for Economical Transportation

CHEVROLET

INSTRUCTIONS

FOR THE OPERATION
AND CARE OF

"SUPERIOR"
MODEL
CHEVROLET
MOTOR CARS

Chevrolet Motor Company
of Canada, Limited

Subsidiary of General Motors of Canada, Limited

Factory and Head Office: OSHAWA, ONT.

Eastern Division
Oshawa, Ont.

Western Division
Winnipeg, Man.

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OUR SERVICE POLICY AS IT APPLIES TO THE CAR OWNER

Chevrolet Motor Company of Canada, Limited, is anxious to see that every new car turned out from the factory gives its owner 100% satisfaction. To accomplish this, we have chosen, with discretion, the business men in each locality, who act as leaders in marketing Chevrolet cars.

The common aim of the Company and of the Dealers is to see that every purchaser of a new car is dealt with in a business-like manner, being treated with courtesy and fairness at all times. This Organization also aims to see that car owners are assisted in every way in keeping their cars in good running condition.

The Service Policy, under which Chevrolet cars are sold, is as follows:

1. Cars are delivered under terms of the "Standard Warranty," printed elsewhere in this Book. This provides for the making good, at the factory, of material returned, charges prepaid, within ninety days after the date you took delivery of your car, providing such parts are found to be defective by our inspection. It provides for the same treatment of parts damaged or otherwise rendered useless through poor workmanship. In such cases the proper procedure is to take the matter up with the dealer from whom you purchased the car, who will look after the return of such material for you. Credit if allowed, will be issued to the dealer's account with us.

   In any special cases, where a car owner feels that he has not been treated fairly by this policy, he is at liberty to take the matter up direct with us.

2. Chevrolet Motor Company of Canada, Limited, specifies in its arrangements with Chevrolet Dealers, that proper service facilities will be maintained. This means that the Chevrolet Dealer will maintain or arrange for a garage where repairs to Chevrolet cars may be made, efficiently and at reasonable prices.

3. Each Chevrolet Dealer is pledged to carry a certain stock of parts, sufficient for the requirements of his territory. The value of this stock is set by the Chevrolet Motor Company of Canada, Limited, and is your protection against unnecessary loss of time with your car. A very large stock of parts is carried by the factory and its Branches, from which Dealers or garagemen may purchase, immediate delivery being made.

4. The prices at which Chevrolet parts are sold is determined by the Chevrolet Motor Company of Canada, Limited, as set forth in our Price Lists, which are distributed from time to time. Overcharging on parts is not tolerated by us, and any cases of such may be taken up direct with the Company at Oshawa or Winnipeg.

5. Up-to-date printed Parts Lists, and Instruction Books are distributed from time to time. Each Dealer should have copies of these for you, free of charge.

6. Chevrolet Motor Company of Canada, Limited, attempts, at all times, to raise the standard of Service among the various Chevrolet Dealers by such methods as (1) Holding Service Conventions, (2) The publication of Service Bulletins, (3) The promotion of better and more modern garage equipment, (4) The introduction of such up-to-date methods as the "Flat Rate System" for Chevrolet Service Operations.

7. Inasmuch as certain items are guaranteed separately by their respective manufacturers, any trouble with them will be taken up by your Dealer, direct with the manufacturers or authorized Service Station. Chevrolet Motor Company of Canada, Limited, however, stands ready, at all times, to see that such service is properly maintained and that Chevrolet owners are fairly dealt with. This list includes Tires, Ignition Apparatus, Horn or other Signalling Devices, Starting Devices, Batteries, Speedometer and other trade accessories.

   Service Stations for the above are located at convenient points throughout the country, as listed on page 6 of this Instruction Book.

8. In taking delivery of your car, see that you receive the proper equipment. If you did not do this at the time of delivery, check over your equipment with the dealer, as soon as possible. This should include:

   (1) Full set of six side curtains, for Touring Models, and four for the Roadsters.

   (2) Spare Rim for extra tire.

   (3) Carpet for tonneau floor.

   (4) Rubber mat for front floor in open Models. Carpet in closed models.

   (5) Full Set of Tools as follows:
   2 Tire Removing Irons.
   1 Spark Plug Wrench.
   1 Dem. Rim Nut Brace Wrench.
   1 Auto Jack.
   1 Starting Crank.
   1 Tire Repair Kit.
   1 Hand Tire Pump.
   1 Hub Cap Wrench.
   1 Oil Can.
   1 Grease Gun.
   1 Remy Adjusting Wrench for distributor.

1 Instruction Package.
1 Tool Bag Assembly containing:
1 Punch.
1 Adjustable Auto Wrench.
2 Open End Wrenches.
1 Combination Pliers.
1 Screw Driver.
1 12 oz. Hammer (Ball Pein).

The Chevrolet Dealer is expected to see that you are given all necessary instruction in driving and caring for your car. Make sure that he gives you a registration card for your storage battery and electrical equipment. See to it yourself that these units are registered with the local or nearest Service Station at once. This will greatly assist you in receiving good service on these units.

A fresh obligation has been assumed by the Dealer and Company in the delivery of a new car to you. It is our business to see that your car performs its duty under normal conditions, and use. Please follow carefully, therefore, the instructions set forth in this booklet.

LOOK FOR THIS SIGN

This is the sign that means Reliable Parts are sold here. Parts that are guaranteed by the Chevrolet Motor Company of Canada, Limited.

Insist on having only guaranteed parts used on your car.

This means Economical Transportation.

FOR QUICK SERVICE

ON

accessories guaranteed by the individual manufacturers apply to the following service points as indicated.

REMEMBER

they are maintained for your convenience. All replacements or repairs should be referred to them.

NOTE:—With Electrical parts, Speedometers, Carburetors and Horns, give make of car, model, when purchased, dealers name, mileage at time trouble developed, Customer's name, serial number of Generator and Starting Motor.

ELECTRICAL SERVICE
OFFICIAL SERVICE STATIONS
AUTO LITE CONNECTICUT REMY

GENERATORS, STARTING MOTORS, LIGHTING & IGNITION SUNDRIES, CIRCUIT BREAKERS, DISTRIBUTORS, COILS, WIRING PARTS.

Province	City	Station
Nova Scotia	Halifax	Halifax Ignition Co., 72 Cornwallis St.
New Brunswick	St. John	Modern Electric Co., 54 Sydney St.
Quebec	Montreal	Battery & Electric Service Co., 172 Bleury St.
	Quebec	Louis Lavoie, 173 Bridge St.
Ontario	Ottawa	Independent Battery Co., 277 Slater St.
	Belleville	Quinte Battery Service, 133 Front St.
	Oshawa	Ontario Battery Service, 11 Church St.
	Toronto	Auto Electric Service Co. Ltd., 252 Victoria St.
		Toronto Ignition Co., 1503 Yonge St.
	Stratford	Harle Bros., 190 Ontario St.
	Brantford	Dell's Rubber Store, 18 King St.
	Barrie	W. L. Brennan
	Guelph	Guelph Storage Battery Service, 166 Upper Wyndham St.
	Owen Sound	Owen Sound Storage Battery Service, 9th St. E.
	Hamilton	Toronto & Hamilton Electric Co., 103 McNab Street, N.
	St. Catharines	Haney Auto Service, 50 Niagara St.
	Ingersoll	Fleisher & Jewett, Box 183
	London	Price & Hawke, 39 King St.
	Windsor	Howitt Storage Battery Service, 221 Sandwich St., W.
Manitoba	Winnipeg	Lion's Auto Garage Ltd., 230 Fort St.
Saskatchewan	Regina	Saskatoon General Electric Co., 2nd. Ave. S. on 19th. St.
Alberta	Lethbridge	Exide Service Station, 718—3rd., Ave., S.
British Columbia	Vancouver	The Battery House, 751 Burrard St.
	Victoria	The Rolfe Electric Co., 847 Yates St., at Quadre

OFFICIAL SERVICE STATIONS (Continued)

Stewart

SPEEDOMETERS, VACUUM TANKS, CASINGS, SHAFTS, CHAIN LINKS, Etc.

Province	City	Station
Quebec	Montreal	Stewart Products Service Station, 146 Bleury St.
Ontario	Toronto	Stewart Products Service Station, 587 Yonge St.
Manitoba	Winnipeg	Stewart Products Service Station, 644 Portage Ave.
Alberta	Calgary	Scarlett Service Station, 303 Seventh Ave., W.
British Columbia	Vancouver	Stewart Products Service Station, 1228 Granville St.

KLAXON - REMY

Distributors, Coils, Horns

DIRECT FACTORY BRANCH

United Motors Service Inc. - - - 490 Yonge St., Toronto, Ontario.

OFFICIAL SERVICE STATIONS

Province	City	Station
Nova Scotia	Halifax	Halifax Ignition Co., 72 Cornwallis St.
New Brunswick	St. John	Modern Electric Co., 84 Sydney St.
Quebec	Montreal	Auto Electric Service, 109 Sherbrooke St.
	Montreal	International Electric Co., 97 Bleury St.
	Montreal	Battery & Electric Co., 172 Bleury St.
	Quebec	J. L. R. Lorquet, 80 Rue D'Aiguillon.
Ontario	Belleville	Quinte Battery Service, 133 Front St.
	Brantford	Dell's Rubber Store, 18 King St.
	Hamilton	Toronto & Hamilton Electric Co., 103 McNab St.
	Ottawa	Welch & Johnston, 474 Bank St.
	Toronto	Auto Electric Service Co., 252 Victoria St.
	Toronto	Toronto Ignition Co., 1503 Yonge St.
	Windsor	Howitt Storage Battery Service, 221 Sandwich St.
Manitoba	Winnipeg	Lion's Auto Garage, 230 Fort St.
Saskatchewan	Regina	Magneto Service Station.
	Saskatoon	Lemery-Denison Electric Co., 11—23rd. St.
Alberta	Calgary	T. H. Peacock, 216—12th. Ave., W.
	Edmonton	T. H. Peacock, 10802 Jasper Ave.
British Columbia	Victoria	Rolfe Elec. & Battery Co., 847 Yates St.
	Vancouver	The Battery House, 751 Burrard St.

"ZENITH" CARBURETORS

DISTRIBUTORS

Province	City	Station
Ontario	Toronto	Cutten & Foster, Ltd., 302 Church St.
Manitoba	Winnipeg	Lion's Auto Garage, Ltd., 230 Fort St.
Saskatchewan	Regina	Bowman Bros. Ltd., 1827 Cornwall St.
	Saskatoon	Bowman Bros. Ltd., 234—20th. St., E.
Alberta	Calgary	The Motor Car Supply Co. of Can. Ltd., 514 Eleventh Ave., W.
British Columbia	Vancouver	Millen's B.C., Ltd., 1305 Granville St.

STANDARD WARRANTY

The Passenger and commercial automobiles and chasses furnished by the Chevrolet Motor Company of Canada, Limited, are warranted to be free from defects in material and workmanship under normal use and service, our obligation under this warranty being limited to making good at our factory any part or parts thereof, which shall within ninety days after delivery to the original purchaser, be returned to us with transportation charges prepaid, and which our examination shall disclose to our satisfaction to have been thus defective: this warranty expressly excludes, and is in lieu of all other warranties or conditions express or implied, and of all other obligations or liabilities on the part of the Chevrolet Motor Company of Canada, Limited, and we neither assume nor authorize any person to assume for us any liability in connection with the sale of Chevrolet passenger or commercial automobiles or chasses.

This warranty shall not apply to any Chevrolet passenger and commercial automobiles and chasses which shall have been repaired or altered outside of our factory in any way so as, in our judgment, to affect their stability or reliability, nor which have been subject to misuse, negligence or accident.

The Chevrolet Motor Company of Canada, Limited, makes no warranty whatever in respect to tires, rims, ignition apparatus, horns, or other signalling devices, starting devices, batteries, speedometer or other trade accessories, inasmuch as they are usually guaranteed separately by their respective manufacturers.

The Chevrolet Motor Company of Canada, Limited, reserves the right to make changes in design or add any improvements on Chevrolet passenger and commercial automobiles and chasses at any time without incurring any obligation to install same on passenger or commercial automobiles and chasses previously purchased.

CHEVROLET MOTOR COMPANY OF CANADA, LIMITED.

Subsidiary of General Motors of Canada, Limited.

Important Notice.

It is understood and agreed that our Standard Warranty is null and void on any Chevrolet Model where parts not made or sold by us are used in any replacements or otherwise.

WHAT TO DO UPON RECEIVING THE CAR

Every Chevrolet Car is thoroughly tested before it leaves the factory and all places requiring oil or grease are supplied with it. It has been our purpose to deliver into your hands a perfectly balanced, well-built automobile of honest and painstaking workmanship.

Your car, therefore, will be ready for use as soon as you have filled the cooling system with clean water and the fuel tank with a good grade of gasoline. After filling the tank with gasoline, tighten the tank cover securely to prevent evaporation.

As a precaution, however, and to avoid mistakes, examine your car: See that the tires are pumped up hard (air pressure should be

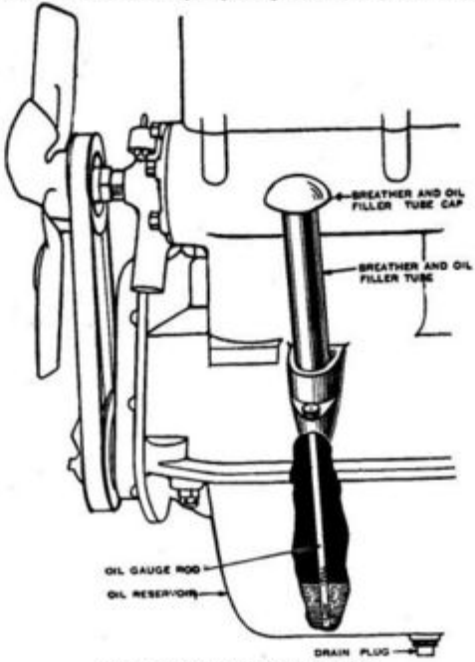


Fig. 1—Oil gauge and filler pipe.

about twenty pounds per inch of tire diameter), remove the caps on all grease cups and see that they are full. Raise the hood and examine the wiring—see that the terminals are tight upon the spark plugs, that no dirt or water covers the coil or ignition system, in short, see that all parts of the motor are clean and free from surplus oil or dirt. Make it your business thereafter, during the life of the car, to keep it in this condition and you will be sure of securing the maximum of service from your motor.

See that the oil reservoir is filled to the proper level with good clean fresh oil. (See Fig. 1). To read the gauge pull up the oil gauge rod located just below the oil filler and breather pipe. Wipe the oil off the rod. Insert the rod and remove it again. In this manner a true reading may be obtained. If the oil gauge rod shows the oil level to be below the full mark, remove the filler pipe cap and pour in a good grade of oil until the "full" mark is reached. Consult your dealer as to the proper oil for your car.

Do not put more oil into the oil reservoir than is required to bring the level up to the "full" mark on the oil gauge rod as the proper level is predetermined to give the best results and over-filling will simply mean increased consumption, smoking and carbonization.

Once a month or every 1000 miles in summer and every 500 miles in winter, all oil in the oil reservoir should be drained off and a fresh supply poured in. The old oil may be drained by removing the drain plug in the bottom of the oil reservoir. After the reservoir is completely drained, replace the plug and fill to the proper level with good oil. (See Fig. 1). Always use the best oil as it is the most economical in the long run.

MOTOR

HOW THE MOTOR OPERATES

The power of the motor is produced by burning or exploding charges of gas in the cylinders above the pistons, the resulting pressure forcing the pistons down.

The pistons are connected with the crank shaft by means of connecting rods and as they move up and down, turn the crank shaft around in a clockwise direction. At the rear end of the crank shaft is a heavy fly wheel in which the clutch engages and transmits the power to the rear wheels through the transmission or gear set.

In the four cycle motor, of which the Chevrolet is an example, it takes four strokes of the piston or two complete revolutions of the crank shaft for each explosion or working stroke in any one cylinder.

As the piston starts downward on the first stroke of the cycle, the intake valve is opened. The motion of the piston creates a vacuum in the cylinder and draws in a charge of gas from the carburetor through the valve opening.

When the piston has reached the bottom of its stroke and starts upward on the second stroke of the cycle, the intake valve closes and the piston compresses the gas that is drawn into the space in the top of the cylinder.

As the piston reaches the end of its upward stroke the compressed gas is ignited by an electric spark which occurs at the points of the spark plug and the resulting explosion or expansion pushes the piston downward, turning the crank shaft on the third or working stroke.

On the upward stroke of the piston, the exhaust valve is opened and the piston forces the remaining burned gas out through the exhaust pipe, leaving the cylinder empty and ready for the beginning of a new cycle.

STARTING THE MOTOR

These few details attended to, you are ready to start the motor

Before you can do so, however—in fact, before you can start the motor at any time—you must make certain of three things.

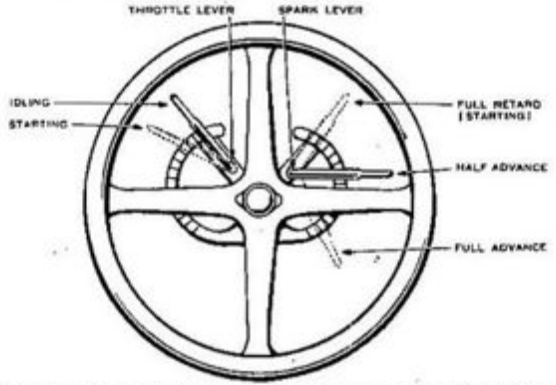


Fig. 2—Position of Spark Throttle Levers when starting Motor.

First, that the gear shifting lever is in neutral position, that is, it should be free to move from right to left.

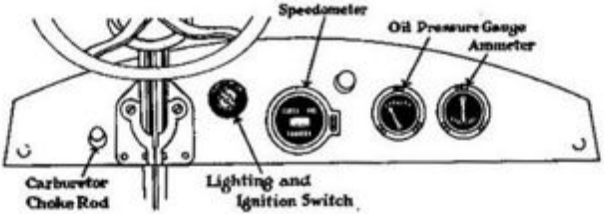


Fig. 3—Instrument Board

Second, that the spark and throttle levers are in proper positions for starting. (Fig. 2.)

Third, that the ignition switch is turned on. (Fig. 3) To do so, insert key, press it forward slightly until it will turn, then give it one quarter turn to right or left.

Be absolutely sure that the spark lever is properly retarded, as shown. Failure to observe this may cause serious damage to the starting equipment and subject you to unnecessary trouble and expense.

We will not be responsible for such damage, so observe this point without fail.

After being absolutely sure that all **three rules** given above have been carefully observed, start the motor.

Located on the floor boards (Fig. 4) within reach of the right

foot is the starting button. Press this down as far as it will go and hold it until the engine starts under its own power. **Remove your foot the moment the engine starts.** Serious damage can be done to the starting motor unless this is watched very carefully.

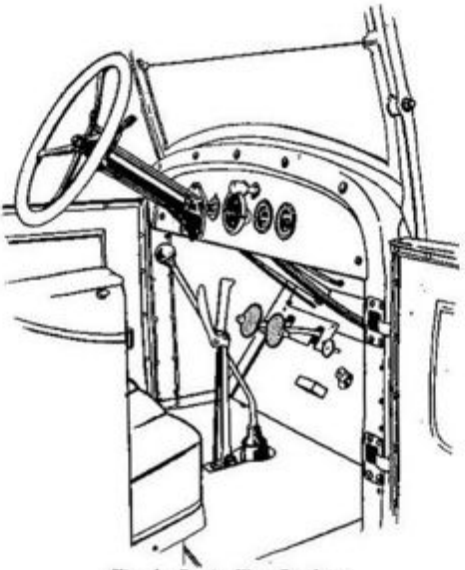


Fig. 4—Controlling Devices.

Never hold the starting button down for any length of time without stopping to examine the position of the levers, switch, etc., as failure to start is generally an indication that something is wrong and a prompt investigation should be made.

Owing to the difference in specific gravity of gasoline obtainable in various localities, and also to difference in atmospheric conditions, it is sometimes necessary to feed the motor a fuel mixture rich in gasoline and poor in air. This is particularly true in cold weather when the motor has become thoroughly chilled. This is done conveniently by means of the carburetor adjusting rod located on the instrument board (Fig. 3). In very cold weather it may be necessary to pull this rod all the way out. As the motor warms up, the rod may be pushed inward again until, when the engine is running

smoothly, being warmed up to the temperature of best efficiency, the rod should again be returned to its original position. The carburetor, before leaving the factory, has been adjusted so that the motor will run at its best efficiency with the least gasoline consumption, therefore always see that as soon as the motor warms up to the proper temperature the rod is returned to its original position as quickly as posible.

A mixture which is "rich" in gasoline heats up the motor causing lubrication troubles, with the consequent danger of "scoring," besides being wasteful of fuel.

MOTOR STARTED

It is not a good thing to let the motor "race" idle (run at considerable speed). Therefore, you should now retard the **throttle lever**, thereby cutting down the gas supply. **At the same time advance the spark lever** until both have the position indicated in Fig. 2.

It is best to retard the throttle lever until the motor turns very slowly, just fast enough to maintain its operation.

For the novice who has yet to learn how his engine works with the motor running but with the car standing still, it is well to try the engine-controlling devices—advancing and retarding the spark, opening and closing the throttle. In this way a fair idea may be gained of the effect of these controlling devices on the action of the motor.

When the car is being operated at a speed greater than fifteen (15) miles an hour, the spark lever should be advanced to the fullest extent. This brings the spark in the cylinder at the proper time to ignite the charge when it will be most effective. This places the spark in the cylinders a trifle in advance of the time when the piston reaches the top of the compression stroke, but it is necessary, as there is a certain lapse of time after the spark crosses the point of the plug before the gas is fully ignited. The full amount of the pressure is then brought to bear on the piston as it is ready to start on the downward or power stroke. By operating the spark in the retard position, when the car is traveling along at some speed, the motor runs hot as the late explosion develops considerably more heat.

When the motor is laboring in sandy roads or on a hill at low speed the spark lever should be retarded just enough to prevent the motor from having an ignition knock. This knock is brought about by the explosion or expansion taking place in the

top of the cylinder before the piston has reached the top of the compression stroke. The motor will develop its maximum power when the spark lever is operated in such a manner so as to ignite the gas at the moment the piston is ready to go downward on the power stroke.

ACCELERATOR

The accelerator pedal is located to the right of the service brake pedal. Pressing down upon this pedal causes the motor to be speeded up or "accelerated." When pressure is released a spring returns it to its normal position. The hand throttle lever and the accelerator pedal are interconnected. Advancing or retarding the hand throttle lever will move the accelerator pedal down or up, but pressing the accelerator pedal down will not actuate the hand throttle lever. It is possible, therefore, to set the hand throttle lever for any desired minimum speed so that when pressure is removed from the accelerator pedal the motor will not stop, but will drop to the minimum speed which you have selected. This arrangement gives greater freedom to the operator's hands, especially when it is necessary to shut off power when going around bad spots in the road, approaching turns or in passing other vehicles.

The hand throttle is used in starting the motor and in touring as an occasional relief to rest the foot at times when the car is run considerable distances without material changes in speed.

PUTTING THE CAR IN MOTION

When you are seated behind the steering wheel in the car, you have at your right hand a vertical lever moving in a ball and socket called the **gear shifting lever** (Fig. 4). This lever controls the various speeds of the car.

The motor is still idling along slowly and the gear shifting lever is still in the neutral position (vertical and free to move to right or left).

You are now going to set the car in motion on the first or low speed.

First, **advance the spark and throttle levers** to the position indicated in Fig. 2. The motor speed will be increased.

Fig. 5—Sketch showing change from neutral to low speed.

Second, **push down on the clutch pedal**, the one under your left foot (**Fig. 4**).

Third, move the gear shifting lever from the neutral position into first or low-speed position by moving it first to the left as far as it will go, and then backwards as shown in Fig. 6.

Fig. 6—Sketch showing shifting lever gear being changed from low to second speed.

In moving the gear-shifting lever be sure to avoid the left-hand forward or reverse position.

While you have been moving the gear-shifting lever you have kept the clutch pedal pressed down with the left foot.

Now let it come up, not suddenly, but gradually and smoothly, little by little, until the car moves slowly ahead. A little practice will soon show the proper clutch manipulation.

Remember, letting the clutch in suddenly is not only unpleasant to the occupants of the car, but very injurious to the entire mechanism.

Since you are in first or low speed your motor will run comparatively fast, but your car will travel slowly. Do not permit your motor to "race" at this stage.

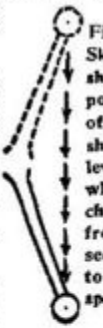


Fig. 7—Sketch showing position of gear-shifting lever when changing from second to high speed.

Be in no hurry to change into a higher speed, but let the car gain some momentum. If you are a novice run along for some distance on the first speed to get the "feel" and to gain the confidence of handling.

After the car has gained sufficient momentum, prepare for changing to second speed.

Speed the car up just a little by opening the throttle.

Release the clutch by depressing the clutch pedal, the one under your **left foot**, and while the car retains its slightly increased speed, and while you **keep the clutch released**, move the gear-shifting lever forward to neutral, thence to the right and right-forward position. (Fig. 6).

Now, let the clutch pedal come back easily as before, and at the same time advance both the spark and throttle levers slightly.

Allow the car to gain some speed (do not permit the motor to race), then prepare for changing to high or third speed.

Release the clutch as before and, while the clutch pedal is depressed, pull the gear-shifting lever straight back into the right-

rear position as indicated in Fig. 7. At the same time advance both the spark and throttle levers a little.

When you have become accustomed to changing gears, try using the accelerator pedal to "accelerate" the motor after making shifts from second to high or high to second. You will find it less awkward, besides giving greater freedom of the hands.

It is possible to move the gear shifting lever from any one position to another, only be careful:

To keep the clutch released while moving the gear shifting lever.

To avoid the left forward or reverse position while the car is moving.

To avoid "clashing" when engaging the gears.

When the gears clash press down a little more upon the clutch pedal and wait a moment before trying again. Remember, clashing the gears burrs up the edges of the teeth, injuring them and, in time, making gear changes exceedingly hard, besides necessitating an early renewal of the gears.

Be deliberate: It is well to pause a moment or two after disengaging the gears before moving into the next speed. The fundamental requirements in every case are that the gears to be meshed shall be revolving at as nearly the same speed as possible. By waiting a moment, time is given for this to take place.

In changing to a higher gear, slow down the motor while the gears are disengaged. When changing to a lower speed, speed up the motor while the gears are disengaged.

STOPPING THE CAR

When you have decided that you want to make a stop, release the clutch and at the same time retard the throttle lever, or remove your foot from the accelerator pedal. Allow the car to coast for a moment or two on its own momentum, then gradually press downward on the service brake pedal, the one under your right foot, until you have reached its limit of downward movement, or until the car comes to a stop.

By applying the pressure on the brakes gradually, and by permitting the car to coast for a distance on its own momentum, you can gauge your stop to a nicety and come to a stop exactly at the desired spot.

You must keep the clutch pedal depressed while the car is coming to rest, and **never under any circumstances take pressure off the clutch pedal** until after you have moved the gear-shifting lever from the high speed position into the **neutral position.**

When the gear-shifting lever is in neutral the transmission gears remain out of engagement and although the pressure on the clutch pedal be now removed, the car will remain motionless, although the motor continues to run.

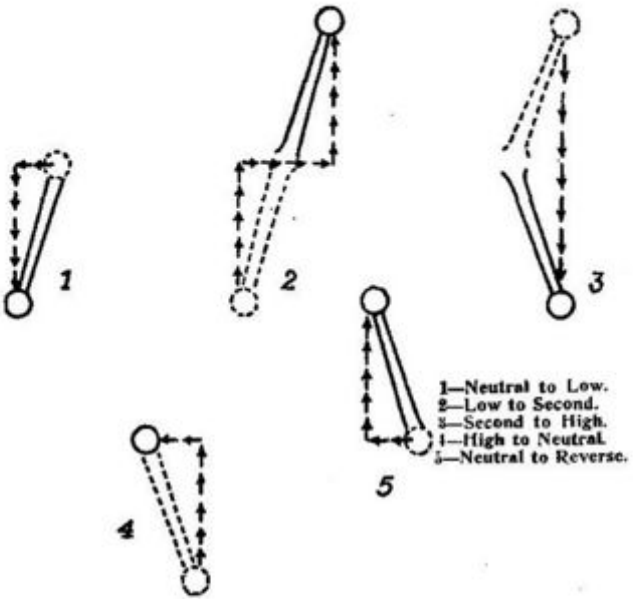


Fig. 8—Gear Shifting table.

If the stop is to be of some duration, always, before leaving the car, set the emergency brake (Figure 4) by pulling the emergency brake lever straight back towards you as far as it will go. Be sure that the pawl attached to the lever engages the tooth segment, otherwise the brake will not hold. To release the brake pull the lever towards you slightly. This causes the pawl to disengage more easily from the toothed segment then the lever can be pushed forward into its original position. Be sure the lever has been pushed forward as far as it will go, otherwise your brake may partially "set," using up power besides wearing out the brake linings.

To stop the motor turn the ignition key to the right or left one-quarter turn and remove it from the switch.

It is also good practice to turn the steering gear so that the wheels "turn in" toward the curb or side of the road. Should the brake, for any reason, be released, this will prevent the car from starting on a "wild plunge," should your stop be on a down grade.

MAKING AN EMERGENCY STOP

There are times when the ability to bring the car quickly to a stop is of the greatest importance. When this occurs, release the clutch by pressing the pedal under your left foot and at the same time **press down hard** on the service brake pedal, the one under your **right** foot. If this braking action is not sufficient to bring the car to a stop in the required time, "set" the emergency brake by pulling the emergency brake lever (Fig 4) towards you as far as it will go. By applying both the service and emergency brakes you apply braking effects in opposite directions, which will have immediate results.

As soon as possible retard the throttle to prevent the motor "racing."

If a full stop is not desired, merely a temporary slackening of the speed, **release the brakes first, then let the clutch pedal come up.**

If the speed of the car has been decreased to any great extent, it is advisable to shift into a lower gear. Never allow the motor to pick up a slowly-moving car on high gear. The strain placed upon it is very great, and the likelihood of "stalling" the motor easily offsets the small effort necessary to change speeds.

Be considerate: the manufacturers have placed three forward speeds at your disposal, each ratio of which is designed for certain loads and conditions. Don't overload the motor; the next lower gear, while a little slower, is in the end an insurance for longer life and more efficiency.

BRAKING EFFECTS

When the brakes are applied suddenly and with full force to the wheels of a car going at a considerable speed, the braking action will be so powerful as to immediately stop the rotation of the driving wheels. But the car will not come to an immediate standstill, its momentum will carry it forward, and the locked rear wheels will slide over the ground with most destructive effect on the tires.

The best method of using the brakes is that which applies pressure on them so gradually that the forward movement of the car and the rotation of the wheels come to a stop **together.**

Avoid spectacular stops; they are not only unnecessary, but indicate a desire to "show off" which is so disgusting to the average motorist. There may also come a time when through constant "showing off" the brakes will fail. The inevitable result will be a bad smash-up with its consequent danger to others.

The careful driver shuts his power off before he reaches the stopping point, and permits the car to carry him along on its momentum, bringing it, with a **gradual** application of the brakes, to a halt at the exact spot.

Never apply the service brake without first closing the throttle or disengaging the clutch if the car is moving at considerable speed as the braking effect would be destroyed, besides it is injurious to the mechanism. The motor can be used, however, in assisting to hold back the car when going down steep grades by leaving the clutch engaged and the transmission gears in first or second speed, as the resistance offered by the compression in the motor makes it unnecessary to apply brakes so hard that they might become overheated.

When operating the car in this manner, keep the throttle closed, but do not turn off the ignition switch, as a certain amount of unburned gas would accumulate in the exhaust pipe and muffler, and there is danger of bursting the muffler when the ignition switch is turned on.

STEERING

Steering is not a difficult task. Perfection comes from confidence, not from knowledge. Within a few minutes the novice will have learned just how much of a movement on the steering wheel is required to turn a corner, pass other vehicles or obstructions.

Turning the steering wheel to the left will cause the front wheels to turn in the same direction and the car will travel to the left. Turning the steering wheel to the right causes the car to travel to the right. This applies when backing up as well as when going forward.

Proceed cautiously, preferably on a road that is little frequented and wide enough to give plenty of room for your first attempt at automobile driving.

Don't forget that after turning a corner the front wheels should be "straightened" up, otherwise you will run off the road.

REVERSING OR BACKING THE CAR

Always bring your car to a "dead" stop before attempting to back up. Failure to observe this may result in serious damage to the transmission and cause unnecessary expense. With the car at rest and the gear-shifting lever in neutral release the clutch by depressing the clutch pedal and move the gear-shifting lever forward into the left position. (Fig. 9). Now let the clutch pedal come back easily and at the same time accelerate the motor speed by opening the throttle slightly.

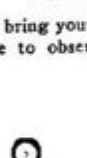


Fig. 9—Sketch showing gear shifting lever being moved from neutral to reverse.

Remember that in moving backward the same movement of the steering wheel will cause you to turn to the right or left as it would were you going forward.

Proceed cautiously—more accidents occur when backing up than when going forward, as you cannot see clearly, so take your time, look around and make sure that you have your car under such control that a stop can be made instantly.

A FEW HINTS ON DRIVING

Never drive your car at high speed over any road, much less a rough or slippery one. The slightest gain in time saved will not offset the liability of an accident nor the pounding and racking to which the car is subjected. Usually the time saved is unimportant when figured in dollars and cents. The resulting repair bills, which in time are sure to follow, are never unimportant.

It has been demonstrated that the motorist who drives his car at average speeds of from twenty-five to thirty-five miles per hour over all sorts of roads pays much more per mile for gasoline, oil and tires than the one who is more conservative and averages from 20 to 25 miles per hour.

In addition, a car which is driven at high speeds all the time is in the repair shop at frequent intervals, which adds to the cost per mile of operation.

It is not a question of how many miles are covered in a given time that counts, but the number of miles of useful travel that can be obtained at the least cost for fuel, oil, tires and repairs.

In times of emergency when to stop suddenly is absolutely necessary, remember the speed at which you are traveling combined with the road surface may spell safety or disaster for you, the occupants and your car. One cannot always observe closely road surfaces when traveling at high speed; the necessity of watching the road far ahead prevents. So, avoid excessive speed is a rule to be observed.

RULES OF THE ROAD

Road and traffic laws vary 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 practically universal in all parts of Canada.

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

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

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

Never turn around or turn off onto another road without making absolutely sure that there are no other vehicles behind you.

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

Do not cross street car or steam railroad tracks without making sure 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 vehicles following cannot stop as quickly as you can. If this is the case, a collision is sure to result.

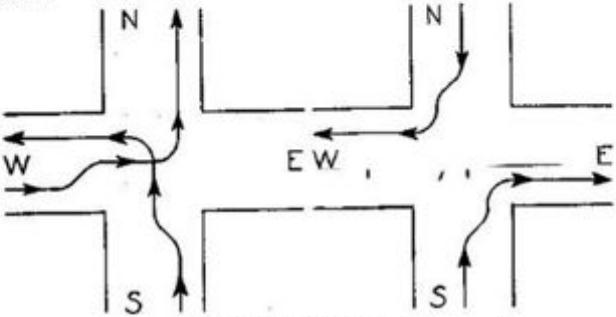


Fig. 10—Traffic diagram

On wet asphalt streets or slippery roads do not apply the brakes suddenly unless absolutely necessary. If the brakes are applied suddenly under these conditions a bad skid is sure to result.

When you have reached a point when you intend turning or stopping, always make your intention known to the driver following **before you reach that point.**

If you are driving north and wish to turn west, or if going east and intend turning north (Fig. 10): First, pull over so that you are traveling in the center of the road some distance from the crossing, and, second, before you begin to turn hold your arm out in a horizontal position so that the driver in your rear may be aware of your intention to turn. He can then pass to your right with plenty of room, and without danger of collision.

If you are driving north and wish to turn east, or if going south and intend turning west (Fig. 10): First, pull over near the curb or side of the road some distance from the crossing, and, second, indicate your intention to the driver in your rear before you begin to make the turn.

When you intend stopping, or, in crowded traffic, slow up, always make your intention known to the driver in your rear by holding your arm out from the side of the car in a horizontal position.

More rear-end collisions occur by neglecting to notify the driver following, that you intend stopping, or turning, than there are through carelessness on the part of the rear driver. Remember, the driver following cannot read your mind—all he can see is the rear of your car and the roadway between—he cannot see the road ahead of you, and is therefore dependent on you to prevent a collision and damage to both cars.

KEEP THE MOTOR CLEAN

Too much stress cannot be laid upon the necessity of keeping the motor clean. The dust drawn through the radiator openings as the car travels ahead contains grit, which, when wet with oil, forms a cutting compound that wears and scratches, leaving an irregular surface. This in time is sure to give trouble, so make it a rule to regularly clean all working parts. The slight inconvenience to yourself will be more than offset by the saving in repair bills later on.

SUMMARY

In order that you may get the maximum of enjoyment and comfort out of your car, you must be as considerate and thoughtful about it as you would of a fine horse that is as fine and costly as your car.

Therefore:

Do not race the motor unnecessarily.

Be warned by every abnormal noise; if a squeak, locate it and lubricate the part. If it is some other noise, locate the loose parts that cause it and tighten the bolts.

Don't tinker. Half the ability to make an adjustment or repair is the ability to discover its necessity.

Some motorists are said to have "luck" with their cars. There never seems to be any trouble, everything is trim and neat, the motor always starts when wanted and runs as long as is needed without any of the exasperating breakdowns on the road with which the unfortunate one thinks himself cursed through the carelessness of the manufacturer. With all adjustments carefully made when needed, every bearing and working part well lubricated, the whole car will work very sweetly and will continue to do so with only a very small fraction of the attention that would be absolutely necessary for the care of a horse.

By neglecting details you will save yourself some time and inconvenience in getting on your way; but the day of reckoning is sure to come. What you have saved will be spent in expensive roadside repairs.

DETECTING TROUBLE

MOTOR WILL NOT START

If for any reason the motor does not start immediately under its own power, remove your foot from the starting button at once. One of the following things may be causing the trouble:

The ignition switch has not been turned on.

Gasoline supply exhausted.

Vacuum tank may be empty due to connection on top of tank or suction line to intake manifold becoming loosened or the shut-off cock under the vacuum tank may be closed.

Filter screen in bottom of carburetor may be clogged with sediment so gasoline cannot enter float chamber (See instructions, Page 58 on carburetors, regarding the cleaning of this screen).

Gasoline line may be clogged with dirt or if it is in cold weather an accumulation of water in the line may have frozen.

The carburetor choke rod may not be pulled out far enough, providing the motor is cold to make the mixture rich enough to ignite, or the choke valve may have been closed too tight, causing the mixture to be so rich with gasoline that it will not ignite. (See instructions, Page 10, covering the operation of the choke rod.)

The storage battery may be partially discharged and when the starting motor is in operation, not enough electric current is flowing to the coil to produce a spark sufficient to ignite the gas.

The coil may be burned out.

The contact points in the igniter may not be opening or the points may be burned so badly as to remain open. (See Page 70 on adjustment of contact points).

The primary wire from coil to igniter, coil to switch or to battery, may be loose or broken, making poor contact.

Spark plugs may be fouled with oil or carbon.

Secondary wire from coil to distributor cover disconnected at coil.

WATER IN GASOLINE SYSTEM

If there is water in the gasoline it will not mix, and being heavier than gasoline will find its way to the bottom of lowest point in the system, which is at the carburetor. In cold weather it may freeze. By pouring hot water or applying hot cloths to the supply pipe of the carburetor, this can be loosened up. If poured on, be careful that none enters the carburetor.

MOTOR MISSES AT HIGH SPEED ONLY

There is insufficient gasoline flowing to carburetor due to obstruction in gasoline line or filter screen, or the shut-off cock may be only partly open.

A valve may be sticking slightly and does not come to its seat properly.

There may be a loose electrical connection.

The spark plug points may not be spaced properly. About 1/32 of an inch is the proper gap.

The springs on the contact arm in the igniter may be weak.

MOTOR MISSES AT ALL SPEEDS

Porcelain in the spark plug may be broken, allowing the spark to jump from the electrode in the centre of the porcelain to the shell of the plug before entering the combustion chamber.

One or more spark plugs may be fouled. Thoroughly clean the sparking points and porcelain with cloth dipped in gasoline.

A valve may be sticking. Remove and thoroughly polish the stems.

Compression may be poor due to pitted or warped valves.

A valve spring may be broken.

Push rods may be adjusted too tight.

Valves may not be seating.

Adjustment for the push rods may have become loosened and valve is not opening.

Filter screen in carburetor clogged and gasoline not flowing to carburetor properly.

One of the ignition wires may be loose and due to vibration makes and breaks the contact.

Contact points in igniter are not opening and closing properly.

Contact points may need cleaning or filing. (See Page 68).

The carburetor may be flooding causing the mixture to be too rich. This is usually caused by the needle valve not seating properly. to correct, remove needle valve cap, rotate valve slowly with fingers and tap lightly on top of the valve with a light hammer. This will cause a new seat to be formed and will also remove any obstruction or roughness that there may be on the needle valve seat.

MOTOR MISSES AT LOW SPEED ONLY

Compression is weak, due to leaky piston rings or valve not seating.

There may be a leaky gasket where the carburetor is attached to the intake manifold or where the manifold attaches to the cylinder head, permitting air to enter, weakening the mixture. To detect the

leak, take a squirt can filled with gasoline and squirt around where the connections are made. If any gasoline enters the opening, the speed of the motor will immediately increase thereby indicating a leak.

The regulator screw (See Figure 34) which regulates the flow of gasoline at low speed only may not be adjusted properly. (See Page 58).

The spark lever may be advanced too far. When running at low motor speeds the spark lever should be retarded.

When running at low motor speed the generator does not deliver electric current to the storage battery as the circuit breaker makes an "open" circuit in the line and ignition current is then supplied from the storage battery. If the battery is in a badly discharged condition it oftimes happens that insufficient current is being supplied for ignition purposes.

There may be one or more weak exhaust springs and with the throttle practically closed the vacuum created in the cylinders by the piston on the suction stroke will open the exhaust valve, drawing in burned gases and weakening the mixture so it will not burn. (See Fig. 12).

MOTOR STOPS SUDDENLY

If the motor stops suddenly without any further explosions:

Examine the switch, and at any point on the reverse side of the instrument board where wires are attached, as the storage battery, igniter and on the coil, for loose connections, as a wire might have become detached.

The switch may be burned out, or the key does not produce a contact.

Test the coil (See Page 70) to determine whether it is burned out, and, in fact, make a thorough examination of the entire ignition system.

Test the wires at the igniter (See Page 25) to determine whether electricity is getting through the ignition switch.

If it is found that the electrical connections are all tight and that there is electricity in the wires, examine the igniter, as the cam which operates the igniter may have become loosened and the contact points are not opening. If this is found to be the case see Page 72 for retiming igniter.

Examine gasoline supply.

Examine carburetor to see if gasoline is running into the float chamber. If motor has been running along evenly and finally stops, it is usually an indication that the gasoline supply is exhausted. When the gasoline gets below a certain point in the carburetor, an insufficient supply is furnished to the cylinders which produces a slow-burning mixture with the resultant backfiring.

MOTOR SPITS AND BACKFIRES

This is usually an indication of carburetor faults although the backfiring through the exhaust pipe or muffler may be due to defective ignition. If for any reason the igniter or ignition apparatus fails to operate for a few revolutions of the motor, there is a considerable amount of unburned gas forced from the cylinders into the exhaust pipe and muffler, then when the gas is ignited in the cylinders the flame which is emitted through the exhaust valve ignites the gas in the muffler, causing an explosion.

Backfiring and spitting through the carburetor is often due to a weakened mixture, which is slow-burning, and as there is still a certain amount of flame in the cylinder when the intake valve opens to receive the new charge of gas, the result is that the gas in the intake pipe is ignited. The cause is usually a low gasoline supply or a clogged gasoline system, or there may be small air leaks in the intake manifold or at the connections which allow air to enter, making the mixture too lean.

Carbon which collects on top of the pistons and in the combustion chamber will sometimes become heated until it is incandescent and will ignite the incoming gas prematurely.

One of the intake valves may be sticking and not getting to its seat in time. It should be removed and the stem polished.

DEFECTIVE IGNITION

First of all, ascertain whether the trouble is in the ignition instrument, the wiring, or the spark plugs. In most cases it will be found in the external wiring or plugs when one cylinder continually misfires.

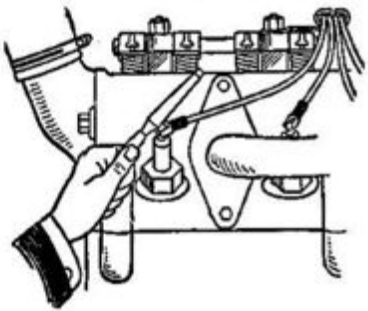


Fig. 11—Short circuiting spark plugs.

To determine the location of the trouble go about the task systematically—do not jump from one thing to another but satisfy yourself that each part examined is working in its proper position.

When the engine misfires, locate the particular cylinder at fault as follows: With a screw driver (having a wooden handle) touch the top of the terminal end of the spark plug and at the same time allowing the screw driver to come in contact with the cylinder head (Fig. 11). If a change in the motor running is noticed, that cylinder is work-

ing properly. Try each spark plug until one is found where "short-circuiting" the plug causes no change in the motor running. You have then located the particular cylinder that is missing.

SPARK PLUGS

The faults generally occurring in the spark plugs are as follows:

(1). Fouled or sooted plugs. These may be very easily cleaned with a brush dipped in gasoline.

(2). Broken insulation or porcelain. A close examination of the plug will determine if this is the cause of the trouble. Replacing the plug is the only remedy.

(3). Too wide gaps between the sparking points. The best width of spark gap is 0.020 inch, or slightly less than 1/32 inch. Larger or smaller gaps are detrimental to the ignition.

(4). The sparking points or electrodes have become burned to such an extent as to increase their resistence. Replacement of the plug is the best remedy.

If, after satisfying yourself that none of the things listed above is the cause of the trouble, find a cylinder that you know is working and put the assumed bad plug in that one and the good plug in the bad cylinder. If the trouble goes with the plug you are sure it is the plug if not, look elsewhere.

SPARK PLUG WIRES

To determine if the spark-plug wire is at fault disconnect it from the spark plug and hold the end about one-quarter inch from the plug. If no spark jumps across the gap with motor running, examine the terminals and insulation. Sometimes the copper wires break but do not damage the insulaton. If no exterior damage can be found replace the wire on the plug, and with motor running, slip the wire out of the socket on the distributor cap and hold it about one-quarter inch away from the brass ring on the socket. If a spark is given off, you are sure the wire is at fault, and should replace it with a new one. If no spark is obtained, remove the distributor cap and examine the passing contact pins protruding from the inside of the cap. If any are found burned or blackened on the points thoroughly clean and polish.

WEAK VALVE SPRINGS

As the valve springs are subjected to considerable heat, it follows that in time their "temper" will be effected.

By inserting a screw-driver or other suitable tool between the coils of the spring (Fig. 12) and turning it (while the motor is running) the tension of the spring can be increased. If the motor picks up and runs properly, replace the spring. If you have no new

spring at hand, remove the old one and stretch it about an inch. As soon as possible, however, a new spring should be secured and installed to insure a permanent repair.

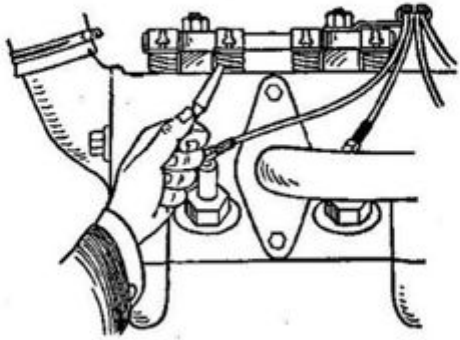


Fig. 12—Testing tension of valve springs.

TESTING IGNITER

If trouble is suspected with the igniter, first see if electric current is being delivered to the igniter by the primary wire from the switch and battery. If the igniter is functioning properly, the primary current will pass through the breaker arm and contact points direct to the coil when the contact points are closed. To determine whether there is any trouble at this point, disconnect at the coil the primary wire which leads from the igniter to the coil, and with the contact points closed and with the ignition switch turned on, strike the terminal end of the wire against the lead frame of the generator.

If there is a spark, the current is flowing properly. If no spark is obtained make the following examination:

Examine the spring on the distributor arm. See that this is not broken and that it is making a good contact with the high tension terminal in the center of the distributor cap.

Examine the primary wire. See that the insulation is good and that it is properly fastened to the igniter.

Occasionally oil or grease will get into the breaker box and form a connection between the case and the insulated contact point. Wipe out thoroughly.

There may be a "ground" in the igniter due to defective insulation between the supports of the contact points and the igniter housing.

Examine the contact points to see that they are opening and closing properly.

TESTING COIL

In order to determine if the coil is operating properly, secure a piece of wire, attach one end to the frame of car or motor casting or other metallic "ground," bring the other end to within $\frac{1}{4}$ inch inch from the point where the high tension wire (running from coil to the central terminal on the igniter) leads from the coil and turn the engine over by hand with the switch on. If a spark occurs at this point the coil is operating properly.

If no spark occurs and the primary circuit from the battery to the coil is intact, it is evident that the coil should be replaced or repaired.

There are times, however, when it is possible to obtain a spark in a test of this kind when the coil will not operate properly at higher speeds. If ignition trouble occurs and it is impossible to locate the trouble at other points, the coil should be taken to some repair station where a test can be made of the coil when it is operating under practically the same conditions as it is in the car when the trouble occurs.

TEST OF PRIMARY CIRCUIT

When testing the primary circuit there are practically only two things to be taken into consideration, namely: the condition of the contact points in the breaker box and the wiring.

TESTING IGNITION SWITCH

In order to test switch and determine if current flows through it, remove the wire from the terminal marked "Bat" on coil. Attach a wire to the negative terminal on the storage battery and bring its free end around so that it can be brought in contact with the free end of the wire which was removed from the coil. Then turn on the ignition switch and make and brake the circuit with the two wires by touching their free ends together. If no spark occurs, bring the free end of the wire attached to the negative terminal of the battery up to the switch and make and brake the circuit by touching the screw on the back of the switch marked C. If a spark is given off then the wire from the switch to the coil is broken or faulty, and should be replaced. If no spark is given off, there is doubtless an open circuit in the interior of the switch.

STARTING MOTOR DOES NOT OPERATE

This is not an infrequent source of difficulty and may be caused by any one of the following:

First—Exhausted storage battery due to excessive use of the starting motor or lights and is the direct result of failure on the part of the owner in not observing the rules set forth for the care of his battery. (See Page 66.)

Second—Broken or loose wires either at the battery, starting switch or starting motor. Examine all connections and wires carefully.

Third—Corroded terminals causing poor contact. Remove and thoroughly clean, then cover with vaseline or petroleum jelly.

Fourth—Starting switch making poor contact, having broken blades or sticking. Remove the switch and make necessary repairs.

Fifth—Starting motor may be "short-circuited" or may have shifted out of line.

MOTOR LACKS POWER AND IS SLUGGISH

This is very apparent when ascending a slight grade or in attempting to accelerate the motor suddenly, and may be caused by the following:

First—Carbonized valves.

As the motive power is obtained by burning or exploding a highly compressed gas mixture, it follows that a certain amount of carbon will be deposited on the **valve seats, piston head and combustion chamber.** Small particles of burnt carbon will lodge under a valve, especially the exhaust, holding it open. As this exposes the valve seat to the heat generated by the explosion, small pits or burnt spots will in time cause the surface to be so roughened as to prevent the proper seating of the **valves.** This will cause a leakage of gases, resulting in loss of power and uneven running of the motor. When this occurs, grinding the valves is the only remedy.

To determine which valves need attention, turn the motor over slowly by hand and note whether the same degree of resistance is met with in each cylinder. The ones offering the least resistance are those whose valves leak. Grinding the valves is the only remedy.

Second—Worn or broken piston rings.

This is sometimes difficult to determine in advance, especially if the valves are badly carbonized and need grinding. By removing the cap from the breather tube (Fig. 1) and holding the ear to the opening you can sometimes hear the gas "blowing" by the rings. Inasmuch as the cylinder head must be removed to make replacement of rings or pistons, it is advisable to examine carefully the valves before going further. Should the rings or pistons be worn, they should be replaced.

Third—Valve push rods set up too tight causing the valves to hold open. With the motor hot, test the valves clearance (Page 35) and adjust accordingly.

Fourth—Late or sluggish ignition.

This is not a common occurrance and is best detected by an almost entire lack of power; also, the motor will heat readily causing the water in the radiator to boil. Where it is very late, the motor will pound and knock on the slightest pull. Check up the timing of the ignition. (Page 73).

Fifth—Badly burned spark plug electrodes, which increases the resistance of the plugs, resulting in a weak spark. Replacing the plug is the only remedy.

MOTOR GETS HOT

The following causes will usually lead to a hot motor:

First—Low water supply in the radiator. It is just as necessary to have a full tank of water as it is to have plenty of gasoline or oil. Make it a rule to regularly inspect and fill the radiator.

Second—Radiator tubes stopped with lime deposits. The radiator should be thoroughly flushed and cleaned. (See Page 32.)

Third—Fan belt too loose, or broken, causing fan to stop rotating.

Fourth—Late or retarded spark. This is usually apparent by a marked loss of power, and can best be detected in that manner.

Fifth—Carburetor choke rod may be partially pulled out causing the mixture from the carburetor to be too rich. This point should be watched very closely and as soon as the motor gets warm after starting, the carburetor choke button should be pushed forward as far as it will go.

Sixth—Examine brakes and see that they are not dragging. Sometimes the emergency brake lever is left partially set.

Seventh—The igniter may have become loosened, resulting in a retarded spark.

MOTOR POUNDS OR KNOCKS

When a peculiar pound or knock, unusual to the regular motor sounds, is heard, it should be investigated to determine as nearly as possible its location and seriousness.

Go about the task of locating the source of trouble carefully—don't jump at conclusions, and, above all, do not operate your car until you are satisfied that no harm will result pending later repairs.

Nearly all motor noises can be definitely located. Some, however, can only be approximated. These noises are usually the result of:

First—An accumulation of carbon deposits on piston heads, valves and combustion chamber.

A motor which is badly carbonized will pound when the power is applied suddenly or when ascending a slight grade. Retarding the spark will reduce the noise; however, the motor will be sluggish heat readily, and labor on the slightest pull.

Carbon will deposit in the combustion chamber of any internal combustion engine, so do not be alarmed. However, at the first opportunity the cylinder head should be taken off, the carbon removed, and the valves reground (Fig. 20).

Second—Loose or worn bearings.

A bearing knock or thump can be detected in two ways: First, by accelerating the motor quickly, at which time a rattling and clashing sound will be produced; and, second, by starting the car with the brakes set, which will cause the motor to pull against resistance. By holding one end of a screw driver, rod or piece of wood to the ear and placing the other end at different points on the motor, the particular spot where the noise is loudest can be determined.

If it is found that the bearings have become loosened, they should be adjusted by a reliable mechanic.

Sometimes an ignition knock is mistaken for a loose bearing. Ignition knocks usually occur when the car is being operated on grades or in sandy roads with the spark fully advanced or when accelerating the motor after the car has been running at a low speed. By retarding the spark slightly, a knock or pound of this kind can be overcome. The spark should be advanced as soon as the car begins to reach its normal speed again and the going becomes easier.

COOLING SYSTEM

The cooling system as used on the Chevrolet is by means of a large cellular type radiator and a belt-driven centrifugal pump. As the circulating pump is connected to the lower radiator outlet

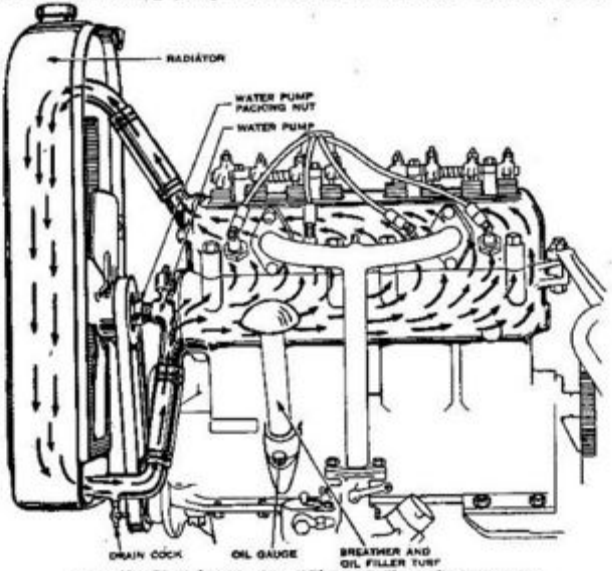


Fig. 13—Sketch showing "Chevrolet" cooling system.

the water is drawn through the radiator before being delivered to the water jackets surrounding the cylinder walls, which insures a proper circulation of cool water at all times, regardless of engine speed. (Fig. 13).

The circulating pump is readily accessible by removing the bolts holding it in to the cylinder jacket. Should water leak through the stuffing box on the end of the pump shaft, tighten the nut. If this does not stop the leak, unscrew the stuffing box nut and wrap around the shaft ordinary candle wicking that has been saturated with tallow or graphite grease and tighten the nut again.

The radiator at all times should be kept full, or trouble is sure to follow. It is a good plan to form the habit of inspecting and filling the radiator before the car is taken from the garage. On long tours, especially when you have been travelling over hilly roads or those with a loose top surface, examine the water supply quite frequently. Consider, always, that the proper amount of water is as important as your supply of gasoline and oil. It is well to examine the water supply every time a stop is made for oil or gasoline.

Always use clear water. If rain water can be had, use it, as less scale deposit will result.

Keep the cellular openings clean. Never allow mud to remain in them, as it cuts down the radiation and prevents proper cooling. The entire circulating system should be thoroughly flushed out occasionally. This can be done in ordinary cases by disconnecting both the upper and lower hose connections and allowing fresh water to enter the filler neck and flow down through the radiator and out the lower hose. The motor water jackets can be flushed out the same way.

When hard water has been used, a scale or deposit will be formed which, unless removed, will obstruct the circulation, causing unnecessary heating and frequent refilling. In this case a good way to clean out the scale is to dissolve a half pound of lye in about five gallons of water. Strain the liquid through a cloth and put in the radiator. Run the motor for about five minutes, then draw off the solution through the radiator drain cock. Fill the radiator with fresh water and run the motor again for several minutes, then drain off the solution and refill with fresh water. **Never use a more powerful chemical.**

Once a week it is a good plan to open the radiator drain cock and let all the water and accumulated dirt run out. If the water is very dirty, flush the radiator with fresh water.

Never—and be sure about this—put cold water into the radiator while the motor is **hot.** By "hot" we mean any temperature which is uncomfortable to the hand when held against the cylinder head.

When a motor gets "hot" the cylinder walls and especially the cylinder head around the exhaust ports are thoroughly heated up. The danger of cracking these ports cannot be overestimated, so make

it a point, should you stop for water after the motor has been running for some time, to test the temperature of the motor by raising the hood and placing your hand on the cylinder head. If you can hold it there with comfort, water can be placed in the radiator; if not, wait until you can. It will only take a few minutes for the motor to cool off, and the repair bill saved will more than offset the slight loss of time and inconvenience.

Leaks in any system subjected to vibration are likely to occur, so don't be alarmed if you find your radiator has "sprung" a leak. As soon as possible it should be soldered, as a leaky radiator is not only a source of some annoyance by reason of frequent refilling, but a seam, once opened up, is likely to get larger, resulting in sudden loss of water with disastrous results.

It is not a good plan to put corn meal, bran or other substances in a radiator to stop a leak. It clogs up the tubes, thereby decreasing the radiating efficiency. Make a permanent repair at the first opportunity.

WINTER DRIVING

As soon as the temperature begins to approach the freezing point, an anti-freezing solution should be placed in the radiator. Wood alcohol or denatured alcohol is best for that purpose.

The following table may be used in estimating the quantity of alcohol required for different temperatures:

(Wood Alcohol)	(Denatured Alcohol)
10 Per Cent 18° F. Above	10 Per Cent 24° F. Above
20 " " 5° F. "	20 " " 16° F. "
30 " " 9° F. Below	30 " " 7° F. "
40 " " 23° F. "	40 " " 2° F. Below
50 " " 36° F. "	50 " " 8° F. "

Since alcohol evaporates more quickly than the water, it is well when filling the radiator to make up the loss by adding a solution of equal parts of alcohol and water.

The use of powerful chemicals, while sometimes cheaper in first cost, is very likely to cause damage later, costing more in repair bills than the amount saved, as they attack the metal system and rubber hose connections.

If the radiator should freeze, do not try to thaw it out by starting the motor, but thaw it by placing in a warm place.

It is a good plan, when making a stop in cold weather, to cover the radiator and hood with a blanket or other covering. This helps hold the heat, and in that way gives considerable protection from the liability of freezing, besides making the motor start easier.

VALVES AND VALVE SETTING

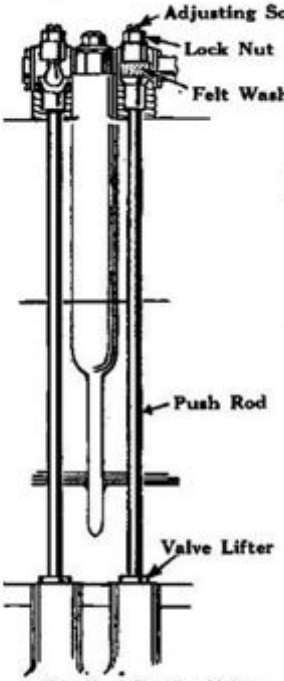


Fig. 14—Adjusting Valves.

The valve mechanism used on Chevrolet cars is recognized as the highest type of engineering practice, not only from the standpoint of greatest efficiency, but of simplicity as well, allowing, as it does, absolute freedom in making adjustments and renewals.

To keep the valves in a state of continued efficiency, it is only necessary to give attention to a few simple rules.

Keep all rocker arms, push rods and tappets clean and free from dirt.

Adjust when needed, the clearance between ends of valve stems and rocker arms. (Fig. 15).

Remove all pits and carbon deposits from valve seats when loss of compression or poor running indicates the necessity.

Too much stress cannot be laid upon the necessity of keeping the motor clean. The dust drawn through the radiator openings as the car travels ahead contains grit which, when wet with oil, forms a cutting compound that wears and scratches, leaving an irregular surface. This in time is sure to give trouble, so make it a rule to regularly clean all working parts. The slight inconvenience to yourself will be more than offset by the saving in repair bills later on.

HOW TO ADJUST VALVE CLEARANCE

The continual action of the push rod, opening and closing the valves, will in time produce wear which must be taken up.

To determine proper valve clearance, crank the motor by hand,

turning the motor until the valve tappet has reached its lowest position.

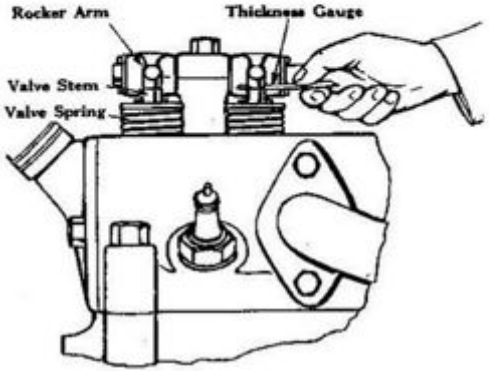


Fig. 15—Determining proper valve clearance.

The space between the rocker arm and the valve stem (Fig. 15) should be about .004 of an inch on the intake valves and about .006 of an inch on the exhaust valves when the valves are seated. The adjustment should be made when the motor is hot, so that the valve stems and push rods will be expanded to the limit. An ordinary sheet of letter paper is about .005 of an inch in thickness. If the space is greater than this, loosen the lock nut on the rocker arm adjusting screw (Fig. 14) and turn the screw slightly with a screwdriver until the proper clearance is obtained, then tighten the lock nut so that the adjustment will not come loose.

Fig. 16 shows one of the valve lifters removed for inspection or replacement.

Caution: The necessity for valve adjustment will show itself first by excessive clicking of valve lifters, and second by poor running of motor. It is not necessary to make alterations under any other conditions.

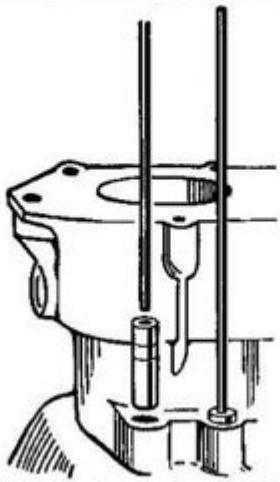


Fig. 16—Push rod and valve lifter removed.

In time the ends of the valve lifters where they come in contact with the cams will become worn to such an extent as to require replacement.

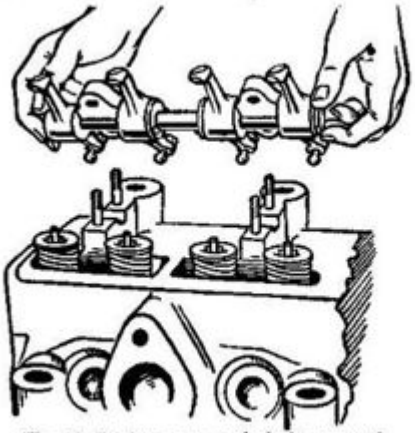


Fig. 17—Rocker arms and shaft removed.

GRINDING VALVES

To determine which valve needs attention, turn the motor over slowly by hand until the number one intake valve closes (the second valve from the radiator). The piston in number one cylinder is then traveling upward on the compression stroke. Then note the amount of compression or resistance offered. Keep turning the motor until the next to the last valve (from the radiator) closes and note the resistance in number four cylinder. Continue to turn until the third valve (from the radiator) closes and note the resistance in number two cylinder. Keep turning until the third valve from the rear closes and note the resistance in number three cylinder.

The ones offering the least resistance, or compression, are those valves which leak and need grinding (Note: Except piston rings leaking—see page 29).

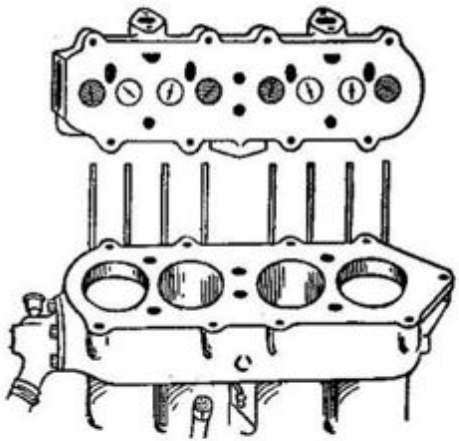


Fig. 18—Cylinder head removed

The grinding of a valve is not a difficult operation when undertaken with patience. First, it is necessary to remove the cylinder head as follows:

Disconnect the upper radiator hose connections and remove rocker arms and shafts (Fig. 17) then each of the bolts holding the cylinder head to the cylinder casting and lift the head off. (Fig. 18.)

To remove the valves, proceed as follows: With a screw-driver and your fingers press down upon the valve spring cap until the

spring has been compressed enough to admit pulling out the valve spring cap pin (Fig. 19.)

Remove each valve separately using care not to mix them in any way, as they must go back into the same valve holes.

Fig. 19—Removing valve springs.

Secure a light coil spring and place it around the valve stem before replacing it for grinding. Use a good grade of grinding material, the best being none too good if a satisfactory job is to be done. Smear the compound thinly on the beveled edge of the valve head and on the seat in the cylinder head. With a brace and screwdriver of good size rotate the valve back and forth (Fig. 20.) **Do not turn the valve through a complete circle,** as this will cause the compound to cut ridges on the surfaces. After rotating the valve a few moments release the pressure on the brace. This will cause the coil spring to act, lifting the valve off its seat. Turn valve slightly before again reseating for further grinding. Continue this method until the entire contact surfaces on both valve head and seat are polished and shows no dark spots. After the surfaces have become apparently properly ground, test the seats for unevenness, as follows: With a pencil mark lines on the beveled edge of the valve head about ¾ inch apart, and reseat the valve. Give it a one-half turn to the right, and then to the left, using a little extra pressure on the brace. If the valve has been ground accurately, each one of the pencil marks will be wiped away; but, on the other hand, if one line, or a part of one, remains untouched, there is an uneven spot, and the valve must be reground until it seats accurately.

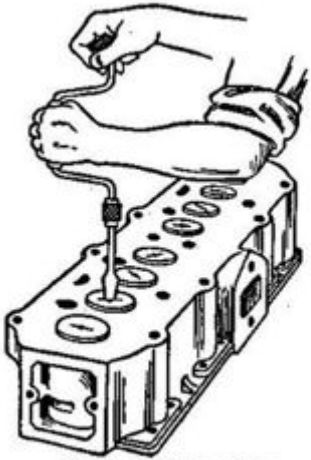


Fig. 20—Grinding valves.

The secret of good valve grinding comes only with experience; however if care is taken to properly rotate the valve back and forth with a reciprocating motion, and at the same time turning the valve so that at the end of several such movements the valve has been turned through a complete circle, a good job will result.

Never grind a valve more than is required to secure a good accurate seat. Excessive grinding will lower the valve seat so that in time the valve head will fall below the top edge of the seat and cause trouble. When this occurs the only remedy is to have an expert reseat the valves with proper tools and replace the worn valve heads with new ones.

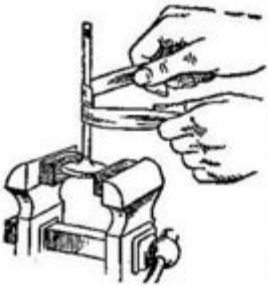


Fig. 21—Polishing Valve Stems.

After having secured a good finish and accurate seat, remove with clean cotton waste **every atom** of grinding compound from the valve head, valve seat and combustion chamber. Wash with gasoline or kerosene and then flush the valve guides. **Be sure about this,** as it requires only a small particle of abrasive to cause trouble.

While you have the valve out, examine the stem, removing every particle of carbon and grit. Do not use a file for this purpose, but a fine grade of emery cloth. A good way to do this without the liability of getting the valve stem out of round is to clamp the valve head between wooden blocks or copper jaws (Fig. 21), then with a strip of emery cloth about ¼ inch wide wrap it around the stem one and one-half turns. Grasp the free ends of the cloth and pull back and forth, at the same time causing it to slide up and down the stem.

REMOVING CARBON DEPOSITS

Before finally replacing the valves it is a good plan to scrape off all carbon deposits from the combustion chamber; however, care must be exercised not to scratch the surfaces of the valve seats. Do not leave any projections of carbon, as they will heat up and cause pre-ignition.

At the same time remove the carbon deposits from each piston head. Scrape clean, but use care not to scratch the surfaces, as this will provide a "pocket" to catch carbon more easily. Brush out all the particles of carbon, and finally wash with clean kerosene.

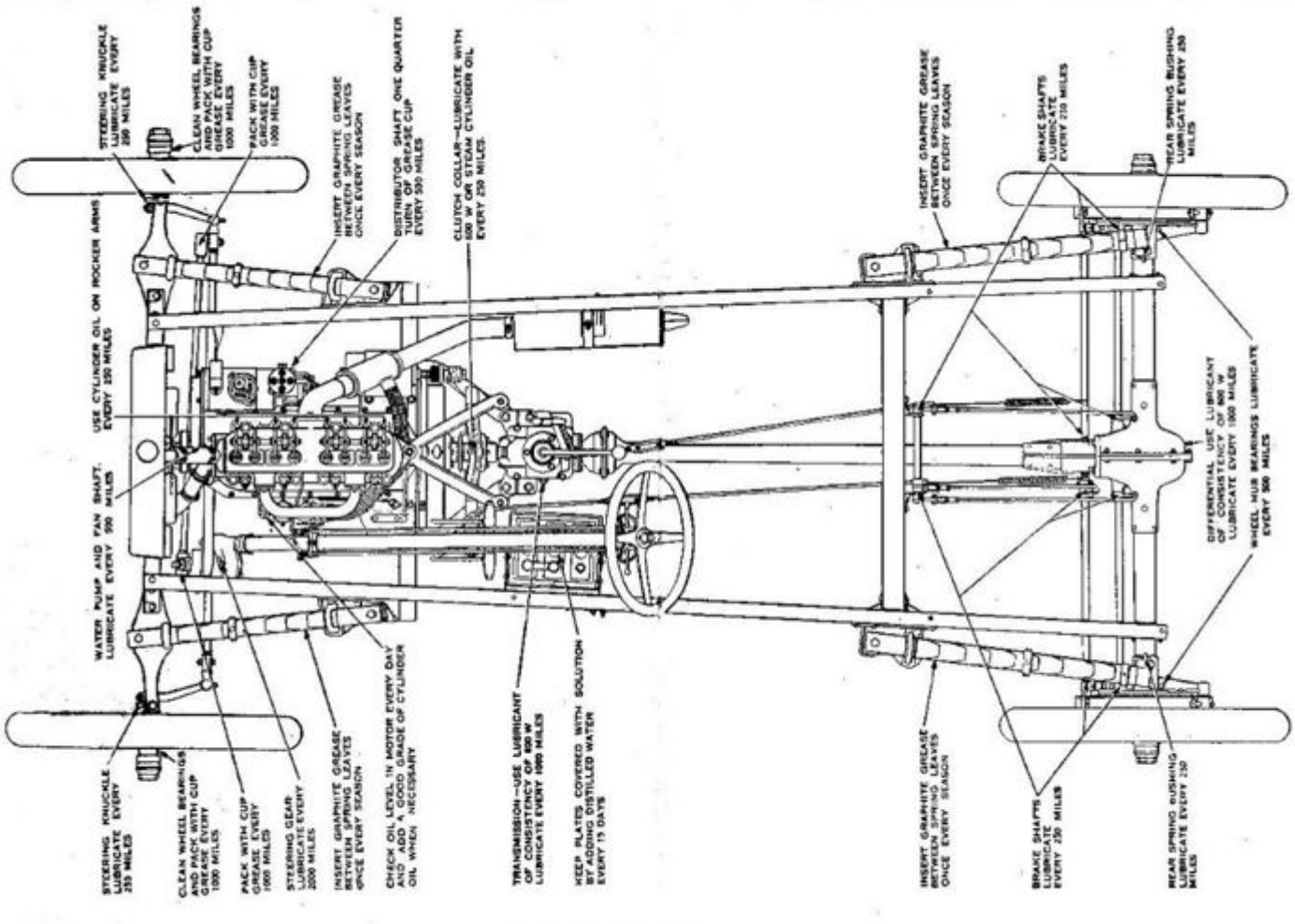


Fig. 22—Lubrication Chart.

Before replacing the cylinder head examine carefully the copper asbestos gasket. If any weak spots appear, it is better to replace the gasket than to try to use the old one, as much depends upon a good fitting gasket. In replacing the cylinder head bolts, run each one down until the head just touches the boss on the cylinder head, then—and be sure about this—**tighten each one evenly a little at a time until finally all are tight.** No one bolt should be drawn down tight until all are set snug.

MOTOR LUBRICATION

The oiling system used on Chevrolet cars is known as the constant-level splash system. The oil is carried in a reservoir located at the bottom of the crank case and is filled through a filler tube on the left side of the motor, just back of the fan.

Oil is drawn from the oil reservoir by a geared pump located on the timing gear cover, and is then "fed" into a basin having four troughs or depressions into which the spoons or splashers on the ends of the connecting rods dip.

The rapid "splashing" of these spoons keeps the main bearings, connecting rod, piston pins and cylinder walls bathed in oil, from whence it drains back into the reservoir, to be used over again.

Once every 1000 miles the lower crank case should be drained removing the drain plug, and thoroughly flushed with kerosene. This removes all "old" or "burned" oil and prevents clogging of oil holes and pockets.

Be absolutely sure that all the kerosene is drained off, otherwise it will mix with fresh oil and will cut down its lubricating qualities.

Fresh oil is cheaper than repair bills, so observe this point regularly.

Use light cylinder oil to lubricate the rocker arms and push-rod felts. Keep the felts saturated with oil. Grease the fan every time you oil the rocker arms.

OIL PUMP

Upon the oil pump depends the successful lubrication of the motor. The pump used on Chevrolet Cars has been simply designed to give a constant, even supply of oil with a minimum of parts and a consequent lessening of pump trouble. Under normal conditions you will not experience the slightest trouble, and will need to give no thought to this important part; however, as a safeguard, and to avoid accidents, a registering dial is mounted upon the instrument board (Fig 3) so that the motorist may observe the action of the pump.

Should this dial for any reason show that the pump has stopped working the car should be stopped at once and the source of the trouble located and remedied. Usually this will be found to be due to

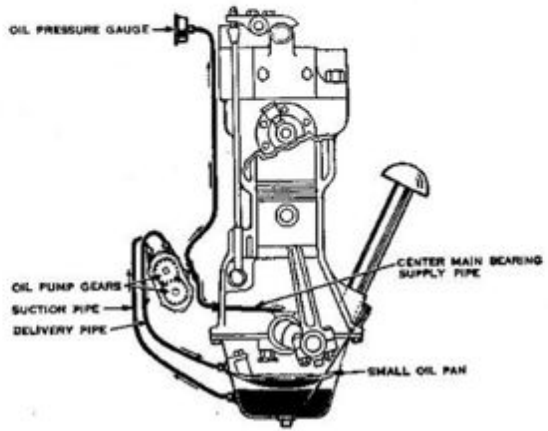


Fig. 23—Sectional view of engine lubricating system.

air leaks in the suction pipe (Fig. 23), and can, in most cases, be corrected by tightening the connections at the upper and lower ends. Occasionally dirt and unburned carbon will form as a sediment and be drawn into the suction and feed pipes, obstructing them, in which case they should be taken off and blown out.

Get into the habit of noting the action of the registering dial regularly—not in the expectation of trouble, but to avoid its possibility and resulting large repair bill. Every few minutes as you drive along, look at the dial—it only takes a second, and requires no special effort. Failure to make proper observations may cost you in time and money several times this amount.

OIL GAUGE

The needle or hand of the oil gauge is actuated by the pressure of oil against a column of air in the tube from the oil pump to the gauge. This instrument is self-contained and will require no attention itself. Should the dial indicate that the pump has stopped working, disconnect the **Supply Pipe** (Fig. 23) at the pump. If the pump is working, oil will be discharged, and the trouble is in the air line or dial. Examine the air line, especially the connections, and see

that they are tight. If tightening the connections does not remedy the trouble, take a squirt can full of oil and, with motor running slowly, squirt oil along the entire length of the air line. If the tubing has split, bubbles will appear at the leak. If the air line is in good condition then it is evident that the gauge is at fault and it should be returned to the makers for repair.

GENERAL LUBRICATION

The chart on lubrication (Fig. 22) shows where and when to lubricate the different units of a Chevrolet Car. The thing to bear uppermost in mind is that oil and grease are much cheaper than repair bills and that a slight inconvenience to yourself is necessary, if you are to secure the maximum of useful service from your car.

Don't wait until you hear a "squeak" before oiling. A "squeak" means a rusted or dry bearing, and when once in that condition trouble soon follows.

The compact construction of a Chevrolet makes necessary the placing of oil holes and grease cups under the floor boards of the car. Don't, because it might cause you a little extra trouble, forget to remove them and lubricate as directed.

We guarantee that, when adjusted and lubricated, following the instructions contained in this booklet, your car will give you a maximum of service at a minimum of upkeep cost.

For those who wish we have prepared an enlarged cut of the oiling chart which can be tacked on the garage wall for handy reference. Write us for this chart.

CLUTCH

The clutch use is the conventional cone engaging with a beveled edge of the fly wheel. The "face" of the cone is covered with a leather band firmly riveted to it. To prevent "grabbing," expanders are placed under the clutch leather so as to present slightly raised points of contact. If the clutch takes hold too quickly and causes the car to start with a jerk, it is an indication that the clutch leather expanders need adjusting. To do this, turn each of the expander nuts to the right, until they lightly touch the clips, and then give them a half turn to the left. This unscrewing a half turn allows the expander to act properly under the clutch leather.

The clutch leather will in time "dry" out, resulting in "grabbing," or slipping. Once a month rub a little neat's-foot or castor

oil on the leather to soften it. Should the clutch leather become greasy, apply a little Fuller's earth to it. **Do not use sand or other gritty substances** to make a slipping clutch hold. If you do, you simply are inviting a large repair bill.

Should the clutch leather become worn because of continued slipping, it should be replaced. We carry in stock clutch bands ready for installation and recommend ordering from us or your nearest dealer when this becomes necessary.

As the clutch leather wears, the clutch will set deeper in the fly wheel, bringing the clutch pedal more closely to the floor board. There

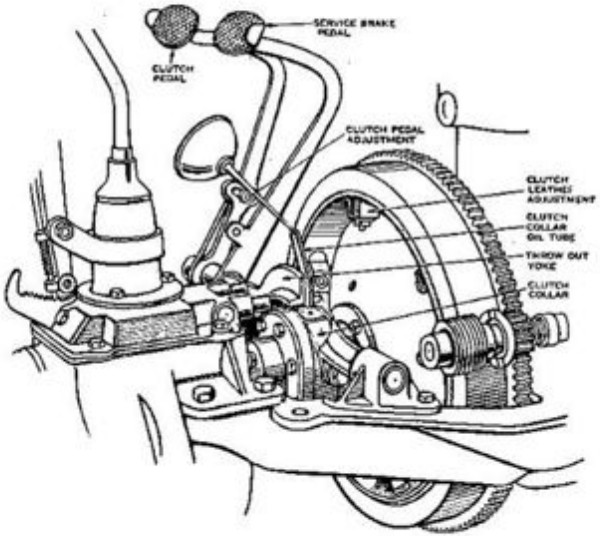


Fig. 24—Clutch and operating mechanism.

should always be sufficient clearance between the pedal and the board to permit the clutch to seat properly. If not, it will slip. An adjustment is provided on the shank of the pedal (See Fig. 24) to compensate for the wear of the leather.

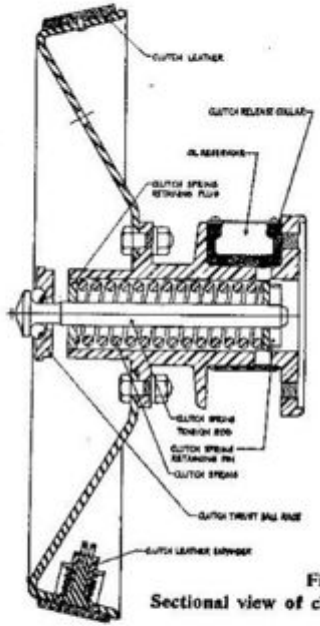


Fig. 25—
Sectional view of clutch and release collar.

LUBRICATING CLUTCH COLLAR

The clutch collar consists of a hollow bronze casting. In its friction surfaces plugs are inserted extending into an oil receptacle formed by the hollow casting; through these plugs the oil exudes (or sweats) and lubricates the friction surfaces.

Fig. 24 illustrates the proper method to pursue in oiling the clutch collar.

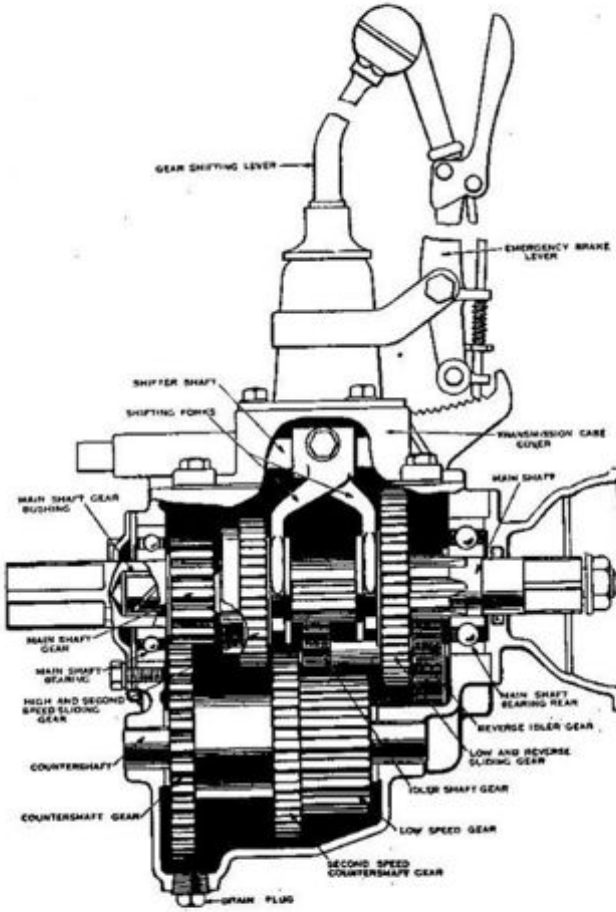


Fig. 26—Sectional View of Transmission.

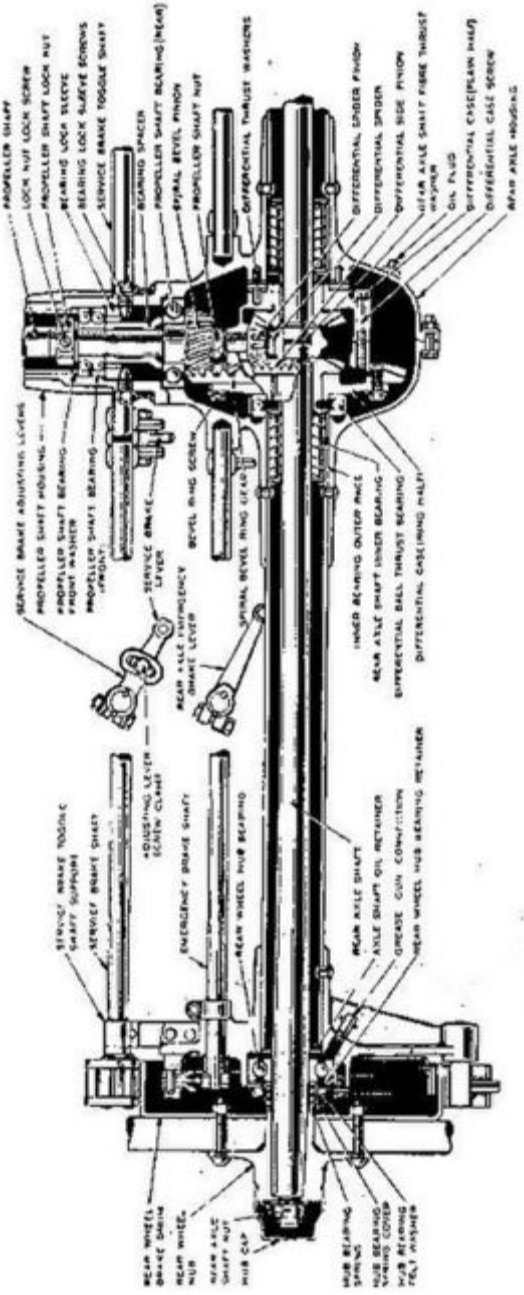


Fig. 27—Sectional View of Rear Axle.

The clutch collar should be oiled regularly every 250 mile with cylinder or machine oil.

TRANSMISSION

The transmission is of the selective type, having three speeds forward and one reverse. Stripped of technicalities, it is composed of a countershaft on which are keyed three gears and a main or splined shaft on which slide two gears, which by lengthwise movement can be made to engage the gears on the countershaft (Fig. 26).

The fundamental requirement is in every case to first engage the gears so that the entire tooth "face" of the sliding gears mesh with those on the countershaft; and second, to properly lubricate all working parts. Proper engagement can be had by being sure when shifting gears that the gear-shift lever travels as far forward or backward as it will go without straining before re-engaging the clutch.

To lubricate the transmission, fill every 1000 miles with No. 600W steam cylinder oil (not grease) so that the oil level stands even with the opening in the elbow filler on the left side of the case.

Once every 2000 miles it is a good plan to wash out the transmission with kerosene to remove any chips of metal knocked off the gears, or other substances. To do this, remove the drain plug at the bottom of the transmission case and allow the oil to drain off, after which flush out thoroughly and refill with oil.

REAR AXLE

The rear axle on the Chevrolet Superior cars is of the semi-floating type.

The axle shafts are supported on the outer ends by heavy duty ball bearings fitted to the taper on the axle shaft and at the inner ends by heavy duty roller bearings.

A glance at the illustration Fig. 27 shows the construction and relative positions of the various units.

The driving torque is transmitted from the motor crankshaft through the clutch and transmission to the propeller shaft.

On the end of the propeller shaft is mounted a bevel pinion called the **Spiral Bevel Pinion,** with spiral cut teeth, which mesh with a large ring gear called the **Spiral Bevel Ring Gear.** This in turn is securely bolted to a housing called the **Differential Case.**

Inside the differential case are mounted five gears. Two of these, called the **Differential Side Pinions,** are fastened to the ends of the axle shafts. The other three gears, called **Differential Spider Pinions,** are mounted on the **Differential Spider** and mesh with the two **Differential Side Pinions.**

The function of a **Differential** is to permit one rear wheel of the car to travel faster than the other, or independent of the other when required. If such a device were not used, turning corners

would be difficult, as without it both wheels would have to move at the same speed, whereas a turn demands that one wheel travel faster than the other.

When the car is travelling over uneven road surfaces, turning corners, or on the side of the roadway, considerable end play or "thrust" is transmitted to the differential. To prevent injury, and to reduce the power loss due to friction, a suitable bearing called a **Differential Ball Thrust Bearing** located on the left side of the differential gear case is used, composed of hardened steel balls mounted between steel washers.

To compensate for wear and to allow proper adjustment of the Differential Drive Gear and Drive Pinion, differential thrust washers are inserted on the right side of the differential case.

The weight of the differential and the driving torque is carried by two roller bearings on either side and bearing on the main axle shafts.

The propeller shaft is housed inside the **Propeller Shaft Housing** and is supported at its lower end by the propeller shaft which is mounted on the hub of the spiral bevel pinion. A ball bearing called the **Propeller Shaft Bearing Front** absorbs the end play of the shaft and driving thrust.

One end of the propeller Shaft Housing is flanged and bolted to the axle housings. The opposite end is supported by a **Ball and Socket Joint,** inside of which works a **Universal Joint** connecting the propeller shaft with the main or splined transmission shaft.

REAR AXLE NOISES

In some axles there is a slight and steady hum which is usually present when gears are used, whether in an axle or otherwise. This noise should not be confused, neither should the motorist become alarmed if it continues steady and uniform.

If a loud noise develops, there is no absolute method of diagnosis except to have the axle disassembled and an examination made of it by a reliable mechanic.

LUBRICATION

An oil of the consistency of 600W should be used to lubricate the differential, and an examination should be made about every one thousand miles. By removing the oil plug on the right hand side of the differential housing, the amount of oil in the housing can be determined. The housing should be filled until the oil is level with the lower edge of the opening from which the oil plug was removed.

REAR WHEEL BEARINGS

Heavy duty ball bearings mounted on the axle shafts carry the car load and insure minimum of power loss and upkeep cost. Outside of seeing that these bearings are properly lubricated by forcing grease through the grease gun connection (See Fig. 27) they should require no attention from the owner.

BRAKES

As will be shown by reference to illustration (Fig. 28), the service brake is the outside or external, and the emergency the inside, or internal. One, the service, contracts on the outside of the brake drum, and the other, the emergency, expands against the inside of the drum.

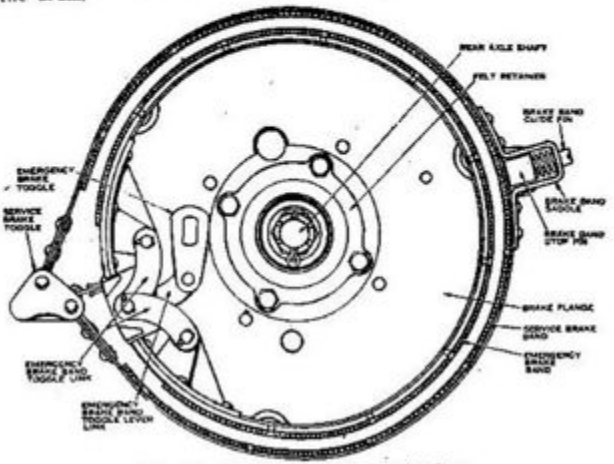


Fig. 28—Chevrolet brake mechanism.

ADJUSTING BRAKES

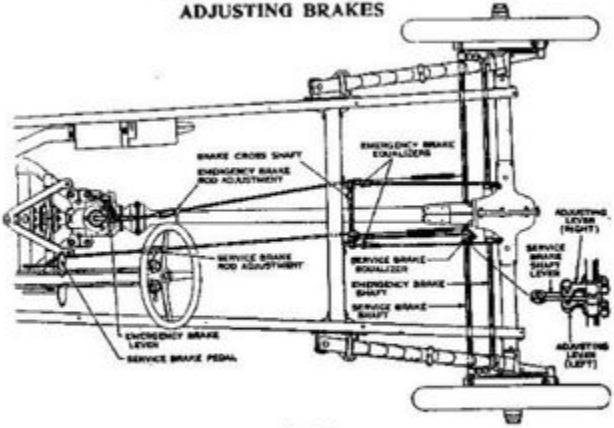


Fig. 29

ADJUSTING BRAKES

No part of an automobile is more neglected by the average user than the brakes. They are of the utmost importance and no effort should be spared to insure their dependable condition at all times. The brakes on the Superior Chevrolet are simple and at the same time very effective and require a minimum of attention. However, the owner should safeguard the car and its occupants by making a rigid inspection at frequent intervals to make sure that all is as it should be with the brake operating parts.

When adjusting the brakes, both rear wheels should be jacked up so that each wheel can be turned to see that it is free when the brakes are released. When the brakes are properly adjusted, the brake bands will not bind or drag on the brake drum and yet be close enough so that when either the service or emergency brake is set the forward motion of the car will be stopped.

When the brake pedal is pressed down as far as it will go without stopping the forward movement of the car, shorten the rod between the service brake pedal and brake shaft (See Fig. 29) by loosening the lock nuts on each side of the "Service Brake Rod Adjustment" and turn the turn-buckle to the right or clockwise.

This adjustment controls the braking action of the service brake on both rear wheels and in the event that one brake should grab or take hold too quickly, they can be equalized by loosening the bolt on the **Service Brake Shaft** lever mounted on the brake cross shaft at rear of the propeller shaft and change the relative positions of the right and left adjusting levers (See Fig. 29) by moving the adjusting levers forward or back as the case may require.

When the hand brake lever is pulled back as far as it will go without stopping the forward movement of the car, shorten the rod between the hand brake lever and the brake shaft by loosening the lock nuts on each side of the "Emergency Brake Rod Adjustment" and turn the turn-buckle to the right or clockwise. This adjustment controls the braking action of the emergency brake on both rear wheels and in the event that one brake should grab or take hold too quickly, they can be equalized by loosening the lock nut just back of each emergency brake equalizer (See Fig. 29) and turn the brake rod yoke to the right to tighten on the emergency brake and to the left to loosen on the emergency brake.

Examine the brakes frequently and if after considerable use you find that practically all of the available space for adjustment has been used, new brake linings should be installed. Do not neglect your brakes.

STEERING GEAR

The steering mechanism used on Chevrolet cars has been designed to give the greatest ease of handling with the least amount of wear and consequent adjustment. No part of the car is so vital, there-

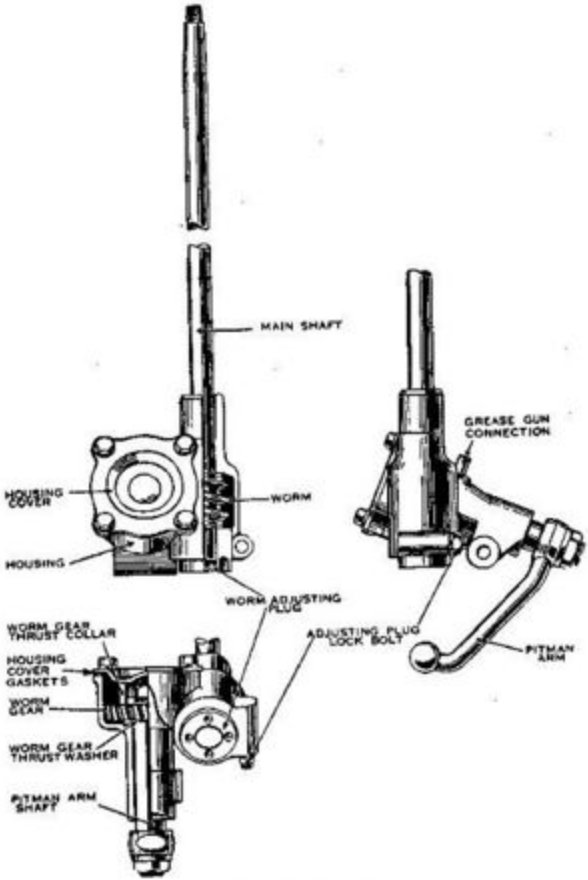


Fig. 30—Steering Gear.

fore it is absolutely essential that it be well lubricated and any looseness immediately corrected. Go over all the connections regularly and tighten any bolts or nuts which are loose, supplying grease and oil where needed, as this is the only safe insurance against a costly accident.

The steering gear on the Superior Model is the worm and worm gear type, in which the worm on the steering gear main shaft meshes with a worm gear on the pitman arm shaft. (See Fig. 30).

To take up the end play in the worm and main shaft loosen the adjusting plug lock bolt and turn with a spanner wrench, the worm adjusting plug to the right. After the adjustment has been made be sure that the adjusting plug lock bolt is again tightened securely. To compensate for wear and to eliminate end play in the pitman arm shaft and worm gear, remove the four cap screws holding the housing cover in place and vary the thickness or number of the housing cover gaskets at this point. (See Fig. 30) which will change the position of the worm gear thrust collar.

The steering gear should be well lubricated at all times. Use a high grade of cup grease forcing a liberal quantity into the steering gear through the grease gun connection, (See Fig. 30) every 2,000 miles by use of the grease gun. (See Oiling Chart, Page 41, and refer to General Lubrication, Page 44.)

The ball and socket connection on the outer end of the pitman arm and on the opposite end of the steering connecting rod should be greased with cup grease every 1,000 miles and any looseness or play removed by tightening the adjustment nut in the end of the rod. (See Fig. 32.) Be sure to fasten the adjusting nuts securely with the cotter pin after the adjustment is made. Failure to do so may cause a serious accident.

FRONT WHEEL BEARINGS

The front wheels run on New Departure ball bearings (Superior Model) which are lubricated through a grease plug on the hub flange, and by filling the hub caps with soft cup grease. In mounting the front

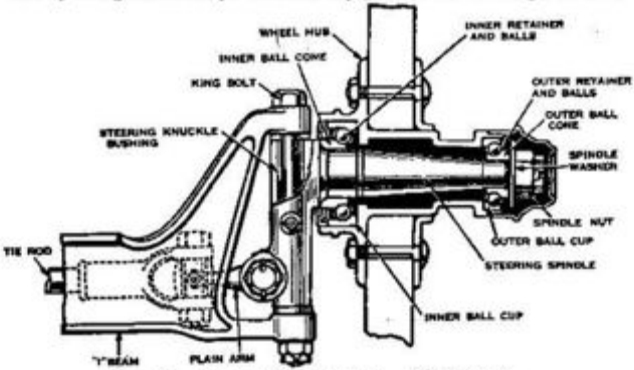


Fig. 31—Front wheel bearings. (Ball type).

wheels, care should be exercised to thoroughly saturate the cone and balls with this grease and also fill the space between the inner cone

and dust enclosure with grease. The best lubricant for front wheel bearings is a straight mineral grease which does not contain any free acid or acid-forming compounds, and which is also entirely free of graphite, asbestos fibre or other foreign matter.

There are two bearings to each front wheel (Fig. 31) and these are held in adjustment by the spindle nut which is fastened with a cotter pin and also by a safety washer which is interposed between the spindle nut and the cone to the outer bearing.

The bearings should be adjusted by drawing the spindle nut up tightly, revolve the wheel a few times to insure that all parts are operating satisfactorily, at the same time tapping the safety washer lightly to insure a proper contact with the outer bearing. The wheel will now revolve somewhat stiffly. Turn the wheel until the valve stem is at the top; unscrew the spindle nut until the weight of the valve stem causes the wheel to rotate, then insert and spread the cotter key. When adjusting wheel bearings, it is sometimes advisable to insert a chisel or a small bar between the axle and the steering knuckle to insure that any play in the steering spindle bolt is not confused with play in the bearings.

FRONT WHEEL ALIGNMENT

To make steering easy it is required that the front wheels should "toe" in; that is, the distance between the inside faces of the wheel felloes, measured at the height of the wheel hubs, should be $\frac{1}{8}$ in. more at the rear than at the front. This causes the wheels to grip the road better, and allows the car to hold its course without undue action on the steering mechanism.

As the car passes over uneven road surfaces the front wheels are subjected to considerable strain; therefore, about once every 2,500 miles their alignment should be checked to make sure that

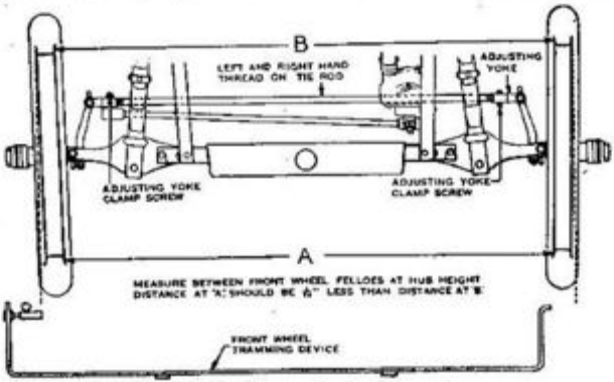


Fig. 32—Front wheel alignment.

none of the steering connections have changed adjustment, otherwise there is the possibility that the front tires may become unduly worn, necessitating early renewal.

By referring to Fig. 32, the distance indicated by line B; i. e., between the inner sides of the wheel felloe at the rear of the front wheels should be $\frac{1}{8}$ inches greater than the distance indicated by line A.

The best method of checking these measurements is by use of a front wheel trammimg device such as is shown in Fig. 32. Almost any good repair shop or tire station is equipped with one of these devices and will be glad to check the alignment of the wheels for you.

If it is found that the front wheels do not have the proper "toe in," that is $\frac{1}{8}$ inches, loosen the adjusting yoke clamp screw at both ends of tie rod as shown in Fig. 32 and with a small pipe wrench or pair of pliers, turn the tie rod to the right to shorten the tie rod and reduce the distance shown in Fig. 32 as "B." To increase the distance indicated in Fig. 32 by line "B," turn the tie rod to the left.

Turning the tie rod to the right will increase the distance shown as line "A" in Fig. 32 and turning the tie rod to the left will decrease the distance indicated by line "A" in Fig. 32.

After proper adjustment has been secured, be absolutely certain to fasten both adjusting yoke clamp screws firmly as failure to do so may result in a serious accident to the car or occupants.

The lubrication of the tie rod bolts is very important, therefore be sure to follow the instructions on the Oiling Chart, Page 40 carefully.

SPRINGS

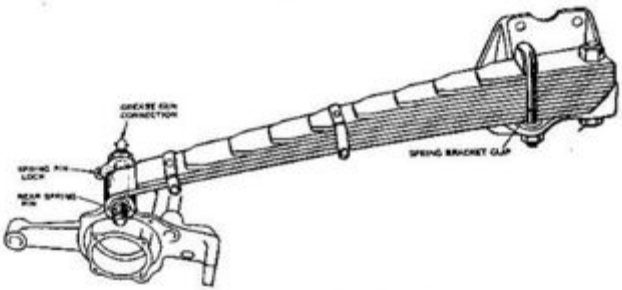


Fig. 33—Keep spring clips tight.

It is of the utmost importance that regular attention be given to the springs on your car if you are to realize their fullest riding qualities. Even the best designed spring will become squeaky as soon as moisture enters between the leaves and causes rust. The fullest

action and resiliency of the springs obtain only when the different leaves are free to slide on each other. A spring which is "rusted up" cannot do this, causing unequal strains to be placed on each leaf, especially the larger or main one. It follows, therefore, that to lubricate the springs as soon as they begin to squeak is the surest way to secure easy riding and prevent spring breakage.

The best way to lubricate the springs is to place a jack under the frame or body and raise the car (not the wheels) until the spring leaves separate far enough so that graphite grease can be spread between them.

Once a week examine the clamping bolts and spring clips holding both front and rear springs to the axles and see that they are absolutely tight. No matter how "tight" they were drawn up at last examination, the action of the spring will cause them to "stretch" or loosen up. Nearly all spring breakage can be traced to loose spring clips and bolts, so observe this rule carefully.

CARBURETOR

The carburetor used on the Superior Model is the Zenith.

These carburetors have been carefully tested and adjusted to the motor before leaving the factory. No adjustments should be made as it has been found by experience that those made at the factory are proper for all changes in gravity and atmospheric conditions when the motor has been heated to a proper temperature. Too often adjustments to the carburetor are made when in reality something else is causing uneven running or the motor has not thoroughly warmed up. It is well to remember that any changes in carburetor's action will come gradually and not suddenly. Therefore if your car was operating properly when run last, you may depend upon it that some other part of the motor is at fault and the trouble should be located and corrected before attempting alterations to the carburetor.

CARBURETOR PRINCIPLE (ZENITH)

On each suction stroke of the piston a partial vacuum is created which causes a fine spray of gasoline to flow from the carburetor jets. This spray is picked up by the air which is also drawn through the fixed air intake, and as it passes through the choke or "venturi" a rotative action is produced (by the special shape of the choke) which breaks up the fine particles of gasoline, and thoroughly mixing with the air, passes into the cylinder through the intake pipe in the form of a carburated gas.

The gasoline from the tank passes through the gasoline inlet, filter screen and needle valve into the float chamber, raising the float as the volume increases. Passing through the centre of the float is a rod or needle valve having a pointed end. This rod is attached to fulcrums which are actuated by the float so that as it raises the needle valve moves downward and the conical end engages and closes the needle-valve seat, thus shutting off the gasoline flow when the proper volume has been obtained.

All gasoline, before being placed in the tank, should be strained through chamois to remove water and dirt; however, in spite of care, a certain amount of dirt or lint will get into the system and interfere with the best working of the carburetor. To remove as much as possible the liability of dirt getting into the instrument itself, a wire-gauze strainer is inserted between the gasoline inlet pipe and the float chamber.

Once every three months, or oftener, should the motor miss firing and pop or splutter, the filter plug should be removed. This allows the gasoline inlet connection to slide off the boss on the end of the carburetor. Surrounding this boss is the filter screen or strainer. Remove and clean thoroughly. In replacing, care should be taken not to damage it, as this must be in perfect condition or trouble will result.

If carburetor float chamber overflows, the trouble will usually be traced to the needle valve seat, and is sometimes caused by either dirt collecting on the seat or some imperfection which permits the gasoline to flow past the point of the valve. Trouble of this sort can usually be eliminated by removing the needle valve cap, rotating the needle

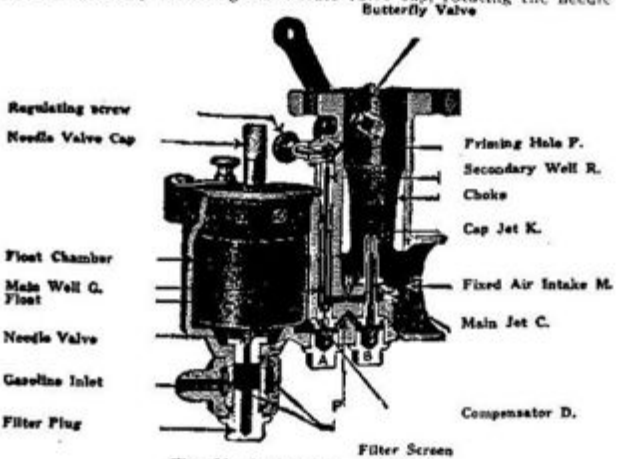


Fig. 34—Carburetor. (Zenith)

valve, at the same time tapping the top of the valve with a light hammer. This causes the valve to form a new seat or push aside any obstructions which may be under it.

In very warm climates or in hot summer months, it may be necessary to open the cool air vent in the air intake sleeve on the carburetor, as the excessive heat drawn through the intake does not form a perfect mixture. It also adds to the heat of the motor.

GASOLINE TANK

Gasoline should be carefully strained before being placed in the tank to remove the sediment which will eventually clog the filter screen in the carburetor.

Vibration will in time cause a loosening of the gasoline pipe connections, causing leaks. Remedy these as soon as they appear, as they are dangerous and also wasteful of fuel.

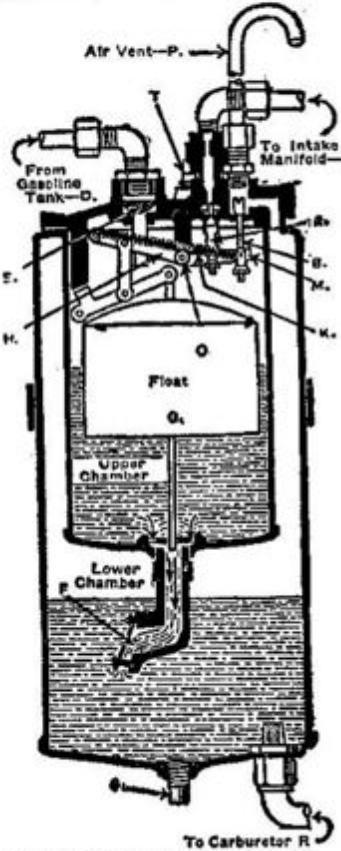


Fig. 35—Vacuum Tank. (Stewart) Closed Models.

In order that the gasoline will flow properly to the carburetor, there is a small hole in the top of the filler cap on the tank so that air can enter as the quantity of gasoline in the tank is decreased. It is essential that this hole be kept open.

VACUUM TANK (Stewart)

As the gasoline tank is mounted on the rear of the car, some distance from the carburetor, it is necessary to provide a means of drawing the fuel from the tank into the carburetor.

This is accomplished by the use of a vacuum tank mounted under the hood, the construction of which is illustrated in Fig. 35.

Every motor draws its supply of gasoline through the carburetor by reason of the pumping action of the pistons, which on their downward or suction stroke create a partial vacuum in the intake pipe. It is this same pumping action which draws gasoline from the main supply tank into the vacuum tank.

The vacuum tank is composed of two chambers. The upper or smaller one is the

filling chamber, and the lower one the emptying chamber. To the upper chamber is connected a copper pipe C, which attached to the intake pipe at the centre of the two branches. Gasoline enters the chamber from the main supply tank through the connection D, at the base of which a small wire strainer E is placed to catch any dirt or lint which may have gotten into the main tank. At the base of this chamber is placed a flapper valve F, which, when closed, prevents the gasoline from running into the lower chamber.

The suction of the pistons on the intake stroke exhausts the air in the upper chamber, creating a vacuum, and this vacuum closes the valve F. As the main supply tank is open to atmospheric pressure (through the vent hole in the filler cap), the vacuum created in the upper chamber will cause the gasoline to flow from the main tank through the supply line and into the chamber through the connection D. Mounted inside of this chamber is a metal float G, and as the gasoline rises in the chamber the lever H moves upward until when the proper quantity has been obtained the direction of pull on the springs K is reversed, which causes the lever M to move upward. This action closes the valve A, thus shutting off the suction from the motor, and opens the valve B, which allows air to flow into the chamber through the vent pipe P.

The admission of outside air destroys the vacuum in the chamber, which automatically releases the suction on the valve F and at the same time stops the flow of gasoline through the pipe D. The weight of the gasoline in the upper chamber then causes the valve F to open, allowing the gasoline to flow into the lower chamber, from whence it flows by gravity to the carburetor through the connection R.

FUEL SYSTEM (G. G.)

The principle on which the "G. G." Fuel System operates is as follows: The rotation of the motor creates, by means of a small pipe connected to the intake manifold, a partial vacuum within the inner chamber A, which is communicated through the vacuum feed to the gasoline tank in the rear of the car. This causes the fuel to be forced by suction into the inner chamber of the vacuum system. When the gas reaches the level, the valve B is automatically closed by action of the float C, thus the "Suction" of the motor, having been temporarily eliminated, normal or atmospheric pressure is established within the inner chamber A, by means of air entering through the small permanent vent D, which is located between the screen E, and the outlet to the manifold F.

The weight of the gasoline now opens the lower valve G, whereby the gasoline flows rapidly from the inner into the outer chamber of storage reservoir, which is independent of any suction of the motor,

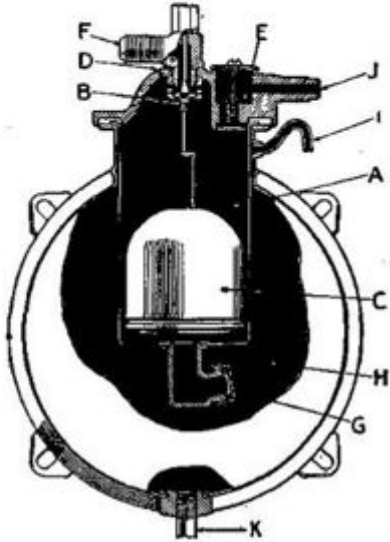


Fig. 36—Fuel System

and functions simply as a storage tank supplying gasoline by gravity to the carburetor.

ELECTRICAL SYSTEM

The electrical system used in the Chevrolet Car is the one wire, battery ignition, two unit system, which in brief is as follows:

Insulated copper wire forms one side of the electrical circuit and the metal of the car forms the ground return side.

The storage battery is the reservoir which supplies the current for starting, lighting and ignition when the engine is idle, starting, or running slowly.

The engine is cranked during starting by the starting motor.

The spark for ignition is supplied by the battery, distributor and coil.

As the engine speeds up, the generator is connected into the circuit by the relay and becomes the source of electrical power. It then not only supplies the current for the lights and ignition, but also sends power to the battery to replace that taken out previously.

GENERATOR

How the Generator Operates.

The generator automatically keeps the battery charged.

At a car speed of approximately eleven (11) miles per hour, the generator develops a voltage sufficient to supply current for lights and ignition and is automatically connected into the circuit by the relay.

As the car speed increases, the generator voltage increases, supplying more and more current to the line until it furnishes more current than is used by the ignition and lights. The surplus recharges the storage battery so that an ample supply of current is always

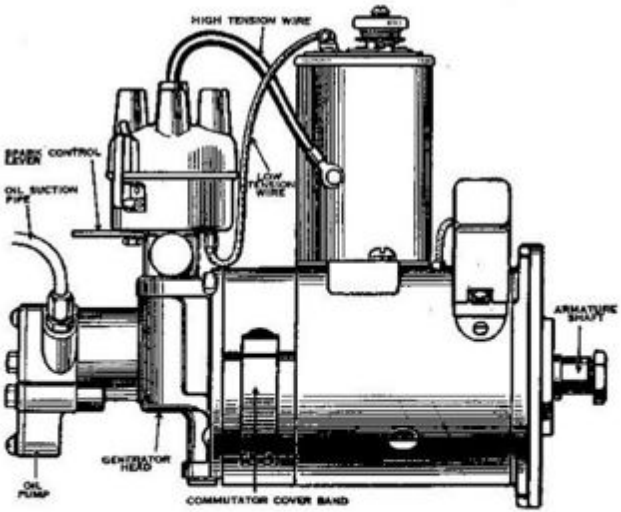


Fig. 37—Generator and Ignition Set.

available for starting purposes, as well as for lights and ignition when the engine is standing still or running slowly.

Third Brush Regulation.

The regulation is accomplished by the third brush method. The position of this third brush in relation to the main brushes determines the maximum output. This is properly adjusted at the factory and should not be changed unless the adjustment is found to be incorrect for driving conditions. **Check the ammeter for incorrect readings.**

Adjusting Output.

To increase the output, move the third brush in direction of armature rotation (counter clockwise viewed from commutator end), and to decrease the output, move the brush in direction opposite to armature rotation.

Running the generator with an open or loose connection in the charging circuit will seriously damage the generator windings.

The third brush generator regulation depends upon the armature current, i.e., as the armature current increases to a certain amount, the terminal voltage decreases. It can be seen then that if the charging circuit has a high resistance or is open, the armature current is low and the voltage keeps on building up until the field current becomes excessive, causing the windings to burn out.

Output Low.

A low charging rate is due to the following:

1. Improper third brush adjustment.
2. Damaged battery.
3. Damaged generator.
4. Dirty commutator or brushes.
5. Open in charging circuit.

To Clean Commutator.

Remove the commutator cover band. If the commutator appears burned, dirty or scored, clean the commutator with No. 00 sandpaper. **Never use emery cloth for this purpose.** Place the sandpaper against the surface of the commutator and with the engine running slowly, press down lightly on the sandpaper, cleaning the surface evenly until perfectly smooth. Blow out all dust.

Brushes.

If the brushes are dirty, noisy, or poorly seated, sand them in, with No. 00 sandpaper, being careful that the sandpaper follows the curved surface of the commutator so that the brushes are not beveled at the edges.

The brushes may not make contact with the commutator due to tight brush holders or weak brush springs.

Oiling.

The oiler at the commutator end should be filled with light oil every 1,000 miles.

Using Car with Storage Battery Disconnected.

If, for any reason, the engine is to be operated with the generator disconnected from the storage battery, short circuit the generator by connecting the generator terminal lead to relay mounting screw.

Ammeter.

The ammeter is connected in series with the charging circuit to the battery and its reading is the battery charge or discharge current at that moment.

Ammeter Reading Indications.

The ammeter should read zero when engine is not running and all lights, etc., are turned off. Ammeter reading other than zero with above conditions indicates:

1st. Ammeter reading incorrect.

2nd. Short or ground in car wiring or switch.

The ammeter will read discharge at low engine speeds, but should read charge whenever the car is driven at more than eleven (11) miles per hour with lights, etc., turned off.

When all lights are on, it will require a speed of approximately fifteen (15) miles per hour to show charge. At a lower speed than this, the ammeter may show discharge, which means that more current is taken by the lights and ignition than is furnished by the generator.

If the ammeter never shows "charge," look for:

1st. Damaged or "shorted out" ammeter.

2nd. Generator trouble.

3rd. Relay trouble.

4th. Open between generator and ammeter.

If, at any time, the ammeter shows a discharge in excess of fifteen (15) amperes, look for a short in car wiring or equipment.

If the ammeter shows charge with the lights on and the engine not running, it indicates:

1st. Battery terminals reversed.

See that negative terminal of battery is connected to frame -side member of the car.

2nd. Ammeter connections reversed.

Discharged Battery.

Inspect the battery for low electrolyte and damaged cells. Clean and tighten the battery terminal connections. Cover terminals with light coat of vaseline. Check the following for excessive demand on battery.

1st. Excessive number or size of lights.

2nd. Extra electrical equipment.

3rd. Excessive starting demand due to frequent or difficult starting.

If the battery is O.K., look for grounds, shorts, open charging circuit, damaged generator or damaged relay.

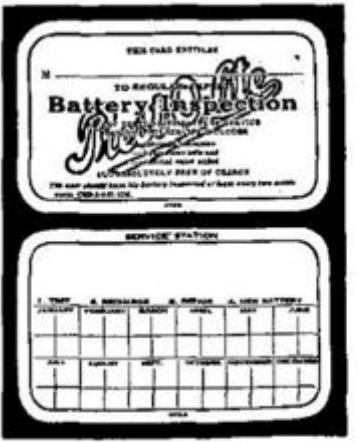
STORAGE BATTERY

The storage battery on this car is manufactured by the Prest-O-Lite Company of Canada, Limited, Toronto, Ont., and is part of the electrical system.

The storage battery, an electro-chemical apparatus, is entirely different from the mechanical parts of the car, and is that part of the electrical system which supplies electrical energy or current for ignition; lighting; and cranking the motor when properly supplied with electrical energy from the generator.

The life of the storage battery and its satisfactory operation depend upon the care which it receives and the kind of service demanded from it. To secure faithful operation and long life the following instructions should be carefully followed:

1. When a new car is purchased, the owner should go to the nearest Prest-O-Lite Service Station immediately and have the battery registered in order to take full advantage of Prest-O-Lite service.



The owner should ask for a service card which entitles him to this service. If you buy a Prest-O-Lite battery to replace the one you now have, secure a registration or service card at the time the purchase is made.

2. The card above mentioned entitles you to the full service Prest-O-Lite Service Stations are in a position to render, that is to say — Prest-O-Lite Service Stations will, without charge, make periodical tests of your battery (and a car owner should have his battery tested at least every two weeks), add distilled water, and will give you such advice as will enable you to get the best possible service from your battery.

3. Should the owner be located at a point distant from a service station, he should test all cells with a hydrometer on the 1st and 15th of every month. If any cells are below 1.260 on two successive test-

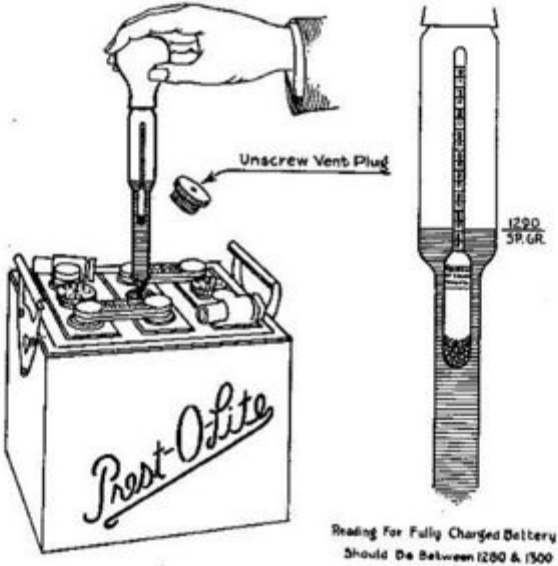
ings, take the battery to the nearest Prest-O-Lite Service Station and have it fully charged. In taking these readings, care should be exercised to return the electrolyte from the hydrometer syringe to the same cell from which it was taken.

4. Keep all cells filled with distilled water to a level ½ in. above the top of the plates. Never fill ABOVE this level.

5. Keep the battery and the battery compartment clean and dry.

6. Keep the terminals clean and tight and well covered with vaseline to prevent corrosion.

7. Never allow the battery to become heated in service above 100° F. Watch the battery for heating one or more times every day



Reading For Fully Charged Battery Should Be Between 1280 & 1300

in warm weather. If the top connectors feel more than blood-warm to the touch burn all the lamps while driving, until you can consult a Prest-O-Lite Service Station which will prescribe what is necessary. If the temperature reaches 120° F., the battery may be ruined.

8. In order to prevent freezing in cold weather, test your battery frequently and see that the gravity is kept up to at least 1.275. A discharged battery will freeze at a little below the freezing point.

9. When filling, if one cell takes considerably more water than

the others, this indicates a leaky jar and the battery should be taken or sent to a Prest-O-Lite Service Station. Unless repaired immediately, the battery may be ruined.

10. If you lay up your car, the battery should be removed and placed in storage with a Prest-O-Lite Service Station, who will issue a receipt for it.

A battery will slowly discharge when standing idle. Serious injury will result if it is not kept charged, and it is not practicable to do this by running the engine when the car is not in use.

AMMETER

The ammeter is self-contained, and requires no lubrication or attention. The accuracy of its reading should be checked up occasionally to make certain that no short circuit has bent the pointer or otherwise injured its internal parts. To test for accuracy, remove the wires from the ammeter terminals or the positive (+) wire from the storage battery. The ammeter pointer should now stand at "zero," and any difference between where it actually stands and "zero" is the degree of error, and should be allowed for when observing ammeter readings.

When for any cause it is necessary to remove the ammeter and operate the car without it, the two wires which were attached to the ammeter terminals should be firmly fastened together and the bare spots covered with electrician's tape.

RELAY

Operation.

The relay is mounted on the generator frame It is an automatic switch for connecting the generator into the charging circuit when the generator voltage becomes higher than the battery voltage and disconnecting it when the generator voltage is less than the battery voltage.

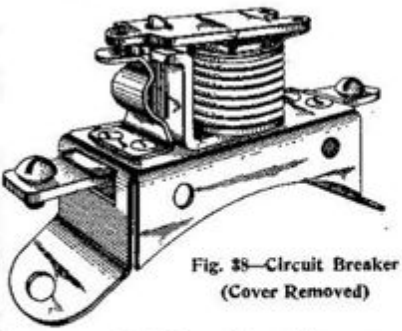


Fig. 38—Circuit Breaker (Cover Removed)

If the battery and generator were connected continuously, the battery would discharge through the generator when the generator was not running or was driven slowly. The relay acts as a check valve permitting current to flow from generator to battery only. As soon as the current tends to flow in the reverse direction, the relay opens the circuit.

Contacts Dirty.

If the contacts become dirty or worn unevenly, clean by passing between them a piece of No. 00 sandpaper. The maximum contact opening is .010" to .016". A discharged battery will result if points stick together.

Contacts Chatter.

The relay points will chatter and burn if:

1. The relay cuts in too soon.
2. The generator has the wrong polarity, or
3. The battery terminals have been reversed.

To avoid needless burning and arcing at contacts, before generator automatically changes polarity, correct the polarity on generator by closing the relay contacts when engine is not running. **See that contacts separate when released.**

Contacts Do Not Close.

The contacts will not close if:

1. Relay contacts are dirty.
2. Shunt winding open.
3. Relay adjusted incorrectly.
4. Damaged generator.
5. Dirty generator commutator.
6. Generator brushes sticking.

Nos. 1, 2, 3 will cause the generator windings to burn out.

Do not attempt adjusting the relay. Any adjustments or repairs should be made by a Branch or Authorized Distributor of the United Motors Service.

IGNITION COIL

The engine derives its power from the explosion and expansion of compressed gas in the engine cylinders, the expansion driving down the pistons which are connected to and turn the crank shaft.

These charges of gas are ignited by an electric spark jumping the spark plug gap. The spark is supplied by the battery, distributor and coil, which gives a good hot spark regardless of engine speed.

The battery voltage is insufficient to jump the spark plug gap, so that an ignition coil is necessary to transform the low voltage of the battery to a voltage (approximately 8,000 volts) which will easily jump the spark plug gap.

Resistance Unit.

A resistance unit, whose resistance increases as it heats, is also provided, which gives it the further distinct advantage of operating satisfactorily on low as well as high voltage should the battery voltage become low due to indiscriminate use of starting motor, lights, cranking a stiff engine, or to other causes.

Testing Coil.

Inspect the resistance unit on top of the coil to see that it is not burned out.

The high tension current is distributed to the cylinders through the cap by a rotor which fits the cam extension in one position only. The cap will fit the distributor in one position only.

The high tension lead of the coil is connected to the center cap terminal, which makes contact with the rotor segment through a carbon brush. The segment, as it rotates with the rotor, conducts this current to the terminal connected to the cylinder in firing position at that moment.

The segment does not make actual contact with the terminal pin, but passes very close (1/64") to it. The current jumps the gap and is carried to the spark plug by the heavily insulated wire connected to that terminal.

Condenser.

A condenser is contained inside the coil. It is connected across the circuit breaker contacts to reduce the arcing and resultant burning of the contacts as well as to give a hotter spark at the spark plug.

If the contacts burn and pit more than would seem reasonable and the spark is weak, look for a damaged coil or condenser. Make sure that base of coil is well grounded.

Contacts.

The contacts should be inspected every 1,000 miles. The contacts

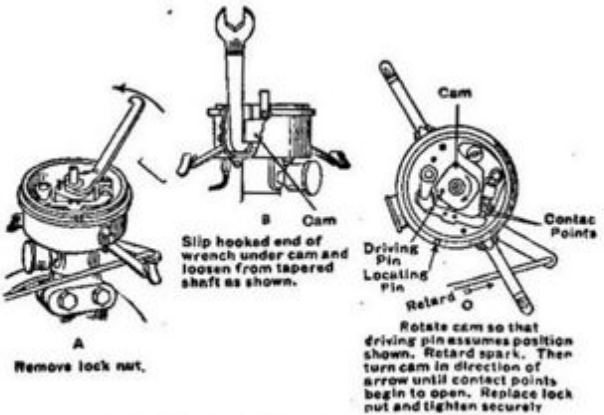


Fig. 39—Disassembling Igniter to clean points.

should have a smooth, bright gray finish. The maximum opening or gap should be .025" to .030".

If they are not making good contact, the surfaces should be cleaned and made smooth with an oil stone or a magneto file. (Fig. 43 D and E.) Badly pitted contacts must be replaced with new ones.

How to Adjust the Contacts (Fig. 39).

To adjust, loosen the contact screw lock nut and adjust to give maximum contact opening of .025"-.030". (Fig. 38F.) Use a gauge to obtain accurate setting, then tighten the lock nut and re-check the gap.

Breaker Spring Tension.

Test the arm for correct spring tension (16-18 oz. at contacts). A weak spring will cause the engine to miss, especially at high speeds.

Oiling.

The distributor is provided with a grease cup which should be kept full of medium grease and turned to the right two or three times every 1,000 miles to force grease into the bearing.

With circuit breaker contacts closed, turn on ignition switch, then hold one end of a wire against coil terminal marked "BAT." and brush the other end of the wire against the metal engine. If no flash or spark results, look for loose connections, an open in the low tension ignition circuit, or damaged switch.

If a flash is obtained, test for ignition spark by holding a wire in contact with the base with the other end within 5/8 inch of the high tension terminal of the coil and open the circuit breaker contacts quickly. A spark will jump the gap if the coil is O.K.

If no spark is obtained at the gap, look for:

1st. Poor coil ground.

2nd. Damaged coil.

No coil repairs, other than replacing the resistance unit, should be attempted.

In emergency cases, temporarily short circuit the burnt out resistance unit.

DISTRIBUTOR

The 366-P distributor is of the manual advance type and provided with a waterproof cap.

The distributor has two functions:

1st. To make and break the ignition low tension current when the piston is in the proper position for firing (near upper dead center of compression stroke).

2nd. To distribute the high tension current from the coil to the cylinders in the proper firing order.

The making and breaking of the ignition low tension current is accomplished by the circuit breaker mechanism, which consists of:

1st. A four-lobed cam connected to engine crank shaft through the generator and gears.

2nd. Two contacts, one stationary (insulated) and one mounted on an arm held against the cam by the arm spring. The lobes of the cam cause the contacts to open and close.

The distributor drive gears are enclosed in the gear box at bottom of distributor shank. Fill this with good grade of fibre grease every season. Fill the oiler with lubricating oil every 1,000 miles.

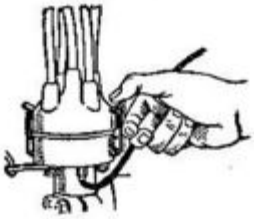


Fig. A.
Unclasp spring hinges on the sides of igniter

Fig. B.
Remove distributor case and wires

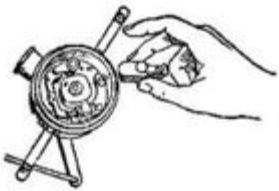


Fig. C.
Remove distributor arm

Fig. D.
Open arm and insert file between contact points

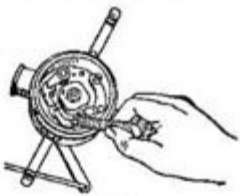


Fig. E.
Close contacts and square points by moving file up and down three or four times

Fig. F.
Adjusting contact points

Fig. 40—Disassembling Igniter to clean points.

A slight trace of vaseline placed on the **fibre block** or the **cam** every 1,000 miles will keep the cam from rusting and wearing excessively.

KEEP CONTACTS FREE OF OIL.

How to Test Ignition.

Remove the high tension lead from the spark plug in the cylinder giving trouble. Place it so that the wire terminal is about $\frac{1}{4}$" from metal of car, turn ignition switch to "on" position and start engine. If spark jumps from the wire terminal to the metal, the ignition up to the spark plug is in good order. Test and clean the spark plug and adjust points to .030 of an inch. Re-attach wire to plug and with plug lying on its side on the cylinder, crank the motor. Failure to give hot spark indicates a defective plug.

If no spark can be obtained at the wire terminal, the coil should be tested. See "Testing Coil," (Page 69).

If the coil is O.K., look for open or grounded high tension leads, distributor rotor broken or missing, or a broken distributor cap.

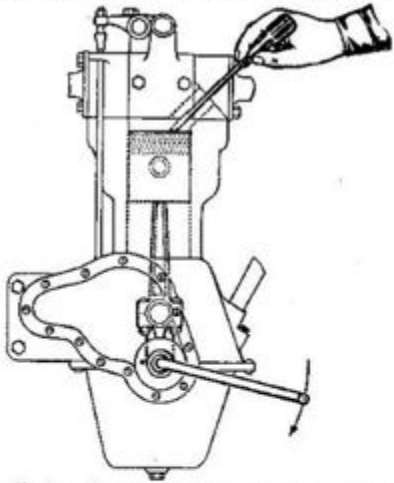


Fig. 41—Locating "Top Center" position of piston.

Timing the Engine.

If it should ever be necessary to retime the ignition distributor, proceed as follows:

Adjust the circuit breaker contacts to give maximum opening of .025"-.030" (see adjusting contacts).

Remove the number one spark plug (nearest radiator).

Turn the engine by hand until the intake valve closes. Watching through the spark plug hole and feeling with a screw driver (Fig. 41), turn the engine until the piston comes to the top of its stroke (approximately one-half revolution). The piston is then on top dead centre of compression stroke and the gases are compressed and ready for firing.

Fully retard the distributor. Loosen the cam by removing the cam nut and lifting the cam from shaft taper with special wrench supplied. (Fig. 39 A and B.)

Rotate the cam in clockwise direction (viewed from top of distributor) until the cam is in such a position that when the cap and rotor are replaced, the segment on the rotor will be nearest the cap extension connected to number one cylinder and the circuit breaker contacts are just starting to separate (Fig. 39C). Press the cam on the shaft taper and tighten the cam nut, being careful not to disturb position of cam, and replace the rotor and cap.

Proceeding in a clockwise direction (viewed from the top) from the high tension terminal connected to number one cylinder, the high tension terminals are connected to cylinders two, four and three respectively. Firing order: 1-2-4-3.

The distributor can be removed by disconnecting the advance rod and loosening the set screw.

STARTING SWITCH

The starting switch is connected between the starting motor and the positive (Fig. 43) battery terminal. When the switch is depressed or closed, current is supplied to the starting motor.

The starting switch requires no lubrication or attention.

STARTING MOTOR

The starting motor is located on the right side of engine (fastened to transmission support with 3 cap screws) and turns the engine during starting.

Bendix.

The motor and engine are connected and disconnected by the Bendix drive. The bendix pinion operates upon a hardened steel sleeve, which is fastened to the motor shaft through the bendix spring by a set screw. The pinion has a lateral travel of about 1½" on this sleeve for engaging it with the teeth on the flywheel.

The bendix spring, besides serving as a flexible coupling between the starting motor shaft and bendix pinion, facilitates the engagement of the gears and absorbs all shocks. The power is supplied to the motor by the battery, to which it is connected through the starting switch.

When the starting switch is pressed down, the starting motor is connected to the battery and the armature, being free, revolves at a high rate of speed.

The bendix pinion, by reason of its inertia, tends to lag behind the rotating shaft whose screw thread thus draws the pinion into mesh with the teeth of the flywheel. As soon as the engine fires, its increased speed of rotation threads the pinion in the opposite direction, disengaging the motor from the engine.

Backfires will be caused by starting the engine with the spark advanced too far. A backfire may seriously damage the bendix or starting motor. Always retard the spark when starting.

The motor requires very little attention. Fill the two oilers with light oil every 1,000 miles.

If the bendix pinion sticks, clean the screw shaft and pinion with gasoline and do not lubricate.

Cranking with a battery in a state of low charge will cause the motor to turn below normal speed and cause arcing and burning of the commutator.

If the lights are dimmed excessively when starting the engine, look for:

1. Loose or corroded battery connections, starting switch or motor.
2. Discharged or damaged battery.
3. Short in starting motor circuit.
4. Damaged motor.
5. Engine stalled or car in gear.

If the starting motor turns at low speed, look for:

1. Loose or corroded connections.
2. Discharged or damaged battery.
3. Short or open in starting motor.
4. Damaged switch.

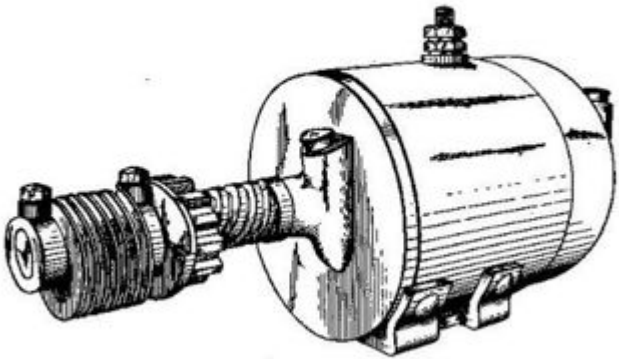


Fig. 42—Starting Motor.

LOCATING TROUBLES

When the electric system gives trouble, do not jump at conclusions. Only when you have made sure that the wiring is in perfect condition, all terminals tight and connected up according to the wiring diagram (Fig. 43), should trouble be looked for in the electrical instruments themselves.

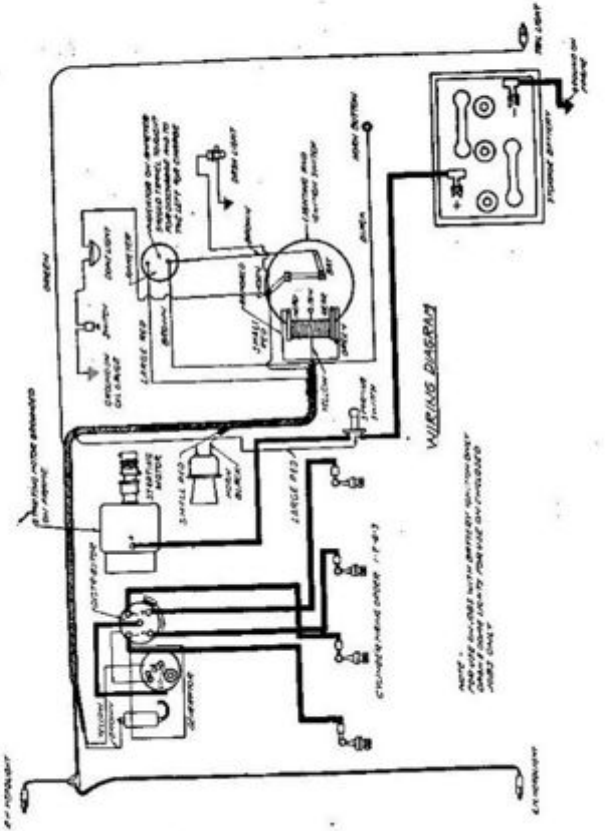


Fig. 43—Wiring diagram.

SHORT CIRCUIT

A short circuit occurs when any two wires of opposite polarity come in contact at exposed places or with any metallic conductor. This will discharge the storage battery in a very short time, therefore, **the greatest care should be taken to see that all connections remain tight and that the insulation of all wires is not broken or cut.**

To prevent a short circuit from damaging the lights a fuse is inserted on the rear of the lighting switch. When this "blows," it can be easily replaced; however, before doing so be sure everything else in the wiring system is in good order.

If the ammeter hand shows a discharge when the lights are turned off and engine idle, disconnect the positive (+) wire from battery, and if the hand goes back to zero it shows that there is a leak or a short circuit, which should be remedied at once. If the hand does not go back to zero, the needle is bent. (See care of ammeter.)

After satisfying yourself that the wiring is in good working order test each of the electrical instruments.

Examine the generator brushes, see that they work freely and that the commutator is clean.

Examine the circuit breaker; see that the points make contact. If not, close them with your fingers. If the ammeter registers "charge" with the engine running at fair speed, remove the circuit breaker and send to the makers for repairs as instructed.

Examine the ammeter. With the lights turned on and engine idle the ammeter hand should register "discharge." If it stands at zero, remove the ammeter and return to the manufacturers as instructed.

You may operate your car while the ammeter is being repaired by connecting the two ends of the wires removed from the ammeter. Be sure to thoroughly cover the connection with electrician's tape.

Examine the storage battery. **See that the solution in each cell covers the plates, and add distilled water if it does not.** See that the top of the battery is **clean and terminals tight.** In case of leakage of the electrolyte in one or more cells take your battery to the nearest service station maintained by the battery manufacturers for examination and replacements.

It should be remembered that the efficiency of any storage battery decreases with a drop in temperature, and for that reason **the starting motor and lights should be used sparingly in cold weather** and the engine run for several minutes at good speed after each start.

WINTER STORAGE OF CARS

When it is found necessary to store the car during the winter months, the water should be thoroughly drained from the radiator and motor, after which the engine should be run under its own power until it becomes thoroughly heated. Do not run the motor too fast, but keep it going long enough to evaporate every particle of water that may be "pocketed" to prevent the water freezing and possibly bursting the water jackets.

It is desirable to remove the tires and place them in a room where they are not subjected to extreme temperature changes. The casings should be thoroughly cleaned to remove all oil which may have adhered to them. After removing the tires, thoroughly clean the inside of the wheel rims and apply a coat of enamel to prevent rust, which is very injurious to the fabric of the tire.

If the tires are not removed, jack up the car so that the wheels clear the floor at least two inches, and let the air out of the tubes.

Under no circumstances should the car be stored in a barn or other building in which horses or cattle are kept at the same time. The ammonia fumes given off will quickly discolor the paint and enamel. Select a building having a good roof, and preferably a wooden floor raised several inches from the ground.

All bright metal parts should be thoroughly coated with slab oil, vaseline, cosmic or gun grease to prevent rusting.

CARE OF TOPS

The top of the car should be thoroughly cleaned and all dust brushed out. Never attempt to clean the top or curtains with gasoline or kerosene—use a good brush or broom.

If possible the top should be kept open, which will keep it well stretched and smooth. If this cannot be done, use care in folding it—see that the folds are straight and that none of the fabric is pinched between the bows or supports.

Do not fold the top until it is thoroughly dry, because any moisture remaining in the fabric will likely cause mildew, resulting in an unsightly and leaky top.

CARE OF CLOTH UPHOLSTERY

To clean the cloth upholstery on Sedan Bodies, use warm water and Ivory Soap only. Gasoline has a tendency to spread the grease and leave a discolored spot.

After cleaning, wipe dry with a clean cloth.

TREATMENT OF BATTERIES IN STORAGE

If the car is to be placed in storage for any length of time without the battery being removed, it should be thoroughly charged. The hydrometer should show that the gravity of the electrolyte in each cell is up to 1.280.

Tests should be made at intervals of two weeks, and if necessary the engine should be run until the hydrometer shows the reading given above. This is especially essential in freezing weather, as a battery in a discharged condition will freeze and considerable damage might result.

The proper method of handling a storage battery, if the car is to be placed in storage either in winter or summer, is to remove the battery from the car and take it to a Presto-lite Service Station where for a nominal sum it can be either placed in dry storage or kept on a tickler charge which will insure it against any damage resulting from standing in a discharged condition and the owner will derive the best results when the car is again placed in operation.

DIRECTIONS FOR ORDERING PARTS

When ordering parts be sure to give the model, year produced and car number for which parts are desired.

The model and car number will be found on the name plate attached to the heel-board under the front seat.

If in doubt as to the name of the part needed, send the broken part to your dealer or the factory or nearest Distributing branch, attention of Parts and Service Department by **prepaid express.** Write your name and address plainly on the package so that it can be identified upon arrival. Write a letter the same day shipment goes forward, stating the purpose for which it is returned, **regardless of any previous correspondence.**

In ordering from the factory or nearest Distributing branch, attention of Parts and Service Department, if possible always send cash with order because we cannot open accounts except with our regularly appointed dealers, who maintain a deposit sufficient to cover their accounts. **Orders not accompanied by cash will be sent C.O.D.**

In ordering parts by telegram, be sure the message is **prepaid. Collect messages will not be accepted** by this company. Always confirm the telegram by a regular order, marked "confirmation of telegram," through the mail.

All Chevrolet dealers carry a stock of such parts as are needed most frequently; therefore, delays can be avoided by ordering from your nearest dealer.

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MEMO

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