How Proper Care will Prolong the Life of Your Car.

"American Tourist" Type 34-A
"American Roadster" Type 32-A

American Motors Company
Indianapolis

READ THIS.

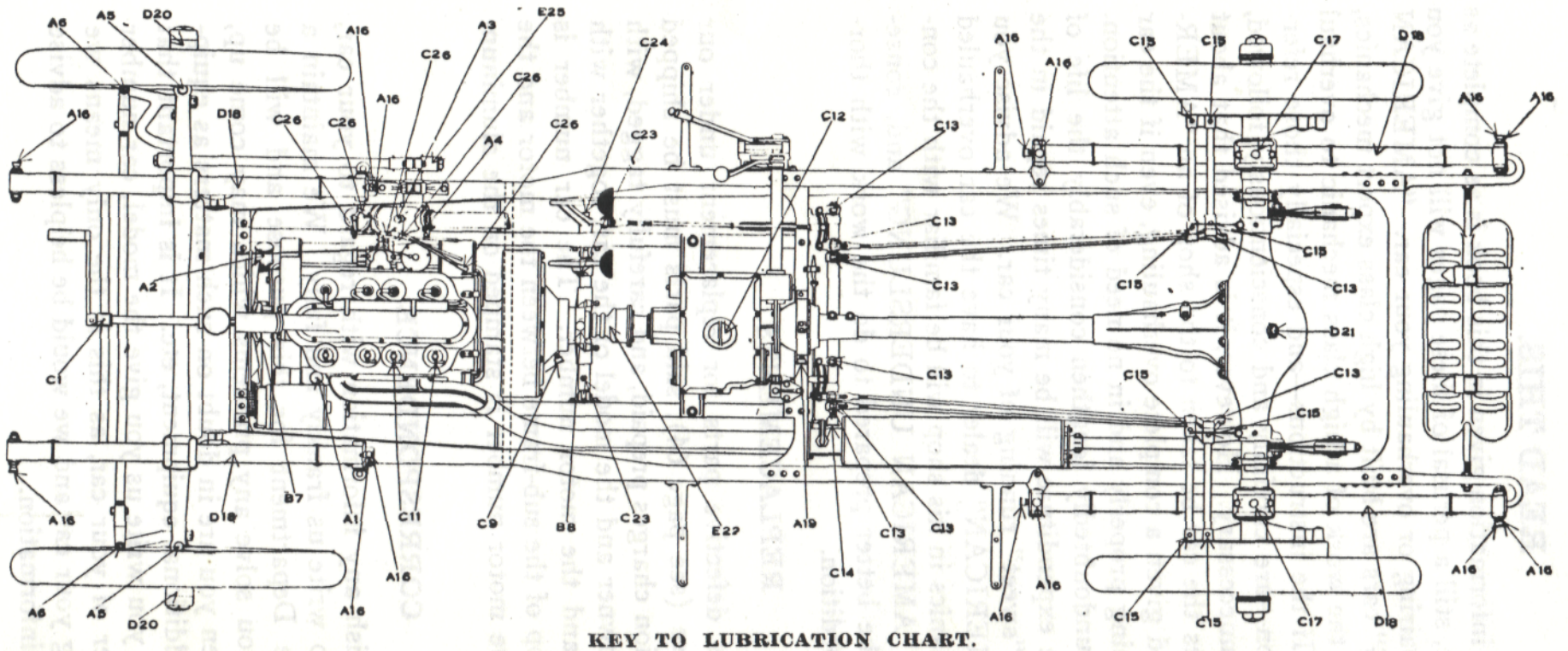
Although the information given in this book is as complete as we could make it, still a perusal of these pages will not give you the ability of repairing or overhauling your car. "AMERICAN UNDERSLUNG" cars are built by high class expert mechanics, and it is equally the work of a high class mechanic to overhaul a car properly. If the instructions—and especially those referring to lubrication—are carefully and conscientiously followed, repairs will be unnecessary. However, it is advised that about every 10,000 miles the car be taken to the shop of an "AMERICAN" dealer and given a complete overhauling, even if the car seems to be running properly and in no need of such attention. Doing this will undoubtedly lengthen considerably the life of your car, and the expenditure will be many times repaid in the satisfactory and "sweet" running of your car. We advise you to go to an "AMERICAN" dealer to have the car overhauled because the mechanics in his shop will be familiar with the construction of the "AMERICAN UNDERSLUNG" and, consequently, he will be better prepared to do the work with thoroughness and expedition.

REPLACEMENTS.

In sending us defective parts for replacement under our standard guarantee (see page 64), said parts must be shipped to us, transportation charges prepaid, and carefully tagged, with the name of the owner and the model of the car, together with the car number and the motor number. The car number is stamped on the top of the sub-frame between the motor and the transmission. The motor number is stamped on the aluminum valve cover plate.

CORRESPONDENCE.

Should you wish any information with regard to your car, do not hesitate to write us frankly and fully. We maintain a Technical Service Department for this purpose and will be pleased to help you solve any problems which may come up, or advise you when you are in doubt on such matters as equipment for tours, additional equipment, etc. It is important that in *EVERY* letter you write us you give the model, car number and motor number of your car, as this is the only means we have of identifying your car and we would be helpless to advise you without this information.



KEY TO LUBRICATION CHART.

A—Every day car is in use or every 100 miles.
B—Twice a week or every 200 miles.
C—Every week or every 300 miles.
D—Once a month or every 1,000 miles.
E—Every 2,000 miles.

1—Crank case.
2—Air pump on motor.
3—Steering gear grease cup.
4—Steering gear oil hole.
5—Steering spindle bolts.
6—Steering spindle tie rod bolts.
7—Fan hub bearing.
8—Clutch release bearing.
9—Clutch thrust bearing.
10—Starting crank bearing.
11—Valve stems.
12—Transmission case.
13—Brake rods and connections.
14—Brake cross shaft.
15—Rear brake cross shafts.
16—Spring bolt grease cups.
17—Spring seat grease cups.
18—Spring leaves.
19—Universal joint grease cup.
20—Front wheels.
21—Differential.
22—Flexible couplings.
23—Foot pedal cross shaft oil holes.
24—Foot pedal cross shaft grease cup.
25—Reach rod.
26—Spark and throttle control shaft joints.

SCHEDULE OF LUBRICATION

Every Day Car is in Use, or Every 100 Miles:

Part.	Quantity.	Lubricant.
Crank case	Wire ¼-in. up in oil gauge for city use. Add one quart for country use (motor still)	Motor oil.
Air pump on motor	Few drops	Motor oil.
Steering gear grease cup	One complete turn	Cup grease.
Steering gear oil hole	Fill	Motor oil.
All spring bolt grease cups	Two complete turns	Cup grease.
Universal joint grease cup	Two complete turns	Cup grease.
Steering spindle bolts	Two complete turns	Cup grease.
Steering spindle tie-rod bolts	Two complete turns	Cup grease.

Twice a Week, or Every 200 Miles:

Part.	Quantity.	Lubricant.
Fan hub bearing	Few drops	Motor oil.
Clutch release bearing	Two complete turns	Cup grease.

Every Week, or Every 300 Miles:

Part.	Quantity.	Lubricant.
Starting crank bearing	Few drops	Motor oil.
Valve stems	Few drops	Motor oil.
Joints of spark and throttle control shafts	Few drops	Motor oil.
Foot pedal cross shaft	Few drops	Motor oil.
Foot pedal cross shaft grease cup	Two complete turns	Cup grease.
Accelerator shaft bearings	Thoroughly	Motor oil.
Transmission case	To center of shaft	Non-fluid oil.
Clutch thrust bearing	Two complete turns	Cup grease.
Brake pull rods and connections	Thoroughly	Motor oil.
Brake cross shaft	Two complete turns	Cup grease.

PREPARING THE CAR FOR OPERATION.

Read This Book.

An automobile is a highly efficient piece of machinery and though simple enough in detail, it will require a certain amount of care on the part of the operator in order to obtain the best results. What to do and when to do it will be more cheaply and readily learned by a careful perusal of this book than by waiting for trouble. "A stitch in time saves nine" was never more truly said than of the automobile.

Inspect Equipment Thoroughly.

When the car reaches you, it should be fitted with the following equipment:

2 Electric Headlights
2 Electric Side Lamps
1 Electric Tail Light
1 Set Shock Absorbers on Rear Axle
1 Prest-O-Lite Tank in tool box on left running board
1 6-Volt 80-Ampere Storage Battery
1 Cravenette Top
1 Horn
1 Electric Lighting Generator
1 Speedometer
1 Wind Shield
1 Disco Self-Starter

In a box accompanying the car should be found:

1 Jack
1 Jack Handle
1 Tire Pump
1 Tire Repair Kit
1 Brace Wrench
1 Oil Can
1 Tool Roll containing the following tools:
1 Monkey Wrench
1 Screw-driver
1 Hammer
1 Pair Pliers
1 End Wrench
1 Cold Chisel
1 Cotter Pin Puller
1 Port Plug Wrench
1 Double End Gasoline Tank and Hub Cap Wrench
1 Rear Wheel Nut Wrench
1 Box Spring Cotters

Attached to the steering wheel should be found:

1 Prest-O-Lite Wrench
1 Eisemann Magneto Wrench
1 Plug for water pump drain
1 Plug for radiator drain
1 Set Tool Box Keys

You should also receive with your car:

1 Spare Demountable Rim
1 Half-gallon Can Motor Oil

Bundle containing:

1 Storm Front
4 Side Curtains
1 Top Boot

You should also receive an envelope of instructions containing:

1 "AMERICAN UNDERSLUNG" Instruction Book
1 Disco Instruction Book
1 Carburetor Instruction Sheet
1 Tire Instruction Sheet
1 Magneto Instruction Book

Fill the Radiator with Rain Water.

For detailed instructions, see page 30.

Fill the Gasoline Tank.

For detailed instructions, see page 24.

Fill Oil Reservoirs, Grease Cups, Etc.

We build a machine with the best of materials and the best of workmanship obtainable, but we cannot build a machine to run without oil or grease. The life of a car is directly proportional to the care and thoroughness with which the car is lubricated, and we cannot emphasize too strongly the fact that the duty of every owner or driver of an automobile is to become thoroughly acquainted with the lubricating system of the car and to form the habit of going over the car regularly to see that it is well and properly lubricated. Again we say, SEE THAT ALL PARTS OF THE CAR ARE WELL AND PROPERLY LUBRICATED.

For detailed instructions, see page 5.

Examine Tires.

For detailed instructions, see page 49.

DRIVING INSTRUCTIONS.

Pump Up Pressure.

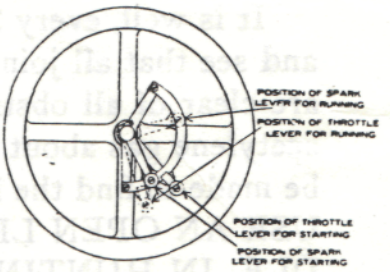
Immediately under the hand pressure pump located between the two front seats is a three-way cock governing the pressure line. Turn the handle until it points downward and pump up two pounds of pressure. The pressure may be read on the pressure gauge located in the center of the dashboard. Then turn the handle until it points toward the right, or driver's side of the car. This shuts the hand pump from the pressure line, permitting the pressure pump on the motor to maintain the required pressure.

At the close of a day's run, or when leaving the car for a long period, such as over night or longer, turn the handle toward the left, or away from the driver's seat. This relieves the pressure from the gasoline tank and will prevent the loss of gasoline through the carburetor flooding.

Put the Change Speed Lever in Neutral.

The change speed lever is the one located at the driver's right, inside the body. Move this lever until it occupies the slot that runs crossways of the car. The lever will move freely to and fro in this slot. This is called the "neutral" position."

Set Control Levers (Spark and Throttle.)



The control levers are located on the steering wheel. The longer one is the throttle lever and controls the amount of fuel admitted to the engine—hence its speed and power. The inside, or shorter one, is the spark lever and controls the timing of the spark. Moving the throttle lever toward the top of the sector opens the throttle, speeding up the engine Moving it downward closes the throttle and checks the speed of the engine. Moving the spark lever toward the top of the sector advances the spark, and moving it downward retards the spark. Move both of the levers on the steering wheel as far down as they will go, then bring the outside, or throttle lever, about 2½ inches up the sector and bring the inside, or spark lever, up until the line on the lever and the line on the sector coincide.

Turn On the Ignition Current.

The kick switch governing the ignition system is located at the extreme left of the dash. Move the handle at the top of this switch so that it points to "Bat." This closes the battery circuit.

To Start the Motor with the Self-Starter.

Turn the handle of the self-starter, on the dash, one quick revolution, clockwise. This permits gas from the Prest-O-Lite tank to enter the cylinders. Move the lever in the center of the ignition switch quickly, as far as it will go. If the motor fails to start, wait a moment, then move the lever in the reverse direction, and the motor will start. Never move this lever to and fro constantly, but wait a moment after each trial. Should the motor fail to start at once, repeat the foregoing. When the pressure in the tank is getting low, or in cold weather, it may be necessary to give the crank of

the self-starter two, and sometimes three, turns. If the motor fails to start after two or three trials, DON'T CONTINUE TURNING THE STARTER CRANK, but look for the trouble. The motor may have siezed up; the gas in the tank may be low; leaky or stopped up piping, or leaky joints may be the cause. Constant turning of the crank of the starter will result in injecting enough gas into the motor to prevent its starting readily.

It is well, every 2,000 miles or so, to look over the starter and see that all joints and pipes are tight, and that the pipes are clear of all obstructions. Should you detect the odor of acetylene gas about your car, immediate investigation should be made to find the leak, and steps taken to stop it. NEVER USE AN OPEN LIGHT, SUCH AS A MATCH OR CANDLE, IN HUNTING FOR A LEAK. The reason for this is obvious. For further instructions, see Disco Instruction Book.

To Start the Motor by Cranking.

Should the self-starter be out of commission, the motor may be started by cranking, as follows:

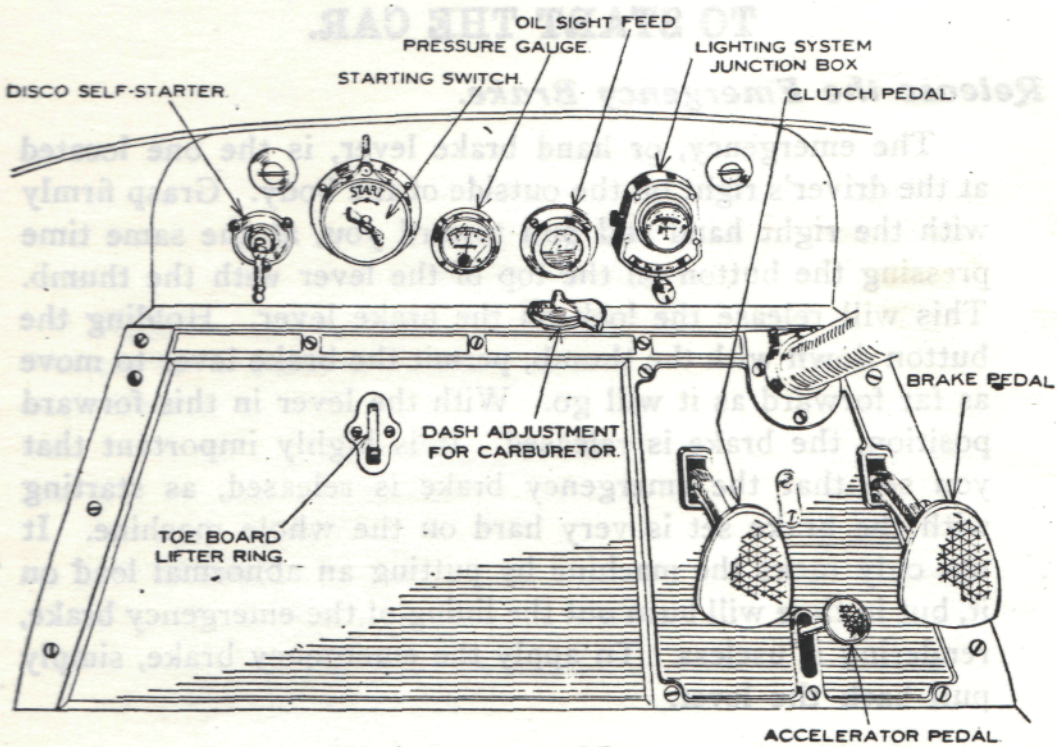
Go around to the front of the car and pull the little button found projecting from the front of the radiator while you count slowly five, or for about five seconds. This floods the carburetor and provides a rich mixture to facilitate starting. Engage the starting crank and the front end of the crank shaft by pressing the hub of the starting crank toward the motor, and at the same time rotate the starting crank counter-clockwise. When the hub of the starting crank is all the way in, the end of the crank shaft is engaged.

There are four positions of the starting crank in which it will engage the end of the crank shaft. The correct position for starting is with the crank pointing approximately 45 degrees downward and to the left as you face the car. With the crank in this position, pull the crank upward (preferably with the left hand) with a sharp, quick movement. If the motor does not start on the first turn, repeat the operation a few times, always keeping clear of the crank. NEVER PUSH DOWN ON THE CRANK TO START. In doing so, you render yourself liable to more or less serious injury from back-kicks. When the motor is started, bring the starting crank back to a position parallel with the starting crank bracket on the left side, where it will engage the lock sup-

porting the starting crank in this position. Should the motor fail to start after repeated cranking, the chances are that the cylinders are filled with a mixture which is too rich to ignite. In this case, open the pet cocks at the top of the cylinders; crank the motor a few times; close the pet cocks and repeat the regular operations for starting.

Starting on the Magneto.

Should the batteries be out of commission, the motor may be started on the magneto by turning the ignition switch to the position marked "Mag.", and spinning the motor, that is, cranking rapidly. If everything on the motor is working properly, the motor will start readily, and when it fails to do so, it is a sure sign of trouble. Do not tire yourself by repeated cranking, but look for the trouble.



Arrangement of Dash.

Set the Control Levers.

Take your place in the driver's seat and move the throttle lever on the steering wheel to its lowest position and the spark lever about half way up.

Turn On the Magneto.

Rapidly move the handle of the ignition switch, at the left of the dash, so that the handle points to "Mag." This will close the magneto circuit and the motor is now running on

the magneto. Do not let your motor run for any length of time on the batteries, as this will discharge them rapidly, leaving you without the means of starting easily unless the indicator on the lighting switch shows that the batteries are being charged.

Inspect Motor Lubrication.

See that the oil flows freely through the glass sight-feed on the dash. When the motor is speeded up, the flow of oil through the sight-feed should be more rapid than when the motor is running slowly.

Your motor is now running "idle" and should operate slowly and smoothly.

TO START THE CAR.

Release the Emergency Brake.

The emergency, or hand brake lever, is the one located at the driver's right on the outside of the body. Grasp firmly with the right hand and pull toward you, at the same time pressing the button on the top of the lever with the thumb. This will release the lock on the brake lever. Holding the button down with the thumb, permit the brake lever to move as far forward as it will go. With the lever in this forward position, the brake is released. It is highly important that you see that the emergency brake is released, as starting with the brake set is very hard on the whole machine. It not only racks the machine by putting an abnormal load on it, but in time will burn out the lining of the emergency brake, rendering it useless. To apply the emergency brake, simply pull back the lever.

Disengage Clutch.

The clutch is controlled by the clutch pedal which is the one located nearest the center of the car. To disengage the clutch, push the pedal down firmly with the left foot as far as it will go.

Low Speed.

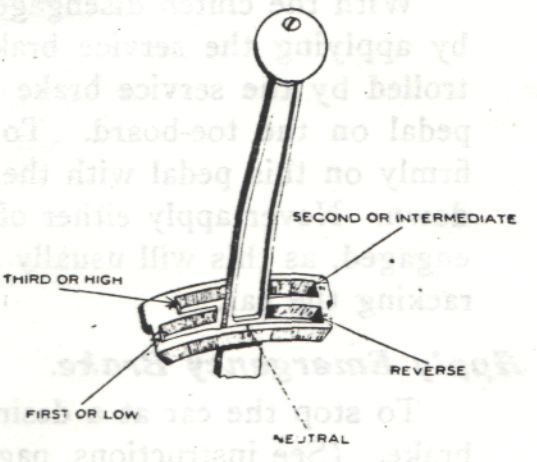
With the clutch pedal down and the clutch disengaged, move the change speed lever to the inside forward position. This throws the first, or low speed gear in mesh. In case the change speed lever will not go forward in its slot, bring it

back to the neutral position and let the clutch pedal come back to its first position. After the pedal has been left in this position a few seconds, repeat the entire operation and the gears will then engage.

NEVER TRY TO MESH GEARS WITH THE CLUTCH ENGAGED. Doing this is liable to cause serious injury to the gears. Slowly release the pressure of the left foot on the clutch pedal, letting it come up, at the same time applying pressure with the right foot to the accelerator pedal. The accelerator pedal is the small aluminum button located on the floor-board, midway of the two large pedals. By pressing down on the accelerator pedal, the throttle is opened and the motor speeded up. These two operations should be carried on simultaneously, and the engine should be speeded up just enough to pick up the load smoothly and without "racing," i. e., rotating at a very high speed. The car will now move forward slowly.

Second Speed.

When the car has attained a speed of about four miles an hour, engage the second, or intermediate speed gear by releasing the accelerator pedal, disengaging the clutch, bringing the gear change lever to the outside rear position, and re-engaging the clutch as directed above.



Third Speed.

When the car has attained a speed of about nine miles an hour, engage the third, or high speed gear by releasing the accelerator pedal, disengaging the clutch, bringing the gear change lever to the outside forward position, and re-engaging the clutch as directed above.

The car is now in high, or regular running speed, and its velocity may be controlled by either the foot accelerator or the hand throttle on the steering wheel. It is advised that

the beginner practice changing gears until he has mastered the art of doing it smoothly and quietly, with no jerk as the clutch is engaged after each successive change and a steady acceleration from a standstill to the desired running speed is obtained.

The foot accelerator is commonly used for driving in traffic, where the car must get away quickly in order to take advantage of openings, while both hands of the operator are busy with the steering wheel and horn. In driving on open roads, where a constant speed is maintained for some time at a stretch, the operator's foot is liable to become tired maintaining a fixed position on the accelerator pedal, and under these conditions, the hand throttle is used.

TO STOP THE CAR.

Disengage Clutch.

See instructions, page 12.

Apply Service Brake.

With the clutch disengaged, check the motion of the car by applying the service brake. The service brake is controlled by the service brake pedal, which is the right hand pedal on the toe-board. To apply the brake, press down firmly on this pedal with the right foot. The car will slow down. Never apply either of the brakes while the clutch is engaged, as this will usually stall or stop the motor, besides racking the car.

Apply Emergency Brake.

To stop the car at a desired point, apply the emergency brake. (See instructions, page 12.)

The beginner should practice reaching for the brake lever until the action becomes almost automatic. As you become more and more familiar with the operation of your car, the various operations incidental to driving will become instinctive. You will go through them as naturally as you walk. This is the end to be striven for.

It is advised that the emergency brake be left applied when the car is left standing.

Put the Change Speed Lever in Neutral.

One of the most common faults of the beginner is to leave the change speed lever in the high speed position after

he has brought the car to a stop. Care should be taken to observe that the change speed lever is always left in the neutral position when leaving the car.

Release Clutch and Brake Pedals.

When the car is stopped at the desired place, and the change speed lever is in the neutral position so that there are no gears in mesh, the pressure of the feet on the brake and clutch pedals may be released, and the car will now be standing with the motor running "idle," just as it was at the beginning of the run.

Stop the Motor.

To stop the motor, turn the handle of the ignition switch to the position marked "off." This breaks the ignition circuit and, as the motor obtains no spark, it will stop. It is advised that just before stopping the motor, it should be speeded up slightly, and after the switch is in the "off" position and the motor is "dying," that is, revolving slower and slower, that the throttle be opened wide so that the motor may draw in a rich charge. With this charge in the cylinders, it will be easy to start the motor the next time you desire to do so.

Starting on Compression.

After the motor has been run and stopped and has a rich mixture in it, it may probably be started the next time by setting the control levers; turning on the switch and merely moving the vibrator handle at the middle of the switch. Starting this way saves gas ordinarily used in the Disco Starter, and is an economy which may be practiced without injuring the car in any way. This is termed "starting on compression," and should the motor fail to start on compression as above, it may be started with the self-starter.

TO REVERSE THE CAR.

Reverse.

To reverse the direction of the car, first bring the car to a dead stop. UNDER NO CONDITIONS SHOULD YOU TRY TO ENGAGE THE REVERSE GEARS WHILE THE CAR IS MOVING FORWARD. Doing this is liable to injure the transmission seriously, besides racking and straining the whole car.

The car being at a standstill, follow the directions for starting the car, bringing the speed gear lever to the inside rear position. Keep a sharp lookout for obstacles and go slowly, especially in backing in and out of garages and similar places.

CHANGING FROM HIGH TO SECOND SPEED.

Disengage Clutch.

For instructions, see page 12.

Change Gears.

With the clutch disengaged, move the gear change lever from the outside forward to the outside rear position. Do this as rapidly as possible. Never try to change from high to second speed while traveling over fifteen miles per hour. Practice shifting from high to second—there is a knack in doing this that can only be attained through practice.

Engage Clutch.

For instructions, see page 13.

On very bad roads, or in deep sand or mud, when the engine labors on high speed, it is advised that you change from high to the lower speed. Also in traffice, where the car has been brought to a standstill and must be started quickly, it is easier on the car and on the operator to start on the low or the second speed than to attempt to make the car pick up its load on the high speed.

Trying to make the car climb very steep hills, go through deep sand or mud, or get away quickly in traffice on the high gear will tend to wear out the clutch and make it slip. It will also rack and strain the car. USE YOUR GEARS. They have been put there for the purpose of reducing the loads on the motor to its capacity for carrying such loads, and any attempt to overwork your motor will ruin your car more quickly than anything else except lack of lubrication.

THE FOUR SYSTEMS OF AN "AMERICAN" MOTOR.

For the successful operation of any automobile motor, various groups of systems of mechanisms are necessary. In the "AMERICAN" motor there are four, namely, the lubrication system, the ignition system, the gasoline or fuel system and the cooling or water system.

Detailed descriptions of these four systems and instructions for their care and operation follow:

LUBRICATION SYSTEM.

General Principles.

A careful study of the lubrication chart and lubrication schedule, found on page 4 of this book, is the best way in which to get acquainted with the general method and order of lubricating the entire car. Supplementing this chart and schedule, however, is the following detailed description of the motor lubrication system:

When oil is poured in the crank case of the motor, it settles to the bottom of the crank case proper. Inside of the crank case is a sheet metal trough with holes in the bottom to permit the entrance of oil. When the motor is standing idle, the oil will enter this trough from the crank case until the level of the oil in the crank case and the trough are equal. When the motor begins to operate, however, the small copper tubes or dippers, found at the bottoms of the connecting rods dip into this oil, and force it up to the connecting rod bearings. The surplus oil on the connecting rods is thrown by their rotary action out upon the walls of the crank case and upon any mechanism within the crank case, such as the cam shaft bearings. In fact observation has shown us that the entire inside of the crank case is filled with a fine mist of oil. This splashing of the oil lubricates the cylinder walls, as well as any other parts of the motor inside of the crank case. Any oil not actually used up in the bearings, or other parts inside the crank case, runs down the side walls and back through the holes in the trough. As more oil is thrown out of the trough than can flow into it, owing to the small size of the holes, the level of the oil outside of the trough will rise above that inside of it until the weight of the oil outside of the trough is enough

to force just as much oil in through the holes of the trough as is thrown out by the connecting rods. By this means, the level of the oil in the crank case is kept constantly correct for running; while for starting, when more oil is needed, the level is higher and more oil is thrown by the connecting rods. It is entirely automatic and requires no attention on the part of the operator beyond seeing that the right amount of oil is in the crank case.

An oil pump is provided which will pump oil to the sight-feed on the dash. If the level of the oil should fall below that necessary for proper lubrication of the motor, the pump will receive no oil—hence none will pass through the sight-feed, and you will know that you motor requires more oil. It is not safe, however, to rely altogether on this sight-feed. It is merely an additional safeguard and a convenient way of seeing that your motor is receiving lubrication. The oil level gauge on the side of the crank case will tell you when your motor has the right amount of oil. (See below.)

Lubricating the Motor.

"Crank case" is the name given to the aluminum base on which the cylinders set. The level of the oil in the crank case may be found by consulting the oil level gauge, located on the right side of the crank case, just ahead of the carburetor. When the oil is at the right level in the crank case with the motor standing still (for ten minutes or more), the little wire in the gauge should show about ¼-inch above the bottom of the slot. With the motor running, the wire should show about ½-inch.

In starting on a run outside of the city where the speed maintained is usually higher than would be the case in the city, it is well to add about a quart of oil to the supply in the crank case when the level is at the position noted above. With the level of the oil in the crank case correct, it will contain about one gallon. Never neglect to observe at least once every day that the motor has sufficient oil in the crank case. Always before starting on a trip of any distance, be sure that you have plenty of oil. Always carry oil with you to provide against leaks or other losses.

Oil is poured into the crank case through the breather pipe. The breather pipe is the large copper tube projecting vertically from the crank case, near the front end on the left side. The cap is fastened in the pipe by a clip. To remove

the cap, merely pull it off. With the cap off, pour oil in this breather pipe slowly. It takes some time for the oil to circulate around and register on the oil level gauge, therefore, it is well to pour in a little oil at a time and then examine the oil level gauge and see how far it has risen. Doing this will prevent putting too much oil in the crank case, thus affecting a saving of oil and helping to keep the motor from smoking or sooting up.

You can always tell when your motor is receiving too much oil by observing the exhaust. If the exhaust shows a heavy, greasy smoke, drain off a little of the oil in the crank case by opening the drain plugs found in the bottom.

LET US SAY AGAIN, SEE THAT YOUR CAR IS PROPERLY LUBRICATED.

IGNITION SYSTEM.

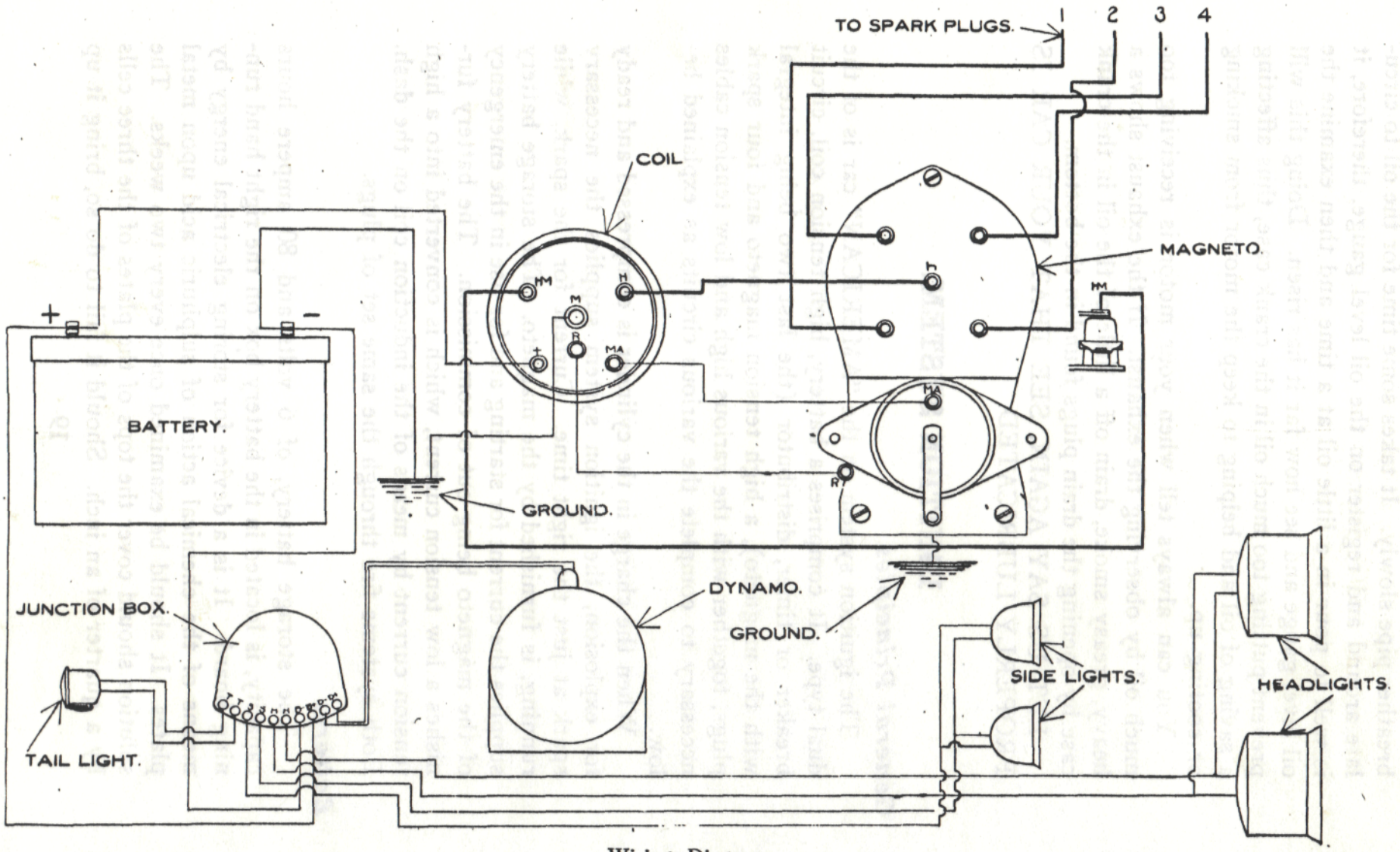
General Principles.

The ignition system on the "AMERICAN" car is of the dual type. It comprises a battery, high tension coil, circuit breaker or timer, distributor (the last two being integral with the magneto), a high tension magneto and four spark plugs, together with the various high and low tension cables necessary to complete the various circuits as explained below.

When the charge in the cylinder is compressed and ready for explosion, the ignition system supplies the necessary spark at just the right time. Current for the spark, while running, is furnished by the magneto. The storage battery supplies the current for starting and for use in the emergency of the magneto being out of commission. The battery furnishes a low tension current, which is converted into a high tension current by means of the induction coil on the dash. Both systems fire through the same set of plugs.

Battery.

The storage battery, of 6 volts and 80 ampere hours capacity, is located in the battery box on the right hand running board. It is a device for storing electrical energy by means of the chemical action of sulphuric acid upon metal plates. It should be examined once every two weeks. The solution should cover the tops of the plates of the three cells by a quarter of an inch. Should it fail to do so, bring it up



Wiring Diagram.

to the correct level by adding DISTILLED or RAIN water. If the solution is spilled, add a mixture of one part pure sulphuric acid and three parts pure water to the solution.

Testing the Battery with a Hydrometer.

A hydometer is an instrument for testing the specific gravity of liquids. A good hydrometer with instructions for using same may be procured at small expense. A portion of the solution should be drawn out with the syringe (usually furnished with the hydrometer) and poured into the tube. The hydrometer should then be immersed in the solution, care being taken that it floats freely. When the battery is fully charged, the hydrometer should read between 1,225 and 1,250. Never let the battery discharge until the reading is below 1,100. When you find the readings of the hydrometer nearing 1,100, the battery should be recharged.

It sometimes happens that when considerable driving is done at night with the lights burning, while comparatively little driving is done during the day, that the load placed upon the battery without a corresponding recharge will so lower the charge in the battery that it may require recharging. The battery is charged by the dynamo on the engine. (See page 51.) To charge the battery, simply run the engine at a speed equivalent to about fifteen miles per hour of the car. This may be done while driving the car during the day. The indicator on the lighting switch will show you when the battery is being charged.

Testing the Battery with a Voltmeter.

A pocket voltmeter can be bought at no great expense and should always be kept on hand. To test the battery, connect the two binding posts of the voltmeter to the terminals of the battery and read the voltmeter. The battery should never be allowed to drop below 5.1 volts. When the battery is fully charged, the voltmeter should read about 6.5 volts. The voltmeter test is not a very reliable one, and should only be used to check up the hydrometer test.

Spark or Induction Coil.

The induction coil on the dash converts the low tension current, supplied by the battery, into a high tension current suitable for sparking. The low tension current, passing from the battery through the primary windings of the coil, is broken in the circuit breaker of the magneto and this pro-

duces (by what is known as "induction") a high tension current in the secondary windings of the coil. At the instant the high tension current is induced, it is distributed to the correct spark plug through the distributor of the magneto. The high tension current, jumping the gap between the sparking points of the spark plug, produces the necessary spark inside the cylinder.

Magneto.

The magneto is located on the left hand side of the motor. It is practically a small dynamo, and generates in itself a high tension current. This current is distributed to the right plugs at the right time by means of the distributor on the magneto itself.

Connections.

On the battery, located in the battery box on the running board, will be found two binding posts which are the two screws projecting from the top of the battery at opposite corners. You will note that one is marked "+" (plus.) This is called the "positive" terminal of the battery. The other binding post is marked "—" (minus). This is the "negative" terminal of the battery.

The low tension current, produced in the battery, flows from it through the positive terminal of the battery to the positive terminal of the primary windings of the induction coil, thence through the induction coil to terminal "M. A." on the back of the coil, and from there to terminal "M. A." on the back of the magneto (side nearest dash). In the magneto, the low tension current is interrupted and flows back from the terminal "R" on the magneto to terminal "R" on the back of the coil. From here it goes through the ignition switch on the front end of the coil and is grounded, i. e., connected to the metal of the chassis so that it may flow back to the battery. It then passes through the chassis back to the negative terminal of the battery, which is also grounded. This completes the low tension circuit.

The high tension current, generated in the coil, passes from terminal "H" on the back of the coil to terminal "H" on the back of the magneto; from there, through the distributor of the magneto to the various spark plugs, where a spark is produced. The high tension current, generated in the magneto itself, passes through the distributor in the magneto to the spark plugs in exactly the same way that

the battery high tension current does. The binding post "H. M.", on the front end of the magneto, is connected with a terminal "H. M." on the back of the coil, and from here passes to the switch on the front end of the coil where the magneto current is turned on or off, as explained on page 9.

The connections and wires necessary to complete these various circuits may be plainly seen by consulting the wiring diagram on page 20.

Timing the Spark.

The time at which the spark occurs in the cylinder relative to the travel of the piston is controlled by the circuit-breaker at the rear end of the magneto. By means of rods and levers connected with the circuit-breaker on the magneto, the spark lever on the top of the steering wheel retards or advances the action of this circuit-breaker and consequently retards or advances the time of the spark.

The combustion of the charge in a cylinder is very rapid but, nevertheless, it takes some time for the entire charge to burn and the expansion of the burning gases to commence. For regular running, the spark should be so timed that it will ignite the charge just long enough before the piston reaches the top of its stroke to permit the charge to burn, so that when the burning gases begin to expand, the piston will be ready to descend on its working stroke and the full value of the combustion charge is obtained.

If the spark were to occur too soon, the gases would begin to expand before the piston reached the top of its stroke and this would tend to make the motor run backwards. When the motor is running rapidly, however, the momentum of the fly wheel will carry the piston to the top of its stroke against the pressure of the expanding gases. When this occurs, the pistons will rattle against the walls of the cylinders, causing a sound known as "knocking," and the motor will labor and run jerkily. Under these circumstances, the spark should be retarded until the knocking and laboring cease. Early explosions of this sort are liable to occur when the motor is started on the battery with the spark not fully retarded, and when they do so occur, the crank will kick back with possible injury to the operator. Therefore, NEVER CRANK THE MOTOR WITH THE SWITCH ON "BATTERY" UNLESS THE SPARK LEVER IS RETARDED TO THE LINE ON THE SECTOR. (See page 9.)

If the spark is too far retarded while running, it will cause the engine to overheat and loss of power will result. A safe rule is to run with the spark as far advanced as possible without causing the motor to labor or knock.

Spark Plugs.

The gap between the sparking points of the spark plugs should be about 1/32-inch. If a worn dime will just fit between the sparking points, the plug is adjusted to about the correct gap. The plugs should be taken out at least once every 1,000 miles and examined. It is well at this time to take the plugs apart and clean them with gasoline. It is advisable always to have a spare set of plugs with you to take care of breakage or other defects in the plugs.

For more detailed information as to the operation and care of the ignition system, consult the magneto instruction book.

GASOLINE OR FUEL SYSTEM.

General Principles.

The gasoline system consists of:

(1) The gasoline tank with auxiliary reserve tank and sediment cup at the bottom.

(2) The gasoline pipe leading from the gasoline tank to the carburetor.

(3) The carburetor.

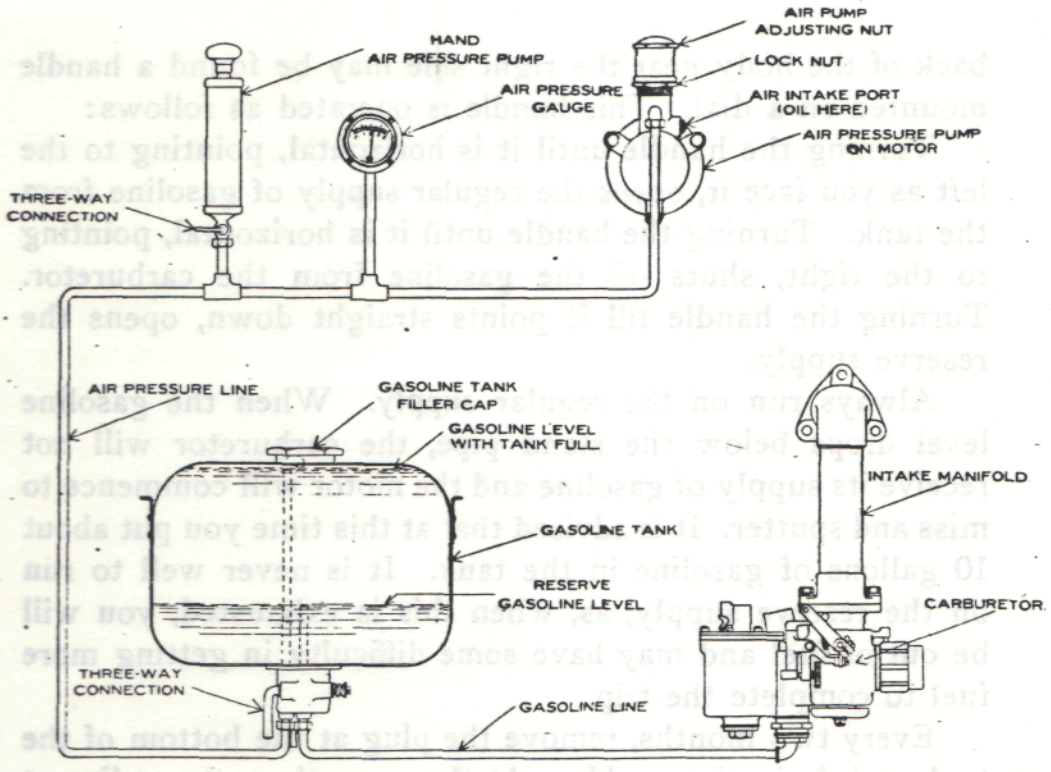
(4) The intake manifold.

The gasoline in the tank is forced, through the gasoline pipe, to the carburetor by means of air pressure (2 pounds). Here it is vaporized and mixed with air in the correct proportions. The mixture is drawn into the cylinders by the suction of the descending pistons and is here exploded by the spark, thus producing power.

Gasoline Tank.

The gasoline tank on the "AMERICAN TOURIST" (Type 34-A) is located under the front seats. Its capacity is 16 gallons; of this, about 11 gallons are used for regular running and 5 gallons for reserve.

To fill the tank, lift up the left hand front seat cushion, which will expose the filler cap. Unscrew the cap and pour in the gasoline. Care should be taken in filling the gasoline



Fuel System.

tank not to spill any gasoline on the car, as it will damage the leather and paint with which it comes in contact. Never fill gasoline tank completely full. Some space should be left at the top of the tank for the compressed air which is to force the gasoline through the gasoline pipe to the carburetor.

Two cocks will be found on the sediment cup underneath the gasoline tank. The one nearest the driver's seat of the car (right side) is a drain cock for emptying the tank. On the left side is a three-way cock which is used as follows:

Turning the handle until it is horizontal, pointing away from the driver's seat, shuts off the gasoline supply from the carburetor. Turning the handle until it points straight down, opens the regular supply. Turning the handle until it is horizontal, pointing toward the driver's seat, opens the auxiliary supply.

On the "AMERICAN ROADSTER" (Type 32-A), the gasoline tank is located at the extreme rear of the body, just behind the luggage compartment. It has a capacity of 14 gallons of which 5 gallons are used for reserve. Two filler caps are provided for convenience in filling. To fill, simply unscrew either of these caps and pour in the gasoline. At the

back of the body near the right side may be found a handle mounted on a dial. This handle is operated as follows:

Turning the handle until it is horizontal, pointing to the left as you face it, opens the regular supply of gasoline from the tank. Turning the handle until it is horizontal, pointing to the right, shuts off the gasoline from the carburetor. Turning the handle till it points straight down, opens the reserve supply.

Always run on the regular supply. When the gasoline level drops below the stand pipe, the carburetor will not receive its supply of gasoline and the motor will commence to miss and sputter. It is advised that at this time you put about 10 gallons of gasoline in the tank. It is never well to run on the reserve supply, as, when this is exhausted, you will be out of fuel and may have some difficulty in getting more fuel to complete the trip.

Every two months, remove the plug at the bottom of the tank and drain thoroughly. At the same time, the sediment cup may be cleaned out. NEVER START ON A RUN OF ANY LENGTH WITHOUT FIRST ASSURING YOURSELF BY INSPECTION THAT YOU HAVE PLENTY OF GASOLINE IN THE TANK AND OIL IN THE MOTOR.

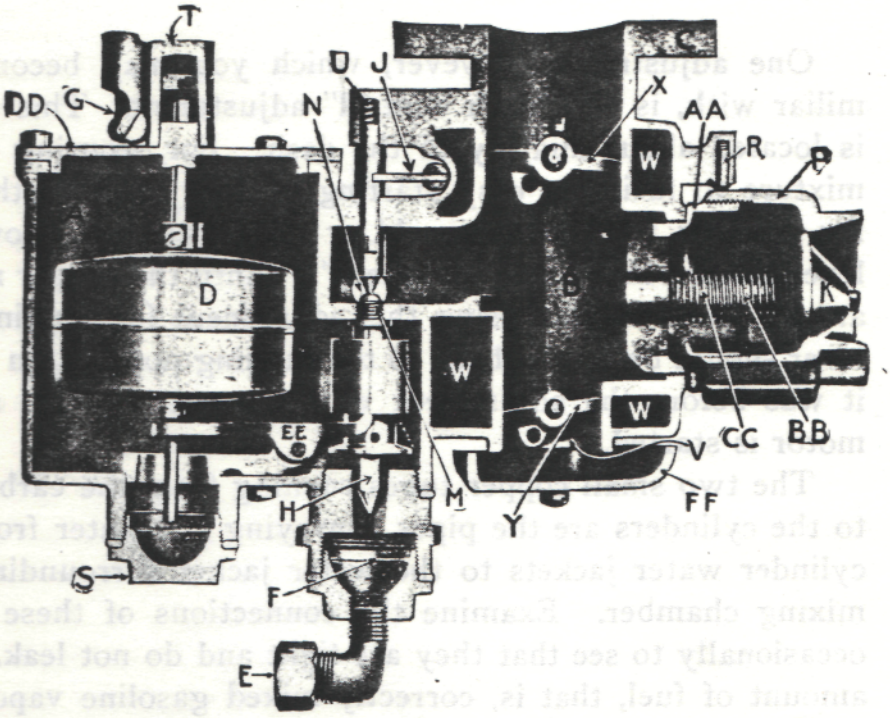
Gasoline Pipe.

The gasoline pipe is the small brass pipe leading from underneath the gasoline tank to the carburetor.

Carburetor.

The carburetor is a device for producing a mixture of gasoline vapor and air in the correct proportion for complete combustion. The carburetor consists of the float chamber in which is the float which regulates, by means of a needle valve, the supply of gasoline to the motor so that its supply is correct for all engine speeds; and a mixing chamber in which the gasoline is vaporized and mixed with air.

The gasoline enters the float chamber through a filter. As the level of the gasoline in the float chamber rises, it raises the float with it and this closes the needle valve, shutting off the supply of gasoline. The float is adjusted when it leaves the factory so that it will shut off the flow of gasoline when the level is correct, and as this gasoline is used



A. Float chamber.
B. Mixing chamber.
C. Flange.
D. Float.
E. Gasoline intake.
F. Strainer.
G. Priming lever.
H. Constant level float needle valve.
J. Spray needle valve adjusting finger.
K. Automatic air valve.
L. Spray needle valve.
M. Spray nozzle.
N. Fixed air intake.
P. Automatic air adjustment.
R. Automatic air adjustment lock.
S. Drain plug.
T. Priming cap.
U. Spray needle valve spring.
V. Mechanical air opening.
W. Water jackets.
X. Butterfly valve.
Y. Auxiliary air butterfly valve.
Z. Connecting rod.
AA. Automatic air adjustment nipple.
BB. Automatic air adjustment spring.
CC. Automatic air adjustment stud.
DD. Float chamber cover.
EE. Float needle valve lever.
FF. Mechanical air intake cover.

up and the level drops, the needle valve will open and more gasoline will be admitted. The action of this valve is continuous and keeps the gasoline level correct at all speeds.

From the float chamber, the gasoline is drawn by the suction of the descending pistons through a small opening which breaks up the stream into a spray. This opening is called the "spray nozzle" and its action is exactly similar to that of an atomizer. This spray of gasoline particles is mixed with air in the mixing chamber. The proportion of air and gasoline in this mixture is correctly made by various adjustments at the factory. It is not an easy matter to adjust a carburetor correctly, and so we advise you not to tamper with your carburetor unless you are perfectly familiar with its action. If you do not get good results from your carburetor, take it to an "AMERICAN" dealer and he will have it correctly adjusted for you.

One adjustment, however, which you may become familiar with, is the "dash control" adjustment. This device is located about midway of the dash. For securing a rich mixture to facilitate easy starting in very cold weather, or for running in extremely cold or damp weather, move the lever toward the position marked "R" until the proper results are obtained. When using this adjustment for starting, the lever should be moved back to the running position, in which it was before the adjustment was changed, as soon as the motor is started.

The two small copper tubes running from the carburetor to the cylinders are the pipes conveying hot water from the cylinder water jackets to the water jacket surrounding the mixing chamber. Examine the connections of these tubes occasionally to see that they are tight and do not leak. The amount of fuel, that is, correctly mixed gasoline vapor and air, admitted to the cylinders is governed by a valve of the butterfly type, which is connected through rods and levers to the accelerator pedal on the toe-board and the throttle lever on the steering wheel.

A butterfly valve consists of a thin disc of metal which operates on a shaft running crossways of a tube (intake manifold). When the disc is turned to lie across the tube, it completely closes the inside of the tube and the valve is closed. When the disc is moved so that it lies along the axis of the tube, the valve is open.

Pushing down of the accelerator pedal, or moving the throttle lever up the sector, opens this butterfly valve, admitting more fuel to the engine, hence increasing its speed and power.

For further details of carburetor adjustment and care, see instruction sheet which you will get with your car.

Pressure System.

A light air pressure (about 2 pounds) is necessary in the gasoline tank to force the gasoline through the gasoline pipe to the carburetor. For starting purposes, this pressure may be pumped up by hand. (See instructions, page 8.) For running, pressure is obtained by means of an air pump located near the front end of the motor, on the right side. From this pump, the compressed air goes through a three-way connection underneath the hand pump (see page 25) to the gasoline tank. There is a branch from this main pres-

sure line leading up to the pressure gauge on the dash. The compressed air is piped from the pump to the gasoline tank through a small copper tube. Examine the joints in the pressure line occasionally to see that they are air tight.

Pressure Pump.

The pressure pump, which is of the plunger type, is operated from the front end of the intake cam shaft by means of an eccentric. The pressure may be adjusted as follows:

Should the pressure be too great, loosen the check nut underneath the cap of the pump and screw this cap counter-clockwise. Should the pressure be too little, loosen the check nut, as above, and screw the cap clockwise. It will take about two complete turns of this cap to vary the pressure ½-pound either way. LUBRICATE THIS PUMP FREQUENTLY. On the side of the pump nearest the motor, will be found a small plug with a hole in it. This is the air intake port of the pump and oil should be injected through this opening with a squirt can.

COOLING SYSTEM.

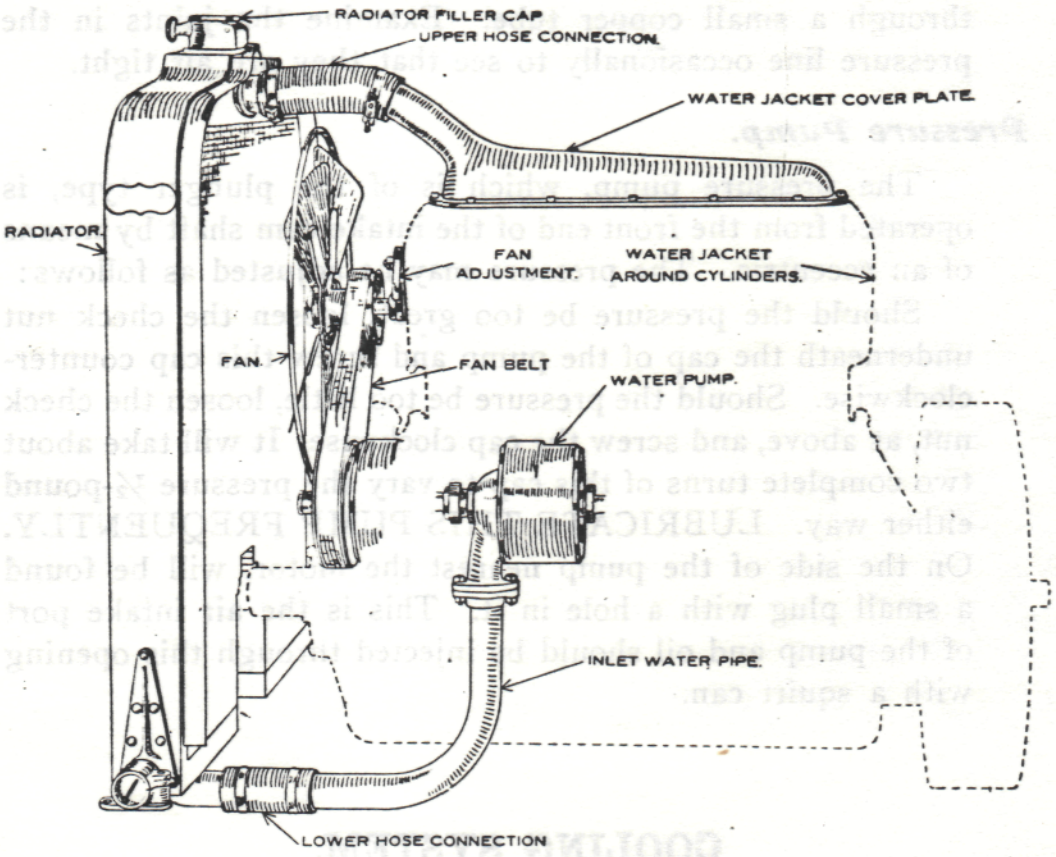
General Principles.

The cooling system consists of:

(1) A radiator and water reservoir.
(2) A water pump.
(3) Water jackets around the cylinders.
(4) A fan.

As the motor operates, a series of explosions of the gasoline vapor occur continuously inside the cylinders. This continued combustion heats the cylinder walls and a cooling system is provided to cool them. The water pump forces a stream of water through the water jackets surrounding the cylinder walls. This water absorbs some of the heat of the cylinder walls and is in turn heated by them. It then passes to the radiator which, having a large radiation surface exposed to the air, cools the water, when it is again returned to the water pump.

The water reservoir is located on the top of the radiator and is integral with it.



Cooling System.

The fan is located on the front of the motor immediately behind the radiator. This fan draws a current of air through the radiator and directs it upon the motor, thus assisting materially in the cooling process.

Radiator.

The radiator is located at the front end of the chassis. It consists of a series of fine pipes with large flanges. Before filling the radiator, be sure that the drain plugs on the water pump and the radiator are in place and tight. To fill the radiator, pull the little button on the radiator cap toward you and swing the cap back on its hinge; pour in the water. Care should be taken not to spill the water on the hood of the car, as the water will drip through upon the motor. When filling the radiator, always use clean water and a clean receptacle from which to pour it. Try, if possible, to get

water free from impurities, such as lime, etc. Always pour water in through the strainer in the radiator cap. Never pour cold water in a hot radiator. Should the radiator run dry through neglect or undiscovered leaks and the motor heat up, wait till the motor cools off before filling the radiator with water.

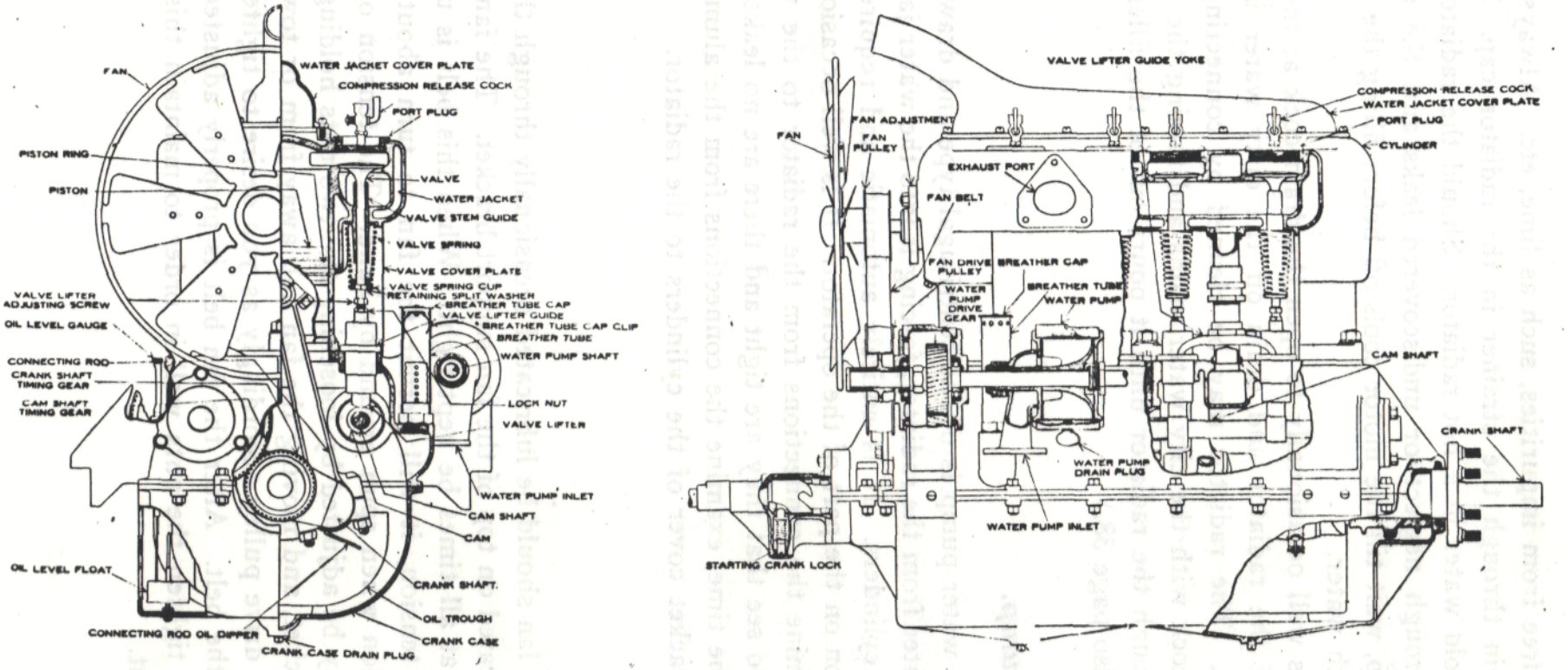
It is well occasionally to open the drain cock at the bottom of the radiator and drain off the dirty water in the system. The radiator may be cleaned by connecting the drain cock with the city water mains and forcing the water up through the radiator until it pours out of the filler cap. (See also page 38.)

Water Pump.

The water pump is of the centrifugal type and draws the cool water from the radiator, forcing it into the water jackets of the cylinders. It is entirely automatic and requires no attention on the part of the operator. It is well occasionally to examine the connections from the radiator to the water pump to see that they are tight and there are no leaks. At the same time, examine the connections from the aluminum water jacket cover of the cylinders to the radiator.

Fan.

The fan should be lubricated occasionally through the oil hole located on top of the fan support bracket. The fan belt should at all times be kept tight. When this belt is under proper tension, it will permit the fan to turn about one revolution when spun around by hand. The tension of the belt may be adjusted by loosening the two nuts holding the fan bracket, and moving the fan hub away from or towards the fan drive pulley accordingly as you desire to tighten or loosen the belt. After the fan belt is properly adjusted, be sure to tighten the nuts well in order to maintain this adjustment.



Motor of the American Tourist (Type 34*a*).

MOTOR.

Operation of Motor.

To make one complete set of operations whereby the fuel (gasoline vapor and air) is converted into mechanical energy, four strokes of the piston or two complete revolutions of the crank shaft are necessary. Each set of four strokes of the piston—from the top of the cylinder to the bottom, or from the bottom to the top—together with the coincident operation of the valves, cranks and flow of gases is called a "four-part cycle"—hence the term "four-cycle."

The four strokes of the cycle are:

(1) Intake.
(2) Compression.
(3) Explosion or Working.
(4) Exhaust or Scavenging.

Intake Stroke.

Let us consider the piston at the top of the stroke. As the piston begins to descend, the intake valve is opened by means of a cam and push rod, and the suction created by the descending piston draws fuel from the carburetor through the intake valve and intake manifold into the cylinder.

Compression Stroke.

Immediately after the piston has reached the bottom of its stroke and has begun to travel upward, the intake valve closes, and as the gas already in the cylinder cannot escape (both valves being closed) it is compressed in the upper portion of the cylinder called the "combustion chamber."

Explosion or Working Stroke.

Just before the piston reaches the top of its stroke, an electric spark is introduced into the cylinder (see page 19) and the charge of fuel in the cylinder is ignited. During the time in which the charge is burning, the piston reaches the top of its stroke, and when the ignited gas in the cylinder expands, it forces the piston downward. The work done by the expanding gas in pushing the piston down is converted into rotary energy by means of the connecting rod and crank shaft.

Exhaust or Scavenging Stroke.

When the piston nears the bottom of its stroke, the exhaust valve is opened and, as the piston ascends on the last stroke of the four, it forces the burnt gases ahead of it out

through the exhaust valve, exhaust manifold and through the muffler to the open air.

In a four-cylinder motor, the operations of the various cylinders are so timed with relation to each other that for every one-half revolution of the crank shaft there is a working stroke. This results in a very even application of power and the motor operates smoothly and with a continuous pull.

In the motor of the "AMERICAN TOURIST" (Type 34-A) and the "AMERICAN ROADSTER" (Type 32-A), the intake valves and manifolds are located on the right-hand side and the exhaust valves and manifold on the left-hand side.

For detailed description of the lubrication system, see page 17.

For detailed description of the ignition system, see page 19.

For detailed description of the fuel system, see page 24.

For detailed description of the cooling system, see page 29.

Testing for Compression.

It is well occasionally to test the motor to see that each cylinder contains the proper compression. This may be done by setting the ignition switch on the "off" position and cranking the motor. The crank should spring up and down against the pull of your hand. Try each cylinder in succession and balance them against each other, seeing that the pressure in each one is equal to that of the others. In case one cylinder shows a marked weakness in this respect, the valves should be examined and ground. It is advised that the valves be examined and ground about once every 2,000 miles or once a month.

Grinding Valves.

To grind a valve, remove the cap over the top of the valve; then holding the valve down against its seat, press upward on the cup at the bottom of the spring and remove the split washer holding the cap in place. A bar supported on some convenient fulcrum may be used to raise the spring, although there are on the market several valve spring tools which will do this work more conveniently. With the spring released, the valve may be taken out and examined. See that there are no abrasions, cuts or other marks on the seat of the valve, in the cylinder, or on the valve itself. Thor-

oughly clean the valve and seat with gasoline and apply the grinding compound with the finger. Replace the valve and with a screw-driver inserted in the slot on the top of the valve head, rotate the valve to and fro using a medium pressure of the hand. It is well occasionally in grinding to raise the valve from its seat and turn it part way around before letting it drop to its seat again, thus preventing "scoring" of the valve. When a valve is properly ground, it will show a bright ring of about ⅛-inch width on its seat. After grinding, clean the valve seat with gasoline, being sure that none of the grinding compound remains in the cylinder or on the valve, as this will work its way into the motor and injure it seriously. After the valves have been ground, they should be re-assembled in the motor, the valve lifters re-adjusted and the motor retimed.

Timing the Motor.

It will be seen on examining the fly wheel that there are various marks stamped on its periphery. These marks indicate the action of the valves. When one of these marks reaches a point on the exact center line of the motor with the marks uppermost on the fly wheel, the valve action indicated should take place as follows:

"1 & 4-IN. OP." Intake valve of cylinder No. 1 or No. 4 opens.

"1 & 4-EX. CL." Exhaust valve of cylinder No. 1 or No. 4 closes.

"2 & 3-IN. CL." Intake valve of cylinder No. 2 or No. 3 closes.

"1 & 4-EX. OP." Exhaust valve of cylinder No. 1 or No. 4 opens.

"2 & 3-IN. OP." Intake valve of cylinder No. 2 or No. 3 opens.

"2 & 3-EX. CL." Exhaust valve of cylinder No. 2 or No. 3 closes.

"1 & 4-IN. CL." Intake valve of cylinder No. 1 or No. 4 closes.

"2 & 3-EX. OP." Exhaust valve of cylinder No. 2 or No. 3 opens.

The line marked "O" and followed by the line marked "1 & 4 IN. OP." is the dead center (the point where the piston reaches its highest point in the cylinder) of cylinders No. 1 & No. 4. The line marked "O" and followed by the line

marked "2 & 3 IN. OP." is the dead center of the cylinders No. 2 & No. 3. Cylinder No. 1 is the one nearest the radiator and the cylinders are called 1-2-3-4 from front to rear. The operation of the various cylinders follow in the order 1-3-4-2, as may be seen by consulting the chart found on page 37.

To time the motor, rotate the fly wheel until the mark "1 & 4 IN. OP." appears on the top directly in the center. At this point, the push rod under the intake valve of either cylinder No. 1 or No. 4 should have risen just enough to touch the valve stem. You can tell when this has happened by trying to turn the valve with a screw-driver inserted in the slot on the head of the valve. When the valve begins to turn, the push rod has just commenced to raise it off its seat. Note on which cylinder (No. 1 or No. 4) the intake valve is opening, and time this cylinder first. Should the valve begin to open before or after the mark "1 & 4 IN. OP" reaches the center of the motor, loosen the check nut underneath the push rod adjusting screw, and adjust this screw down or up until the valve opens at just the right moment. Rotate the fly wheel counter-clockwise (looking at the back of the motor) a little over one-half a revolution until the mark "1 & 4 IN. CL." on the top of the fly wheel reaches the center position. The intake valve should close at this point. It is more important that the intake valve should open and the exhaust valve close at the points marked on the fly wheel, than that the intake valve should close and the exhaust valve open at their respective marks. Therefore, should the valve (due to wear or other cause) remain open a longer or shorter time than is indicated by the marks on the fly wheel, adjust the push rod until the intake valve opens and the exhaust closes on the marks, and let the intake close and the exhaust open where they will. Should the error in these markings, however, be more than 2-inches, it is a sign that the valve lifting mechanism is worn and the motor should be carefully looked over by a reliable and experienced mechanic.

In re-assembling the motor, the cam shaft timing gears should be assembled with the crank shaft timing gear so that the teeth marked "O" fall in the spaces marked in the same manner.

The cam shaft should be assembled with its timing gear so that the mark "O" on the cam shaft flange comes opposite the mark "O" on the timing gear.

STROKES	Cylinder No. 1	Cylinder No. 2	Cylinder No. 3	Cylinder No. 4
1st.	Intake Stroke	Compression Stroke	Exhaust Stroke	Working Stroke
2d.	Compression Stroke	Working Stroke	Intake Stroke	Exhaust Stroke
3d.	Working Stroke	Exhaust Stroke	Compression Stroke	Intake Stroke
4th.	Exhaust Stroke	Intake Stroke	Working Stroke	Compression Stroke

Simultaneous operations in the four cylinders of a four-cycle motor.

Ignition Timing.

The motor will reach you with the ignition so timed that the spark will occur when the dead center mark on the fly wheel is past the center of the motor by ¼-inch with the spark fully retarded. This setting is permanent and can only be changed by changing the meshing of the magneto drive gear with the cam shaft timing gear. In assembling the motor after overhauling, care should be taken to get this gear back in exactly the same way it was when taken out.

Adjusting Connecting Rod Bearing.

When the motor is being overhauled, the bearings of the crank shaft and connecting rods should be examined. If the connecting rods are found to be at all loose, they may usually be tightened by merely taking up the connecting rod nuts. Should the wear be considerable, however, one of the shims from between the connecting rod and its cap should be removed and the bearings scraped to a fit.

Adjusting Main Crank Shaft Bearings.

If, upon examination, considerable wear is noted in the main bearings, they should be adjusted by removing one of the shims and rescraping. In fitting bearings, NEVER DRAW UP BEARINGS TOO TIGHTLY, as this is liable to cause excessive friction when the motor is started, and may injure the bearings seriously. Adjusting the bearings is a delicate job and can only be done by an experienced and capable mechanic. Therefore, do not attempt to adjust the bearings yourself unless you are a good mechanic and perfectly familiar with the motor.

Cleaning Water Jackets.

The continued use of discolored water, or water containing lime, will usually result in a scale being formed on the inside of the radiator and the water jacket of the cylinders. When this occurs, the motor will not be cooled properly and consequently will overheat. A good way to remove this scale is to remove the drain plug from the bottom of the radiator and insert the end of a hose in the radiator cap; turn on the water and let the motor run for 15 or 20 minutes with this fresh water constantly running through the cooling system. Then dissolve as much washing soda as may be dissolved in enough water to fill the radiator and water jackets, and let the motor run with the spark retarded. until the solution is brough to a boil. Allow this solution to remain in the cooling system for several hours, then drain it off and cleanse the system thoroughly with fresh running water as above. Where a scale is once started in the water jacket, its growth will be rapid and, unless taken care of at once, may grow to serious proportions. In such cases, it is well to repeat the use of the soda solution several times, letting the motor stand for several hours with each solution. The final cleansing of the system should be very thorough as the solution, if any is left in the system, will work its way into the motor and the chemical action of this solution may result in injury to the motor.

Removing Carbon from the Cylinders.

Another cause for overheating is excessive carbon deposits on the tops of the pistons and the walls of the combustion chamber. This may usually be detected by pre-igniting of the motor and knocking. To remove the carbon, dismount the cylinders, take out the valves and scrape out the carbon with a screw-driver or other convenient tool. Wash the cylinders thoroughly with clean gasoline or kerosene. Where the carbon has become hardened and does not scrape off easily, it may be softened by pouring a little kersosene into the combustion chamber and letting it stand over night. This is the most reliable way of removing carbon from the cylinders and will always give satisfactory results. A good preventative against accumulation of carbon in the cylinders, as well as a general "tonic" for the engine, is the use every 500 miles or so of about a quarter of a pint of kerosene in

each cylinder. The kerosene should be poured in through the compression cocks when the car is put up for the night. When the motor is started in the morning, the kerosene will be blown out through the exhaust, thus cleaning the whole engine.

Muffler.

The muffler is located inside the left side member of the frame, immediately under the front seat. A cut-out to permit of the engine exhausting into the open air is provided at the front end of the muffler. To open the cut-out, pull up the hook, located on the floor-board, immediately in front of the heel-board on the driving side of the car, until it may be engaged with the cleat supporting it in this open position. When you are in doubt as to whether your engine is firing evenly on all four cylinders, the muffler may be opened and the exhaust of the engine plainly heard.

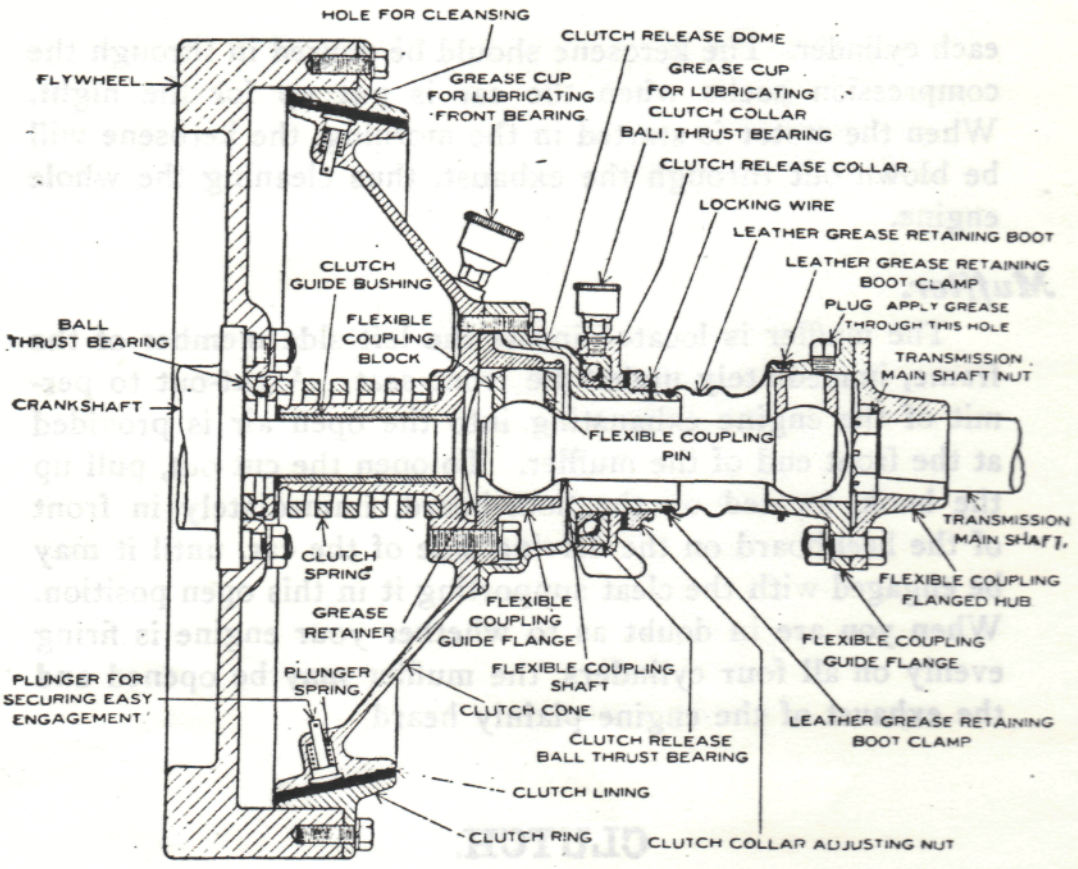
CLUTCH.

Operation of Clutch:

The clutch is used to couple the engine to the transmission. It consists briefly of a cone covered with a non-slipping substance (called "clutch lining") and a ring tapered on the inside to fit this cone. Since the cone is moved forward away from its ring, rather than backward, it is said to be of the inverted cone type.

When the clutch is engaged, the cone is pulled against the ring by a heavy spring and the friction between the clutch lining and the ring prevents slipping, and makes the whole clutch a unit. When you press down on the clutch pedal to disengage the clutch, the heavy spring is compressed and the cone moved away from the ring, thus permitting the engine to run independently of the rest of the car.

There is a ball thrust bearing in the clutch throw-out collar lubricated by the grease cup on the collar. The thrust of the spring is taken by another ball thrust bearing at its front end, the bearing being lubricated by the grease cup on the aluminum cone of the clutch. The six small springs and plungers, placed around the cone underneath the clutch lining, push the lining out far enough to engage with the ring and set the clutch turning before the whole cone is in place



Cross Section Through Clutch.

and the clutch tight. This makes the action of the clutch gradual and permits of the engine picking up its load evenly and smoothly.

Between the clutch and the transmission is the drive shaft. It consists of a bar of steel with a large ball on each end of it. Through these balls are pressed pins with square steel blocks on them. The blocks, operating in slots, form the two flexible couplings which take up any disalignment between the clutch and the transmission.

To Remedy Slipping.

Should the clutch slip when the load is applied to it, that is, the car started or driven up a steep grade, through deep sand or mud, it is usually caused by grease or oil on the clutch lining. This is one place where oil is bad. To remedy slipping, pour gasoline with a squirt can through the small hole in the clutch ring, at the same time, turning the clutch

over slowly by hand. This will clean out the grease or oil on the clutch surface and permit it to engage properly.

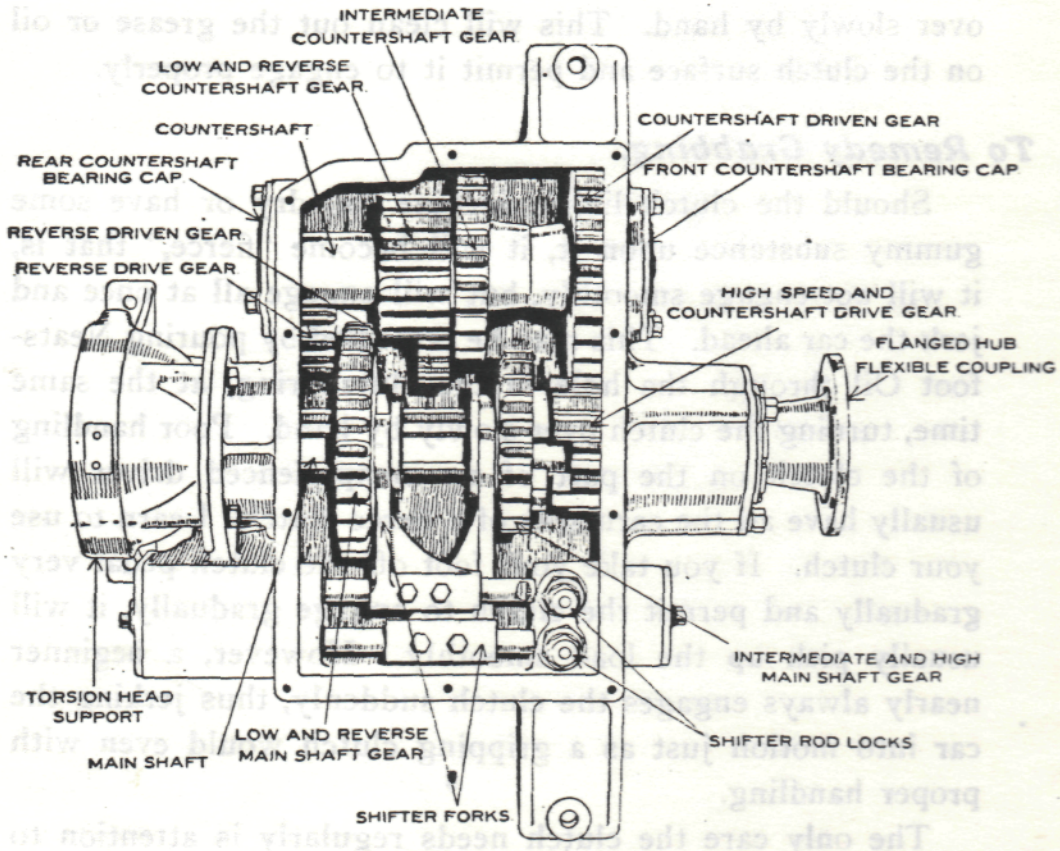
To Remedy Grabbing.

Should the clutch lining become too dry or have some gummy substance upon it, it will become "fierce," that is, it will not engage smoothly, but will engage all at once and jerk the car ahead. This may be remedied by pouring Neatsfoot Oil through the hole in the clutch ring, at the same time, turning the clutch over slowly by hand. Poor handling of the clutch on the part of an inexperienced driver will usually have all the earmarks of a fierce clutch. Learn to use your clutch. If you take your foot off the clutch pedal very gradually and permit the clutch to engage gradually, it will usually pick up the load smoothly. However, a beginner nearly always engages the clutch suddenly, thus jerking the car into motion just as a gripping clutch would even with proper handling.

The only care the clutch needs regularly is attention to lubrication. (See lubrication schedule, page 5.)

To Remove the Clutch.

To remove the clutch, remove the pad from the clutch pedals; remove the two pins supporting the clutch pedal cross shaft to the sub-frame, and take out the pedal and clutch throw-out. Take out the cap screws between the coupling at the front end of the transmission and the back end of the drive shaft, then remove the cap screws from between the clutch cone and the clutch release dome. The drive shaft together with both universal joints and the housings thereon may now be taken out. Remove the set screws from the clutch ring around the fly wheel, and the whole clutch will then slide back on the end of the crank shaft and may be lifted out. In re-assembling the clutch, care must be taken to replace the thrust bearing at the front end of the spring in exactly the same position in which it was when the clutch was taken out. The universal joints should be packed with No. 2 cup grease. The clutch itself requires no other lubrication than is furnished through the two grease cups mentioned above.



Transmission.

TRANSMISSION.

Operation of Transmission.

The transmission contains a series of sets of gears of such proportions that the ratio between the turning of the rear wheels and the turning of the engine may be altered to fit the driving conditions. For example: When starting the car, more work is required to overcome the lack of momentum of the car and drive it at a given speed than when the car is in motion. To permit the engine to do this, a pair of gears is engaged in the transmission which permits the engine to turn over about ten times while the rear wheels revolve once. This is accomplished by having one set of gears fixed in a stationary position on the counter shaft and having another set of gears slide on the main shaft. The gears on the main shaft are slipped along by means of forks pinned on two rods, which in turn are moved by the change speed lever. When the change speed lever is moved, it actuates one of the rods and forks, sliding one of the gears along the main shaft until it is in line and meshed with the

proper gear on the counter shaft. The reverse is obtained by means of engaging a third gear between the counter shaft gear and the main shaft gear. The shafts in the transmission are all supported on annular ball bearings.

To Take Down the Transmission.

Remove clutch. (See page 41.) Unscrew torsion tube ball lock ring; remove the two cap screws holding the transmission case to the sub-frame; remove the two cap screws holding the ball housing to the cross member, also the cap screws underneath the change speed lever housing. The transmission may now be picked up out of the car.

To remove the shafts and gears, take out the cap screws between the transmission case and the transmission case torsion head support. The main shaft, together with the bearing at the back end, may now be removed through the opening thus uncovered. The two gears on the shaft may be removed through the top of the transmission. Take out the cap screws holding the counter shaft bearing retainer at the back end of the case, when the counter shaft may be slid back far enough to permit of its being lifted out through the top of the case. The rods and forks may be removed through the top of the case.

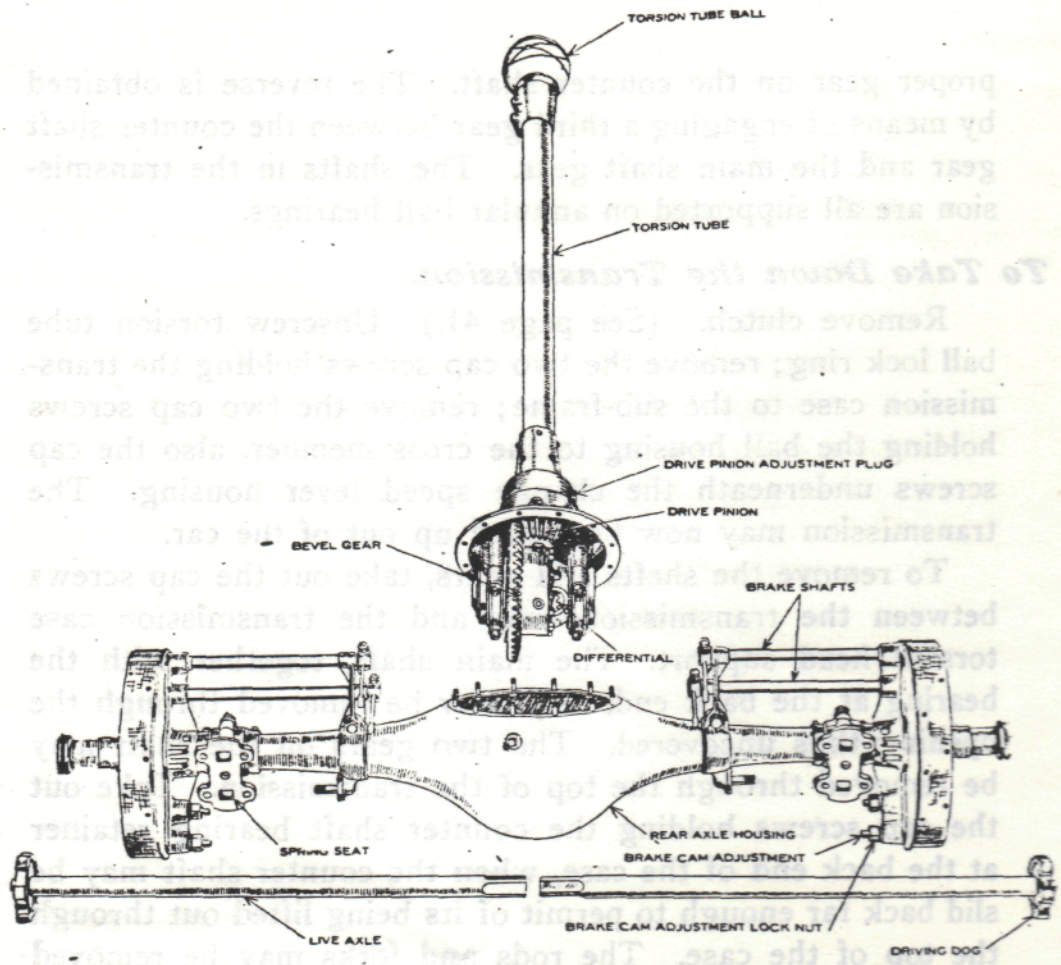
After the transmission has been re-assembled, it should be carefully filled with non-fluid oil. (See lubrication chart, page 5.)

REAR SYSTEM.

Operation of Rear System.

The rear system consists of a propeller shaft enclosed in the torsion tube, the differential, drive shafts enclosed in the rear axle housing, and the brakes.

Power is transmitted to the propeller shaft from the transmission and through the propeller shaft to the differential. The differential is a device consisting of bevel pinions which will take up the difference in speed of rotation of the rear wheels in turning a corner. Through the differential, the power is transmitted through the drive shafts to the wheels by means of driving dogs on the outer ends of the drive shafts, which engage with similar dogs on the wheels. The weight of the car is entirely supported on the rear axle housing, and the drive shafts have nothing to do beyond transmit-



ting power. The brakes are both of the internal expanding type and are operated in dust protected drums by means of cams.

Adjustment of Driving Pinion.

To adjust the driving pinion, remove the plug from the torsion tube rear flange and move the notched nut upward to tighten the pinion or downward to loosen it.

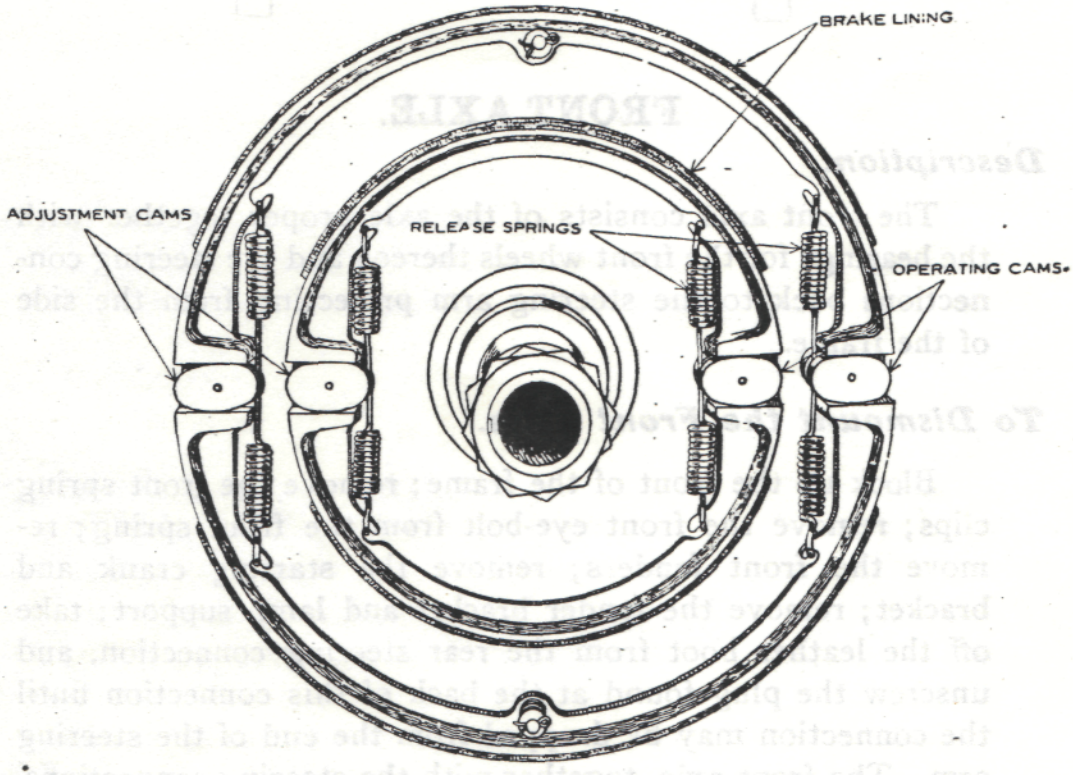
To Dismount the Rear System.

Disconnect the brake rods, block up the rear of the frame, and remove the spring clip nuts; block up the torsion tube and remove the nuts from the cap screws holding the torsion tube rear flange to the rear axle housing; remove the hub caps and take out the driving shafts. The rear axle may now be moved back away from the car. This will expose the differential and driving gears. To remove the propeller

shaft and torsion tube, unscrew the torsion tube ball lock ring, when the propeller shaft and torsion tube may be taken out of the car.

To Adjust the Brakes.

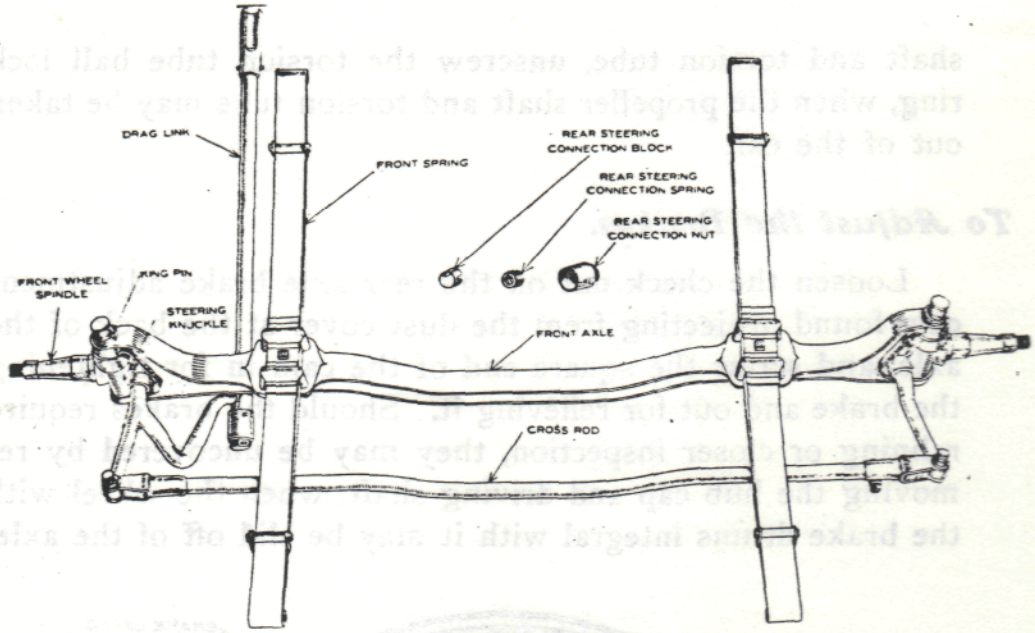
Loosen the check nut on the rear axle brake adjustment cam found projecting from the dust cover at the back of the axle, and screw the square end of the cam in for tightening the brake and out for relieving it. Should the brakes require relining or closer inspection, they may be uncovered by removing the hub cap and driving shaft, when the wheel with the brake drums integral with it may be slid off of the axle.



Brakes.

Care of Brakes.

In descending a long hill where the brakes are used continuously, it is advised that you use the foot brake and emergency brake alternately so as not to heat either one unduly. The brakes should be exposed about once every 500 miles and cleaned thoroughly with gasoline. The main features in caring for the rear system are an occasional tightening of the spring clip nuts and lubrication. Consult and follow closely the lubrication schedule on page 5.



FRONT AXLE.

Description.

The front axle consists of the axle proper together with the bearings for the front wheels thereon and the steering connections back to the steering arm projecting from the side of the frame.

To Dismount the Front Axle.

Block up the front of the frame; remove the front spring clips; remove the front eye-bolt from the front spring; remove the front fenders; remove the starting crank and bracket; remove the fender bracket and lamp support; take off the leather boot from the rear steering connection, and unscrew the plug found at the back of this connection until the connection may be dropped from the end of the steering arm. The front axle, together with the steering connections, may now be moved forward out of the car. It is very seldom that the front axle needs to be removed from the car, as all of its parts are readily accessible with the axle in place. To take off the front wheel, remove the hub cap and the nut underneath it, when the front wheel, together with its bearings, will slide off the spindle. To remove the spindle, take the nut off the underside of it and pull the king pin out through the top. The spindle may now be taken out. When the axle is removed, in overhauling the car, the wheels should

be lined up. This is done by setting the wheels until one of them is exactly parallel to the frame. (The distance from the frame to the rim of the wheel may be measured, and the wheel turned until this measurement taken at the front and the back of the wheel is the same.) With one wheel parallel to the frame, the other should measure ¼-inch less at the front than it does at the back. In case it fails to do so, it may be lined up by adjusting the end of the tie-rod.

The only care that the front system needs is attention to lubrication and an occasional tightening of the spring clip nuts. The wheels should be removed about once every 1,000 miles and cleaned out with gasoline and repacked with grease.

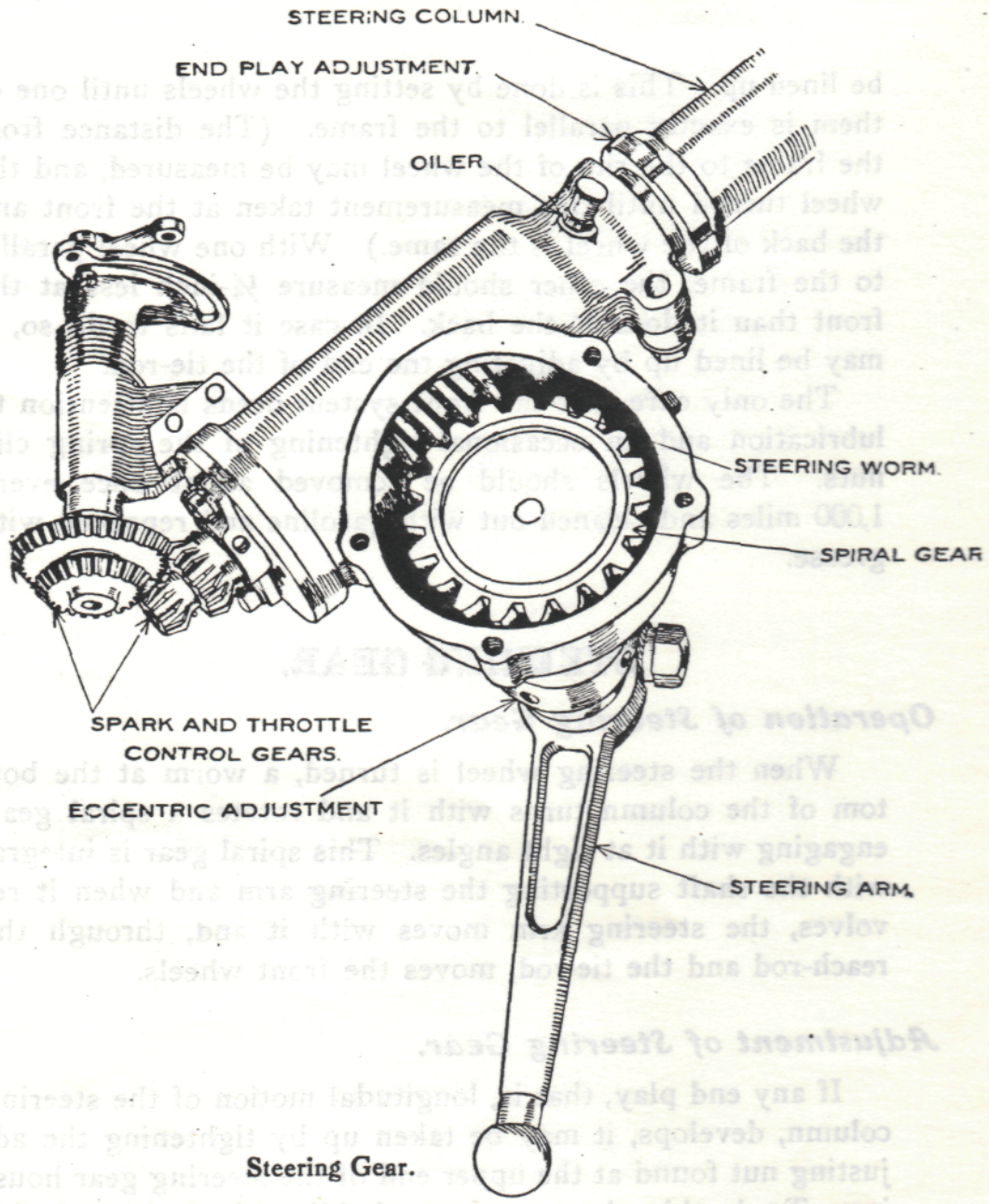
STEERING GEAR.

Operation of Steering Gear.

When the steering wheel is turned, a worm at the bottom of the column turns with it and rotates a spiral gear, engaging with it at right angles. This spiral gear is integral with the shaft supporting the steering arm and when it revolves, the steering arm moves with it and, through the reach-rod and the tie-rod, moves the front wheels.

Adjustment of Steering Gear.

If any end play, that is, longitudal motion of the steering column, develops, it may be taken up by tightening the adjusting nut found at the upper end of the steering gear housing. To do this, the two screws holding the locking device on this nut should be removed and the nut turned to the right. When free motion of the steering wheel without corresponding motion of the front wheels develops, it may be taken up by turning the eccentric sleeve just inside of the steering arm. Turning this eccentric sleeve brings the spiral gear closer to the steering gear worm and takes up any lost motion there may be between these two. Should the gear become tight, it may be eased up by turning the eccentric sleeve the other way. When the wear between the worm and the gear in the steering becomes considerable, a new portion of the gear may be brought to bear against the worm by removing the steering arm, turning the steering wheel 2½ revolutions, and replacing the arm.



Steering Gear.

To Dismount the Steering Gear.

Disconnect the throttle and spark connections at the bottom of the steering gear; remove the sector, control levers, and steering wheel; remove the two cap screws supporting the steering bracket on the main frame, and the two cap screws holding the steering gear housing to the sub-frame. The gear may now be taken out through the floor-boards.

It is highly important that the steering gear receive proper lubrication, as upon the steering gear depends a great deal of the control of the car. Lack of lubrication will tend to wear the parts of the steering gear and render the car less easy of control. (See lubrication schedule, page 5.)

TIRES.

Inspection of Tires.

When the car is received, carefully examine the tires for proper inflation. The pressure in the tires should be from 75 to 80 pounds. The tires should bulge out slightly on each side where they come in contact with the ground.

Care of Tires.

The pressure given above is the one under which tires will operate to the best adavntage. Nothing ruins a tire more surely than under-inflation. Air is free; tires cost money. Use plenty of air and your tire expense will be lowered to a noticeable degree. When the car reaches you, the probability is that the pressure in the tires will not be up to standard. In this case, the tires should be pumped up. In pumping up a tire, it is advised that a small pressure gauge be used, especially if the person pumping the tire is inexperienced. A gauge made for this purpose and of strong and simple construction may be had at any supply house at a nominal cost.

Keep oil away from the tires. Oil is no respecter of rubber and will soon rot any tubes or shoes with which it comes in contact.

When the car is stored for the winter, or left standing for a considerable period, that is, a few weeks or more, the tires should be removed or the car jacked up so that there is no weight resting upon the tires, and enough air left out of the tires to take the strain off them. If the car is jacked up and the tires left on, do not deflate them completely, since they are liable to sag and when pumped up again may crack. It is advised that about every 2,000 miles the demountable rims should be removed from the wheels and the shoes be removed from the rims for inspection. At this time, some of the talc powder, furnished with the tire repair outfit, should be sprinkled inside the shoe and the whole outfit given a careful and thorough inspection. About 75% of tire expense (outside of accidents) is due to neglect on the part of the user of the tires, and you will be amply repaid in long life and good service for the little trouble you take in caring for your tires.

How to Repair a Simple Puncture.

After locating the hole in the tube, take a course emery cloth or sandpaper and rub the surfact of the rubber for several inches around the puncture. Then clean the surface with benzine or gasoline. Roughen the surface of the rubber patch, taking care to select one that will cover the hole by a wide margin, and also clean off with benzine or gasoline. Cover well with rubber cement the space around the puncture and the rough side of the rubber patch—this to be done two or three times at intervals of five to fifteen minutes—the coating to be applied when the preceding is perfectly dry. Press the patch against the tube firmly and thoroughly to remove all air bubbles beneath it and to insure proper adherence of the surfaces. Remove all uncovered solution with benzine and spread some soapstone, talc powder, or French chalk, all of which are synonymous, over the solutionized surface, so as to prevent the tube sticking to the cover.

Always make sure that the surfaces are well roughened and cleaned before application of the cement, and the solution be given ample time to dry. If the cement is not dry and "tacky," the patch will not adhere as it should and might loosen while the tire was being put in the casing. The same results would be obtained if the surface was not properly cleaned or roughened before application of the cement. Before the tube is put in the casing, plenty of talc powder should be sprinkled in the latter.

How to Repair a Small Hole or Cut in the Casing.

Never allow a cut in the casing to go without immediate repair—moisture and dirt will surely enter in quick order and weaken the exposed fabric.

Look your tires over every once in a while—the oftener, the better—and when you find a cut or a gouge that extends to the fabric, bear in mind that your tire is "hurt to the quick," that is, the fabric is exposed to the disintegrating effects of moisture and dirt, which will in short order weaken the stoutest fabric, not only at the point of the incision, but perhaps a foot or more away, as the dampness follows along the thread of the fabric like oil in a wick. This accounts for blow-outs at points on the tire where the surface is intact. The remedy that serves all immediate needs is not necessarily a repair garage or a vulcanizing outfit. Just wash out

and thoroughly dry the cut, then apply "Plastic." It is a self-drying, self-curing cement, easy to use, not mussy, but very effective, as it securely seats itself and seals the hole or cut against the entry of moisture or grit. Where the cut extends entirely through the casing, a temporary repair may be effected by cementing the blow-out patch (found in the repair kit), inside the shoe, immediately under the cut.

Removing and Replacing Tires.

When a tire goes flat, it should receive immediate attention. It will have to be attended to sooner or later and running on a flat tire for even a short distance will injure it seriously. For detailed directions as to how to remove and replace tires, see tire instruction sheet.

LIGHTING SYSTEM.

Operation.

The lighting system consists of a dynamo, battery, switch and lights. The dynamo charging the battery generates a direct current of constant voltage, no matter how high the speed of the car. The battery current, directed as desired at the lighting switch, is used to light the lamps and, through the ignition switch, to start the engine. (See page 9.)

The dynamo is prevented from overcharging the battery by an automatic regulator which cuts out the dynamo from the battery circuit when the battery is fully charged. The automatic switch, which connects the dynamo to the battery and regulates the current, is mounted under the cap at the front or driving end of the dynamo. The regulator is adjusted at the factory and should need no attention.

The commutator and brushes are under the rear cover, readily accessible by unscrewing the thumb screw. An oiler is provided under the cover for oiling the ball bearings. Oiling once a season is sufficient.

The carbon brushes are held against the commutator by springs and will last indefinitely.

Connections.

The current generated by the dynamo is led from the cord at the front end of the dynamo through the double enclosed cable to the terminals "D+" and "D—" on the switch. From here, the current flows through the terminals marked

"B+" and "B—" to the positive and negative terminals on the battery respectively. The positive (+) terminal of the battery is painted red and is connected to the red cable. The negative (—) terminal is painted black and is connected to the black cable. NEVER REVERSE THESE CONNECTIONS OR RUN THE CAR WITHOUT A BATTERY CONNECTED. The current for the headlights flows from the battery through the switch terminals "H"; for the side lights through the terminals "S"; and for the tail light, through the terminal "T." (For wiring diagram, see page 20.)

Care of Lighting System.

Besides caring for the battery (see page 19), an occasional examination of the lighting system, particularly with reference to security of the connections, is advised. When any of the lights go out, it is a sign that the bulb is broken or blown out, or one of the fuses (small lead wires) in the junction box has melted. This is called "blowing out a fuse." Replace the fuse with a piece of the lead fuse wire furnished with the outfit. When this is gone, more may be procured at any electric supply house. Ask for "10 ampere fuse wire." NEVER USE ANY WIRE OR CONNECTION OF ANY KIND EXCEPT "10 AMPERE FUSE WIRE." Continued blowing out of fuses on any one circuit indicates that the insulation of that circuit has been worn through at some point and the current is short circuited. Carefully go over all the wiring in the circuit at fault and replace the damaged cable. When the lights begin to fluctuate greatly with the speed of the car, it is a sign that one of the battery connections has come loose or is broken. Look for the broken connection and repair it. In case it is impossible to find the break at once, all the lights should be turned on and the car run JUST FAST ENOUGH to keep the lights bright. As soon as a garage or other convenient place is reached, the wiring should be carefully gone over and the broken connection repaired.

If the battery is removed from the car for examination DO NOT attempt to burn the lamps on the dynamo alone, as its voltage is necessarily higher in order to charge the battery, and would result in burning the bulbs at a higher candle-power than they were designed for when the engine of the car is run at high speed.

The charge indicator on the fact of the junction box tells when the dynamo is charging the battery; the hand showing on the dial registers the amperage. When the car is running 12 miles per hour or better, the hand will move over to the charge side. If the engine is stopped with lights burning, the indicator shows the discharge of the storage battery. Failure of the hand to indicate shows loose connection, etc. The PROPER current for the lamps to draw from the storage battery is about six to eight amperes; higher candle-power lamps consuming more current. When replacing bulbs, get the same candle-power and voltage as the bulbs originally furnished.

When the lamps in the car do not light up to full brilliancy, it shows that the battery is in a discharged condition. If the engine is running and the current indicator on the lighting switch shows on the charge side, the battery will become restored. If the indicator fails to show charge, look to loose connections, dynamo brushes, loose driving sprocket, etc. A little fine sandpaper rubbed on the commutator once a season helps to improve matters.

It would be well when the battery is low to economize on current, running with the side and tail lights only, allowing the current that would be used for headlights to recharge the battery. Always when leaving the car, turn out the headlights and switch on side and tail lights, as the headlights draw ¾ of the lighting current. The plug on the left hand side of the lighting switch should be removed in the daytime, the same as the ignition key, as it prevents any one from tampering with the lighting circuits and running down the storage battery.

COLD WEATHER SUGGESTIONS.

Carburetor.

In cold weather, or in extremely damp atmospheres, a richer mixture is needed, especially for starting. This may be obtained by moving the dash control adjustment (see page 28), toward the letter "R" until satisfactory results are obtained. Should your carburetor fail to act properly with this adjustment, consult an "AMERICAN" dealer or the Service Department of the factory.

Radiator.

When the car is stored during cold weather, always open the drain cock at the bottom of the radiator and drain off all the water. When the car is stopped outdoors for some time, cover the radiator and hood with a heavy robe. In extremely cold weather, the fan belt may be removed and a portion of the radiator covered with a cloth or leather pad.

Anti-freezing solutions for the cooling system may be made as follows:

For temperatures not lower than five degrees below zero:

Wood Alcohol	15%
Glycerine	15%
Water	70%

For temperatures not lower than fifteen degrees below zero:

Wood Alcohol	17%
Glycerine	17%
Water	66%

About 3½ gallons will be required.

Lubrication.

In extremely cold weather, it is advised that somewhat lighter lubricants be used than during the milder seasons.

MISCELLANEOUS.

Washing the Car.

Clean off all grease and oil with a soft woolen rag. Wash the car with cold water and plenty of it. Direct a slow stream slantingly (not directly) upon the car and wash with a soft sponge free from grit. Clean the running gear as often as the body. Never wash the car in the sun. Don't keep the car in an unventilated barn with horses or other animals, as the action of ammonia is injurious to the varnish. Polish the bright work every time the car is washed. Keep your car and engine clean and bright. In cleaning the car, you should be constantly inspecting all the parts and keeping everything in shape.

DON'TS.

Don't start on a trip of any length without assuring yourself that you have plenty of gasoline, oil, grease and water in the car.

Don't fail to look over your tires before starting on a run.

Don't fail to lubricate your car regularly.

Don't tamper with the magneto.

Don't forget to see that the change speed lever is in neutral before starting the engine.

Don't forget to release the emergency brake before starting the car.

Don't try to shift gears without disengaging the clutch.

Don't try to engage the reverse gears until the car has come to a dead stop.

Don't race the engine.

Don't try to jump your car ahead by suddenly engaging the clutch or opening the throttle.

Don't neglect your brakes. Test them from time to time and keep them adjusted.

Don't leave your car with the engine running.

Don't stop on the wrong side of the street.

Don't violate speed regulations.

Don't tamper with the carburetor. The dash adjustment is sufficient for all ordinary needs and should your carburetor fail to give satisfaction with this adjustment, take it to an "AMERICAN" dealer who will have it correctly adjusted for you.

Don't start in to tear down the car as soon as trouble develops, but take a few minutes to reason out what the trouble can be. Go about it logically and systematically.

Don't wait until some other time to attend to that tire, oil, water, etc. DO IT NOW.

TROUBLES.

Motor Fails to Start

Ignition switch not turned on.

Lack of gasoline.

See if tank is empty.
See if cock is open.
See if gasoline pipes are clear.
Use reserve if necessary.

Spark plugs defective.
Wires disconnected.
Gaps too wide.
Plugs fouled.
Porcelains broken.
Loose battery connection.
Improper mixture.
Consult "AMERICAN" dealer or write factory.

Motor Misses.

Lack of compression.
Cylinders worn from lack of lubrication.
Valves not seating properly.
Spark plugs defective.
See above.
Improper mixture.
Consult "AMERICAN" dealer or write factory.

Motor Stops.

Lack of gasoline.
Broken magneto connection.
Magneto short circuited.
Take out plugs, leaving wires on; lay on cylinder; crank engine and observe if they spark.
Lack of water or oil.
Motor will get hot (preceded by knocking).
Improper mixture.
Consult "AMERICAN" dealer or write factory.

Knocking.

Spark too far advanced.
Loose bearings.
Lack of oil.
Motor will heat up.
Carbon in cylinders.
Motor will continue running after spark has been turned off.
Improper mixture.
Consult "AMERICAN" dealer or write factory.

Motor Overheats.

Lack of oil.
Poor circulation.
Take off radiator cap; see if water is being pumped. Feel if radiator is cool at bottom.

Bearings too tight.
Motor will be hard to turn over by hand.
Spark too far retarded.
Carbon in cylinders.
Fan belt loose or off.
Improper mixture.
Consult "AMERICAN" dealer or write factory.
factory.

Motor Will Not Stop.

Short circuit in switch.
Magneto short circuiting connection broken.
Connection from "H" on coil to "H" on magneto.
Carbon in cylinders.
See above.
Spark plugs defective.
Points red hot (also see above).

Motor Fails to Develop Power.

Lack of compression.
Cylinders worn from lack of lubrication.
Valves not seating properly.
Brakes dragging.
Mud and dirt in brakes.
Brakes not adjusted properly.
Flat tire.
Lack of gasoline, water or oil.
Improper mixture.
Consult "AMERICAN" dealer or write factory.

Clutch Slips.

Clean with gasoline.

Clutch Grabs.

Apply Neats-foot Oil.

Squeaking.

Lubricate springs.
Examine body for squeaks.

Back-Firing in Carburetor.

Lack of gasoline.
See above.
Restricted gasoline passage.

Pre-ignition.

Carbon in cylinders.

Magneto not timed correctly.

Intake valve fails to seat.

Improper mixture.

Consult "AMERICAN" dealer or write factory.

Steering Gear Stiff.

Lack of lubricant in steering gear.

Incorrect adjustment.

Flat tire.

Car will tend to drag over toward flat tire.

Lights Dim.

Batteries nearly discharged.

Turn off headlights and run motor equivalent to speed of 15 miles per hour. Run in second speed, if necessary.

Lights Out.

Broken wire.

Trace connections and repair break.

Fuse blown.

Replace fuse.

Lights Fluctuate.

Battery connection loose or broken.

Trace connection and repair break.

INDEX

OUR GUARANTEE.

THE guarantee placed upon its product by the American Motors Company, both cars and parts, is as follows:—

We guarantee all goods furnished by us for six months following the date of their shipment, based upon the date of invoice covering the goods; this guarantee being limited to the replacement in our factory of all parts giving out under normal service in consequence of defect of material or of workmanship without other responsibility on our part of any character.

If the circumstances do not permit that the work shall be executed in our factory, the said guarantee is limited to the shipment, without charge, of the parts intended to replace those acknowledged by us to be defective.

It is, however, understood that we make no guarantee whatever regarding pneumatic tires, batteries, magnetos or other accessories, as these are parts guaranteed by their respective manufacturers.

We cannot accept any responsibility in connection with any of our motor cars when they have been altered or repaired outside of our factory, and our guarantee extends to and covers car in hands of first purchaser only.

Our dealers are solely responsible to the purchaser of our goods for all undertakings and guarantees made by them beyond those expressed above.