Reference Book



Emblem of Satisfaction

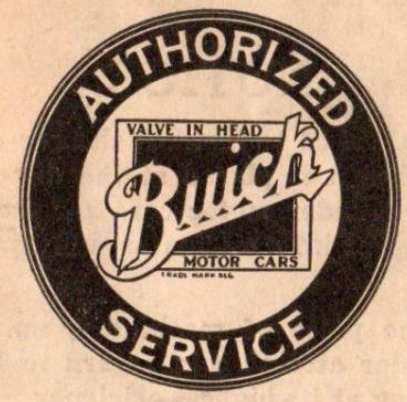
1923
SIX CYLINDER SERIES

23-6-41	5 Pass. Touring Sedan
23-6-44	- - 2 Pass. Roadster
23-6-45	- 5 Pass. Touring Car
23-6-47	- - - 5 Pass. Sedan
23-6-48	- - - 4 Pass. Coupe
23-6-49	- 7 Pass. Touring Car
23-6-50	- - - 7 Pass. Sedan
23-6-54	3 Pass. Sport Roadster
23-6-55	4 Pass. Sport Touring

BUICK MOTOR COMPANY
FLINT, MICHIGAN, U. S. A.

FLINT PRINTING CO., FLINT, MICH.

Reference Book



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NOTICE

This book is not published to instruct the car owner how to assemble or disassemble his car but it is placed at the disposal of the owners and operators of Buick six cylinder motor cars for the purpose of conveying such specific and intelligent information as will enable them to derive the maximum of service.

Like any other fine piece of machinery, an automobile requires a certain amount of regular attention in regard to lubrication and adjustment, to keep it operating at its highest efficiency.

It is quite impossible to compile instructions sufficiently clear to warrant a novice attempting all of the adjustments and inspection which the car requires.

The information in this book is intended to familiarize the owner or driver with the mechanical details of his car so that he can give it attention when necessary, but in case of an accident requiring repair or replacements, it is expected that the owner will call on the nearest Buick Dealer or service station for expert attention.

Repair parts or any additional information may be obtained from the nearest Buick Dealer or from any of the Buick Branches and Distributors listed on page three. In all correspondence concerning the car be sure to give Model and Serial number. The Model will be found stamped on a plate on the front of the dash under hood. Serial number (see oval plate on left side of frame, beneath front fender).

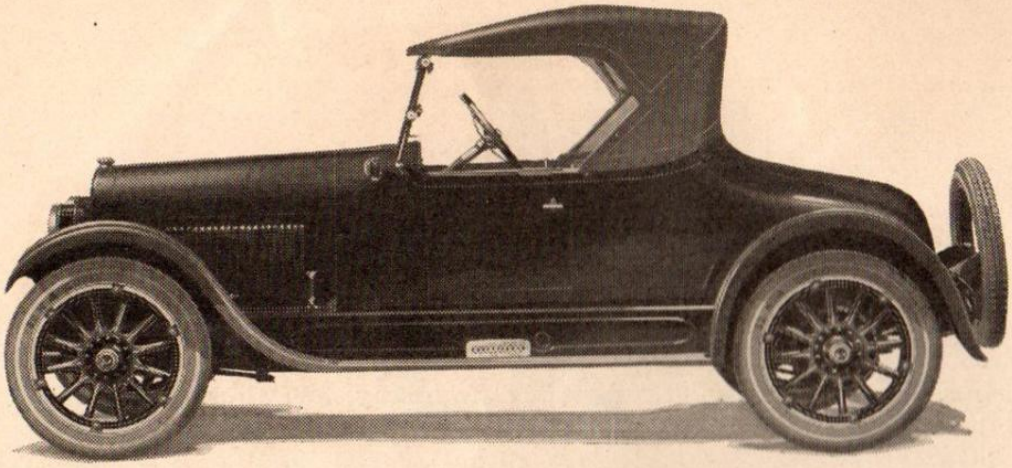
BUICK MOTOR COMPANY

Flint, Mich., U. S. A., August 1st, 1922.

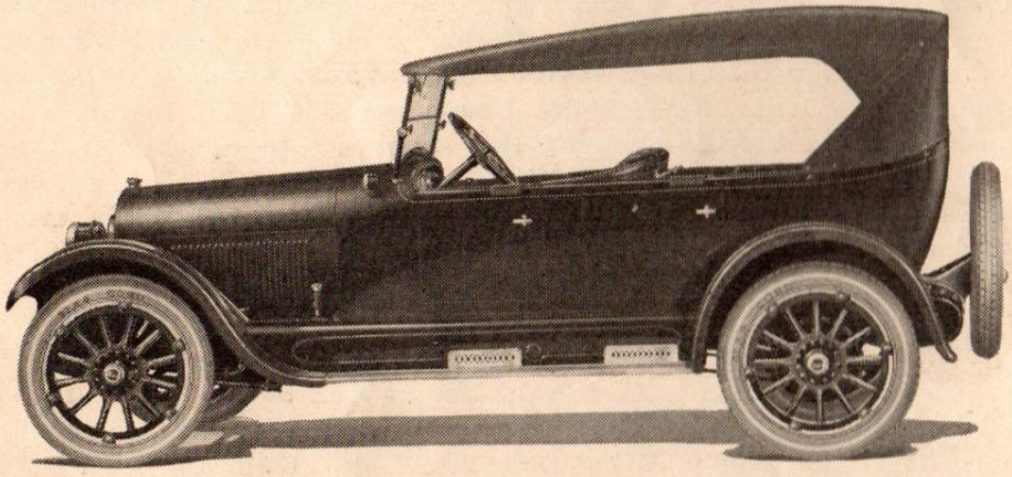
BUICK BRANCHES AND DISTRIBUTORS

Atlanta	Buick Motor Company, 241-243 Peachtree Street
Battle Creek	Buick Motor Company, 82-84 West Main Street
Boston	The Noyes-Buick Company, 857 Commonwealth Ave.
Buffalo	Buick Motor Company, 1094-1100 Main Street
Charlotte, N. C.	C. C. Coddington, Inc., 432 West Trade Street
Chicago	Buick Motor Company, 2031 Calumet Avenue
Cincinnati	Leyman-Buick Company, 630 Walnut Street
Cleveland	The Ohio-Buick Co., Buick Bldg., E. 19th, near Euclid
Dallas	Buick Motor Co., 1420-24 Young Street
Denver	McFarland Auto Company, Lincoln St. and 7th Ave.
Detroit	Buick Motor Co., General Motors Bldg., West Grand Blvd.
El Paso, Texas	Buick Motor Co., Corner of Mesa Ave. and Montana St.
Flint	Buick Motor Company, 602-4 N. Saginaw Street
Indianapolis	Buick Motor Company, 363-365 N. Illinois Street
Kansas City, Mo.	Buick Motor Co., Admiral Blvd. and McGee Street
Lincoln, Neb.	Nebraska-Buick Auto Co., 1300 Q Street
Memphis, Tenn.	Buick Motor Company, 739 Union Avenue
Milwaukee	Buick Motor Company, 156-160 Wisconsin Street
Minneapolis	Pence Automobile Co., Hennepin Ave. and 8th St.
New York City	Buick Motor Co., Broadway at 55th St.
New York City	General Motors Export Company, 224 West 57th St.
Oklahoma City	Buick Motor Co., 504-506 N. Broadway
Philadelphia	Buick Motor Company, 900 N. Broad Street
Pittsburgh	Buick Motor Company, Baum Blvd. and Euclid Ave.
Rochester, N. Y.	C. L. Whiting, 342 East Avenue
Saginaw	Garber-Buick Company, 208-218 N. Washington Avenue
St. Louis, Mo.	Vesper-Buick Auto Co., Grand Ave. at Lindell Blvd.
Salt Lake City	Randall-Dodd Auto Co., 47-53 South Second St. East
San Antonio, Texas	Buick Motor Company, 300-2 Avenue C
San Francisco	Howard Auto Company, 1601 Van Ness Avenue
Seattle, Wash.	Eldridge-Buick Co., Eleventh Ave. and East Union
Washington, D. C.	Buick Motor Co., 1021 Fourteenth St. N. W.

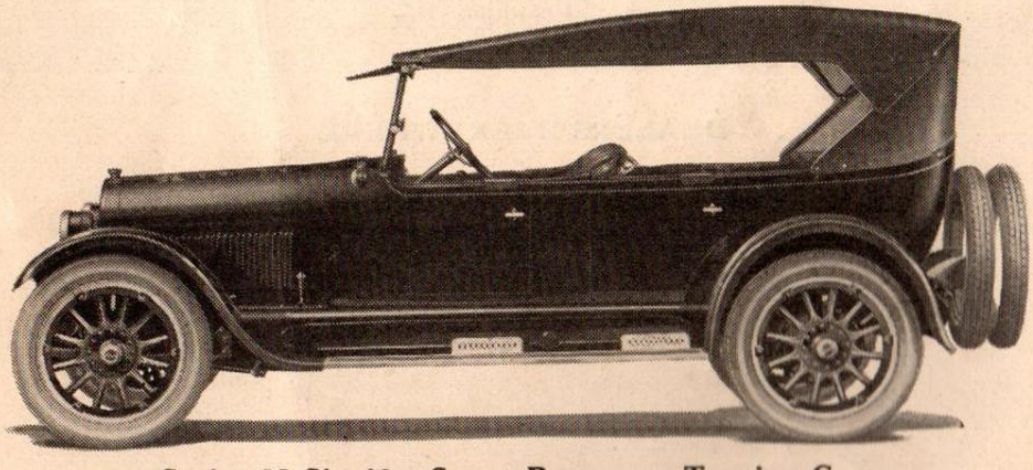
DEALERS EVERYWHERE



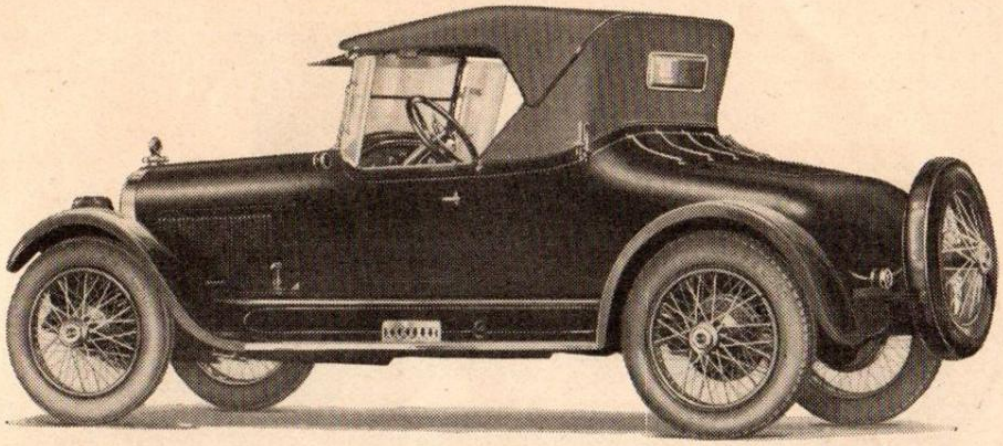
Series 23-Six-44—Two Passenger Roadster



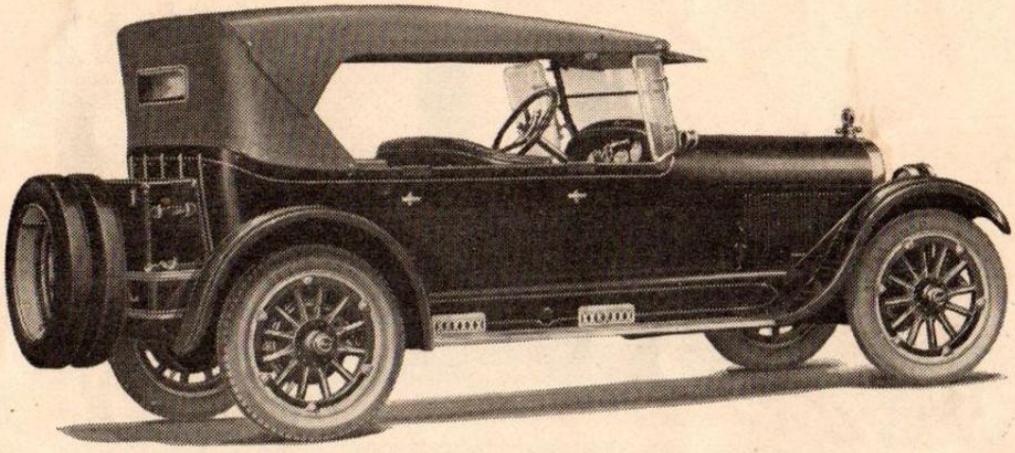
Series 23-Six-45—Five Passenger Touring Car



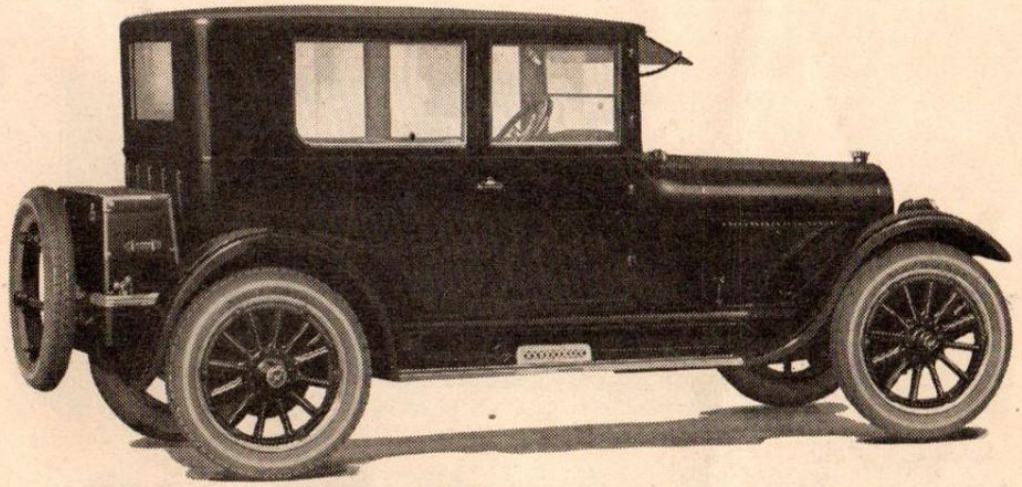
Series 23-Six-49—Seven Passenger Touring Car



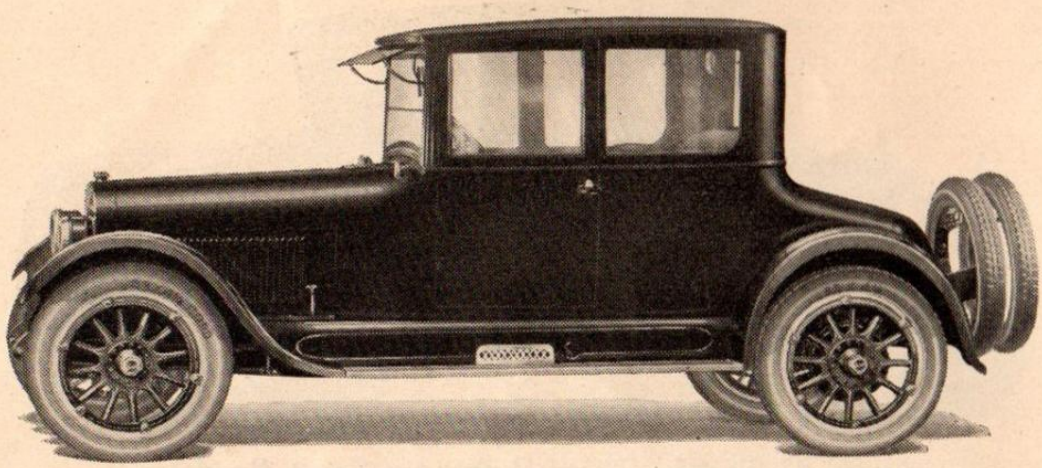
Series 23-Six-54—Three Passenger Sport Roadster



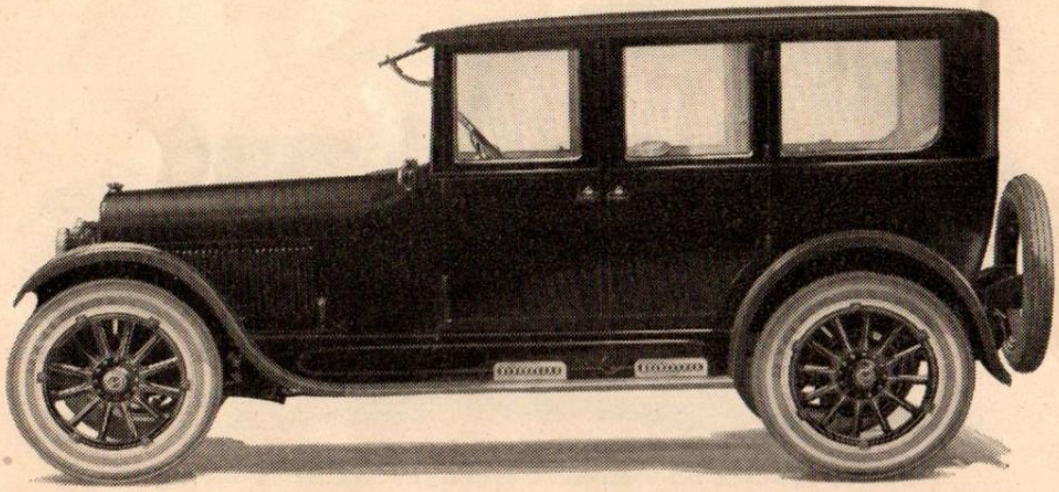
Series 23-Six-55—Four Passenger Sport Touring



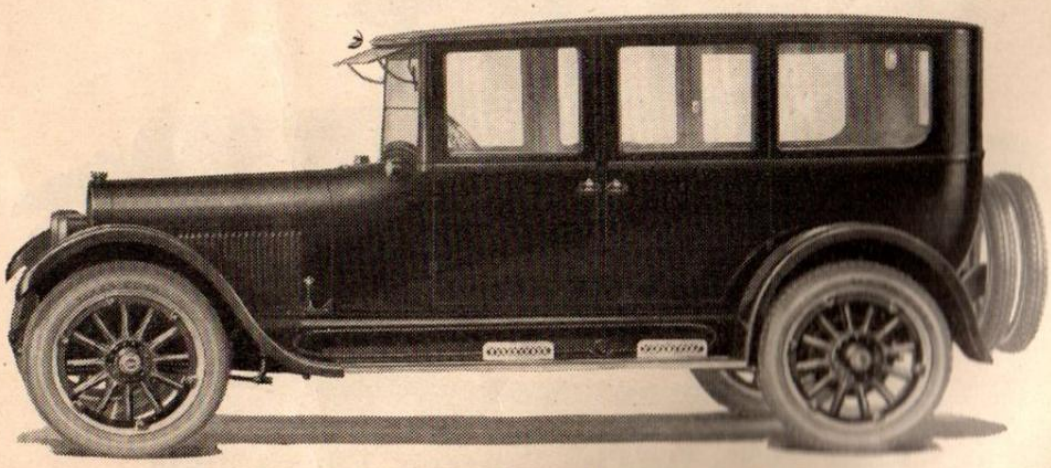
Series 23-Six-41—Five Passenger Touring Sedan



Series 23-Six-48—Four Passenger Coupe



Series 23-Six-47—Five Passenger Sedan



Series 23-Six-50—Seven Passenger Sedan

LICENSE APPLICATIONS

In those states or territories requiring license under a power rating, the following information will be necessary:

Model—(See plate on the front of the dash, under the hood.)

Serial Number—(See oval plate on left side of frame, beneath front fender.)

Engine Number—(See number stamped on left side of crank case near front oil filler tube.)

Number of cylinders—Six.

Diameter of bore—3.375 inches.

Stroke—4.50.

S. A. E. or N. A. C. C. horsepower rating—27.3 horsepower.

Shipping Weight—

23-6-41—3315 pounds	23-6-48—3505 pounds
23-6-44—2960 pounds	23-6-49—3355 pounds
23-6-45—3080 pounds	23-6-50—3690 pounds
23-6-47—3500 pounds	23-6-54—3320 pounds
23-6-55—3320 pounds	

GUARANTEE

The automobiles furnished by the Buick Motor Company are warranted to be free from defects in material and workmanship under normal use and service, our obligation under this guarantee being limited to making good at our factory any part or parts thereof, which shall within ninety (90) 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 guarantee being expressly in lieu of all other guarantees expressed or implied, and of all other obligations or liabilities on the part of the Buick Motor Company, and we neither assume, nor authorize any person to assume for us any liability in connection with the sale of Buick automobiles.

This guarantee shall not apply to any Buick automobiles, 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 Buick Motor Company makes no guarantee whatever in respect to tires, rims, ignition apparatus, horns or other signalling devices, starting devices, batteries, speedometers or other trade accessories, inasmuch as they are usually guaranteed separately by their respective manufacturers.

The Buick Motor Company reserves the right to make changes in design or add any improvements on Buick cars at any time without incurring any obligations to install same on cars previously purchased.

BUICK MOTOR COMPANY,
Flint, Michigan.

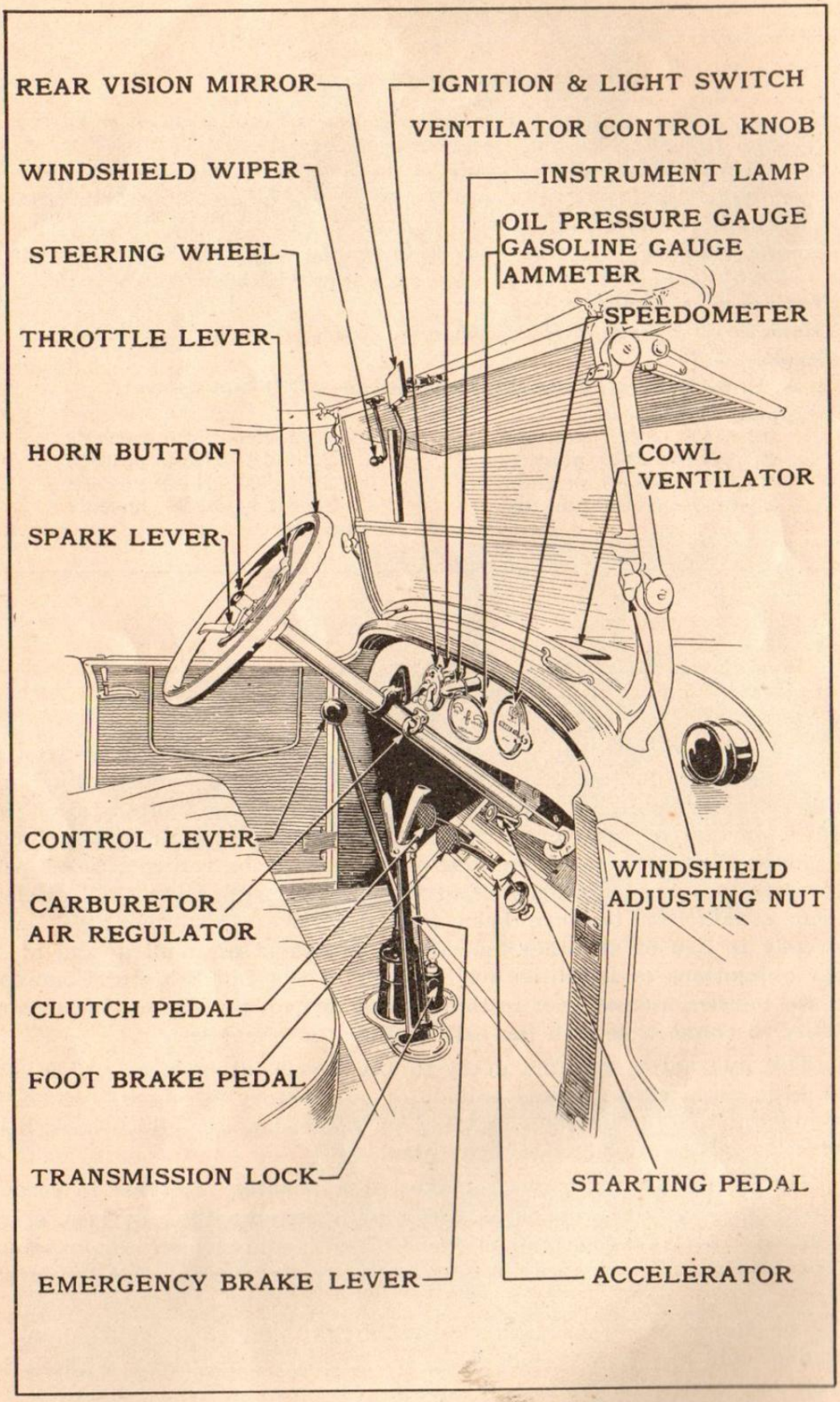


Plate No. 1
Driving Compartment

OPERATION

Before attempting to drive the car, make sure it is ready for the road. See that there is gasoline in the tank at the rear; that the radiator is filled to the level of the overflow with clean water, or with an anti-freezing mixture in winter; that the engine crank case is filled with oil to the place indicated by "FULL" on the measuring stick; that the storage battery is properly connected; that the gasoline shutoff cock between the vacuum tank and the carburetor is fully open; and that the car is provided with a driving license, that the fan is working and that the tires are properly inflated. If the car has been standing idle for several days, it may also be necessary to prime the vacuum tank by removing the pipe plug in the cover and introducing a pint or so of gasoline. Be sure to screw the plug in tight when replacing it.

TO START THE ENGINE

See that the ball-topped control lever stands in neutral position, where it is free to move sideways. Set spark and throttle levers on the steering wheel about one-third of the way down the sector. Unlock the switch and turn the ignition lever on switch to point marked "On." Turn air regulator to "choke" position, hold the clutch pedal out with left foot and press the starting pedal.

Pressing the starting pedal sets the electric starter in motion and meshes the gears on its shaft with the teeth in the fly wheel to crank the engine.

If the engine does not start within thirty seconds, release the starting pedal, examine all controls to see that they are properly set and try again. In winter, when the engine is very cold, it will require more cranking, but in ordinary weather the engine should start on the first few turns.

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

RUNNING POSITION

As soon as the engine starts, turn air regulator to "Hot" position; close throttle and advance spark about half way down the sector until motor runs slowly and evenly. The automatic spark advance will now take care of the spark position for all ordinary driving. The foot accelerator can be used to control the speed of the engine. As the engine warms up, the air regulator can be adjusted between "hot" and "cold" positions to obtain even running at all speeds.

When taking long drives adjust air regulator to "cold" except in extremely cold weather.

Never allow the engine to run any length of time with the air regulator turned to "choke," as this gives an excessively rich mixture and uses an abnormal amount of gasoline and causes crank case dilution.

HAND CRANKING

If the storage battery should be run down or the starter out of order the engine may be started by hand cranking. To crank by hand set switch and air regulator as before. Bring throttle lever one-third of the way down on the sector and move spark lever slightly away from topmost position. Remove cap from starting crank below radiator and attach hand crank. Push in on crank until starting clutch is engaged, and turn engine over by pulling up sharply on the crank.

Never try to start an engine by pushing down on the starting crank as a back-fire is likely to result in a broken arm.

TO START THE CAR

To start the car first see that the transmission is not locked and the engine running slowly and evenly, grasping the steering wheel firmly with the left hand. With the right hand, release the emergency brake lever, and push it as far forward as it will go. Place the left foot on the clutch pedal, and press down firmly, holding it in this position, with the right hand, shift the ball-topped lever first to the right, then back.

LOW SPEED

The gearset is now in the first or "low speed" position. Gently release the pressure of the left foot on clutch pedal and at the same time press down slightly on the accelerator pedal with the right foot to increase the speed of the engine. As the clutch takes hold, the car will commence to move forward. Continue to press down on the accelerator pedal until the car gains some headway before attempting to change to a second speed.

SECOND SPEED

When the car is well under way, disengage the clutch, at the same time releasing the pressure on the accelerator pedal to prevent the engine racing, and with the right hand shift the ball-topped control lever forward and to the left, then forward again. Engage the clutch immediately and accelerate the engine as before. The car is now in second or intermediate speed.

HIGH SPEED

Again accelerate the engine until the car is moving forward rapidly; disengage the clutch and release the pressure from the accelerator pedal as before, quickly shifting the control lever straight back as far as it will go, and again engage the clutch. The car is now in high speed which is the normal driving position.

Do not try to start the car with gears in "high or second position" as it places a severe strain on the driving parts and also makes it necessary to slip the clutch, which shortens its life.

SHIFTING GEARS

In shifting from a lower to a higher gear, as in getting under way, it is important that the speed of the car be accelerated just before making the change, so that the two gears that are to be meshed together will be running at approximately the same speed. The proper handling of the clutch pedal and accelerator so as to make the engine "pick up" its load quickly, and at the same time prevent it from "racing" when the clutch is released, requires considerable practice.

In changing gears, and especially when starting the car from a standstill, always let the clutch pedal come back gently. If the foot is suddenly removed from the pedal it will let the clutch take hold with a violent jerk.

In shifting gears, from one speed to another, the motion should be made firmly and without hesitation. If the gears fail to mesh correctly the first time, release the pressure on the control lever and clutch pedal for a moment and try again. With a little practice the various changes can be made easily and without noise.

SHIFTING DOWN

Shifting from a higher to lower gear, or "shifting down," is accomplished in the same way as shifting up; that is, by releasing the clutch, moving the control lever quickly to the proper position, and engaging the clutch. It will be found much easier to shift gears from higher to lower speeds if clutch pedal is pressed down only enough to release clutch.

DRIVING

Ordinarily the car is driven in high or third speed and first and second speeds are used only for starting. Occasionally, however, a steep hill, muddy or sandy road will be encountered which requires more power, and since it is for this purpose that the lower speeds are provided, the driver should not hesitate to use them.

The Buick will climb practically any hill "on high," but after the driver has demonstrated this to his satisfaction, it is suggested that he make use of a lower gear which will not cause so great a strain on his engine.

STEERING

Steering is largely a matter of practice. Drive slowly at first. Do not attempt to turn corners too sharply or too quickly. Always slow down or stop before crossing railroad and car tracks. In a short time a driver gets the "feel" of his car, and then steering becomes almost an involuntary action; so that all the attention can be concentrated on the road. Learn

to watch the road from 100 to 300 feet ahead of the car, depending on the speed. In this way there is always time to prepare for obstacles before the car reaches them.

HANDLING THE SPARK

Advance spark lever downward until it comes to the lower arrow point on sector marked "Driving Range." This gives the correct position for all ordinary driving, the automatic spark advance, which is incorporated in the ignition system, will control the spark position without further attention on the part of the driver. It is arranged to automatically advance or retard the spark to the proper position, depending on the speed of the engine, but as the car slows down, as in ascending a steep hill or negotiating a heavy road, it is necessary to retard the spark by hand until the engine runs smoothly and without knocking.

Never allow the engine to run for any length of time with the spark retarded, as such practice only consumes an abnormal amount of gasoline, and has a tendency to overheat the engine.

TO STOP THE CAR

To stop the car slow down the engine by removing the pressure from the accelerator pedal, at the same time making sure that the steering gear throttle lever is in its topmost position. If the car still retains too much speed apply the service brake by pressing the brake pedal with the right foot gradually until it slows down to the desired speed; then release the clutch, shift the control lever to neutral, remove the foot from the clutch pedal and apply the service brake until the car is brought to a stop. You can save your brakes by allowing the motor to act as a brake. This is accomplished by leaving the clutch in and with the gas shut off the car will have to drive the motor, which takes considerable energy and slows the car down noticeably.

TO REVERSE

To reverse the motion of the car, or drive backwards, first come to a full stop. Release clutch and shift control lever to the right and forward. Engage clutch and accelerate engine as before.

Never attempt to reverse the motion of the car before it has come to a complete stop. The car cannot move in two directions at the same time and the result is certain to be serious if this is attempted.

EMERGENCY STOPS

If for any reason it should become necessary to stop the car suddenly, press both pedals and at the same time pull back on the emergency brake lever with the right hand. The car should not be stopped suddenly except in an emergency as such stopping is extremely hard on the tires and strains the entire mechanism. A good rule is to use brakes and clutch as little as possible and endeavor to control the car with the accelerator.

TO STOP THE ENGINE

To stop the engine turn ignition lever on switch to position marked "OFF" and at the same time open the hand throttle to the starting position. This will allow the engine to take in a full charge of gas before coming to rest and leave it ready for a quick start next time; also move the spark lever to the starting position and set the emergency brake before leaving the car.

Form the habit of locking the ignition switch and transmission when leaving car standing alone. Never leave car with engine running, as this is a useless waste of gasoline and there is always a chance that children or others may throw the transmission gears into mesh.

STARTING ON A GRADE

It sometimes becomes necessary to start the car on an up-grade. To accomplish this, start engine as before, then release emergency brake and hold car with service brake while shifting gears. Now accelerate engine with the hand throttle while gradually releasing pressure on both pedals together. It takes considerable practice in operating the clutch and brake pedals to make the one take hold while releasing the other without "stalling" the engine, but it can be done with a little practice.

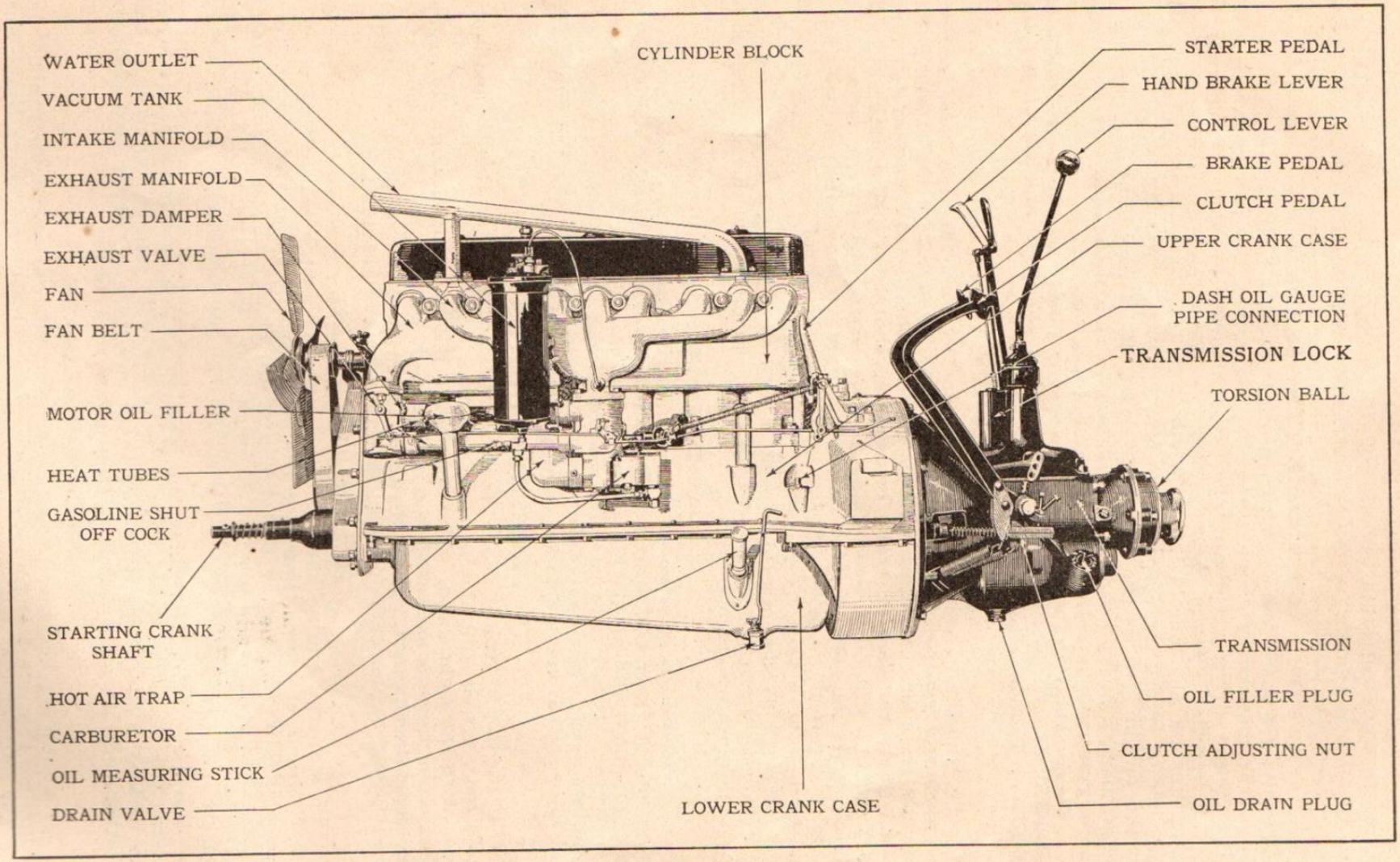


Plate No. 2
Carburetor Side of Power Plant

SKIDDING

Sudden application of the brakes, especially when turning a corner or on slippery pavement, is liable to make the car "skid." Skidding is caused by the rear wheels suddenly losing their traction while the car is subject to centrifugal force from turning. The result is that the rear end swings suddenly toward the outside of the curve.

The best way to avoid skidding is to drive slowly. **When a skid occurs, release the brake for an instant and turn steering wheel in the direction the car is skidding, but do not release clutch.**

Tire chains will be found a convenience when driving on wet pavements or muddy roads, but should not be used unnecessarily.

RACING THE ENGINE

Never open the throttle suddenly when not necessary, or leave it open very far when the car is standing and the engine running idle. This is known as racing the engine, and there is nothing more injurious especially when the engine is cold. More engines have been ruined by racing while idle than have ever been worn out in actual driving under load.

SPEEDING

Drive slowly at first. Extremely high speeds are dangerous under all conditions and fifteen or twenty miles an hour on good roads is fast enough for the inexperienced driver. Learn to handle the car properly under all conditions of roads and traffic before attempting higher speeds.

RULES OF THE ROAD

The following "rules of the road" apply to the entire United States and the greater part of Canada. Every driver of a motor car should understand and obey them:

1. When coming to dead stop hold arm out horizontally.
2. When desiring to turn **Right** hold arm out horizontally, then drop 45°.
3. When desiring to turn **Left** hold arm out horizontally, then raise 45°.
4. When meeting a vehicle going in the opposite direction, turn out to the right.
5. When passing a vehicle going in the same direction, pass it on the left, after warning with horn.
6. In turning a corner to the right, keep as close as possible to the right hand ditch or curb.
7. In turning a corner to the left, continue in center of street past the center of intersection of the two roads or streets before making the turn.
8. In stopping the car always stop with the right hand side of the car at the right hand curb.

USE OF LIGHTS

Buick cars are provided with electric lights operated from the instrument board. For night driving on country roads both head and tail lights should be turned on by turning the lever or lighting switch to proper position. For city driving and meeting vehicles turn lighting switch to dim. When leaving the car standing at the curb turn lighting switch to side. By turning lighting switch to rear the tail lamp only is lighted.

An instrument lamp is provided on the instrument board which is controlled by a separate button on switch and will illuminate the instruments at night. This can be lighted momentarily by pressing on the knurled button of switch and will remain lighted when the button is turned to the right.

ADJUSTING HEADLIGHTS

The beams from the headlights can be properly directed on the road by loosening the bolts which fasten the lamps to the fenders, and swinging the bottoms of the brackets. The brightest part of the light should strike the road about 300 feet ahead of the car. The lamps may be focused by adjusting with a screw driver the focus screw found on the back side of lamp. Turn screw to the left to shorten focus and reverse operation to lengthen.

WATCH THE INSTRUMENTS

Instruments placed conveniently on the instrument board keep the driver constantly informed as to the operation of his car, and he should form a habit of glancing at these instruments occasionally while driving.

The oil pressure gauge tells, by the position of the indicator hand, when sufficient oil is being circulated through the engine lubricating system.

To wind the clock on models 41, 47, 48 and 50, turn the rim to the right as far as it will go. To set the clock, pull out on the rim and set the hands by turning to the right or left, as the case may be.

The clock on models 54 and 55 is shown through the speedometer dial. This clock operates as a watch, by a stem, which is below the instrument board, directly beneath the speedometer dial.

The ammeter shows the amount of current, in excess of that being used for lights and ignition, going to the storage battery. It also shows the amount taken from battery when rotating the armature or for idling the engine.

The speedometer gives the speed of the car and the number of miles traveled, both total and trip. The trip register may be set back to zero or to any given figure by turning the knurled finger screw protruding through the face.

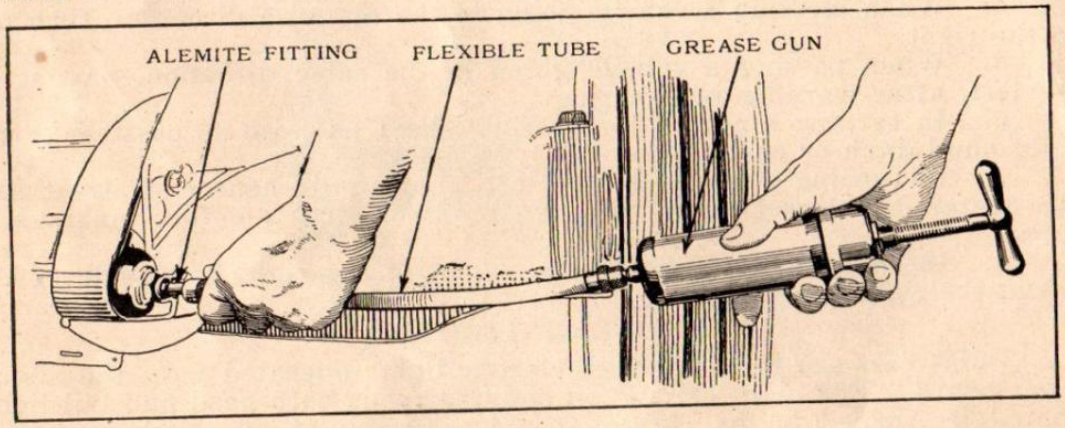
The clock on models 54 and 55 is visible through the speedometer dial and operates the same as a watch, by a stem below the instrument board directly beneath the speedometer.

The ventilator is controlled from the driving compartment by the ventilator control knob located in the instrument board.

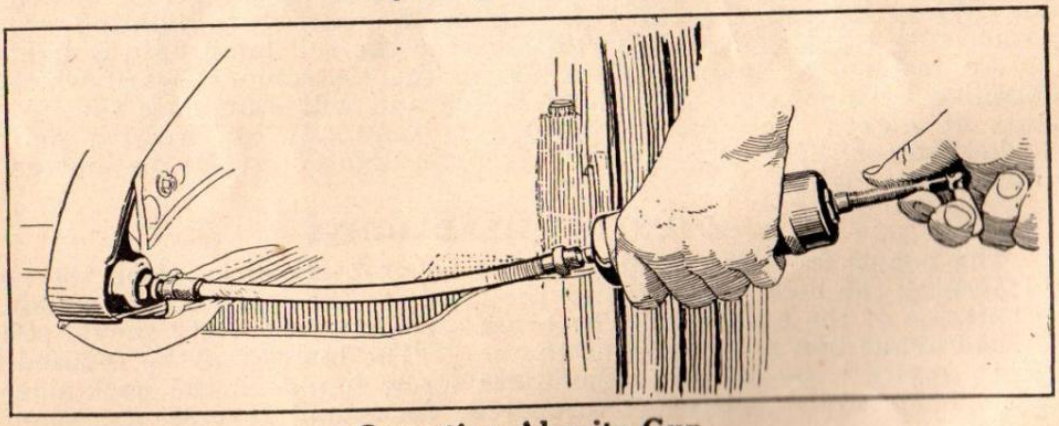
The heater on the closed models is located on the left side of the car. Pull up on handle to turn on heat, and release to shut off.

THE ALEMITE HIGH PRESSURE LUBRICATING SYSTEM

Thorough and frequent lubrication of all bearings is necessary to riding comfort and life of the car. To make this essential work simple and convenient, the Buick cars are equipped with the ALEMITE HIGH PRESSURE LUBRICATING SYSTEM.



Adjusting Alemite Gun



Operating Alemite Gun

The Alemite System consists of ball-check valve fittings on all chassis lubricating points, a compressor, and a flexible steel hose. (See Lubrication Chart.)

OPERATING THE SYSTEM

Filling the Compressor. Disconnect the hose first. Unscrew removable head of compressor, and turn out piston rod until leather plunger is drawn up inside the head.

Fill cylinder with soft cup grease. A small paddle may be used for packing grease into the cylinder.

When cylinder is filled, replace the head and screw down—**tightening by hand only.** Replace hose by screwing large swivel on lower end of compressor. This may be tightened with a wrench.

Lubricating the bearings. Be sure that the Alemite fittings are wiped free from dust or dirt, in order that fittings will not be clogged or dirt forced into the bearing.

Place the bayonet coupling of hose over the fitting. With a slight pressure forward and a turn to the right, the coupling is locked over the steel pin, and a tight joint is made. Give the compressor handle a few turns until old grease is forced out on opposite side of the bearing, which assures you that fresh grease has been forced through the contact points. **Use hands only in operating compressor. A pressure of 500 pounds to the square inch is secured in this manner.**

The flexible steel hose will be found a great convenience in reaching ordinarily inaccessible lubricating points. When in use, however, this hose is under tremendous pressure. Care should accordingly be taken not to bend the hose to an acute angle.

Before disconnecting hose coupling from fitting, relieve pressure by reversing handle of compressor two or three turns. The coupling can then be disconnected easily by a slight twist to the left.

OVERHAULING

About twice a year all the oil should be drained out of engine, transmission and rear axle, and these parts washed out thoroughly with gasoline. It pays to change the oil in the engine frequently (see lubrication instructions). Do not use too much oil. Enough is just right and any more will simply run out of the bearings and collect dust and dirt on other parts of the car.

At least once a year the car should receive a thorough overhauling at which time the engine, clutch, transmission, universal joint, steering gear, and front and rear axle assemblies should be taken apart and carefully cleaned and adjusted before being reassembled. If lower half crank case is removed for any reason, be sure and fill all troughs with oil before replacing. When timing gear housing is removed be sure to fill case through plug on top of housing before starting. This work should be done by an experienced mechanic. Springs should be cleaned, car jacked up to take weight off springs and thin oil applied every 2,000 miles.

GENERAL LUBRICATION

See Chart

LUBRICANTS

Engine oil should be a high grade, medium heavy mineral oil, with a flash point of not less than 375 degrees Fahrenheit and a viscosity of 45 to 55 seconds Saybolt at 210 degrees Fahrenheit. This oil should be used exclusively in the engine lubricating system, for valve rocker arms, distributor and generator bearings, and for all small joints not otherwise provided with lubrication, such as spark and throttle rods, brake rods, etc.

Steam cylinder oil should be a high grade heavy mineral oil with a viscosity of 120 to 150 seconds at 210 degrees Fahrenheit, and should be mixed half and half with engine oil of a cold test not exceeding 5 degrees Fahrenheit for use at temperatures below freezing point, for the transmission gears, differential gears and steering gear. It is better for this purpose than most of the so-called "gear greases"

Soft cup grease should be a homogenous mixture consisting of high grade mineral oil and pure lime soap. It should be free from acids and

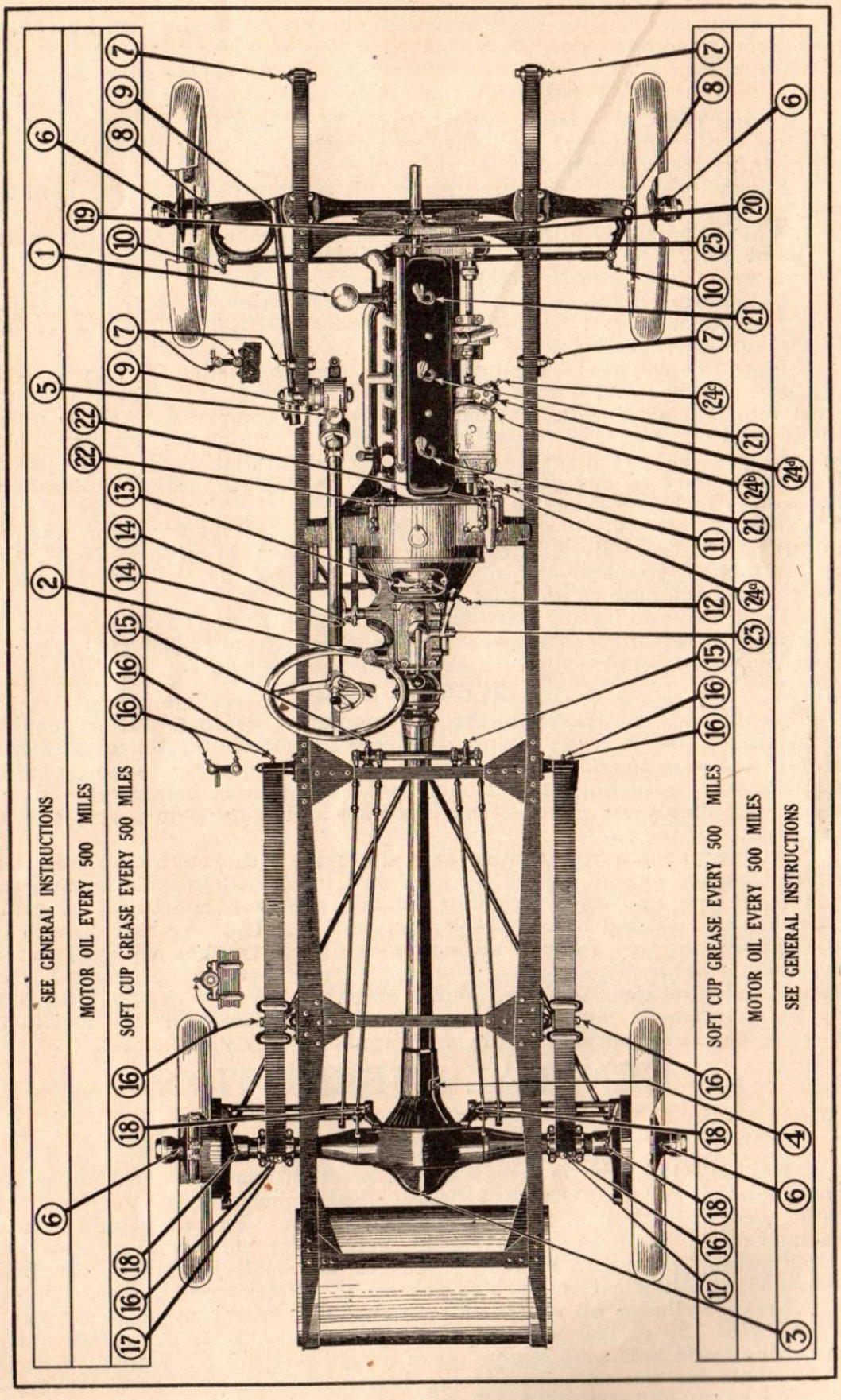


Plate No. 3
Lubrication Chart

high melting point to prevent free flowing in warm weather and should be used in Alemite gun to lubricate parts so equipped.

1. **ENGINE MOTOR OIL.**
   Fill through oil filler tube to "Full" mark on measuring stick.
   Inspect frequently and maintain this level.
   Crank reservoir holds six quarts.
   Drain oil from engine and replace with fresh oil after first 500 miles and every 500 miles in winter and 800 in summer thereafter.
2. **TRANSMISSION—STEAM CYLINDER OIL.**
   Use Steam Cylinder Oil for all temperatures above freezing. Thin with low cold test engine oil sufficiently to make liquid below freezing temperature.
   Remove filler cap on left side of transmission case and fill to level of opening. Inspect frequently.
3. **REAR AXLE—STEAM CYLINDER OIL.**
   Use steam cylinder oil for all temperatures above freezing. Thin with low cold test engine oil sufficiently to make liquid below freezing temperature.
   Remove plug in differential housing cover and fill to level of opening. Inspect frequently.
4. **PINION SHAFT BEARINGS—SOFT CUP GREASE.**
   Remove adjusting cover plate and fill every 1,000 miles.
5. **STEERING GEAR—STEAM CYLINDER OIL.**
   Insert oil until positive housing is full, every 1,000 miles.
6. **WHEEL BEARINGS—SOFT CUP GREASE.**
   Remove plugs and fill every 1,000 miles.
7. **FRONT SPRING SHACKLE BOLTS—SOFT CUP GREASE.**
   Use Alemite gun.
8. **KING BOLTS—SOFT CUP GREASE.**
   Use Alemite gun—work grease in well by moving knuckles.
9. **STEERING CONNECTING ROD—SOFT CUP GREASE.**
   Use Alemite gun.
10. **TIE ROD BOLTS—SOFT CUP GREASE.**
    Use Alemite gun—work grease in well by moving knuckles.
11. **STARTER MOTOR SLIDING GEAR SHAFT—SOFT CUP GREASE.**
    Use Alemite gun.
12. **CLUTCH THRUST BEARING—SOFT CUP GREASE.**
    Use Alemite gun.
13. **CLUTCH RELEASE FORK PIN—SOFT CUP GREASE.**
    Remove transmission cover plate and use Alemite gun.
14. **CLUTCH AND BRAKE PEDALS—SOFT CUP GREASE.**
    Use Alemite gun.
15. **BRAKE CROSS SHAFT—SOFT CUP GREASE.**
    Use Alemite gun every 500 miles.
16. **REAR SPRING SHACKLE BOLTS—SOFT CUP GREASE.**
    Use Alemite gun.
17. **REAR SPRING SEAT—SOFT CUP GREASE.** Use Alemite gun.
18. **BRAKE CAM SHAFT—SOFT CUP GREASE.** Use Alemite gun.
19. **FRONT ENGINE SUPPORT—ENGINE OIL.** Add a few drops of oil.
20. **FAN HUB—ENGINE OIL.** Remove plug and add oil.
21. **VALVE ROCKER ARMS—ENGINE OIL.**
    Turn oil caps on top of engine and fill oil wells.
22. **SPARK CONTROL CROSS SHAFT—ENGINE OIL.**
    Add a few drops every 500 miles.
23. **HAND BRAKE LEVER—ENGINE OIL.**
    Add a few drops of engine oil.
24. **DELCO UNIT—ENGINE OIL.**
    (a) Add engine oil; (b) Add engine oil; (c) Use Alemite gun; (d) Apply thin coating of vaseline to distributor cam and rotor track until surface becomes glazed.
25. **FAN BRACKET SUPPORT—SOFT CUP GREASE.**
    Use Alemite gun.

BRAKE PINS AND CONNECTIONS:
Add a few drops of engine oil occasionally.

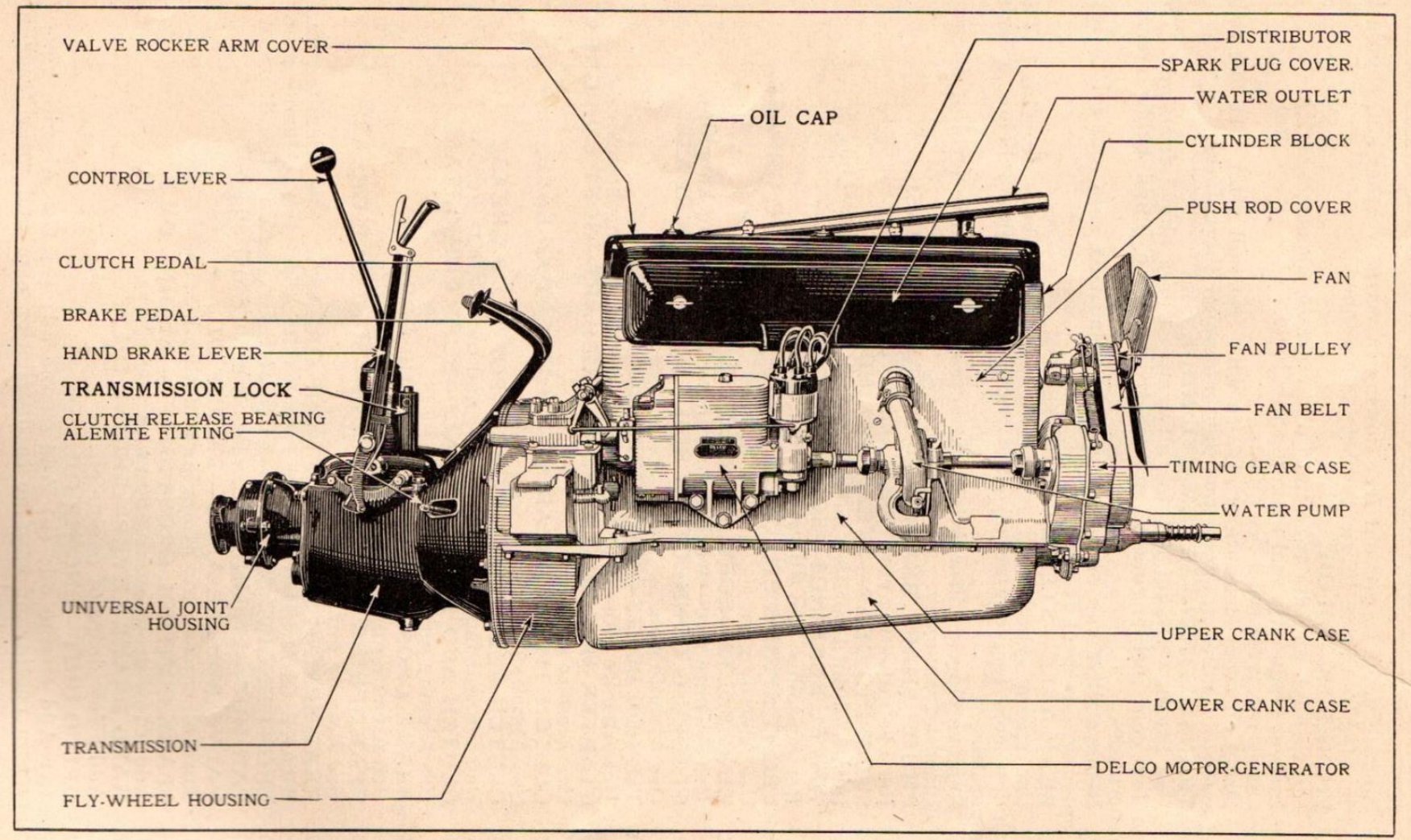


Plate No. 4
Generator Side of Power Plant

POWER PLANT

The unit power plant is the most important part of the car. It develops the necessary power for driving the car and delivers it to the axle and road wheels where it is finally converted into motion of the vehicle..

The power plant consists of:

The engine.
The lubricating system.
The fuel system.
The Delco system.
The cooling system.
The exhaust system.
The clutch.
The transmission gearset.
The universal joint.

The engine is the machine which turns the pressure of the exploding gas into rotary motion of the crankshaft.

The lubricating system supplies oil for the different parts of the engine automatically varying the amount to agree with the speed of the engine.

The fuel system draws the raw gasoline from the fuel tank at the rear of the car, vaporozies it, mixes it with the proper proportion of air and delivers it to the cylinders in quantities proportional to the load.

The Delco system generates the electric current, increases its voltage sufficiently to enable it to jump the spark gaps, and distributes it to the cylinders in proper rotation. It also supplies the electrical energy which is accumulated in the storage battery to crank or "spin" the engine for starting and to operate the electric lights.

The cooling system protects the working parts of the engine by absorbing the excess heat of the explosions and diffusing it to the surrounding atmosphere.

The exhaust system carries the waste products of combustion away from the engine and muffles the noise of the explosions.

The clutch is the connecting link between the engine and the transmission, and connects or disconnects the two units at the will of the operator.

The transmission gearset allows the speed of the engine to be varied in relation to the speed of the rear wheels, so that the energy can be applied at a faster rate under certain conditions.

The universal joint is the flexible coupling at the rear of the transmission which connects the power plant to the rear axle and allows the axle to move up and down over the road surface without interrupting the driving effort.

ENGINE

The engine consists essentially of a row of six cylinders in which the gas is exploded, the force of the explosion acting on pistons which move up and down in the cylinders. The pistons are connected by means of the connecting rods with the crankshaft, and as they move up and down turn the crankshaft around in a clockwise direction. At its rear end the crankshaft carries a heavy fly wheel which engages with the clutch and transmits the power on to the rear wheels. Teeth are cut around the rim of the fly wheel and a small gear, driven by the electric starter, engages with these teeth when spinning the crank shaft to start the engine. The crank case, which is fastened to the frame of the car, supports the cylinders and encloses the crank shaft and its bearings.

At their upper ends the cylinders have two openings, closed by poppet valves. One of these communicates with the exhaust system and the other with the intake manifold and carburetor. The valves are opened and closed at the proper interlals in the cycle by rocker arms and push rods, actuated by the cam shaft, which is geared to the crank shaft and runs at one-half the crank shaft speed, so that the valves are each opened and

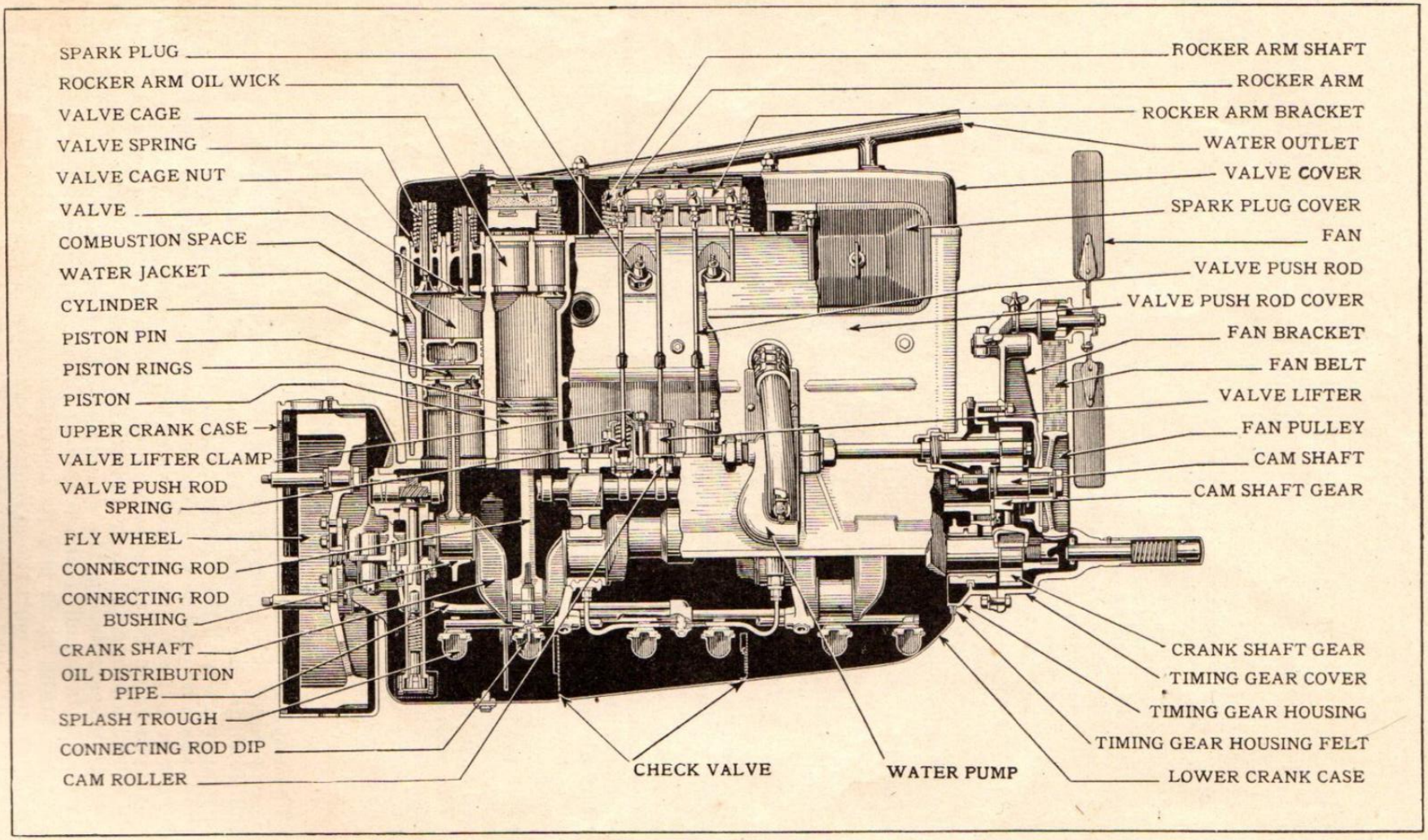


Plate No. 5

Interior Construction of Engine

closed once for every two revolutions of the crank shaft. The oil pump located in the lower half of the crank case is driven from the rear of the cam shaft.

Spark plugs project into the combustion space at the upper ends of the cylinders and serve to ignite the gas when a cylinder is ready for the explosion.

A double wall or water jacket entirely surrounds the upper part of the cylinders and water is kept constantly circulating through the space between the two walls by means of the water pump, which is attached to the right side of the crank case and is driven by another shaft geared to the cam shaft. The pump shaft runs 1½ times as fast as the crank shaft and also drives the Delco generator through a coupling at its rear end.

HOW THE ENGINE WORKS

The power of the engine is produced by burning or exploding charges of gas in the cylinders, above the pistons, the resulting pressure forcing the pistons down causing the crank shaft to rotate. In the four cycle engine, of which the Buick engine 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. This will be more readily understood by reference to the cycle diagram.

As the piston starts down on the first stroke of the cycle, as in "A," the inlet valve is opened. The motion of the piston tends to create a vacuum in the cylinder, and this sucks in a charge of fresh gas from the carburetor, through the valve opening.

When the piston has reached the bottom of its stroke, and starts back, as in "B," the intake valve closes and the piston compresses the gas it has sucked in, into the space at the top of the cylinder.

As the piston reaches the end of its upward stroke, as in "C," the compressed gas is ignited by an electric spark which occurs at the points of the spark plug, and the resultant explosion creates a large amount of heat and pressure, which pushes the piston down during the next, or working stroke, and turns the crank shaft.

On the return upward stroke of the piston, "D," the exhaust valve is opened, and the piston pushes the remaining burnt gas out through the exhaust pipe, leaving the cylinder empty and ready for the beginning of a new cycle.

It will be noticed from the above that only one stroke out of the four is a working stroke in any one cylinder, but as the engine has six cylinders, the crank shaft actually receives three impulses every revolution.

TIMING THE VALVES

The exact point in the cycle at which the valves are opened and closed is determined by the shape of the cams which operate them and by the angular relation between the camshaft and crankshaft. If it should ever become necessary to remove one of these shafts or the gears which drive them, they must be replaced in proper relation to one another or the valves will be "out of time." To obtain this relation, the punch-marked tooth on the crank shaft gear should be set to match with the punch-marked space on the cam shaft gear.

ADJUSTING PUSH RODS

With the timing gears properly matched, the setting of the valves is made by adjusting the push rods to proper length by means of the adjusting ball ends and lock nuts. This adjustment must be made when engine is hot.

To make this adjustment, the valve must be closed. To insure this position, turn the engine with the crank until the rocker arm depresses valve and allows it to return, then turn crank one-eighth revolution further. By means of ball ends and lock nut on the push rod, set the clearance between the valve stem and rocker arm to from .006 to .008 inch.

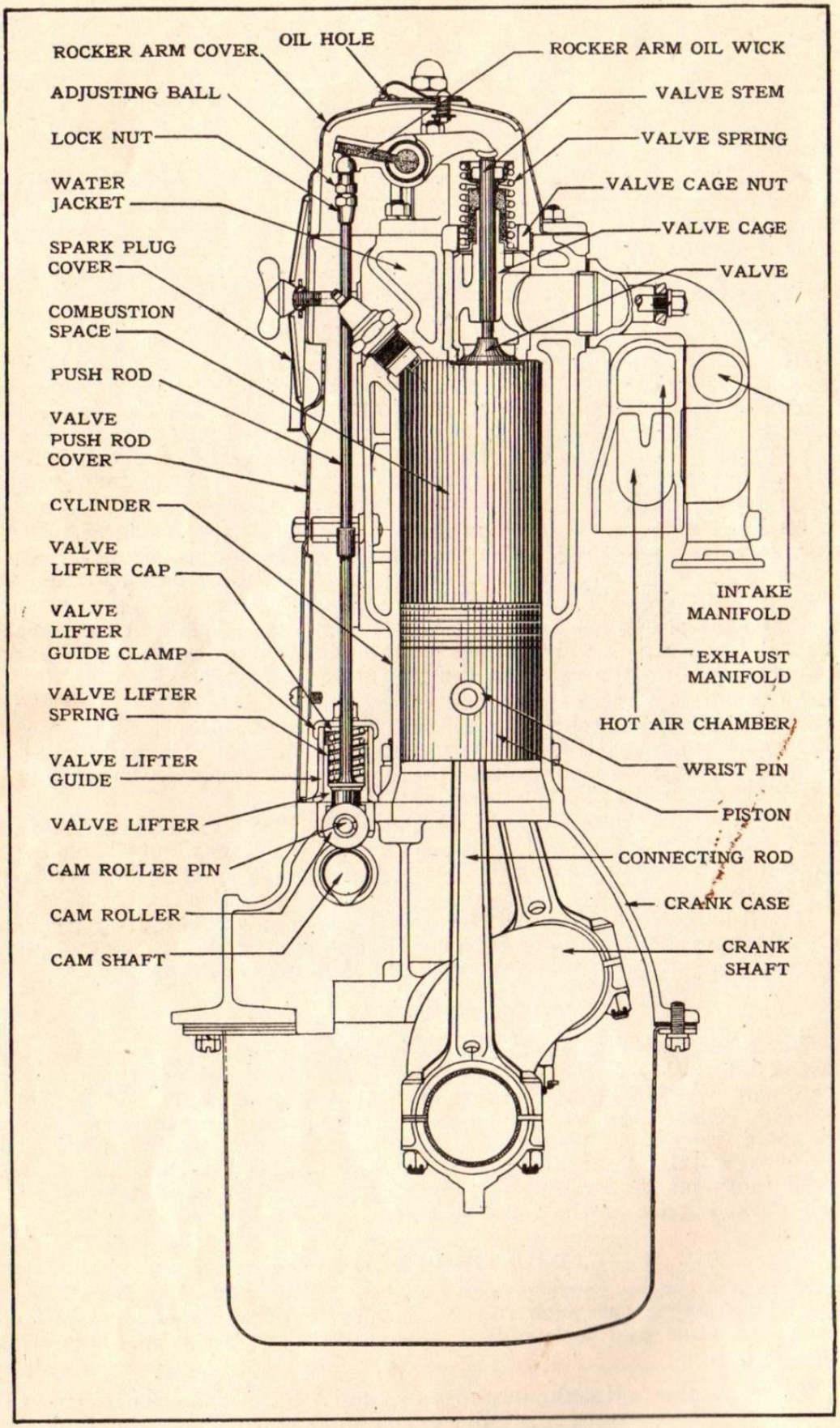


Plate No. 6
Buick Valve Mechanism

One-half teaspoonful of kerosene inserted around the valve stem at least once a week while engine is running will keep valve free from carbon and prevent it from sticking in the valve cage guide.

In setting the marks on the fly wheel be careful to turn the engine only in clockwise direction, otherwise the backlash in the timing gears will affect the result.

GRINDING VALVES

To keep the engine up to its maximum efficiency, the valves must be gas tight when closed. When leakage occurs the valves should be ground as follows: Compress valve spring and lift push rod out of socket in valve lifter. Loosen valve cage nuts with the special drift furnished in tool kit and remove by unscrewing. A light tap with a hammer on the end of the valve stem will loosen cage so it may be withdrawn. Be careful not to injure the small bronze packing ring on top. Remove valve spring and after cleaning with gasoline or kerosene, smear the valve and its seat with fine emery dust and oil, or with one of the grinding pastes now on the market. Grind, by turning valve back and forth on its seat until both valve and seat show a bright ring 1/32 inch wide all the way around. In grinding the valve it should be lifted from its seat occasionally.

Be careful to clean out all traces of abrasive material before replacing valve.

Be sure to clean valve stems of all carbon deposits.

After grinding valves, it will usually be found necessary to readjust the push rods to compensate for the wear.

REMOVING CARBON

Too much lubricating oil or too rich a mixture will form carbon in the cylinder. An excessive deposit of carbon sometimes becomes incandescent and ignites the charges before the piston has finished its compression stroke, resulting in a knock in the engine.

The carbon deposit in the compression chamber may be burned out with an oxygen torch through the spark plug holes.

ADJUSTING BEARINGS

A sharp, metallic knock in the engine, audible every revolution of the crank shaft, may mean that one of the bearings is loose. If retarding spark or removing carbon does not stop the noise, remove lower half of crank case and examine bearings.

When the loose one is located, it can be taken up by removing the cap and taking out one or more of the thin metal shims. The same holds true of the connecting rod bearings. Note that bearing is bright and shows no indication of a lack of lubrication.

INSERTING PISTON RINGS

Piston rings seldom break, but if one does it can be most easily replaced by removing the connecting rod cap and pulling piston and rod out from below. The rings may be slipped on or off the piston by inserting thin strips of sheet metal under them to prevent their dropping into the grooves, until in their proper places.

ASSEMBLING CONNECTING RODS

In assembling connecting rods to the crankshaft, it should be noted that the connecting rods are offset from the center line with relation to the bearings and great care should be exercised when assembling rods to see that the identification marks, which are a raised pad and the forging number (158731 or 158732) in the channel of the rod, are assembled next to the adjacent main crank shaft bearings. This also brings the smooth channel of the rods facing each other in pairs between the main crank shaft bearings.

KEEPING THE ENGINE CLEAN

Nothing will add more to the appearance of the car when the hood is raised, than a clean engine. Use soft cloth moistened with gasoline or kerosene and a stiff brush to get dirt out of sharp corners.

ENGINE LUBRICATING SYSTEM

The engine is provided with an automatic lubricating system which operates as follows:

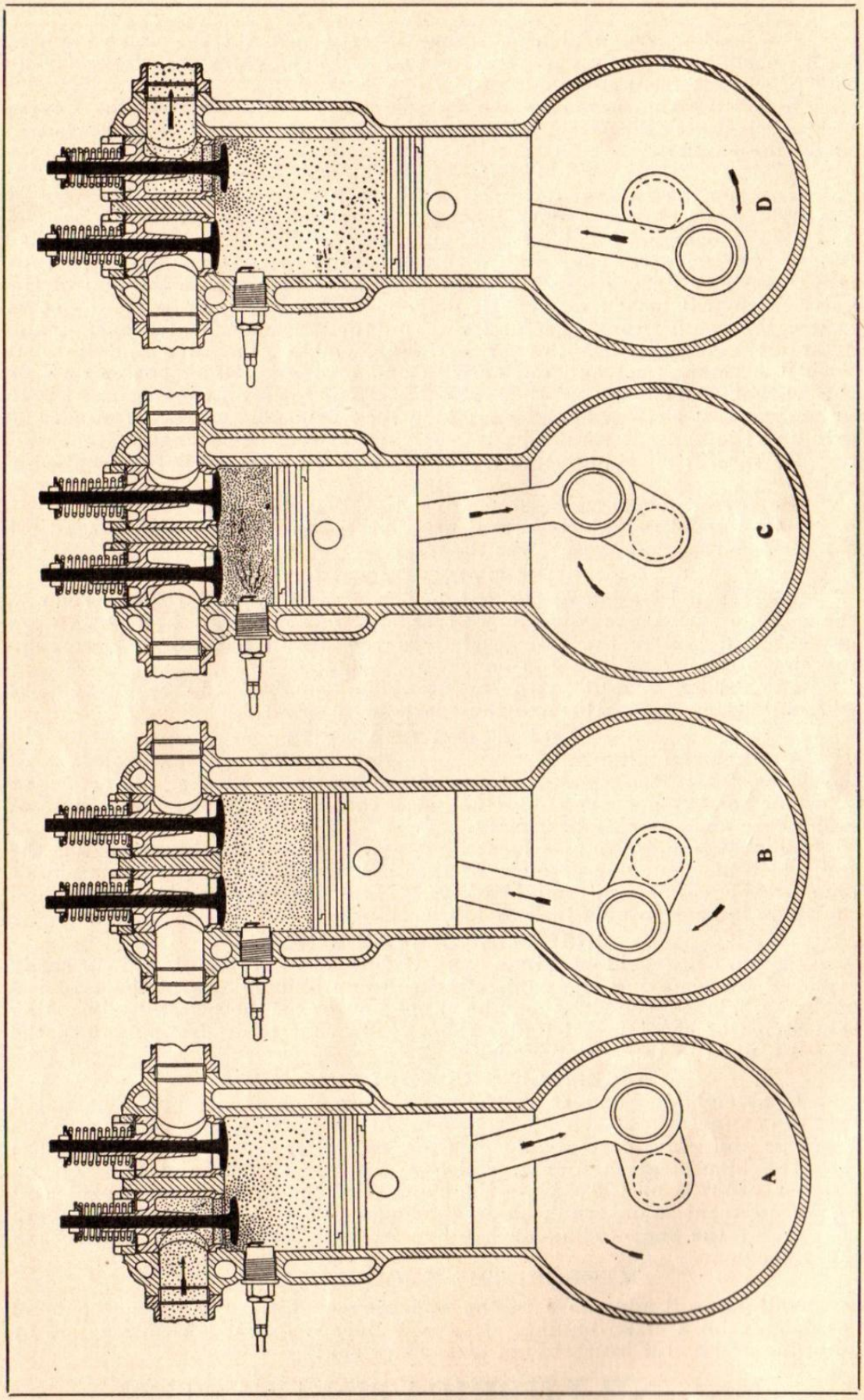


Plate No. 7
Cycle Diagram

Oil from the reservoir, in the lower half of the crank case, is drawn through a strainer into the gear pump enclosed in the rear end of the lower crank case.

The oil pump forces the oil through a pipe past a by-pass valve and the spring tension exerted on the by-pass valve causes the pressure gauge to register on the cowl instrument plate.

After passing the by-pass valve the oil flows through the distributor pipe to splash troughs fastened in the lower half of the crank case into which the connecting rods dip, forcing some of the oil through oil grooves up into the connecting rod bearings and splashing remainder over the interior of the crank case and up into pistons and cylinders. The crankcase main bearings are lubricated by splash and in addition oil is forced directly from the pump to the two center bearings.

As the oil drains back, it is caught in ducts and led to all the bearings of the engine, a quantity passing from the front main bearing pocket through a hole in the back wall of timing gear case, thereby lubricating the gear, the excess falling back into the reservoir to be used over again. The normal oil pressure as indicated by the hand on the pressure gauge is four pounds. If indicator hand on pressure should fall to zero while engine is running, the engine should be immediately stopped and an investigation made to ascertain if oil in crank case is up to the required level; should it prove to be so, an examination of the by-pass valve, located in oil pump, should be made, as the small hole will probably be found to contain some foreign substance which is preventing the flow of oil.

OIL CIRCULATING PUMP

The oil pump consists of two small gears enclosed in a close fitting housing and driven by a vertical shaft and spiral gears from the cam shaft. As the gears turn, they take the oil into the spaces between their teeth and carry it around to the outlet, where the action of the teeth meshing together squeezes the oil out of the spaces and forces it to flow through the distributor pipe. The pump is automatic in action and requires no attention or adjustment, except the addition of fresh oil to the crank case reservoir as often as necessary to keep the oil level up to the "FULL" mark on measuring stick.

OIL PRESSURE GAUGE

The oil pressure gauge merely indicates circulation of the oil, and does not show when the supply in the crank case reservoir is running low. Watch and test the oil level in the crank case by reading measuring stick.

Caution! Do not attempt to determine oil level while engine is running and wipe measuring stick clean before taking correct reading.

FUEL SYSTEM

The fuel system consists of the gasoline tank, piping, vacuum tank, carburetor and intake manifold. There is nothing connected with the gasoline tank or piping to get out of order, the chief consideration being to carefully strain all gasoline and to avoid leaks which are sometimes caused by road vibration.

VACUUM TANK

The vacuum tank draws the fuel from the gasoline tank at the rear and delivers it to the carburetor at a constant head, as needed. It consists of two steel shells, the inner one of which encloses the float and the valve mechanism attached to the cover, while the outer one acts as the fuel reservoir and is connected to the carburetor. The float operates two small valves which control openings connected to the inlet manifold and to the atmosphere. A flapper check valve closes the bottom of the inner shell. As the inner shell empties, the float falls and closes the atmospheric valve and opens the suction valve.

The suction of the pistons tends to create a vacuum in the inner shell, drawing gasoline into the inner tank from the main fuel tank at the rear of the car. When the inner tank has filled, the float rises, closing the suction valve and opening the atmospheric valve, allowing air to enter the inner tank through the vent tube, while the gasoline passes through the flapper check valve into the outer tank and from there to the carburetor.

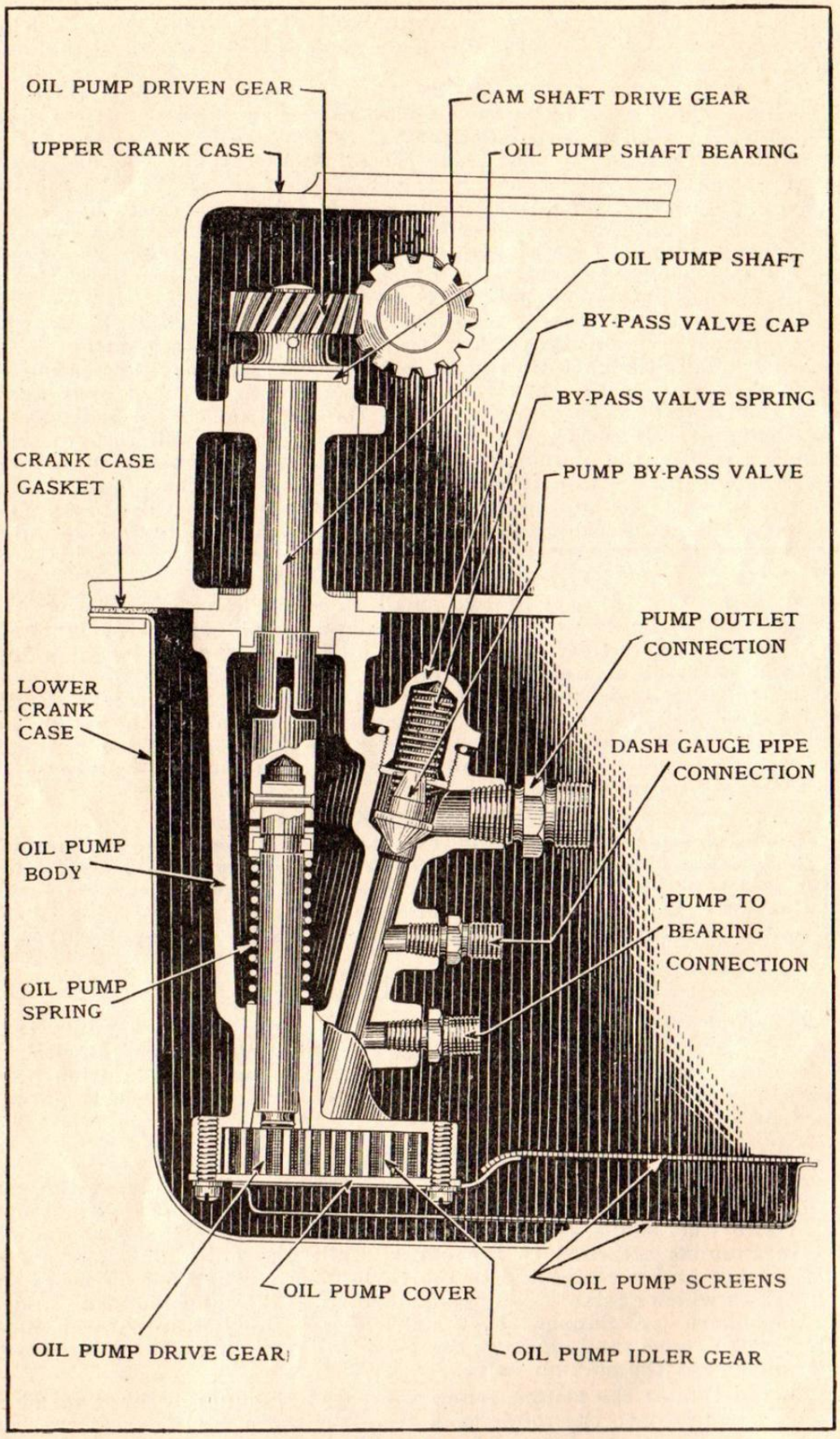


Plate No. 8
Oil Pump and Shaft

The action of the vacuum tank is entirely automatic. There are no adjustments, and it will require no attention aside from an occasional examination of the connections to see that they are tight and free from dirt. It is advisable to drain the tank every 500 miles to remove any sediment that may have collected.

If vacuum tank runs dry, with no air leak in gas line, close throttle and crank engine 15 or 20 turns with starter. Then release starter, wait two or three minutes, then start engine in usual manner.

The gasoline tank in the rear should be drained every 2,000 miles to remove any sediment and prevent same from reaching the carburetor and causing trouble.

Do not allow the vent tube in vacuum tank or the small hole in the gasoline tank filler cap to get stopped up with dirt.

CARBURETOR AND HEAT CONTROL

The carburetor is the instrument which measures the fuel charges for the engine and automatically mixes them with the proper amount of air to form a combustible gas.

The float chamber contains a float attached to a valve in such a manner that fuel is admitted only as it is needed to maintain a constant level in the spray nozzle. The spray nozzle opening is regulated by a gasoline needle valve which constitutes the gasoline adjustment and it is surrounded by a venturi tube through which a portion of the incoming air passes at high velocity, picking up gasoline from the end of the nozzle in passing.

The mixing chamber also contains the air valve and the high speed jet.

The air valve is pressed against its seat by an adjustable spring which is housed inside of the air screw and which presses against a plunger also housed inside the air-screw, the plunger being connected to the air-valve by means of a connecting rod; the adjustment of the air-screw constituting the air adjustment. As the speed of the engine increases, the velocity of the entering air increases until the valve is lifted from its seat and at the same time an additional amount of gasoline is taken from the high speed jet located immediately under the tip of the air valve.

The plunger housed within the air-screw against which one end of the air valve spring presses, together with the shell of the air-screw, constitutes a dash pot, the effect of the action of which is to slightly retard the opening action of the air-valve, thus assisting in quick pick-up and also overcoming any undue vibration of the air valve.

To remove air-valve spring, turn air screw all the way out to the left, taking care that spring does not fall out and get lost by dropping into the pan as it is not fastened at either end.

In re-assembling the air-valve-spring in the air-screw-shell, merely place the spring inside the latter and insert same, picking up at the same time end of plunger which works inside the air-screw-shell also; and screw the air-screw-shell into its place; the air-valve-spring will find its proper seat at both ends automatically owing to the cone-shaped form of seats in which it fits, one end being in end of plunger and the other end in end of air-screw-shell.

Changes of air-valve-springs must never be made unless done so advisedly as each size motor requires its particular size of spring. Neither should any other make of air-valve-spring other than those made by the manufacturers of the carburetor and sold by them through authorized dealers or authorized Buick dealers, ever, under any circumstances, be used as these springs must be carefully made and tested for size and tension to meet the requirements of the particular size motor for which they are intended.

The air-valve is hinged on the insert which is housed by the mixing chamber and carries the spray nozzle already referred to and also the high speed jet.

The air enters the carburetor through a three-way valve connected to the air-regulator marked "Cold," "Hot" and "Choke" on the instrument board. The air-regulator is fastened to the instrument board by means of two screws, the head of one of the screws being to the right of "Hot" and

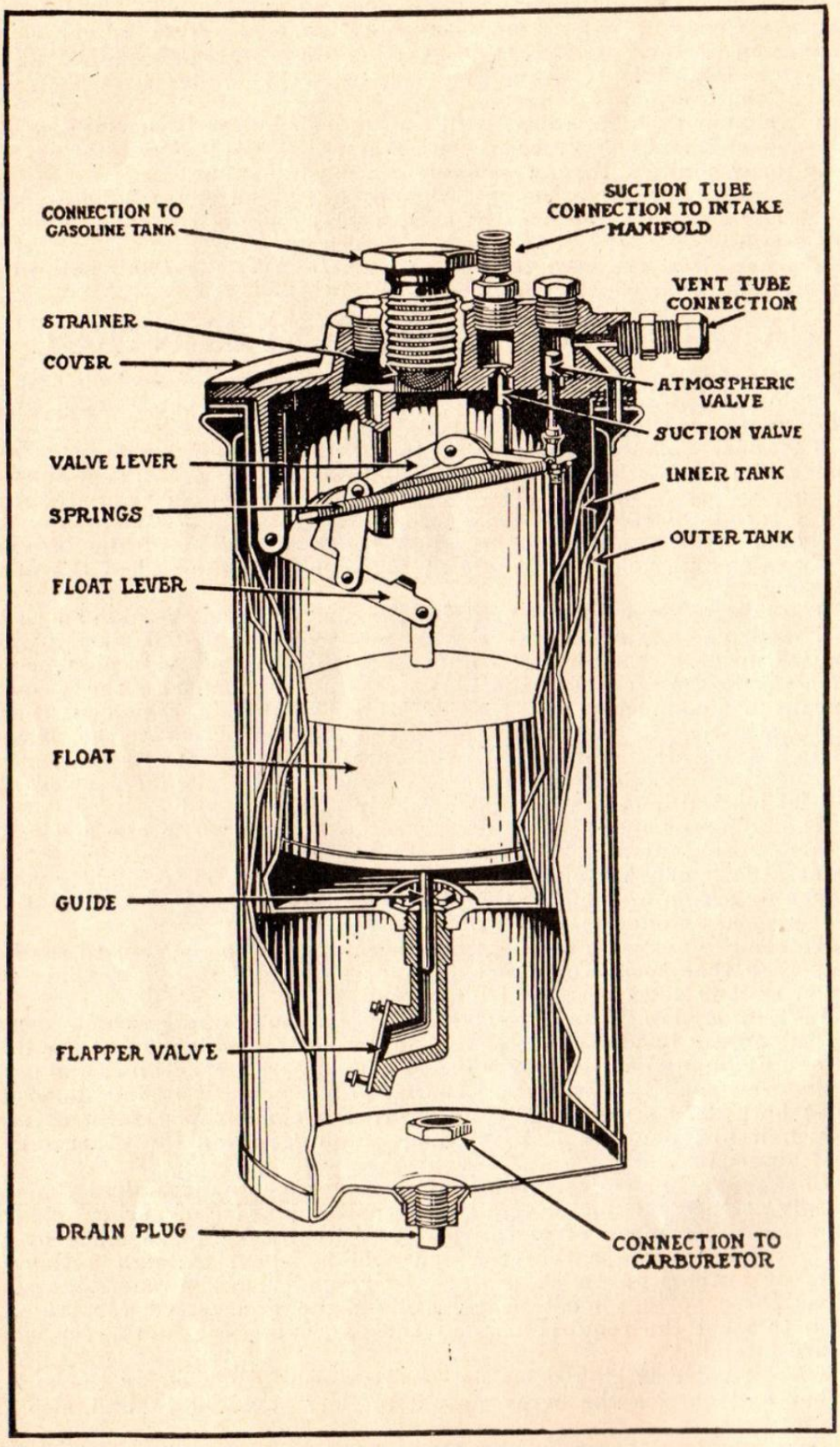


Plate No. 9
Vacuum Tank

the other to the left. When the point of the indicator for the regulator is turned to the right as far as it will go, pointing to "Choke," the air supply to intake of carburetor is closed off as far as possible and causes the carburetor to give off excessively rich charges for starting and in cold weather upon starting engine, should be released to "Part Choke" only, meaning two-thirds of the way back toward "Hot" until point of indicator is just under head of screw to the right of "Hot," just as soon as engine fires in starting, as otherwise too much fuel will be drawn from the carburetor, causing flooding of the motor and failure of the latter to continue to promptly fire. After starting and promptly releasing indicator to "Part Choke" as described, and upon engine warming up which should be accomplished within one to three minutes, depending upon the atmospheric temperature, the indicator should be further released to the left toward "Hot" or entirely to "Hot" or on toward "Cold," depending upon weather temperature and motor needs.

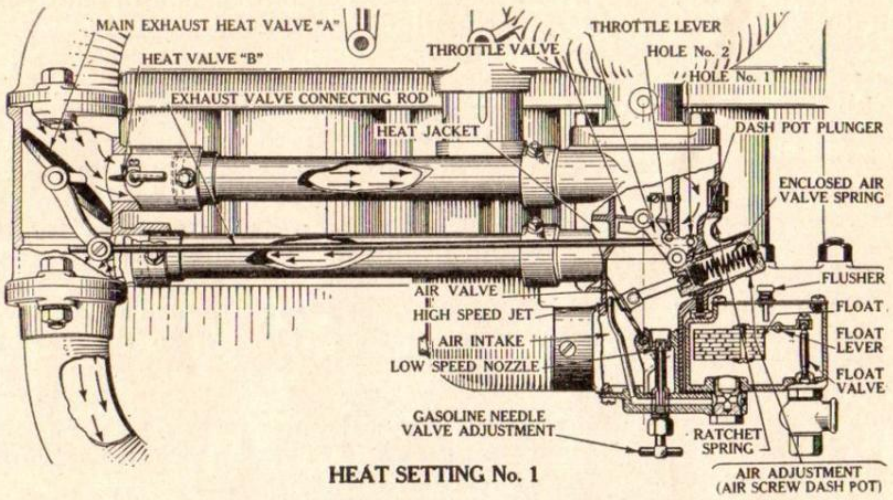
In hot or summer weather it is not usually necessary to turn indicator all the way toward "Choke" in starting as the fuel to the motor feeds more readily in warm than in cold weather.

When the indicator is set, pointing to "Hot," the air for carburetor is being taken from heater under the exhaust manifold and is therefore warm air. When the indicator is turned to the left as far as possible where it will point to "Cold," the air for carburetor is then being taken directly from the atmosphere and is not pre-heated, hence is called cold air. By means of the air regulating valve as described above, it will be noted that different proportions of air and fuel as well as different temperatures of the former may be maintained in driving. When the indicator, as stated, is turned to the right as far as possible toward "Choke," the richest mixture possible is obtained and is used in starting only and then just long enough to cause motor to fire, whereupon it is at once turned two-thirds of way back toward "Hot," in which position a mixture is obtained which is richer than if indicator is standing at "Hot" and is used in this position for a very short time to allow motor to warm up after accomplishing which, it is further released to "Hot" or still further toward "Cold" depending upon the weather temperature. In summer season, after starting motor and running for a few minutes on "Hot" to allow motor to get up to normal running temperature, the indicator should be turned to "Cold." This is also true in driving in winter when practicable, as upon cross-country driving or long runs, as "Cold" position on indicator causes the least suction on the fuel jets within the carburetor and therefore tends to increase mileage.

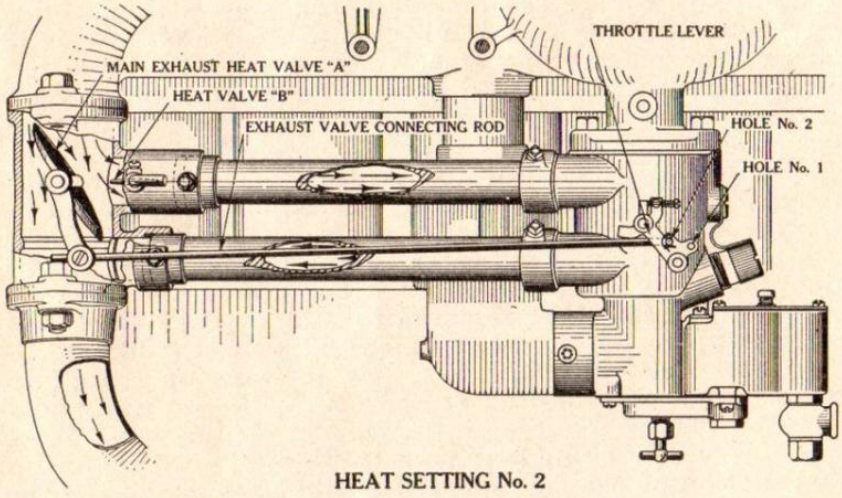
The adjustment of the carburetor should not be confused with the above description of the air-regulator as the latter is used as described, namely, for starting and for richer and warmer mixtures in warming up and meeting weather conditions, and has nothing to do with the adjustment of the carburetor except as described under the heading "Adjustment of Carburetor." The passage-way from the mixing chamber to the intake manifold is controlled by a butterfly valve which is called the throttle-valve and is connected to the throttle-lever on the steering wheel as well as to the foot accelerator, its position determining the amount of gas and air or mixture being fed the engine.

The upper portion of the mixing chamber is surrounded by a large heat jacket provided with an inlet and an outlet opening and connected by means of tubes to an exhaust manifold valve body in the exhaust pipe of the engine; this valve body housing a large valve called the main-exhaust-heat-valve within the body itself and also a smaller valve located in the outlet opening in the upper portion above the main-exhaust-heat-valve which opening carries the inlet tube to the carburetor heat jacket, the return or outlet tube from the carburetor heat jacket entering the valve-body in the lower portion below the main-exhaust-heat-valve.

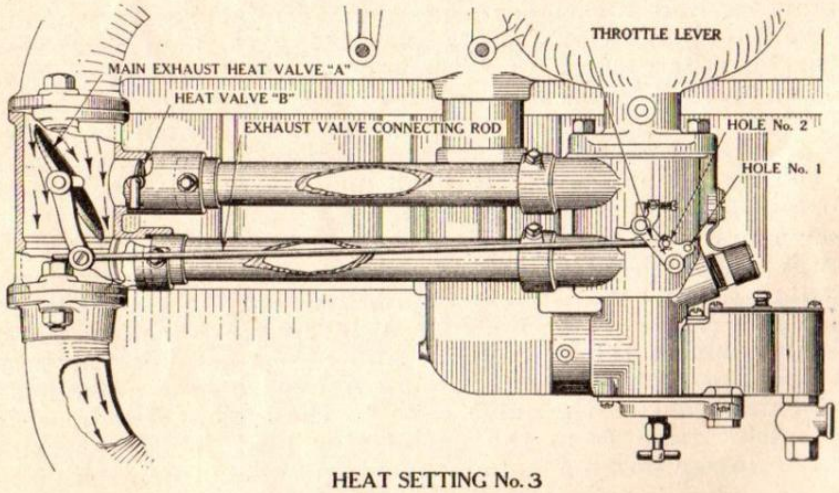
The smaller valve referred to is manually operated and is held in position by means of a set-screw on the shaft carrying it and the position of the damper is indicated by position of damper shaft lever operating same. If lever is in horizontal position the damper is open. If the lever is in vertical position the damper is closed. The main-exhaust-heat-valve



HEAT SETTING No. 1



HEAT SETTING No. 2



HEAT SETTING No. 3

Plate No. 10
Carburetor Settings

is connected by means of a longer lever and long connecting rod to the throttle lever of the carburetor so that when the throttle valve is operated the main-exhaust-heat-valve is operated simultaneously with it.

The purpose of the carburetor heat jacket and valves in exhaust line with connections described, is to provide means for utilizing the heat of the exhaust gases of the motor for vaporization of the fuel supplied the engine by the carburetor and to do so automatically. The automatic feature of same is accomplished by setting the smaller valve "B" in wide open position indicated by horizontal position of lever of same and setting the Main-Exhaust-Heat-Valve "A," by means of the long connecting rod, in closed position with the closed or idling position of the throttle valve, thus providing for and causing all of the exhaust gases of the engine to pass through the heat jacket of the carburetor when engine is idling and to regulate the volume of this heat as throttle is opened by automatically opening the main-exhaust-heat-valve, thus allowing the increasing volume of the exhaust gases to pass on out through the main exhaust pipe without being deflected and by-passed to the carburetor heat-jacket as the motor speed increases.

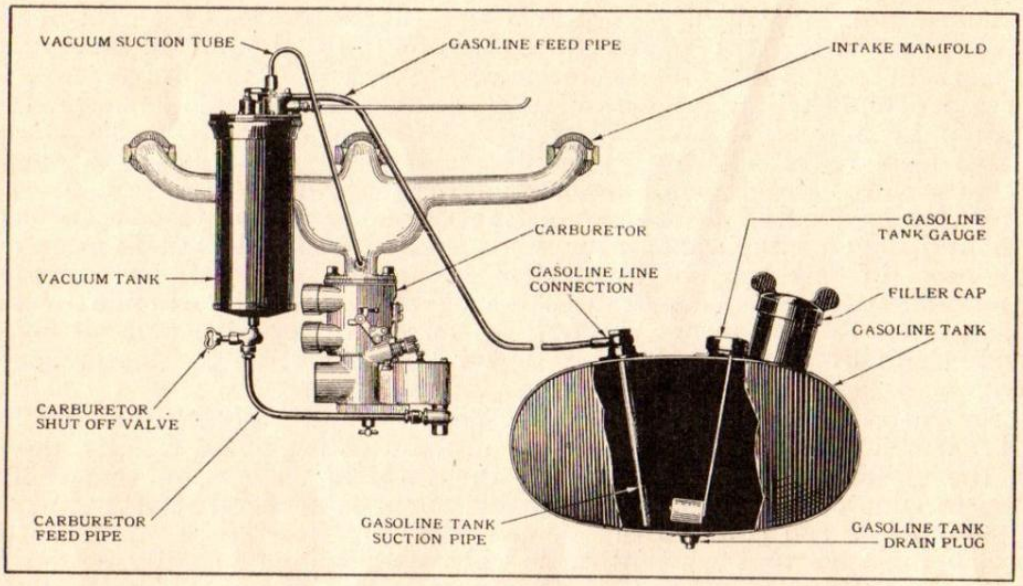
By referring to the cut shown on page 30 and noting "Heat Setting No. 1," it will be noted that Valve "A" in main exhaust line is fully closed with the closed or idling position of the throttle valve, and that Valve "B" is in wide open position. This adjustment is accomplished by having long connecting rod from valve "A" Lever set in "Hole No. 1," in Throttle Lever, being sure that when throttle valve is standing in fully closed or idling position that valve "A" is also in closed position, proving out the latter feature by loosening connection of valve "A" lever holding the long connecting rod; holding Throttle Lever in closed or idling position and bringing up valve "A" Lever on the long connecting rod as far as it will go to the right toward the carburetor and tightening its connection on the long connecting rod in that position. After having made the adjustment as just described, it is assured that "Heat Setting No. 1" has been properly made and that all of the heat possible from the exhaust has been secured. However, should there develop any noise from valve "A" vibrating against its seat when motor is idling, valve "A" Lever may be re-adjusted by again loosening its connection on the long connecting rod and moving to the left away from the carburetor a very little so as to keep it slightly off its seat when motor is idling. This will not affect the volume of heat obtained to any appreciable extent and will overcome the valve noise should any occur.

This "Heat Setting No. 1," also called "Winter Setting," provides as stated, for the most exhaust heat obtainable and should be used during the entire year except in extremely hot seasons or hot climates or when high-test gasoline is being used in engine and even then unless engine is losing power due to excessive heat.

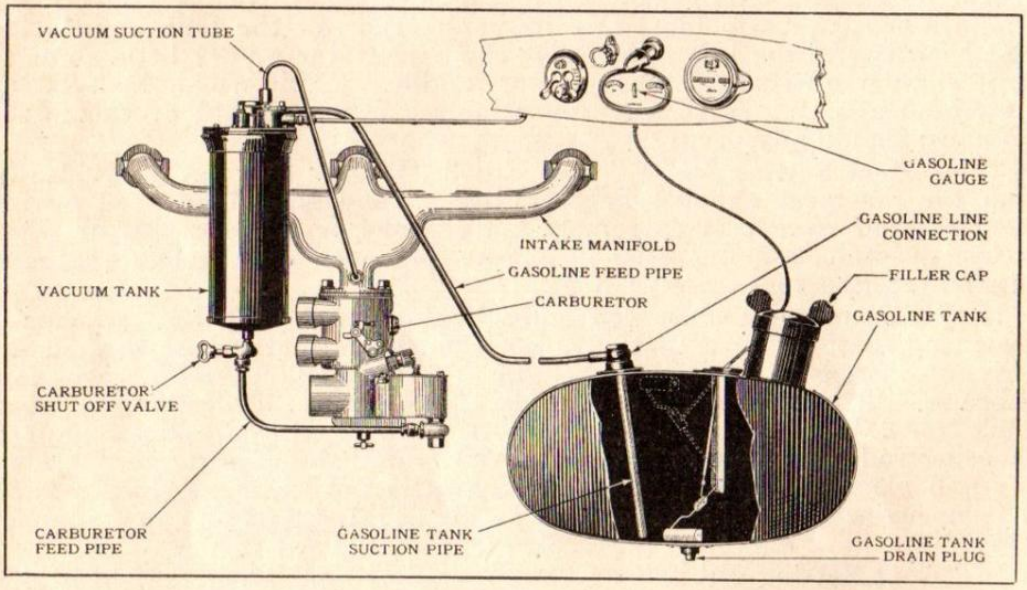
If loss of power due to too much heat in extremely hot weather is experienced, first be sure that it is not due, after motor has warmed up, to driving on hot-air instead of cold-air. After making this observation, if there is still too much heat, refer to Cut on page 30 describing "Heat Setting No. 2," also called "Summer Setting." It will be noted that long connecting rod from valve "A" is removed from "Hole No. 1," in Throttle Lever and placed in "Hole No. 2," in Throttle Lever. This change is all that is necessary in order to change from "Winter Setting" to "Summer Setting."

In "Heat Setting No. 2," or "Summer Setting," when the throttle is in closed or idling position, Valve "A" is quite a way off its seat, Valve "B" remaining in horizontal or wide open position. This adjustment provides for a great deal less heat than is provided by "Heat Setting No. 1" or "Winter Setting" and is all that is required in the reduction of the volume of heat together with driving on "Cold" air for the main-air-supply, in the warmest weather or hottest climates.

"Heat Setting No. 3" on page 30 shows just the same as "Heat Setting No. 2," except that Valve "B" is closed, indicated by lever of same being set in vertical position. **This adjustment should never be used unless in extremely hot climates or when using high test gasoline and not**



Gasoline System for Models 44 and 45



Gasoline System for Models 41-47-48-49-50-54 and 55

Plate No. 11

then unless motor is losing power after "Heat Setting No. 2" has been tried by driving with air supply on "Cold" air. Under no circumstances should "Heat Setting No. 1" be used with Valve "B" closed, as to do so would not allow any escape for exhaust gases in idling position of throttle.

NOTE—**After original position of Valve "A" is made as described in "Heat Setting No. 1"** do not again readjust Valve "A" on connecting rod but when changing from "Heat Setting No. 1" to "Heat Setting No. 2," merely change position of long connecting rod from Hole No. 1 to Hole No. 2 in throttle lever.

GASOLINE GAUGE FOR MODELS 44 AND 45

In order that the operator may be fully acquainted with the supply of gasoline in the tank, a dial indicating gasoline gauge has been adopted and is conveniently located at the top of gasoline tank at the rear of the car.

The gauge seldom, if ever, requires any attention, but can be removed by unscrewing the cap from the tank and the complete assembly can be lifted from position. It is possible when filling the tank that gauge will continue to register "empty," and can be attributed to two reasons: The cork float may have become logged and needs to be dried and again shellaced in order to make it float. Then again, the nut could possibly become loosened and allow the gear to drop out of mesh with the other gear which is carried fixed in the vertical shaft.

The gauge hand is attached to the vertical shaft and as the float rises and lowers the hand revolves and indicates the gasoline in the tank by pointing to the figures on the dial.

GASOLINE GAUGE FOR MODELS 41, 47, 48, 49, 50, 54 and 55

In order that the operator may be fully acquainted with the supply of gasoline in the tank at all times a visual gasoline gauge has been adopted and very conveniently located on the dash of the closed models only and is a mechanically operating device which registers at all times the quantity of gasoline remaining in the gasoline tank attached to the rear of the car.

It consists of a cork float, a piano wire and a graduated registering dial. The cork float is fastened to the tank base extension by means of an arm bent at the proper angle which raises and lowers as the gasoline level changes.

The piano wire is attached to the float arm by means of a clip and as the float raises and lowers it forces the wire to oscillate in and out of the tank through an aperture in the tank base which is fastened to the tank, from which a flexible tube or casing extends to the gauge on the dash inside of which the piano wire oscillates.

The graduated dial or drum is enclosed in a housing which fastens to the instrument plate and the gasoline level is registered by the longitudinal motion of the wire. The drum is supported by pivot pins and a constant tension is maintained with a hair spring adjustment set in such a manner as to permit the drum to rotate. The registering figures are placed on the outside of the drum and show through a small aperture in the face of the instrument conveniently located on the dash.

DELCO SYSTEM

The single unit Delco starting, lighting and ignition system as furnished for the 1923 Buick six cylinder models is built expressly to meet the requirements of this particular engine and car. It consists of the following Delco units as assemblies:

Motor-Generator No. 249.

Motor Clutch No. 15796.

Ignition Coil No. 2176.

Lighting and Ignition Switch No. 1232-1233, and the necessary terminals and clips.

The entire system is of the six-volt, single wire or grounded type, the engine and frame of the car forming the negative side of the electrical circuit. The Delco apparatus does not include the storage battery, lamps, horn or wiring.

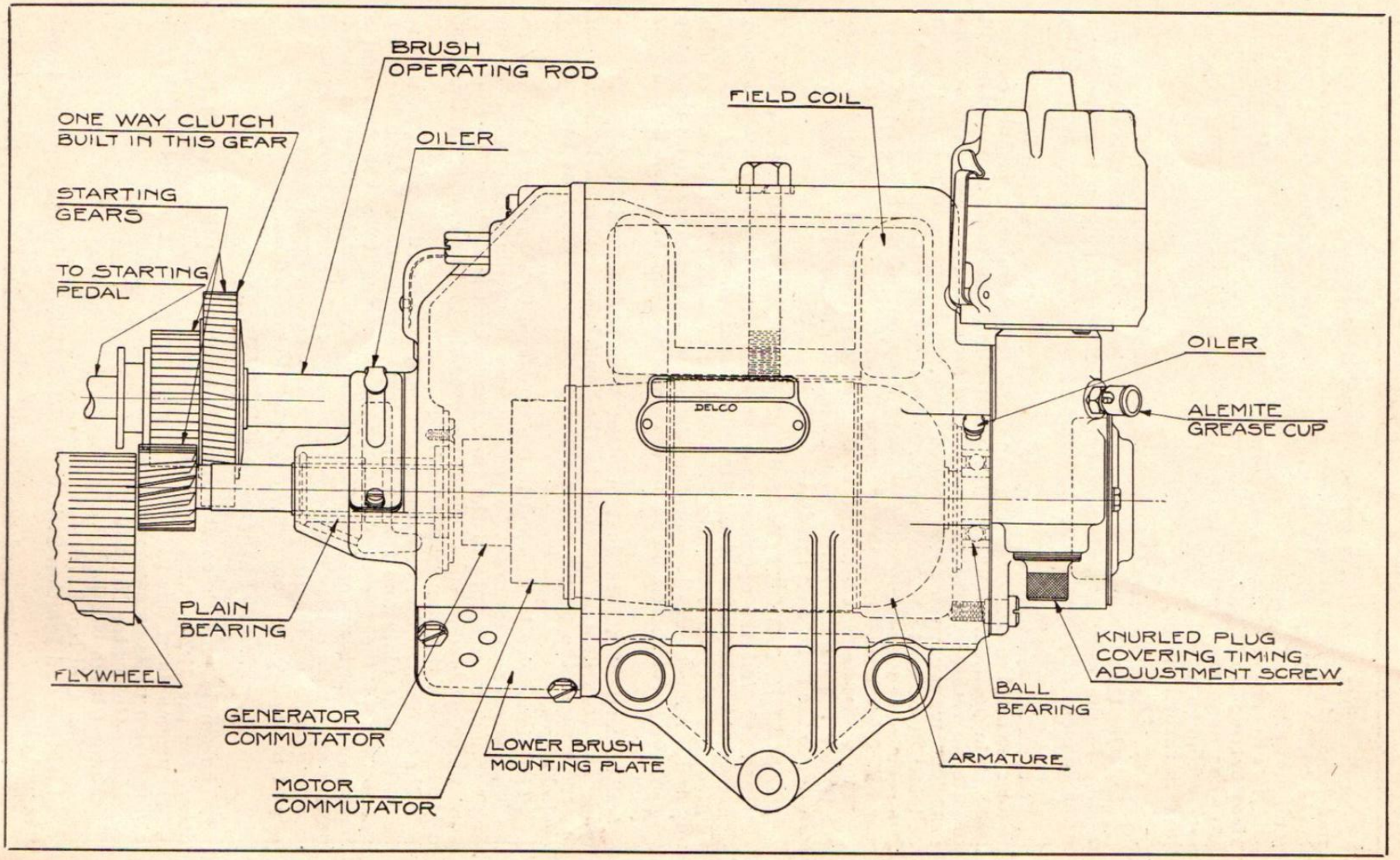


Plate No. 12
Side View of Motor Generator

MOTOR-GENERATOR

The motor-generator serves both as a generator of current and as an electric motor for cranking the engine when starting. The principal elements of the motor-generator are an armature and a field. There are two windings on the armature and two on the field. One of the armature windings and one of the field windings are known as motor windings as they are used when the engine is being cranked. The other windings are used primarily for generating.

The distributor is located in the forward end of the motor-generator. This is for the purpose of properly timing and distributing the ignition current for firing the mixture of air and gasoline in the different cylinders.

The motor-generator performs three different operations which are as follows:

1. Motoring the generator. This operation is necessary in order that the starting gears may be brought into mesh with the small gear on the armature shaft, and with the teeth on the flywheel. This takes place whenever the "ignition" switch lever is turned to the "IGN" position. Current then flows from the storage battery thru the generator windings, and causes the armature to revolve slowly. A clutch in the forward end of the motor-generator allows the armature to rotate ahead of the driving shaft. This clutch, being a smooth type, will not give a clicking sound when the ignition is switched on as with former models. In meshing these gears, do not try to force them if they fail to mesh immediately, but simply allow the starting pedal to come back for an instant, giving the gears time to change their relative positions, then press the starting pedal again.

2. Cranking operation. When the starter pedal is pushed down, the circuit between the battery and generator armature winding is broken by the upper generator brush being raised from the commutator. It is very essential that the brush be lifted entirely off of the commutator during this operation. The last movement of the starting pedal causes the upper motor brush to make contact with the motor commutator, thus closing the circuit between the storage battery and the motor commutator on the armature of the motor-generator, causing it to act as a powerful electric motor which rapidly cranks the engine. This operation requires a heavy discharge from the storage battery. There must be no loose connections in this circuit, which includes the battery connections, ground wire from the negative terminal of the battery to frame of car, motor connections and brush contact.

As the gear ratio between the armature shaft and the crank shaft is approximately 21 to 1, the armature would be driven at an excessively high rate of speed after starting the engine and before the operator lets the starter pedal back if it were not for an over-running clutch in the hub of the sliding starter gears between the flywheel and the armature shaft. These gears are assembled in the housing covering the flywheel. The electric motor cranks the engine thru this clutch but after the engine has started and begins to run faster than the electric motor turns it, the starting clutch over-runs.

However, in order to prolong the life of the lubricant in the clutch, the starter pedal should be released immediately after the engine starts running under its own power. A driver's continued practice of retaining the foot on the starting pedal for a long time after the engine has started running under its own power, may result in the clutch lubricant being consumed, permitting the clutch to stick, with probable serious damage to the armature windings.

3. Generating electrical energy. When the starter pedal is let up the first movement breaks the motor circuit between the electric motor and the storage battery, a further movement causes the starter gears to slide out of mesh and the final movement completes the circuit between the generator and the storage battery, which was broken when the starter pedal was pushed down. With the engine running and the circuit closed between the battery and the generator windings, the generation of current begins. At a car speed of approximately seven miles an hour, the generator is operating so that current is prevented from discharging from the battery thru the generator windings. At higher speeds a part of the

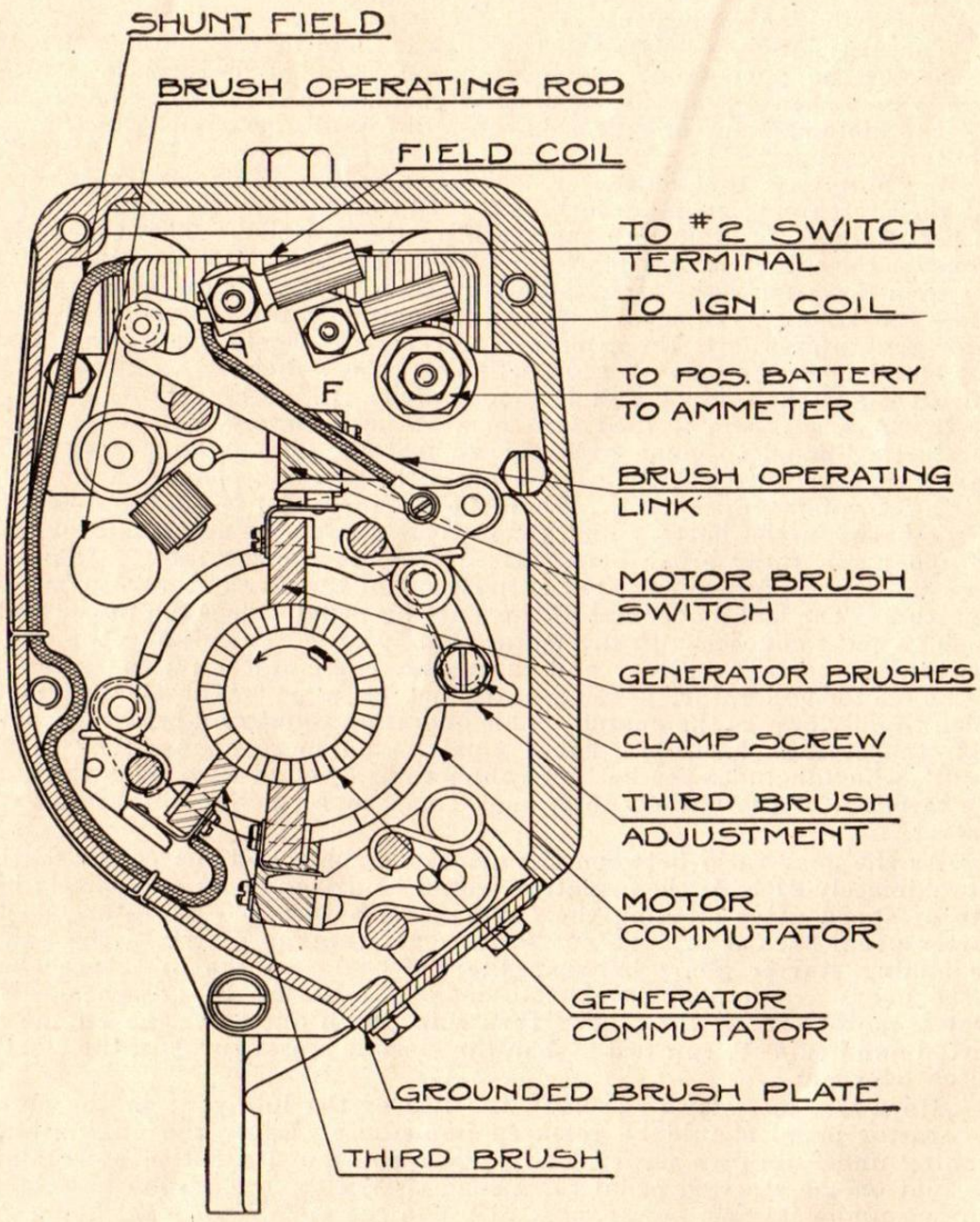


Plate No. 13
End View of Motor Generator

current generated is used directly for ignition and lighting purposes, while the remainder of the current is charged thru the storage battery. The generator output increases to speeds of 20 to 25 miles per hour. At higher speeds the charging rate decreases.

The general construction of the motor-generator is shown in the illustrations.

REGULATION

The third brush method of generator regulation is used. The third brush to which one of the generator field leads is connected, is mounted on an adjustable plate between the two main brushes. With this form of regulation it is the natural characteristic of the generator to have the field current decrease at high speeds causing a corresponding decrease in the generator output. It is possible, therefore, to obtain a fairly high charging rate at low speeds as well as a charging rate which is very satisfactory for higher speeds.

It also offers the advantage of being readily adjustable in cases where a driver operates under conditions which are out of the ordinary and require either a higher or a lower charging rate than the average. When the generator leaves the factory it is adjusted to meet the requirements of the average driver.

When the postion of the third brush is changed, it may be necessary to reseat the brush on the commutator to obtain the maximum true charging rate. To refit the third brush, or both of the main generator brushes, take out the two hexagon head screws in the diagonally opposite corners of the plate which carries the grounded generator and motor brushes, after which the plate and brushes may be removed. Loosen the adjusting screw in the slot in the third brush mounting plate, and move brush as far as possible. Then place a strip of fine sand paper or sand cloth, having a width slightly greater than that of the brushes, snugly around as much of the commutator as possible, with the rough side next to the brushes. Replace the plate with the grounded brushes, and seat all three generator brushes together by drawing the sand cloth back and forth a few times.

The charging rate should not be changed except by one who fully understands the work. The ammeter should be carefully observed while the engine is gradually speeded up, and the maximum rate noted. With the lights off, the charging rate should not exceed, in any case, 18 amperes at the generator when the generator is hot.

To adjust the position of the third brush, loosen the clamp screw, and shift the third brush mounting plate slightly in the same direction that the armature rotates to increase the charging, or in the reverse direction to decrease the rate. The armature rotates anti-clockwise viewed from the commutator end. Make sure that all generator brushes are well seated. After the adjusting is complete, tighten securely the clamp screw.

DISTRIBUTOR

The distributor is mounted on the front end of the motor-generator, and its purpose is to secure the proper timing and distribution of the ignition current. The distributor shaft is driven at one-half engine speed by a spiral gear cut on the outer edge of the generator clutch shell.

Plate No. 14 shows the general construction of the distributor. The vertical shaft carries the manual spark advance mechanism, governor assembly controlling the automatic spark advance, the breaker cam and the rotor.

The manual spark advance control is linked up with the spark lever on the steering wheel, and is for the purpose of securing the proper retard of ignition for the starting operation and very slow idling speeds, and to secure the proper advance required for maximum power at very low engine speeds, and at very high engine speeds, over which the automatic feature has no control.

The automatic advance mechanism is of the centrifugal type and automatically advances the breaker cam a pre-determined amount at the different speeds at which the engine might be run during average driving conditions. The spark lever should be retarded while the engine is cranked by the starting motor, to prevent a back-kick from the engine. When the engine runs under its own power the spark lever should be placed in a posi-

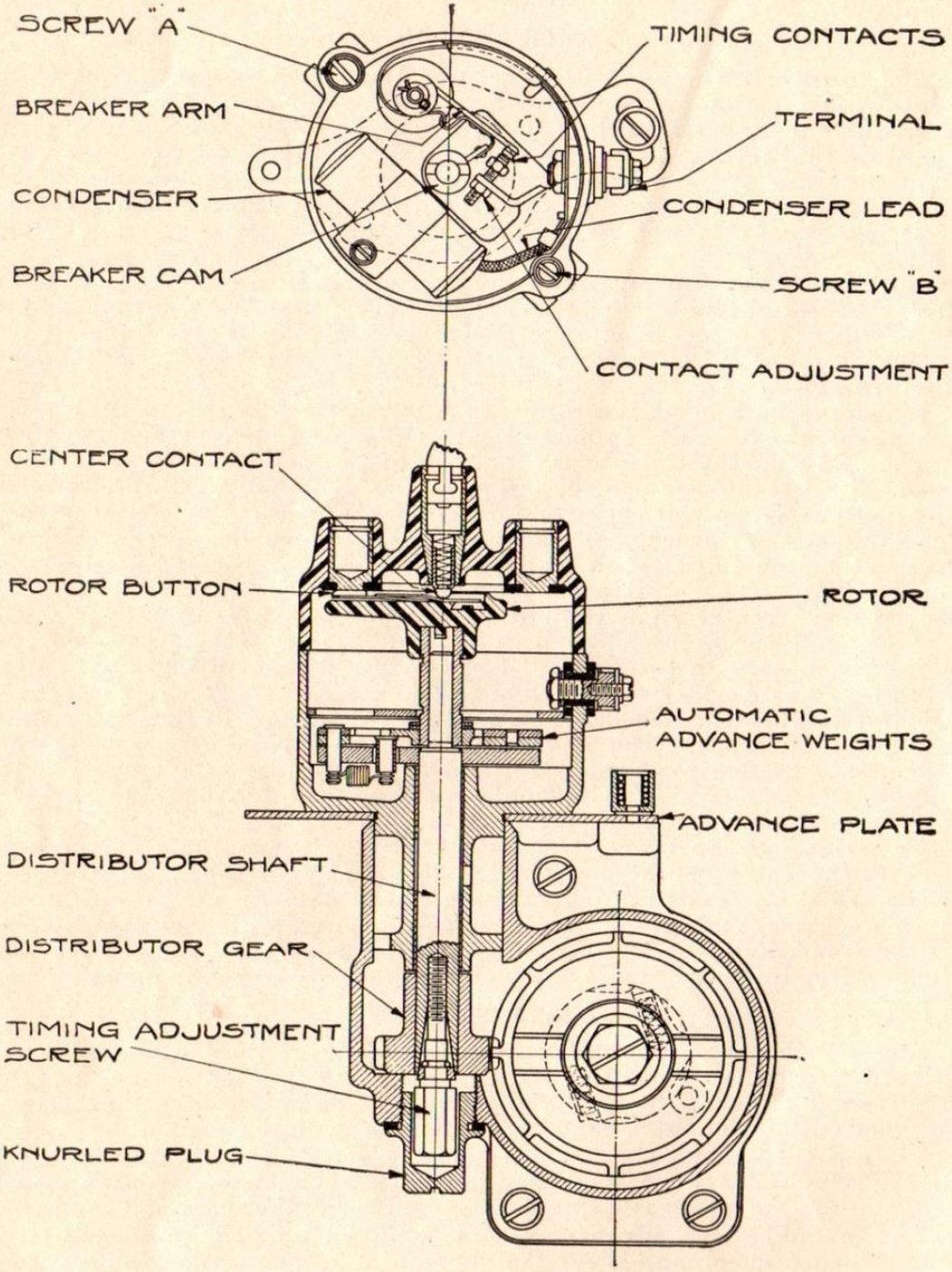


Plate No. 14
Sectional View of Distributor

tion known as the driving position, which has been determined by the motor car builder. The driver's experience with a certain engine and car often assist him to locate the position of the spark lever at which the best performance is secured. The automatic then gives the ignition the proper amount of advance for all average driving speeds without manipulation of the spark lever. Therefore, the engine develops the maximum power possible at these average driving speeds. At very high engine speeds additional advance should be secured thru a further advance movement of the spark lever, in order to obtain the maximum power at extremely high speeds.

Timing of the ignition current is effected by the interruption of the primary ignition current by the timing contacts.

The rotor is carried on the upper end of the distributor shaft, and is for the purpose of distributing the high tension current to the different spark plugs at the proper time. The breaker cam and rotor are so located that when the current is interrupted and the spark produced, the rotor will be located in the proper position to fire the cylinder which is under compression. The center plunger contact in the distributor head should always make contact with the rotor.

CONDENSER

The condenser is enclosed in a moisture-proof metal case, and mounted inside the distributor housing. This consists of two long strips of tinfoil insulated from each other by strips of paraffined paper. It is connected in parallel with the timing contacts, as indicated in the circuit diagram. Its purpose is to decrease the amount of burning at the timing contacts and increase the voltage of the high tension current, assisting in the production of a strong ignition spark.

RESISTANCE UNIT

A resistance unit is mounted on the top of the ignition coil and is connected in series with the primary circuit of the ignition system. It prevents excessive discharge from the storage battery when the ignition switch is in the "IGN" position when the engine is not operating, and also causes the spark to be more nearly uniform at different engine speeds.

ADUSTING TIMING CONTACTS

Adjustment of the timing contacts should be such that when they are separated the maximum distance by the cam, the distance should be the thickness of the gauge on the distributor wrench marked "Distributor," which is .020". Due to the wearing to a seat of the fiber rubbing block on the contact arm, one or two adjustments may possibly be necessary during the first 2000 miles of driving, after which practically no attention is necessary other than to occasionally note that the adjustment of the contacts conforms to specifications.

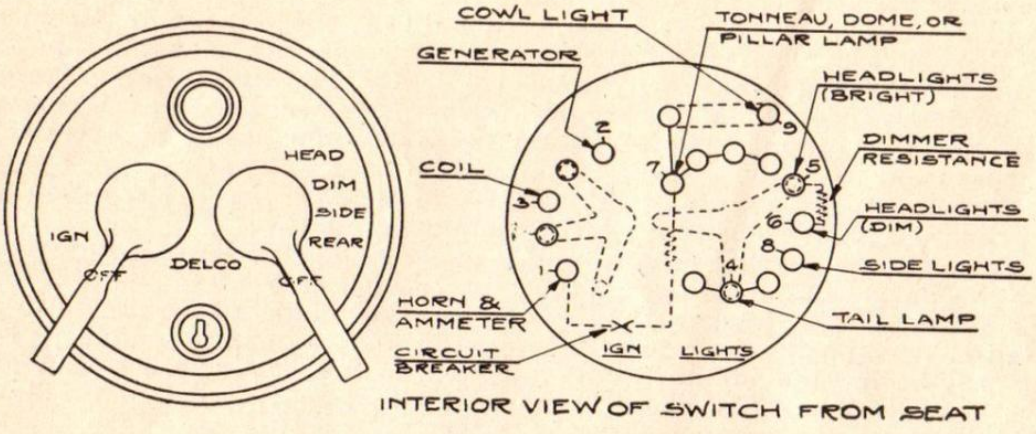
The contact points are made of tungsten. This metal is too hard to file. Should it be necessary to dress them, an oil stone should be used. It is not necessary to entirely remove by grinding each small pit from the point surface to secure proper operation of the contacts. To do so wastes the tungsten metal of the point. Simply brighten up the surface of the pitted contact and remove the small raised portion of metal from the surface of the opposite contact.

Care should be taken that they seat properly against each other and are correctly adjusted after being replaced.

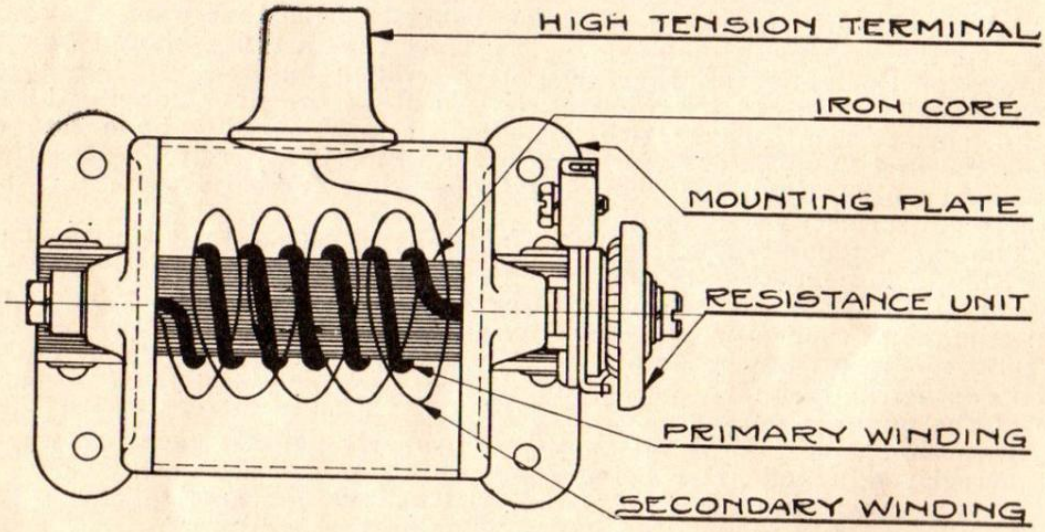
It is a good plan after adjusting the timing contacts to check the ignition timing See instruction under "Timing the Ignition."

IGNITION COIL

The ignition coil furnishes ignition current for the spark plugs. Low voltage current from the storage battery or generator is converted by the ignition coil into a current of high voltage which will jump the gap at the spark plug points. An ignition coil consists of a soft iron core around which and insulated from it is wound the primary winding. This consists of a few turns of comparatively heavy copper wire. Over the primary winding and insulated from it are wound several thousand turns of very fine wire called the secondary winding.



Front and Rear View of Switch



Cross Section of Coil

Plate No. 15

When the current from the storage battery or generator flows thru the primary winding, it magnetizes the iron core, and when the current is interrupted by the timing contacts in the distributor, the magnetism dies out. A high voltage current is thereby induced in the secondary winding. One end of the secondary is connected to the high voltage terminal on the shell while the other end is connected to one end of the primary winding. It is from the high tension terminal of the coil that current is conducted to the distributor head, rotor and spark plugs.

TIMING THE IGNITION.

The ignition system is carefully timed when the car leaves the factory. However, should it become necessary for any reason to retime the ignition, the following instructions should be closely followed.

1. Place the spark lever on the steering wheel in the fully retarded position.
2. Turn the engine to the seven degree mark (which is approximately one inch after dead center) with the No 1 cylinder on the firing stroke.
3. Remove the knurled cover screw over the lower end of the distributor shaft. See illustration. Using a Delco distributor wrench, or any suitable wrench, loosen the hexagon head timing adjustment screw. The cam may now be turned so that the rotor button will be in position under No. 1 high tension terminal when the distributor head is properly located. Locate the breaker cam carefully in this position so that when the back-lash in the distributor gears is rocked forward the contacts will be opened, and when the back-lash in the gears is rocked backward the contact will just close. The distributor shaft rotates clockwise when viewed from the top.

Unless the hexagon head screw is sufficiently loosened before attempting to turn the distributor cam, the distributor shaft may be bent or some other part of the distributor mechanism damaged.

4. Tighten the adjustment screw securely and replace the knurled cover screw, rotor and distributor head, making sure that the head is correctly placed on the housing. The cylinders fire in the following order: 1-4-2-6-3-5.

LUBRICATION

Lubrication of the parts of the motor-generator should be taken care of as follows:

1. The oiler with the hinged cover which supplies oil to the ball-bearing on the forward end of the armature shaft near the distributor should receive 20 to 25 drops of engine oil each 500 miles.
2. Place in the oiler supplying the rear armature shaft plain bearing an amount of engine oil each 500 miles equivalent to one teaspoonful. This bearing is packed with cotton waste.
3. An Alemite plug is located on the distributor housing and should receive lubrication once every 500 miles with grade "B" Sunoco grease or its equivalent. The distributor driving gears and distributor shaft bearing are lubricated in this manner.
4. An Alemite plug is located in the rear of the starter sliding gear shaft which should be lubricated every 500 miles. The starting motor clutch should be taken apart by a competent mechanic, cleaned and re-packed with grade "B" Sunoco grease, or its equivalent once each season.
5. The rubber track in the distributor head upon which the steel rotor button bears should receive a small amount of vaseline applied two or three times during the first 2000 miles driving. The track will then become glazed. It is then only necessary to wipe out the distributor head occasionally with a clean cloth.
6. A very small amount of vaseline should be applied to the surface of the breaker cam each 1000 miles.
7. Do not for any reason put oil or grease on the commutators of the motor-generator.

ADJUSTING SPARK PLUGS

The proper gap when adjusting the spark plug electrodes should be thirty-thousands of an inch (.030"), or the thickness of the gauge on the Delco wrench marked "Spark Plug."

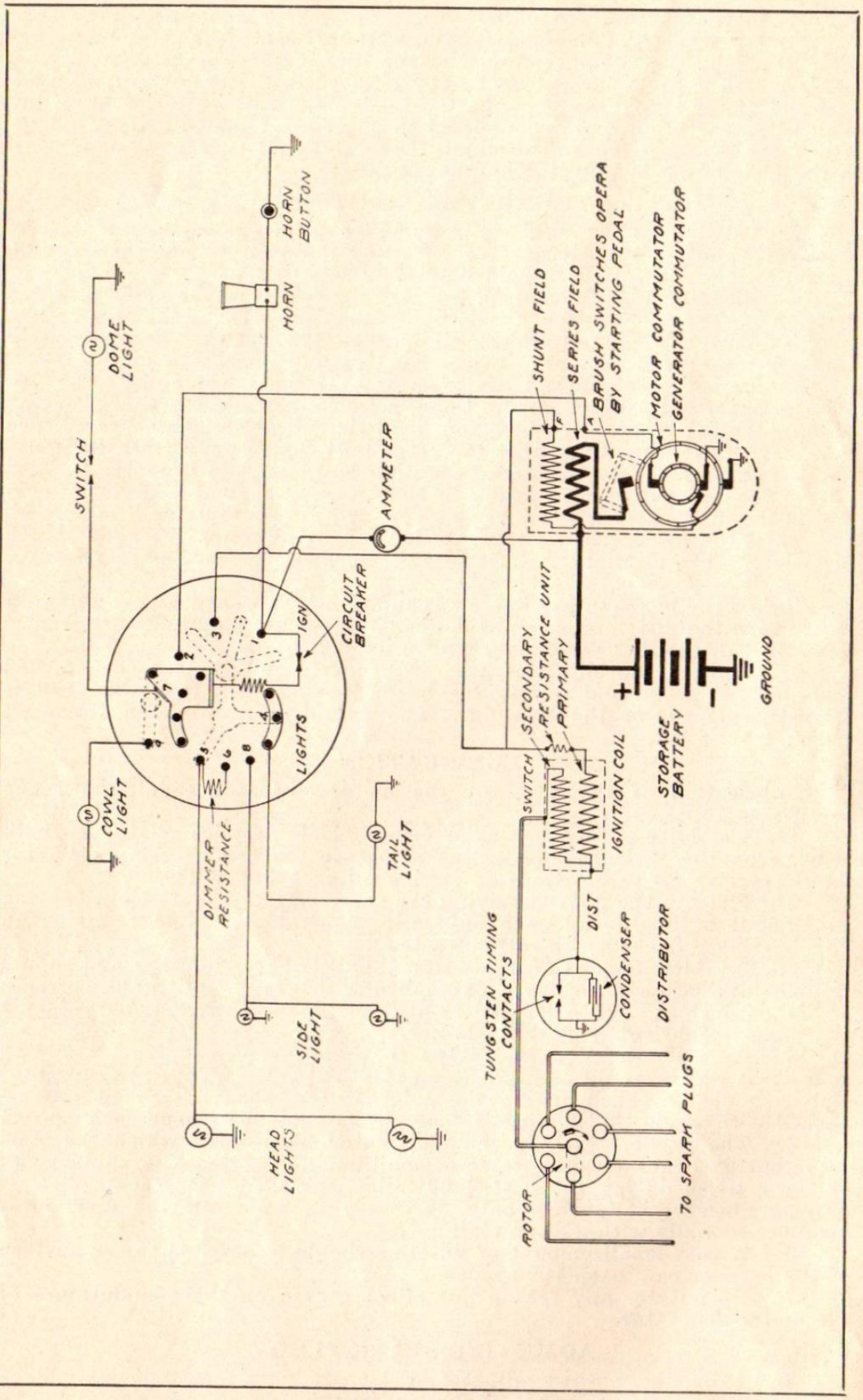


Plate No. 16
Circuit Diagram

IGNITION AND LIGHTING SWITCH

A combination lighting and ignition switch is used to control the lighting and ignition circuits, and the circuit between the generator and the storage battery.

The left hand lever controls the ignition and the circuit between the generator and storage battery. By controlling the latter circuit it performs the function of an automatic cut-out which is commonly used for this purpose. For this reason this lever should not be left in the "IGN" position when the engine is not running.

The lever at the right controls all lights except the cowl light which is operated by the button at the top of the switch. With the ignition lever in the "OFF" position, the switch may be locked. The lighting lever cannot be locked in any position.

CIRCUIT BREAKER

On the back of the combination switch is located the circuit breaker. This is a protective device which takes the place of fuses which are commonly used for this purpose. The normal current to the lighting circuits does not affect the circuit breaker, but in the event of an abnormally heavy current, such as would be caused by a ground on any of the lighting circuits flowing thru the circuit breaker, it begins to function. This current causes the circuit breaker to operate and intermittently cut off the flow of current, thus causing an audible clicking sound which gives a distinctive warning that abnormal conditions exist in the circuit. This will continue until the ground is removed, or the switch is operated to cut off the circuit on which the ground exists. In this manner the circuit breaker protects the wiring, switch and storage battery. As soon as the ground is removed, the circuit breaker restores the circuit and there is nothing to replace.

AMMETER

Although the ammeter is not a part of the Delco equipment it is used in connection with the electrical equipment and permits the driver to keep a check on the performance of the electrical system. The instrument is for the purpose of indicating the net amount of current that the generator is supplying to the storage battery when the engine is running and indicates the amount of current that the battery is furnishing for lights when the engine is not operating.

At all car speeds faster than approximately 7 miles an hour with the lights "OFF" the ammeter should always indicate "charge." With the lights "ON," a slight discharge will be indicated at slow speeds. The lamp load will also reduce the charging rate at high speeds, as this load reduces the amount of current passing thru the storage battery.

Should the ammeter indicate "Discharge" with the engine running at normal driving speed without lights, it should be taken as an indication of trouble and the electrical equipment and wiring should be checked over by the dealer or at a service station having men trained in the handling of electrical work.

CIRCUIT DIAGRAM

The internal wiring circuits of the electrical equipment are shown in the circuit diagram plate. With the aid of this diagram each circuit thru the several units can be easily checked.

CAUTION

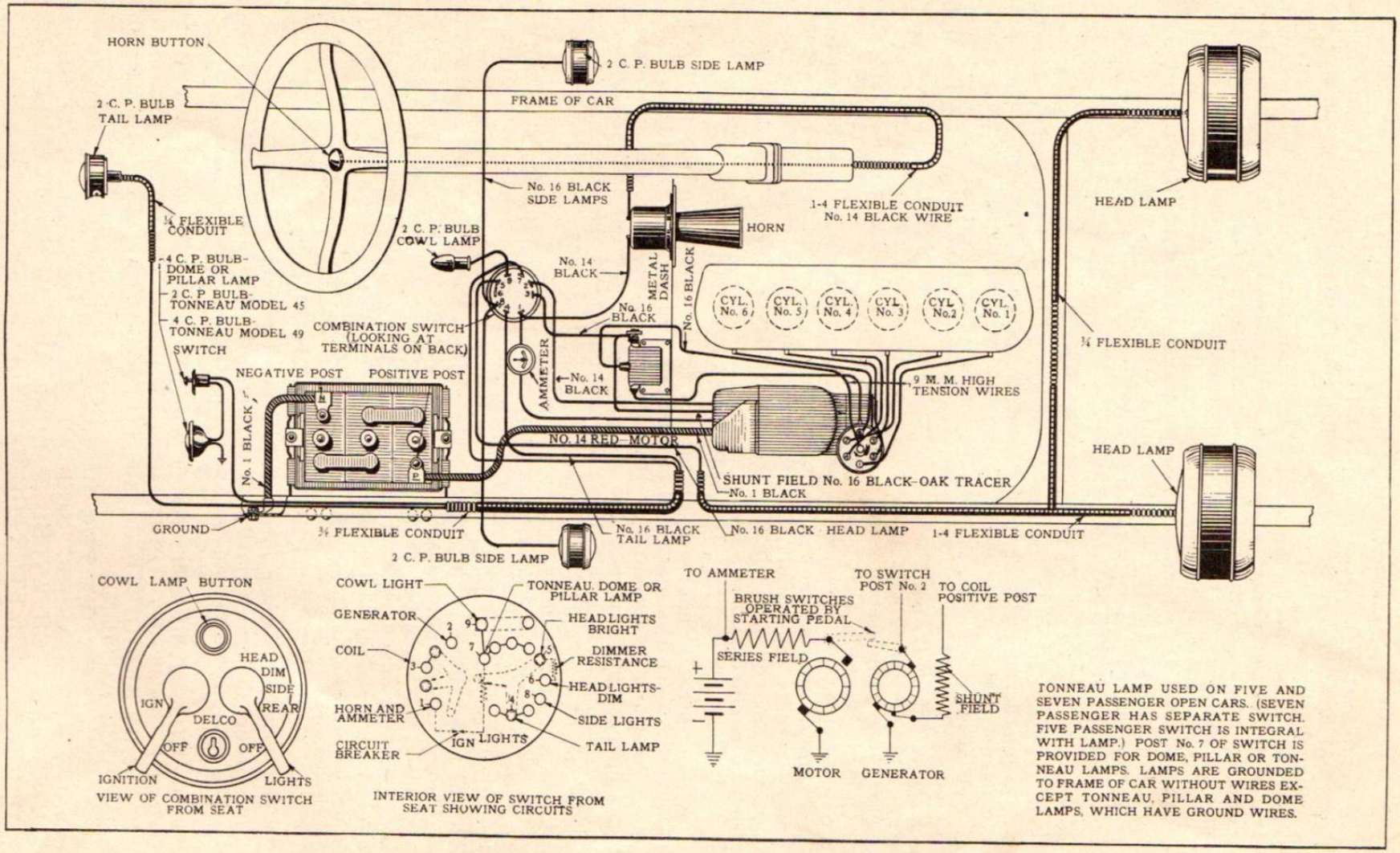
DO NOT ATTEMPT TO OPERATE THE SYSTEM WITH THE STORAGE BATTERY DISCONNECTED OR REMOVED FROM THE CAR. VERY SERIOUS DAMAGE TO THE APPARATUS MAY RESULT FROM SUCH ACTION.

DO NOT REMOVE THE MOTOR-GENERATOR OR ATTEMPT TO CHANGE ANY CONNECTIONS AT BACK OF THE IGNITION AND LIGHTING SWITCH WITHOUT FIRST DISCONNECTING THE LEAD FROM ONE OF THE STORAGE BATTERY TERMINALS.

WIRING DIAGRAMS

The wiring diagram shown on plate 17 is to assist in tracing the wiring of the car to the various units showing the proper connections.

Plate No. 17
Wiring Diagram



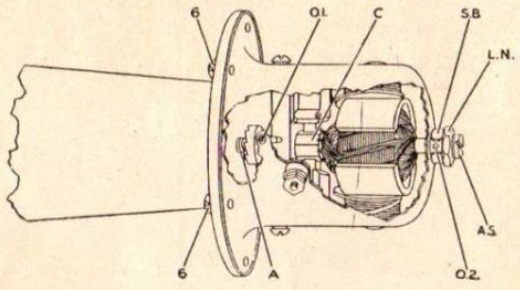
TONNEAU LAMP USED ON FIVE AND SEVEN PASSENGER OPEN CARS. (SEVEN PASSENGER HAS SEPARATE SWITCH. FIVE PASSENGER SWITCH IS INTEGRAL WITH LAMP.) POST No. 7 OF SWITCH IS PROVIDED FOR DOME, PILLAR OR TONNEAU LAMPS. LAMPS ARE GROUNDED TO FRAME OF CAR WITHOUT WIRES EXCEPT TONNEAU, PILLAR AND DOME LAMPS, WHICH HAVE GROUND WIRES.

MAINTENANCE OF KLAXON WARNING SIGNAL

If the instructions given here are followed, your Klaxon will operate satisfactorily for an indefinite period.

Should the instrument, however, be injured through accident or misuse you can get it repaired with minimum delay and expense at any one of the Branches or Authorized Distributors of the United Motors Service, Inc.

United Motors Service, Inc., is the Service Division of the Klaxon Company. It has Branches and Authorized Distributors in all principal cities.



Lubricate once a month:

The oilers "O-1" and "O-2" should get a few drops of light cylinder oil each month.

"O-1" is kept sealed by a ball. Depress ball with oil can spout and put in a few drops of oil. Spin the motor by sounding a short blast and put in another drop or two.

"O-2" is kept closed by a steel spring band, "S-B." Push band around till oil hole is uncovered and put in a few drops of oil. Be sure to return spring band to original position so as to cover oil hole.

Do not adjust before investigation:

Trouble may be due to—

1. Battery not fully charged.

2. Wire having loose or corroded connections, accidental grounds or breaks inside of insulation.

3. Push button having corroded contacts or improper adjustment.

4. The six collar screws (6-6) not being properly tightened.

5. The instrument not being properly lubricated.

Make sure that the battery, wiring and push button are in perfect condition, tighten the six collar screws (6-6) and lubricate the instrument according to instructions under "Lubricate." If the Klaxon still fails to operate properly, adjustment is necessary.

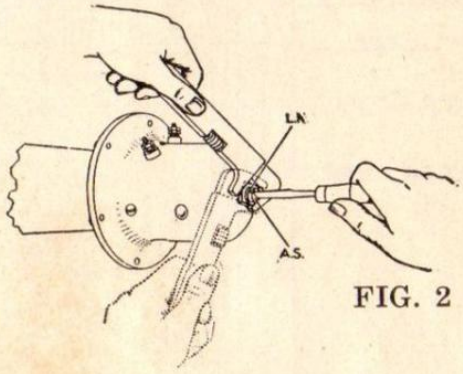


FIG. 2

To adjust:

Loosen lock nut "LN" with wrench by turning it to the left as shown in Fig. 2. Continue holding nut with wrench and turn adjustment screw "AS" to left until no sound is heard when Klaxon is operated, except the humming of the motor.

Then turn screw back to right (still holding lock nut with wrench) until the note is loud and clear. (Do not turn further than necessary to secure a good note. Too tight an adjustment overloads the motor and the battery.) Then hold screw in this position with screw-driver and lock it by turning the lock nut to the right with wrench.

To clean:

If, after long use, the Klaxon should fail to operate properly even after everything is done as instructed above, the instrument should be cleaned as follows:

Remove the six collar screws (6-6) as in Figure 1 and lift off collar and projector. Remove diaphragm, taking care not to damage the felt washers on either side.

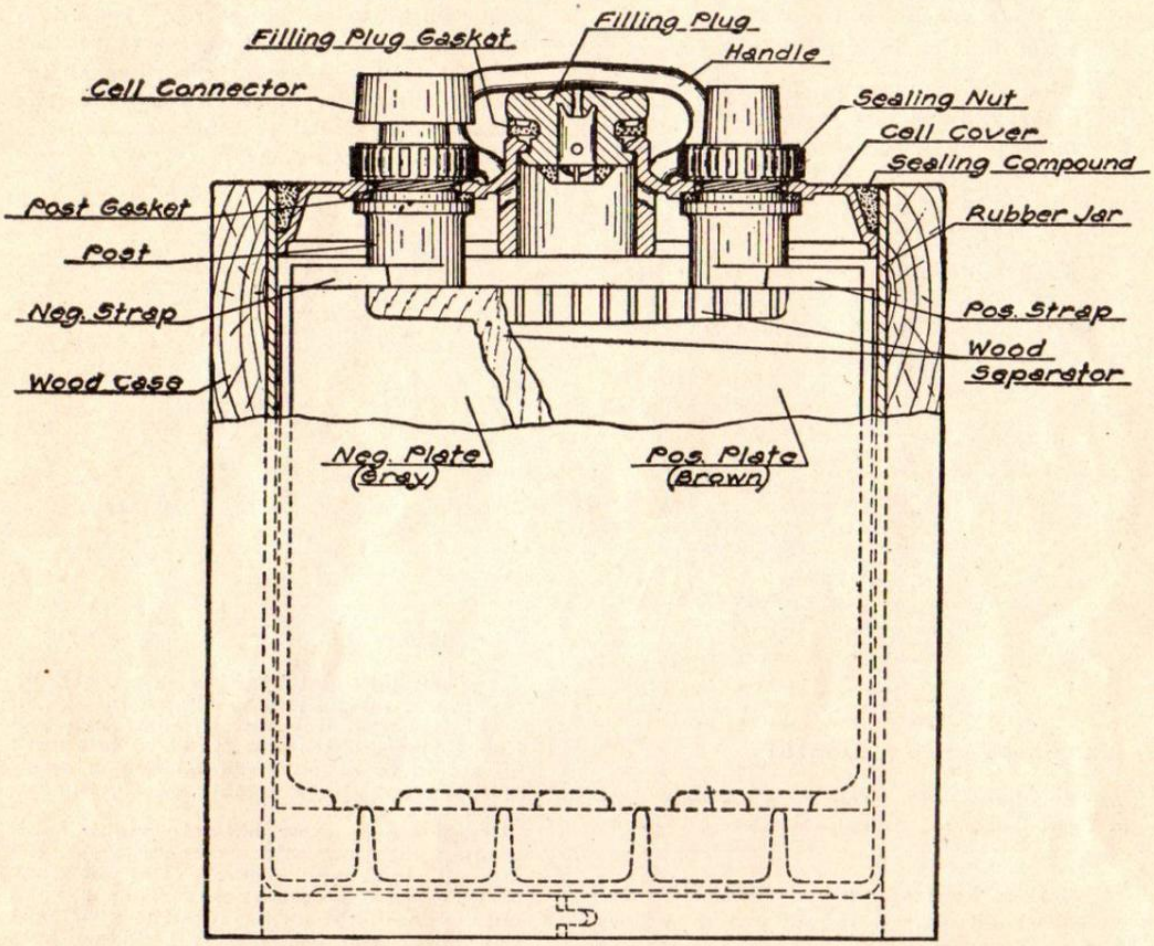
This reveals the inside mechanism. Wipe commutator "C" and the inside of the motor case with clean rag moistened with gasoline.

Replace felt washers and diaphragm in original positions. The diaphragm must be carefully placed so that the Anvil A faces in towards the motor. The six collar screw holes in collar, diaphragm and felt washers should be in perfect alignment before screws (6-6) are replaced. These screws should be equally tight.

STORAGE BATTERY

Buick six cylinder cars are equipped with a 6 volt, 15 plate Exide battery, Type 3-XC-15-1.

Fig. 1. Battery cut away to show construction.



BATTERY GUARANTEE

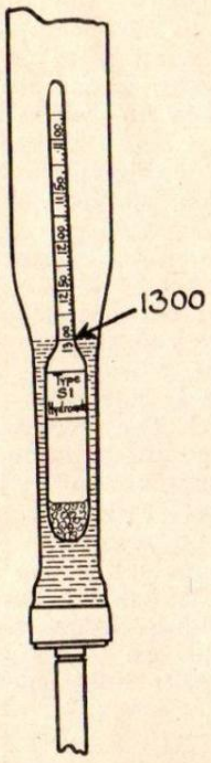
The Exide Batteries are guaranteed by the manufacturer (The Electric Storage Battery Company, Philadelphia) to be free from defects in material and workmanship.

At any time within three months from date of delivery to the purchaser any battery which may prove to be defective or incapable, when fully charged, of giving its rated capacity, will be repaired or replaced free of expense on receipt, transportation charges prepaid, at any Exide Battery Depot or authorized Exide Battery Service Station. This guarantee does not cover the free charging of batteries, nor the making good of damage resulting from continued lack of charge, nor from failure to keep the plates covered with solution by filling the cells from time to time with pure water. No claims on account of alleged defects can be allowed unless made within three months of date of delivery of battery to purchaser, and the right is reserved to refuse to consider claims in the case of batteries opened by other than authorized Exide Battery Service Stations.

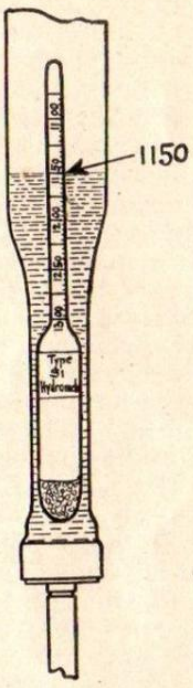
Purchasers of cars equipped with Exide Batteries are earnestly urged to co-operate with the battery manufacturers by taking their cars, as promptly as possible after receipt, to the nearest Exide Battery Service Station in order that the battery may be tested and its condition and installation checked. No charge is made for this inspection.

CONDENSED RULES FOR OPERATION

The battery requires very little attention, but that little is absolutely necessary. Its disregard has resulted in many batteries wearing out in



Hydrometer Reading of 1300.



Hydrometer Reading of 1150

half the time it would have taken if this attention had been given. The attention required may be summed up in the following simple rules:

1. Add nothing but distilled or other "pure" water to replace evaporation. Do this often enough to keep the plate (Fig. 1) covered, and in freezing weather do not add it until just before using the battery.
2. Keep the connections tight and covered with vaseline.
3. Keep the filling plugs tight and the battery dry and clean.
4. Take hydrometer readings every month at any time except just after adding water, and **be guided by their indications,** as follows:

(a) Reading less than 1225 [1155*], but more than 1150 [1080*], indicate a battery less than half-charged. Use lamps and starter sparingly until the reading becomes more than 1250 [1180*].

(b) Readings less than 1150 [1080*] indicate complete discharge; in which case the battery should be given a bench charge. This discharged condition may be due to need of adjustment in the system. To determine this, follow the rules below and on next page and remedy the cause before again running the car.

(c) If the reading of one cell differs from the others by 50 points or more, it indicates that the cell is not in good order. Take the battery to a skilled service station for attention.

5. If the car is to be laid up for the winter, take the battery to a **skilled service station for proper storage.**
6. If repairs are necessary, take the battery to a skilled service station. Do not trust it to inexperienced or unskilled hands.

SERVICE STATIONS

Exide Battery Service Stations are maintained in principal cities and towns throughout the country to assist you to obtain good service from your battery. Do not entrust your battery to the care of a novice.

IN CASE OF TROUBLE

1. Go over all connections. A loose or dirty connection is often the cause of trouble. If the connections between the battery and cable terminals are not kept well coated with vaseline, they may corrode, causing a poor connection, or opening the circuit. If the connector is causing the trouble, remove it and clean the parts thoroughly with weak ammonia.

*The reading in brackets applies to batteries used in climates where freezing of water never occurs.

Then remove all dirt, apply vaseline, tighten the connections perfectly and give the whole connection a heavy coating of vaseline.

2. There may be a leak or ground in the wiring. Test for this by turning on all lamp switches and then removing the bulbs from the sockets. Disconnect one of the cables at the battery and in its place tightly hold a file against the battery post, making sure there is good electrical contact between the file and post. Then rub the cable terminal along the file; if sparks are noticed, there is a ground in the wiring, which must be looked for and removed.

3. If engine will not crank, turn on lights and attempt to start in the usual manner. If lights become dim, battery is in poor condition and should be given a bench charge and the cause of the trouble investigated and removed. If lights continue to burn brightly, the trouble is elsewhere than in the battery.

4. If the generator of the starting system is not in proper adjustment, the battery will not be kept supplied with the proper amount of current. If the supply is insufficient, the battery will become discharged. If it is too much, the battery solution will become hot (110 degrees Fahrenheit). The generator should be readjusted to deliver more or less current, as the case may require. On all cars, the generator is originally adjusted to supply an amount of current which experience has shown to be the most satisfactory for average running conditions. If the car is run only at night, more current is naturally required because the lights use a large part of the current which would otherwise go to the battery. If long daylight runs are the rule, the opposite is true because then almost all the current goes into the battery.

ADDING WATER

The solution in the battery is a mixture of pure water and pure sulphuric acid. Water evaporates; sulphuric acid does not. This is one reason why it is necessary to add water, and also why it is unnecessary to add acid. Another reason is that whenever the battery gases or bubbles, the action going on changes some of the water into gas which escapes. The acid is not so affected.

Add water often enough to keep the plates covered. There is a certain space above the top of the plates for holding a quantity of solution, and this may be regarded as a reservoir, the object being to keep it from becoming empty or, in other words, to keep the plates from being exposed. Just how long the supply will last depends on several conditions, among which is temperature. Water will be required more frequently in summer than in winter. It is a good plan to add water at least once a week in summer and every other week in winter. When long daylight runs are made, water must be added still more frequently.

In warm weather, it makes no difference when water is added. In freezing weather, it should be added just before using the car. The reason is that water will remain on top of the solution until it is mixed with it by action of the battery. If not mixed with the solution, it would freeze almost as quickly as outside the battery.

"PURE" WATER

By "pure" water is meant water which contains nothing injurious to the battery. Water may be excellent for drinking and yet contain something injurious to the battery. Distilled (but not merely boiled) water, melted artificial (but not natural) ice or rain water (if obtained in the open country from a clean slate or shingle-covered roof) are generally satisfactory.

All water for battery use should be kept in clean, covered vessels of glass, china, earthenware, rubber or lead.

HYDROMETER READINGS

Hydrometer readings are taken with an instrument called a "hydrometer syringe" by inserting the end of the syringe in a filling tube (Fig. 2) and drawing up enough solution to float the glass bulb inside the instrument. The reading of the scale at the surface of the liquid (Figs. 3 and 4) gives the strength of the solution.

Hydrometer readings should be taken at least every month and may be taken at any time except in the interval between adding water and operating the battery. During this interval the water just added has not been mixed with the solution and the hydrometer reading would show but little more than the strength of this water.

CLEANLINESS

It is very important. Dampness or dirt on the battery permits the electric current to leak away and attracts and holds small quantities of battery solution which in time accumulate sufficiently to corrode terminals and rot the wood case.

If a battery has become wet, before drying, go over it with a rag dampened with ammonia solution. This will counteract the effect of the battery solution.

Battery connections are made of metal parts, heavily coated with lead to prevent exposure to corrosion. If the coated metal become exposed corrosion may appear. To guard against this, the terminals should be kept heavily coated with vaseline. If corrosion should appear, remove it and clean the parts thoroughly with weak ammonia. Then apply vaseline. Also be sure the connections are kept tight.

STORING STORAGE BATTERY

Remove storage battery by disconnecting both positive and negative leads from battery. Take Hydrometer reading of solution to ascertain the battery is in the fully charged state (Specific gravity 1285) add pure distilled water necessary to bring solution ½" above plates, being sure to thoroughly mix the water added with the solution contained in the battery.

Replace filler plugs, apply a thorough coat of vaseline to terminals, nuts and washers, which will prevent corroding. Place battery in a room where the temperature will always be above freezing. This is important. Once a month remove plugs and bring solution to ½" above the plates by adding distilled water as before. Take hydrometer reading, and if specific gravity has fallen below 1260, have battery charged to bring it back to fully charged state.

STORING CAR FOR WINTER

If car is to be placed in storage during the winter months, the following instructions should be carefully adhered to:

Wash and dry car thoroughly, using a pure soap, cold water and soft chamois; a soft cloth saturated with kerosene (coal oil) will be found convenient to remove any surface grease from motor metal parts. With top in the fully raised position, place car in a dry place, free from dust. By some convenient method, jack car up, so weight is entirely removed from all wheels, deflate tires to a few pounds pressure. Drain all water from radiator, engine and water pump, by removing plugs and opening petcocks. Drain all oil from engine by opening drain cock in lower half of crank case. Insert a few drops of kerosene around each valve stem; also pour a tablespoonful of kerosene on top of piston, through spark plug hole, and replace spark plugs. Be sure water is thoroughly drained from all parts.

PUTTING CAR INTO SERVICE

In putting the car into service in the Spring, care should be taken to see that all parts are in proper working condition before attempting to use car. First inflate tires to proper pressure. See that radiator is filled with clean water; that crank case is filled with engine oil to the "full" mark on measuring stick. See that spark plugs are clean and free from carbon.

Connect Storage Battery by replacing Positive and Negative leads. Insert a few drops of engine oil in all oil holes, fill grease cups with fresh grease; apply a few drops of kerosene to each valve stem and make sure fan is working properly. It is advisable to turn engine over a few times with the hand crank to make sure all moving parts are free before attempting to use the self-starter. Transmission and differential should be carefully inspected to see that they contain the proper amount of oil. Storage battery should be in the fully charged state (specific gravity 1285) and solution ½" above plates.

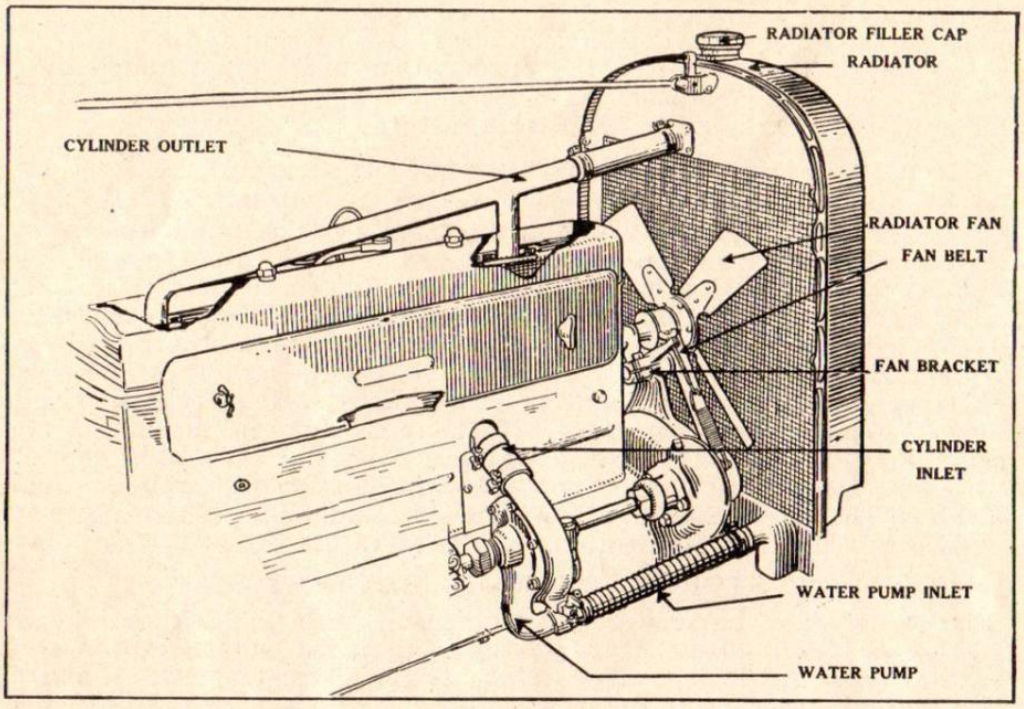


Plate No. 18
Cooling System

COOLING SYSTEM

The cooling system includes the radiator, water circulating pump, water connections and radiator fan.

RADIATOR

The radiator consists of an upper and lower tank connected by a large number of narrow passages in the cellular core. The hot water from the engine enters the upper tank and gradually flows through the passages in the core to the lower tank while a current of cool air is circulated through the opening in the core by the radiator fan. An enameled shell encloses the radiator and supports it on the frame of the car.

WATER PUMP

The water pump is of the centrifugal type and consists of an impellor with straight blades, fastened to the shaft, and a loose fitting, air tight casing, with inlet and outlet connections, fastened to the engine crank case. As the impellor revolves, it draws water from the radiator to the center of the impellor and by centrifugal force, throws it off at the outer ends of the blades and out of the casing to the cylinder jackets.

In order to keep the casing air tight the pump shaft is carried in glands, filled with prepared wick packing which also acts as a lubricant. These glands should be tightened from time to time as they show indications of leakage, but care must be taken to keep them from binding the shaft.

The radiator fan is mounted on the front end of the motor and is driven by belt from the cam shaft. It should be lubricated at intervals by introducing engine oil through the oil plug hole on fan hub. The belt can be tightened by screwing down wing nut or adjusting screw.

To prevent overheating keep radiator filled with clean water, see that fan belt is tight, and avoid leaky connections.

DRAINING

To drain cooling system, open drain valve at inside lower left corner of bottom of radiator and open draincock in water pump. Do not store car without draining cooling system thoroughly.

ANTI-FREEZING MIXTURE

In cold weather, the cooling system should be drained and filled with a solution that will not freeze when car is allowed to stand. The best anti-freezing mixtures are composed of denatured alcohol and water, as follows:

Freezing Point Wood Alcohol	Freezing Point Denatured Alcohol	Alcohol	Water
5° above zero	16° above zero	20%	80%
8° above zero	8° above zero	30%	70%
22° below zero	0° zero	40%	60%
35° below zero	8° below zero	50%	50%
50° below zero	16° below zero	60%	40%

Four ounces of glycerine added to these mixtures will retard the evaporation of the alcohol to some extent, but the alcohol will always evaporate more rapidly than the water and more should be added at frequent intervals to keep the mixture up to strength.

CLUTCH

A gasoline engine cannot be started under load and for this reason the engine is connected to the driving mechanism by means of a friction clutch which can be released by pressing down on the clutch pedal.

The clutch consists of a series of steel plates operating between steel plates faced with asbestos friction material, which are connected alternately to the fly wheel and to the clutch shaft of the transmission. When the clutch is engaged, a spring forces the plates together so that they revolve as a unit with the fly wheel of the engine, but when the clutch pedal is pressed down the plates separate, those connected to the fly wheel continuing to revolve while those connected to the transmission are stopped.

ADJUSTMENT OF CLUTCH

In the course of time the friction facing on the clutch discs will wear and when this occurs the clutch should be adjusted to prevent slipping. Adjustment can be made by moving lock nut and adjusting nut on clutch release rod to allow more clearance between the clutch release bearing and the plates. When properly adjusted there should be 1/32" clearance between the ball thrust bearing and the rear plate against which it operates. When properly adjusted there should be enough lash or clearance to allow from one inch to one and one-half inch of movement of the clutch pedal before it commences to act or the pressure is noticeably felt.

The position of the clutch pedal can be adjusted by means of the set screw in the rear end of the clutch pedal.

Do not put any oil or grease on the clutch discs.

The clutch operating parts are lubricated by two Alemite fittings, one located on the clutch release yoke pin and one on the clutch release bearing retainer, both of which should receive attention at least once every 500 miles. A few drops of oil applied to the pins on which the discs slide will prevent squeaking.

EXHAUST SYSTEM

The exhaust system includes the exhaust manifold, exhaust pipe and muffler.

The muffler consists of three concentric sheet metal drums which are perforated at opposite ends, so that the gas is compelled to travel the full length of each drum in turn while it is expanding and losing its heat.

In the muffler elbow a plug is provided principally to test the firing of the engine and this plug should never be removed for use as a warning signal or for amusement. Removal of this plug will not materially increase the power of the engine.

The exhaust system requires no attention on the part of the driver.

TRANSMISSION

The transmission system includes all those parts which transmit power from the engine to the rear wheels, but generally the transmission gearset alone is described by this term.

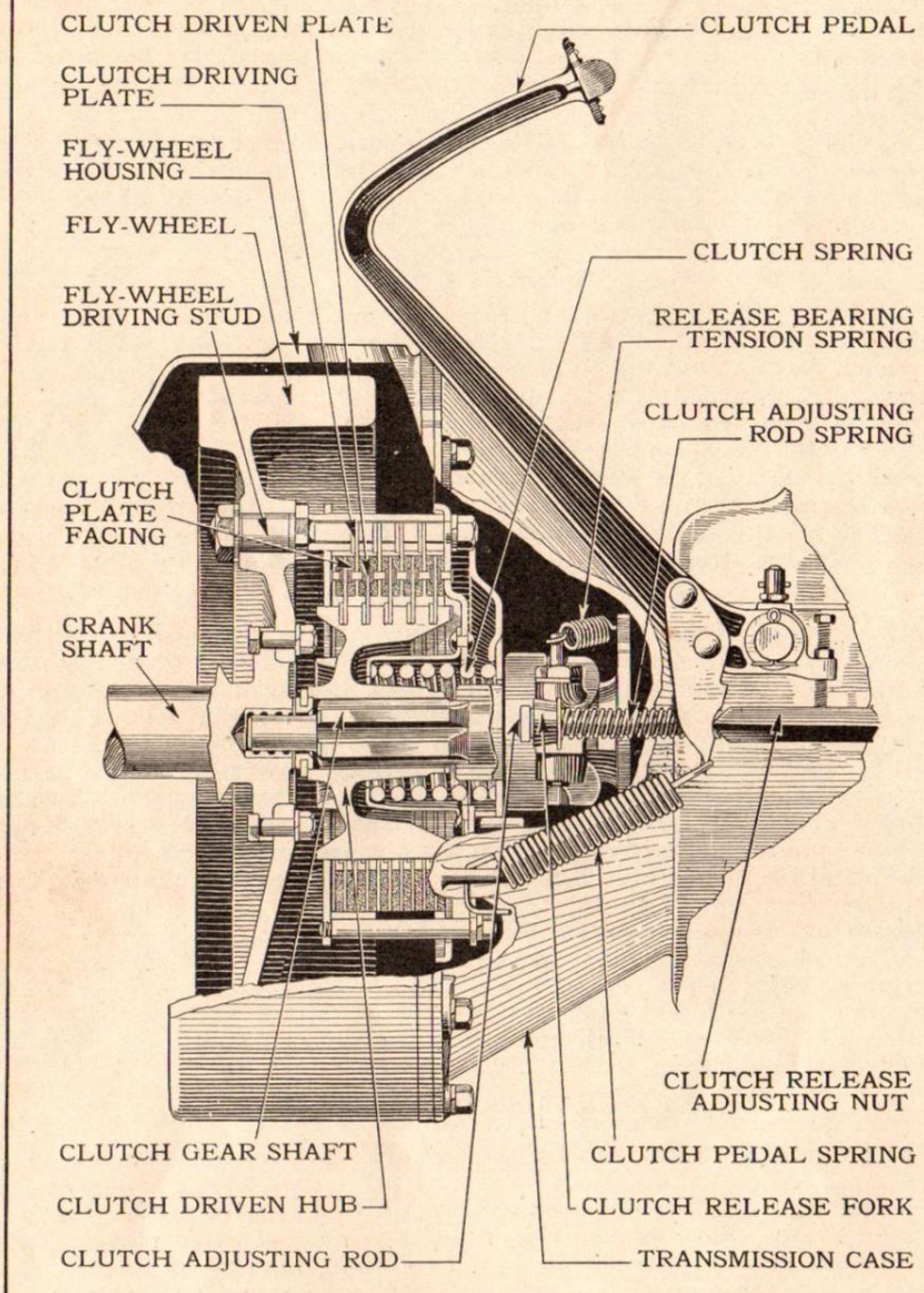


Plate No. 19
Clutch

GEARSET

The gearset, or change speed gear, is made necessary on account of the fact that a gasoline engine develops power in proportion to its speed; the higher the speed, the greater the power output. On the other hand the car frequently requires more power at low speeds than at higher and at such times the gearset is used to change the ratio between the speed of the engine and the speed of the rear wheels.

The change speed gears are carried on two shafts, the lower of which is known as the countershaft and carries the counter-gears, while the upper or main shaft carries the sliding gears. The main shaft is mounted in a ball bearing at its rear end and runs in a bearing in the clutch gear at its forward end.

The counter shaft is stationary and the counter-gears revolve on it. The reverse idler gear is mounted on a separate shaft to one side of countershaft and is in constant mesh with the counter gear. The sliding gears are mounted on the main shaft in such a manner that they can be moved along to engage with one or the other of the counter-gears.

The high and intermediate sliding gear is provided with internal teeth on its forward side so that it can be moved over the clutch gear to lock the main shaft and clutch gear together.

All the gears run in a constant bath of oil which also lubricates the bearings of the main shaft, clutch gear and universal joint. An oil filler hole is provided on the side of the transmission case for introduction of new oil, and a drain plug at the bottom allows emptying and cleaning.

NEUTRAL POSITION

The clutch gear is directly connected to the engine and consequently turns in the same direction, but the counter-gear, being in constant mesh with the clutch gear revolves in the opposite direction. When the control lever is in neutral position, neither of the sliding gears is in mesh with any other gear and therefore the main shaft does not turn.

FIRST SPEED POSITION

When the control lever is moved to the first speed position, the low and reverse sliding gear is slid into mesh with the counter-gear and the car moves forward.

SECOND SPEED POSITION

When the control lever is moved to the second speed position, the low and reverse sliding gear is drawn out of mesh with the counter-gear and the high and intermediate sliding gear is moved back into mesh with the intermediate speed counter-gear. In this position the main shaft also turns in the same direction as the engine.

HIGH SPEED POSITION

When the control lever is moved to third, or high speed position, the high and intermediate sliding gear is moved forward on the main shaft until the internal teeth slip over and engage the teeth of the clutch gear, locking the main shaft and clutch gear together, thus giving the engine a "direct drive" to the rear axle.

REVERSE POSITION

Moving the control lever to the reverse position slides the low and reverse sliding gear back into mesh with the reverse idler gear which in turn meshes with counter-gear, the main shaft now turns in the opposite direction of the engine, driving the car backwards.

CONTROL LEVER

The sliding gears are moved back and forth on the main shaft by means of shifter forks which are carried on a rod in the transmission cover. The control lever is pivoted in the cover so that it may be swung to one side or the other. When swung to the right it picks up the fork which moves the low and reverse sliding gear, and when swung to the left it operates the high and intermediate sliding gear. Small spring plungers in the sides of the cover engage with slots in the shifter forks to hold the sliding gears in position.

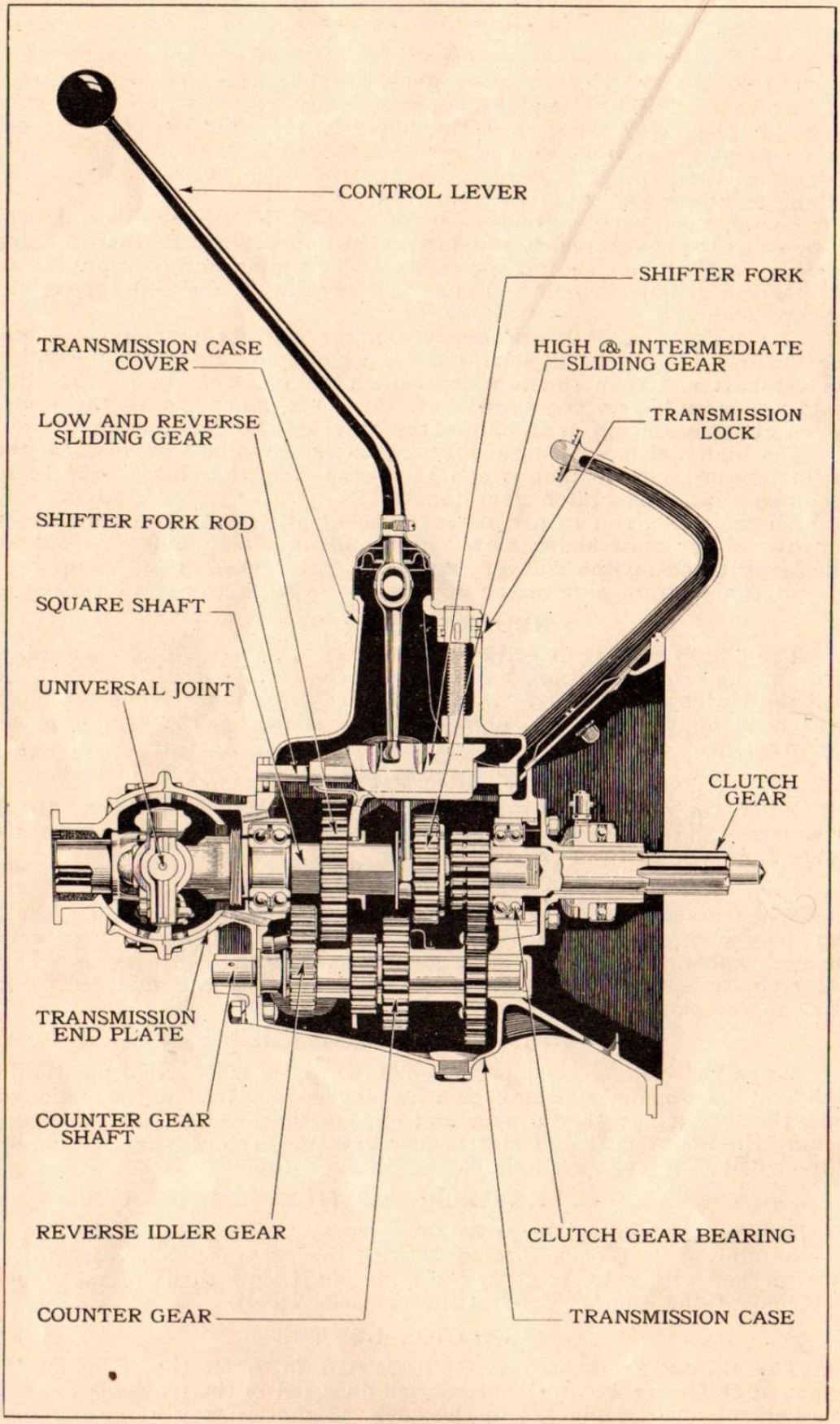


Plate No. 20
Transmission

TRANSMISSION LOCK

The transmission lock is connected to the gear shift of the transmission, locking the gear shift in neutral position.

To lock, first see that gear shift is in neutral, insert the key, turn a quarter turn, then press lock down even with lock housing and holding in that position turn key back to original position and the transmission is locked.

To unlock insert key as before, turn a quarter turn and lock is released, then turn key back to original position and the transmission gear shift may be changed to any position desired. The transmission cannot be locked or unlocked without the key. The transmission lock key and switch key are interchangeable; either fitting the other.

UNIVERSAL JOINT

The transmission gearset is fastened solidly to the engine, which in turn is fastened to the car frame, but the rear axle is hung on springs and must be free to follow the uneven surface of the road. In order to allow continuous transmission of power from the gearset to the rear wheels, the universal joint is interposed between them. It consists principally of a split ring having four bearing surfaces. A yoke attached to the main shaft of the gearset is assembled into two of these bearing surfaces, while the splined yoke that slips on forward end of axle is assembled into the other two bearing surfaces. The joint is enclosed in a special housing and is automatically lubricated by oil from the transmission.

SPEEDOMETER

The speedometer registers the speed at which the car is traveling, the total number of miles traveled, and the trip mileage. The total cannot be reset, but the trip mileage can be reset to zero by pulling out and turning the knurled finger nut backward or forward, which protrudes through the face for that purpose.

If the speedometer head is removed for any reason, handle it as you would a fine watch, as the head is made up of such intricate parts that it can easily be damaged by rough handling.

The drive is taken from a worm gear which is attached to the main shaft of the transmission through the transmission end plate, being supported with suitable bearings and held in place by a set screw.

The drive shaft is enclosed in a flexible tube which is attached with a nut at either end and can be lubricated by removing; unhook at lower end of chain and pull chain clear of the tube from opposite end. Then smear chain freely with a good quality of cup grease twice a year. And under no circumstances should the instrument head receive oil.

REAR AXLE

The rear axle assembly includes the propellor shaft, differential, axle shafts, brakes and wheels and constitutes the final element in the driving mechanism.

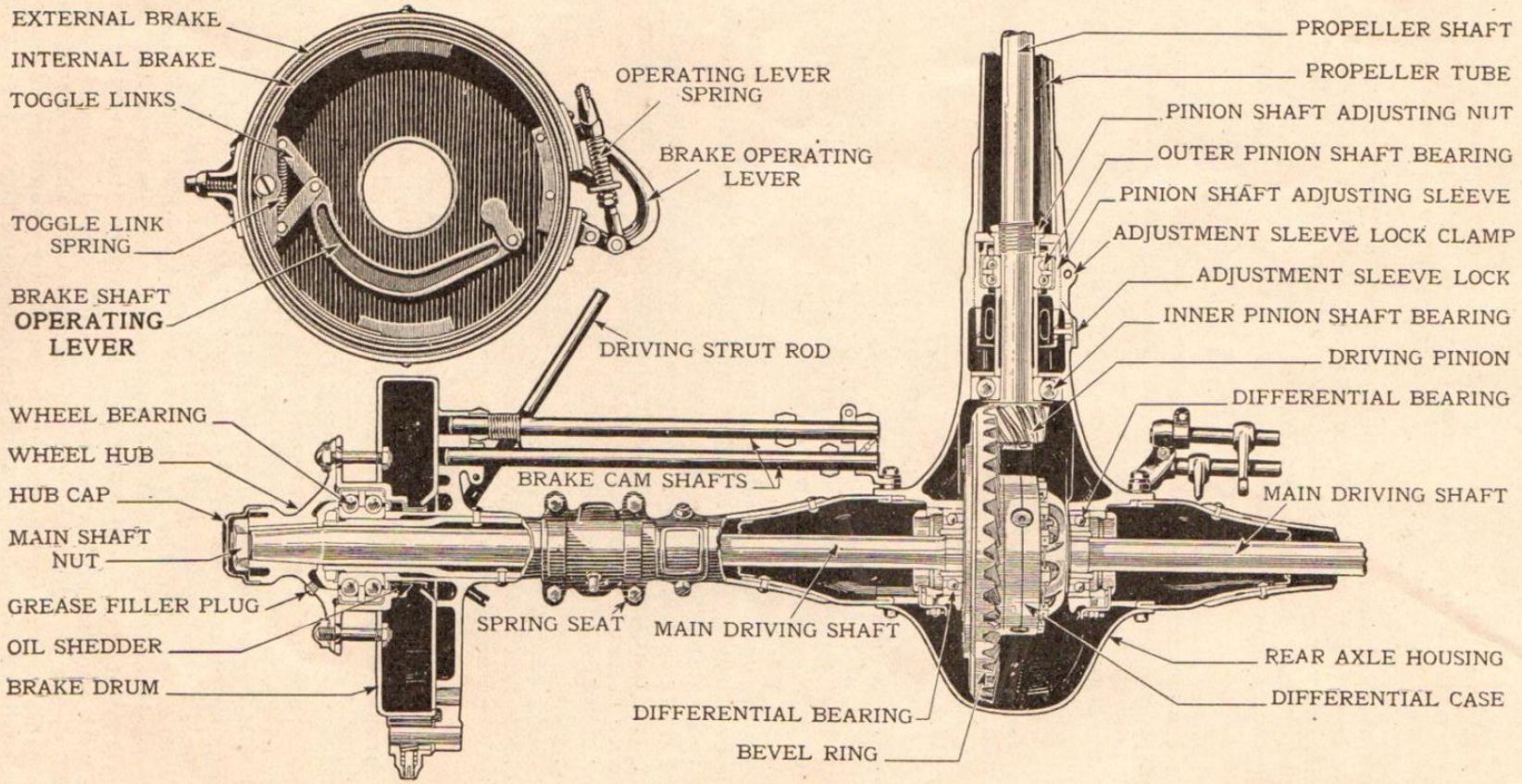
PROPELLOR SHAFT

The propellor shaft transmits the power from the universal joint to the driving gears of the differential. It is enclosed for its entire length in a steel tube carrying the driving flange which attaches to the universal joint housing on the rear of the transmission. The driving effort from the rear wheels is transmitted by the pinion tube through the ball joint to the transmission case and the frame of car. The pinion tube also absorbs the torque reaction of the bevel driving gears. At its rear end the propellor shaft is mounted on ball bearings and carries the driving pinion which meshes with the large ring gear on the differential.

The depth to which the pinion meshes with the teeth of the ring gear is adjustable and adjustment can be made by removing the cover plate on the right side of the pinion flange and loosening the adjusting sleeve clamp screw on the right side. The sleeve which carries the outer bearing can then be turned to adjust the position of the pinion.

Adjustment of the pinion shaft should be made only by an experienced mechanic. In case of trouble, take car to the nearest Buick dealer or service station.

Plate No. 21
Rear Axle



DIFFERENTIAL

The differential equalizes the amount of power applied to each of the rear wheels and allows one wheel to travel faster than the other wheel when the car is rounding a curve. It consists of a case mounted on tapered roller bearings which hold it in position. The large driving ring is attached to the outside of the case and meshes with the driving pinion. Inside of this case is a set of four bevel gears, all of which mesh with the side or intermediate pinions, into which the main axle shafts slide from the outside, they being connected to the rear wheels.

When the car is being driven straight ahead, the differential gears lock themselves and revolve with the motion of the case as a solid unit.

When the car turns a corner, the inside wheel slows down retarding its main shaft and the intermediate gear to which it is connected in the differential, but since the engine continues to drive the differential case at the same speed, the side pinions begin to revolve on their bearings, thus increasing the speed of the outside wheel.

The position of the differential and driving gear with respect to the driving pinion can be adjusted by removing the cover plates on each side of the housing at the rear and turning the adjusting sleeves. Both sleeves must be turned the same amount and in the same direction to prevent any end play in the differential bearings.

The differential is mounted on proper bearings and should be so adjusted that the differential will rotate freely without any perceptible end play or shake. These bearings are adjustable for wear and any excessive amount of wear that may develop would probably occur in the first 1,000 miles and examination should be made of these bearings after a run of this distance.

The differential and its bearings run in a continual oil bath introduced through the filler plug in the axle housing. The old oil should be drained off, differential washed out with gasoline and fresh oil introduced twice a season.

Adjustment should be made by an experienced mechanic and in case of trouble, car should be taken to nearest Buick dealer or service station, and the following directions will assist in adjusting the Rear Axle Spiral Bevel Gears.

ADJUSTING OF SPIRAL BEVEL GEARS IN REAR AXLE

In order that the Spiral Bevel Ring Gear and Pinion may operate correctly, the rear axle must be in perfect alignment. That is, the differential axis must be in the same plane as the pinion axis. If there is any variation at all, the pinion axis must not be above the gear axis, as that would throw the contact or load on the heel of the tooth.

It is very important that a careful inspection of the bearings be made before they are put back in their respective positions. If single row ball bearings are used, they may have a little angular movement, but must not have any radial play. By angular movement, we mean a slight rock; an action which we get in a ball joint. By radial movement we mean straight movement up and down. Also, make sure that the balls are not damaged. If they spin freely, no doubt they are all right. If the bearing sticks, clean it carefully with gasoline to make sure that all foreign matter is removed.

The bearings on the differential are of the ball type and the balls, cups and cones should be examined to be sure they are not pitted or worn too badly.

Make sure that all parts which go on the inside of the gear housing are thoroughly cleaned. Any chips, grit or other hard substances grind out the bearings and gears very quickly. All studs and nuts must be a good fit in threads, so as to hold the gears and bearings in place. If these are loose, they will let the gears vibrate, and they will probably go to pieces in a very short time.

SECTION OF SPIRAL TOOTH RING GEAR

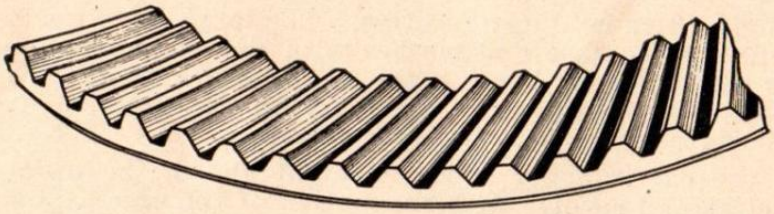


FIG. 1

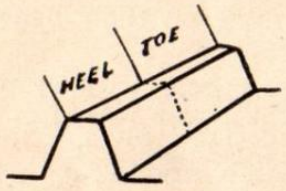


FIG. 2

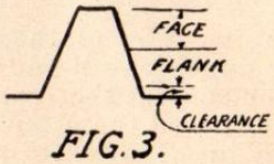


FIG. 3.

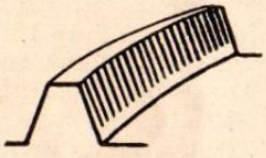


FIG. 4.

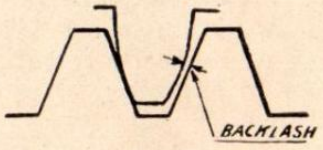


FIG. 5

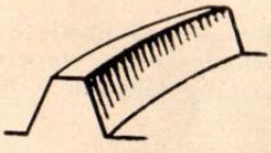


FIG. 6.

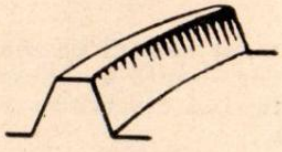


FIG. 7.

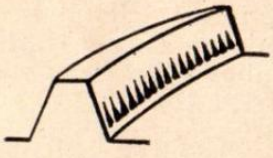


FIG. 8

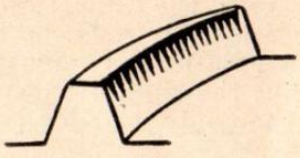


FIG. 9.

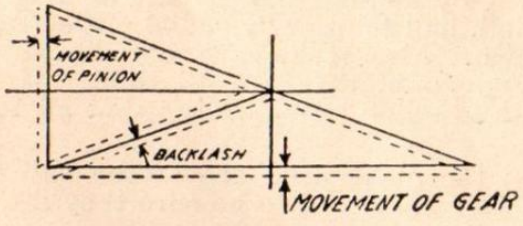


FIG. 10.

Plate No. 22
Sections of Ring Gear and Pinion

In mounting ring gear on differential, inspect ring gear seat of differential case to determine whether it runs true with the bearing hubs. If it runs out more than .002", face it off in lathe to make it run true. When riveting ring gear on case, make certain that it is riveted tight. Ring gear should not run out more than .008", using the bearing hubs of the differentials as centers.

When driving pinion on shaft, see to it that it does not ride the key, also that it is driven on tight. Pinion must not run out more than .004" on shaft.

The most common method of setting up Spiral Bevel Gears, is to set ring gear and pinion so they come flush, either at the large or small end of the teeth, and have an operating clearance of from .005" to .008". For perfect adjustment, however, this method must be forgotten. An experienced mechanic can very often locate the proper running position by his sense of touch, but even that is not always dependable. This method is not correct at all times. This depends largely on the cut of the gear and the variation which takes place in its manufacture.

When the mechanic is ready to place the gears back into the axle, the best way to do is to roll the pinion around the ring gear by hand and note the position which the pinion takes at the large or small end, whether it sticks out or runs in. Assemble them in the axle as near as you can, in that position, allowing from .005" to 008" back lash between them. Place the axle under the car, and at the same time paint the gear teeth with a thin coat of white lead. After this is done jack up the rear wheels and start the engine, throwing transmission into high gear, also throw in your brake, which must be equalized so you can get about the same load on each wheel. This will wipe the paint off the teeth. You may find a condition as illustrated in Figure 9. The shaded portion represents the contact of your gear. That means the load is pulling on this portion of the teeth. In that case, move your pinion in, or toward the rear, two, three or more notches of your adjusting nut, until the pinion wipes off the paint as shown in shading on Figure 4.

Figure 4 illustrates what we term a desirable contact on the Spiral Tooth Ring Gear. Contact as shown is just a trifle heavier on the toe of the tooth (Figure 2) than it is on the heel. The heel of the gear tooth is the large end, and the toe is the small end. We intend to set the gears in this way, so as to be sure that we get an even contact when a full load is applied; the pinion in that case always having a tendency to lift.

If you have a contact as illustrated in Figure 8 or where the load comes on what we term the flank of the gear tooth, it means that the pinion is too far in toward the axle. Gears set up in this way are noisy. To correct, pull pinion out until contact comes to the full working depth of gear tooth, without leaving lowest point of contact (See Figure 4). If the contact is as shown in Figures 8 and 9, it should only be changed by moving the pinion. If the load is centered in this place, you always find that you have a noisy axle. Noise almost always can be eliminated by the pinion adjustment.

If the contact on tooth appears as shown by shading in Figure 6, it means that there is too much back lash between Ring Gear and Pinion. Gears set up this way will eventually break off at the heel. To correct, move ring gear toward pinion, but make sure there is back lash, as gears cannot run tight. If the contact still shows heavy on the heel, the large end of the gear (see Figure 2), change the gear. If you still have that contact, the axle is machined wrong or sprung.

Contact as shown in Figure No. 7; that is, heavy on the small end, or the toe of the tooth is not bad, although it doesn't want to be centered there too much. Gears set up this way will eventually break off at the toe. To correct, move ring gear away from pinion. Under no circumstances should the gear pass with a heavy contact on the heel.

Figure 10 illustrates two cones, which spiral bevel gears really are. It illustrates to you the difference you get in back lash, by moving either the ring gear or the pinion the same amount. For example, on a 4:1 gear ratio, it would be necessary to move the pinion four times as much as the ring gear, in order to get the same amount of back lash. So when it is necessary to increase or decrease back lash very much, it is best to try to

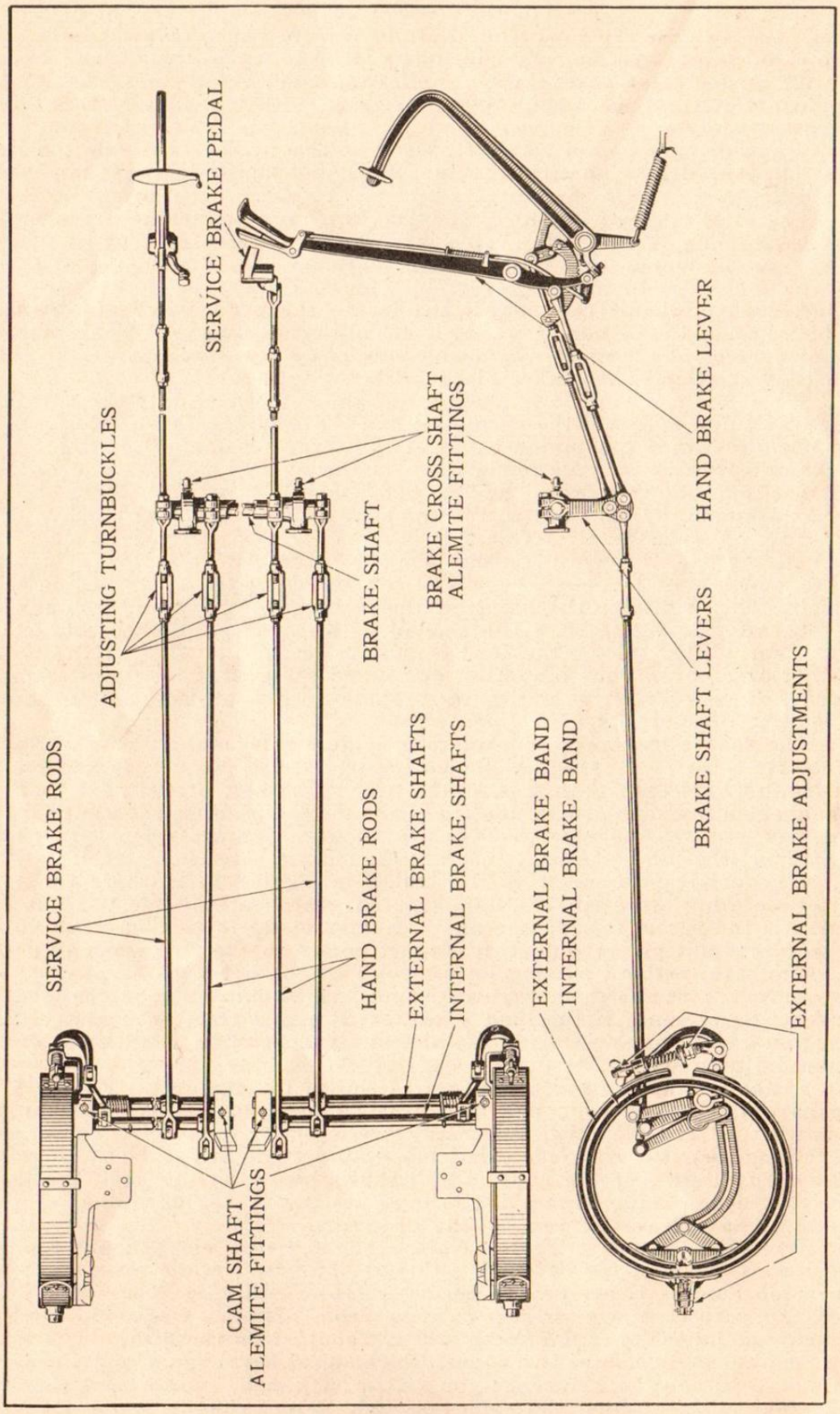


Plate No. 23
Brake Adjustment

move the ring gear. However, you can tell from your contact just which of the two gears to move.

When the gears are adjusted in this manner under the car, and you feel sure that you have set them up as good as you can make them, you may run the car out on the road and give it a one mile test without putting oil in the axle housing. This will tell you what can be expected, as far as noise is concerned. Oil will not deaden the noise very much; it only acts as a lubricant. If you find it advisable to make further adjustments to make axle quieter, before filling up case with oil and turning car over to the customer, paint the gears up again and make certain that you have contact as illustrated in Figure 4. Full tooth contact is necessary to carry the load.

While this method may seem complicated at first, with a little practice a good mechanic can set up gears in the above manner almost as easy as by guess work, and it certainly will give a lot more satisfaction to the owner of the car.

WHEEL HUBS

Driving flanges are keyed to the outer ends of the axle shafts and bolted to the wheel hubs, which run on double row ball bearings mounted on the outer ends of the axle tubes, so that all of the weight of the car is carried by the housing, and the axle shafts transmit only the driving effort. The hub bearings are lubricated with cup grease introduced through a filler plug hole in each hub. The hubs are also provided with felt washers and oil deflectors which throw off any oil which might work out from the differential and prevent it from getting on the brake. This surplus oil or grease is drained off through a drain tube which projects from the inner side of the brake flange underneath the axle tube. **CARE SHOULD BE EXERCISED TO SEE THAT THESE TUBES ARE ALWAYS OPEN AND CLEAN.**

BRAKES

The brakes are supported by brake spiders attached to the main tubes of the axle and are operated by the brake cam shafts. They consist of steel bands lined with friction fabric and so arranged that they can be expanded or contracted against the circumference of the brake drums by means of a pedal or lever.

SERVICE BRAKES

The External or Service Brakes are operated by the right pedal in the driving compartment. The wear of the brake lining should be taken up by adjustment at the brake instead of at the turnbuckle on the pull rods. When adjustment is necessary, disconnect pull rods from brake levers on axle, turn adjusting screw in anchor pin at the rear, turn the lock nuts for the lower part of the band and the hexagonal nut for the upper half. These adjustments to be made in order mentioned and to get a uniform clearance of 1/32" between the drum and the lining when the brakes are released. After making these adjustments connect rods to levers on axle, varying the length of these rods by adjusting the turnbuckles so that ends of rods will register with eyes in levers.

While the rear axle is still on the jacks, try the brakes to see whether they are holding even. If not, make slight adjustments at the brake only. The foot pedal should travel about 3" to set the brakes properly.

See that brakes on both wheels are adjusted alike.

EMERGENCY BRAKES

The emergency brakes are the internal brakes and are operated by the hand brake lever in the driving compartment. They are seldom used and hence wear very slowly, but when adjustment is necessary, it can be made by shortening the rods with the turn-buckles.

SPRING SEATS

The rear springs are attached to the rear axle by means of spring seats which are free to turn on the axle tube. The spring seats are provided with Alemite fittings and should be filled with soft cup grease at least once every 500 miles.

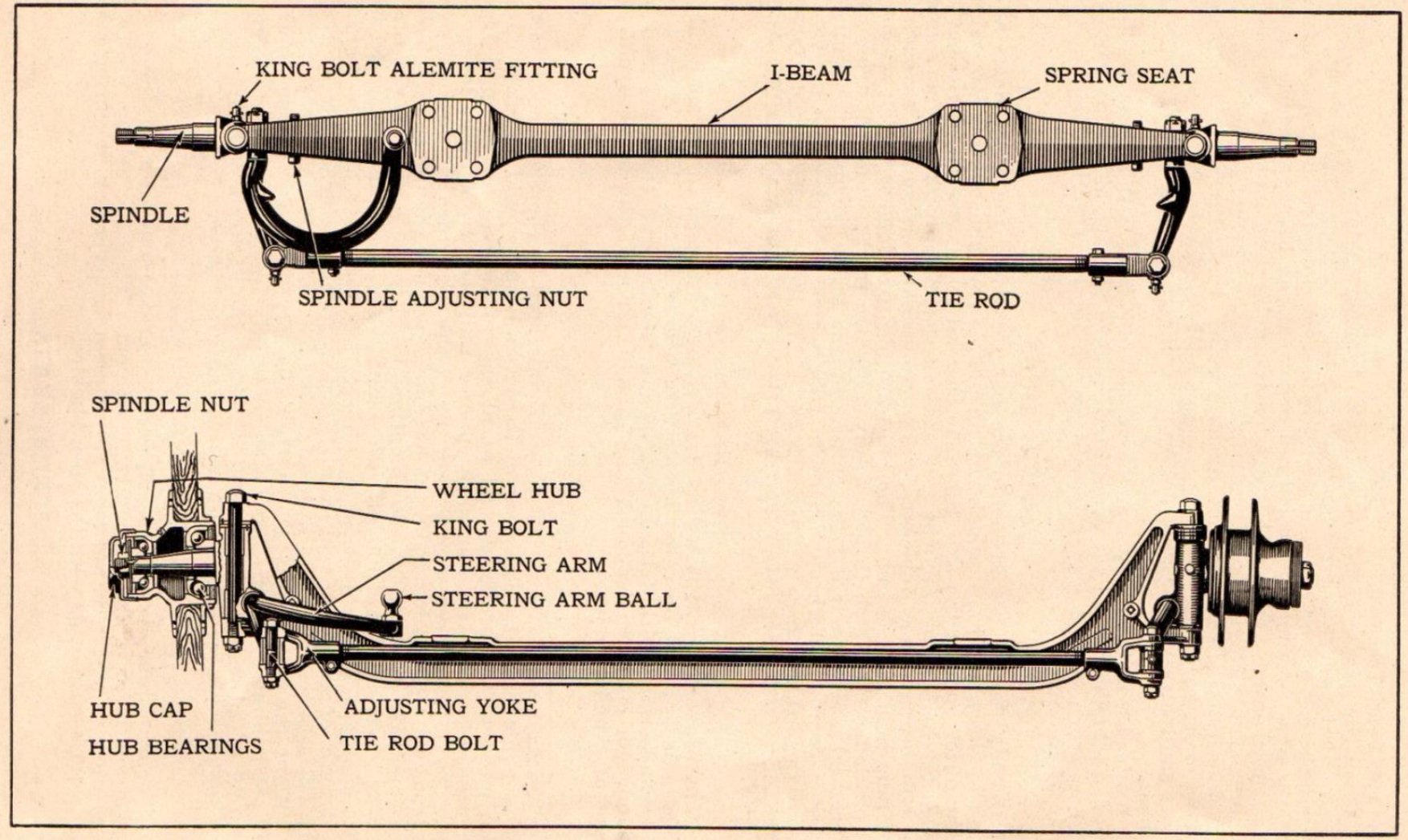


Plate No. 24
Front Axle

FRONT AXLE

The front wheels are mounted on steering knuckles pivoted to the front axle, so that they may be turned by the steering gear. Steering arms attached to the knuckles are connected by an adjustable tie rod, and the left steering arm has a third arm which connects to the steering gear by means of the steering connecting rod.

TIE ROD ADJUSTMENT

The front wheels do not stand exactly square but are set at an angle which makes the car steer easily. This angle can be adjusted by means of the adjusting yokes on the tie rod. When properly adjusted, the wheels should measure ¼ to ⅜ inch closer together at the front than the rear and 1 7/16 inch closer at the bottom than at the top, these measurements being taken between the inner sides of the steel felloes.

FRONT HUBS

The front wheels run on proper bearings, 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 wheels, care should be exercised to thoroughly fill the bearings with grease, and also the space between the bearings. 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 from graphite, asbestos, fibre and other foreign matter.

There are two bearings to each front wheel and these are held in adjustment by the spindle nut, which is fastened with a cotter and a safety washer, which is interposed between the spindle nut and the cone of the outer bearing.

FRONT WHEEL BEARING ADJUSTMENT

To adjust front wheel bearings, spin wheel, and turn spindle nut so it just comes tight, then turn it back from one to two slots in nut.

The wheel should turn from the weight of the valve and may have a slight shake but it must never be tight. Do not confuse a looseness at king bolt with a looseness in the wheel bearing.

These adjustments should be made by a competent mechanic or the car taken to the nearest Buick dealer or service station.

STEERING GEAR

The steering wheel is attached to a long tube, the lower end of which carries a double threaded worm or screw, engaging with two half nuts which slide up and down in guides in the steering gear housing. The threads on the steering screw are right and left hand, and one of the half nuts has a right hand thread; the other a left hand thread. When the steering wheel is turned, one of the half nuts rises in its guide while the other is forced downward. At their lower ends the half nuts carry hardened steel thrust blocks which push against rollers attached to the steering yoke, and by their motion the yoke is tilted in the housing, moving the steering pitman arm backward and forward, and by means of the steering connecting rod, turning the front wheels to one side or the other.

The steering screw is provided with a ball thrust bearing and adjusting nut at its upper end for the purpose of taking up any back lash or lost motion in the steering wheel. For best results the steering wheel should not have over one inch of lost motion at wheel rim.

An oiling cup is provided in the steering gear housing and the housing should be kept filled with heavy steam cylinder oil.

The sector bracket which carries the spark and throttle levers on top of the steering wheel is supported by a stationary tube inside the steering tube. The spark and throttle connections are operated by small concentric tubes enclosed in the stationary tube and carrying bevel gears at their lower ends. The horn button is located in the center of the steering wheel and is connected with the horn by a wire through the center of the inner tube.

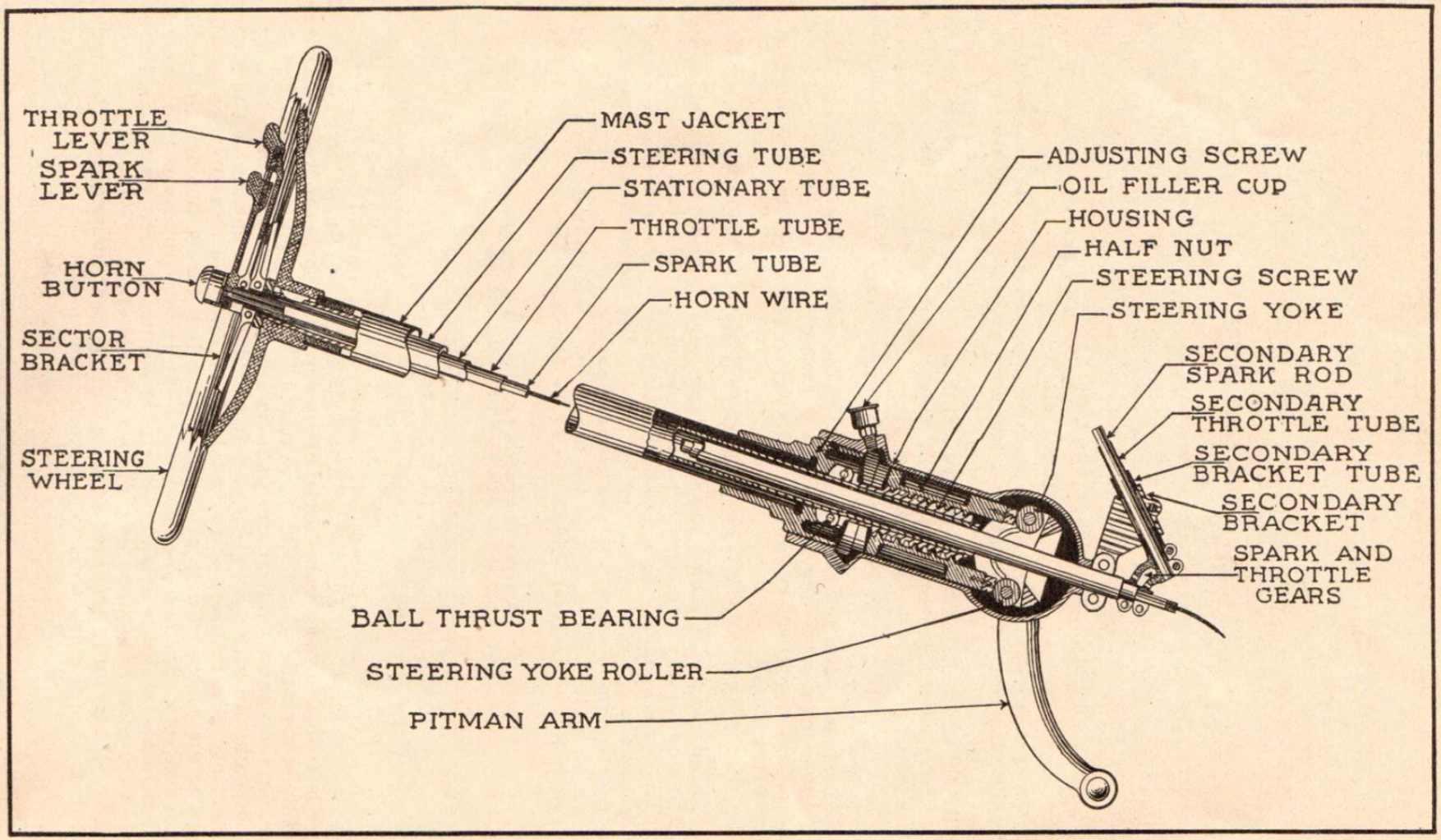


Plate No. 25
Steering Gear

SPRINGS

The springs are interposed between the axles and the frame to absorb road shocks before they are transmitted to the remainder of the mechanism or to the passengers.

The front springs are attached to the frame at both ends and to the axle in the center, while the rear springs attach to the frame at their centers and front ends and carry the axle on their rear ends.

The springs are provided with Alemite fittings at their ends and these should be filled with soft cup grease every 500 miles.

Squeaking springs can be overcome by jacking up frame of car to release weight on springs and thin oil applied between leaves or springs can be removed, disassembled and heavy steam cylinder oil or a good grade graphite grease applied between spring leaves.

After the car has been driven a few hundred miles there is a tendency for the spring clips to loosen. The spring clips should be tightened as often as found necessary.

Broken springs are almost invariably caused by careless driving or loose spring clips. See that spring clip nuts are tight at all times.

WHEELS

(Artillery Type)

TO REMOVE THE RIM

The demountable rims are of the bolted on type and may be removed from the wheels with the tire by the following operations:

Remove the dust cap and nut from air valve stem. With the rim wrench remove all of the nuts from the bolts except the one on each side of the tire valve, which should be loosened (Fig. 1). Insert screw driver end of the demountable rim wrench between the felloe and wedge to pry loose and remove, (Fig. 2) after wedges have been removed turn wheel towards you until it clears the felloe sufficiently to raise up to disengage the valve stem from the felloe (Fig. 3).

TO REPLACE RIM

Loosen nut at lower edge of tire carrier at rear of car with rim wrench and turn the lug until it clears the rim. Remove air valve stem cap and nut and lift the rim off the carrier. To replace rim on wheel the tire must be fully inflated. Insert valve stem in proper hole in felloe and driving lug over rim bolt (Fig. 3) and force lower part of rim on the wheel with the foot. Replace all wedges, drawing them up evenly until all are tight. Squeaking rims are usually caused by loose wedges. Note that edges of rim at split are even and not more than 1/32 inch apart.

TO REMOVE TIRE FROM RIM

First of all make sure that the tire is fully deflated before attempting this operation.

To take the rim out of the tire, lay rim and tire flat with the notched side of locking plate up. Unlock rim by inserting screw driver end of rim wrench into locking plate (see Fig. 4) and turn until clear of locking plate. Insert screw driver end of rim wrench in the notch in the locking plate as Fig. 5 and pry the lock plate clear of the hole. Continue this operation until the end of rim which carries the lock plate is free from tire and rim (Fig. 6). Grasp the free end of the rim firmly with the hands, holding the tire firmly with the foot, and pull the rim entirely out of the tire as in Fig. 7.

TO REPLACE TIRE ON RIM

Turn the rim over so that the end with the valve stem hole is on top. Place rim flat as before. Insert valve stem in hole in rim, place both tire bead in rim for ⅔ of distance around tire (see Fig. 8), turn tire and rim over, prying in on rim and forcing it down into position with the foot (see

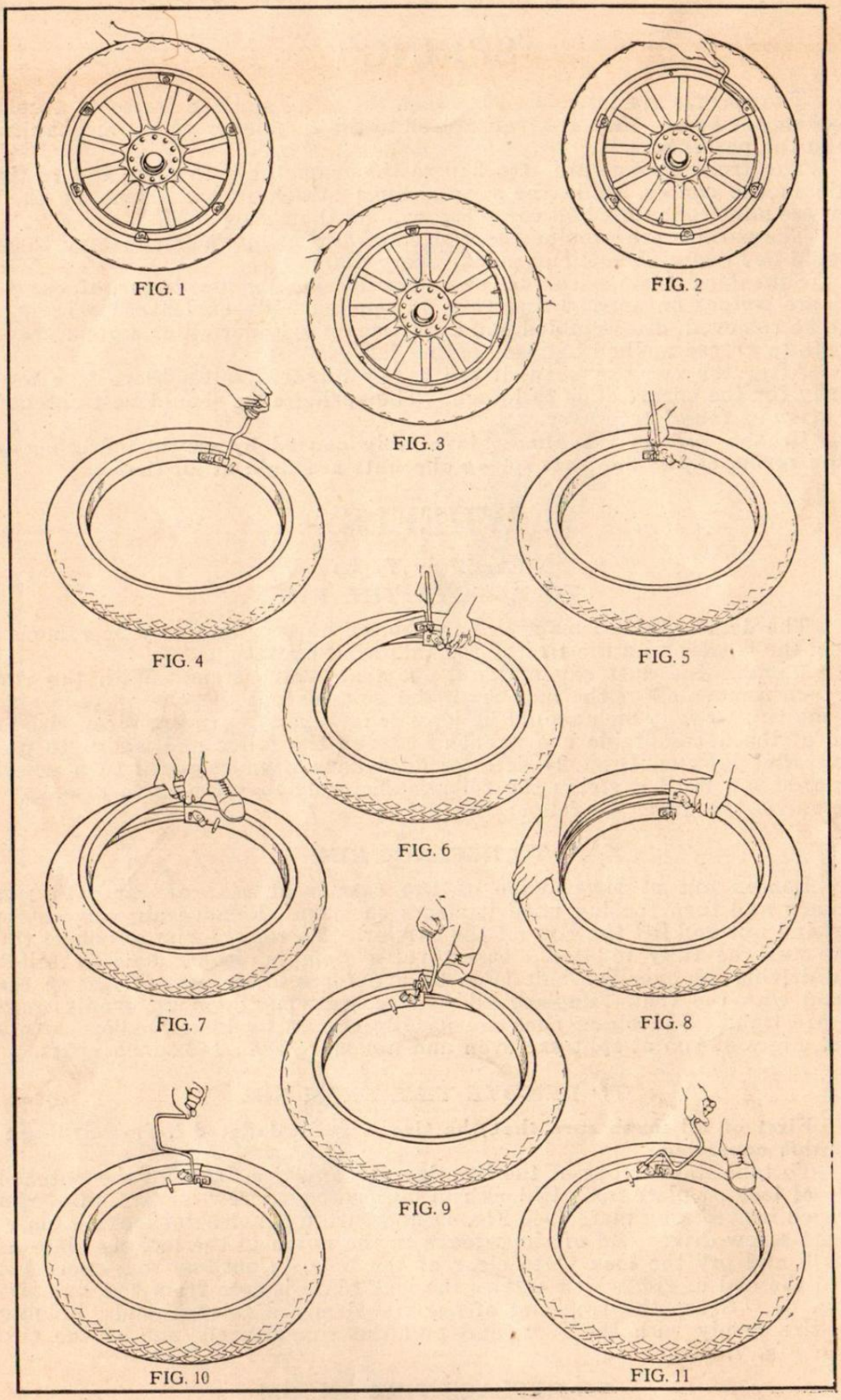


Plate No. 26
Operation of Demountable Rim

Fig. 9), with screw driver end of wrench pry rim into place so that ends butt together (see Fig. 10). Lock rim by means of rim wrench (see Fig. 11). The tire is now ready for inflation.

TIRES

Tires are of the standard straight side cord type, into which two rings of braided steel wire are moulded to form the beads which hold the tire on the rim.

Punctures cannot be avoided, but a well inflated tire is less likely to pick up nails than a soft one. Bruises, cuts and sand boils can generally be avoided by careful driving, but should be repaired as soon as they appear. Gasoline and oil should be kept away from the tires as they tend to soften the rubber. If car is to be out of service any length of time, remove tires, deflate to a few pounds pressure and store in a cool, dark place. Three-fourths of all tire trouble is due to lack of pressure; therefore, a gauge should be used to determine the pressure and the tire should be kept inflated to proper pressure.

BODY

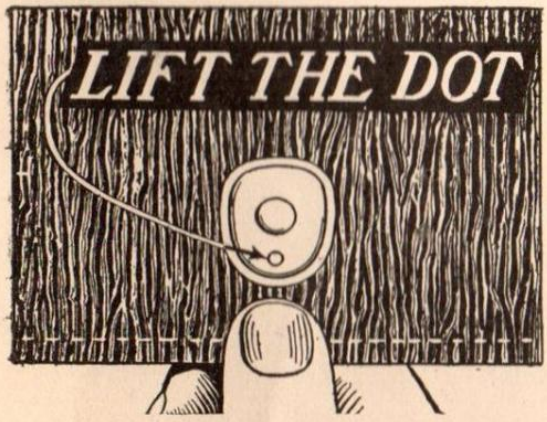
The body is the passenger carrying part of the car and consists principally of a frame covered with a steel shell, and into which the seats and cushions are fitted. It is bolted to the frame of the car, and to prevent squeaks, the body bolts should be kept tight. Aside from washing and cleaning, the body will require no further attention.

WASHING

When washing the car, soak the dirt off with a gentle stream of cold water, using sponge gently with water. Mud is much more easily removed before it gets dry and hard. Rinse thoroughly with cold water, dry and polish with a piece of clean soft chamois skin.

TOP

The top should never be folded until it is thoroughly cleaned and dried. Dust on the outside can be removed by washing with clear cold water. Be sure to rinse thoroughly or clean with a clean, moist cloth. The inside should be dusted out with a stiff whisk broom.



LIFT THE DOT FASTENER

The "Lift the Dot" fastener is used to fasten the side curtains in place. To remove fastener from over stem, grasp the curtain just below the fastener as shown in cut and give it a sharp, quick jerk.

WINDSHIELD

The windshield is adjustable for rain vision and ventilation. Friction stops hold the glass in any position and may be tightened by turning the wing nuts on the posts. The large nuts which fasten the windshield posts to the cowl bracket should be kept tight at all times.

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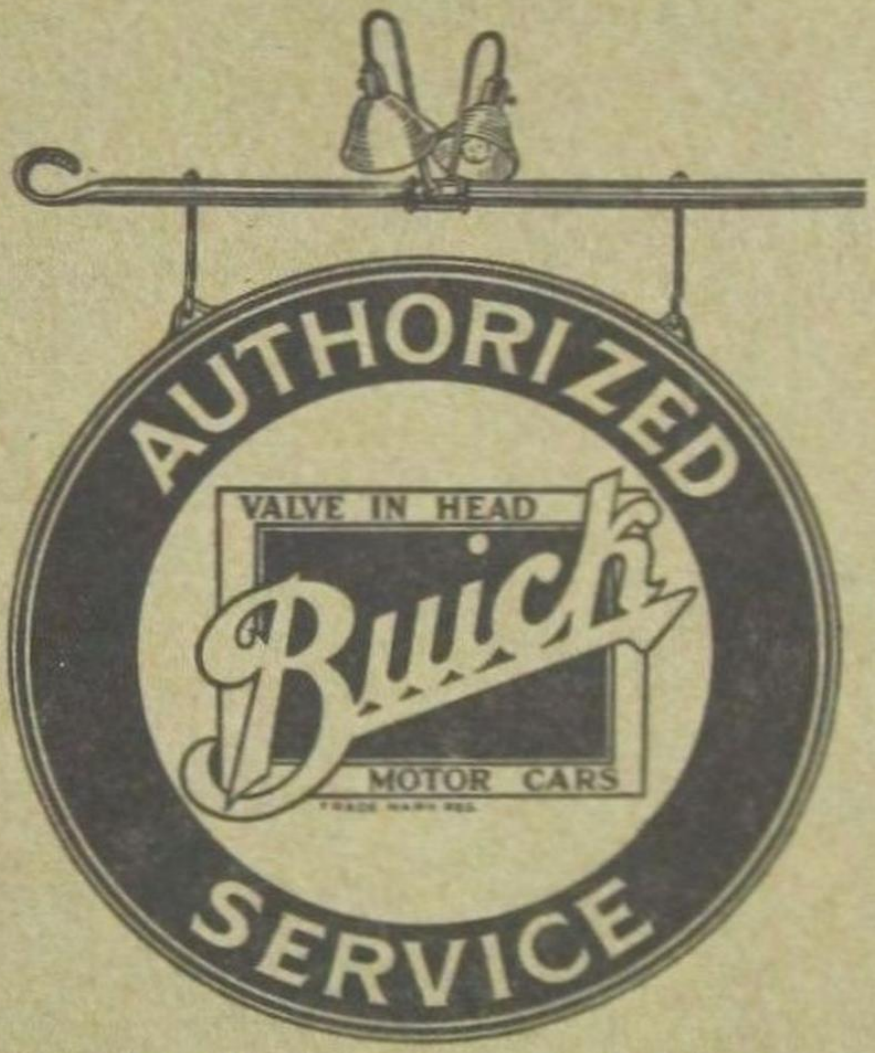
Look for this Sign



"Emblem of Satisfaction"

NATION WIDE BUICK SERVICE
BACKS UP BUICK QUALITY