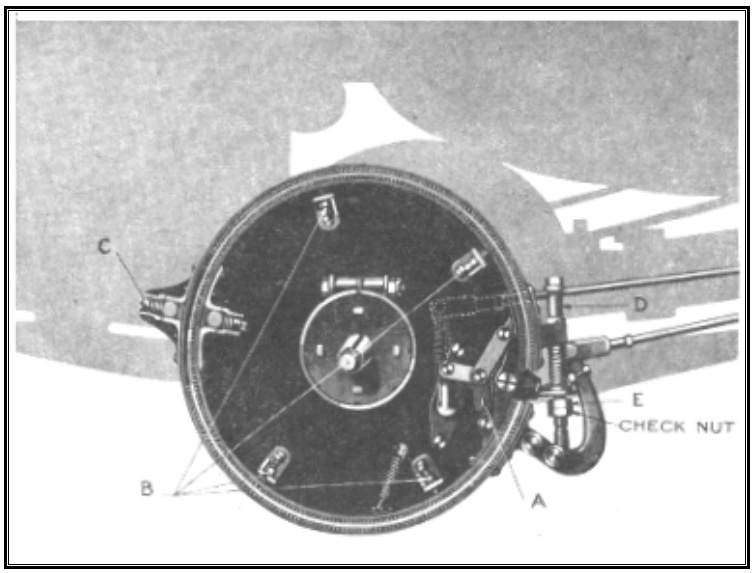
When replacing rear wheels, the key should not be Inserted until the wheel has been mounted on the shaft, so that the keyways in both hub and shaft line up properly. Then drive in key until end is flush with hub.

Brake Adjustments

Before proceeding with the following adjustments, it is necessary to inspect the brake rods to make sure that they are in proper position. The brake levers on the equalizer under the frame cross member should point to the rear. The brake rods should be lengthened or shortened as the need may be, so that full leverage will be exerted when the brakes are applied.



How to Adjust to Obtain Proper Leverage



Brake Band Adjustments

To Adjust Foot Brakes 1. Turn adjustment "C" in untl the band just clears the drum by the drum by the thickness of a thick visiting card.

2. Then turn check nut and "E" down, thereby raising the lower half of the band until proper clearance has been obtained.

3. The upper band will now stand away from the drum and can be brought to place by the adjustment nut "D".

Always follow the above procedure in adjusting the foot brake bandfirst, back; second, lower half; third, upper half.

Adjusting the Hand Brake Each internal brake Is provided with set screws and locks, as shown and locks, as shown at "B". These are for the purpose of making the band conform to the inside surface of the drum. The wheel may be removed with a wheel the band adjusted by means of these set screws until the drum will slide over the band snugly and the wheel revolve freely.

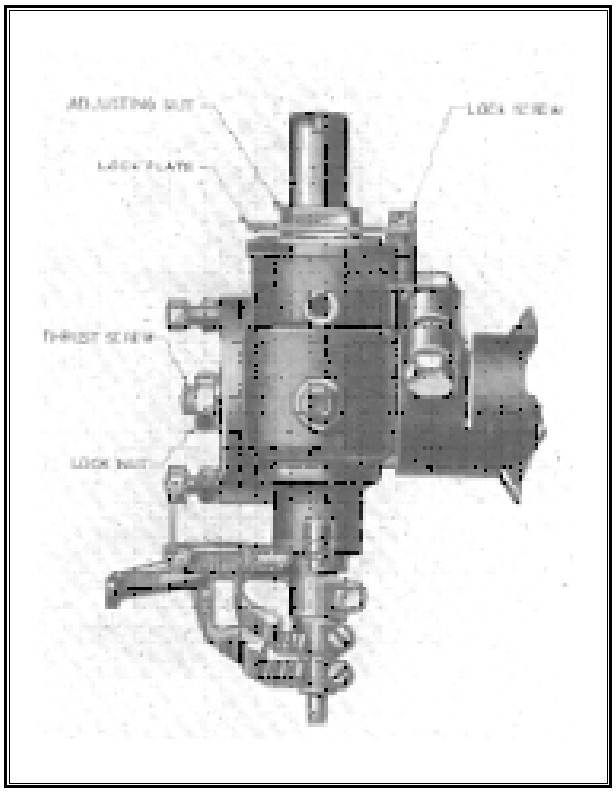
If the brakes do not hold until pressure has been applied for several seconds, it indicates that the lining is worn, or the leverage is In need of adjustment. Check leverage before relining.

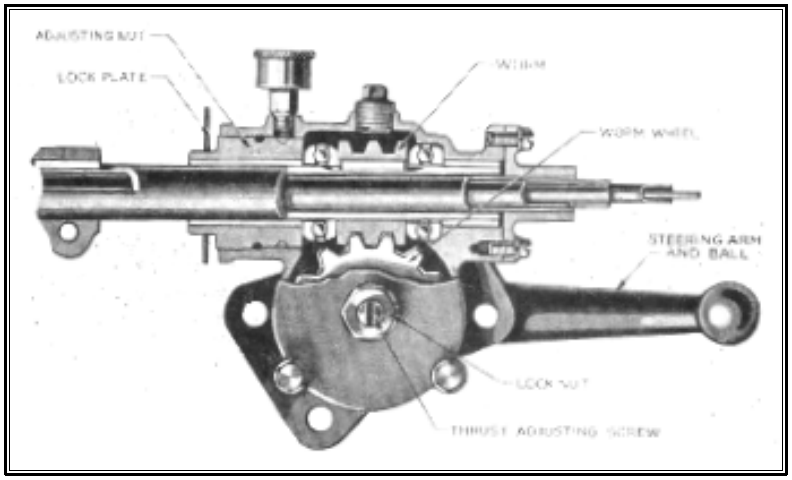
Steering Gear

The Hudson steering gear has been designed so that wear of any kind can be compensated for. The steering gear case should be kept filled with light grade of Whitmore Compound. A heavy lubricant should not be used.

To Remove End Play In Steering Post

Take out locking screw and lift lock plate clear of adjusting nut. Adjust by turning the nut downwards until play is eliminated. Replace locking plate in position to bring one of the two holes as nearly in line with the hole in the housing as possible. If necessary, back off adjustment until a screw can be-entered through one of the two holes in the plate and through the tappet hole in the housing.

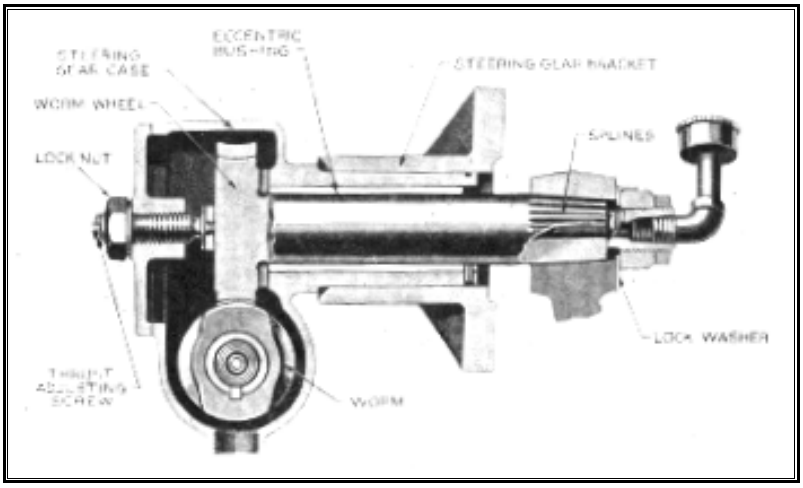




To Remove Back Lash or Play in Gears In order to bring the worm wheel deeper into mesh in in order to bring the worm wheel, first remove the steering gear case from the bracket on frame, after taking off the steering arm and ball. Remove pin at outer end of case near arm and turn eccentric bushing until the mesh is correct. Then replace pin.

If worm wheel is worn in one spot, give it about one-third turn and put the steering arm and ball back in new position.

To Remove End Play in Worm Wheel and Shaft Loosen lock nut and turn thrust adjusting screw in until play is eliminated. Then tighten lock nut.



Springs and Spring Shackles

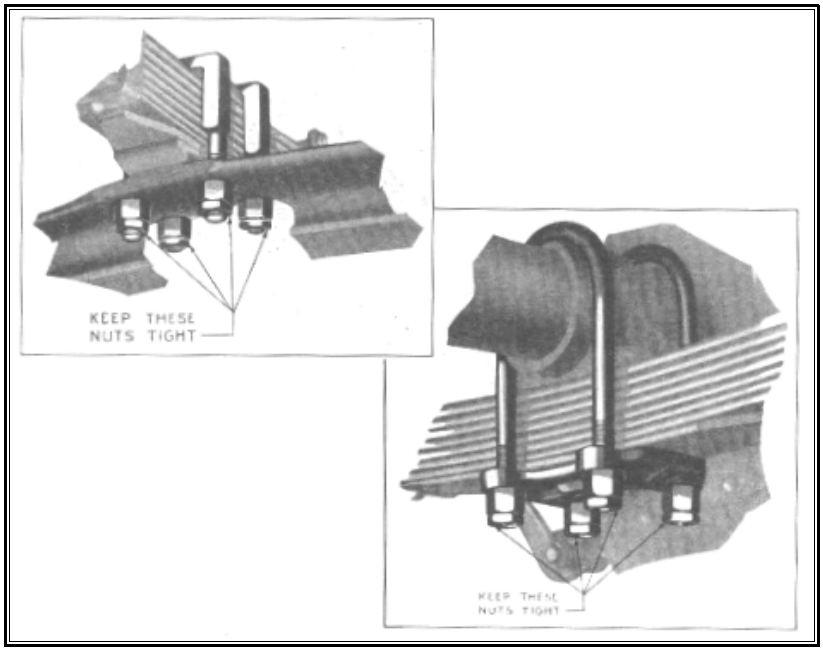
'To eliminate squeaks and obtain easy riding, the springs should be lubricated with cylinder oil. Frequent attention with an oil can along the sides of the leaves is recommended. If you hear a squeak, when you step on the running board, the springs need attention.

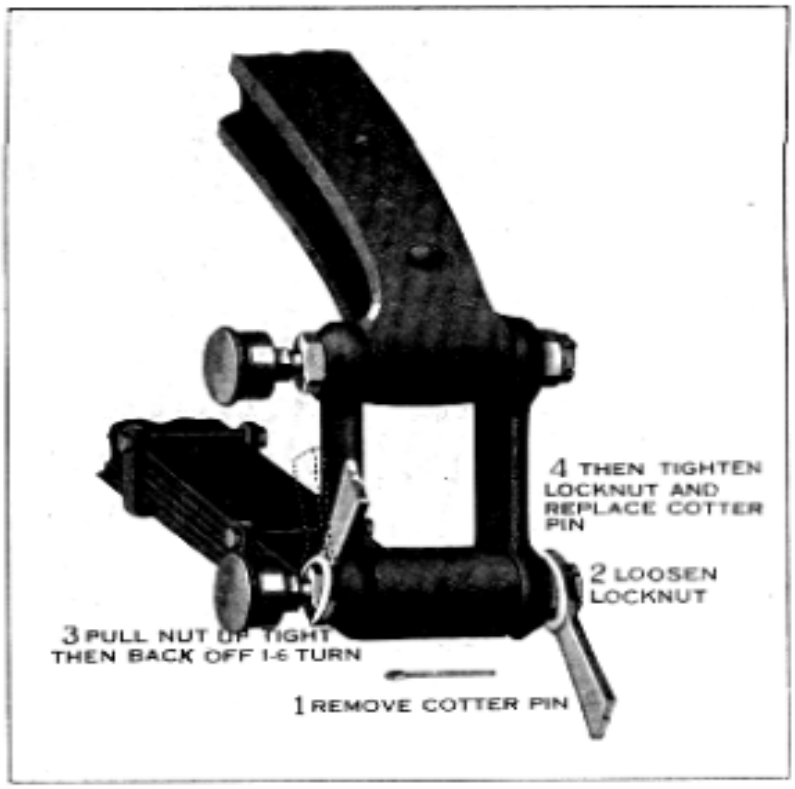
Spring Clips Spring breakage is usually caused by lack of lubrication and loose spring clips-those clips which secure the springs to the axles. It is essential that these clips be inspected regularly for tightness.

Spring Shackles Spring eyes and shackles are subject to a certain

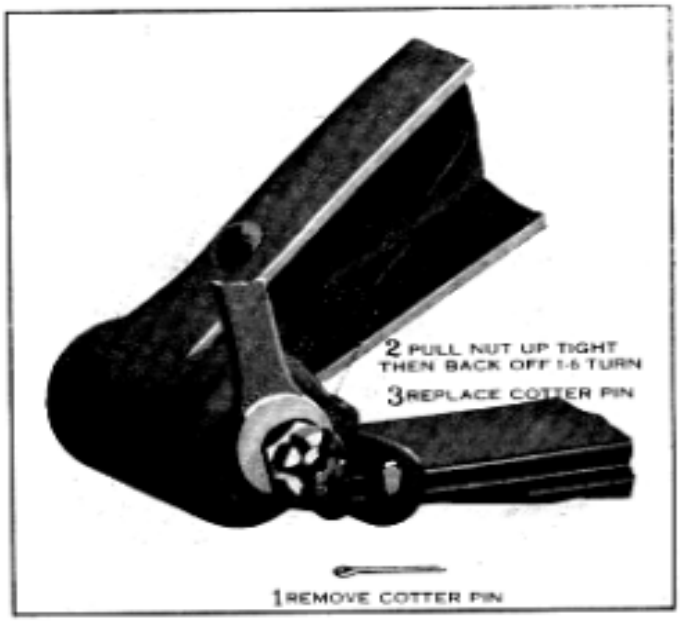
amount of wear, which, in time, will cause a, knock or rattle. This side play can be eliminated by loosening up the shackle bolt nut and turning the bolt until the threaded shackle takes up the play. Then tighten nut and reinsert cotter pin.

Front Ends of Springs To tighten the front end of springs, it Is only necessary to remove cotter pin and tighten the nut. Then back nut off one-sixth turn and insert cotter pin.





Spring Shackle Adjustment



Adjusting Front End of Springs

Tires and Rims

Keep tires inflated to pressure recommended by maker.

Clean out tread cuts with gasoline. Apply rubber cement and squeeze in a little tire putty as supplied by tire manufacturers.

All cuts or tears should be vulcanized by a tire repairman.

The constant wearing down of the tread, either unevenly or round in circumference, may be caused by quick starting or stopping, or on the front wheels by improper alignment of wheels. (See page 52.)

If you find it necessary to use tire chains, they should be applied fairly loosely. Chains that are too tight cut and tear the rubber; if too loose, they will fold under and produce same result.

Tires should be protected from extreme temperatures, bright light, grease and oil. If necessary to drive over oiled roads, tires should be cleaned with gasoline upon returning.

When applying a new tire tube, examine the rim carefully. Remove rust with sandpaper and paint with regular rim paint or powdered graphite and gasoline.

In applying tubes, dust inside of shoe with French Tale.

Inflate tube sufficiently to hold it round so that tube will not be pinched.

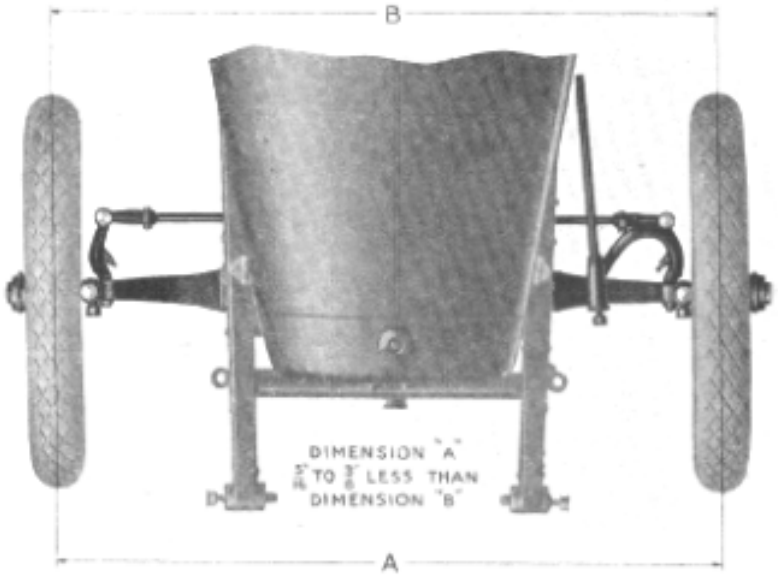
Test the valve to make sure that it does not leak. If it leaks, tighten the valve inside with reverse end of valve cap. if this does not stop it, remove inside and insert a new one.

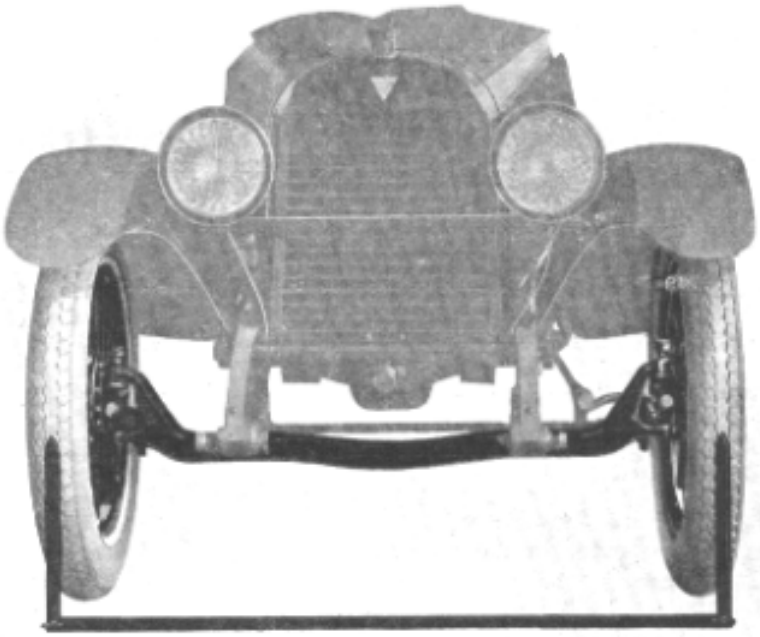
Spare tubes should be carried in the box in which they come, or should be carefully wrapped to prevent chaffing or coming in contact with grease or oil. Don't carry them in a tool box over the muffler.

The following tire supplies should be kept on hand: Extra tire and tube for emergency. Pressure gauge.

A heavy rim cut or emergency blowout patch and sufficient cement and patch rubber for repairing ordinary punctures.

Rims When mounting a rim on a wheel, the clamp nuts should be inserted so that the full surface of the clamp comes in contact with the rim. The clamps should be turned to the right as far as possible in order to obtain this result. When tightening the clamps, be sure and do so in a uniform manner to avoid the possibility of having the rim run untrue. After the rim has been centered, all the clamps may be tightened up to the maximum degree, but they need not be tightened excessively or the threads on the rim bolts may be stripped.


B
DIMENSION "A"
$\frac{5}{16}$" TO $\frac{3}{8}$" LESS THAN
DIMENSION "B"
A



Wheel Alignment

Because the alignment of the wheels is an important factor in the life of the front tires, the distance rod is provided with adjustments. The front of the tires should be about 5/16" closer together than the rear, measured at the same height from the ground.

To check this adjustment, jack up the front of the car from the center of the axle so that the distance rod is not interfered with. With both wheels free to revolve, a center line may be marked on each tire by holding a soft lead pencil against it when spinning. The pencil must be held steady or the result will not be a straight line. Next, measure with a tape or stick the distance between these lines at a point opposite the hub; turn the wheels half a revolution and measure again. The distance between the two results is the average, allowing for a slight wobble, and should be 5/16" to 3/8" less than the distance measured in the same way at the rear.

The handiest way to check this alignment is with the distance stick shown in the illustration. To adjust the distance rod, remove one of the bolts so that the clamp screw can be loosened and the clevis adjusted by turning on the threads of the distance rod. Any back lash in the axle knuckles and clevises should be taken up by straining the wheels outward in front before setting the distance by the rod.

The job should always be checked after the wheels have been let down on the ground with the weight of the car on them.

Cold Weather Precautions

There are four things which must be taken into consideration when operating the car in freezing weather. They are: lubrication, danger of freezing the cooling system, difficulty in starting, and, fourth, the increased attention required by the storage battery.

Lubrication Oils are affected by temperature. So-called medium oils become very sluggish In cold weather and are too heavy for the pump to handle. Therefore, In cold weather use nothing but light oil in the Super-Six. Change at least every 500 miles if you will prevent scored cylinders, burned bearings and premature wear. Lubricating oil Is rapidly spoiled by gasoline and water vapor during the winter months, and becomes absolutely worthless as a lubricant. Avoid the frequent additions of new oil. Better allow the oil supply to get low, then drain off and refill with new oil. Detailed instructions on changing oil will be found on page 18.

Danger of Freezing If temperatures below freezing are encountered, the water in the cooling system should be completely drained off, If the car is allowed to remain idle for any length of time. Drain at the points designated on page 6.

If continually operated at low temperatures, an anti-freeze solution should be employed. We recommend the following:

For 5º below zero:

Alcohol	15%
Glycerine	15%
Water	70%

or

Alcohol	30%
Water	70%

For 10º below zero:

Alcohol	18%.
Glycerine	18%
Water	64%

or

Alcohol	35%
Water	65%

Always adjust the shutters to maintain the motometer fluid at the arrow designated as anti-freeze, close them when the car is standing.

Difficulty in Starting Gasoline does not vaporize easily at low temperatures. It is necessary to increase the amount entering the combustion chamber in order to start a cold motor. This is done by choking the carburetor. Note: Full instructions for using the choke will be found on page 10. As the motor warms up, the gas or upper lever should be moved over to the lean side. Never run on a rich mixture longer than necessary. In cold weather it is advisable to crank the motor with the clutch pedal in. This lightens the load on the starting motor and allows it to crank at a slightly higher rate of speed.

To Insure Easy Starting During Cold Weather Drain the water and sediment from vacuum tank and tank and carburetor every week; otherwise it may freeze and block the flow of gasoline.

See that the ignition distributor is properly adjusted at all times.

Keep the motor as hot as is required. Close the shutter when you stop the car.

Storage Battery During the winter months lights are burned for longer periods and the starting motor takes more current to crank the engine. This drains the battery more quickly; therefore, have it tested every two weeks. Use a hydrometer in order to be sure that the cells register the proper specific gravity. Let your nearest Exide battery station make the inspection and advise you at least every three weeks.

Storing the Car

It is essential to observe the following details in order to prevent depreciation during the storage period:

Building Select a dry building, and preferably one not connected with horse stables. Dampness must be avoided, because in a short time rust will make inroads on the exposed metal parts that are decidedly detrimental.

Preparation See that the car and chassis is perfectly clean. Drain all the oil from the motor base, replace the plug and pour one gallon of castor oil in the oil reservoir.

Take out the spark plugs and pour, one-half cupful of castor oil in each cylinder. Then replace plugs and wires.

Start motor and allow it to run at a moderate rate of speed for about ten minutes.

Drain all water from cooling system by removing plug and opening small drain cock in cylinder block. See page 6.

Turn motor over a few times with starter.

Jack up all four wheels and let the air out of the tires. Cover the tires to exclude light.

Rub a small quantity of vaseline (not grease) on all nickeled parts, hub caps, exhaust manifold and carburetor and spark control rods.

Rub a little vaseline in the joints where the fenders join the splash guards.

Drain off all water and sediment from the carburetor and vacuum tank.

Remove battery from car.

Cover the car completely with some sort of tarpaulin or car cover.

Battery A storage battery gradually runs down when not in use, and if allowed to become exhausted, it may be prematurely ruined.

If possible, allow an authorized Exide Battery Service Station to take care of the battery during the storage period. If this is not possible, then follow implicitly the rules laid down under "Storage Battery" on page 31.

Washing the Car

The car should be regularly and systematically cleaned and renovated. The varnish on a new car is always benefited by an occasional washing with clear, pure water. The car, even when not in active use, should be cleaned at stated Intervals. In summer, preferably the water should be cool. On a new car occasional washing with cold water serves to harden the varnish and increase its brilliancy. During the winter, if the washing is performed in a warm place, the use of cold water for an occasional washing may be continued, but cold water applied in a cold place at a frigid season of the year I s injurious to the varnish.

When the car is in daily use or following each period of road service, the varnish should be washed, top cleaned and the interior furnishings of the car renovated.

Things to remember: Never wash the car in bright sunlight. The sun dries the water up too rapidly, and causes streaks in the finish. Always use absolutely clean water and change it often to keep it clean. Never turn the hose on the body unless the stream is so broken up that it does no more than spray the body, but we advise the use of the pall and the sponge in preference to the hose.

Clean Top First Before starting the washing of the car the topshould receive attention. The top can be sponged off with clean tepid water and when coated with road dust or mud, this water should contain enough Castile soap to provide sufficient alkali to cleanse. Follow this cleaning by drying with a chamois skin.

Washing the Body Begin washing the body by dipping the sponge well into the water, in order to pick up as much water as it will hold, then begin at the top of the panels and gently dash the water obliquely against the panels. Another way is to squeeze the water out of the sponge at the top of the panels to loosen the dirty accumulations, and cause them to drop off: These instructions are for cars that are washed immediately after road service.

When Washing is Delayed Provided the car has been put away for the night unwashed, and the mud and other road refuse allowed to dry on to the finish, it will harm the varnish to apply water and attempt to remove these dry, crusty accumulations at once. All such surfaces should have plenty of fresh, clean water run down in art easy volume over the finish. Continue this practice until the dirt encrusted surface is thoroughly soaked up. Then let the work stand for 15 to 20 minutes for the water to so act on the body of dirt and mud that under a fresh flow of water it will readily run away without injury to the finish.

In all cases the mud and dirt should be floated off by a natural flow of water rather than wiped off. This latter practice usually results in the finish being scratched and disfigured by the grit and dirt. It must be understood that a water-loaded sponge drawn or rubbed over a dirty or mud-bespattered panel develops a scouring effect. This diminishes the brilliancy of the varnish and reduces its capacity for protecting the undercoats.

The Second Washing After concluding the first or preliminary washing of the surface a new sponge and a new pail should be taken in hand and the surface again washed with a fresh. supply of clean water. A soft wash brush, oval in form and chisel pointed, should be used to tool around the surface ornaments, mouldings and other attached body fixtures. Such places cannot be effectively reached with a sponge.

Use the same care and precautions in washing the chassis and under no circumstances employ the same tools for the body and the chassis and vice versa. In this way avoid transferring grease and oil stains from one part of the car to the other.

Drying the Body and Chassis For drying off the water from the body of the car or chassis use a chamois skin free from lint and absolutely clean. Wring the chamois out after rinsing in clear water, or if dirty after washing ut in a solution Of soft water and Castile soap. Begin at the first part of the car washed, proceed to pass the chamois over the surface with just sufficient pressure to take up the water with the exception of a mist, which will quickly evaporate.

To attempt to wipe the car perfectly dry in all parts will result in injury to the luster of the finish. An erosive effect on the surface can be produced under the pressure of the chamois and this effect must be avoided at all times.

No car should be left unwashed for more than 24 hours.

Finish Cracked and Spotted By Mud Mud in its various forms, in drying on a body of varnish, takes up the oil from the varnish, and in so doing destroys the luster. Road dirt or dust picked up on highways largely given to horse travel Is often saturated with ammonia, and all such accumulations are destructive to the finish. Such road refuse, if allowed to dry upon the finish, not only spots the varnish, but fractures the film and causes it to decay and crumble away.

Mud and dirt from the roads traversing lime districts are likewise destructive to both the luster and the fabric of varnish, the latter disintegrating under the effects of lime. Some varnishes, or, in fact, a great many of them, will spot under the effects of soapy or dirty water, the alkali and capillary mediums contained in these waters going at once to the luster of the varnish.

The car not systematically and regularly washed will have its finish spotted from the effects of various gases and garage impurities. Many manufacturing cities are so poisoned with deleterious fumes that the finish on the irregularly and too infrequently washed car is spotted and deprived of its luster in a comparatively short time. Moreover, loss of luster is a direct result of improper and infrequent washing.

Care of Enamel On Splash Guards and Fenders Notwithstanding the extreme care and pains taken in enameling, and careful washing, the finish on these parts will show a tendency to dull from service. This is attributed to the fact that enamel has a peculiar affinity to dirt. The fenders are subjected to exposure, to dust, dirt, oil and grease. These conditions in time cause a sort of filmy covering to form, which deadens the original gloss. The longer this condition is allowed to exist, the harder it will be to restore the luster. This is brought about by the simple expedient of taking off the greasy substance which is adhering to the surface of the enamel.

There are a number of preparations for removing the dirt and cleaning the enamel, which can be secured from any accessory house. Careful washing with Ivory soap and water, afterwards removing the suds before they are allowed to dry, and polishing with a chamois, will restore the finish. Fuller's earth and water can also be used to rub off the dirt If It Is very obstinate, and will not harm the finish.

Cleaning of Nickel Plated Parts All nickel-plated parts may be cleaned with lamp black or with regular silver cleaner paste. Use only the softest flannel rag or chamois to rub with.

Do not clean lamp reflectors except when absolutely necessary and then use Putz Pomade, applied with a very soft clean chamois skin. These reflectors are silver plated and are very easily spoiled by frequent polishing.

Diagnosis of Trouble

Electrical Cranking FaiIs 1. Loose battery connections. The clamps on the battery post should be kept tight and the parts coated with vaseline in order to prevent corrosion.

2. Depleted storage battery.

3. Brush contact faulty in starting motor.

4. Frozen water pump or transmission gears engaged.

5. Faulty switch contact. A clicking noise should be heard in the motor-generator when the ignition switch is on "ON" position.

Failure of Motor To Start 1. Water in gasoline. Drain from bottom of vacuum tank and carburetor.

2. Faulty ignition. Contact points out of adjustment or dirty. (See pages 26 and 27.)

3. Resistance coil on distributor broken.

4. Water on coil or wires.

5. Broken down condenser or poor connections.

6. Motor flooded with gasoline, caused by continued use of choke. Crank motor with gasoline feed lever on lean position and choke lever on air position until the motor fires. If there is gasoline In the carburetor and a good spark at the plugs, the motor will start it properly handled.

If Motor Stops 1. Out of gasoline. Check main tank.

2. Vacuum tank failing to work. Open drain cocks at bottom of vacuum tank and see if fuel flows. If not, there is a possibility that the valve on the pipe leading from the intake passage is not working. Gently tapping this connection on top of the tank will cause the valve to seat again.

3. Vent In gasoline tank cap plugged.

4. Loose electrical connections. (See Nos. 2, 3, 4 and 5 under

5. Out of motor oil, indicated usually by knocking In the motor, followed by an abrupt stop. Do not attempt to use motor until the oil supply has been replenished and the motor examined by a competent mechanic.

Reasons for Motor Missing

1. Driving with a cold motor. To thoroughly vaporize the fuel, it is necessary to adjust the shutter so as to maintain the motor at its most efficient temperature. (See page 10.)

2. Too rich a gasoline mixture. See that lever on Instrument board is adjusted to lean position.

3. Short circuited spark plug. Clean the plugs and adjust the points to .025 to .028" gap.

4. Improperly adjusted distributor points or poor electrical connections.

5. Tappets not adjusted properly, causing the valves to ride.

6. Valves may need regrinding.

7. Valve spring may be weak or broken.

8. When the motor misses you may locate the missing cylinder by short-circuiting the spark plugs on top of the cylinders, one at a time. After replacing the. spark plug in the missing cylinder with a new one, you will have to determine whether the missing is caused by defective connections or wires leading to same. If the trouble is still continuing turn over the motor slowly by the hand crank, in an endeavor to detect a defect in the compression of different cylinders.

9. The check valve on top of the vacuum tank, which shuts off the suction from the intake pipe, may not be seating properly. This will cause continual missing on the last three cylinders, or the ones adjacent to the suction pipe. (See the Instruction book on the vacuum system, or take the car to the nearest Stewart Service Station.

10. Packing gland nut in carburetor loose, causing excess gasoline to be drawn into the intake passage. Retighten gland according to instructions under carburetor.

11. Water in gasoline, causing the motor to run spasmodically. (This is difficult to distinguish from other causes and should be one of the last things looked for). Drain some of the fuel from the vacuum tank and carburetor and note if any improvement in running occurs. If so, it is advisable to drain all the fuel from the tank, strain through a chamois skin and replace.

If Motor Lacks Power

1. Loss of compression, due to leaky valves.

2. Too rich a mixture. See that gasoline feed lever is carried on the right or lean side.

3. Late ignition See directions for timing the distributor, page 26.

4. Lack of oil in motor or improper motor oil. Use nothing but a high grade medium-light oil and change it frequently.

5. Dirt In the gasoline, causing impeded flow of fuel to carburetor. Thoroughly clean the screen at the gasoline inlet at the base of the carburetor and drain sediment from vacuum tank.

6. Dragging brakes or improper lubrication, adjustment of wheel bearings, etc. The car should be rolled easily by hand when placed on

a level surface. If brakes drag, the brake drums on the wheels will become hot. This can be detected by placing your hand on the parts.

7. Low tire pressure. The pressures advised by manufacturer should be adhered to. Partially deflated tires present such a large surface to the road that a great deal of power is lost in friction.

8. Cylinders badly carbonized. This will be Indicated by a knocking in the motor when endeavoring to climb grades. The remedy Is, have the carbon removed immediately and the valves ground If necessary.

If Motor Knocks 1. Spark advanced too far. (See directions for timing the distributor, page 26.) Always retard the spark lever on the steering wheel quadrant, if necessary, when climbing grades at low speed.

2. Motor speed too low for the work the car has been called upon to perform. Transmission gears are placed there for a purpose and the gears should be shifted to intermediate on any indication that the motor Is laboring.

3. Loose timing gears.

4. Loose connecting rod bearings. Light knock at high speeds.

5. Loose wrist pins. A metallic knock, more noticeable when the motor is running idle.

6. Crank shaft bearing loose. Heavy pounding at low motor speeds and under heavy loads.

7. Worn valve tappets. Light tapping sound.

8. Tappet noise, due to improper adJustment.

9. Carbonized cylinders,

Reasons for Overheating 1. Water supply low.

2. Cooling system clogged with Impurities. Remedy for this is to obtain about two pounds of Sal or washing soda, dissolve it in hot water and pour In cooling system. Drive car with this mixture for about one-half hour, then drain and flush out with pure water and refill.

3. Carbonized cylinders.

4. Lack of motor oil.

5. Ignition timing set too late, or owner driving with spark lever on steering wheel quadrant retarded.

6. Broken or inoperative pump. In freezing weather care must be exercised In order to prevent the water freezing in the pump. When the motor is started the impeller

may become damaged or broken and the, circulation thereby retarded. With the first indication of cold weather, fill the cooling system with the anti-freeze solution which we recommend. (See page 39.)

7. Cells in radiator stopped up with mud. When cleaning the cells, do not poke a wire or other sharp instrument between them. Force the mud out with a hose by directing a stream of water from the motor side of the radiator.

8. Loose or broken fan belt, or fan blades having become bent so that they do not circulate the air properly.

9. Too lean a mixture of gasoline. Do not carry the gasoline feed regulator lever on the extreme lean side in very hot weather if the motor shows any tendency to overheat.

10. Using too heavy an oil. Use nothing but high grade light oil and change it frequently.

In General 1. Transmission change speed lever slipping out of gear or jumping when the car is In motion. This is caused by excessive end play in the main transmission shaft which can be corrected by removing the necessary amount of shims from the rear main bearing cap. (See page 41, Transmission.)

2. If the lever slips out of gear, the interlocks which operate In the notched control shaft should be examined. The springs may be weak or broken and should be replaced if necessary. See that the interlock seats properly In the notched shaft.

3. Clutch slipping. This may be caused by clutch out of adjustment, or the clutch oil having become gummed. Drain the oil out of the clutch by way of the plug In the flywheel. Flush out with kerosene and refill with one-half pint of a mixture of kerosene and light lubricating oil in equal proportions. For adjusting clutch pedal mechanism, see page 40.

4. Play in driving mechanism when the clutch is engaged. This is usually caused by loose spring clips on the rear axle. The springs absorb the torque or drive of the car, and it is necessary that these clips be frequently inspected and tightened if necessary.

5. Rear axle noise. Usually caused by insufficient lubricant. See that the rear axle contains the necessary amount of Whitmore's Compound and make sure that the pinion shaft, immediately forward of the differential, is thoroughly lubricated. This shaft runs at the same speed as the motor and unless properly lubricated will wear the bearings rapidly. If the rear axle is noisy on coast, or noisy when the throttle is closed preparatory to slowing down, there is a possibility that end play exists in the pinion shaft or that the pinion shaft has cut, through lack of lubrication. Full Instructions will be found under the heading of "Rear Axle" for adjusting the pinion shaft and bearings.