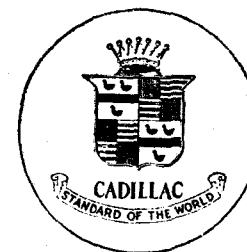


MANUAL  
OF  
CARE AND OPERATION

FOR OPERATOR'S USE



Type 61

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Price, 35 Cents

Cadillac Motor Car Company

Detroit, Michigan, U. S. A.

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Detroit, Mich.

## Part I

# OPERATION

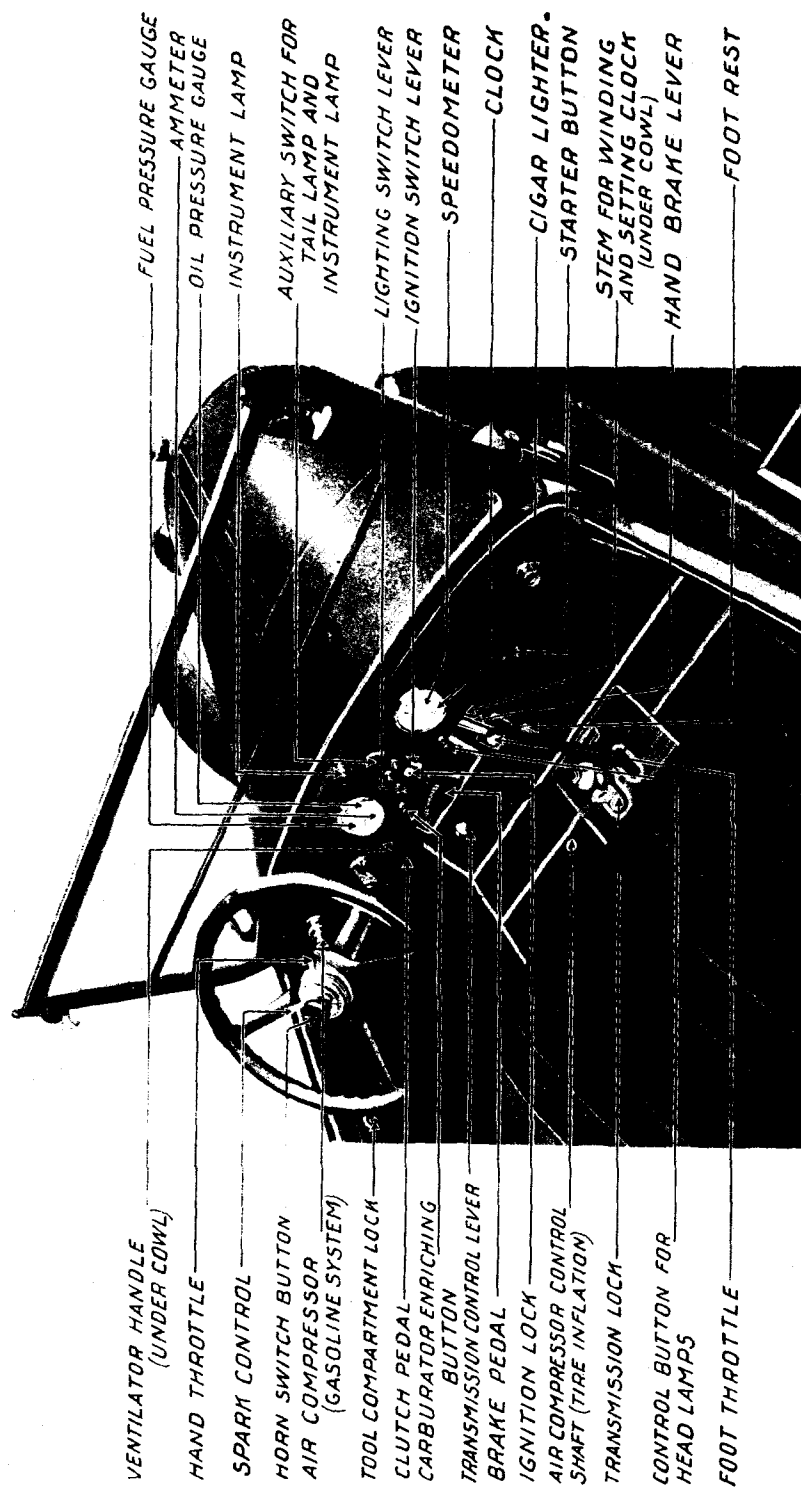


Fig. 1. Instruments, Control Levers and Pedals.

## LICENSE DATA

The following information may be found useful in making license application:

Number of cylinders.....8  
 Cylinder bore..... $3\frac{1}{8}$  in.  
 Piston displacement.....314 cubic in.  
 Stroke..... $5\frac{1}{8}$  in.  
 Horsepower (N. A. C. C. rating).....31.25

Engine number:

The engine number is stamped on the crank case just back of the right-hand block of cylinders, and on the name plate attached to the forward face of the dash.

The number of each Type "61" engine begins with the figures "61."

Wheelbase:.....132 in.  
 Tread.....56 in.

## THE USER'S RESPONSIBILITY

The information, advice and instruction contained in this Manual are furnished because the user of a motor car needs them. But if the user fails heed the advice, the loss is not wholly his but partly ours as well.

A Cadillac car in the hands of an operator who will give it the reasonable consideration to which it is entitled, and which every car requires, will run as smoothly and as quietly as is possible for any motor car to run. No car will give greater satisfaction nor will any car stand more abuse. But no car can be expected to stand continued abuse without showing the results sooner or later.

We are interested that Cadillac cars render unfailing service and satisfaction. They are built for that purpose but the user must do his part after the car comes into his possession. The Cadillac is capable of rendering the best of service and directions are furnished which will guide the user toward obtaining that service. But if he persists in ignoring these directions, there is no one but himself upon whom he can rightfully place the responsibility for difficulties which may result.

## DRIVING AND CARING FOR A MOTOR CAR

Driving an automobile means more than simply starting, steering and stopping. To drive an automobile properly requires an understanding of the principles involved and the exercise of intelligence and judgment.

With well designed and correctly built automobiles, probably 95 per cent of the so-called "troubles" are directly traceable to lack of lubrication, abuse, carelessness, and a lack of an understanding of the principles involved.

To begin with, the driver should study the construction of his car and thoroughly acquaint himself with its mechanism, the functions of its various parts and the "why" of everything connected with it. If he understands these he is better able to realize why certain things must be done and why certain other things must not be done, if he is to obtain the most satisfactory results, the greatest efficiency and the greatest economy, together with durability and long life of the engine and car. Remember that the difference between a comprehensive understanding of your car and the superficial knowledge possessed by many drivers is the difference between having "troubles" and not having them.

On the other hand is frequently found the user who is constantly tinkering with his car when there is no necessity for it. Avoid both extremes. If, after seeing that all parts are lubricated properly and that all bolts, nuts and screws are tight, the car is running well, let it alone. Many users drive their Cadillacs for months without finding an adjustment necessary. If ad-

justment seems necessary and you are not sufficiently acquainted with the construction of the car to know what adjustment is necessary or how to make it, *don't experiment* but take the car to a Cadillac service station.

The most important thing in the care of an automobile is proper lubrication. Part Two of this Manual gives detailed directions regarding lubrication.

## PLACING A NEW CAR IN RUNNING CONDITION

Before the cars are shipped, the fuel and cooling systems are drained. When the car is received and before it is placed in use, the supply of gasoline and water must be replenished. During freezing weather an anti-freezing solution should be used instead of water. (See under "Anti-Freezing Solutions," page 24.)

The car should be lubricated thoroughly in accordance with directions contained in this Manual. (See under "Lubrication," Part II.)

### Filling the Cooling System

Fill the cooling system with water during warm weather and with a suitable anti-freezing solution during freezing weather. (See under "Anti-Freezing Solutions," page 24.) To fill the cooling system, proceed as follows:

With a screw driver close the cylinder drain cocks "D" and turn the valves "B," (Figure 26) to the "Fill" position. If a water pump drain does not turn easily force down on the screw driver. In extreme cases it may be necessary to strike the end of the screw driver with your hand to unseat the drain cock.

There is a drain cock "D" in each cylinder block and a valve "B" at each water pump.

Remove the filler cap "A" and fill the system. Screw down the cap firmly after replacing it.

Turn the valves "B" to the "Close" position.

To fill the radiator condenser (see under "Condenser," page 52), take out the floor board just forward of the transmission control lever and replace the drain plug "F." (Figure 26.) Remove the condenser filler cap "E" and fill the condenser one-half full, using the same liquid as in the radiator. Replace the filler cap.



*Caution:—Do not use water in the cooling system during freezing weather. Use a good anti-freezing solution. Water will freeze even though the engine is run continuously.*

### **Filling the Gasoline Tank**

The gasoline tank is at the rear of the car. (See Figure 25.) The filler cap can be removed after loosening the thumb screw.

Gasoline should be strained through a wire cloth of very fine mesh before it is poured into the tank. If dirt or water enters the gasoline system it may cause trouble.

After filling the tank and screwing on the filler cap, tighten the thumb screw. This is necessary to prevent leakage of the air pressure by which gasoline is forced to the carburetor.

### **Operating a New Car**

It is recommended that the operator of a new car refrain from driving it at its maximum capacity and speed until the car has been driven at least five hundred miles.

Although the parts of a Cadillac car are machined and ground with the greatest possible accuracy and fineness of finish, manufacturing processes cannot give to bearing surfaces the fine polish which results from actual operation at moderate speed and under light loads.

For this reason, it is advised that a car be driven no faster than twenty miles per hour for the first two hundred and fifty miles, and no faster than twenty-five miles per hour for the second two hundred and fifty miles.

## **THE THREE MOST IMPORTANT THINGS IN CONNECTION WITH THE CARE OF THE ENGINE**

### **1. Use of Suitable Oil**

The use of Cadillac Motor Oil is recommended (see under "Lubricants" page 31.)

### **2. Replacement of Oil**

Replace the engine oil at the end of each 500 miles of travel during warm weather and at the end of each 350 miles of travel or once a week during cold weather. (See under "Replace Engine Oil" page 33 and "Replace Engine Oil Frequently During Cold Weather," page 34.)

### **3. Manipulation of Carburetor Enriching Button**

After starting the engine, do not run it with the carburetor enriching button pulled back any longer than is absolutely necessary. (See under "Starting the Engine," page 10.)

## STARTING THE ENGINE

1. First make certain that the transmission control lever is in the neutral position and that the hand brake is applied, (see Figure 1.)
2. If the fuel pressure gauge on the instrument board indicates a pressure of less than one pound, increase the pressure by means of the hand air compressor. The handle of the compressor is screwed into place. Loosen it by unscrewing it a few turns in the counter-clockwise direction. After the pressure has been increased to at least one pound, lock the plunger in place by holding it in and turning it in the clockwise direction.
3. Place the spark lever about one-third the way down from the "Advance" position, except in cold winter weather, when it should be at the "Advance" position. If the engine should be cranked by hand, always place the spark lever at the "Retard" position. If this precaution is not observed, a back kick will occur, resulting in personal injury.
4. In extremely cold winter weather, prime the carburetor by placing the throttle lever at the "Close" position, then pushing the accelerator button down to the floor and permitting it to return. Twice repeat this operation. Do not prime the carburetor except in extremely cold weather.
5. Place the throttle lever approximately one-fourth the way down from the "Close" position.
6. In cold weather, or in warm weather, if the engine has been standing for some time, pull back the carburetor enriching button.
7. Switch on ignition by moving the ignition switch lever up.
8. Push down on the starter button. This will bring the starter into operation and will cause the engine to "turn over." (See under "Caution.") In extremely cold weather, when the car has been standing long enough to have become thoroughly chilled, it is a good plan to release the clutch before pressing down on the starter button, and to hold the clutch pedal down during the cranking operation.

9. Immediately the engine commences to run under its own power, which should be in a few seconds, permit the starter button to return to the normal position. If the carburetor enriching button is back, push it as far forward as possible without causing the engine to stop, or a material reduction in engine speed, as soon as the engine commences to run under its own power and as far forward as it goes as soon as the engine is warm enough to permit it. *It is important that the button be left back no longer than is absolutely necessary.*

If the engine does not start within thirty seconds, do not continue to operate the starter, but permit the starter pedal to return to the normal position and determine the cause. Be certain that the ignition is on, that there is gasoline in the tank, and sufficient pressure to force it to the carburetor. The starter will crank the engine only; ignition and gasoline must be present before it will run.

### Caution

*Caution:—The action which causes the engine to "turn over" is produced by a gear of the electric starting motor sliding into mesh with teeth on the fly wheel of the engine. When pushing down on the starter button to throw these gears into mesh, if it should so happen that they are in just such positions that the ends of the teeth of the starter gear come against the ends of the teeth of the fly wheel, instead of the teeth of one sliding between the teeth of the other, do not use force. Simply permit the starter button to return to the normal position and then push it down again. In the meantime, the gears will probably have changed their relative positions sufficiently to permit the teeth to mesh.*

### Oil Pressure

Lubricating oil is fed under pressure to the main and connecting rod bearings of the engine (see under "Engine Lubrication," page 32.) The pressure of the oil is indicated by the pressure gauge on the instrument board. (See Fig. 1.)

When the engine is not running, the hand of the oil pressure gauge should remain at zero, but immediately the engine is started and while it is in operation, pressure should be indicated. The pressure indicated depends upon the speed of the engine and the viscosity of the oil.

If at any time while the engine is in operation, the hand of the oil pressure gauge remains at zero, stop the engine at once and determine the cause. Serious engine trouble is a result of continuing to run the engine without oil pressure.

## GEAR SHIFTING

*Caution: Do not attempt to shift from neutral to any gear, or from one gear to any other without first disengaging the main engine clutch by pushing and holding down the clutch pedal (see Figure 1.)*

As the transmission is of the selective type, the operator may shift from any gear to any other gear without shifting through a third gear.

Referring to Fig. 2, the ball at the top of the transmission control or gear shifting lever is shown at "N" in

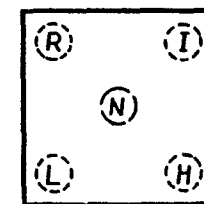


Fig. 2.

Control Lever  
Positions.

he neutral position, at "L" in the low gear position, at "I" in the intermediate gear position, at "H" in the high gear position, and at "R" in the reverse gear position.

### Starting the Car

To start the car, after starting the engine and unlocking the transmission lock, push down on the left pedal, which is the clutch pedal, thereby releasing the main engine clutch. Then disengage the hand brake by means of the hand lever—still holding the clutch pedal down. (If the car is standing on a grade it will be necessary to hold it with the foot brake until ready to start.) Next shift into low gear.

To do so, move the control lever as far to the left as possible and then pull it back as far as it will go (Fig. 3.) Open the throttle slightly by means of the accelerator pedal or throttle lever and permit the main clutch to engage gradually, by allowing the pedal to come towards you slowly.

If it should so happen that the gears which mesh to make low gear are in positions such that the ends of the teeth of one gear come against the ends of the teeth of the other gear instead of the teeth of one sliding between the teeth of the other, do not force them but return the transmission control lever to the neutral position, engage the clutch by allowing the clutch pedal to come towards you, again release the clutch, then shift into low gear as directed above.

After the car is under way in low gear, release the clutch and shift into intermediate gear. To do this move the control lever back to the neutral position, then to the right and push it forward as far as it will go (Fig. 4.) Then permit the clutch to engage. In shifting from low to intermediate gear, it is advisable to pause for a moment in the neutral position if there is a tendency of the gears to clash.

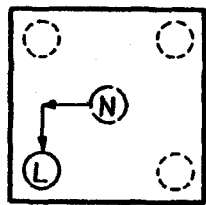


Fig. 3.

Neutral to Low Gear.

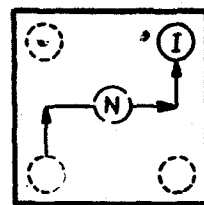


Fig. 4.

Low Gear to Intermediate Gear.

After the car is under way in intermediate gear, shift into high gear. To do this, simply release the clutch and then pull the control lever straight back (Fig. 5.) Then permit the clutch to engage.

It is possible when starting the car on level ground to shift from low gear to intermediate gear and from intermediate to high gear at low speeds, and shifting can be done more quietly than at higher speeds. In starting on an incline a higher rate of speed must be attained before shifting gears.

### Reversing

To start the car backwards, with the control lever in the neutral position, release the clutch, move the control lever to the left and push it forward as far as it will go. Open the throttle slightly by means of the accelerator pedal or throttle lever and engage the main clutch gradually.

If it should so happen that the transmission gears which mesh to make reverse are in just such positions that the ends of the teeth of one gear come against the ends of the teeth of the other gear, do not force them, but return the transmission control lever to the neutral position, engage the clutch, again release the clutch and shift into reverse gear as directed.

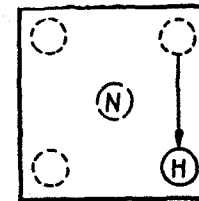


Fig. 5.

Intermediate Gear to High Gear.

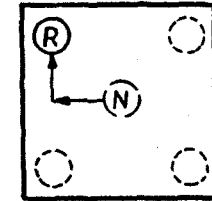


Fig. 6.

Neutral to Reverse Gear.

### Shifting into Lower Gear

If, when ascending steep grades or pulling through soft mud roads or deep sand in high gear, the speed of the car is reduced until the engine labors, shift into intermediate gear. To do this, release the clutch, then push the control lever forward as far as it will go. Then engage the clutch. It is best to allow the car to slow down before making the shift and then, after releasing the clutch, to shift quickly. An experienced driver may find it more satisfactory to shift from high into intermediate gear in the following manner:

Release the clutch, return the control lever to the neutral position, engage the clutch, at the same time slightly accelerating the engine; then release the clutch again, and instantly shift into intermediate gear. Engage the clutch.

This entire change may be made in less time than it takes to read these directions by one who becomes familiar with this method. Shifting in this manner may be accomplished satisfactorily at higher speeds than is possible

When shifting in the usual manner. It is not recommended, however, that the operator attempt to shift from high to intermediate gear in this manner until he has considerable experience in shifting in the ordinary way.

### ***Stopping the Car***

First close the throttle and then release the engine clutch. Next return the transmission control lever to the neutral position. The clutch may then be re-engaged. Stop the car by pushing forward on the brake pedal. After the car has been brought to a stop, apply the hand brake by means of the hand and brake lever.

### ***Stopping the Engine***

After stopping the car and applying the hand brake, move the ignition switch lever down.

## **TILTING HEAD LAMP REFLECTORS**

The reflectors in the head lamps are pivoted so that they can be tilted and are controlled by a button on the instrument board (see Figure 1.) When the road is clear and illumination of the distant road is desired, the reflectors direct the rays ahead. When a vehicle traveling in the opposite direction approaches, rays from the headlamps can be deflected further than already deflected by the lenses, increasing illumination directly in front of the car, by simply pushing forward the button and thereby tilting down the reflectors.

## **DRIVING SUGGESTIONS**

### ***Rules of the Road***

Road and traffic laws vary greatly in different localities. It is, therefore, impossible to set down a complete list of rules which may be followed in all parts of the country. The following are some of the rules which are universal in practically all parts of the United States.

In meeting a vehicle going in the opposite direction *pass to the right.*

In passing a vehicle going in the same direction *pass to the left.*

Always stop with the right hand side of the car next to the curb. If it is necessary to turn the car around to do this, it should be done.

Never turn around or turn off onto another road without making absolutely certain that there is no other vehicle directly behind you.

Never enter upon street car tracks without making sure that there is no car directly behind you—*no matter how sure you feel, look and see.*

Do not cross street car or steam railroad tracks without making certain that it is absolutely safe to do so.

In crowded traffic do not apply the brakes suddenly unless it is absolutely necessary. It may be that a following vehicle cannot stop as quickly as you can.

On wet asphalt streets or slippery roads do not apply the brakes suddenly unless it is absolutely necessary. If the brakes are applied suddenly under these conditions disastrous skidding is apt to occur.

In crowded traffic it is a good plan to signal vehicles at the rear, before turning, slowing down or stopping.

It is a good plan to slow down in passing vehicles going in the opposite direction.

One of the most essential things to remember is that you should *never* "take a chance."

### ***Coasting***

To coast on the level, close the throttle and then release the main engine clutch by pushing forward on the left pedal.

When descending grades a good method is to close the throttle and, with the clutch engaged, allow the engine to do the holding back as much as possible. This saves much wear on the brake band linings. The resistance offered by causing the car to drive the engine when "high gear" or "direct drive" is engaged is usually sufficient to control the speed. When the engine does not offer sufficient resistance the speed may be checked further by applying the foot brakes.

When it is necessary to descend a very steep grade it is best to engage the intermediate or possibly the low speed gear *before commencing the descent*, and if the resistance thus obtained is not sufficient, to supplement it by the foot brakes. Bear in mind that the more the resistance of the engine is used in coasting the longer the brake band linings will last and the longer the brakes will retain their adjustment.

## **DON'T'S FOR GENERAL OPERATION**

Don't fail to change the engine oil frequently.

Don't fail to push forward the carburetor enriching button as soon after starting as possible.

Don't fill the lubricating system in the engine only and neglect to lubricate all other parts of the car.

Don't neglect the lubrication of any part of the car.

Don't run the car at sustained high speed when it is new.

Don't put oil in the engine without first straining it through cheese cloth or fine wire mesh and making sure that it is free from dirt and lint.

Don't allow the clutch to engage suddenly.

Don't prime the carburetor too much.

Don't attempt to shift from neutral to any gear, or from one gear to another gear without first releasing the clutch.

Don't attempt to shift from the reverse gear to any other gear when the car is moving.

Don't attempt to shift from any forward gear to the reverse gear when the car is moving.

Don't attempt to shift from the high gear to the low gear when the car is moving.

Don't attempt to shift from the intermediate gear to the low gear when the car is moving, unless it is moving very slowly. Ordinarily it is best to stop the car altogether.

Don't push the starter button when the engine is running.

Don't turn the steering gear when the car is standing. This is not only unnecessary but is also bad practice.

Don't fail to investigate any unusual sound which may develop in the car. The car should be inspected at the service station of a Cadillac distributor or dealer.

Don't neglect to inspect the level of the acid in the storage battery every 500 miles.

Don't turn corners at high speed.

Don't neglect to keep the cooling system filled.

Don't drive fast or attempt to stop suddenly on wet pavements.

Don't attempt to start the engine with the switch turned off, without air pressure or without gasoline in the tank.

Don't neglect to keep the tires inflated properly.

Don't race the engine when it is not driving the car. There is no worse abuse.

## CURTAINS

### Storage of Curtains

The side curtains for open cars are carried in an envelope provided with cloth partitions to prevent the curtains from rubbing and chafing. All curtains are tagged to facilitate attaching.

In the touring car the curtains are stowed under the front seat. In the phaeton the curtains are stowed in a compartment provided in the back of the front seat and which opens in the tonneau. The roadster has a parcel-compartment just back of the seat in which the curtains are stowed.

Before the curtains are stowed away they should be dry and clean.

### Curtain Fasteners

The curtains are held in place with fasteners which become locked on three sides when snapped into place and must be lifted on the side which is not locked in order to release them. This side is indicated by a small projection on the fastener as shown by the arrow (Figure 7). This type of fastener cannot be released by lifting it at any other side.



Fig. 7.

Curtain Fastener

## SPEEDOMETER

The speedometer registers the speed at which the car is traveling, the total number of miles traveled, and the trip mileage. The total mileage cannot be reset but the trip mileage can be reset to zero.

An automobile repairman should never be permitted to attempt to adjust or repair the speedometer head or to replace the glass. This work can be done only by men experienced in speedometer work and only with special machinery and tools.

If the speedometer head is removed, handle it with the same care that you would a fine watch. The speedometer head may easily be damaged by rough handling.

## CLOCK

The clock is in combination with the speedometer. It has an eight day movement and is wound and set in the same manner as any stem winding watch. The winding and setting stem is on the under side of the speedometer just back of the instrument board.

## DEMOUNTABLE RIMS

### Demounting Rim with Tire

Jack up the axle until the wheel is free from the ground. Then remove the valve cap; loosen the eight clamping nuts with the brace wrench furnished with the tool kit, and turn each clamp to the left until it strikes the stop pin in the fellow band. Turn the wheel so that the valve is at the top and pull the bottom of the rim towards you until it clears the wheel. The rim with tire can then be removed by lifting it straight up. (Figure 8.)

### Mounting Rim with Tire

If the rim you are mounting has no split clamping ring, take the one from the rim removed. Turn the wheel so that the hole for the valve stem is at the top. Hold the rim so that the valve stem is at the top and so that the rim latch and the clamping ring are towards you. Insert the valve stem and then push the bottom of the rim into place. (Figure 9.)



Fig. 8.

Demounting Rim from Wheel.



Fig. 9.

Mounting Rim on Wheel.

Turn each clamp to its original position and turn the clamping ring so that the split in the ring comes directly under one of the clamps. Tighten each clamping nut slightly. Then continue around the wheel, tightening each nut firmly. Screw on the valve cap.

If the rim does not run true, mark the part that runs "out" from the face of the wheel. Then slightly loosen the nuts diametrically opposite this part and tighten the nuts at the marked part. Proceed in this manner until the rim does run true.

### Removing Tire from Rim

The tire may be removed without removing the rim from the wheel.

*Deflate the tire.* Then open the lock with the pointed end of the tire tool or with a screw-driver.

Raise one end of the ring with the tool as shown (Figure 10) until the lug is clear of the slot in the rim.



Fig. 10.

Removing Tire from Rim  
First Position.

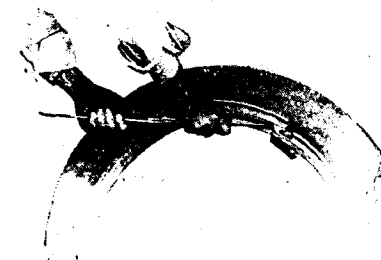


Fig. 11.

Removing Tire from Rim,  
Second Position.

Raise the end of the ring further and force the lug out over the edge of the rim. (Figure 11.)

Start at the end of the ring, which is out of the groove, and remove the entire ring from the rim. (Figure 12.) (See note.)

Turn the wheel until the valve stem is at the top, and pull the lower part of the tire towards you until it is clear of the rim. The tire may then be removed from the rim by lifting it straight up.

*Note*—In removing the ring from the rim, care should be taken to avoid opening the ring beyond its elastic limit. When the ring is free from the rim, the ends should overlap from  $\frac{1}{2}$  to  $1\frac{1}{2}$  inches, which they will not do if the ring has been stretched in removal.



Fig. 12.

Removing Tire from Rim,  
Third Position.

If the ends of the ring do not overlap they should be closed together before replacing. If this is not done there is a possibility of the lock fail-

ng to engage the lugs on the ends of the ring. This might later be the cause of an accident.

**Caution**—Do not attempt to remove a tire from a demountable rim without first completely deflating the tire. Serious personal injury may result if this is attempted.

### Placing Tire on Rim

If the demountable rim is on the wheel, jack up the axle and turn the wheel until the hole for the valve is at the top.

Hold the tire so that the valve stem is at the top and insert the valve stem in the valve stem hole in the rim and wheel. Then push the bottom of the tire into place.



Fig. 13.  
Placing Tire on Rim,  
First Position.



Fig. 14.  
Placing Tire on Rim,  
Second Position.



Fig. 15.  
Placing Tire on Rim,  
Third Position.

Insert one end of the locking ring in the slot in the rim. Then with the tool as a lever, force the tire back far enough to allow the ring to go on easily. (Figure 13.)

Starting at the end of the ring which is inserted in the slot in the rim, force the remainder of the ring into place by using the tire tool as pliers. (Figure 14.)



Fig. 16.  
Placing Tire on Rim,  
Fourth Position.

Insert the flat end of the tool between the rim and the ring and turn the tool up edgewise. (Figure 15.) This will lift the loose end of the ring and force it into place.

Draw the ends of the locking ring together with the tool. (Figure 16.) Then swing the lock into place.

Then inflate the tire. (See under "Tire Air Compressor," page 21.)

If the demountable rim is not attached to a wheel, lay the rim with the tire flat on the ground when removing or replacing a tire.

### TIRE HOLDER

The tire holder is designed to carry two standard size tires inflated on rims.

To remove the tire with rim, remove the cap from the lock at the center of the clamp and unlock it. Then unscrew the clamp as far as it will go. The tire then may be removed.

To put a tire on the holder proceed in the reverse manner.

When mounting two tires on the tire holder, the clamping or locking rings should face each other to prevent theft of the tires by removing them from the rims. If mounting one tire on the tire holder, the clamping or locking ring should face to the front or toward the body.

Care should be exercised not to permit the inner tire to strike the body of the car when removing or replacing it.

### TIRE AIR COMPRESSOR

#### Using the Compressor

To inflate a tire, first attach the air hose to the connection projecting from the left hand dust shield just back of the battery box cover, then connect the other end to the tire valve. Do not connect the hose to the tire first, if there is air pressure in the tire.

If the engine is running, release the clutch by pushing the left pedal down. Hold the pedal down until you are certain the transmission gears have ceased to revolve, and then turn the slotted head of the compressor control shaft in the clockwise direction (see Figure 1). If the engine is not running, it is unnecessary to disengage the clutch before bringing the compressor into operation.

Run the engine at a speed of approximately 1,000 revolutions per minute.

With all lights turned off, the ammeter on the instrument board should register approximately thirteen at 1,000 revolutions per minute of the engine. The compressor operates at its most efficient speed at 1,000 revolutions per minute of the engine. Do not race the engine in operating the compressor, or at any other time, when it is not driving the car.

To stop the compressor, turn the slotted head of the control shaft in the counter-clockwise direction.

*Caution:—Do not turn the compressor control shaft to bring the compressor into operation when the engine is running and the clutch is engaged.*

## COLD WEATHER SUGGESTIONS

### STARTING THE ENGINE

#### **Manipulation of Carburetor Enriching Button**

Pull back the carburetor enriching button before attempting to start the engine in cold weather, but immediately the engine commences to run under its own power push the button as far forward as possible without causing the engine to stop, or a material reduction in engine speed, and as far forward as it goes as soon as the engine is warm enough to permit it.

#### **Priming the Carburetor**

In *extremely* cold weather, if the engine is not started in 30 seconds with the carburetor enriching button pulled back, remove your foot from the starter button. This will stop the cranking operation. Now open and close the throttle once or twice with the hand throttle or the foot accelerator. *Do not* open and close the throttle more than twice. Opening and closing the throttle operates the throttle pump of the carburetor. This raises the level of the gasoline in the carburetor, thereby priming it. If the throttle is opened and closed more than twice, gasoline is forced out of the carburetor.

#### **Position for Spark Lever**

Except in extremely cold weather the spark lever should be placed about one-third the way down from the "Advance" position when starting. In extremely cold weather, it should be in the "Advance" position when starting. (If the engine is to be cranked by hand, the spark lever should be placed at the "Retard" position.)

It is the practice of some drivers to place the spark lever at the "Retard" position when starting the engine. While this is the proper position for the spark lever if the engine is to be hand cranked, there is no reason for retarding the spark when the engine is electrically cranked and starting is facilitated if the spark lever is advanced. In extremely cold weather there is no reason why the spark lever cannot be placed in the "Advance" position if the

engine be electrically cranked and a quicker start is assured if this is done. The following will explain why it is possible to fully advance the spark lever at such times:

The mixture in a cold engine does not burn as rapidly, nor is there so much energy in it, as when the engine is warmer and the fuel is better vaporized. When the engine is cold a large percentage of the heat of each explosion is instantly dissipated by reason of the cold combustion chambers and cylinder walls, the result being that an explosion which in a hot engine would occur early enough and have energy enough to produce a "spark knock" or "back kick," occurs so much later and is so much less intense, that neither of these results is produced.

It is best to have the spark lever in the fully advanced position for cold weather starting for the following reasons:

As explained before, a cold mixture ignites much more slowly than a hot mixture. A cold, slow-burning mixture, if ignited on top dead center on account of the spark being in the retarded position, may burn through the power stroke, through the exhaust stroke and may be still burning in the combustion chamber when the inlet valve is opened to draw in another charge. When this happens, the flame sets fire to the incoming charge, igniting the mixture in the intake pipe and carburetor, producing a "pop back" in the carburetor. The possibility of this happening is very much less if ignition is started earlier by placing the spark lever in the fully advanced position.

#### **Position for Throttle Lever**

In winter weather the throttle lever should be opened only slightly for starting. Many drivers make a practice of opening the throttle wide or nearly so immediately the engine is started and after shifting the transmission into gear. The full suction of each piston through the carburetor under these conditions causes the auxiliary air valve in the carburetor to open wide, allowing a large volume of cold air to rush into the carburetor.

The proportion of air to gasoline drawn in under these conditions is practically the same as when the engine is hotter, but as only a portion of the gasoline drawn in is vaporized, and as only the vaporized portion burns, the proportion of air to gasoline burned is greater than when the engine is warmer, thus producing a "lean" mixture. A "lean" mixture is slow burning, whether it is warm or hot, and a cold "lean" mixture is particularly slow burning. Thus if the throttle is opened suddenly before the engine is thoroughly warm, the cold "lean" mixture resulting, burns so slowly that a "pop back" in the carburetor is almost sure to occur.



### Use of Starter Button

*Do not press the starter button while the engine is running.*

In extremely cold weather, when the car has been standing long enough to become thoroughly chilled, it is a good plan to release the clutch before pressing down the starter button and to hold the clutch pedal down during the cranking operation. If this is not done, the starter is called upon to turn the jackshaft in the transmission in addition to cranking the engine. While at ordinary temperatures the additional energy required is almost negligible, in extremely cold weather the lubricant in the transmission may offer enough resistance to the transmission gears to increase considerably the demand upon the battery.

### ANTI-FREEZING SOLUTIONS

In cold weather a good anti-freezing solution should be used. A solution of commercial glycerine and water is recommended of the correct proportion for the temperature experienced. The following are the freezing temperatures of glycerine and water solutions:

Glycerine (% by volume)	Water (% by volume)	Freezing Temperature (degrees Fahr.)
35%	65%	+10°
40%	60%	+6°
45%	55%	+3°
50%	50%	0°
55%	45%	-2°
60%	40%	-4°

Do not use a solution containing calcium chloride, as it is injurious to the metal parts of the cooling system.

The radiator condenser also makes it possible to use with safety an anti-freezing solution of denatured or wood alcohol and water. The following are the freezing temperatures of denatured alcohol and water solutions.

Denatured Alcohol (% by volume)	Water (% by volume)	Freezing Temperature (Hydrometer reading)	Specific Gravity (degrees Fahr.)
20%	80%	+13°	.974
30%	70%	-3°	.964
40%	60%	-20°	.953
50%	50%	-34°	.936

It is a good plan to draw out a sample of the solution occasionally and to test its specific gravity with a hydrometer graduated between the limits of the above table.

The capacity of the cooling system is five and one-quarter gallons. The condenser should contain an additional three quarts, making a total of six gallons.

*Caution—Do not use water in the cooling system during freezing weather. Use a good anti-freezing solution. Water will freeze even though the engine be run continuously.*

### ADDITIONAL COLD WEATHER SUGGESTIONS

#### Starting in Intermediate or High Gear

Starting in intermediate or high gear should not be done at any time, but this is particularly unfair to a cold engine, as it necessitates a further opening of the throttle than is necessary when starting on low gear, with the probability of a "pop back" in the carburetor.

#### Cold Test of Engine Oil

Use oil having a low cold test. In other words, use oil which flows freely at low temperature. (See under "Lubricants," page 31.)

#### Frequent Changing of Oil

Water and gasoline may accumulate in the crank case of the engine during cold weather. It is necessary, therefore, to drain the oil frequently and replace it. (See under "Replace Engine Oil Frequently During Cold Weather," page 34.) If water and gasoline are permitted to accumulate in the crank case, serious damage to the engine may result.

#### Strainers in Gasoline System

It may be found necessary to remove the strainers in the gasoline line more frequently during cold weather in order to prevent an accumulation of water at these points which would freeze and prevent the gasoline from flowing to the carburetor. (See under "Settling Chambers and Strainers," page 50.)

### OPERATION OF ENGINE

#### General Principle

The production of power by the engine may be described briefly as follows:

Gasoline is forced by air pressure from the tank to the carburetor. At the carburetor the gasoline is mixed with air in the proper proportion, forming an explosive vapor or gas. The gas is drawn through the intake manifold and inlet valves into the cylinders of the engine, where it is compressed and ignited by electric sparks, the pressure of the resulting explosions producing the power.

The quantity of gas supplied to the engine is regulated by a throttle valve at the carburetor which is operated by means of the throttle lever at the steering wheel or by the accelerator button at the right of the brake pedal.

### Four-Cycle Engine

The engine is of the four-cycle type, that is, there are four movements or strokes of each piston and two revolutions of the flywheel to complete each power producing stroke. The four strokes of the cycle each have a different function and follow one another in the same order as follows:

**Suction Stroke.** The suction stroke commences with the piston at its highest point in the cylinder and with the inlet and exhaust valves closed. Immediately the piston starts to descend the inlet valve opens and through this valve a charge of gas from the carburetor is drawn into the space above the piston.

**Compression Stroke.** As the piston starts upward again after completing the suction stroke, the inlet valve closes. As there is then no escape for the gas in the cylinder, it is compressed, the maximum compression being reached when the piston is at the top of its stroke.

**Power Stroke.** At the completion of the compression stroke, the spark takes place at the spark plug, igniting the compressed charge of gas. The heat resulting from the rapid combustion causes the pressure of the confined gas to rise almost instantaneously to several times its pressure before the explosion. This pressure exerted on the piston forces down the piston and produces the impulse which is transmitted by the connecting rod to the crankshaft, causing it to rotate.

**Exhaust Stroke.** Just before the piston reaches the end of the power stroke, the exhaust valve opens. It remains open as the piston travels upward again on the exhaust stroke, driving the burned gas out from the cylinders. By the time the piston has reached its highest point it has forced out the burned gas and the exhaust valve closes. Having completed the four strokes, the piston is now ready to draw in a new charge and to repeat the cycle.

The same cycle of events takes place in all of the cylinders but no two pistons are at the same point in the cycle at the same time. In the Cadillac eight cylinder V-type engine, the impulses in the eight cylinders are so timed that a power stroke is begun every quarter turn of the crankshaft. In other words, the crankshaft receives four overlapping impulses every revolution. The order in which the impulses take place is shown in Figure 17.

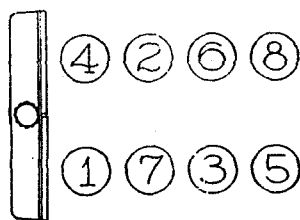


Fig. 17. Firing Order

### Automatic Spark Control

When each piston is at its highest position in the cylinder is, of course, the time when the charge is at its greatest compression, or, in other words, when the gas is "jammed in the tightest." Ignition occurring exactly at this instant produces a much more forceful explosion than if it occurred at a time when the charge was not so tightly compressed.

If the charge were ignited the instant the contact is made in the ignition timer, regardless of the speed of the engine, the spark could be set permanently in one position and would not require changing. But a certain amount of time elapses from the instant the circuit is closed at the ignition timer until the charge is ignited in the cylinder. While this time is but the merest fraction of a second, in fact, almost infinitesimal, yet it is time just the same and must be taken into account when dealing with such a rapidly acting mechanism as an automobile engine.

The lapse of time required to ignite the charge is always the same regardless of the speed of the engine and pistons. You will realize that when the engine is running, say 3000 R. P. M., the pistons are traveling many times as fast as they do when it is running only 300 R. P. M. When the engine is running 3000 R. P. M., it is necessary therefore to start the ignition process earlier.

In the Cadillac this is accomplished by means of a ring governor located directly under the ignition timer. As the speed of the engine increases, the ring in the governor assumes a position more nearly horizontal, forcing the timer cam slightly ahead on the shaft by which it is driven. This causes the timer contact points to break earlier, thereby starting the ignition process earlier in relation to the positions of the pistons. When the engine slows down, the ring in the governor assumes a position more nearly vertical, forcing the cam back on the shaft by which it is driven, causing the contact points to break later and thereby starting the ignition process later in the strokes of the pistons.

### Manual Spark Control

The automatic control takes care of the spark position for all ordinary driving. A spark lever is provided, however, by which the ignition timing may be still further advanced or retarded.

Ordinarily the spark lever should be carried about one-third the way down from the "Advance" position. To get the best results, however, it should be retarded further for extremely low speeds and advanced further for extremely high speeds. The car should be driven at all times with the greatest possible spark advance permitted by the speed of the engine.

Advancing the spark too far for given engine speeds will usually cause a slight pounding noise, which is sometimes not noticed by the beginner, as it is usually but slight owing to the substantial character of the crankshaft and bearings.

When starting the engine, place the spark about one-third the way down from the "Advance" position, except during extremely cold weather when it should be placed at the "Advance" position. If the engine should be cranked by hand, the lever should be placed at the "Retard" position. If this caution is not observed a "back kick" may occur, probably resulting in personal injury.

### WINDSHIELD POSITIONS.

#### *For inclement weather*

The normal position of the windshield for inclement weather is with the upper and lower sections closed and with the removable rubber strip between the glasses. If rain or snow should freeze on the glass making it impossible to clean it with the windshield wiper, the upper section may be tilted out at a slight angle. This is known as the rain vision position. The driver may then look between the sections of the shield, at the same time being protected to some extent. The clamping nuts at the top of the windshield standards must be loosened before the upper section can be moved and should be tightened after it is in the desired position.

#### *For ventilation*

When greater ventilation in the front compartment is desired than provided by the cowl ventilator, the lower section of the windshield should be tilted in. The clamping nuts, half way up the windshield standards, must be loosened before the lower section can be moved and should be tightened afterwards.

If still greater ventilation is desired the upper section may be tilted toward the driver.

The rubber strip between the windshield glasses should be removed before either the upper or lower section of the shield is tilted inward.

## Part II

## LUBRICATION

## IMPORTANCE OF LUBRICATION

There is no one thing which is the primary cause of more trouble and the cause of more expense in maintenance to the mechanism of an automobile than insufficient lubrication.

All moving parts of the Cadillac car are manufactured with an unusual degree of accuracy. In order to maintain the splendid running qualities of the car, it becomes necessary systematically to introduce suitable lubricants between surfaces which move in contact with one another.

*It should be borne in mind constantly that where one part moves upon or in contact with another friction is created. Friction means wear, and the wear will be of the metal itself unless there is oil. The use of too much oil is better than too little, but just enough is best.*

Proper lubrication not only largely prevents the wearing of the parts, but it makes the car run more easily, consequently with less expense for fuel and makes its operation easier in every way.

The oiling diagram shown on page 36 indicates the more important points which require attention. But do not stop at these. Notice the numerous little places where there are moving parts, such as the yokes on the ends of various brake rod connections, etc. A few drops of oil on these occasionally will make them work more smoothly.

Judicious lubrication is one of the greatest essentials to the satisfactory running and the long life of the motor car. Therefore, lubricate, and lubricate judiciously.

## LUBRICANTS

There are many grades of oils. There are none too good. Naturally, we have experimented a great deal with numerous lubricants to determine which are best adapted for the various parts of the Cadillac car. It is not always an easy matter for users to obtain suitable lubricants. The constant demand made upon us by Cadillac users has induced us to provide suitable lubricants which may be obtained from Cadillac distributors or dealers.

### Motor Oil

Cadillac Motor Oil is recommended and may be used both summer and winter. If you prefer to use some other oil and will write our Technical Department, a complete up-to-date list of tested and approved oils will be mailed to you.

The oil used should be a filtered one and not an acid or alkali treated oil.

We cannot hold ourselves responsible for damage resulting from the use of oil not suited to the Cadillac engine.

*Engine oil should be strained through cheese cloth or fine mesh wire cloth before using.*

### Rear Axle and Transmission Lubricant

Cadillac Rear Axle and Transmission Lubricant is recommended for the rear axle and transmission or in its absence a mixture of steam cylinder oil and a small amount of cup grease mixed to such a consistency that the mixture flows easily at temperatures from 60° to 70° Fahrenheit.

### Gun Grease

Cadillac Gun Grease is recommended for use in the grease gun or, in its absence, number three cup grease.

### Distributor Grease

Cadillac Distributor Grease is recommended for the Distributor.

### Universal Joint Grease

Cadillac Universal Joint Grease is recommended for the universal joints on the drive shaft or, in its absence, number three fibre grease.

### Steering Gear Lubricant

A mixture consisting of seventy-five per cent of Cadillac Rear Axle and Transmission Lubricant and twenty-five per cent Cadillac Gun Grease or number one cup grease is recommended for the steering gear.

## ENGINE LUBRICATION

### Lubricating System

The lubrication of the engine is by oil under pressure. A supply of oil is carried in the oil pan. Oil is drawn from the oil pan by an oil pump and forced to the main engine bearings.

The connecting rod bearings on the crank shaft are lubricated by oil from the main bearings forced through holes drilled in the crank shaft. A hole drilled in the forward end of the crankshaft communicates with a hole drilled in the crankshaft sprocket through which oil is supplied to the camshaft driving chain. The cylinders are lubricated by oil thrown from the lower ends of the connecting rods.

The pressure of the oil is regulated by pressure regulator (Figure 18), containing a valve under spring tension. When the pressure is reached for which the valve is set, the valve is forced open and the oil overflows past the valve. A small hole drilled in the regulator housing allows oil to by-pass the valve when the valve is seated. Oil flowing through the by-pass and oil forced past the valve is carried to the camshaft bearings, power pressure pump in the gasoline system and the camshaft sprockets and chains through a hole drilled in the camshaft.

There is one gauge and one indicator in the lubricating system. The pressure gauge is located on the instrument board and indicates the pressure of the oil. The indicator is attached to the upper cover of the crank case near the carburetor and indicates the level of the oil in the engine.

### Filling Lubricating System

An oil level indicator on the engine is for the purpose of indicating when the supply of engine oil is low and when a sufficient amount has been added. The indicator is between the cylinder blocks and is under the intake manifold, on the right hand side.

Oil should be added whenever the red ball of the indicator is down to the line marked "Fill." Do not risk running the engine after the red ball has reached the line marked "Fill." If, through oversight, the red ball should reach the line marked "empty" the engine should be stopped immediately and supplied with oil. The oil filler is just forward of the oil level indicator. (See Figure 18.)

Use only oil which is suitable (see under "Lubricants," page 31), and be certain that the oil is free from dirt or lint before pouring it into the

engine. It is a good practice to strain the oil through cheese cloth or fine mesh wire cloth.

When the red ball of the indicator is at "Full" the engine should contain seven quarts of oil.

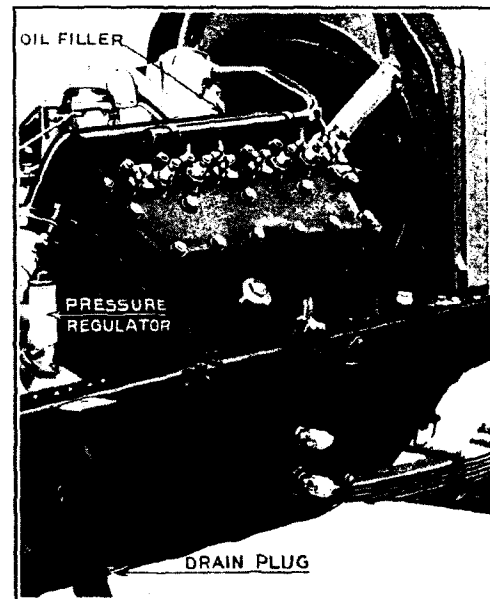


Fig. 18.

Oil Filler, Pressure Regulator and Drain Plug.  
(Fender and Hood Removed.)

### Replace Engine Oil

At the end of each 500 miles of travel remove the drain plug from the engine oil pan (see Figure 18). After the oil has drained out replace the plug and through the oil filler on the housing just back of the fan, add seven quarts of fresh engine oil (see under "Replace Engine Oil Frequently During Cold Weather," page 34). A socket wrench with a long handle is supplied with the tool equipment to facilitate the removal and replacement of the drain plug.

At the end of the first 1,000 miles of travel, at the end of the next 4,000 miles of travel and at the end of every 5,000 miles of travel, thereafter drain the oil pan as directed in the preceding paragraph, replace the plug and through the filler add a mixture consisting of three quarts of kerosene oil

and one quart of engine oil. The mixture must be free from dirt and lint. Run the engine at a speed of between 600 and 1,000 revolutions per minute for the period of one minute. Then drain the oil pan, remove it and the screen from the engine and thoroughly clean the oil pan and screen. Do not fail to add seven quarts of fresh engine oil after replacing the oil pan.

After cleaning the lubricating system with a mixture of kerosene and engine oil it is a good plan to clean the valve and seat of the pressure regulator. The regulator is located just back of the right hand block of cylinders. The valve can be removed after removing the regulator cover by unscrewing it. It is important also to make certain that the small by-pass hole by which oil is permitted to escape when the regulator valve is closed, is clean and free from any obstruction.

Do not use waste in cleaning the regulator valve or its seat. Use cloth free from lint.

*Caution:—Do not fail to replace the engine oil as frequently as suggested.*

### **Replace Engine Oil Frequently During Cold Weather**

The mileages given under "Replace Engine Oil" at which engine oil should be replaced and the oil pan and screen cleaned are those at which this work should be done during warm weather.

During cold weather water and gasoline may accumulate in the crankcase of the engine. It is necessary, therefore, to drain the oil pan and clean the oil pan and screen much more frequently than during warm weather.

The frequency with which it is necessary to do this depends very largely upon the manner in which the car is driven. In cases where the car is driven short distances only and frequent stops are made so that the engine base and the oil remain cold it will be necessary to drain the oil pan and to clean the oil pan and screen much more frequently than in cases where the car is driven for longer distances with fewer stops, so that the engine base becomes thoroughly warmed.

If the car is constantly making short trips in cold weather the oil should be drained every 350 miles of travel or once a week and the oil pan and screen cleaned once a month.

*Unless the oil is drained out and the oil pan and screen are cleaned frequently in cold weather, serious damage to the engine may result, particularly on cars in short trip service.*

### **Oil Pressure**

The pressure indicated by the oil gauge on the instrument board varies with the speed and temperature of the engine and the viscosity of the oil.

When the engine is warm and supplied with fresh Cadillac Motor Oil or oil of approximately the same viscosity, the pressure as indicated by the gauge should be from five to seven pounds when the engine is idling. (When idling the engine should run at approximately 300 revolutions per minute, if the throttle stop-screw at the carburetor is properly adjusted.) At higher speeds a higher pressure should be indicated and at lower speeds, a lower pressure. Before the engine has become warm, higher pressures will be indicated at given speeds. In other words, maximum pressures will be indicated at given speeds when the engine is cold and the oil is fresh; minimum pressures, when the engine is hot and the oil becomes thin from use.

Practically all engine lubricating oils become less viscous from use even under normal conditions. Running the engine too long with the auxiliary air control lever pulled back will cause the oil to be thinned more rapidly due to the condensation of gasoline from the rich mixture.

### **Caution**

If when starting the engine after replacing the oil it is found that the pressure gauge does not register pressure, stop the engine immediately and prime the oil pump. This may be done by disconnecting, at its upper end, the oil pipe running from the engine around the right hand side of the dash, and forcing clean engine oil into the pipe with the oil gun furnished in the tool kit. Connect the pipe and tighten the union before starting the engine.

*Do not continue to run the engine if, as a result of low viscosity of the oil, or other cause, pressure is not indicated on the gauge when the engine is running. (See under "Replace Engine Oil," page 33.)*

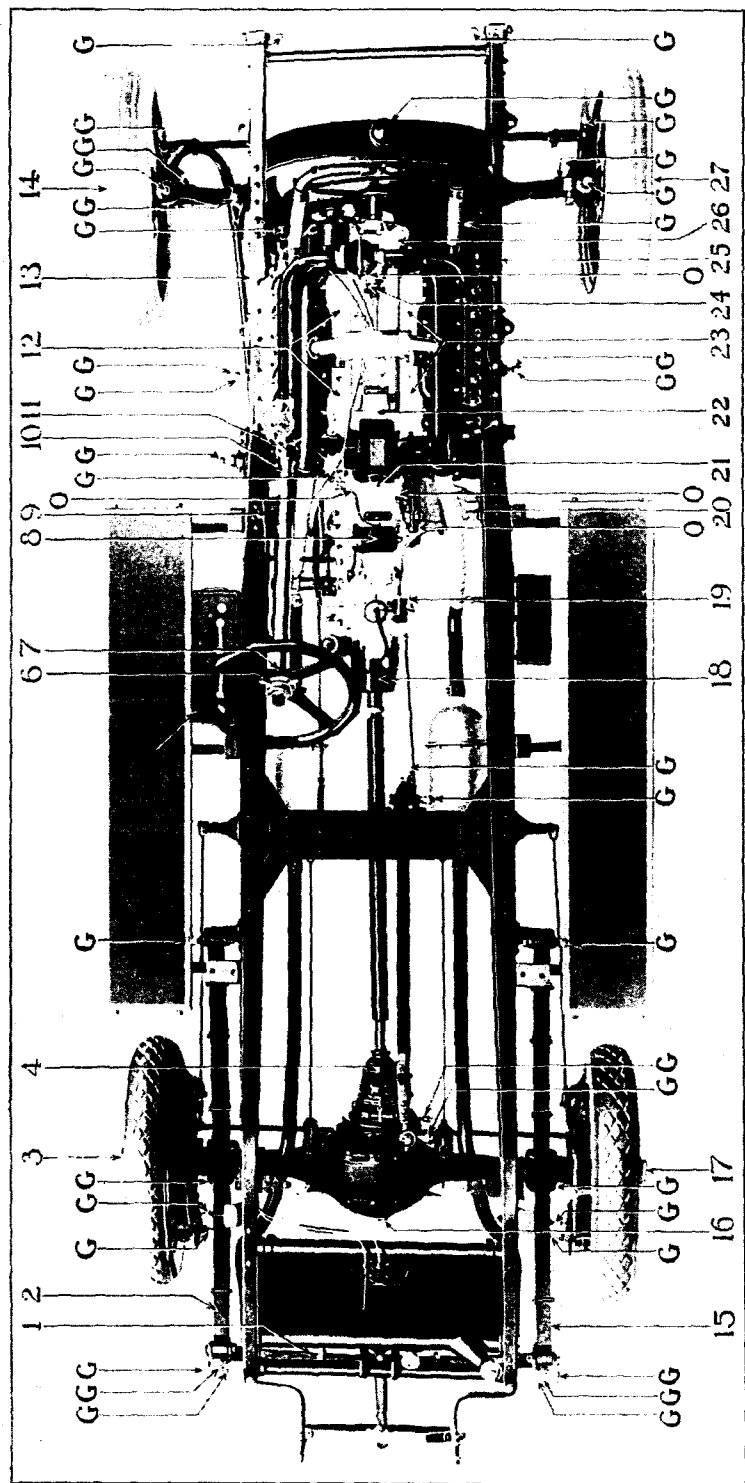


Fig. 19. General Lubrication Diagram.

Each "G" Indicates a Grease Gun Connection. Each "O" Indicates An Oiling Point at Which Engine Oil Should Be Applied. Each Number Indicates a Lubricating Point for Which Instructions Are Given Under "General Lubrication."

## LUBRICATION

37

### GENERAL LUBRICATION

It is manifestly impossible to give exact directions in every instance as to just how frequently each individual point should be oiled or exactly how much lubricant should be applied. In the following directions this is given approximately, based on average use.

With the tool equipment of each car is packed a lubrication chart, with a schedule for the lubrication of the car. This is intended to be hung in the garage to serve as a reminder.

#### EVERY 125 MILES

##### Engine: 24

At every 125 miles, or oftener, determine the quantity of oil in the engine and add oil if required (see under "Filling Lubricating System," page 32, and under "Replace engine Oil," page 33).

#### EVERY 500 MILES

##### Grease Gun Connections: G

Points "G" should be lubricated with the grease gun at every 500 miles of travel.

Grease gun connections at all shackle bolts are fitted to grease cups. This makes it possible to lubricate shackle bolts while the car is on the road by simply screwing down the cups.

Grease cups should be screwed all the way back before refilling them with the grease gun. A reservoir of grease is thus provided.

##### Springs: 1, 2, 13, 15, 23

It is recommended that the springs be lubricated every 500 miles by painting the edges and ends of the leaves with engine oil. A small, stiff brush should be used. After applying the oil, the car should not be washed until it has been driven far enough to allow the lubricant to work in between the leaves.

##### Replace Engine Oil

Replace the engine oil at the end of every 500 miles of travel. (See under "Replace Engine Oil" Page 33 and "Replace Engine Oil Frequently During Cold Weather," page 34.)

##### Water in Storage Battery

Every five hundred miles or at least every two weeks inspect the level of the acid in the storage battery and add *distilled* water if the level is low. (See under "Adding Water to Storage Battery," page 58.)

#### EVERY 1000 MILES

##### Oil Cups: O

A few drops of engine oil should be applied at points "O" every 1,000 miles.

**Universal Joints: 4, 18**

Fill the forward and rear universal joints on the drive shaft between the transmission and rear axle, with Cadillac Universal Joint Grease every 1,000 miles. A connection is furnished with the grease gun which fits the filling holes.

The forward joint is covered by a cylindrical shield to prevent grease from being thrown onto the under side of the floor. To fill the joint it is necessary first to detach the shield from the transmission case and to slide it back over the drive shaft. This may be done after loosening the two screws which hold the shield and turning the shield through a small arc in a counter-clockwise direction.

**Generator Oil Cups: 21, 22**

These oil cups conduct lubricant to the forward and rear bearings on the armature shaft of the motor generator. A few drops of engine oil should be applied every 1,000 miles.

**Oil Holes at Steering Wheel: 6, 7**

A few drops of engine oil should be applied every 1,000 miles.

**Engine Rear Supports: 9, 20**

There are felt wicks in the frame bracket to which the engine supports are bolted. Engine oil should be applied at these points every 1,000 miles of travel or oftener if necessary.

**Clutch Thrust Bearing: 8**

Every 1,000 miles remove the cover plate shown at "8." With the engine not running reach in and turn the clutch thrust bearing so that the small filler screw is at the top. Remove the screw with a screw driver. Care must be exercised not to drop the screw into the clutch case.

A small connection for the grease gun is furnished with the tool kit. Screw this into the threaded hole from which the filler screw was removed and attach the grease gun.

Cadillac Rear Axle and Transmission Lubricant is recommended.

**Clean Engine Lubricating System**

At the end of the first 1,000 miles of travel, at the end of the next 4,000 miles of travel, and at the end of every 5,000 miles of travel thereafter, clean the lubricating system and the oil pan and screen. (See under "Replace Engine Oil" page 33 and "Replace Engine Oil Frequently During Cold Weather," page 34.)

**EVERY 2500 MILES****Transmission: 19**

The transmission should contain sufficient lubricant to bring it up to the level of the filling hole at the right hand side. The level should be inspected every 2,500 miles and lubricant added if necessary. Cadillac Rear Axle and Transmission Lubricant is recommended.

**Rear Axle: 16**

The rear axle should contain enough lubricant to bring it up to the level of the filling hole in the rear cover plate. The level should be inspected every 2,500 miles and lubricant added if necessary. Cadillac Rear Axle and Transmission Lubricant is recommended.

**Timer and Distributor: 24**

Every 2,500 miles remove the small breather at the rear of the distributor housing by unscrewing it and pack distributor grease around the gears by which the timer and distributor are driven.

**Valve Stems: 12, 23**

Apply engine oil to the valve stems and cam slides every 2,500 miles. This may be done by lifting the valve compartment covers and inserting the spout of the oil gun.

**Wheels: 3, 14, 17, 27**

Every 2,500 miles, or every six months if the car is driven but little, all the wheels should be removed (see under "Wheels" page 64) and the bearings thoroughly cleaned in either gasoline or kerosene and examined. The bearings should be lubricated with a thin grease. Cadillac Gun Grease is recommended. Do not use heavy grease, as it will roll away from the path of the rolls and will not return.

There is an oil cup in the hub of each rear wheel. Inject engine oil here whenever you are oiling the car. Wipe the dirt from the cups first so that it will not get into the bearings.

**Steering Gear: 10, 11**

The steering gear should be lubricated every 2,500 miles. Steering Gear Lubricant is recommended. (See page 31.)



***Speedometer Flexible Drive Shaft***

The flexible shaft by which the speedometer is driven is carried in a flexible casing. The shaft should be removed from the casing and lubricated at the end of every 2,500 miles of travel. Cadillac cup grease is recommended.

Do not under any circumstances attempt to lubricate the speedometer head. Any parts in the head which require lubrication are amply supplied when the head is assembled.

EVERY 5000 MILES

***Clean Engine Lubricating System***

At the end of every 5,000 miles of travel clean the engine lubricating system and the oil pan and screen. (See under "Replace Engine Oil" page 33 and "Replace Engine Oil Frequently During Cold Weather," page 34.)

***Replace Transmission Lubricant: 19***

At the end of every 5,000 miles of travel remove the drain plug from the under side of the transmission case and drain out all of the lubricant. Refill with two quarts of suitable lubricant. Cadillac Rear Axle and Transmission lubricant is recommended. The filler is shown at "19."

***Replace Rear Axle Lubricant: 16***

At the end of every 5,000 miles of travel remove the drain plug from the rear axle and drain out all of the lubricant. Refill with 5 quarts of suitable lubricant. Cadillac Rear Axle and Transmission Lubricant is recommended. The filler is shown at "16."

**ADDITIONAL**

In addition to the places specially mentioned, note carefully and oil all of the small connections and joints throughout the car, such as the various brake rod connections and joints in the brake mechanism.

Remember that wherever one part moves in contact with another, wear will be reduced to the minimum by lubrication.

**Part III****GENERAL CARE**

## TIRES

Each tire maker publishes a booklet with instructions for care and repair of tires. Every motorist should provide himself with one of these and thoroughly familiarize himself with the contents. We give here suggestions that apply to pneumatic tires in general.

Probably 75% of so-called "tire trouble" is the result of misuse. In the following we have illustrated some of the more common causes of tire breakdown.

### *Result of Improperly Adjusted Tire Chains*

Figure 20 illustrates a tire which has been badly damaged through the use of tire chains which were improperly adjusted or fastened to the spokes holding the chains tightly in place. The tread is cut through to the fabric and in fact loosened up and torn badly in many places.

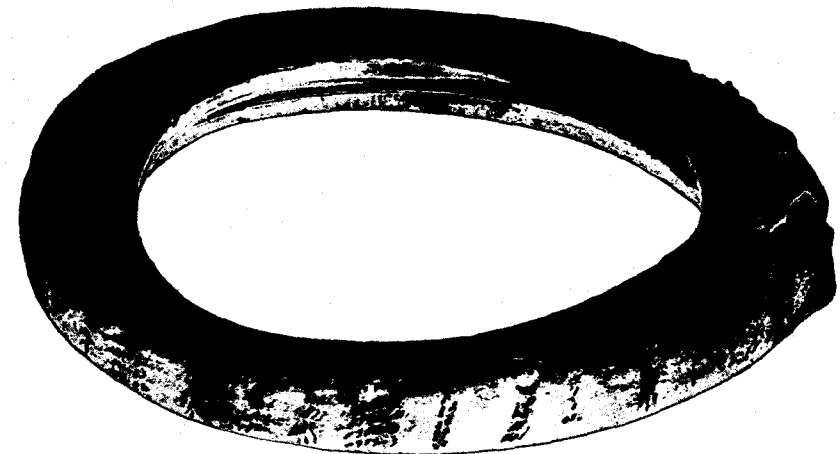


Fig. 20. Result of Improperly Adjusted Tire Chains.

The least injury results when chains are applied loosely, and have play enough to work themselves around the tire, distributing the wear on all points alike. Probably the greatest amount of injury comes from using chains unnecessarily on paved streets.

### *Neglect of Small Cuts*

Figure 21 illustrates a tire damaged from the neglect of two small cuts extending to the fabric. (Note the two prominent "bumps" which show plainly.)



In case of puncture, the car should be stopped at once and the tube repaired or replaced, or the tire replaced by the extra one. The tire should also be examined carefully and the cause of the puncture ascertained and the nail, glass or whatever it may be, should be extracted. Before replacing the tire on the rim, examine the inside of the casing to see that the cause of the puncture is not still protruding. It is also advisable to look over the outside of the tires frequently and take out any pieces of glass or other articles which may have become imbedded in the casing.

Don't run in ruts or car tracks; the sides of a tire will soon wear out under such treatment. Avoid large stones or other obstructions in the road. To hit one of these may break the fabric even though no external injury be visible.

The garage floor should be kept free from oil or gasoline. The tires on a car left standing on a grease-covered floor deteriorate quickly, the natural enemies of rubber being oil and gasoline. These destroy the nature of the rubber, rendering it soft, so that it cuts and wears away quickly.

If the car is not used during the winter, it is better to remove the tires from the rims, keeping casings and tubes in a fairly warm atmosphere away from the light. It will be better to slightly inflate the tubes, as that keeps them very nearly in the position in which they will be used later on. If the tires are not removed and the car is stored in a light place, it will be well to cover the tires to protect them from the strong light, which has a deteriorating effect on rubber.

The greatest injury that can be done to tires on a car stored for the winter is to allow the weight of the car to rest on the tires. The car should be blocked up, so that no weight is borne by the tires, and the tires should then be deflated partially. This will relieve the tires of all strain, so that in the spring they should be practically no worse for the winter's storage.

## STORAGE

### Engine

To prepare the engine for storage proceed as follows: Start the engine, cover the radiator and run the engine until it is hot. (See under "Personal Danger in Running Engine in Closed Garage," page 52.) The engine should be run at a speed which will show an ammeter reading of about 10 with all lights switched off. It usually requires from two to ten minutes to heat up the engine.

After the engine is hot, stop the flow of gasoline to the carburetor by removing the gasoline tank filler cap, thus relieving the air pressure. Immediately the engine starts to slow down from a "lean mixture" inject from three to four tablespoonfuls of clean fresh engine oil into the carburetor. This may be done easily after removing one of the four screws which hold the cover over the air valve. This will stop the engine. Be certain there is no fire near when the filler cap is removed. Replace and tighten the cap after the engine stops and replace the screw.

Open the compression cocks. Inject from two to three tablespoonfuls of clean fresh engine oil into each cylinder and before closing the cocks crank the engine three or four revolutions with the ignition switched off. This will tend to distribute the oil over the cylinder walls.

If the engine is started again repeat the series of operations given in Paragraphs 1, 2 and 3.

Drain the cooling system. You will find complete directions in this book under "Draining the Cooling System," page 54.

### Storage Battery

(See under "Preparing Battery for Winter Storage," page 60).

### Tires

During winter storage it is best to remove the tires from the rims and keep the casings and tubes in a fairly warm atmosphere away from the light. It is best to inflate the tubes slightly after the tires have been removed to keep the tires in the position in which they are when inflated on the rim.

If the tires are not removed from the car, and the car is stored in a light place, it is best to cover the tires to protect them from strong light, which has a deteriorating effect on rubber.

The greatest injury that can be done to tires when the car is stored is to allow the weight of the car to rest on them. If the tires are not removed the car should be blocked up so that no weight is borne by the tires and the tires partly deflated.

### **Body and Top**

It is best to put the top up and cover the entire car to protect it from dust.

### **Putting the Car Out of Storage**

When the car is taken out of storage and before the engine is started, drain the oil from the oil pan, remove and clean the oil pan and baffle plate and replace the oil with fresh oil. (See under "Replace Engine Oil," page 33.)

The following instructions should be followed carefully in starting the engine:

Open the compression relief cocks and inject from two to three tablespoonfuls of clean fresh engine oil into each cylinder.

Close the cocks and with the ignition turned off turn the engine over a few revolutions by hand. This will tend to distribute the oil over the cylinder walls.

Start the engine in the usual manner.

Immediately the engine starts push the carburetor enriching button as far forward as possible without causing the engine to stop or a material reduction in engine speed and open the throttle to a point which causes an ammeter reading of approximately 10 with all lights switched off. With the engine running inject from two to three tablespoonfuls of clean fresh engine oil into the primary air inlet at the right hand side of the carburetor.

Push the carburetor enriching button forward as far as it will go as soon as the engine is warm enough to permit it.

### **CARE OF THE FINISH**

The finish of an automobile requires more careful and frequent attention when the car is new than when it is older and the varnish is harder. Particular care should be taken to keep mud from the body and hood of the car while new.

Never permit mud to remain on the finish over night or long enough to dry. If it is not possible to wash the car thoroughly before putting it away for the night, flush it off and then thoroughly wash the car the next morning. Mud permitted to remain on the car until it has dried, is not only difficult to remove but stains and dulls the finish.

### **WASHING THE CAR**

Use clean water and plenty of it. Do not use water containing alkali. In parts of the country where the regular water supply contains alkali use rain water. Do not use hot water, as it destroys the lustre. The temperature of the water should be between 40 and 60 degrees Fahrenheit. Do

not wash the hood while it is hot. The effect on the finish is the same as washing it with hot water. Unless the hood is allowed to cool before washing, the lustre will soon disappear.

If a hose is used in washing, do not have water pressure greater than will carry the water 6" beyond the end of the hose. Water under higher pressure drives the grit and dirt into the varnish. It is best not to use a nozzle.

Start at one of the front wheels, first going over the underside of the fender, the wheel and the chassis nearby, with water flowing gently from the hose. This will flush off most of the mud and dirt.

If it is necessary to use soap to remove road oil from the underside of the fenders or machine oil or grease from the chassis, use a little good automobile soap dissolved in a pail of water and apply the soapy solution with a sponge. Do not let this soapy solution remain on the finish more than two or three minutes but immediately wash it off thoroughly with a good soft carriage sponge. Then proceed to wash the under surfaces of the remaining fenders, the wheels and the remainder of the chassis in a similar manner.

When the washing of the chassis is completed begin at the front of the car and with the water running gently from the hose, flow on the body, hood and upper surfaces of the fenders. This will soften the accumulation of road dirt and remove most of it. Then go over the car again and remove all dirt by rubbing lightly with a soft wool sponge, which is used exclusively for the body, hood and upper surfaces of the fenders. At the same time, apply gently from a hose an abundance of water. Rinse the sponge frequently in clean water to remove any grit. After the washing is completed squeeze the sponge as dry as possible and pick up all water from crevices.

Then thoroughly wet a clean soft chamois, wring it as dry as possible, and dry the finish. Rinse the chamois and wring it out frequently. Do not rub the finish or apply more pressure than is necessary to dry off the water. Water evaporates quickly and leaves the finish in good condition.

If it is desired to chamois the wheels and chassis, wet the parts with clean water if they have become dry, and then wipe them. Use a separate chamois for the chassis. Do not use on the body a chamois that has been used on the chassis or wheels.

Do not use soap, gasoline, kerosene or anything of this nature on the finish. Such ingredients attack the varnish.

Do not clean the glass with preparations which may contain harmful ingredients. Use only cleaning compounds which are known to have no destructive effects on highly polished glass.

## GASOLINE SYSTEM

### General Description

The supply of gasoline is carried in a tank at the rear of the car and is forced to the carburetor by air under a pressure of one to two pounds. A controlled needle valve in the carburetor maintains the gasoline at a correct level in the carburetor bowl.

The gasoline pressure is indicated by a gauge on the instrument board (see Figure 1). A hand air compressor on the instrument board is provided, which pressure for starting may be obtained when the car has been standing long enough to make this necessary. When the engine is running, pressure is automatically maintained by an air compressor on the engine, driven by an eccentric on the front end of the cam shaft. An air pressure relief valve connected in the air line prevents the pressure rising above that for which the valve is set.

The pipe extending almost to the bottom of the gasoline tank is a continuation of the gasoline line. The air line simply enters the tank at the top and does not extend into the gasoline.

### Filling the Gasoline Tank

The gasoline tank is at the rear of the car. (See Figure 25.) The filler cap may be removed after loosening the thumb screw.

Gasoline should be strained through a wire cloth of very fine mesh before it is poured into the tank. If dirt or water is allowed to enter the gasoline system it may cause great annoyance by getting under the carburetor inlet needle and causing the carburetor to flood.

After filling the tank, screw on the filler cap and tighten the thumb screw. This is necessary to prevent leakage of the air pressure by which the gasoline is forced to the carburetor.

### Settling Chambers and Strainers

There are two settling chambers in the gasoline system, one at the under side of the gasoline tank and the other attached to the left hand side of the frame of the car just under the front floor boards.

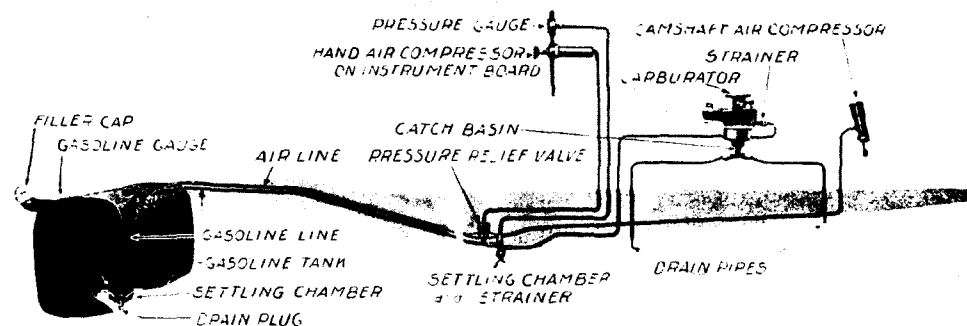


Fig. 25. Gasoline System.

There is a drain plug at the bottom of each of these settling chambers. Every one thousand miles or oftener the plug in the settling chamber under the floor boards and the plug in the settling chamber underneath the gasoline tank should be removed to drain the settling chambers of any dirt or water which has accumulated. Before unscrewing either of the plugs, the car should be driven out of the garage into the open and the gasoline system relieved of all air pressure by removing the gasoline filler cap on the tank. Be sure there is no fire near the car when these plugs are removed.

There are two strainers in the gasoline system which require cleaning periodically—one at the point where the gasoline feed pipe is attached to the carburetor, and the other attached to the drain plug in the settling chamber under the front floor boards. (See Figure 25.)

The strainers should be removed and cleaned every one thousand miles or oftener. Remove the filler cap to relieve the air pressure before removing either strainer. In cold weather it may be found necessary to remove the strainers more frequently, to prevent an accumulation of water at these points which would freeze and prevent gasoline from flowing to the carburetor.

## CARBURETOR

The carburetor is correctly adjusted when the car is assembled and unless tampered with should not require readjustment. It is unnecessary to change the adjustment for changes in season and weather.

Good carburetor action cannot be expected until the engine is thoroughly warmed up. Imperfect carburetor action while the engine is cold does not indicate that the carburetor requires adjustment.

If adjustment of the carburetor seems to be necessary have it made by a Cadillac distributor or dealer. The adjustment should not be attempted by one unfamiliar with it.

### Personal Danger of Running Engine in Closed Garage

Carbon monoxide, a deadly poisonous gas, is present in the exhaust of gasoline engines. Increasing the proportion of gasoline to air in the mixture fed to the engine, in other words, enriching it, increases the amount of carbon monoxide given off.

The presence of carbon monoxide makes it very dangerous to run the engine while the car is in a small, closed garage. If the doors and windows are open the danger is lessened, but it is far safer, particularly if an adjustment of the carburetor is being made, to run the car into the open.

Serious personal injury may be caused by the presence of carbon monoxide in a garage if the percentage of it in the air is greater than a very small fraction of one per cent. Unconsciousness may result without warning. It is reported that no indication of danger is given by personal discomfort until too late. Deaths resulting from the presence of carbon monoxide in garages have been reported.

## COOLING SYSTEM

### General Description

The cooling system is of the forced circulation type. Circulation through each cylinder block is independent of that through the other, two pumps being provided.

The temperature of the liquid circulated by the pumps is under thermostatic control, the purpose of which is to permit liquid circulated through the water jackets of the cylinders to warm up to the temperature at which the engine operates best, very soon after the engine is started and to prevent the temperature dropping below this point while the engine is running.

### Condenser

A condenser, the purpose of which is to prevent the loss of the cooling medium by evaporation, is attached to the right hand side of the car frame.

The operation of the condenser requires an air tight seal at the radiator filler cap. To make it possible to screw down and tighten the cap without injury to the rubber gasket, two metal washers are interposed between the head of the cap and the gasket. It is important that nothing be installed in the radiator cap which may cause an air leak or which makes necessary the elimination of the washers or cutting a hole through the gasket.

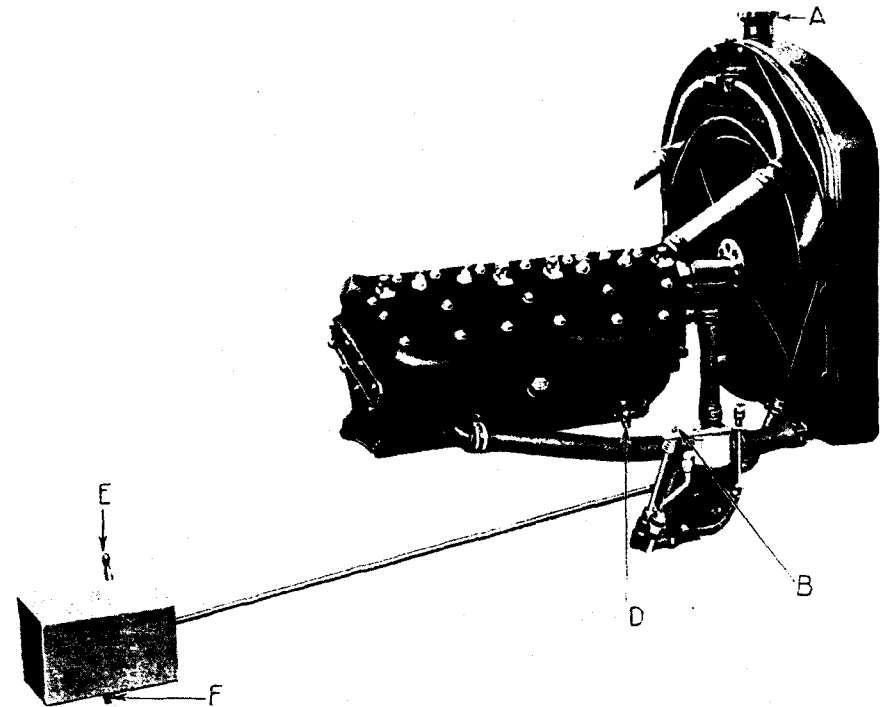


Fig. 26. Cooling System

### Refilling the Cooling System

Fill the cooling system with water during warm weather and with a suitable anti-freezing solution during freezing weather. (See under "Anti-freezing Solutions," page 24.) To fill the cooling system proceed as follows:

With a screw driver close the cylinder drain cocks "D" and turn the valves "B" (Figure 26) to the "Fill" position. (See Note page 54.)

There is a drain cock "D" in each cylinder block and a valve "B" at each water pump.

Remove the filler cap "A" and fill the system. Screw down the cap firmly after replacing it. This is important.

Turn the valves "B" to the "Close" position.

To fill the radiator condenser, take out the removable floor board, just forward of the transmission control lever. Remove the condenser filler cap "E" (Figure 26), and fill the condenser one-half full, using the same liquid as in the radiator. Replace the filler cap.

### **ding Cooling Solution**

If only a small amount of cooling solution is necessary to fill the system, s necessary only to remove the radiator filler cap and pour in the required ount.

Screw down the radiator filler cap firmly after replacing it. This is essary to insure operation of the condenser.

### **aining the Cooling System**

To drain the cooling system, open the cylinder drain cocks "D" and n the water pump valves "B" to the "Drain" position. (See Note.)

There is a drain cock "D" in each cylinder block and a valve "B" at h water pump.

To drain the condenser, remove the drain plug "F."

### **aning the Cooling System**

The cooling system should be drained and flushed out every two or three nths. This can be done in the following manner:

Run the engine with the radiator covered until the liquid in the cooling stem is boiling hot.

Shut off the engine and immediately open the cylinder drain cocks "B" d turn the water pump valves "D" to the "Drain" position.

There is a drain cock "D" in each cylinder block and a valve "B" at h water pump.

If an alcohol anti-freezing solution is drawn off part of it may be used ain if the sediment is allowed to settle. In case it is used the specific vity should be tested with an hydrometer, after it has cooled thoroughly.

After the liquid is drained off, close the cylinder drain cocks "D" and turn e valves "B" to the "Fill" position. Fill the cooling system with hot water d repeat the operations outlined above.

If, in draining the second time, the water is very dirty, it may be desir- le to repeat the flushing operation a third time, using a solution of sal- la. If the sal-soda solution is used, be sure that it is drained out and the stem flushed again with clear water.

The sal-soda solution should not be permitted to get onto the finish of e hood or radiator.

After the cooling system has been cleaned out and clear water or an ti-freezing solution (if during freezing weather) is replaced, turn the ter pump valves to the "Close" position.

**NOTE:**—If a water pump drain cock does not turn easily force down on e screw driver. In extreme cases it may be necessary to strike the end of the ew driver with your hand to unseat the drain cock.

## **CADILLAC-DELCO ELECTRICAL SYSTEM**

### **General Description**

The Cadillac-Delco system is the single wire, single unit system. One side of the motor, generator, storage battery, lamps, horn and ignition apparatus is connected to some part of the frame of the car or the engine. The other connections are made with copper wires or cables.

The motor generator serves both as a generator of current and as an electric motor for cranking the engine when starting. The principal elements of the motor generator are an armature and a field. There are two windings on the armature and two in the field—one on the armature and one in the field are used when the motor generator is used as a generator and the other windings when it is used as a motor.

### **GENERATION OF CURRENT**

When the engine is not running and the lights are turned on, the ammeter, located on the instrument board (see Figure 1) indicates on the "discharge" side of the dial, the amount of current drawn from the storage battery for the lights. When the ignition switch is turned on the ammeter indicates in addition the current used in slowly rotating the armature of the motor generator. When the starter button is pushed down, the current is no longer required for slowly rotating the armature of the motor generator. The ammeter then indicates only the current used for ignition and lights if turned on. The ammeter does not indicate the amount of current used in the cranking operation.

Before the engine is running fast enough to generate sufficient current to equal the current demand, the ammeter indicates on the "Discharge" side the amount of current being drawn from the storage battery. When the engine has attained a speed sufficient to generate current to more than equal demand, the ammeter indicates on the "Charge" side the excess current. This passes to the storage battery and recharges it.

Ordinarily, with all lights switched off, sufficient current is generated to start recharging the battery when the car is operated in high gear at speeds from ten to twelve miles per hour and, of course, at much lower speeds when the car is operated in low or intermediate gear. With all lights turned on sufficient current is generated to take care of the requirements at speeds from ten to fifteen miles per hour. At speeds greater than this the surplus current passes through the storage battery and recharges it. In other words, the ammeter indicates the rate at which the storage battery is being charged or discharged.

To determine the total output of the generator turn off all the lights and add the amount of current used for ignition, i. e., two to three amperes, to the ammeter reading.



**MOTOR GENERATOR COMMUTATORS**

Do not put oil on the commutators of the motor generator.

**IGNITION SYSTEM**

The ignition system embodies the following elements: A source of current, the generator, or at low speeds, the storage battery; an ignition timer, which interrupts the low tension current at the proper instant to produce spark in the high tension circuit; an induction coil, transforming the primary current of six volts into one of sufficient voltage to jump between points of the spark plugs; a condenser, which assists the induction coil to raise the voltage, and which protects the contact points of the ignition timer from burning; and a high tension distributor which directs the distribution of the high tension current to the spark plugs in the respective cylinders.

**Spark Plugs**

Spark plugs should be clean. When carbon or soot is permitted to collect on them short circuiting of the current results and prevents the proper ignition of the charge in the cylinder. A good method of cleaning plugs is to wash them in alcohol. Use gasoline in the absence of alcohol.

In order to get the best results the points of the spark plugs should be spaced 3/8 of an inch apart.

**Cleaning Lamp Reflectors**

The reflectors of the head and side lamps are plated with pure silver. In polishing, extreme care must be exercised in selecting materials which will not scratch it.

Powdered dry rouge and a chamois skin are recommended. If the reflectors are tarnished, moisten the rouge with alcohol, and apply with the chamois. Then polish with a dry chamois and rouge.

The chamois should be soft and must be free from dust. Do not use a chamois used for any other purpose.

**Lamp Bulbs**

It is recommended that bulbs for the lamps be purchased from a Cadillac distributor or dealer. In any event bulbs should have the correct voltage

and candle power rating. The following is a table of correct voltages and candle powers:

<i>Lamps</i>	<i>Voltage</i>	<i>Candle Power</i>
Head	8	21
Side	8	4
Instrument	4	2
Tail	4	2
Tonneau	8	2
Portable	8	6
Dome, enclosed cars	8	6
Quarter, enclosed cars	8	2

**Cigar Lighter**

The wire to the Cigar Lighter (See Figure 1) is carried on a reel fastened to the front face of the instrument board. Pulling the cigar lighter out of its receptacle on the instrument board automatically operates a switch in the reel chamber by which current to the cigar lighter is controlled. Permitting the cigar lighter to return to its receptacle automatically switches off the current.

**Portable Lamp**

The portable lamp is attached to the right hand side of the front face of the dash. To use the lamp lift the right hand side of the engine hood and pull the lamp straight out from its socket. The wire to the lamp is wound upon a reel. To return the portable lamp to its socket, operate the small lever on the dash at the side of the lamp receptacle. This will throw a catch which holds the reel and permit it to rewind the wire. The lamp is lighted by the small pull switch near the lamp.

**STORAGE BATTERY****General Description**

The storage battery consists of three cells. It is carried in a compartment in the left hand dust shield. The cover of this compartment forms a part of the dust shield and may be removed after unscrewing the two nickel-plated screws.

The battery is designed especially for the Cadillac-Delco electrical cranking, lighting and ignition system and is made by the Electric Storage Battery Co., Philadelphia, Pa., whose batteries are known as "Exide" batteries.

The specific gravity of the acid solution in the battery is an indication of the state of charge. (See under "Hydrometer Syringe," page 59.) In a fully charged battery the specific gravity should be from 1.270 to 1.290. If the specific gravity registers from 1.150 to 1.170 it indicates that the battery

is practically discharged. A battery discharged below a specific gravity of 1.150 will not crank the engine nor will it burn the lights to full candle-power when the engine is not running.

*Caution:—Never run the engine with the storage battery disconnected. Serious damage to the motor generator may result. Do not remove the motor generator or attempt any adjustment of the circuit breakers or remove any of the wires to the circuit breakers, without first disconnecting the storage battery.*

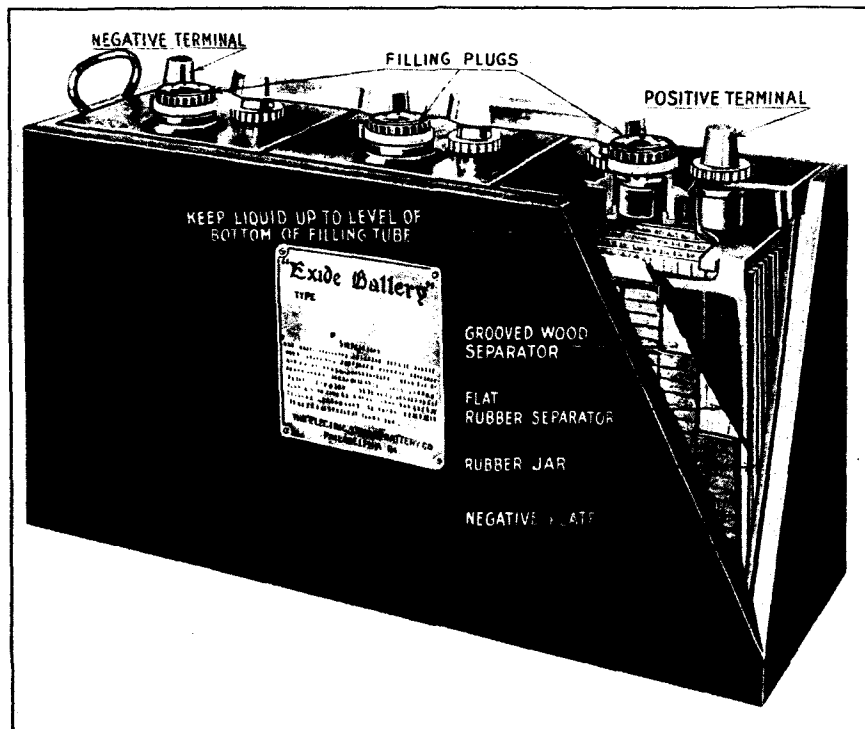


Fig. 27. Storage Battery, Sectional View.

### Adding Water to Storage Battery

The acid solution in the battery must always cover the plates and the level of the acid solution should be kept even with the bottom of the filling tubes. Water should be added frequently enough to keep the level up to this point. *Do not add acid.* Ordinarily water should be added every 500 miles, but it should be added at least every two weeks and more frequently if found necessary. Usually it will require only a teaspoonful or so; in hot weather it may require more. Be sure to replace and tighten the filling plugs after adding water.

To remove a filling plug, turn it as far as possible in the counter-clockwise direction, then lift it straight up. To replace it, hold it so that the large arrow is perpendicular to the center line of the car, set the plug in place and turn it in the clockwise direction until tight.

If a plug is left out or is loose, acid solution will escape from the cell, especially when the battery is being charged. If a plug is lost or broken, obtain a new one and install it as soon as possible.

If one cell regularly requires more water than the others, thus lowering the specific gravity of the acid solution in that cell, a leaky jar is indicated. Even a very slow leak will in time result in the loss of all the acid solution in the cell. A leaky jar should be replaced immediately by a new one.

Water for filling the battery must be pure. Distilled water, melted artificial ice or fresh rain water are suitable for this purpose. If rain water is used, it should not be allowed to come in contact with any metal. It should not be caught from a metal roof or in a metal receptacle.

Never keep the water in a metal container, such as a metal bucket or can. It is best to get a bottle of distilled water from a druggist or from an ice plant. A quart will last a long time. The whole point is to keep metal particles out of the battery. Spring water, well water or hydrant water from iron pipes generally contains iron and other metals in solution, which will ultimately cause trouble if used.

### Hydrometer Syringe

An hydrometer (Figure 28) is an instrument for testing the specific gravity of a liquid. An hydrometer syringe is an hydrometer specially designed for convenience in testing the specific gravity of the acid solution in storage batteries. Hydrometer syringes are not a part of the electrical system but can be purchased from any "Exide" service station.



Fig. 28. Hydrometer Syringe

To test the solution in the storage battery with an hydrometer syringe, proceed as follows:

Remove the filling plug from the cell to be tested, compress the rubber bulb of the syringe, and insert the pipette into the solution of the cell. Hold the syringe as nearly vertical as possible, and gradually lessen the pressure on the bulb until enough of the acid solution is drawn into the syringe to float the hydrometer. The specific gravity reading is taken on the hydrometer at the surface of the acid solution in the glass barrel.

If the acid solution is below the top of the battery plate, or so low that is not possible to draw enough of the solution into the barrel to float the hydrometer, fill the cell to the proper level (see Figure 27), by adding pure water, run the engine until the water has become thoroughly mixed with the acid solution, and then take the reading as above described. The engine could run for several hours after water is added before an hydrometer reading is taken.

### **Preparing Battery for Winter Storage**

When the car is stored for the winter the level of the acid solution should be even with the bottom of the filling tubes. (See under "Adding Water to Storage Battery," page 58.) If water is added it should be added just before the last time the car is used so that it will be thoroughly mixed with the acid solution. When the car is stored, the specific gravity of the acid should register from 1.270 to 1.290. In this condition there is no danger of the acid solution freezing. The specific gravity of water is 1.000 and water freezes at 32 degrees F. above zero.

*Unless the battery is fully discharged or nearly so it is probable that the acid solution in the battery will freeze and cause extensive damage.*

The following is a table of the freezing temperatures of sulphuric acid and water solutions of specific gravities from 1.050 to 1.300.

Specific Gravity (Hydrometer Reading)	Freezing Temperature (Degrees Fahr.)
1.050	+27°
1.100	+18°
1.150	+ 5°
1.164	0°
1.200	-17°
1.250	-61°
1.275 to 1.300	-90°

The battery should be charged every two months during the "out of service" period, by running the engine. If the above is impossible and there is no garage equipped for charging batteries to which it may be conveniently sent, the battery may be allowed to stand without charging during the winter, provided the specific gravity of the acid solution registers from 1.270 to 1.290 at the time the car is laid up. Much better results and longer life from the battery will be obtained by giving the periodic charges.

The wires of the battery should be disconnected during the "out of service" period, as a slight leak in the wiring will discharge the battery

### **Placing Battery in Service Again**

If the battery has received periodic charges it will be unnecessary to give it any special attention, other than to fill it to the proper height with distilled water and connect the wires which were disconnected when the car was stored. After the car has been driven for a number of hours, the specific gravity of the acid solution should be taken with a hydrometer syringe. The solution should register from 1.270 to 1.290 if the battery is fully charged.

A greenish deposit sometimes exists on the terminals of a storage battery which has been stored. This deposit may be removed with a solution of bicarbonate of soda (common cooking soda) in water. Do not allow any of this solution to get into the cells of the battery.

If the battery has not been kept charged during the winter, it is advisable to remove it from the car and have a plant equipped to take care of the work, give it a fifty-hour charge at a 4-ampere rate, before putting it into service again.

### **Sediment**

The sediment which gradually accumulates in the bottom of the jars, should be removed before it reaches the bottom of the plates. The need of cleaning may be determined by inspection. Its necessity is indicated by lack of capacity, excessive evaporation of the acid solution and excessive heating when charging. If a battery is in need of cleaning or repairs, it is best to communicate with a Cadillac distributor or dealer or with the nearest Exide depot, who will advise you where to ship the battery. *Do not ship batteries without receiving instructions.*

### **Exide Depots and Sales Offices**

The Electric Storage Battery Company, whose general offices and works are at Alleghany Avenue and 19th Street, Philadelphia, Pa., has service stations in towns of any considerable size where battery repair work is done, as well as sales offices and Exide battery depots in a number of the larger cities of the country, where complete assembled batteries and repair parts are carried in stock. For the location of the nearest Exide depot or service station, write the local Cadillac distributor or dealer, or, if preferred, the Electric Storage Battery Company, at Philadelphia.

## TRANSMISSION AND CLUTCH

### TRANSMISSION

#### General Description

The transmission is in unit with the engine, and is of the selective type of sliding gear. The gear changes are accomplished by the movement of a hand lever at the driver's right (see Figure 1, also under "Gear Shifting," page 11).

When traveling in high gear, power from the engine is transmitted through the transmission without passing through any of the transmission gears. Power is transmitted through transmission gears when the car is operated in intermediate, low, or reverse gear.

Changes of gear must never be attempted without first disengaging the clutch by holding down on the clutch pedal.

#### Lubrication

The transmission case should always contain lubricant enough to bring the level up to the filler plug in the right-hand side of the case. The level should be inspected at least every 2,500 miles, and lubricant added if necessary.

At the end of every 5,000 miles the transmission case should be thoroughly drained and refilled with fresh lubricant.

Cadillac Rear Axle and Transmission Lubricant is recommended for the transmission. In its absence steam cylinder oil mixed with gun grease may be used. The consistency of the mixture should be such that the mixture will flow easily at temperatures of from 60° to 70° Fahrenheit.

### CLUTCH

#### General Description

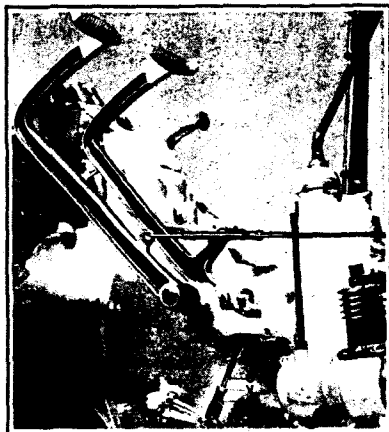


Fig. 29. Clutch Control.

The main clutch is of the multiple disc dry plate type. The driving discs are covered on both sides with a friction material composed largely of asbestos, and are driven by gear teeth in a clutch ring bolted to the fly wheel of the engine.

The driven discs are not covered. These discs are carried on a clutch hub and drive the clutch hub through keys. The clutch hub in turn drives the transmission shaft.

When the clutch is engaged by allowing the clutch pedal to come toward you, the clutch spring forces all of the discs together.

The resulting friction between the driving and driven discs drives the transmission shaft and the car when the transmission control lever is in other than neutral position.

The clutch pedal should be adjusted occasionally to compensate for wear on the facings of the clutch discs. This adjustment is explained below under "Adjustment of Clutch Pedal Clearance."

#### Adjustment of Clutch Pedal Clearance

After the car has been run for some time it may be found that the facings on the clutch discs have become compressed or worn to some extent and that consequently the clutch pedal strikes the stop screw before the clutch is fully engaged. When this condition exists a readjustment may be made as follows:

Remove the pin "N," Figure 29, and unscrew the yoke "P," which is threaded on the rod "O," so that when the pin "N" is replaced the clutch pedal has a movement back and forth of one and one-quarter inches without starting to release the clutch. Secure the pin "N" with a cotter pin and tighten the lock nut "V."

### STEERING GEAR

#### General Description

The steering gear is of the worm and sector type. Adjustments are provided in the steering gear for taking up play, which may result after long use.

#### Lubrication

The mechanism of the steering gear is lubricated through the gun connection "A," Figure 30.

Steering Gear Lubricant, made by mixing seventy-five per cent of Cadillac Rear Axle and Transmission Lubricant and twenty-five per cent of Cadillac Gun Grease or number one cup grease, should be used.

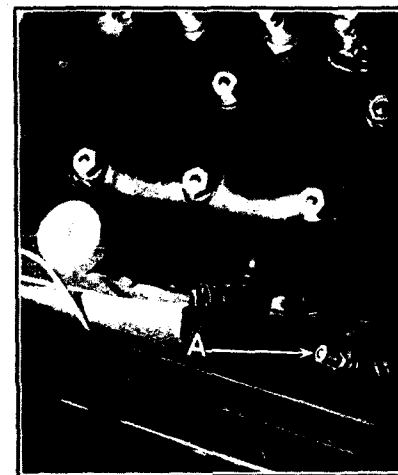


Fig. 30.  
Steering Gear.

Filling at "B" is facilitated by first turning the steering wheel so that the front wheels face to the right as far as they go. The car should be in motion when the steering wheel is turned.

### WHEELS

The adjustment of wheel bearings or the removal of wheels should not be attempted by one unfamiliar with work of this nature. It is recommended that the car be taken to a Cadillac distributor or dealer for this work.

#### Removing a Front Wheel

Jack up the axle until the wheel is free from the ground.

Remove the hub cap by unscrewing it.

Remove the cotter pin.

Remove the lock nut "A," Figure 31.

Remove the washer "B."

Remove the adjusting nut "C."

The wheel may now be removed.

Before replacing the wheel, see that the bearings are clean and that they are filled with a thin grease. Be sure that the grease is free from dirt and grit.

#### Replacing a Front Wheel and Adjusting Bearings

In replacing the wheel, adjust the nut "C" very carefully. (See under Caution in Adjusting Wheel Bearings," page 66.) Replace washer "B," being sure that one of the holes in the washer fits over the stud "D." Replace the lock nut "A" and tighten carefully. Replace the cotter pin.

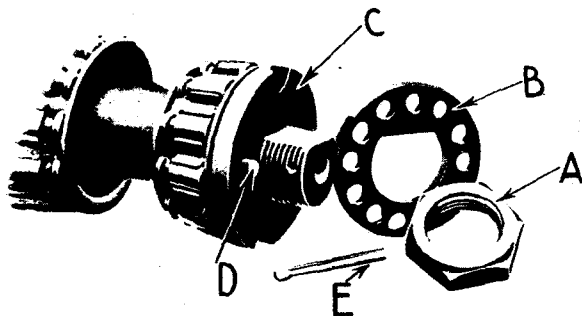


Fig. 31. Front Wheel Bearings and Adjusting Nuts.

It is better to adjust the wheel bearings a little too loose than tight. If, after the adjustment is apparently correct, a hole in the washer "B" is not directly over the stud "D," it is best to loosen the adjustment rather than to tighten it.

#### Removing a Rear Wheel

Remove the lubricator "A," Figure 32.

Remove the hub cap "B" by unscrewing it.

Remove the spring locking ring "I."

Withdraw the axle shaft "K."

Jack up the axle so that the wheel will clear the floor.

Remove the lock nut "D," the washer "E" and the adjusting nut "F."

The wheel can then be taken off.

#### Replacing a Rear Wheel and Adjusting Bearings

Before putting the wheel on again, see that the bearings "G" and "H" are clean and filled with light grease which is free from dirt and grit.

In putting the wheel on again, set the adjusting nut "F" very carefully. (See under "Caution in Adjusting Wheel Bearings.") Place the washer "E" in position, and tighten the lock nut "D."

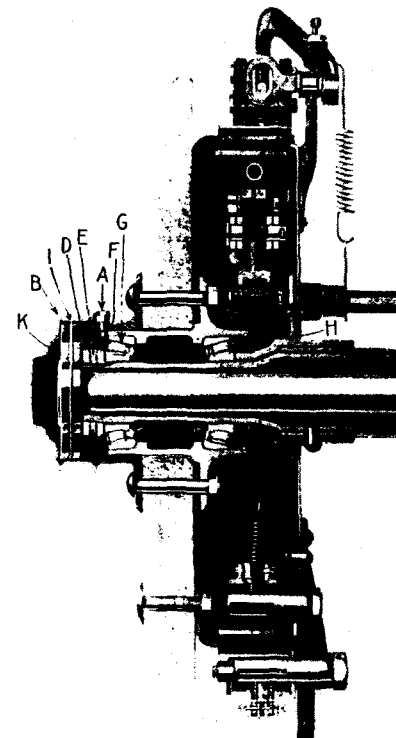


Fig. 32. Sectional View of Rear Hub, Showing Bearings.

## CAUTION IN ADJUSTING WHEEL BEARINGS

When adjusting the wheel bearings, with which the wheels are equipped, great care must be exercised not to get them tight. These bearings will evolve even when adjusted very tightly, but that condition is sure to prove disastrous. They should be adjusted so that a very slight amount of play or looseness may be discerned.

If, after a bearing has been adjusted to a point that is apparently correct, the locking device cannot be placed in position without changing the adjustment, it is far better to *loosen* the adjustment until it can be secured with the locking device than to *tighten* the bearing adjustment.

## REAR AXLE

### General Description

The rear axle is of the full floating type. The wheels rotate on the axle housing. The axle shafts do not carry the weight of the car, but simply transmit power from the differential to rotate the wheels.

## BRAKES

### General Description

There are two pairs of brakes. The regular service brakes, which are operated by the right pedal, contract upon the outside of the drums. The hand brakes, operated by a hand lever, expand within the drums.

Connections from the right pedal and hand lever are made through equalizing bars so that each drum will be gripped with practically the same pressure. While these equalizing bars compensate for a certain amount of inequality in tension, it is desirable to adjust the brakes as nearly alike as possible.

The brake band linings can be renewed when necessary.

When the brake band linings are wet and muddy they are less effective than at other times. Hence more care must be exercised in driving at such times.

The brakes and all parts relating thereto should be examined and tested occasionally to be sure that they are in serviceable condition.

The joints and all working parts should be oiled occasionally to avoid any possibility of the parts rusting and sticking together.

### Adjustment of Foot Brakes

Brake adjustment should not be attempted by one unfamiliar with it. It is recommended that the car be taken to a Cadillac distributor or dealer.

Provision is made in the brakes for adjustment. Do not attempt to adjust the brakes by the pull rods. The brakes cannot be adjusted properly in this manner. To adjust each foot brake, proceed as follows:

Remove the cotter pin in the adjusting screw "A," Figure 33, and turn the screw "A" until that part of the brake band lining opposite the screw just clears the drum. Adjust the two nuts "B" on the yoke bolt so that the lower part of the brake band lining just clears the drum.

Then adjust the nut "C" on the upper end of the yoke bolt so that the lever "D" is brought into the position shown in Figure 33, when the brake is fully applied—i. e., so that the lower edge of the pin "T" and the upper edge of the pin "S" are tangent to an imaginary horizontal line shown at "X." Lock all adjustments.

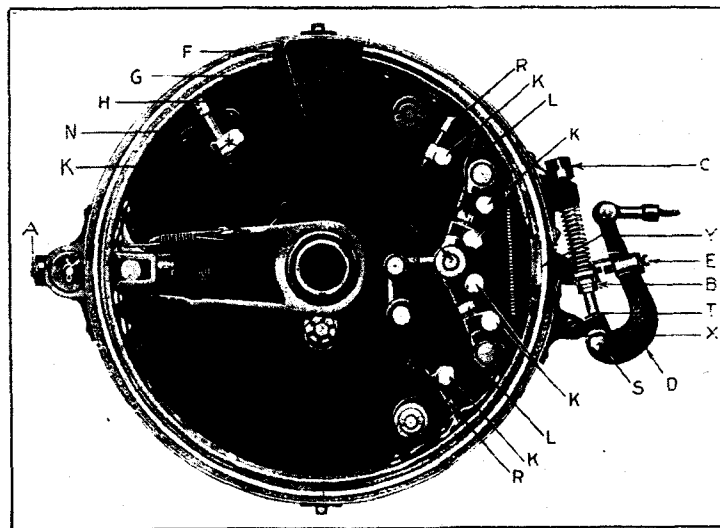


Fig. 33. Brakes (Wheel Removed.)

### Adjustment of Hand Brakes

When adjustment of the brakes becomes necessary it is recommended that the car be taken to a Cadillac distributor or dealer.

Provision is made in each brake for its adjustment. Do not attempt to adjust the brakes by the pull rods. The brakes cannot be properly adjusted in this manner. To adjust each hand brake proceed as follows:

Place a jack under the rear axle housing and raise the axle so that the wheel can be turned by hand. Remove the cover "F," Figure 33; this may be done by loosening the lock nut "G" and turning the bolt to the left about one-quarter of a turn, which releases the clamping bar "H."

Rotate the wheel until the opening gives access to the screw "J." Turn the screw "J" until that part of the brake band lining opposite the screw just clears the drum.

Rotate the wheel and through the opening loosen the seven locking screws "K." Then turn the two adjusting screws "L," which have right-hand threads on one end and left-hand threads on the other, so that when the brake is fully applied the center of the pin "M" stands three and three-sixteenths inches to three and one-quarter inches away from the inside of the brake drum at "Y." The screws "L" should be turned equally and in the same direction.

Release the brakes and adjust the stop screws "R" so that the upper and lower parts of the brake band lining are equidistant from the brake drum. Adjust the stop screw "N" so that the head of the screw just touches the inside of the brake band. Tighten the seven locking screws "K" and replace the cover "F."

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## REPAIR PARTS

### *Ordering New Parts*

With many thousands of Cadillac automobiles in use, it is obviously impractical to deal directly with each Cadillac owner. We cannot open accounts with any except regular distributors with whom annual contracts are made.

To avoid unnecessary delay and correspondence new parts should, where possible, be ordered from the distributor or dealer from whom the car was purchased or from the nearest Cadillac distributor or dealer, who is generally in a position to supply it from his stock. If he cannot do so, he can order it for you.

Where, however, conditions are such as in our judgment to warrant it, we will fill orders for parts at current list prices, f. o. b. factory, provided the order is accompanied by cash. In ordering, send the engine number and type of the car with an accurate description of the part desired, preferably accompanied by a sketch with dimensions. If this cannot be done, return the part tagged properly and with transportation charges prepaid. (See below under "Returning Parts"). Otherwise, we cannot promise prompt service or to fill the order intelligently.

Our responsibility ceases in all cases, with delivery to the transportation company.

### *Returning Parts*

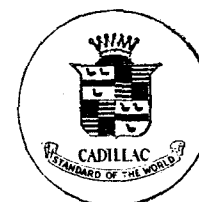
In the event parts are returned, transportation charges must be prepaid or the parts will not be accepted. They should be tagged properly with the name of the owner and the engine number of the car. A letter should be sent, giving complete instructions regarding the disposition of the parts.

### *Tires, Speedometer and Clock*

In cases of repairs to tires, speedometer, or clocks, correspondence should be opened with the manufacturers or one of their branches. If necessary the parts should be sent to them. Transportation charges should be prepaid.



TOOL MANUAL  
AND  
PRICE LIST



PRICE 50 CENTS

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DETROIT, MICH., U. S. A.

FIRST EDITION

THESE PRICES ARE EFFECTIVE JAN. 1ST 1921

### ***PREFACE***

There are contained in this manual directions covering the use of the more complicated tools furnished in the Cadillac Special Tool Kit.

On pages 1 to 5 is a complete list of the tools with the purpose of each, a list of the types of cars upon which they can be used and the page numbers where directions, if any, are given. On pages 7 to 10 are illustrations of the tools.

Our Technical Department invites questions from shop superintendents and foremen concerning the purpose of any tool or directions for its use.

**CADILLAC MOTOR CAR CO.**

**DETROIT, MICH., U. S. A.**

## TOOL INDEX

Name	PURPOSE	Number	Type	Page	Price List
<b>AXLES</b>					
Bar	Adjustment of differential bearing adjusting nuts.....	72799	1912-59		\$ 1.40
Puller	Removal and replacement of front axle yoke upper bearing mountings.....	72407	'13-51-55-59	12	9.50
Puller	Removal of pinion shaft flange.....	72354	51-53-57		3.25
Wrench	Removal and replacement of front wheel dust washers.....	72353	55-59		4.25
Wrench	Adjustment of pinion and pinion bearings..	72850	51, 53, 59		1.50
<b>CARBURETOR</b>					
Reseater	Replacement of air valve seat.....	55405	51-59	14	12.50
Weight	Adjustment of automatic throttle valve spring.....	67327	51-59	14	2.40
<b>ELECTRICAL</b>					
Puller } Clamp }	Removal of generator ball bearing inner race.....	{ 59599 51300 }	13-51		12.00 6.50
Puller	Removal of generator driving clutch.....	65493	51-59		2.10
Puller } Clamp }	Removal of generator roller bearing inner race.....	{ 65400 51300 }	53-57		11.00 6.50

Name	PURPOSE	Number	Type	Page	Price List
Wrench	Removal and replacement of lock nut on lower end of distributor shaft	72840	51-55		\$ .50
Wrench	Removal and replacement of battery terminal nuts	72845	1913-59		.50
<b>ENGINE</b>					
Arbor (Master)	To aid in fitting engine bearings	72395	51, 57, 59		8.50
Gauge	To test connecting rods for alignment	71969	51-59	16	55.00
Indicator Ring (Master)	To test cylinder bores for size and parallelism	71967	51-59	18	40.00
Indicator Holder	To determine clearance in straight connecting rod lower bearings	67870	51-59	20	6.50
Indicator Bar		196-B			14.00
		57736			2.10
Indicator Holder	To determine clearance in main crankshaft bearings	65530	51-59	21	6.50
Indicator Puller		196-B			14.00
		72631			7.00
Lifter (Valve)	To lift single valve	65201	51-59		4.00
Lifter (Valve)	To lift eight valves simultaneously	69283	51-59		14.00
Micrometer	General use 3 to 4 in outside	None	All		12.00
Puller	Removal of fan shaft coupling	71955	51-59	22	3.80
Puller	Removal of fan disc	56218	51		5.85
Puller	Removal of water pump drive shaft bushings	66869	51-59	23	10.50
Puller	Removal of camshaft sprocket	56678	51-57		7.50
Puller	Removal of forward camshaft bearing	72406	51-57	24	17.00
Name	PURPOSE	Number	Type	Page	Price List
Puller	Removal and replacement of Numbers 2, 3 and 4 camshaft bushings	72407	51-59	13	\$ 9.50
Puller	Removal of cam slide guides	72394	51-59	25	3.00
Puller	Removal of tire air compressor driving gear	57081	51		14.00
Puller	Removal of spiral gear from crankshaft, crankshaft sprocket or distributor driving gear from fan shaft	70003	51-59		19.00
Press	Removal and replacement of piston pins	56478	51		10.00
Press	Replacement of camshaft sprockets	66160	51-57		11.50
Press	Replacement of fan	56598	51		9.00
Reamer (Martell)	To ream main and connecting rod bearings	None	51-59	25	150.00
Returning Tool (Weber)	To True-up crank pins	None	51-59	29	250.00
Reamer	To ream piston pin holes oversize (first operation)	68350	51		4.50
Reamer	To ream piston pin holes oversize (second operation)	68351	51		4.50
Reamer	To ream piston pin holes oversize	67927	53		5.50
Reamer	To ream connecting rod bushings oversize	67928	53		4.50
Reamer	To ream piston pin holes oversize	68200	55-59		4.50
Reamer	To ream connecting rod bushings oversize	68201	55-59		5.50
Reseater	To reseal engine valves	55592	51-53		6.00
Reseater	To reseal engine valves	65743	55-59		7.20

Name	PURPOSE	Number	Type	Page	Price List	
Riveting Block		56332			\$ 3.55	
Rivet Inserter	To rivet chains in place on sprockets.....	56331	51-59		1.45	
Rivet Set		56322			2.10	
Tool	To oscillate valves in grinding.....	56330	51-59		3.50	
Wrench	Removal and replacement of $\frac{1}{4}$ ", $\frac{3}{16}$ ", $\frac{3}{8}$ " and $\frac{7}{16}$ " cylinder block nuts.....	71968	51-59		15.00	
Wrench	Removal and replacement of main bearing cap nuts.....	71970	51-59		3.00	
Wrench	Removal and replacement of straight connecting rod nuts.....	73075	51-59		1.80	
Wrench	Removal and replacement of forked connecting rod nuts.....	72813	51-59		2.00	
Wrench	Removal and replacement of forward fan shaft bearing locking nut.....	72855	51-53		2.40	
Wrench	Removal and replacement of water plug in cylinders.....	55910	51-55		2.00	
Wrench	Removal and replacement of rear fan shaft bearing locking nut.....	72849	51-57		2.40	
Wrench	Adjustment of cam slides.....	75368	51-59		.45	
Wrench	Removal and replacement of valve caps....	55773	51-55		6.00	
Wrench	Removal and replacement of bolts holding rear of engine to frame.....	72836	51-59		1.85	
<b>TRANSMISSION AND CLUTCH</b>						
Puller	Removal of flange from rear end of transmission shaft.....	72354	51-59		4.25	
Name	PURPOSE	Number	Type	Page	Price List	
Puller	Removal of clutch driver from shaft.....	56667	51-59		\$ 8.75	
Riveter	To set rivets in clutch facing.....	71975	51-59	32	8.00	
Wrench	Removal of nut at front end of clutch connection shaft.....	72817	51-59		1.50	
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Puller	Removal and replacement of spring eye bushings.....	72355	51-59	33	13.75	
Puller	Removal and replacement of spring shackle bushings in frame at rear of front springs	71953	51-59	34	5.00	
<b>WATER PUMPS</b>						
Puller	Removal of water pump drive shaft bearings.....	66869	51-59		10.50	
Wrench	To tighten gland nuts.....	72841	51-59		2.00	
Wrench	To open and close thermostat valves and remove and replace water pump drain plugs	E-4369	51-59		1.00	
<b>MISCELLANEOUS</b>						
Flanger	To flange oil, air or gasoline pipes.....	71974	All		3.75	
Puller	Removal of steering wheel.....	56479	1914-59		7.75	
Puller	Removal of steering arm.....	72354	57, 59		3.25	
Screw Driver	General use.....	72810	All		1.50	
Wrench	Removal and replacement of top supports..	72820	53, 55, 57		2.00	
Wrench	General use.....	72825	51-59		5.00	
Wrench	General use.....	72621	51-59		20.00	

## Walden-Worcester Wrenches

### General Use

#### SOCKET WRENCHES

Number	Size	Price
394	$\frac{3}{4}$ " x $\frac{7}{8}$ "	\$ .77
395	$\frac{1}{2}$ " x $\frac{9}{16}$ "	.66
751	$\frac{5}{8}$ " x $\frac{25}{32}$ "	.72
762	1" x $1\frac{1}{16}$ "	1.21
5660	$\frac{7}{8}$ " x $\frac{15}{16}$ " x $\frac{11}{16}$ "	1.20

#### BRACE SOCKET WRENCHES

6018	$\frac{9}{16}$ "	.88
6020	$\frac{5}{8}$ "	.88
6218	$\frac{9}{16}$ "	1.10

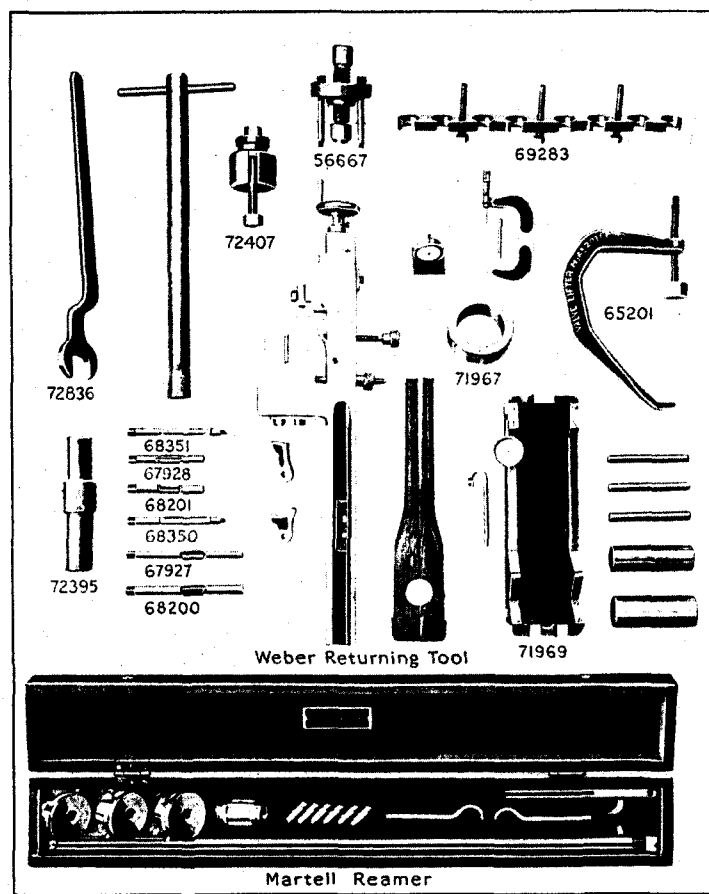


Fig. 1



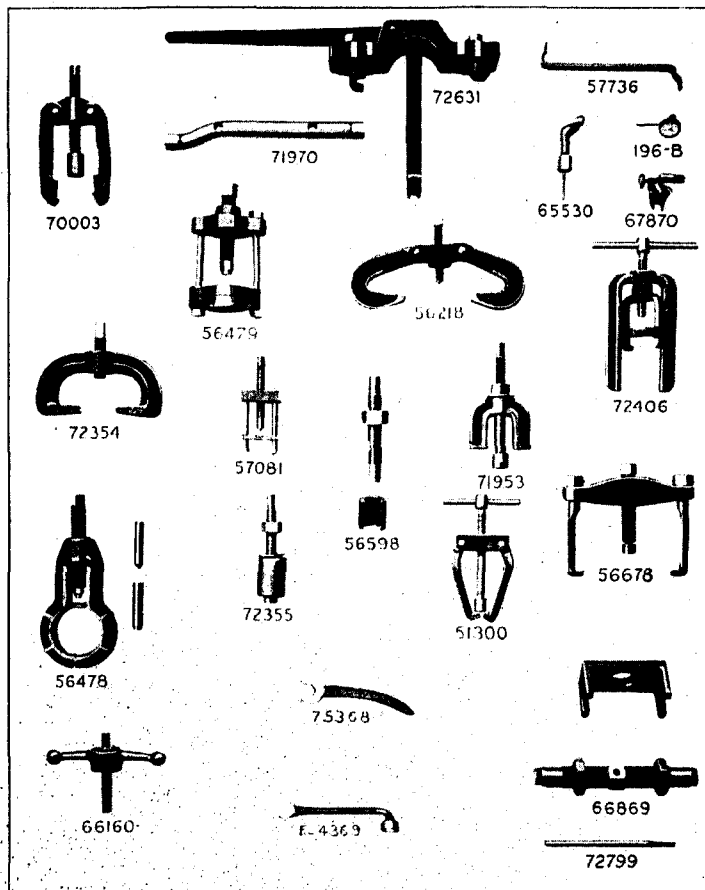


Fig. 2

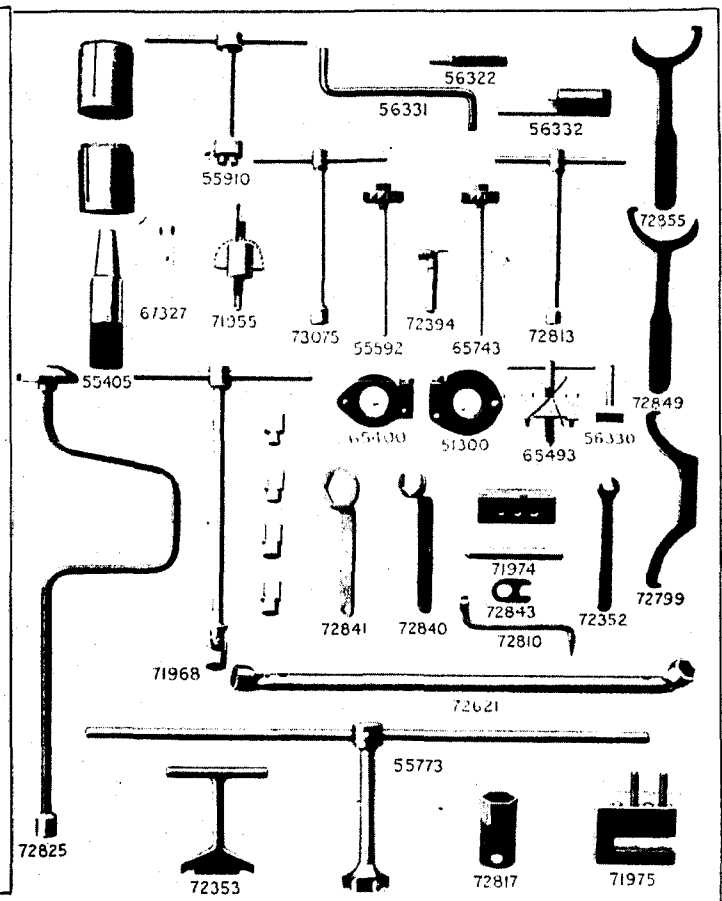


Fig. 3

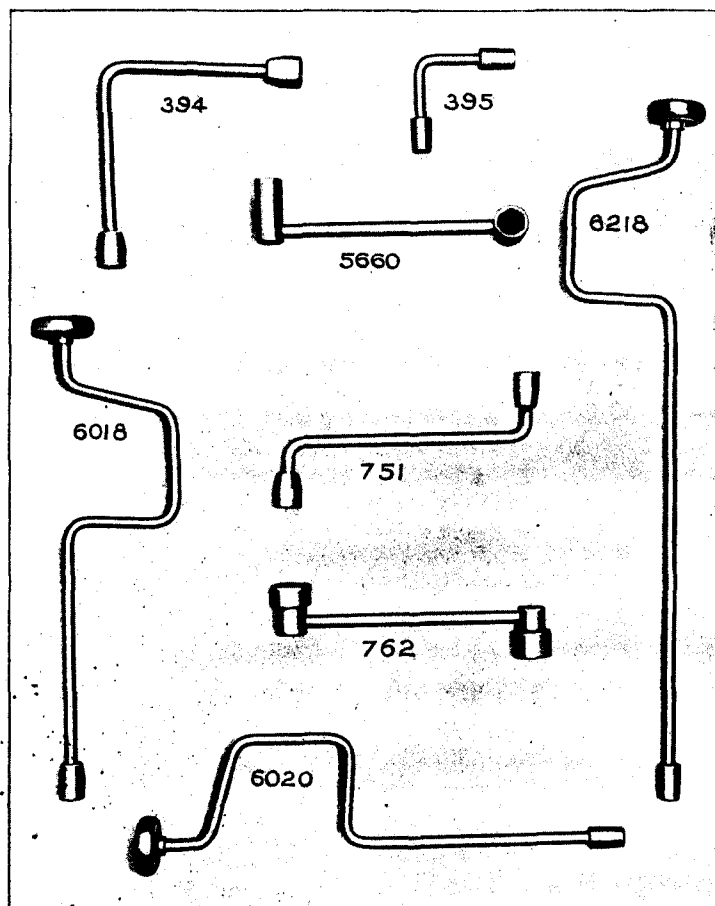


Fig. 4

## Tool Directions

## PULLER

**Tool Number 72407**

### Purpose:

This puller is for use in removing and replacing the mountings at the upper ends of front axle spindles on 1913, 1914, Type 51, 55, 57 and 59 cars, also numbers two, three and four eight-cylinder cam shaft bearings.

### Directions for Use:

#### To Remove Bearing Mounting:

Remove the front wheel and the spindle, also the cap from the upper end of the front axle yoke. (See Shop Manual.)

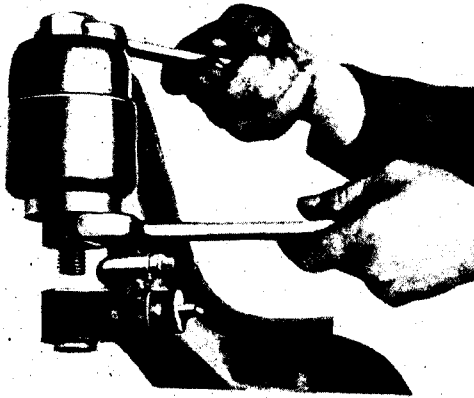


Fig. 5

Place the tool in position as shown in Fig. 5 using the larger washer. Screw on and tighten the nut. This will force out the mounting.

#### To Replace Bearing Mounting:

To replace the mounting reverse the large casting having it bear against the upper edge of the axle yoke and with the

large washer in place against the lower edge of the mounting and the mounting lubricated, screw on and tighten the nut. This will force the mounting into place.

#### To Remove Cam Shaft Bearing:

With the cam shaft removed place the large casting against the web of the crank case with the slot in the casting fitted over the oil tube above the bearing as shown in Fig. 6. With the smaller washer in place against the edge of the bearing, screw on and tighten the nut using the long socket wrench.

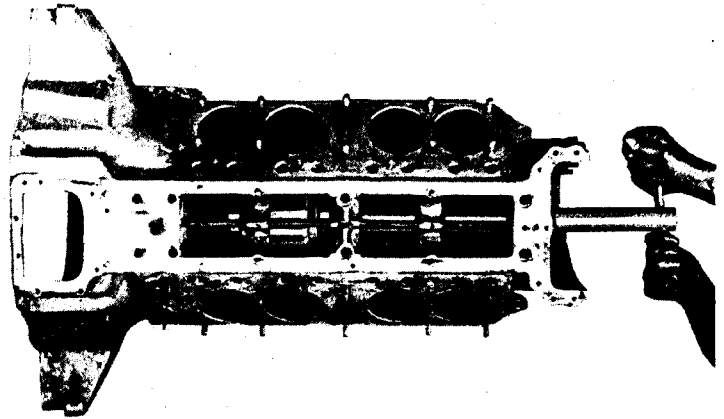


Fig. 6

#### To Replace Cam Shaft Bearing:

To replace, reverse the casting and with either the larger or smaller washer in place, screw up on the nut. It is well to lubricate the new bushing before pulling it in.

## RESEATER

Tool Number 55405

### Purpose:

This tool is for use in replacing the leather air valve seat of any eight cylinder carburetor.

### Directions for use:

Remove the carburetor from the engine and remove the auxiliary air valve cover plate, the valve and spring, and the ring and leather seat. Also remove the scoop from the carburetor body.

Place the new ring upon the tool "A," Fig. 7. Set the tool with the ring in place into the underside of the opening for the air valve. With a blunt screw driver or other suitable tool force the new leather seat into place. The beveled edge

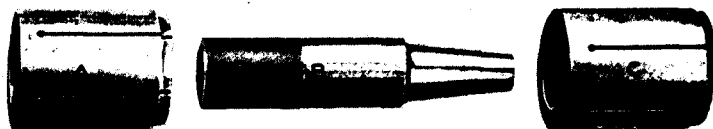


Fig. 7

of the leather seat should be toward the auxiliary air valve. After making certain that the leather seat is properly in place, place the carburetor upside down with the upper face of the auxiliary air valve chamber resting upon a solid block. Insert the tool "B" into the tool "A" and tap it lightly. This will expand the ring against the carburetor body and will hold the ring and leather seat in place.

Remove the tool "B" and replace the tool "A" by the tool "C." Then insert the tool "B" and tap it firmly into place. This will crimp the ring and will fasten the leather seat firmly.

## BALANCING WEIGHT

Tool Number 67327

### Purpose:

This tool is for use in setting the tension of the spring of the automatic throttle valve of type 51, 53, 55, 57 and 59 carburetors.

### Directions for Use:

With the carburetor removed from the engine, first make certain that the automatic throttle shaft works freely in its bearings. Test this by rotating the shaft approximately 180° from the normal position and permitting it to return slowly. If there is any tendency of the shaft to stick, remove it and clean the bearings. (See Shop Manual).

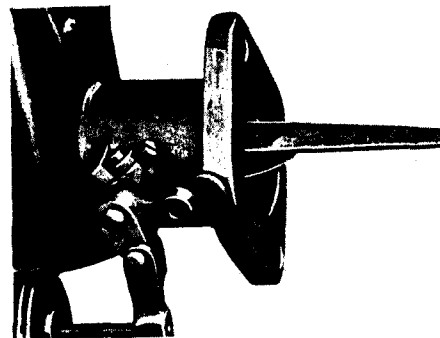


Fig. 8

After making certain that the shaft works freely, hook the balancing weight over the throttle disc as shown in Fig. 8. Hold the carburetor in the horizontal position and note the position the disc assumes. The disc should assume the horizontal position. If it does not and you are certain the throttle shaft is free in its bearings, slightly loosen the two screws holding the plate at the right hand end of the shaft, and with a screw driver turn the large adjusting cap. Turn-

ing the cap in a clockwise direction increases the tension of the spring, turning it in a counter clockwise direction decreases the tension.

After the adjustment is completed tighten the two screws.

## GAUGE

### Tool Number 71969

#### Purpose:

The purpose of this gauge is to test for alignment any eight cylinder connecting rod, also to assist in fitting main engine bearings.

#### Directions for Use:

##### Alignment Of Single Rod:

Clamp the arbor into the lower bearing and with the hand lightly force an arbor of the correct size into the upper bearing. With the indicator in place on the gauge, set the connecting rod with arbor into the gauge, as shown in Fig.

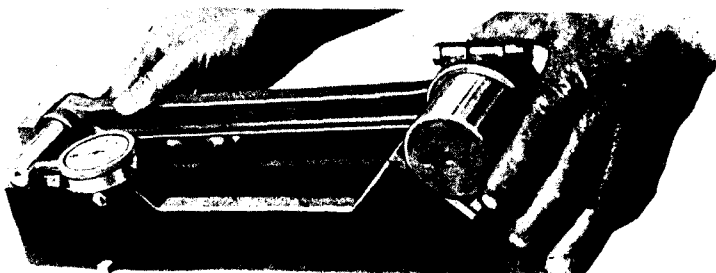


Fig. 9

9 first making certain that the arbor and the bearing surfaces of the gauge are clean. Each end of the small arbor should rest squarely upon the machined surfaces of the gauge, if they do not, remove the rod from the gauge and spring it lightly until they do. Then move the small end of the connecting rod up and down and watch the indicator.

Set the indicator to zero by turning the dial. Remove the connecting rod with arbors and set it back in the gauge upside down. Move the small end of the connecting rod as before and watch the indicator. If the hand does not indicate zero, remove the connecting rod and spring it lightly. Continue in this manner until the arbors are parallel.

##### Alignment Of Forked Rod:

To test the forked rod for alignment proceed as directed in the preceding paragraph with the lower bearing clamped in place. If the arbor is not a tight fit in the lower bearing use a new bearing.

##### Fitting Main Bearings:

By reversing the tool, a face plate is provided for determining the amount to be taken off the edges of main bearings in adjustment and for holding emery cloth to reduce the edges.

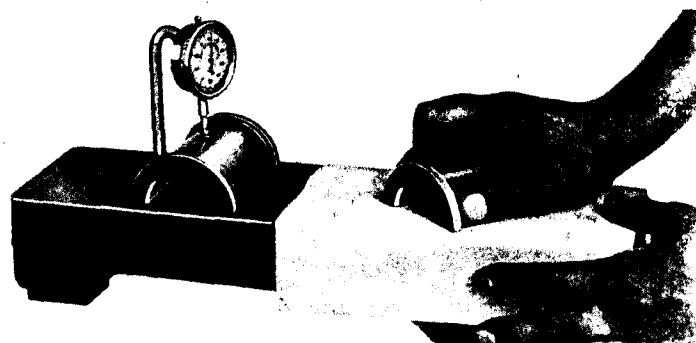


Fig. 10

After the clearance in the bearing has been determined (see page 21) place the lower half of the bearing under the gauge as shown in Fig. 10 and sliding it back and forth, set the indicator to zero. By making tests after reducing the

edges of the bearing, the actual amount taken off can be determined accurately.

Main engine bearings should have between .001 inch to .002 inch clearance after adjustment. See the Shop Manual for directions concerning main bearing adjustment.

Caution: Use care in handling the arbors and in handling the gauge not to mar the finished surfaces. Use as much care in handling the indicator as you would in handling a fine watch.

## INDICATOR

### Tool Number 71967

#### Purpose:

The purpose of this gauge is to test for size and parallelism any cylinder bore of an eight cylinder engine.

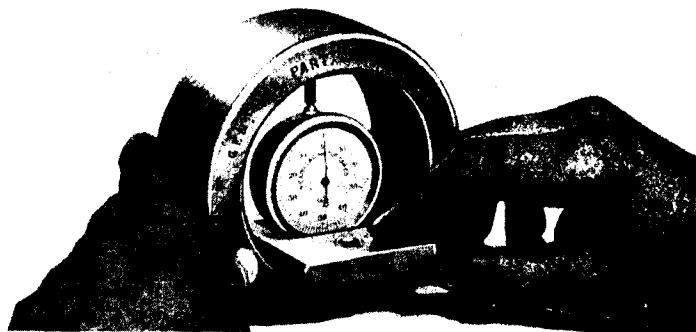


Fig. 11

#### Directions for Use:

With a cloth free from lint, soaked in gasoline, carefully clean out the cylinder bore and wipe it dry.

Wipe out the master ring and wipe off the shoe which holds the indicator. Then set the indicator with shoe into

the master ring as shown in Fig. 11 and turn the face of the indicator so that the hand points to zero. This will set the indicator to the mean standard cylinder size, which is 3.126 inch. Cadillac cylinders in manufacture are ground to the following limits. Standard size 3.125 inch to 3.127 inch. First oversize 3.141 inch to 3.143 inch. Second oversize 3.156 inch to 3.158 inch.

Set the indicator with shoe into the cylinder bore as shown in Fig. 12 and with a bent rod fitted into the hole drilled in the shoe, move the indicator back and forth. The size of the cylinder bore and any variation in size between the upper and lower end may thus be determined.

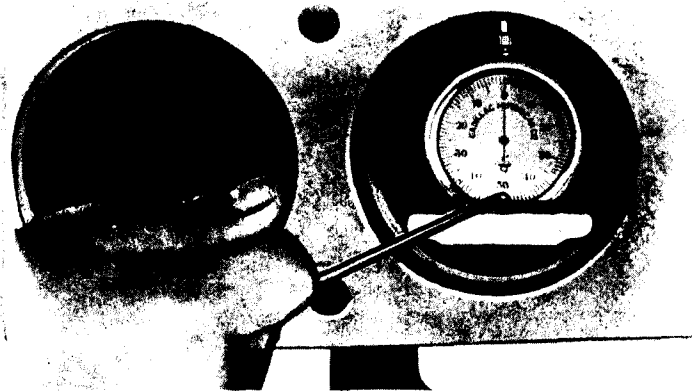


Fig. 12

Caution: Use as much care in handling the master ring and the indicator as you would in handling a fine watch. These parts may easily be rendered inaccurate.

## INDICATOR

### Tools Numbers 67870, 196-B, 57736

#### Purpose:

These tools are used in determining the clearance in the

bearings at the lower ends of straight connecting rods of all eight cylinder engines.

#### **Directions For Use:**

With the oil pan and baffle plate removed, turn the engine over by hand to bring the throw of the crank shaft to the lower center. Then place the indicator in the holder and clamp the holder to the forked connecting rod, as shown in Fig. 13.

With the bar in position as shown, force the rod up and set the dial of the indicator to zero. Then with the bar, over the head of the straight connecting rod bolt and under a nut on a forked rod bolt, force the rod down. The clearance in the bearing will be indicated on the dial.

See the Shop Manual for detailed directions concerning the adjustment of these bearings.

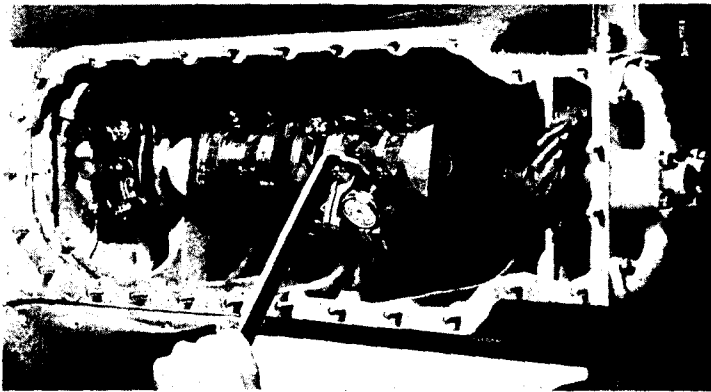


Fig. 13

**Caution:** Use as much care in handling the indicator as you would in handling a fine watch.

## **INDICATOR AND PULLER**

**Tools Numbers 65530, 196-B and 72631**

#### **Purpose:**

These tools are for use in determining the clearance in the main bearings of all eight cylinder engines.

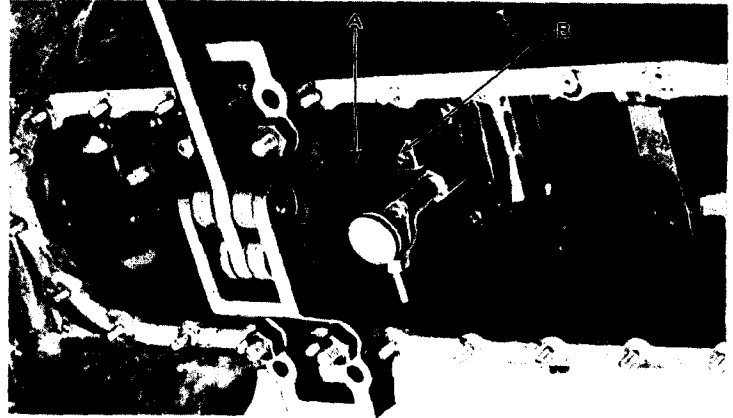


Fig. 14

#### **Directions For Use:**

Remove the oil pan of the engine and the oil pipe between the oil manifold and the main bearing cap. It is best to remove the oil manifold also.

Then screw the indicator holder on to the nipple screwed into the bearing cap and place the indicator in the holder as shown in Fig. 14.

Turn the crank shaft so that the cheeks are in the horizontal plane. Place the puller up against the under face of the crank case, turn the clamping screws outward and

tighten the nut on each clamp. Place the arm "A" over the cheek of the crank shaft and tighten the set screw "B."

Set the indicator to "O", then force the lever up and down watching the indicator hand. The bearing clearance can thus be determined. The clearance in each of the three main bearings can be determined in like manner.

See the Shop Manual for directions covering main bearing adjustment.

Caution: Use as much care in handling the indicator as you would in handling a fine watch.

### **PULLER**

#### **Tool Number 71955**

##### **Purpose:**

This tool is used in removing the coupling from the rear end of the fan shaft of all eight cylinder engines.

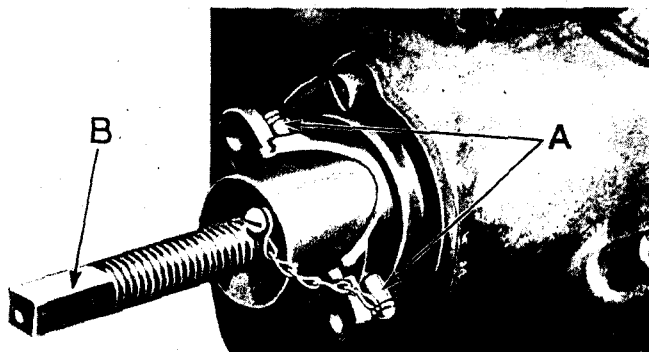


Fig. 15

##### **Directions for Use:**

With the generator drive shaft and the large cap screw in the rear end of the fan shaft removed, assemble the tool

into the coupling as shown in Fig. 15, and insert the two pins "A."

The coupling can then be removed by turning up on the screw "B."

### **PULLER**

#### **Tool Number 66869**

##### **Purpose:**

This tool is for use in removing the water pump drive shaft bushings from the crank cases of all eight cylinder engines.

##### **Directions for Use:**

Remove the water pump, the gland nut and packing and the set screw which holds the bushing in place, (The set screw is not used on type 59 engines).

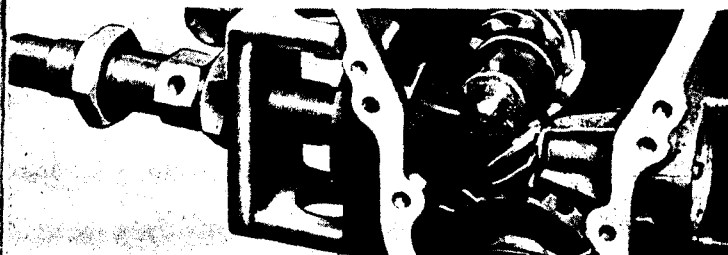


Fig. 16

Place the tool in position as shown in Fig. 16 screwing the threaded portion well into the bushing to be removed and screw up and tighten the large nut.



The right hand bushing has a left hand thread while the left hand bushing has a right hand thread. There is a right hand thread on one end of the tool and a left hand thread on the other for the removal of either bushing.

### **PULLER**

**Tool Number 72406**

#### **Purpose:**

This tool is for use in removing the forward cam shaft bearing from type 51, 53, 55 and 57 engines.

#### **Directions for Use:**

After removing the front cover plate, engine pan, cam shaft sprockets and fan shaft housing, remove the set screw

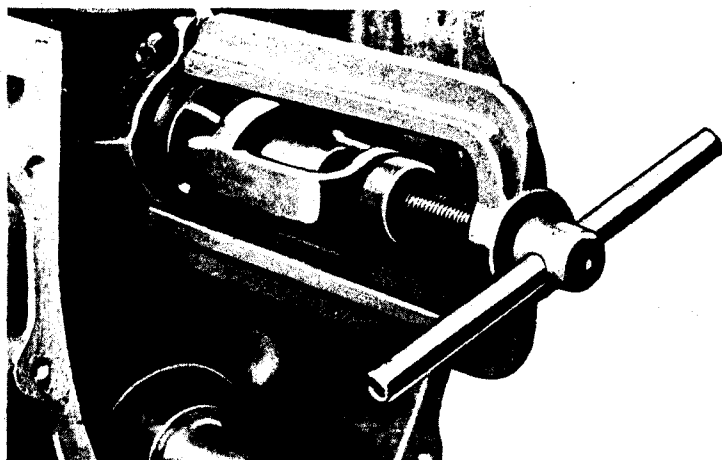


Fig. 17

which holds the bushing in place. The head of the screw is at the upper face of the crank case. Place the tool in position as shown in Fig. 17. and screw up on the handle.

### **PULLER**

**Tool Number 72394**

#### **Purpose:**

With this tool cam slide bushings can be removed from the crank case of any eight cylinder engine.

#### **Directions for Use:**

Remove the cam slide and the clamp for the cam slide bushings. Insert the part "A" (Fig. 18), in the cam slide guide, force it to one side of the guide and insert the locking wire "B." With a bar under the hook "C" the slide can be removed.

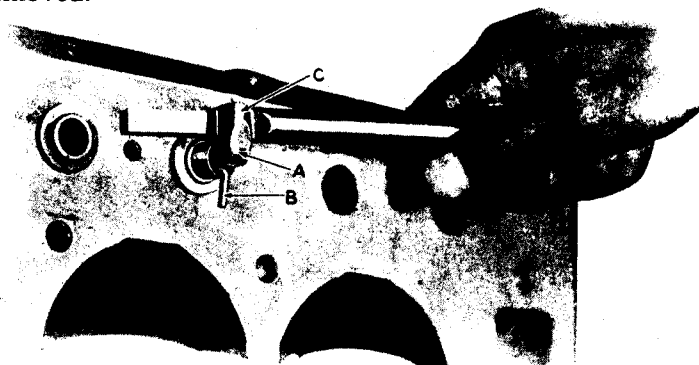


Fig. 18

### **MARTELL REAMER**

#### **Purpose:**

This tool is used in reaming the main and connecting rod bearings of any eight cylinder Cadillac engines also the bearings of 1913 and 1914 Cadillac engines. Main and connecting rod bearings may be reamed if two additional centering bushings are used, which can be secured from the Taft-Pierce Mfg. Co., Woonsocket, R. I.

#### **Directions for Use:**

To ream main bearings:

Disassemble the engine and remove the crankcase from the chassis and place it upside down upon a suitable support. Assemble the main bearings to be reamed into the crankcase with the liners in place and tighten down the bearing cap nuts.

If the reamer is not fitted with cutters of the proper size replace them. To do so proceed as follows: Place the reamer upon the short shaft furnished with the tool and clamp the shaft in a vice. Fig. 19. With a spanner wrench furnished loosen one of the clamping collars "A" or "B" and remove the cutters. Cutters of the correct size may then be assembled into the reamer and the collar tightened. The

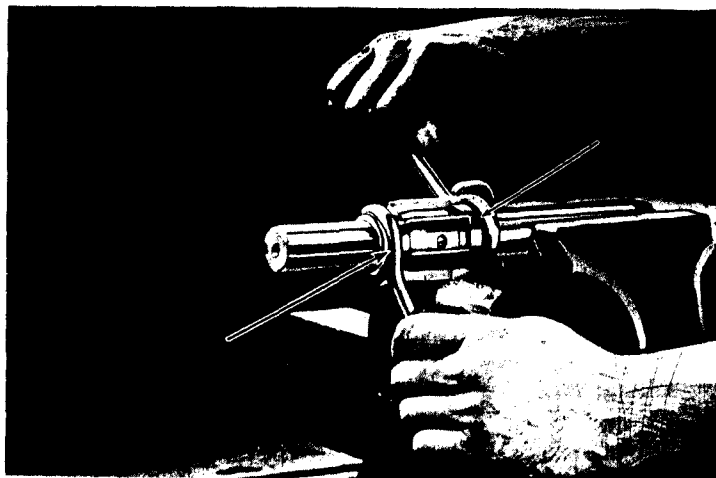


Fig. 19

cutters are stamped with figures from one to six. The grooves into which they fit are similarly marked. It is important that each cutter be placed in its proper groove.

After cutters of the correct size are assembled into the reamer, micrometer the crank shaft bearings and set the

reamer .002 inch to .003 inch larger than the bearings. This will give from .001 inch to .002" clearance between the shaft and bearings after reaming is completed. To increase the size of the reamer loosen the collar "A" and tighten the collar "B." To decrease the size, loosen the collar "B" and tighten the collar "A."

With cutters of the correct size in place and the reamer set to the correct size, assemble the bar with centering bushings and reamer into the crank case as shown in Fig. 20. Have the 6° cutting edge of the reamer face toward the forward bearing.

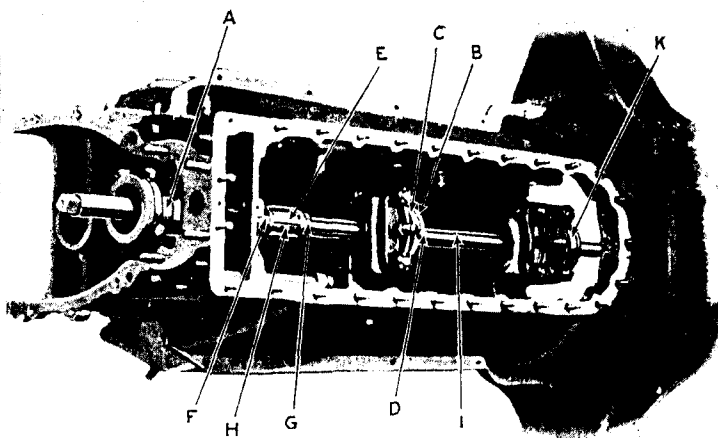


Fig. 20

With the two parts of centering bushings "A," "B" and "C," fitted tightly together, screw the threaded portions tightly into the ends of the bearings as shown. Have two of the set screws of the centering bushings "B," in a horizontal plane, and the other two in the vertical plane. Move

the center portion of centering bushing "B" back  $\frac{1}{16}$  inch to  $\frac{1}{8}$  inch and adjust the set screws so that they just touch the parallel surface of the conical center.

To determine if the centering bushings have been lined up correctly pull the bar back until it just leaves the forward support and then push it forward. The bar should enter the hole without clicking. If it does not, reset the set screws of centering bushing "B." After the bar is lined up correctly lubricate the reamer with a good quality of lard oil and ream the forward bearing, continuing the reaming operation until the reamer just touches the forward centering bushing. Then remove the bushing and continue the reaming operation. After completing the work pull the reamer about one half way out of the bearing just reamed and carefully replace the centering bushing by again screwing it into place. The bar should be lubricated with a good quality of light engine oil.

Carefully remove the bar just far enough to permit turning the reamer around and then replace it. The center bearing may then be reamed in similar manner. After completing this work place the reamer between the second and third bearings and ream the rear bearing.

### ***To Ream Connecting Rod Bearings:***

To ream a connecting rod bearing, clamp the connecting rod into vice protecting the rod with wood blocks or coppers jaws. Set the reamer to the proper size, assemble it upon the short shaft and place the reamer with shaft and a centering bushing into the connecting rod as shown in Fig. 21.

Hold firmly together the two portions of the centering bushing and with the  $6^\circ$  cutting edge of the reamer held tightly against the opposite end of the connecting rod bearing to center that end of the reamer shaft, screw the centering bushing into place. Lubricate the reamer with a good quality of lard oil and ream the bearing until the

reamer strikes the centering bushing. Then remove the bushing and continue with the reaming operation.

After this work is completed the connecting rods should be aligned in accordance with directions on page 16.

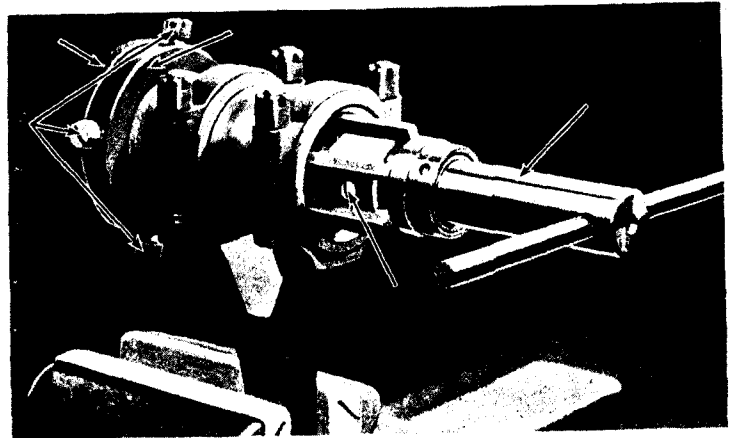


Fig. 21

### ***Caution:***

Inaccurate work will result unless very great care is used in handling this tool, particularly the long bar which may be easily rendered inaccurate by rough handling. Keep all parts well oiled with a good quality of engine oil and packed in the box in which they are received.

## ***WEBER CRANK PIN RETURNING TOOL***

### ***Purpose:***

This tool is used in the trueing up of the crank pins of any Cadillac crank shaft.

### Directions for Use:

Remove the crank shaft from the engine (see Shop Manual) remove the plugs from the oil ways and clean the crank pins. Do not use emery cloth for this purpose. Then place the shaft upon lathe centers as shown in Fig. 22, being careful not to adjust the centers tightly enough to spring the shaft.

Using the scale "A" set the tool to the diameter of the crank pin. Three bronze shoes are furnished with each tool. Install the one marked "2" and place the tool over the crank pin as shown. Set the screw "E" bringing the shoe

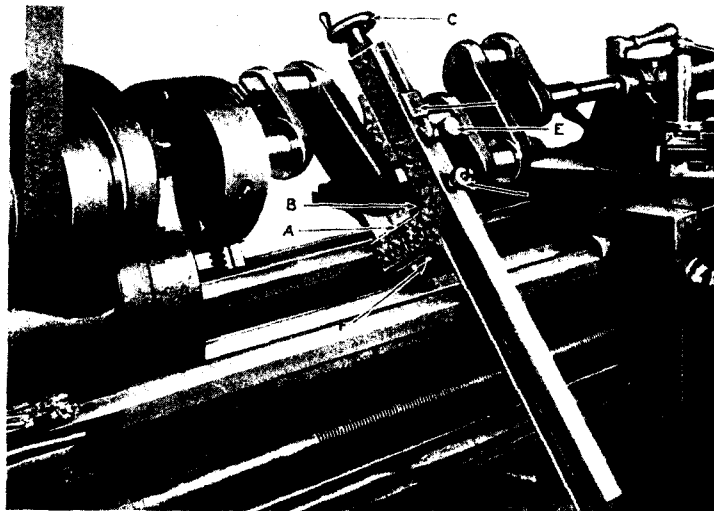


Fig. 22

against the crank pin thereby holding the shaft firmly in place. Do not adjust the shoe too tightly.

Adjust the cutter by the hand wheel "C" so that it just clears the crank pin at its largest diameter. The lathe

should be turned by hand to make certain the cutter is adjusted correctly.

Start the lathe on the lowest back gear speed. A speed of between eight and ten revolutions per minute is recommended. In no event should the speed exceed fifteen revolutions per minute. Start the cutting operation with a feed of not more than .0005 inch per revolution. Keep the bronze shoe screwed tightly against the crank pin while the work is being done. An out of round crank pin will result if this is neglected. Remove only enough metal to true up the pin.

Use freely a cutting lubricant consisting of equal parts of lard oil and turpentine. Do not use a water compound.

Do not back off the cutter while the lathe is in operation. Injury to the hardened steel plates is the result if this is done. If through mistake the plates are injured in this manner, use a fine India oil stone in dressing them up.

All crank pins should be turned to the same diameter. This can be done by using the graduation on the hand wheel as a scale.

If a crank pin is worn badly out of parallel with the main bearings the handle of the tool will oscillate on the ways of the lathe. This can be overcome by running the carriage lightly against the handle of the tool. When overcome run the carriage back.

After the work is completed, stop the lathe remove the tool, place a piece of number 00 emery cloth in the wooden hand clamp and with the pin well lubricated polish it with this tool. Finish polish with crocus cloth and oil.

After completing the work, thoroughly clean out all oil passages and replace the plugs.

It is important that the cutter edge be sharp and free from nicks. It is recommended that you permit the tool manufacturers, The Sawyer-Weber Tool Manufacturing

Company, 350 South Alameda Street, Los Angeles, California, or the Special Tool Co., 1141 Jefferson Ave. E. Detroit, Mich. to regrind them when necessary.

Fit new undersize bearings after completing the work. These may be obtained from the Cadillac Motor Car Company. Complete directions covering the refitting of new bearings will be found in the Shop Manual.

Caution: Care should be used in handling this tool. Do not injure the surface of the steel plates or the cutting edge.

### **RIVETER**

**Tool Number 71975**

#### **Purpose:**

This tool is used in setting the clutch rivets of all eight cylinder cars.

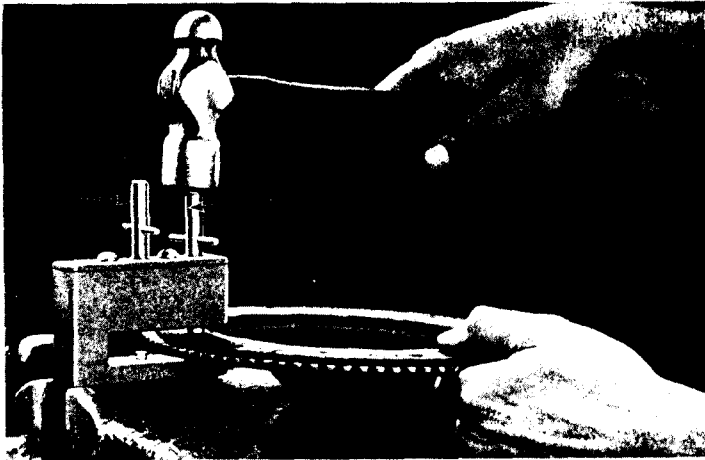


Fig. 23

#### **Directions for Use:**

Insert the brass tube rivet through the holes in the clutch discs and facings, alternating the rivet heads. Place the disc

with facings into the tool as shown in Fig. 23, so that the punch "A" enters one of the rivets. Tap the punch firmly then move the disc under the punch "B" and complete the riveting. Set each rivet in a similar manner.

After completing the work, smooth down the new facings with a press or a steel block and hammer.

### **PULLER**

**Tool Number 72355**

#### **Purpose:**

This tool is used in removing or replacing spring eye bushings in all Cadillac springs in which bushings are used.

#### **Directions for Use:**

Remove the spring bolt and force the spring eye out of the shackle. Place the tool in position as shown in Fig. 24. The bushing may then be removed by screwing up on the nut.

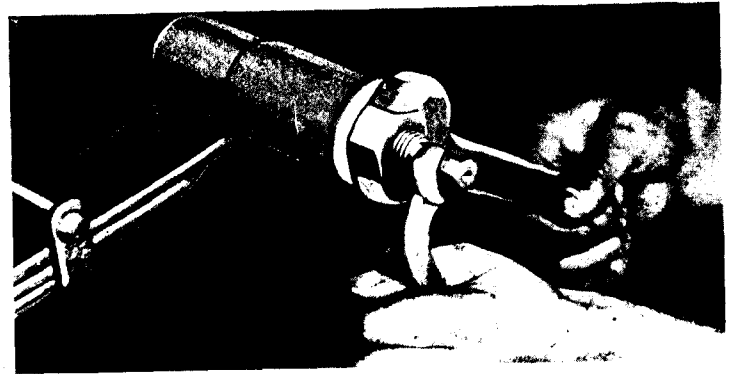


Fig. 24

To pull a bushing into place, place the tool in the reverse position lubricate the bushing and tighten up on the nut.

## **PULLER**

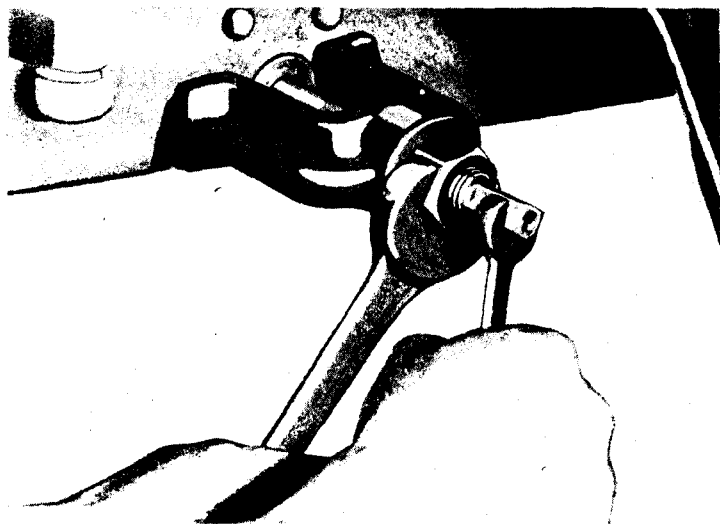
### **Tool Number 71953**

#### ***Purpose:***

The purpose of this tool is to remove and replace spring shackle bushings in the frame at the rear ends of front springs of all eight cylinder cars.

#### ***Directions for Use:***

To force out a bushing after the shackle bolt has been removed and the shackle forced down out of the way, place



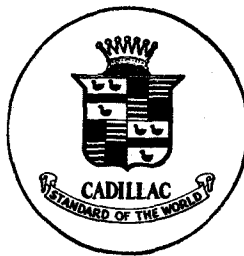
*Fig. 25*

the tool in position as shown in Fig. 25 and draw up on the large nut.

To replace a bushing reverse the tool. Lubricate the bushing before pulling it in.

**MANUAL**  
**OF**  
**CARE AND OPERATION**

**FOR OPERATOR'S USE**



**Type 61**

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<b>Part II. Lubrication</b>	<b>Page 29</b>
<b>Part III. General Care</b>	<b>Page 41</b>

**Price, 35 Cents**

**Cadillac Motor Car Company**

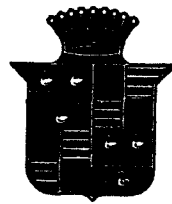
**Detroit, Michigan, U. S. A.**

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Detroit, Mich.



# **CADILLAC OPERATORS' MANUAL**



**TYPE 61**

**PRICE 85 CENTS**

**CADILLAC MOTOR CAR COMPANY  
DETROIT, MICH., U. S. A.**

# OPERATION

## Part I

VENTILATOR HANDLE  
(UNDER COWL)

HAND THROTTLE

SPARK CONTROL

HORN SWITCH BUTTON

AIR COMPRESSOR  
(GASOLINE SYSTEM)

TOOL COMPARTMENT LOCK

CLUTCH PEDAL

CARBURATOR ENRICHING  
BUTTON

TRANSMISSION CONTROL LEVER

BRAKE PEDAL

IGNITION LOCK

AIR COMPRESSOR CONTROL  
SHAFT (TIRE INFLATION)

TRANSMISSION LOCK

CONTROL BUTTON FOR  
HEAD LAMPS

FOOT THROTTLE

FUEL PRESSURE GAUGE

AMMETER

OIL PRESSURE GAUGE

INSTRUMENT LAMP

AUXILIARY SWITCH FOR  
TAIL LAMP AND  
INSTRUMENT LAMP

LIGHTING SWITCH LEVER

IGNITION SWITCH LEVER

SPEEDOMETER

CLOCK

CIGAR LIGHTER

STARTER BUTTON

STEM FOR WINDING  
AND SETTING CLOCK  
(UNDER COWL)

HAND BRAKE LEVER

FOOT REST

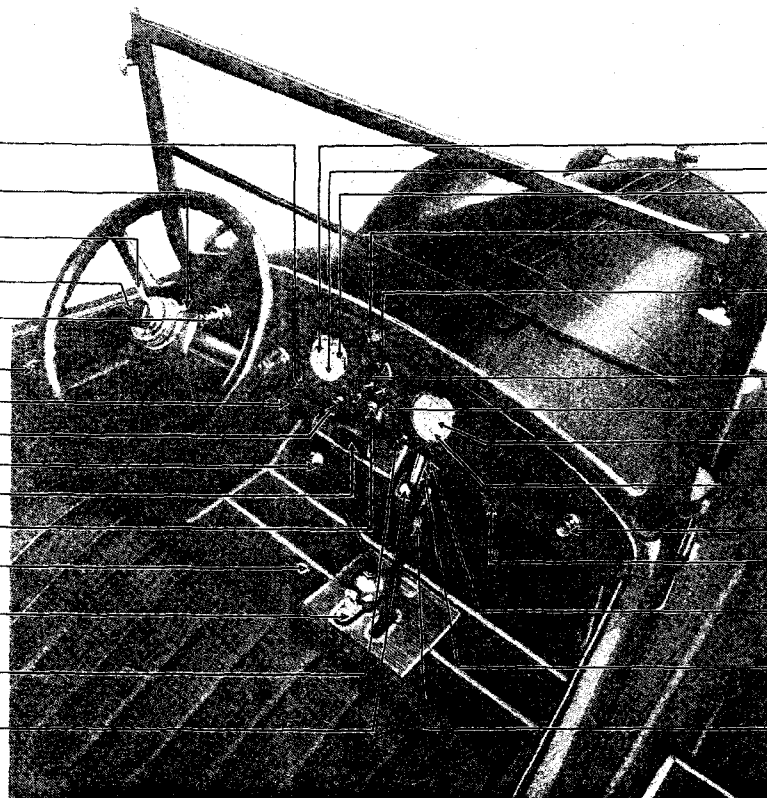


Fig. 1. Instruments, Control Levers and Pedals.

## LICENSE DATA

The following information may be found useful in making license application:

Number of cylinders.....	8
Cylinder bore.....	3 $\frac{1}{8}$ in.
Piston displacement.....	314 cubic in.
Stroke.....	5 $\frac{1}{8}$ in.
Horsepower (N. A. C. C. rating).....	31.25

Engine number:

The engine number is stamped on the crank case just back of the right-hand block of cylinders, and on the name plate attached to the forward face of the dash.

The number of each Type "61" engine begins with the figures "61."

Wheelbase:.....	132 in.
Tread.....	56 in.

---

## THE THREE MOST IMPORTANT THINGS IN CONNECTION WITH THE CARE OF THE ENGINE

### *1. Use of Suitable Oil*

The use of Cadillac Engine Oil is recommended (see under "Lubricants" page 31.)

### *2. Replacement of Oil*

Replace the engine oil at the end of each 500 miles of travel during warm weather and at the end of each 350 miles of travel or once a week during cold weather. (See under "Replace Engine Oil" page 33 and "Replace Engine Oil Frequently During Cold Weather," page 34.)

### *3. Manipulation of Carburetor Enriching Button*

After starting the engine, do not run it with the carburetor enriching button pulled back any longer than is absolutely necessary. (See under "Starting the Engine," page 9.)

## THE USER'S RESPONSIBILITY

The information, advice and instruction contained in this Manual are furnished because the user of a motor car needs them. But if the user fails to heed the advice, the loss is not wholly his but partly ours as well.

A Cadillac car in the hands of an operator who will give it the reasonable consideration to which it is entitled, and which every car requires, will run as smoothly and as quietly as is possible for any motor car to run. No car will give greater satisfaction nor will any car stand more abuse. But no car can be expected to stand continued abuse without showing the results of it sooner or later.

We are interested that Cadillac cars render unfailing service and satisfaction. They are built for that purpose but the user must do his part after the car comes into his possession. The Cadillac is capable of rendering the best of service and directions are furnished which will guide the user toward obtaining that service. But if he persists in ignoring these directions, there is no one but himself upon whom he can rightfully place the responsibility for difficulties which may result.

## DRIVING AND CARING FOR A MOTOR CAR

Driving an automobile means more than simply starting, steering and stopping. To drive an automobile properly requires an understanding of the principles involved and the exercise of intelligence and judgment.

With well designed and correctly built automobiles, probably 95 per cent of the so-called "troubles" are directly traceable to lack of lubrication, abuse, carelessness, and a lack of an understanding of the principles involved.

To begin with, the driver should study the construction of his car and thoroughly acquaint himself with its mechanism, the functions of its various parts and the "why" of everything connected with it. If he understands these he is better able to realize why certain things must be done and why certain other things must not be done, if he is to obtain the most satisfactory results, the greatest efficiency and the greatest economy, together with durability and long life of the engine and car. Remember that the difference between a comprehensive understanding of your car and the superficial knowledge possessed by many drivers is the difference between having "troubles" and not having them.

On the other hand is frequently found the user who is constantly tinkering with his car when there is no necessity for it. Avoid both extremes. If, after seeing that all parts are lubricated properly and that all bolts, nuts and screws are tight, the car is running well, let it alone. Many users drive their Cadillacs for months without finding an adjustment necessary. If ad-

justment seems necessary and you are not sufficiently acquainted with the construction of the car to know what adjustment is necessary or how to make it, *don't experiment* but take the car to a Cadillac service station.

The most important thing in the care of an automobile is proper lubrication. Part Two of this Manual gives detailed directions regarding lubrication.

### PLACING A NEW CAR IN RUNNING CONDITION

Before the cars are shipped, the fuel and cooling systems are drained. When the car is received and before it is placed in use, the supply of gasoline and water must be replenished. During freezing weather an anti-freezing solution should be used instead of water. (See under "Anti-Freezing Solutions," page 22.)

The car should be lubricated thoroughly in accordance with directions contained in this Manual. (See under "Lubrication," Part II.)

#### *Filling the Cooling System*

Fill the cooling system with water during warm weather and with a suitable anti-freezing solution during freezing weather (see under "Anti-Freezing Solutions," page 22.) To fill the cooling system proceed as follows:

Close the drain cock "D" (Fig. 20) on each cylinder block and the drain cock "C" on each water pump. If the indicator on the end of each pump shaft "B" does not point up turn the shaft so that it does. The shaft may be turned in either direction.

Remove the filler cap "A" and fill the cooling system. Screw the cap down tightly after replacing it. This is important since the operation of the radiator condensor depends upon a tight joint at the radiator cap.

Turn each pump shaft "B" so that the indicator points down. To fill the radiator condensor (see under "Condensor" page 50) take out the floor board just forward of the transmission control lever and replace the drain plug "F" (Fig. 20.) Remove the condensor filler cap "E" and fill the condensor one half full using the same liquid as in the radiator. Replace the filler cap.

Type 61 cars carrying engine numbered 61-U-47 or a lower engine number are filled in the following manner:

Close the cylinder drain cocks "D", (Fig 20) and turn the valves "G" to the "Fill" position. If a water pump drain cock does not turn easily force

down on the screw driver. In extreme cases it may be necessary to strike the end of the screw driver with the hand to unseat the drain cock.

There is a drain cock "D" in each cylinder block and a valve "G" at each water pump.

Remove the filler cap "A" and fill the cooling system. Screw down the cap firmly after replacing it.

Turn the valves "G" to the "Close" position.

*Caution:—Do not use water in the cooling system during freezing weather. Use a good anti-freezing solution. Water will freeze even though the engine be run continuously.*

### ***Filling the Gasoline Tank***

The gasoline tank is at the rear of the car. (See Figure 19.) The filler cap can be removed after loosening the thumb screw.

Gasoline should be strained through a wire cloth of very fine mesh before it is poured into the tank. If dirt or water enters the gasoline system it may cause trouble.

After filling the tank and screwing on the filler cap, tighten the thumb screw. This is necessary to prevent leakage of the air pressure by which gasoline is forced to the carburetor.

### ***Operating a New Car***

It is recommended that the operator of a new car refrain from driving it at its maximum capacity and speed until the car has been driven at least five hundred miles.

Although the parts of a Cadillac car are machined and ground with the greatest possible accuracy and fineness of finish, manufacturing processes cannot give to bearing surfaces the fine polish which results from actual operation at moderate speed and under light loads.

For this reason, it is advised that a car be driven no faster than twenty miles per hour for the first two hundred and fifty miles, and no faster than twenty-five miles per hour for the second two hundred and fifty miles.

## STARTING THE ENGINE

1. First make certain that the transmission control lever is in the neutral position and that the hand brake is applied, (see Figure 1.)
2. If the fuel pressure gauge on the instrument board indicates a pressure of less than one pound, increase the pressure by means of the hand air compressor. The handle of the compressor is screwed into place. Loosen it by unscrewing it a few turns in the counter-clockwise direction. After the pressure has been increased to at least one pound, lock the plunger in place by holding it in and turning it in the clockwise direction.
3. Place the spark lever about one-third the way down from the "Advance" position, except in cold winter weather, when it should be at the "Advance" position. If the engine should be cranked by hand, always place the spark lever at the "Retard" position. If this precaution is not observed, a back kick will occur, resulting in personal injury.
4. In extremely cold winter weather, prime the carburetor by placing the throttle lever at the "Close" position, then pushing the accelerator button down to the floor and permitting it to return. Twice repeat this operation. Do not prime the carburetor except in extremely cold weather.
5. Place the throttle lever approximately one-fourth the way down from the "Close" position.
6. In cold weather, or in warm weather, if the engine has been standing for some time, pull back the carburetor enriching button.
7. Switch on ignition by moving the ignition switch lever up.
8. Push down on the starter button. This will bring the starter into operation and will cause the engine to "turn over." (See under "Caution.") In extremely cold weather, when the car has been standing long enough to have become thoroughly chilled, it is a good plan to release the clutch before pressing down on the starter button, and to hold the clutch pedal down during the cranking operation.
9. Immediately the engine commences to run under its own power, which should be in a few seconds, permit the starter button to return to the normal position. If the carburetor enriching button is back, push it as far forward as possible without causing the engine to stop, or a material reduction in engine speed, as soon as the engine commences to run under its own power and as far forward as it goes as soon as the engine is warm enough to permit it. *It is important that the button be left back no longer than is absolutely necessary.*



If the engine does not start within thirty seconds, do not continue to operate the starter, but permit the starter pedal to return to the normal position and determine the cause. Be certain that the ignition is on, that there is gasoline in the tank, and sufficient pressure to force it to the carburetor. The starter will crank the engine only; ignition and gasoline must be present before it will run.

*Caution:—The action which causes the engine to "turn over" is produced by a gear of the electric starting motor sliding into mesh with teeth on the fly wheel of the engine. When pushing down on the starter button to throw these gears into mesh, if it should so happen that they are in just such positions that the ends of the teeth of the starter gear come against the ends of the teeth of the fly wheel, instead of the teeth of one sliding between the teeth of the other, do not use force. Simply permit the starter button to return to the normal position and then push it down again. In the meantime, the gears will probably have changed their relative positions sufficiently to permit the teeth to mesh.*

### Oil Pressure

Lubricating oil is fed under pressure to the main and connecting rod bearings of the engine (see under "Engine Lubrication," page 32.) The pressure of the oil is indicated by the pressure gauge on the instrument board. (See Fig. 1.)

When the engine is not running, the hand of the oil pressure gauge should remain at zero, but immediately the engine is started and while it is in operation, pressure should be indicated. The pressure indicated depends upon the speed of the engine and the viscosity of the oil.

If at any time while the engine is in operation, the hand of the oil pressure gauge remains at zero, stop the engine at once and determine the cause. Serious engine trouble is a result of continuing to run the engine without oil pressure.

### GEAR SHIFTING

*Caution: Do not attempt to shift from neutral to any gear, or from one gear to any other without first disengaging the main engine clutch by pushing and holding down the clutch pedal (see Figure 1.)*

As the transmission is of the selective type, the operator may shift from any gear to any other gear without shifting through a third gear.

Referring to Fig. 2, the ball at the top of the transmission control or gear shifting lever is shown at "N" in the neutral position, at "L" in the low gear position, at "I" in the intermediate gear position, at "H" in the high gear position, and at "R" in the reverse gear position.

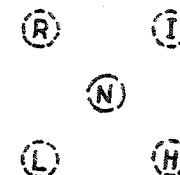


Fig. 2.  
Control Lever  
Positions.

### *Starting the Car*

To start the car, after starting the engine and unlocking the transmission lock, push down on the left pedal, which is the clutch pedal, thereby releasing the main engine clutch. Then disengage the hand brake by means of the hand lever—still holding the clutch pedal down. (If the car is standing on a grade it will be necessary to hold it with the foot brake until ready to start.) Next shift into low gear.

To do so, move the control lever as far to the left as possible and then pull it back as far as it will go (Fig. 3.) Open the throttle slightly by means of the accelerator pedal or throttle lever and permit the main clutch to engage gradually, by allowing the pedal to come towards you slowly.

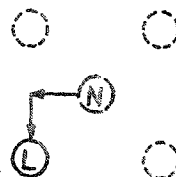


Fig. 3.  
Neutral to Low  
Gear.

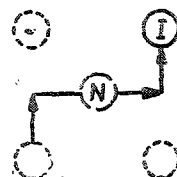


Fig. 4.  
Low Gear to  
Intermediate Gear.

If it should so happen that the gears which mesh to make low gear are in positions such that the ends of the teeth of one gear come against the ends of the teeth of the other gear instead of the teeth of one sliding between the teeth of the other, do not force them but return the transmission control lever to the neutral position, engage the clutch by allowing the clutch pedal to come towards you, again release the clutch, then shift into low gear as directed above.

After the car is under way in low gear, release the clutch and shift into intermediate gear. To do this move the control lever back to the neutral position, then to the right and push it forward as far as it will go (Fig. 4.) Then permit the clutch to engage. In shifting from low to intermediate gear, it is advisable to pause for a moment in the neutral position if there is a tendency of the gears to clash.

After the car is under way in intermediate gear, shift into high gear. To do this, simply release the clutch and then pull the control lever straight back (Fig. 5.) Then permit the clutch to engage.

It is possible when starting the car on level ground to shift from low gear to intermediate gear and from intermediate to high gear at low speeds, and shifting can be done more quietly than at higher speeds. In starting on an incline a higher rate of speed must be attained before shifting gears.

### Reversing

To start the car backwards, with the control lever in the neutral position, release the clutch, move the control lever to the left and push it forward as far as it will go. Open the throttle slightly by means of the accelerator pedal or throttle lever and engage the main clutch gradually.

If it should so happen that the transmission gears which mesh to make reverse are in just such positions that the ends of the teeth of one gear come against the ends of the teeth of the other gear, do not force them, but return the transmission control lever to the neutral position, engage the clutch, again release the clutch and shift into reverse gear as directed.

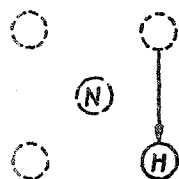


Fig. 5.  
Intermediate Gear  
to High Gear.

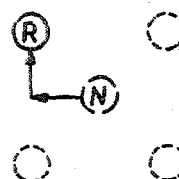


Fig. 6.  
Neutral to Reverse  
Gear.

### Shifting into Lower Gear

If, when ascending steep grades or pulling through soft mud roads or deep sand in high gear, the speed of the car is reduced until the engine labors, shift into intermediate gear. To do this, release the clutch, then push the control lever forward as far as it will go. Then engage the clutch. It is best to allow the car to slow down before making the shift and then, after releasing the clutch, to shift quickly. An experienced driver may find it more satisfactory to shift from high into intermediate gear in the following manner:

Release the clutch, return the control lever to the neutral position, engage the clutch, at the same time slightly accelerating the engine; then release the clutch again, and *instantly* shift into intermediate gear. Engage the clutch.

This entire change may be made in less time than it takes to read these directions by one who becomes familiar with this method. Shifting in this manner may be accomplished satisfactorily at higher speeds than is possible

when shifting in the usual manner. It is not recommended, however, that the operator attempt to shift from high to intermediate gear in this manner until he has considerable experience in shifting in the ordinary way.

### *Stopping the Car*

First close the throttle and then release the engine clutch. Next return the transmission control lever to the neutral position. The clutch may then be re-engaged. Stop the car by pushing forward on the brake pedal. After the car has been brought to a stop, apply the hand brake by means of the hand brake lever.

### *Stopping the Engine*

After stopping the car and applying the hand brake, move the ignition switch lever down.

## TILTING HEAD LAMP REFLECTORS

The reflectors in the head lamps are pivoted so that they can be tilted and are controlled by a button on the instrument board (see Figure 1.) When the road is clear and illumination of the distant road is desired, the reflectors direct the rays ahead. When a vehicle traveling in the opposite direction approaches, rays from the headlamps can be deflected further than already deflected by the lenses, increasing illumination directly in front of the car, by simply pushing forward the button and thereby tilting down the reflectors.

## DRIVING SUGGESTIONS

### *Rules of the Road*

Road and traffic laws vary greatly in different localities. It is, therefore, impossible to set down a complete list of rules which may be followed in all parts of the country. The following are some of the rules which are universal in practically all parts of the United States.

In meeting a vehicle going in the opposite direction *pass to the right.*

In passing a vehicle going in the same direction *pass to the left.*

Always stop with the right hand side of the car next to the curb. If it is necessary to turn the car around to do this, it should be done.

Never turn around or turn off onto another road without making absolutely certain that there is no other vehicle directly behind you.

Never enter upon street car tracks without making sure that there is no car directly behind you—*no matter how sure you feel, look and see.*

Do not cross street car or steam railroad tracks without making certain that it is absolutely safe to do so.

In crowded traffic do not apply the brakes suddenly unless it is absolutely necessary. It may be that a following vehicle cannot stop as quickly as you can.

On wet asphalt streets or slippery roads do not apply the brakes suddenly unless it is absolutely necessary. If the brakes are applied suddenly under these conditions disastrous skidding is apt to occur.

Always signal vehicles at the rear, before turning, slowing down or stopping.

Slow down in passing vehicles going in the opposite direction.

One of the most essential things to remember is that you should *never* "take a chance."

### **Coasting**

To coast on the level, close the throttle and then release the main engine clutch by pushing forward on the left pedal.

When descending grades a good method is to close the throttle and, with the clutch engaged, allow the engine to do the holding back as much as possible. This saves much wear on the brake band linings. The resistance offered by causing the car to drive the engine when "high gear" or "direct drive" is engaged is usually sufficient to control the speed. When the engine does not offer sufficient resistance the speed may be checked further by applying the foot brakes.

When it is necessary to descend a very steep grade it is best to engage the intermediate or possibly the low speed gear *before commencing the descent*, and if the resistance thus obtained is not sufficient, to supplement it by the foot brakes. Bear in mind that the more the resistance of the engine is used in coasting the longer the brake band linings will last and the longer the brakes will retain their adjustment.

### **DONT'S FOR GENERAL OPERATION**

Don't fail to change the engine oil frequently.

Don't fail to push forward the carburetor enriching button as soon after starting as possible.

Don't fill the lubricating system in the engine only and neglect to lubricate all other parts of the car.

Don't neglect the lubrication of any part of the car.

Don't run the car at sustained high speed when it is new.

Don't put oil in the engine without first straining it through cheese cloth or fine wire mesh and making sure that it is free from dirt and lint.

Don't allow the clutch to engage suddenly.

Don't prime the carburetor too much.

Don't attempt to shift from neutral to any gear, or from one gear to another gear without first releasing the clutch.

Don't attempt to shift from the reverse gear to any other gear when the car is moving.

Don't attempt to shift from any forward gear to the reverse gear when the car is moving.

Don't attempt to shift from the high gear to the low gear when the car is moving.

Don't attempt to shift from the intermediate gear to the low gear when the car is moving, unless it is moving very slowly. Ordinarily it is best to stop the car altogether.

Don't push the starter button when the engine is running.

Don't turn the steering gear when the car is standing. This is not only unnecessary but is also bad practice.

Don't fail to investigate any unusual sound which may develop in the car. The car should be inspected at the service station of a Cadillac distributor or dealer.

Don't neglect to inspect the level of the acid in the storage battery every 500 miles.

Don't turn corners at high speed.

Don't neglect to keep the cooling system filled.

Don't drive fast or attempt to stop suddenly on wet pavements.

Don't attempt to start the engine with the switch turned off, without air pressure or without gasoline in the tank.

Don't neglect to keep the tires inflated properly.

*Don't race the engine when it is not driving the car. There is no worse abuse.*

## CURTAINS

### *Storage of Curtains*

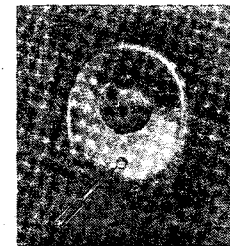
The side curtains for open cars are carried in an envelope provided with cloth partitions to prevent the curtains from rubbing and chafing. All curtains are tagged to facilitate attaching.

In the touring car the curtains are stowed under the front seat. In the phaeton the curtains are stowed in a compartment provided in the back of the front seat and which opens in the tonneau. The roadster has a parcel-compartment just back of the seat in which the curtains are stowed.

Before the curtains are stowed away they should be dry and clean.

### *Curtain Fasteners*

The curtains are held in place with fasteners which become locked on three sides when snapped into place and must be lifted on the side which is not locked in order to release them. This side is indicated by a small projection on the fastener as shown by the arrow (Figure 7). This type of fastener cannot be released by lifting it at any other side.



*Fig. 7.*

*Curtain Fastener*

## SPEEDOMETER

The speedometer registers the speed at which the car is traveling, the total number of miles traveled, and the trip mileage. The total mileage cannot be reset but the trip mileage can be reset to zero.

An automobile repairman should never be permitted to attempt to adjust or repair the speedometer head or to replace the glass. This work can be done only by men experienced in speedometer work and only with special machinery and tools.

If the speedometer head is removed, handle it with the same care that you would a fine watch. The speedometer head may easily be damaged by rough handling.

## CLOCK

The clock is in combination with the speedometer. It has an eight day movement and is wound and set in the same manner as any stem winding watch. The winding and setting stem is on the under side of the speedometer just back of the instrument board.

## DEMOUNTABLE RIMS

### *Demounting Rim with Tire*

Jack up the axle until the wheel is free from the ground. Then remove the valve cap; loosen the eight clamping nuts with the brace wrench furnished with the tool kit, and turn each clamp to the left until it strikes the stop pin in the fellow band. Turn the wheel so that the valve is at the top and pull the bottom of the rim towards you until it clears the wheel. The rim with tire can then be removed by lifting it straight up.

### *Mounting Rim with Tire*

If the rim you are mounting has no split clamping ring, take the one from the rim removed. Turn the wheel so that the hole for the valve stem is at the top. Hold the rim so that the valve stem is at the top and so that the rim latch and the clamping ring are towards you. Insert the valve stem and then push the bottom of the rim into place.

Turn each clamp to its original position and turn the clamping ring so that the split in the ring comes directly under one of the clamps. Tighten each clamping nut slightly. Then continue around the wheel, tightening each nut firmly. Screw on the valve cap.

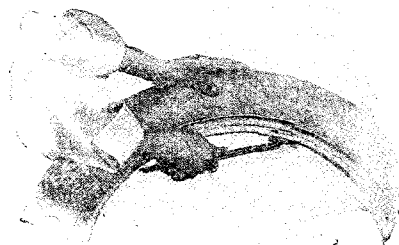


Fig. 8.  
*Removing Tire from Rim  
First Position.*

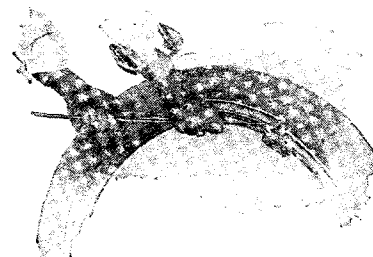


Fig. 9.  
*Removing Tire from Rim,  
Second Position.*

If the rim does not run true, mark the part that runs "out" from the face of the wheel. Then slightly loosen the nuts diametrically opposite this part and tighten the nuts at the marked part. Proceed in this manner until the rim does run true.

### *Removing Tire from Rim*

The tire may be removed without removing the rim from the wheel.

Deflate the tire. Then open the lock with the pointed end of the tire tool or with a screw-driver.



Raise one end of the ring with the tool as shown (Figure 8) until the lug is clear of the slot in the rim.

Raise the end of the ring further and force the lug out over the edge of the rim. (Figure 9.)

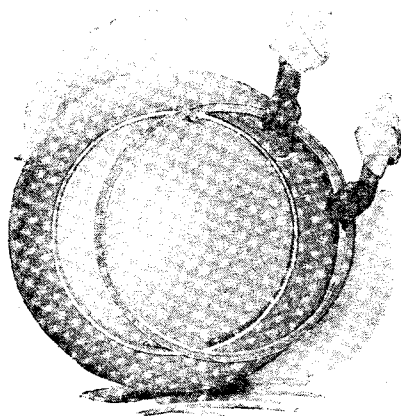


Fig. 10.  
Removing Tire from Rim,  
Third Position.

Start at the end of the ring, which is out of the groove, and remove the entire ring from the rim. (Figure 10.) (See note.)

Turn the wheel until the valve stem is at the top, and pull the lower part of the tire towards you until it is clear of the rim. The tire may then be removed from the rim by lifting it straight up.

*Note*—In removing the ring from the rim, care should be taken to avoid opening the ring beyond its elastic limit. When the ring is free from the rim, the ends should overlap from  $\frac{1}{2}$  to  $1\frac{1}{2}$  inches, which they will not do if the ring has been stretched in removal.

If the ends of the ring do not overlap they should be closed together before replacing. If this is not done there is a possibility of the lock failing to engage the lugs on the ends of the ring. This might later be the cause of an accident.

*Caution*—Do not attempt to remove a tire from a demountable rim without first completely deflating the tire. Serious personal injury may result if this is attempted.

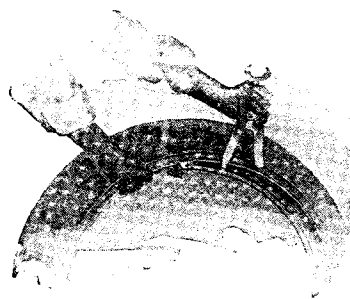


Fig. 11.  
Placing Tire on Rim,  
First Position.

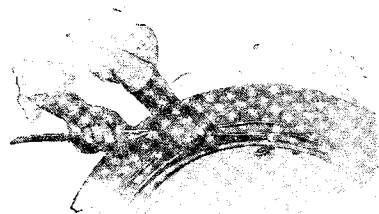


Fig. 12.  
Placing Tire on Rim,  
Second Position.

### Placing Tire on Rim

If the demountable rim is on the wheel, jack up the axle and turn the wheel until the hole for the valve is at the top.

Hold the tire so that the valve stem is at the top and insert the valve stem in the valve stem hole in the rim and wheel. Then push the bottom of the tire into place.



*Fig. 13.*  
*Placing Tire on Rim.*  
*Third Position.*

Insert the flat end of the tool between the rim and the ring and turn the tool up edgewise. (Figure 13.) This will lift the loose end of the ring and force it into place.

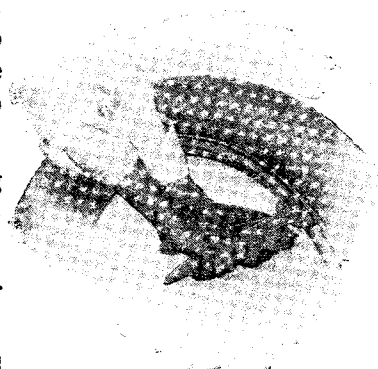
Draw the ends of the locking ring together with the tool. (Figure 14.) Then swing the lock into place.

Then inflate the tire. (See under "Tire Air Compressor," page 20.)

If the demountable rim is not attached to a wheel, lay the rim with the tire flat on the ground when removing or replacing a tire.

Insert one end of the locking ring in the slot in the rim. Then with the tool as a lever, force the tire back far enough to allow the ring to go on easily. (Figure 11.)

Starting at the end of the ring which is inserted in the slot in the rim, force the remainder of the ring into place by using the tire tool as pliers. (Figure 12.)



*Fig. 14.*  
*Placing Tire on Rim,*  
*Fourth Position.*

#### TIRE HOLDER

The tire holder is designed to carry two standard size tires inflated on rims.

To remove the tire with rim, remove the cap from the lock at the center of the clamp and unlock it. Then unscrew the clamp as far as it will go. The tire then may be removed.

To put a tire on the holder proceed in the reverse manner.

When mounting two tires on the tire holder, the clamping or locking rings should face each other to prevent theft of the tires by removing them from the rims. If mounting one tire on the tire holder, the clamping or locking ring should face to the front or toward the body.

Care should be exercised not to permit the inner tire to strike the body of the car when removing or replacing it.

#### TIRE AIR COMPRESSOR

##### *Using the Compressor*

To inflate a tire, first attach the air hose to the connection projecting from the left hand dust shield just back of the battery box cover, then connect the other end to the tire valve. Do not connect the hose to the tire first, if there is air pressure in the tire.

If the engine is running, release the clutch by pushing the left pedal down. Hold the pedal down until you are certain the transmission gears have ceased to revolve, and then turn the slotted head of the compressor control shaft in the clockwise direction (see Figure 1). If the engine is not running, it is unnecessary to disengage the clutch before bringing the compressor into operation.

Run the engine at a speed of approximately 1,000 revolutions per minute. With all lights turned off, the ammeter on the instrument board should register approximately thirteen at 1,000 revolutions per minute of the engine. The compressor operates at its most efficient speed at 1,000 revolutions per minute of the engine. Do not race the engine in operating the compressor, or at any other time, when it is not driving the car.

To stop the compressor, turn the slotted head of the control shaft in the counter-clockwise direction.

*Caution:—Do not turn the compressor control shaft to bring the compressor into operation when the engine is running and the clutch is engaged.*

#### COLD WEATHER SUGGESTIONS

##### STARTING THE ENGINE

##### *Manipulation of Carburetor Enriching Button*

Pull back the carburetor enriching button before attempting to start the engine in cold weather, but immediately the engine commences to run under its own power push the button as far forward as possible without causing the engine to stop, or a material reduction in engine speed, and as far forward as it goes as soon as the engine is warm enough to permit it.

##### *Priming the Carburetor*

In *extremely* cold weather, if the engine is not started in 30 seconds with the carburetor enriching button pulled back, remove the foot from the starter button. This will stop the cranking operation. Now open and close the throttle once or twice with the hand throttle or the foot accelerator. Do

not open and close the throttle more than twice. Opening and closing the throttle operates the throttle pump of the carburetor. This raises the level of the gasoline in the carburetor, thereby priming it. If the throttle is opened and closed more than twice, gasoline is forced out of the carburetor.

### *Position for Spark Lever*

Except in extremely cold weather the spark lever should be placed about one-third the way down from the "Advance" position when starting. In extremely cold weather, it should be in the "Advance" position when starting. (If the engine is to be cranked by hand, the spark lever should be placed at the "Retard" position.)

It is the practice of some drivers to place the spark lever at the "Retard" position when starting the engine. While this is the proper position for the spark lever if the engine is to be hand cranked, there is no reason for retarding the spark when the engine is electrically cranked and starting is facilitated if the spark lever is advanced. In extremely cold weather there is no reason why the spark lever cannot be placed in the "Advance" position if the engine be electrically cranked and a quicker start is assured if this is done. The following will explain why it is possible to fully advance the spark lever at such times:

The mixture in a cold engine does not burn as rapidly, nor is there so much energy in it, as when the engine is warmer and the fuel is better vaporized. When the engine is cold a large percentage of the heat of each explosion is instantly dissipated by reason of the cold combustion chambers and cylinder walls, the result being that an explosion which in a hot engine would occur early enough and have energy enough to produce a "spark knock" or "back kick," occurs so much later and is so much less intense, that neither of these results is produced.

It is best to have the spark lever in the fully advanced position for cold weather starting for the following reasons:

As explained before, a cold mixture ignites much more slowly than a hot mixture. A cold, slow-burning mixture, if ignited on top dead center on account of the spark being in the retarded position, may burn through the power stroke, through the exhaust stroke and may be still burning in the combustion chamber when the inlet valve is opened to draw in another charge. When this happens, the flame sets fire to the incoming charge, igniting the mixture in the intake pipe and carburetor, producing a "pop back" in the carburetor. The possibility of this happening is very much less if ignition is started earlier by placing the spark lever in the fully advanced position.

### *Position for Throttle Lever*

In winter weather the throttle lever should be opened only slightly for starting. Many drivers make a practice of opening the throttle wide or nearly so immediately the engine is started and after shifting the transmission into gear. The full suction of each piston through the carburetor under these conditions causes the auxiliary air valve in the carburetor to open wide, allowing a large volume of cold air to rush into the carburetor.

The proportion of air to gasoline drawn in under these conditions is practically the same as when the engine is hotter, but as only a portion of the gasoline drawn in is vaporized, and as only the vaporized portion burns, the proportion of air to gasoline burned is greater than when the engine is warmer, thus producing a "lean" mixture. A "lean" mixture is slow burning, whether it is warm or hot, and a cold "lean" mixture is particularly slow burning. Thus if the throttle is opened suddenly before the engine is thoroughly warm, the cold "lean" mixture resulting, burns so slowly that a "pop back" in the carburetor is almost sure to occur.

### *Use of Starter Button*

*Do not press the starter button while the engine is running.*

In extremely cold weather, when the car has been standing long enough to become thoroughly chilled, it is a good plan to release the clutch before pressing down the starter button and to hold the clutch pedal down during the cranking operation. If this is not done, the starter is called upon to turn the jackshaft in the transmission in addition to cranking the engine. While at ordinary temperatures the additional energy required is almost negligible, in extremely cold weather the lubricant in the transmission may offer enough resistance to the transmission gears to increase considerably the demand upon the battery.

### ANTI-FREEZING SOLUTIONS

In cold weather a good anti-freezing solution should be used. A solution of commercial glycerine and water is recommended of the correct proportion for the temperature experienced. The following are the freezing temperatures of glycerine and water solutions:

Glycerine (% by volume)	Water (% by volume)	Freezing Temperature (degrees Fahr.)
35%	65%	+10°
40%	60%	+6°
45%	55%	+3°
50%	50%	0°
55%	45%	-2°
60%	40%	-4°

Do not use a solution containing calcium chloride, as it is injurious to the metal parts of the cooling system.

The radiator condenser also makes it possible to use with safety an anti-freezing solution of denatured or wood alcohol and water. The following are the freezing temperatures of denatured alcohol and water solutions.

Denatured Alcohol (% by volume)	Water (% by volume)	Freezing Temperature (Hydrometer (degrees Fahr.)	Specific Gravity reading)
20%	80%	+13°	.974
30%	70%	— 3°	.964
40%	60%	—20°	.953
50%	50%	—34°	.936

It is a good plan to draw out a sample of the solution occasionally and to test its specific gravity with a hydrometer graduated between the limits of the above table.

The capacity of the cooling system is five and one-quarter gallons. The condenser should contain an additional three quarts, making a total of six gallons.

*Caution—Do not use water in the cooling system during freezing weather. Use a good anti-freezing solution. Water will freeze even though the engine be run continuously.*

#### ADDITIONAL COLD WEATHER SUGGESTIONS

##### *Starting in Intermediate or High Gear*

Starting in intermediate or high gear should not be done at any time, but this is particularly unfair to a cold engine, as it necessitates a further opening of the throttle than is necessary when starting on low gear, with the probability of a "pop back" in the carburetor.

##### *Cold Test of Engine Oil*

Use oil having a low cold test. In other words, use oil which flows freely at low temperature. (See under "Lubricants," page 31.)

##### *Frequent Changing of Oil*

Water and gasoline may accumulate in the crank case of the engine during cold weather. It is necessary, therefore, to drain the oil frequently and replace it. (See under "Replace Engine Oil Frequently During Cold Weather," page 34.) If water and gasoline are permitted to accumulate in the crank case, serious damage to the engine may result.

### ***Strainers in Gasoline System***

It may be found necessary to remove the strainers in the gasoline line more frequently during cold weather in order to prevent an accumulation of water at these points which would freeze and prevent the gasoline from flowing to the carburetor. (See under "Settling Chambers and Strainers," page 48.)

## **OPERATION OF ENGINE**

### ***General Principle***

The production of power by the engine may be described briefly as follows:

Gasoline is forced by air pressure from the tank to the carburetor. At the carburetor the gasoline is mixed with air in the proper proportion, forming an explosive vapor or gas. The gas is drawn through the intake manifold and inlet valves into the cylinders of the engine, where it is compressed and ignited by electric sparks, the pressure of the resulting explosions producing the power.

The quantity of gas supplied to the engine is regulated by a throttle valve at the carburetor which is operated by means of the throttle lever at the steering wheel or by the accelerator button at the right of the brake pedal.

### ***Four-Cycle Engine***

The engine is of the four-cycle type, that is, there are four movements or strokes of each piston and two revolutions of the flywheel to complete each power producing stroke. The four strokes of the cycle each have a different function and follow one another in the same order as follows:

*Suction Stroke.* The suction stroke commences with the piston at its highest point in the cylinder and with the inlet and exhaust valves closed. Immediately the piston starts to descend the inlet valve opens and through this valve a charge of gas from the carburetor is drawn into the space above the piston.

*Compression Stroke.* As the piston starts upward again after completing the suction stroke, the inlet valve closes. As there is then no escape for the gas in the cylinder, it is compressed, the maximum compression being reached when the piston is at the top of its stroke.

*Power Stroke.* At the completion of the compression stroke, the spark takes place at the spark plug, igniting the compressed charge of gas. The heat resulting from the rapid combustion causes the pressure of the confined gas to rise almost instantaneously to several times its pressure

before the explosion. This pressure exerted on the piston forces down the piston and produces the impulse which is transmitted by the connecting rod to the crankshaft, causing it to rotate.

*Exhaust Stroke.* Just before the piston reaches the end of the power stroke, the exhaust valve opens. It remains open as the piston travels upward again on the exhaust stroke, driving the burned gas out from the cylinders. By the time the piston has reached its highest point it has forced out the burned gas and the exhaust valve closes. Having completed the four strokes, the piston is now ready to draw in a new charge and to repeat the cycle.

The same cycle of events takes place in all of the cylinders but no two pistons are at the same point in the cycle at the same time. In the Cadillac eight cylinder V-type engine, the impulses in the eight cylinders are so timed that a power stroke is begun every quarter turn of the crankshaft. In other words, the crankshaft receives four overlapping impulses every revolution. The order in which the impulses take place is shown in Figure 15.

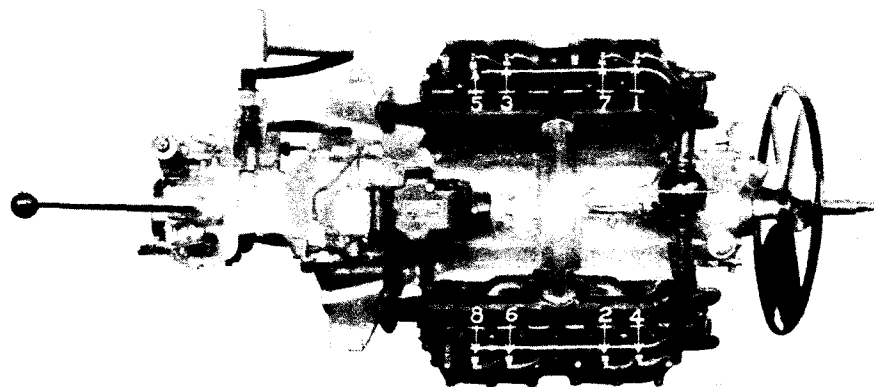


Fig. 15. Firing Order

#### ***Automatic Spark Control***

When each piston is at its highest position in the cylinder is, of course, the time when the charge is at its greatest compression, or, in other words, when the gas is "jammed in the tightest." Ignition occurring exactly at this instant produces a much more forceful explosion than if it occurred at a time when the charge was not so tightly compressed.

If the charge were ignited the instant the contact is made in the ignition timer, regardless of the speed of the engine, the spark could be set permanently in one position and would not require changing. But a certain amount of time elapses from the instant the circuit is closed at the ignition timer until the charge is ignited in the cylinder. While this time is but the



merest fraction of a second, in fact, almost infinitesimal, yet it is time just the same and must be taken into account when dealing with such a rapidly acting mechanism as an automobile engine.

The lapse of time required to ignite the charge is always the same regardless of the speed of the engine and pistons. You will realize that when the engine is running, say 3000 R. P. M., the pistons are traveling many times as fast as they do when it is running only 300 R. P. M. When the engine is running 3000 R. P. M., it is necessary therefore to start the ignition process earlier.

In the Cadillac this is accomplished by means of a ring governor located directly under the ignition timer. As the speed of the engine increases, the ring in the governor assumes a position more nearly horizontal, forcing the timer cam slightly ahead on the shaft by which it is driven. This causes the timer contact points to break earlier, thereby starting the ignition process earlier in relation to the positions of the pistons. When the engine slows down, the ring in the governor assumes a position more nearly vertical, forcing the cam back on the shaft by which it is driven, causing the contact points to break later and thereby starting the ignition process later in the strokes of the pistons.

### ***Manual Spark Control***

The automatic control takes care of the spark position for all ordinary driving. A spark lever is provided, however, by which the ignition timing may be still further advanced or retarded.

Ordinarily the spark lever should be carried about one-third the way down from the "Advance" position. To get the best results, however, it should be retarded further for extremely low speeds and advanced further for extremely high speeds. The car should be driven at all times with the greatest possible spark advance permitted by the speed of the engine.

Advancing the spark too far for given engine speeds will usually cause a slight pounding noise, which is sometimes not noticed by the beginner, as it is usually but slight owing to the substantial character of the crankshaft and bearings.

When starting the engine, place the spark about one-third the way down from the "Advance" position, except during extremely cold weather when it should be placed at the "Advance" position. If the engine should be cranked by hand, the lever should be placed at the "Retard" position. If this caution is not observed a "back kick" may occur, probably resulting in personal injury.

## WINDSHIELD POSITIONS.

### *For inclement weather*

The normal position of the windshield for inclement weather is with the upper and lower sections closed and with the removable rubber strip between the glasses. If rain or snow should freeze on the glass making it impossible to clean it with the windshield wiper, the upper section may be tilted out at a slight angle. This is known as the rain vision position. The driver may then look between the sections of the shield, at the same time being protected to some extent. The clamping nuts at the top of the windshield standards must be loosened before the upper section can be moved and should be tightened after it is in the desired position.

### *For ventilation*

When greater ventilation in the front compartment is desired than provided by the cowl ventilator, the lower section of the windshield should be tilted in. The clamping nuts, half way up the windshield standards, must be loosened before the lower section can be moved and should be tightened afterwards.

If still greater ventilation is desired the upper section may be tilted toward the driver.

The rubber strip between the windshield glasses must be removed before either the upper or lower section of the shield is tilted inward.

# LUBRICATION

## Part II

NO PAGE 28

### IMPORTANCE OF LUBRICATION

There is no one thing which is the primary cause of more trouble and the cause of more expense in maintenance to the mechanism of an automobile than insufficient lubrication.

All moving parts of the Cadillac car are manufactured with an unusual degree of accuracy. In order to maintain the splendid running qualities of the car, it becomes necessary systematically to introduce suitable lubricants between surfaces which move in contact with one another.

*It should be borne in mind constantly that where one part moves upon or in contact with another friction is created. Friction means wear, and the wear will be of the metal itself unless there is oil. The use of too much oil is better than too little, but just enough is best.*

Proper lubrication not only largely prevents the wearing of the parts, but it makes the car run more easily, consequently with less expense for fuel and makes its operation easier in every way.

The oiling diagram shown on page 36 indicates the more important points which require attention. But do not stop at these. Notice the numerous little places where there are moving parts, such as the yokes on the ends of various brake rod connections, etc. A few drops of oil on these occasionally will make them work more smoothly.

Judicious lubrication is one of the greatest essentials to the satisfactory running and the long life of the motor car. Therefore, lubricate, and lubricate judiciously.

## LUBRICANTS

There are many grades of oils. There are none too good. Naturally, we have experimented a great deal with numerous lubricants to determine which are best adapted for the various parts of the Cadillac car. It is not always an easy matter for users to obtain suitable lubricants. The constant demand made upon us by Cadillac users has induced us to provide suitable lubricants which may be obtained from Cadillac distributors or dealers.

### ***Engine Oil***

Cadillac Engine Oil is recommended and may be used both summer and winter. If you prefer to use some other oil and will write our Technical Department, a complete up-to-date list of tested and approved oils will be mailed to you.

The oil used should be a filtered one and not an acid or alkali treated oil.

We cannot hold ourselves responsible for damage resulting from the use of oil not suited to the Cadillac engine.

*Engine oil should be strained through cheese cloth or fine mesh wire cloth before using.*

### ***Rear Axle and Transmission Lubricant***

Cadillac Rear Axle and Transmission Lubricant is recommended for the rear axle and transmission or in its absence a mixture of steam cylinder oil and a small amount of cup grease mixed to such a consistency that the mixture flows easily at temperatures from 60° to 70° Fahrenheit.

### ***Gun Grease***

Cadillac Gun Grease is recommended for use in the grease gun or, in its absence, number three cup grease.

### ***Distributor Grease***

Cadillac Distributor Grease is recommended for the Distributor.

### ***Universal Joint Grease***

Cadillac Universal Joint Grease is recommended for the universal joints on the drive shaft or, in its absence, number three fibre grease.

### ***Steering Gear Lubricant***

A mixture consisting of seventy-five per cent of Cadillac Rear Axle and Transmission Lubricant and twenty-five per cent Cadillac Gun Grease or or number one cup grease is recommended for the steering gear.

## ENGINE LUBRICATION

### *Lubricating System*

The lubrication of the engine is by oil under pressure. A supply of oil is carried in the oil pan. Oil is drawn from the oil pan by an oil pump and forced to the main engine bearings.

The connecting rod bearings on the crank shaft are lubricated by oil from the main bearings forced through holes drilled in the crank shaft. A hole drilled in the forward end of the crankshaft communicates with a hole drilled in the crankshaft sprocket through which oil is supplied to the camshaft driving chain. The cylinders are lubricated by oil thrown from the lower ends of the connecting rods.

The pressure of the oil is regulated by pressure regulator (Figure 16), containing a valve under spring tension. When the pressure is reached for which the valve is set, the valve is forced open and the oil overflows past the valve. A small hole drilled in the regulator housing allows oil to by-pass the valve when the valve is seated. Oil flowing through the by-pass and oil forced past the valve is carried to the camshaft bearings, power pressure pump in the gasoline system and the camshaft sprockets and chains through a hole drilled in the camshaft.

There is one gauge and one indicator in the lubricating system. The pressure gauge is located on the instrument board and indicates the pressure of the oil. The indicator is attached to the upper cover of the crank case near the carburetor and indicates the level of the oil in the engine.

### *Filling Lubricating System*

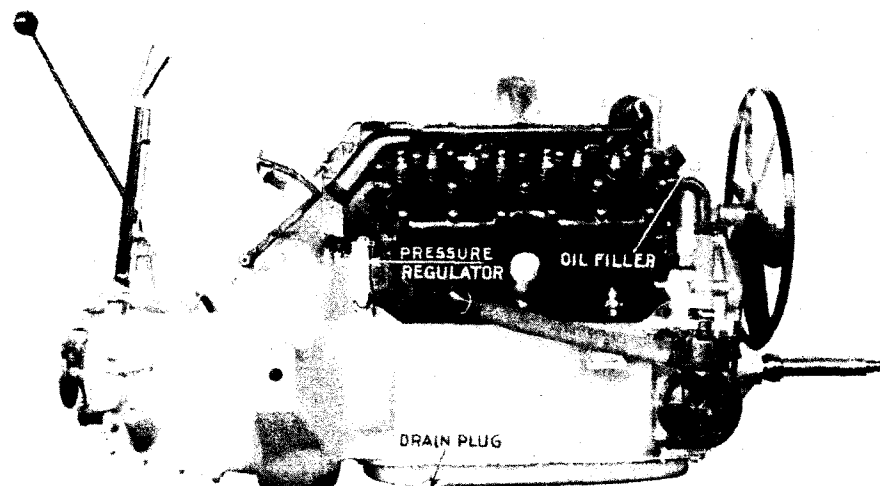
An oil level indicator on the engine is for the purpose of indicating when the supply of engine oil is low and when a sufficient amount has been added. The indicator is between the cylinder blocks and is under the intake manifold, on the right hand side.

Oil should be added whenever the red ball of the indicator is down to the line marked "Fill." Do not risk running the engine after the red ball has reached the line marked "Fill." If, through oversight, the red ball should reach the line marked "empty" the engine should be stopped immediately and supplied with oil. The oil filler is just forward of the oil level indicator. (See Figure 16.)

Use only oil which is suitable (see under "Lubricants," page 31), and be certain that the oil is free from dirt or lint before pouring it into the

engine. It is a good practice to strain the oil through cheese cloth or fine mesh wire cloth.

When the red ball of the indicator is at "Full" the engine should contain seven quarts of oil.



*Fig. 16.*

*Oil Filler, Pressure Regulator and Drain Plug.*

### **Replace Engine Oil**

At the end of each 500 miles of travel remove the drain plug from the engine oil pan (see Figure 16). After the oil has drained out replace the plug and through the oil filler on the housing just back of the fan, add seven quarts of fresh engine oil (see under "Replace Engine Oil Frequently During Cold Weather," page 34). A socket wrench with a long handle is supplied with the tool equipment to facilitate the removal and replacement of the drain plug.

At the end of the first 1,000 miles of travel, at the end of the next 4,000 miles of travel and at the end of every 5,000 miles of travel, thereafter drain the oil pan as directed in the preceding paragraph, replace the plug and through the filler add a mixture consisting of three quarts of kerosene oil and one quart of engine oil. The mixture must be free from dirt and lint. Run the engine at a speed of between 600 and 1,000 revolutions per minute for the period of one minute. Then drain the oil pan, remove it and the screen from the engine and thoroughly clean the oil pan and screen. Do not fail to add seven quarts of fresh engine oil after replacing the oil pan.

After cleaning the lubricating system with a mixture of kerosene and engine oil it is a good plan to clean the valve and seat of the pressure regulator. The regulator is located just back of the right hand block of cylinders. The valve can be removed after removing the regulator cover by unscrewing it. It is important also to make certain that the small by-pass hole by which oil is permitted to escape when the regulator valve is closed, is clean and free from any obstruction.

Do not use waste in cleaning the regulator valve or its seat. Use cloth free from lint.

*Caution:—Do not fail to replace the engine oil as frequently as suggested.*

### ***Replace Engine Oil Frequently During Cold Weather***

The mileages given under "Replace Engine Oil" at which engine oil should be replaced and the oil pan and screen cleaned are those at which this work should be done during warm weather.

During cold weather water and gasoline may accumulate in the crank-case of the engine. It is necessary, therefore, to drain the oil pan and clean the oil pan and screen much more frequently than during warm weather.

The frequency with which it is necessary to do this depends very largely upon the manner in which the car is driven. In cases where the car is driven short distances only and frequent stops are made so that the engine base and the oil remain cold it will be necessary to drain the oil pan and to clean the oil pan and screen much more frequently than in cases where the car is driven for longer distances with fewer stops, so that the engine base becomes thoroughly warmed.

If the car is constantly making short trips in cold weather the oil should be drained every 350 miles of travel or once a week and the oil pan and screen cleaned once a month.

*Unless the oil is drained out and the oil pan and screen are cleaned frequently in cold weather, serious damage to the engine may result, particularly on cars in short trip service.*

### ***Oil Pressure***

The pressure indicated by the oil gauge on the instrument board varies with the speed and temperature of the engine and the viscosity of the oil.

When the engine is warm and supplied with fresh Cadillac Engine Oil or oil of approximately the same viscosity, the pressure as indicated by the gauge should be from five to seven pounds when the engine is idling. (When idling the engine should run at approximately 300 revolutions per minute if the



throttle stop-screw at the carburetor is properly adjusted.) At higher speeds a higher pressure should be indicated and at lower speeds, a lower pressure. Before the engine has become warm, higher pressures will be indicated at given speeds. In other words, maximum pressures will be indicated at given speeds when the engine is cold and the oil is fresh; minimum pressures, when the engine is hot and the oil becomes thin from use.

Practically all engine lubricating oils become less viscous from use even under normal conditions. Running the engine too long with the auxiliary air control lever pulled back will cause the oil to be thinned more rapidly due to the condensation of gasoline from the rich mixture.

### **Caution**

If when starting the engine after replacing the oil it is found that the pressure gauge does not register pressure, stop the engine immediately and prime the oil pump. This may be done by disconnecting, at its upper end, the oil pipe running from the engine around the right hand side of the dash, and forcing clean engine oil into the pipe with the oil gun furnished in the tool kit. Connect the pipe and tighten the union before starting the engine.

*Do not continue to run the engine if, as a result of low viscosity of the oil, or other cause, pressure is not indicated on the gauge when the engine is running. (See under "Replace Engine Oil," page 33.)*

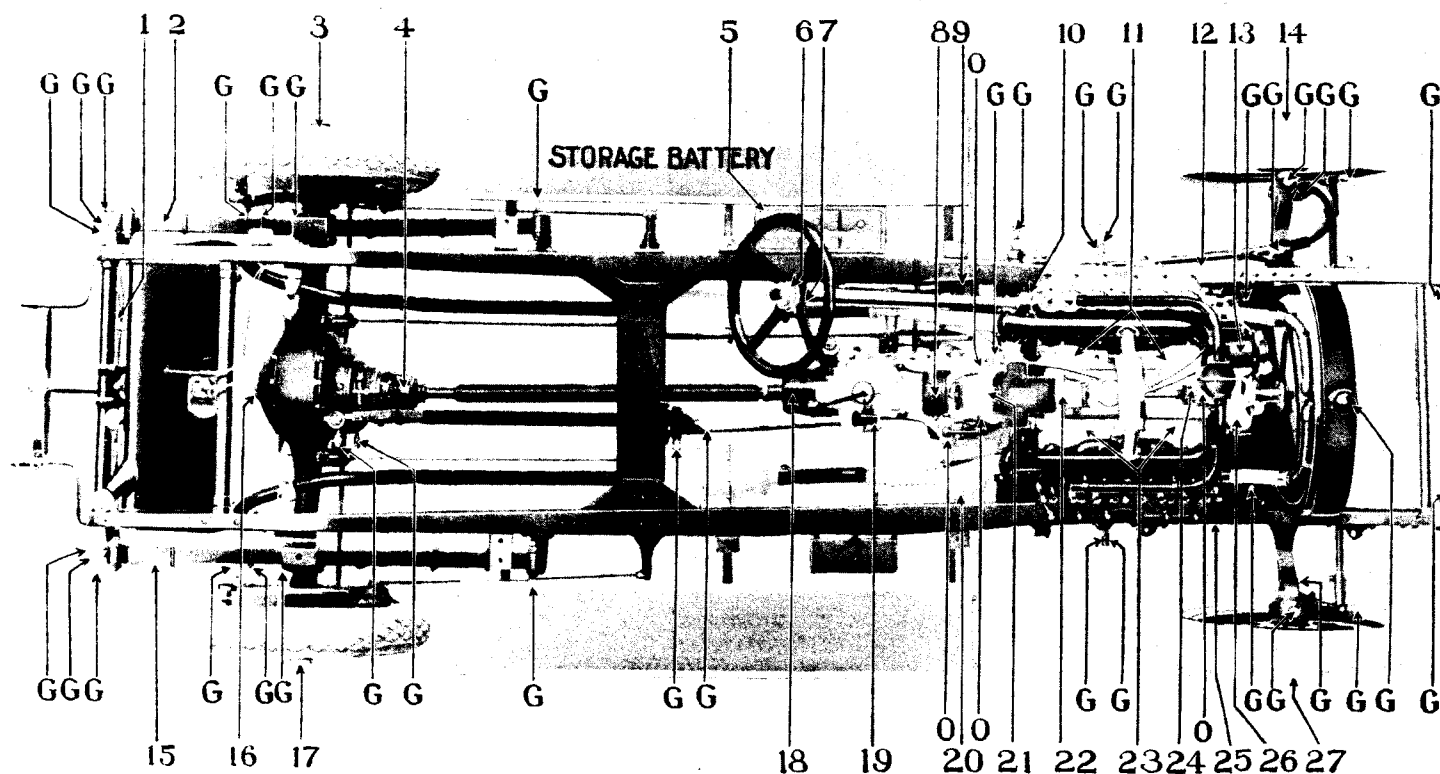


Fig. 17. General Lubrication Diagram.

Each "G" Indicates a Grease Gun Connection. Each "O" Indicates An Oiling Point at Which Engine Oil Should Be Applied.  
Each Number Indicates a Lubricating Point for Which Instructions Are Given Under "General Lubrication."

### GENERAL LUBRICATION

It is manifestly impossible to give exact directions in every instance as to just how frequently each individual point should be oiled or exactly how much lubricant should be applied. In the following directions this is given approximately, based on average use.

With the tool equipment of each car is packed a lubrication chart, with a schedule for the lubrication of the car. This is intended to be hung in the garage to serve as a reminder.

#### EVERY 125 MILES

##### **Engine: 26**

At every 125 miles, or oftener, determine the quantity of oil in the engine and add oil if required (see under "Filling Lubricating System," page 32, and under "Replace Engine Oil," page 33).

#### EVERY 500 MILES

##### **Grease Gun Connections: G**

Points "G" should be lubricated with the grease gun at every 500 miles of travel.

Grease gun connections at all shackle bolts are fitted to grease cups. This makes it possible to lubricate shackle bolts while the car is on the road by simply screwing down the cups.

Grease cups should be screwed all the way back before refilling them with the grease gun. A reservoir of grease is thus provided.

##### **Springs: 1, 2, 12, 15, 25**

It is recommended that the springs be lubricated every 500 miles by painting the edges and ends of the leaves with engine oil. A small, stiff brush should be used. After applying the oil, the car should not be washed until it has been driven far enough to allow the lubricant to work in between the leaves. Do not open the leaves and insert lubricant.

##### **Replace Engine Oil**

Replace the engine oil at the end of every 500 miles of travel. (See under "Replace Engine Oil" Page 33 and "Replace Engine Oil Frequently During Cold Weather," page 34.)

##### **Water in Storage Battery: 5**

Every five hundred miles or at least every two weeks inspect the level of the acid in the storage battery and add *distilled* water if the level is low. (See under "Adding Water to Storage Battery," page 57.)

#### EVERY 1000 MILES

##### **Oil Cups: O**

A few drops of engine oil should be applied at points "O" every 1,000 miles.

***Universal Joints: 4, 18***

Fill the forward and rear universal joints on the drive shaft between the transmission and rear axle, with Cadillac Universal Joint Grease every 1,000 miles. A connection is furnished with the grease gun which fits the filling holes.

The forward joint is covered by a cylindrical shield to prevent grease from being thrown onto the under side of the floor. To fill the joint it is necessary first to detach the shield from the transmission case and to slide it back over the drive shaft. This may be done after loosening the two screws which hold the shield and turning the shield through a small arc in a counter-clockwise direction.

***Generator Oil Cups: 21, 22***

These oil cups conduct lubricant to the forward and rear bearings on the armature shaft of the motor generator. A few drops of engine oil should be applied every 1,000 miles.

***Oil Holes at Steering Wheel: 6, 7***

A few drops of engine oil should be applied every 1,000 miles.

***Engine Rear Supports: 9, 20***

There are felt wicks in the frame bracket to which the engine supports are bolted. Engine oil should be applied at these points every 1,000 miles of travel or oftener if necessary.

***Clean Engine Lubricating System***

At the end of the first 1,000 miles of travel, at the end of the next 4,000 miles of travel, and at the end of every 5,000 miles of travel thereafter, clean the lubricating system and the oil pan and screen. (See under "Replace Engine Oil" page 33 and "Replace Engine Oil Frequently During Cold Weather," page 34.)

**EVERY 2500 MILES*****Transmission: 19***

The transmission should contain sufficient lubricant to bring it up to the level of the filling hole at the right hand side. The level should be inspected every 2,500 miles and lubricant added if necessary. Cadillac Rear Axle and Transmission Lubricant is recommended.

***Rear Axle: 16***

The rear axle should contain enough lubricant to bring it up to the level of the filling hole in the rear cover plate. The level should be inspected

every 2,500 miles and lubricant added if necessary. Cadillac Rear Axle and Transmission Lubricant is recommended.

***Timer and Distributor: 24***

Every 2,500 miles remove the small breather at the rear of the distributor housing by unscrewing it and pack distributor grease around the gears by which the timer and distributor are driven.

***Valve Stems: 11, 23***

Apply engine oil to the valve stems and cam slides every 2,500 miles. This may be done by lifting the valve compartment covers and inserting the spout of the oil gun.

***Wheels: 3, 14, 17, 27***

Every 2,500 miles, or every six months if the car is driven but little, all the wheels should be removed (see under "Wheels" page 62) and the bearings thoroughly cleaned in either gasoline or kerosene and examined. The bearings should be lubricated with a thin grease. Cadillac Gun Grease is recommended. Do not use heavy grease, as it will roll away from the path of the rolls and will not return.

***Steering Gear: 10***

The steering gear should be lubricated every 2,500 miles. Steering Gear Lubricant is recommended. (See page 31.)

***Speedometer Flexible Drive Shaft***

The flexible shaft by which the speedometer is driven is carried in a flexible casing. The shaft should be removed from the casing and lubricated at the end of every 2,500 miles of travel. Cadillac cup grease is recommended.

Do not under any circumstances attempt to lubricate the speedometer head. Any parts in the head which require lubrication are amply supplied when the head is assembled.

***Clean and Lubricate Horn: 13***

Clean and lubricate the horn at each 2,500 miles of travel. To do so it is first necessary to remove the horn from the engine and remove the motor shell. Pack the rear bearing with a light cup grease, and with an oil can put not more than two or three drops of engine oil in the front bearing. Care should be taken not to use an over supply of oil. Wipe off the commutator with a clean dry cloth.

**EVERY 5000 MILES*****Clutch Thrust Bearing: 8***

Every 5,000 miles remove the cover plate shown at "8." With the engine not running reach in and turn the clutch thrust bearing so that the small filler screw is at the top. Remove the screw with a screw driver. Care must be exercised not to drop the screw into the clutch case.

A small connection for the grease gun is furnished with the tool kit. Screw this into the threaded hole from which the filler screw was removed and attach the grease gun.

Cadillac Rear Axle and Transmission Lubricant is recommended.

***Clean Engine Lubricating System***

At the end of every 5,000 miles of travel clean the engine lubricating system and the oil pan and screen. (See under "Replace Engine Oil" page 33 and "Replace Engine Oil Frequently During Cold Weather," page 34.)

***Replace Transmission Lubricant: 19***

At the end of every 5,000 miles of travel remove the drain plug from the under side of the transmission case and drain out all of the lubricant. Refill with two quarts of suitable lubricant. Cadillac Rear Axle and Transmission lubricant is recommended. The filler is shown at "19."

***Replace Rear Axle Lubricant: 16***

At the end of every 5,000 miles of travel remove the drain plug from the axle and drain out all of the lubricant. Refill with 5 quarts of suitable lubricant. Cadillac Rear Axle and Transmission Lubricant is recommended. The filler is shown at "16."

**ADDITIONAL**

In addition to the places specially mentioned, note carefully and oil all of the small connections and joints throughout the car, such as the various brake rod connections and joints in the brake mechanism.

Remember that wherever one part moves in contact with another, wear will be reduced to the minimum by lubrication.

# GENERAL CARE

## Part III

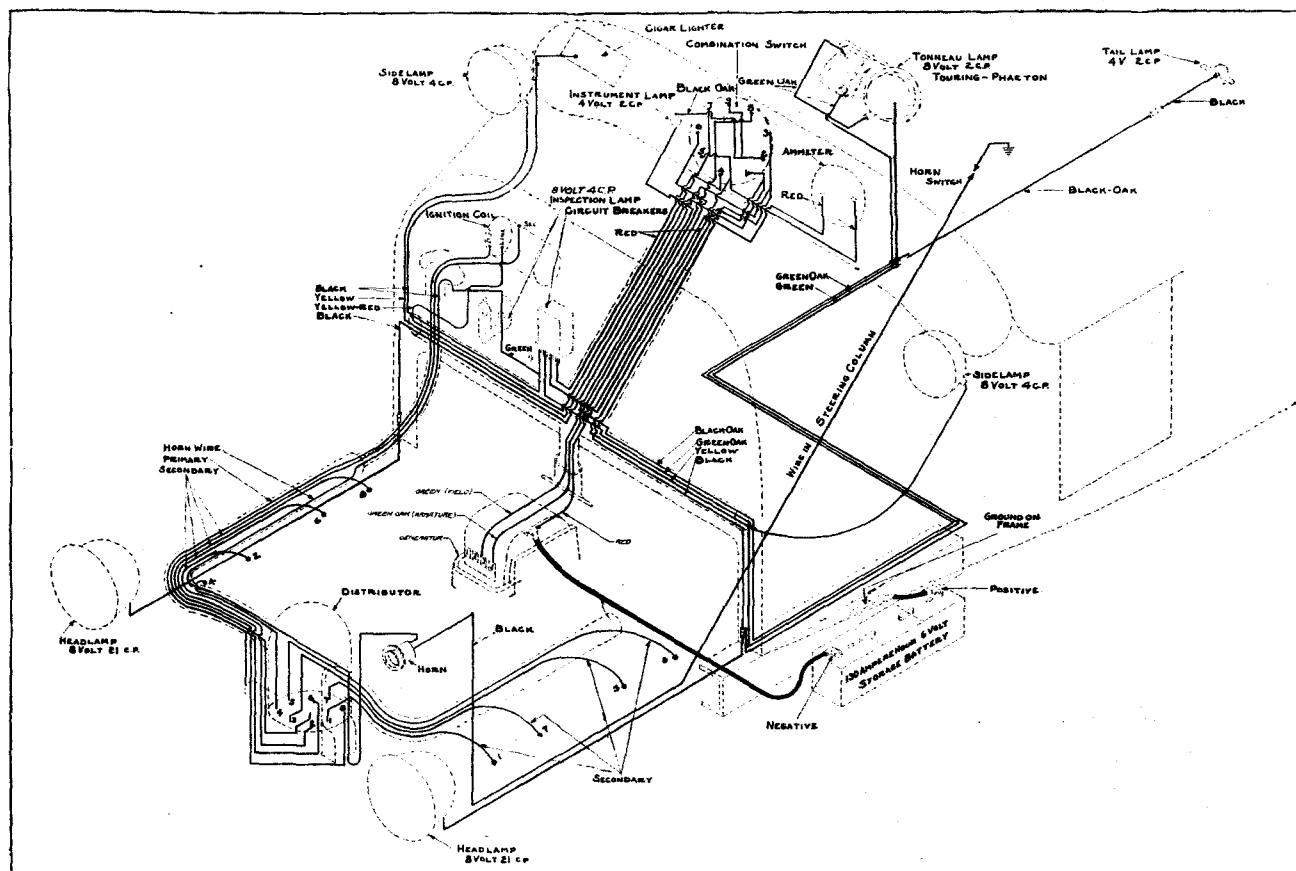


Fig. 18. Wiring Diagram



## TIRES

Each tire maker publishes a booklet with instructions for care and repair of tires. Every motorist should provide himself with one of these and thoroughly familiarize himself with the contents. We give here suggestions that apply to pneumatic tires in general.

Probably 75% of so-called "tire trouble" is the result of misuse. In the following we have illustrated some of the more common causes of tire breakdown.

### ***Result of Improperly Adjusted Tire Chains***

Tires are sometimes badly damaged through the use of tire chains which are incorrectly adjusted or which are fastened to the spokes of the wheel holding the chains tightly in place.

The least injury results when chains are applied loosely leaving play enough to permit them to work around. The wear on the tire is thus distributed evenly. Probably the greatest amount of injury comes from using chains unnecessarily on paved streets.

### ***Neglect of Small Cuts***

If cuts extending to the cords of fabric are neglected deterioration and blistering of the tire tread is the result. It is unnecessary to remove a tire to treat small cuts of this nature. Tire companies furnish a plastic compound for filling cuts. This prevents moisture and dirt from getting in.

### ***Result of Improperly Aligned Front Wheels***

Running a car with the front wheels out of alignment causes rapid tread wear. This usually affects both tires similarly, although sometimes only one tire is affected. An incorrect adjustment of the parallel rod in front of the axle or a bent steering arm is responsible for the condition. Unless the wheels are in proper alignment the treads of the front tires will wear away in a remarkably short time.

### ***Result of Sudden Application of the Brakes***

The sudden application of the brakes resulting in sliding the wheels causes the treads to wear away in spots. A tire will give away very rapidly under this severe treatment.

### ***Result of Under Inflation***

Under inflation causes a tire to flatten out under load. This causes the side walls to bend sharply as the tire revolves. The result is the breaking of the side walls.

### ***Additional Suggestions***

The tires are constructed for the purpose of carrying up to certain maximum loads and no more. It should be realized that overloading a car beyond the intended carrying capacity is sure to materially shorten the life of the tires.

Do not turn corners or run over sharp obstructions, like car tracks, at a high rate of speed. Such practice is sure to strain or possibly break the fabric, with the result that the further life of the tires will be limited. Remember that most tire troubles are the result of abuse.

Avoid scraping the tires against the curb and running in ruts. This kind of wear scrapes off the rubber side wall and exposes the fabric to dirt and moisture, which soon starts to rot the threads.

In turning in a narrow street, avoid striking the curb.

If a tire goes flat, see that the valve is not leaking. A little moisture on the tip will show bubbles if the air is escaping.

In case of puncture, the car should be stopped at once and the tube repaired or replaced, or the tire replaced by the extra one. The tire should also be examined carefully and the cause of the puncture ascertained and the nail, glass or whatever it may be, should be extracted. Before replacing the tire on the rim, examine the inside of the casing to see that the cause of the puncture is not still protruding. It is also advisable to look over the outside of the tires frequently and take out any pieces of glass or other particles which may have become imbedded in the casing.

Don't run in ruts or car tracks; the sides of a tire will soon wear out under such treatment. Avoid large stones or other obstructions in the road. To hit one of these may break the fabric even though no external injury be visible.

The garage floor should be kept free from oil or gasoline. The tires on a car left standing on a grease-covered floor deteriorate quickly, the natural enemies of rubber being oil and gasoline. These destroy the nature of the rubber, rendering it soft, so that it cuts and wears away quickly.

If the car is not used during the winter, it is better to remove the tires from the rims, keeping casings and tubes in a fairly warm atmosphere away from the light. It will be better to slightly inflate the tubes, as that keeps them very nearly in the position in which they will be used later on. If the tires are not removed and the car is stored in a light place, it will be well to cover the tires to protect them from the strong light, which has a deteriorating effect on rubber.

The greatest injury that can be done to tires on a car stored for the winter is to allow the weight of the car to rest on the tires. The car should be blocked up, so that no weight is borne by the tires, and the tires should then be deflated partially. This will relieve the tires of all strain, so that in the spring they should be practically no worse for the winter's storage.

## STORAGE

### *Engine*

To prepare the engine for storage proceed as follows: Start the engine, cover the radiator and run the engine until it is hot. (See under "Personal Danger in Running Engine in Closed Garage," page 50.) The engine should be run at a speed which will show an ammeter reading of about 10 with all lights switched off. It usually requires from two to ten minutes to heat up the engine.

After the engine is hot, stop the flow of gasoline to the carburetor by removing the gasoline tank filler cap, thus relieving the air pressure. Immediately the engine starts to slow down from a "lean mixture" inject from three to four tablespoonfuls of clean fresh engine oil into the carburetor. This may be done easily after lifting the large relief valve on the carburetor. This will stop the engine. Be certain there is no fire near when the filler cap is removed. Replace and tighten the cap after the engine stops.

Open the compression cocks. Inject from two to three tablespoonfuls of clean fresh engine oil into each cylinder and before closing the cocks crank the engine three or four revolutions with the ignition switched off. This will tend to distribute the oil over the cylinder walls.

If the engine is started again repeat the series of operations given in Paragraphs 1, 2 and 3.

Drain the cooling system. You will find complete directions in this book under "Draining the Cooling System," page 52.

### *Storage Battery*

(See under "Preparing Battery for Winter Storage," page 58).

### *Tires*

During winter storage it is best to remove the tires from the rims and keep the casings and tubes in a fairly warm atmosphere away from the light. It is best to inflate the tubes slightly after the tires have been removed to keep the tires in the position in which they are when inflated on the rim.

If the tires are not removed from the car, and the car is stored in a light place, it is best to cover the tires to protect them from strong light, which has a deteriorating effect on rubber.

The greatest injury that can be done to tires when the car is stored is to allow the weight of the car to rest on them. If the tires are not removed the car should be blocked up so that no weight is borne by the tires and the tires partly deflated.

### ***Body and Top***

It is best to put the top up and cover the entire car to protect it from dust.

### ***Taking the Car Out of Storage***

When the car is taken out of storage and before the engine is started, drain the oil from the oil pan, remove and clean the oil pan and baffle plate and replace the oil with fresh oil. (See under "Replace Engine Oil," page 33.)

The following instructions should be followed carefully in starting the engine:

Open the compression relief cocks and inject from two to three tablespoonfuls of clean fresh engine oil into each cylinder.

Close the cocks and with the ignition turned off turn the engine over a few revolutions by hand. This will tend to distribute the oil over the cylinder walls.

Start the engine in the usual manner.

Immediately the engine starts push the carburetor enriching button as far forward as possible without causing the engine to stop or a material reduction in engine speed and open the throttle to a point which causes an ammeter reading of approximately 10 with all lights switched off. With the engine running inject from two to three tablespoonfuls of clean fresh engine oil into the carburetor. This may be done after lifting the large relief valve on the carburetor.

Push the carburetor enriching button forward as far as it will go as soon as the engine is warm enough to permit it.

### **CARE OF THE FINISH**

The finish of an automobile requires more careful and frequent attention when the car is new than when it is older and the varnish is harder. Particular care should be taken to keep mud from the body and hood of the car while new.

Never permit mud to remain on the finish over night or long enough to dry. If it is not possible to wash the car thoroughly before putting it away

for the night, flush it off and then thoroughly wash the car the next morning. Mud permitted to remain on the car until it has dried, is not only difficult to remove but stains and dulls the finish.

#### WASHING THE CAR

Use clean water and plenty of it. Do not use water containing alkali. In parts of the country where the regular water supply contains alkali use rain water. Do not use hot water, as it destroys the lustre. The temperature of the water should be between 40 and 60 degrees Fahrenheit. Do not wash the hood while it is hot. The effect on the finish is the same as washing it with hot water. Unless the hood is allowed to cool before washing, the lustre will soon disappear.

If a hose is used in washing, do not have water pressure greater than will carry the water 6" beyond the end of the hose. Water under higher pressure drives the grit and dirt into the varnish. It is best not to use a nozzle.

Start at one of the front wheels, first going over the underside of the fender, the wheel and the chassis nearby, with water flowing gently from the hose. This will flush off most of the mud and dirt.

If it is necessary to use soap to remove road oil from the underside of the fenders or machine oil or grease from the chassis, use a little good automobile soap dissolved in a pail of water and apply the soapy solution with a sponge. Do not let this soapy solution remain on the finish more than two or three minutes but immediately wash it off thoroughly with a good soft carriage sponge. Then proceed to wash the under surfaces of the remaining fenders, the wheels and the remainder of the chassis in a similar manner.

When the washing of the chassis is completed begin at the front of the car and with the water running gently from the hose, flow on the body, hood and upper surfaces of the fenders. This will soften the accumulation of road dirt and remove most of it. Then go over the car again and remove all dirt by rubbing lightly with a soft wool sponge, which is used exclusively for the body, hood and upper surfaces of the fenders. At the same time, apply gently from a hose an abundance of water. Rinse the sponge frequently in clean water to remove any grit. After the washing is completed squeeze the sponge as dry as possible and pick up all water from crevices.

Then thoroughly wet a clean soft chamois, wring it as dry as possible, and dry the finish. Rinse the chamois and wring it out frequently. Do not rub the finish or apply more pressure than is necessary to dry off the water. Water evaporates quickly and leaves the finish in good condition.

If it is desired to chamois the wheels and chassis, wet the parts with clean water if they have become dry, and then wipe them. Use a separate

chamois for the chassis. Do not use on the body a chamois that has been used on the chassis or wheels.

Do not use soap, gasoline, kerosene or anything of this nature on the finish. Such ingredients attack the varnish.

Do not clean the glass with preparations which may contain harmful ingredients. Use only cleaning compounds which are known to have no destructive effects on highly polished glass.

## GASOLINE SYSTEM

### *General Description*

The supply of gasoline is carried in a tank at the rear of the car and is forced to the carburetor by air under a pressure of one to two pounds. A float controlled needle valve in the carburetor maintains the gasoline at the correct level in the carburetor bowl.

The gasoline pressure is indicated by a gauge on the instrument board (see Figure 1). A hand air compressor on the instrument board is provided, by which pressure for starting may be obtained when the car has been standing long enough to make this necessary. When the engine is running, pressure is automatically maintained by an air compressor on the engine, driven by an eccentric on the front end of the cam shaft. An air pressure relief valve connected in the air line prevents the pressure rising above that for which the valve is set.

The pipe extending almost to the bottom of the gasoline tank is a continuation of the gasoline line. The air line simply enters the tank at the top and does not extend into the gasoline.

### *Filling the Gasoline Tank*

The gasoline tank is at the rear of the car. (See Figure 19.) The filler cap may be removed after loosening the thumb screw.

Gasoline should be strained through a wire cloth of very fine mesh before it is poured into the tank. If dirt or water is allowed to enter the gasoline system it may cause great annoyance by getting under the carburetor inlet needle and causing the carburetor to flood.

After filling the tank, screw on the filler cap and tighten the thumb screw. This is necessary to prevent leakage of the air pressure by which the gasoline is forced to the carburetor.

### *Settling Chambers and Strainers*

There are two settling chambers in the gasoline system, one at the under side of the gasoline tank and the other attached to the left hand side of the engine compartment just under the front floor boards.

There is a drain plug at the bottom of each of these settling chambers. Every one thousand miles or oftener the plug in the settling chamber under the floor boards and the plug in the settling chamber underneath the gasoline tank should be removed to drain the settling chambers of any dirt or water which has accumulated. Before unscrewing either of the plugs, the car should be driven out of the garage into the open and the gasoline system relieved of all air pressure by removing the gasoline filler cap on the tank. Be sure there is no fire near the car when these plugs are removed.

There are two strainers in the gasoline system which require cleaning periodically—one at the point where the gasoline feed pipe is attached to the carburetor, and the other attached to the drain plug in the settling chamber under the front floor boards. (See Figure 19.)

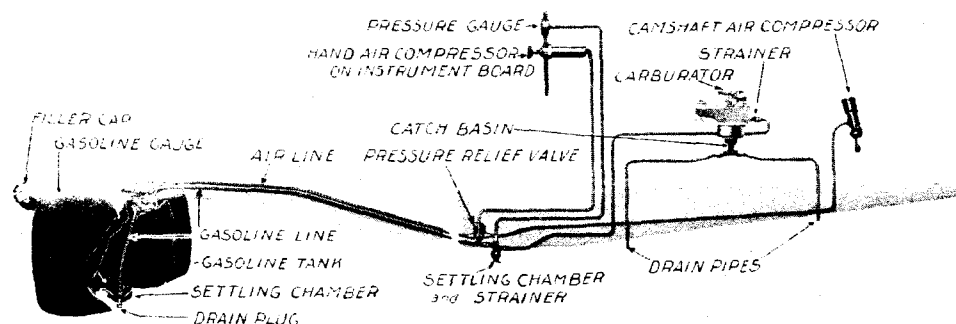


Fig. 19. Gasoline System.

The strainers should be removed and cleaned every one thousand miles or oftener. Remove the filler cap to relieve the air pressure before removing either strainer. In cold weather it may be found necessary to remove the strainers more frequently, to prevent an accumulation of water at these points which would freeze and prevent gasoline from flowing to the carburetor.

#### CARBURETOR

The carburetor is correctly adjusted when the car is assembled and unless tampered with should not require readjustment. It is unnecessary to change the adjustment for changes in season and weather.

Good carburetor action cannot be expected until the engine is thoroughly warmed up. Imperfect carburetor action while the engine is cold does not indicate that the carburetor requires adjustment.

If adjustment of the carburetor seems to be necessary have it made by a Cadillac distributor or dealer. The adjustment should not be attempted by one unfamiliar with it.

### ***Personal Danger of Running Engine in Closed Garage***

Carbon monoxide, a deadly poisonous gas, is present in the exhaust of gasoline engines. Increasing the proportion of gasoline to air in the mixture fed to the engine, in other words, enriching it, increases the amount of carbon monoxide given off.

The presence of carbon monoxide makes it very dangerous to run the engine while the car is in a small, closed garage. If the doors and windows are open the danger is lessened, but it is far safer, particularly if an adjustment of the carburetor is being made, to run the car into the open.

Serious personal injury may be caused by the presence of carbon monoxide in a garage if the percentage of it in the air is greater than a very small fraction of one per cent. Unconsciousness may result without warning. It is reported that no indication of danger is given by personal discomfort until too late. Deaths resulting from the presence of carbon monoxide in garages have been reported.

## **COOLING SYSTEM**

### ***General Description***

The cooling system is of the forced circulation type. Circulation through each cylinder block is independent of that through the other, two pumps being provided.

The temperature of the liquid circulated by the pumps is under thermostatic control, the purpose of which is to permit liquid circulated through the water jackets of the cylinders to warm up to the temperature at which the engine operates best, very soon after the engine is started and to prevent the temperature dropping below this point while the engine is running.

### ***Condenser***

A condenser, the purpose of which is to prevent the loss of the cooling medium by evaporation, is attached to the right hand side of the car frame.

The operation of the condenser requires an air tight seal at the radiator filler cap. To make it possible to screw down and tighten the cap without injury to the rubber gasket, two metal washers are interposed between the head of the cap and the gasket. It is important that nothing be installed on the radiator cap which may cause an air leak or which makes necessary the elimination of the washers or cutting a hole through the gasket.



### *Refilling the Cooling System*

Fill the cooling system with water during warm weather and with a suitable anti-freezing solution during freezing weather (see under "Anti-Freezing Solutions" page 22). To fill the cooling system proceed as follows:

Close the drain cock "D" (Fig. 20) on each cylinder block and the drain cock "C" on each water pump. If the indicator on the end of each pump shaft "B" does not point up turn the shaft so that it does. The shaft may be turned in either direction.

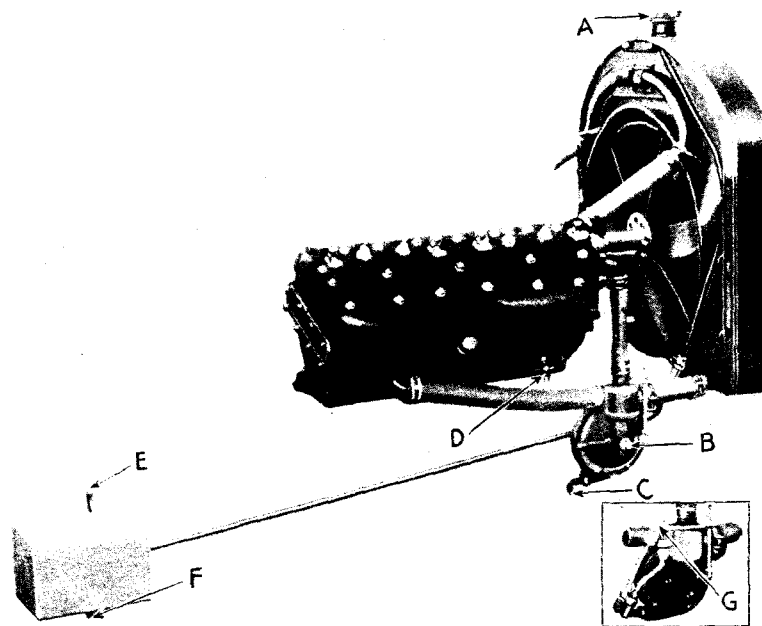


Fig. 20. Cooling System

Remove the filler cap "A" and fill the cooling system. Screw the cap down tightly after replacing it. This is important since the operation of the radiator condenser depends upon a tight joint at the radiator cap.

Turn each pump shaft "B" so that the indicator points down.

To fill the radiator condenser (see under condenser page 50) take out the floor board just forward of the transmission control lever and replace the drain plug "F" (Fig. 20.) Remove the condenser filler cap "E" and fill the condenser one half full using the same liquid as in the radiator. Replace the filler cap.

Type 61 cars carrying engine numbered 61-U-47 or a lower engine number are filled in the following manner.

Close the cylinder drain cock "D," (Fig. 20) and turn the valves "G," to the "Fill" position. If the water pump drain cock does not turn easily force down on the screw driver. In extreme cases it may be necessary to strike the end of the screw driver with the hand to unseat the drain cock.

There is a drain cock "D" in each cylinder block and a valve "G" at each water pump.

Remove the filler cap "A" and fill the cooling system. Screw down the cap firmly after replacing it.

Turn the valves "G" to the "Close" position.

### ***Adding Cooling Solution***

If only a small amount of cooling solution is necessary to fill the system, it is necessary only to remove the radiator filler cap and pour in the required amount.

Screw down the radiator filler cap firmly after replacing it. This is necessary to insure operation of the condenser.

### ***Draining the Cooling System***

To drain the cooling system turn the shaft "B," (Fig. 20) on each water pump so that the indicator on the end of the shaft points up. The shaft may be turned in either direction. Then open the drain cock "C" on each water pump and the drain cock "D" on each cylinder block.

To drain the condenser remove the drain plug "F."

A slight change was made in the design of the water pumps beginning with engine numbered 61-U-48. To drain the cooling system on a car numbered 61-U-47 or with a lower engine number, proceed as follows:

Open the drain cocks "D" (Fig. 20) and turn the water pump valves "G" to the "Drain" position. If a water pump drain cock does not turn easily, force down on the screw driver. In extreme cases it may be necessary to strike the end of the screw driver with the hand to unseat the drain cock.

There is a drain cock "D" in each cylinder block and a valve "G" at each water pump.

### ***Cleaning the Cooling System***

The cooling system should be drained and flushed out every two or three months. This can be done in the following manner:

Run the engine with the radiator covered until the liquid in the cooling system is boiling hot.

Shut off the engine and immediately drain the cooling system.

If an alcohol anti-freezing solution is drawn off part of it may be used again if the sediment is allowed to settle. In case it is used the specific gravity should be tested with a hydrometer, after it has cooled thoroughly.

After the liquid is drained off, refill the cooling system with hot water and repeat the operations outlined above.

If, in draining the second time, the water is very dirty, it may be desirable to repeat the flushing operation a third time, using a solution of sal-soda. If the sal-soda solution is used, be sure that it is drained out and the system flushed again with clear water.

The sal-soda solution should not be permitted to get onto the finish of the hood or radiator.

## CADILLAC-DELCO ELECTRICAL SYSTEM

### *General Description*

The Cadillac-Delco system is the single wire, single unit system. One side of the motor, generator, storage battery, lamps, horn and ignition apparatus is connected to some part of the frame of the car or the engine. The other connections are made with copper wires or cables.

The motor generator serves both as a generator of current and as an electric motor for cranking the engine when starting. The principal elements of the motor generator are an armature and a field. There are two windings on the armature and two in the field—one on the armature and one in the field are used when the motor generator is used as a generator and the other windings when it is used as a motor.

### GENERATION OF CURRENT

When the engine is not running and the lights are turned on, the ammeter, located on the instrument board (see Figure 1) indicates on the "discharge" side of the dial, the amount of current drawn from the storage battery for the lights. When the ignition switch is turned on the ammeter indicates in addition the current used in slowly rotating the armature of the motor generator. When the starter button is pushed down, the current is no longer required for slowly rotating the armature of the motor generator. The ammeter then indicates only the current used for ignition and lights if turned on. The ammeter does not indicate the amount of current used in the cranking operation.

Before the engine is running fast enough to generate sufficient current to equal the current demand, the ammeter indicates on the "Discharge" side the amount of current being drawn from the storage battery. When the engine has attained a speed sufficient to generate current to more than

equal demand, the ammeter indicates on the "Charge" side the excess current. This passes to the storage battery and recharges it.

Ordinarily, with all lights switched off, sufficient current is generated to start recharging the battery when the car is operated in high gear at speeds from ten to twelve miles per hour and, of course, at much lower speeds when the car is operated in low or intermediate gear. With all lights turned on sufficient current is generated to take care of the requirements at speeds from ten to fifteen miles per hour. At speeds greater than this the surplus current passes through the storage battery and recharges it. In other words, the ammeter indicates the rate at which the storage battery is being charged or discharged.

To determine the total output of the generator turn off all the lights and add the amount of current used for ignition, i. e., two to three amperes, to the ammeter reading.

#### MOTOR GENERATOR COMMUTATORS

Do not put oil on the commutators of the motor generator.

#### IGNITION SYSTEM

The ignition system embodies the following elements: A source of current, the generator, or at low speeds, the storage battery; an ignition timer, which interrupts the low tension current at the proper instant to produce a spark in the high tension circuit; an induction coil, transforming the primary current of six volts into one of sufficient voltage to jump between the points of the spark plugs; a condenser, which assists the induction coil to raise the voltage, and which protects the contact points of the ignition timer from burning; and a high tension distributor which directs the distribution of the high tension current to the spark plugs in the respective cylinders.

##### ***Spark Plugs***

Spark plugs should be clean. When carbon or soot is permitted to collect on them short circuiting of the current results and prevents the proper ignition of the charge in the cylinder. A good method of cleaning plugs is to wash them in alcohol. Use gasoline in the absence of alcohol.

In order to get the best results the points of the spark plugs should be .023 of an inch apart.

##### ***Cleaning Lamp Reflectors***

The reflectors of the head and side lamps are plated with pure silver. In polishing, extreme care must be exercised in selecting materials which will not scratch it.

Powdered dry rouge and a chamois skin are recommended. If the reflectors are tarnished, moisten the rouge with alcohol, and apply with the chamois. Then polish with a dry chamois and rouge.

The chamois should be soft and must be free from dust. Do not use a chamois used for any other purpose.

### ***Lamp Bulbs***

It is recommended that bulbs for the lamps be purchased from a Cadillac distributor or dealer. In any event bulbs should have the correct voltage and candle power rating. The following is a table of correct voltages and candle powers:

<i>Lamps</i>	<i>Voltage</i>	<i>Candle Power</i>
Head	8	21
Side	8	4
Instrument	4	2
Tail	4	2
Tonneau	8	2
Portable	8	4
Dome, enclosed cars	8	4
Quarter, enclosed cars	8	2

### ***Cigar Lighter***

The wire to the Cigar Lighter (See Figure 1) is carried on a reel fastened to the front face of the instrument board. Pulling the cigar lighter out of its receptacle on the instrument board automatically operates a switch in the reel chamber by which current to the cigar lighter is controlled. Permitting the cigar lighter to return to its receptacle automatically switches off the current.

### ***Portable Lamp***

The portable lamp is attached to the right hand side of the front face of the dash. To use the lamp lift the right hand side of the engine hood and pull the lamp straight out from its socket. The wire to the lamp is wound upon a reel. To return the portable lamp to its socket, operate the small lever on the dash at the side of the lamp receptacle. This will throw a catch which holds the reel and permit it to rewind the wire. The lamp is lighted by the small switch near the lamp.

## **STORAGE BATTERY**

### ***General Description***

The storage battery consists of three cells. It is carried in a compartment in the left hand dust shield. The cover of this compartment forms a

part of the dust shield and may be removed after unscrewing the two nickel-plated screws.

The battery is designed especially for the Cadillac-Delco electrical cranking, lighting and ignition system and is made by the Electric Storage Battery Co., Philadelphia, Pa., whose batteries are known as "Exide" batteries.

The specific gravity of the acid solution in the battery is an indication of the state of charge. (See under "Hydrometer Syringe," page 57.) In a fully charged battery the specific gravity should be from 1.270 to 1.290. If the specific gravity registers from 1.150 to 1.170 it indicates that the battery is practically discharged. A battery discharged below a specific gravity of 1.150 will not crank the engine nor will it burn the lights to full candle-power when the engine is not running.

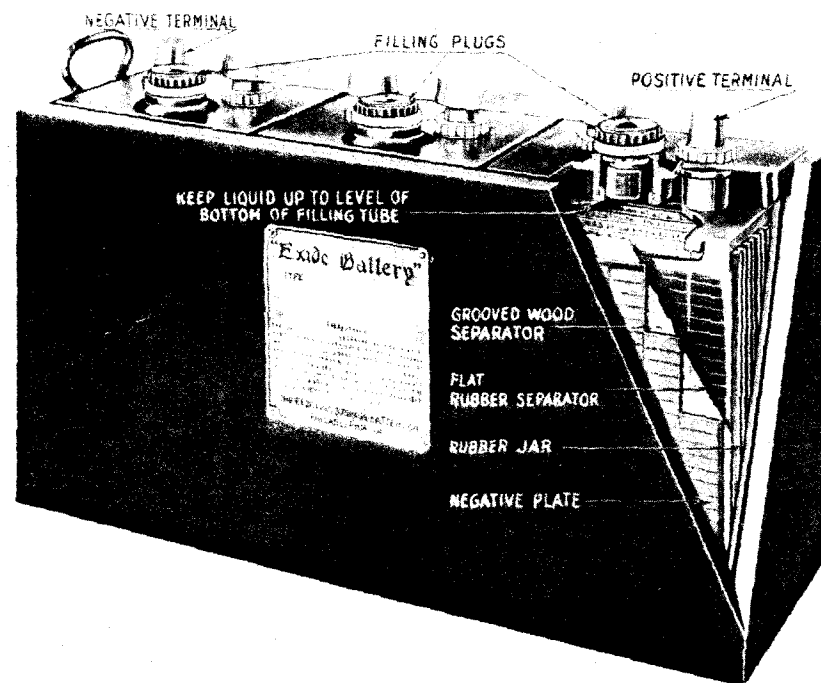


Fig. 21. Storage Battery, Sectional View.

*Caution:—Never run the engine with the storage battery disconnected. Serious damage to the motor generator may result. Do not remove the motor generator or attempt any adjustment of the circuit breakers or remove any of the wires to the circuit breakers, without first disconnecting the storage battery.*

### ***Adding Water to Storage Battery***

The acid solution in the battery must always cover the plates and the level of the acid solution should be kept even with the bottom of the filling tubes. Water should be added frequently enough to keep the level up to this point. *Do not add acid.* Ordinarily water should be added every 500 miles, but it should be added at least every two weeks and more frequently if found necessary. Usually it will require only a teaspoonful or so; in hot weather it may require more. Be sure to replace and tighten the filling plugs after adding water.

To remove a filling plug, turn it as far as possible in the counter-clockwise direction, then lift it straight up. To replace it, hold it so that the large arrow is perpendicular to the center line of the car, set the plug in place and turn it in the clockwise direction until tight.

If a plug is left out or is loose, acid solution will escape from the cell, especially when the battery is being charged. If a plug is lost or broken, obtain a new one and install it as soon as possible.

If one cell regularly requires more water than the others, thus lowering the specific gravity of the acid solution in that cell, a leaky jar is indicated. Even a very slow leak will in time result in the loss of all the acid solution in the cell. A leaky jar should be replaced immediately by a new one.

Water for filling the battery must be pure. Distilled water, melted artificial ice or fresh rain water are suitable for this purpose. If rain water is used, it should not be allowed to come in contact with any metal. It should not be caught from a metal roof or in a metal receptacle.

Never keep the water in a metal container, such as a metal bucket or can. It is best to get a bottle of distilled water from a druggist or from an ice plant. A quart will last a long time. The whole point is to keep metal particles out of the battery. Spring water, well water or hydrant water from iron pipes generally contains iron and other metals in solution, which will ultimately cause trouble if used.



*Fig. 22. Hydrometer Syringe*

### ***Hydrometer Syringe***

A hydrometer (Figure 22) is an instrument for testing the specific gravity of a liquid. A hydrometer syringe is a hydrometer specially designed for convenience in testing the specific gravity of the acid solution in storage batteries. Hydrometer syringes are not a part of the electrical system but can be purchased from any "Exide" service station.

To test the solution in the storage battery with a hydrometer syringe, proceed as follows:

Remove the filling plug from the cell to be tested, compress the rubber bulb of the syringe, and insert the pipette into the solution of the cell. Hold the syringe as nearly vertical as possible, and gradually lessen the pressure on the bulb until enough of the acid solution is drawn into the syringe to float the hydrometer. The specific gravity reading is taken on the hydrometer at the surface of the acid solution in the glass barrel.

If the acid solution is below the top of the battery plate, or so low that it is not possible to draw enough of the solution into the barrel to float the hydrometer, fill the cell to the proper level (see Figure 21), by adding pure water, run the engine until the water has become thoroughly mixed with the acid solution, and then take the reading as above described. The engine should run for several hours after water is added before an hydrometer reading is taken.

#### ***Preparing Battery for Winter Storage***

When the car is stored for the winter the level of the acid solution should be even with the bottom of the filling tubes. (See under "Adding Water to Storage Battery," page 57.) If water is added it should be added just before the last time the car is used so that it will be thoroughly mixed with the acid solution. When the car is stored, the specific gravity of the acid should register from 1.270 to 1.290. In this condition there is no danger of the acid solution freezing. The specific gravity of water is 1.000 and water freezes at 32 degrees F. above zero.

*Unless the battery is fully discharged or nearly so it is probable that the acid solution in the battery will freeze and cause extensive damage.*

The following is a table of the freezing temperatures of sulphuric acid and water solutions of specific gravities from 1.050 to 1.300.

Specific Gravity (Hydrometer Reading)	Freezing Temperature (Degrees Fahr.)
1.050	+27°
1.100	+18°
1.150	+ 5°
1.164	0°
1.200	-17°
1.250	-61°
1.275 to 1.300	-90°

The battery should be charged every two months during the "out of service" period, by running the engine. If the above is impossible and there



is no garage equipped for charging batteries to which it may be conveniently sent, the battery may be allowed to stand without charging during the winter, provided the specific gravity of the acid solution registers from 1.270 to 1.290 at the time the car is laid up. Much better results and longer life from the battery will be obtained by giving the periodic charges.

The wires of the battery should be disconnected during the "out of service" period, as a slight leak in the wiring will discharge the battery.

### ***Placing Battery in Service Again***

If the battery has received periodic charges it will be unnecessary to give it any special attention, other than to fill it to the proper height with distilled water and connect the wires which were disconnected when the car was stored. After the car has been driven for a number of hours, the specific gravity of the acid solution should be taken with a hydrometer syringe. The solution should register from 1.270 to 1.290 if the battery is fully charged.

A greenish deposit sometimes exists on the terminals of a storage battery which has been stored. This deposit may be removed with a solution of bicarbonate of soda (common cooking soda) in water. Do not allow any of this solution to get into the cells of the battery.

If the battery has not been kept charged during the winter, it is advisable to remove it from the car and have a plant equipped to take care of the work, give it a fifty-hour charge at a 4-ampere rate, before putting it into service again.

### ***Sediment***

The sediment which gradually accumulates in the bottom of the jars, should be removed before it reaches the bottom of the plates. The need of cleaning may be determined by inspection. Its necessity is indicated by lack of capacity, excessive evaporation of the acid solution and excessive heating when charging. If a battery is in need of cleaning or repairs, it is best to communicate with a Cadillac distributor or dealer or with the nearest Exide depot, who will advise you where to ship the battery. *Do not ship batteries without receiving instructions.*

### ***Exide Depots and Sales Offices***

The Electric Storage Battery Company, whose general offices and works are at Alleghany Avenue and 19th Street, Philadelphia, Pa., has service stations in towns of any considerable size where battery repair work is done.

as well as sales offices and Exide battery depots in a number of the larger cities of the country, where complete assembled batteries and repair parts are carried in stock. For the location of the nearest Exide depot or service station, write the local Cadillac distributor or dealer, or, if preferred, the Electric Storage Battery Company, at Philadelphia.

## TRANSMISSION AND CLUTCH

### TRANSMISSION

#### *General Description*

The transmission is in unit with the engine, and is of the selective type of sliding gear. The gear changes are accomplished by the movement of a hand lever at the driver's right (see Figure 1, also under "Gear Shifting," page 10).

When traveling in high gear, power from the engine is transmitted through the transmission without passing through any of the transmission gears. Power is transmitted through transmission gears when the car is operated in intermediate, low, or reverse gear.

Changes of gear must never be attempted without first disengaging the clutch by holding down on the clutch pedal.

#### *Lubrication*

The transmission case should always contain lubricant enough to bring the level up to the filler plug in the right-hand side of the case. The level should be inspected at least every 2,500 miles, and lubricant added if necessary.

At the end of every 5,000 miles the transmission case should be thoroughly drained and refilled with fresh lubricant.

Cadillac Rear Axle and Transmission Lubricant is recommended for the transmission. In its absence steam cylinder oil mixed with gun grease may be used. The consistency of the mixture should be such that the mixture will flow easily at temperatures of from 60° to 70° Fahrenheit.

## CLUTCH

**General Description**

The main clutch is of the multiple disc dry plate type. The driving discs are covered on both sides with a friction material composed largely of asbestos, and are driven by gear teeth in a clutch ring bolted to the fly wheel of the engine.

The driven discs are not covered. These discs are carried on a clutch hub and drive the clutch hub through keys. The clutch hub in turn drives the transmission shaft.

When the clutch is engaged by allowing the clutch pedal to come toward you, the clutch spring forces all of the discs together.

The resulting friction between the driving and driven discs drives the transmission shaft and the car when the transmission control lever is in other than neutral position.

The clutch pedal should be adjusted occasionally to compensate for wear on the facings of the clutch discs. This adjustment is explained below under "Adjustment of Clutch Pedal Clearance."

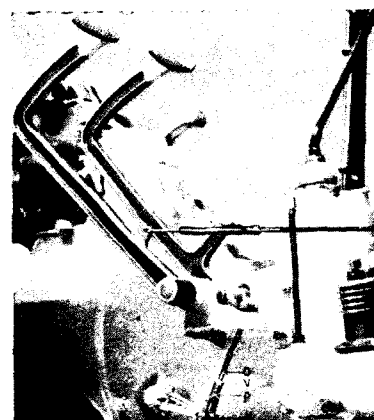


Fig. 23. Clutch Control.

**Adjustment of Clutch Pedal Clearance**

After the car has been run for some time it may be found that the facings on the clutch discs have become compressed or worn to some extent and that consequently the clutch pedal strikes the stop screw before the clutch is fully engaged. When this condition exists a readjustment may be made as follows:

Remove the pin "N," Figure 23, and unscrew the yoke "P," which is threaded on the rod "O," so that when the pin "N" is replaced the clutch pedal has a movement back and forth of one and one-quarter inches without starting to release the clutch. Secure the pin "N" with a cotter pin and tighten the lock nut "V."

## STEERING GEAR

### *General Description*

The steering gear is of the worm and sector type. Adjustments are provided in the steering gear for taking up play, which may result after long use.

The worm and sector are contained in a housing, which is bolted to the web of the side bar, and serves as a container for lubricant.

### *Lubrication*

The mechanism of the steering gear is lubricated through the gun connection "A," Figure 24.

Steering Gear Lubricant, made by mixing seventy-five per cent of Cadillac Rear Axle and Transmission Lubricant and twenty-five per cent of Cadillac Gun Grease or number one cup grease, should be used.



Fig. 24. Steering Gear.

## WHEELS

The adjustment of wheel bearings or the removal of wheels should not be attempted by one unfamiliar with work of this nature. It is recommended that the car be taken to a Cadillac distributor or dealer for this work.

### *Removing a Front Wheel*

Jack up the axle until the wheel is free from the ground.

Remove the hub cap by unscrewing it.

Remove the cotter pin.

Remove the lock nut "A," Figure 25.

Remove the washer "B."

Remove the adjusting nut "C."

The wheel may now be removed.

Before replacing the wheel, see that the bearings are clean and that they are filled with a thin grease. Be sure that the grease is free from dirt and grit.

### Replacing a Front Wheel and Adjusting Bearings

In replacing the wheel, adjust the nut "C" very carefully. (See under "Caution in Adjusting Wheel Bearings," page 64.) Replace washer "B," being sure that one of the holes in the washer fits over the stud "D." Replace the lock nut "A" and tighten carefully. Replace the cotter pin.

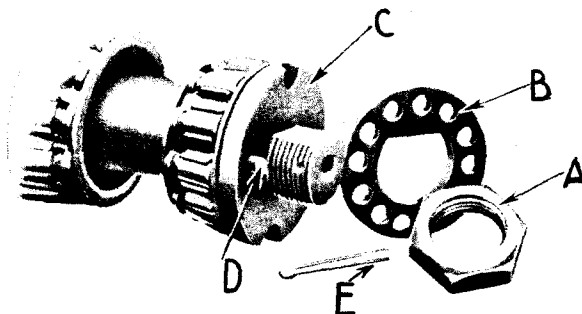


Fig. 25. Front Wheel Bearings and Adjusting Nuts.

washer "B" is not directly over the stud "D," it is best to loosen the adjustment rather than to tighten it.

### Removing a Rear Wheel

Remove the lubricator "A," Figure 26. (The lubricator is not used on later Type 61 cars.)

Remove the hub cap "B" by unscrewing it.

Remove the spring locking ring "I."

Withdraw the axle shaft "K."

Jack up the axle so that the wheel will clear the floor.

Remove the lock nut "D," the washer "E" and the adjusting nut "F."

The wheel can then be taken off.

### Replacing a Rear Wheel and Adjusting Bearings

Before putting the wheel on again, see that the bearings "G" and "H" are clean and filled with light grease which is free from dirt and grit.

In putting the wheel on again, set the adjusting nut "F" very carefully. (See

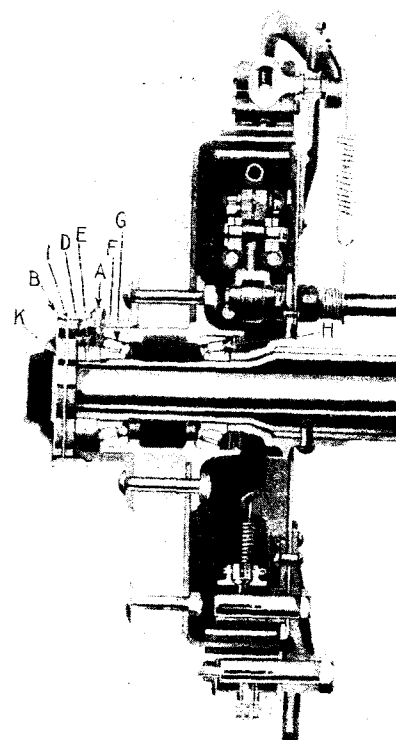


Fig. 26. Sectional View of Rear Hub, Showing Bearings

under "Caution in Adjusting Wheel Bearings.") Place the washer "E" in position, and tighten the lock nut "D."

### CAUTION IN ADJUSTING WHEEL BEARINGS

When adjusting the wheel bearings, with which the wheels are equipped, great care must be exercised not to get them tight. These bearings will revolve even when adjusted very tightly, but that condition is sure to prove disastrous. They should be adjusted so that a very slight amount of play or looseness may be discerned.

If, after a bearing has been adjusted to a point that is apparently correct, the locking device cannot be placed in position without changing the adjustment, it is far better to *loosen* the adjustment until it can be secured with the locking device than to *tighten* the bearing adjustment.

### REAR AXLE

#### *General Description*

The rear axle is of the full floating type. The wheels rotate on the axle housing. The axle shafts do not carry the weight of the car, but simply transmit power from the differential to rotate the wheels.

### BRAKES

#### *General Description*

There are two pairs of brakes. The regular service brakes, which are operated by the right pedal, contract upon the outside of the drums. The hand brakes, operated by a hand lever, expand within the drums.

Connections from the right pedal and hand lever are made through equalizing bars so that each drum will be gripped with practically the same pressure. While these equalizing bars compensate for a certain amount of inequality in tension, it is desirable to adjust the brakes as nearly alike as possible.

The brake band linings can be renewed when necessary.

When the brake band linings are wet and muddy they are less effective than at other times. Hence more care must be exercised in driving at such times.

The brakes should be examined and tested occasionally to be sure that they are in serviceable condition.

All joints should be oiled occasionally.

#### *Adjustment of Foot Brakes*

Brake adjustment should not be attempted by one unfamiliar with it. It is recommended that the car be taken to a Cadillac distributor or dealer.

Provision is made in the brakes for adjustment. Do not attempt to adjust the brakes by the pull rods. The brakes cannot be adjusted properly in this manner. To adjust each foot brake, proceed as follows:

Remove the cotter pin in the adjusting screw "A," Figure 27, and turn the screw "A" until that part of the brake band lining opposite the screw just clears the drum. Adjust the two nuts "B" on the yoke bolt so that the lower part of the brake band lining just clears the drum.

Then adjust the nut "C" on the upper end of the yoke bolt so that the lever "D" is brought into the position shown in Figure 27, when the brake is fully applied—i. e., so that the lower edge of the pin "T" and the upper edge of the pin "S" are tangent to an imaginary horizontal line shown at "X." Lock all adjustments.

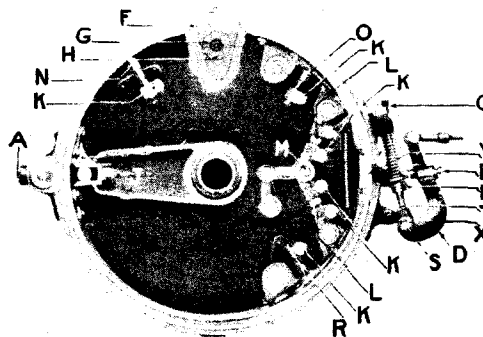


Fig. 27. Brakes (Wheel Removed.)

### Adjustment of Hand Brakes

When adjustment of the brakes becomes necessary it is recommended that the car be taken to a Cadillac distributor or dealer.

Provision is made in each brake for its adjustment. Do not attempt to adjust the brakes by the pull rods. The brakes cannot be properly adjusted in this manner. To adjust each hand brake proceed as follows:

Place a jack under the rear axle housing and raise the axle so that the wheel can be turned by hand. Remove the cover "F," Figure 27; this may be done by loosening the lock nut "G" and turning the bolt to the left about one-quarter of a turn, which releases the clamping bar "H."

Rotate the wheel until the opening gives access to the screw "J." Turn the screw "J" until that part of the brake band lining opposite the screw just clears the drum.

Rotate the wheel and through the opening loosen the seven locking screws "K." Then turn the two adjusting screws "L," which have right-hand threads on one end and left-hand threads on the other, so that when the brake is fully applied the center of the pin "M" stands three and three-sixteenths inches to three and one-quarter inches away from the inside of the brake drum at "Y." The screws "L" should be turned equally and in the same direction.

Release the brakes and adjust the stop screws "R" so that the upper and lower parts of the brake band lining are equidistant from the brake drum. Adjust the stop screw "N" so that the head of the screw just touches the inside of the brake band. Tighten the seven locking screws "K" and replace the cover "F."



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## REPAIR PARTS

### *Ordering New Parts*

With many thousands of Cadillac automobiles in use, it is obviously impractical to deal directly with each Cadillac owner. We cannot open accounts with any except regular distributors with whom annual contracts are made.

To avoid unnecessary delay and correspondence new parts should, where possible, be ordered from the distributor or dealer from whom the car was purchased or from the nearest Cadillac distributor or dealer, who is generally in a position to supply it from his stock. If he cannot do so, he can order it for you.

Where, however, conditions are such as in our judgment to warrant it, we will fill orders for parts at current list prices, f. o. b. factory, provided the order is accompanied by cash. In ordering, send the engine number and type of the car with an accurate description of the part desired, preferably accompanied by a sketch with dimensions. If this cannot be done, return the part tagged properly and with transportation charges prepaid. (See below under "Returning Parts"). Otherwise, we cannot promise prompt service or to fill the order intelligently.

Our responsibility ceases in all cases, with delivery to the transportation company.

### *Returning Parts*

In the event parts are returned, transportation charges must be prepaid or the parts will not be accepted. They should be tagged properly with the name of the owner and the engine number of the car. A letter should be sent, giving complete instructions regarding the disposition of the parts.

### *Tires, Speedometer and Clock*

In cases of repairs to tires, speedometer, or clocks, correspondence should be opened with the manufacturers or one of their branches. If necessary the parts should be sent to them. Transportation charges should be prepaid.

Since this "Numerical List" was placed with the printer, change notices have been issued effecting symbols which should be corrected before the list is put into use.

#### Add to list:

##### Cadillac Symbols.

2085	Carburetor	J-194
2786	Tube	J-52
4346	Brass washer	Y-3169H
5022	Air pipe	J-243
5038	Brass washer	SS-165A
5154	Worm shaft	J-287
6007	Tube	J-1223
8884	Flange	C-441B
9548	Bracket	Y-364
17339	Magnet	BB-811
18908	Cover	A-6182
20162	Rod	B3-382
20169	Pump cover	BB-276
20282	Aux. disc	J-225
20292	Jackshaft	J-507B
24441	Dust shield	A-6171
24442	Dust shield	A-6174
24443	Dust shield	A-6177
24444	Dust shield	A-6180
25497	Conn. rod	E-2646A
32944	Support	A-4640
32945	Support	A-4644
33470	Clip	A-4626
33627	Bow socket	A-7001
34857	Front wheel	A-3037B
34858	Rear wheel	A-8037C
38252	Wood bow	A-7250

40452	Conn. rod	BB-2110
41319	Dust shield	BB-2248
41510	Dust shield	BB-2250
41960	Connection	A-3430
45904	Bow socket	A-7292
50010	Front wheel	E-3439A
50011	Rear wheel	E-3539C
50650	Rear wheel	E-3539D
50651	Front wheel	E-3539B
75368	Wrench	Tool-kit List

##### Delco Symbols.

12140D	Coro	E-1226
31399D	Change serial to	E-836
32812D	Change serial to	E-788
On Page 125		
22781D	should be	22881D

##### Timken Symbols.

T-4122	Adj. ring	BB-2555
T-4315	Gasket	BB-2494
T-4518	Axle housing	Y-2631

##### National Gauge Symbols.

1204	Change to	1204US
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Add to index, "Spicer Mfg. Co." Page 143.

#### Remove from list:

##### Cadillac Symbols.

3920	12875	17162	22617
6029	13307	17163	23418
7313	13308	17164	23419
8226	13595	17546	23636
8719	13756	17548	23637
8720	13757	17549	23709
8726	13857	17551	23896
8729	13858	17614	24459
9573	14081	18074	24460
9574	14718	18077	24461
9886	14719	19221	24462
9887	16217	19222	24522
10059	16705	19576	25836
10596	16708	20217	30507
11522	16991	20218	30571
11642	16992	21436	30596
12131	17014	21542	30597
12132	17016	21690	30699
12156	17017	21699	32598
12167	17019	21856	33080
12561	17160	21859	33518

##### Delco Symbols. Kelsoy Wheel Symbols.

11189D	3674KW
11369D	
11864D	

##### Spicer Symbols.

4-3-17
4-5-1

##### National Gauge Symbols.

481
626

##### Timken Symbols

L-893
L-1391
T-3088
W-C55
W-875

