



**Directions  
for  
Operation  
and Care of  
E-M-F "30"  
Motor Cars**

HEARN AUTOMOBILE CO.  
PINE BLUFF, ARK.

**Studebaker Corporation**  
E-M-F Factories  
Detroit, Michigan

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## Foreword

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The object of this book is to instruct you in the care of your E-M-F "30." No pains have been spared to make the matter intelligible to the novice driver. The matter has been arranged systematically to cover the difficulties which are likely to present themselves to any driver-owner and will be found to treat thoroughly the details of management, which would otherwise of necessity, be learned by long and often laborious experience.

In connection with the instructions for the care of the car are a number of suggestions, which will be of value. It will interest the owner to know that no car yet designed has lent itself so readily to satisfactory manipulation by the owner-driver, who is not a skilled mechanic, as the E-M-F "30." The simplicity of design which is the keynote of the entire plan of the car makes this feature particularly noticeable. In all probability E-M-F "30" owners will find slight need of the hints regarding repairs and adjustments. Every car is covered by a guarantee of material and workmanship, which is tacit evidence of the company's confidence in the quality of its output.

# GENERAL INSTRUCTIONS

## Inspection

Make a thorough examination and see that the car has all its catalog equipment, such as lamps, tools, etc. Also see that the car or tires have not been damaged in transportation, as all cars upon leaving the factory are thoroughly inspected and shipped in perfect order. Should the car reach you in a damaged condition, claim for damage should be made immediately to the railroad, before unloading. Also notify the Studebaker Corporation, and it will do all in its power to effect a prompt and satisfactory settlement.

## Guarantee

In an envelope attached to the steering wheel of each car will be found an identification card to be filled out by the owner immediately upon receipt of the car, and returned to the Studebaker Corporation. Upon receipt of the card the guarantee covering the car for one year will be forwarded without delay, providing the car was purchased direct from the factory or through the dealer controlling the territory.

## Washing

See that the car is thoroughly washed, avoiding the use of gasoline and strong alkaline soaps, as each has a damaging effect upon the varnish. The use of castile soap with luke-warm water, applied with a soft sponge, will remove all grease and mud spots without any bad effects. See that the car is thoroughly rinsed with clear water and that the soap is not allowed to dry. After rinsing, dry the car with a soft, clean chamois.

## Dusting

Washing is always better, but in case of dusting never use a feather duster, as it will scratch the varnish. Use a woolen duster or a clean, soft cloth.

## Cleaning Tops

Never use gasoline, as it will dissolve the rubber in the fabric and cause the fabric to separate and leak. A stiff clothes brush will remove the spots when dry. To remove grease spots use castile soap with luke-warm water.

## Filling Oil Lamps

Detach the oil reservoir from the side and tail-lamps and fill three-quarters full of kerosene oil, which will supply sufficient for 20 to 30 hours of burning. Clean the oil burner and trim the wicks daily. This will not only give better light and appearance, but will prevent the light from being blown out.

## Charging Acetylene Gas Generator

Turn water valve of center of generator to position marked "OFF," unscrew water filler caps at top of generator and fill with clean, clear water. Detach the bottom of generator by releasing fasteners provided and fill the wire basket with one-half inch lump calcium carbide, which can be obtained through your dealer or from the Studebaker Corporation in two or ten-pound cans. Replace bottom of generator and turn water valve to position marked "ON." After waiting about a minute to allow the gas to generate, open both doors on gas lamps, allowing any gas that may have accumulated to escape before lighting. In event the light does not burn evenly there may be a small particle of dirt in the burner, which can often be removed by tapping lightly on side of burner. Should the lights fail to burn, examine all hose connections between the generator and lamps and see that they are free from leakage or water, caused by condensation. If the latter, detach hose and drain out. To extinguish the lights, turn water valve to position marked "OFF."

### To Clean Generator

Detach the bottom as in filling, remove wire basket and clean out ashes in the bottom. In case of ashes becoming wet or damp by failure to turn off water, see that ash reservoir has been thoroughly cleaned and dried before replacing.

## filling

All cars are drained free from gasoline and water before leaving factory. Sufficient oil is left to run at least fifteen or twenty miles.

### To Fill Water System

Close the drain cocks on bottom of radiator, one connecting with radiator, the other with the pump. Unscrew filler cap on top of radiator and fill with clean, clear water, being careful that it is free from oil, as oil will lodge on the radiating surfaces and prevent radiation and is liable to cause over-heating. After filling, open drain cocks and allow about one quart of water to be drained off, to release any air that may have been trapped or bound in the circulating system. Close drain cocks and refill radiator. See Water System.

### To Fill Gasoline System

See that drain cocks at bottom of tank and at bottom of carburetor are closed, remove gasoline tank filler cap, insert funnel and fill by straining gasoline through a dry chamois. Replace filler cap. The filler cap has a small air vent in its center. Should anything be placed under the seat below the seat board of the Runabout or Suburban models care should be taken not to cover the vent. If gasoline leaks at carburetor after filling, see carburetor adjustments.

### To Fill Motor Oiler

Unscrew filler cap at top of oil reservoir which is built in the right hand side of the crankcase, insert funnel and

fill with cylinder oil. Replace filler cap and see that it is screwed down tightly by the use of a wrench provided in the tool kit. **This is imperative.** For further information regarding oiler and grade of oil to be used, see Lubrication.

### To Oil Running Gear

Oil all spring shackles, steering gear connections and fan pulley through oilers provided with cylinder oil reduced one quarter by kerosene. Fill the grease cups on motor and rear axle with Albany grease. Screw down one turn daily, then refill and repeat. Remove forward floor board and oil the clutch-shifting bearings with ten or twelve drops of reduced cylinder oil. Oil all brake-actuating rods and connections with one or two drops of oil and car is ready to start.

## To Operate Motor

### To Start in Warm Weather

All new motors will turn hard at first, but will free up after a day or two of usage. All cars, however, are properly adjusted before leaving factory and should start without readjustments.

See that the gear-shifting lever is in neutral position.

Open throttle lever (the outer one) one-fifth way by moving forward. Move spark controlling lever (the inner one) to extreme back position. This is imperative, as, when it is in any other position the motor may kick back when cranking and result in personal injury. See Spark Lever.

Insert electric switch key and throw to side marked "battery."

If the motor is cold it is sometimes advisable to prime the carburetor by drawing forward ring attached to cord protruding through lower right hand side of radiator. Do not prime too long as it may result in flooding the motor with too much gasoline, which can be remedied only by the tiresome routine of cranking with the gasoline supply shut off and priming cocks open.

### To Start Car on Magneto

In event the battery should become exhausted, the motor can be started on magneto. Open throttle lever as above described, advance spark lever to position half way forward. Turn electric switch to position "Magneto." Crank the motor rapidly by spinning clockwise. After motor has started, the electric switch key should always be pointed to position marked "Magneto." Advance spark-lever (the inner lever) one-half way forward. Close throttle lever (the outer lever) by moving to extreme back position, and car is ready to start.

### To Start in Cold Weather

If motor does not start readily after priming as described above, open the small priming cocks provided at top of motor and inject a teaspoonful of gasoline into each cylinder. Close priming cocks, prime carburetor, crank

and motor should start. For further cold weather procedure see Carburetor Adjustment.

### To Stop Motor

Turn electric switch to vertical position and simultaneously move throttle controlling lever (the upper one) one-quarter way forward, thus allowing the cylinders to fill with gasoline after current has been turned off. This operation will cause the motor to re-start more readily. It is good practice to move spark lever (the lower one) to extreme back position before leaving car, so that no mistake will be made in re-starting.

To re-start motor while motor is warm, priming is unnecessary.

### To Start Car

Disengage clutch by pressing forward on left hand foot pedal. Release hand brake, move shifting-gear lever to No. 1 notch on "H" plate, allowing engine to gain speed slightly by pressing right foot on accelerator. Engage clutch by letting pedal back slowly till car starts to move. After the car has gained speed, disengage the clutch by pressing forward and move gear-shifting lever to No. 2 notch on "H" plate. Engage clutch, allowing car to gain speed required to make third and last shift into high speed which is No. 3 on "H" plate. In case of steep hills or heavy roads, should you require more power than the motor is capable of delivering in high speed, after the car has already slowed down, disengage clutch, quickly move gear-shifting lever from third notch into second and re-engage clutch. Run on second gear until sufficient speed has been gained to resume high gear. For ordinary road driving the use of the hand throttle is more desirable than the accelerator, but on rough roads and in congested districts the accelerator is more advantageous. The position of the spark lever in running should be as high or as far forward as possible without causing the motor to knock. See Spark Lever.

The use of the first or low gear is necessary only on starting and on exceedingly heavy roads and unusually steep hills. Its use should be avoided as much as possible because excessive use of low gear may overheat the motor.

### To Stop Car

Close hand throttle by moving to back position, release accelerator, disengage clutch and apply foot brake gently. After car has come to a stop, while clutch is still disengaged, move gear-shifting lever to neutral position, set hand brake and engage clutch.

## Care of Car

### Lubrication

Quantity and quality of lubrication determine the life and efficiency of a motor car.

### Motor Lubrication

E-M-F "30" motor oiler is a one-gallon reservoir built in right hand side of crank case. It is absolutely automatic in its action and requires no attention other

than making sure that it is kept supplied with oil, and that the filler cap is screwed down tightly with the wrench provided. Its principle of operation is by vacuum, therefore, if the filler is not screwed down tightly, it will cause an air leak that will release the vacuum and allow the entire reservoir of oil to float into the crank case through the two supply pipes leading from the bottom of the reservoir to the forward and aft compartments of the crank case. This will allow an unnecessary amount of oil to flow into the crank case and will cause the motor to smoke and possibly to foul spark plugs. See Spark Plugs.

### Lubrication System

Two supply pipes run from bottom of oil reservoir to and projecting through the bottom of crank case, to a point about five-eighths of an inch from the bottom. With the crank case dry and oiler full, the air, being lighter than the oil, will pass through the oil supply pipes to the top of the oil reservoir. This action relieves the vacuum in the reservoir and allows the oil (it being heavier than the air) to flow into the bottom or crank case until the oil in crank case has reached a height that will cover and seal the mouths of the supply pipes. This process obviously will keep out the air and cause a vacuum in reservoir that will hold the remaining body of oil until such time as the motor has consumed a sufficient amount of oil to uncover the supply pipes in the crank case. This, in turn, will allow the air to pass through and release sufficient oil to re-cover the mouths of the supply pipes, thus maintaining a constant level.

### Oiler Check Valve

When the filler cap is removed a three-sixteenths inch rod will follow it part of the way. The lower end of the rod, in the operation of replacing the oil filler cap, automatically opens the oil valve which, when the filler cap is removed, returns to closed position by automatic action.

The construction itself is nothing more than a small leather valve that is forced into place by a spring when filler cap is removed. In case this valve should leak while filling, it can be taken out for inspection through a hole provided directly under the valve at bottom of oiler.

### To Be Oiled Daily

Every part that rubs another should be lubricated. Every part of the motor, with the exception of shaft which drives pump and magneto, is automatically lubricated by the system above described, so it is necessary only to see that at all times reservoir has a plentiful supply of oil.

### Oil Weekly

Use lubricating oil or cylinder oil, reduced one-fourth by kerosene. Oil thoroughly all steering gear, brake-actuating rods and connections, spring shackles, steering knuckle bolts and fan pulley, through oilers provided.

To oil clutch remove front floor boards, disengage clutch and oil shifting collars with lubricating oil.



## Oil Monthly

Oil transmission gears through plate provided at top of transmission case with Dixon's Graphite Transmission oil or heavy cylinder oil. Oil rear axle through hole provided at top of axle, with semi-fluid grease composed of three parts of Albany grease to one of cylinder oil, taking care that mixture is not so thin as to overflow into brake drums. Oil front wheels by packing bearings with vaseline. Oil motor cam shaft and pump driving gears through hole and grease cups provided, with Albany or Dixon's Graphite Cup Grease. Fill the universal joint in rear of clutch with Albany or Dixon's Cup Grease, by releasing dust cover. Oil steering-gear gears by packing with Albany Grease.

## Grade of Oil

In warm weather medium heavy cylinder oil should be used. In cold weather lighter or thinner grades of oil and grease will be found more satisfactory.

## Cleaning Crank Case

Once a month, or every 1,000 to 1,500 miles, the crank case should be cleaned. Remove the oiler filler cap to prevent the oil from feeding into crank case. Open cock provided at bottom of crank case, drain off the oil and close draining cock. Pour two quarts of kerosene oil in each vent or breather pipe. Start motor and allow it to run ten to fifteen seconds (no longer). The kerosene oil will be thrown up by the connecting rods and will clean piston rings, cylinder walls, engine bearings and crank case. Open draining cock and drain out kerosene. Close drain cock and replace filler cap. It will not be necessary to pour any oil into the crank case as the oiler will immediately supply the proper amount as soon as the filler cap is replaced. After the filler cap has been replaced four or five minutes most of the oil in oiler will have escaped into the crank case. The oiler should then be refilled. See Care of Motor.

## Lack of Lubrication

If through oversight the oil supply should become exhausted the motor will heat and knock. It should be stopped immediately and should not be started until it has cooled and the oiler has been refilled. See Over-Heating.

# Gasoline System

## Gasoline Tank

The gasoline tank is located under the front seat or in its immediate rear, and has a capacity varying from 12 to 20 gallons, according to model of car. In filling, care should be taken that no dirt or foreign matter be allowed to drop into the tank. Gasoline should always be strained through a chamois. This not only frees the gasoline from dirt, but water as well.

## Gasoline Shut-off Valve

The Gasoline Shut-off Valve is located at bottom of right side of tank. It is in closed position when valve

handle points down and is in open position when parallel with bottom of tank.

### Gasoline Feed

The tank being higher than the carburetor permits gasoline to be fed by gravitation.

### Grade of Gasoline

High-test gasoline is quicker and more spontaneous than ordinary gasoline, but does not contain as many heat units, nor gives as much mileage, and is therefore not worth the extra cost. All cars before leaving factory are adjusted for the use of ordinary gasoline. We recommend its use to be economical and satisfactory.

### Gasoline Leaks

Often fires and heavy losses have been traced to leaky tanks and pipes used for holding and conveying gasoline. Therefore make regular investigations of the gasoline tank and supply pipe. Should a leak be found, have it repaired at once. If neglected it may result in a damaging fire as well as personal injury.

### To Extinguish a Gasoline Fire

Sand or dust is more effective than water, and a pail of either should be kept in the garage at all times.

## Carburetor

The carburetor is located on the right side of motor and is of the float-feed type, consisting of a float chamber, auxiliary air valve, mixing chamber and throttle valve.

### Float Chamber

The purpose of the float chamber is to maintain a constant level and uniform pressure of gasoline for carburetor supply. The float is arranged to allow the gasoline to enter the float chamber from the supply pipe until it has reached a pre-determined height. At this height the gasoline causes the float to rise to a point where it closes the float admission valve or float valve.

### Float Valve

This is a small needle valve at side of float chamber that is caused to open and close by action of float. Should a particle of dirt or sediment by chance lodge on the float valve seat, it will allow the gasoline to leak through and cause the float chamber to flood or overflow. The obstruction can sometimes be dislodged by forcing the priming pin down once or twice, or by tapping lightly on side of float chamber. In event the valve seat should require regrinding, pumice stone should be used instead of emery, as the valve seat is brass and will allow the emery to become embedded, which may cause trouble later.

### Mixing Chamber

The mixing chamber is a tapering tube containing a spray nozzle and is located in the center of the float

chamber. The amount of gasoline allowed to flow through spray nozzle from the float chamber is regulated by the size of hole in spray nozzle, a dimension which has been determined by long and careful experiments and should not be enlarged or decreased. The suction caused by pistons causes the air to rush through the mixing chamber. The air is there mixed with the gasoline emitted from the spray nozzle, thus forming a combustible mixture.

### Auxiliary Air Valve

This is the only carburetor adjustment. It is located on the upper side of the carburetor and lies in a horizontal position. Its function is to admit the proper amount of air to compensate for the varying amount of gas the engine requires at different speeds. The construction consists of a leather valve held in place by a spring, and mounted on a threaded stem that affords an adjustment of spring tension before leaving the factory and requires readjustment only in extreme weather conditions. In extremely cold weather the mixture requires less air, and in hot weather more air. **To give carburetor more air** loosen thumb lock nut provided on valve stem; turn valve stem to right. **To give less air** loosen lock nut, turn stem to left.

### To Adjust Mixture

While motor is running with the throttle lever about one-fifth open, turn auxiliary air valve stem to left, not more than five turns. Proceed to turn valve stem slowly to right until you have reached a point where the motor runs best.

### Symptoms of Improper Mixture

Dense black smoke emitted from the muffler signifies that the mixture is too rich. The carburetor should be given more air, as above described. **Blue smoke signifies too much oil.** When the motor misses at low speed the trouble is usually caused by too rich a mixture. To remedy, give carburetor more air. Should the motor make a coughing noise when the throttle is opened suddenly, it is caused by too lean a mixture or too much air. To remedy give carburetor less air.

### Throttle Valve

This is located directly above auxiliary air valve, is of the butterfly type, and is actuated by the hand throttle lever on steering column and by the accelerator. Its purpose is to regulate the amount of gas admitted to the cylinders, and consequently the speed of motor, by turning on and shutting off the supply of gasoline vapor. It has, however, nothing to do with the adjustment of mixture.

### Throttle Valve Adjusting Screw

This is located on side of carburetor directly under the throttle valve lever. Its purpose is to prevent the throttle valve from closing entirely when the hand throttle lever on steering column is closed. Should the engine

run too fast or too slow with throttle lever closed, adjust throttle valve-adjusting screw to the speed desired.

### **Carburetor Drain Cock**

This is located at bottom of float chamber and is the lowest point in the gasoline system. Consequently it is the place where water will locate should, through oversight, any be allowed to get into the gasoline tank. It is good practice to drain off three or four ounces of the float chamber's contents at intervals of once a week. This will allow water or sediment to escape.

## **Ignition**

The ignition system consists of magneto, four dry cells, spark coil or transformer, and the necessary wiring.

### **Dry Cells**

Four dry cells are located in tool box compartment or under rear seat as per model of car. They are used for starting the motor and in cases of emergency. It is not, however, compulsory to start the motor on battery, as the motor can be started on magneto. See Starting Motor.

### **Spark Coil**

The spark coil or transformer is located on dash, or on rear side of motor, and contains electric switch. It has no adjustments and requires no attention.

### **Magneto**

This is located on left side of motor and furnishes principal and main supply of current for motor. It requires little or no attention, other than oiling with one or two drops of lubricating oil through oilers provided, about once a month. It has but one adjustment which is located in the breaker box on rear end of the armature shaft. Removal of the breaker box cover discloses two platinum contact points which, after much usage, become pitted so that a bad contact results. These points should be filed flat with a fine file, taking care not to file off any more than is absolutely necessary. Then reset the adjusting screw so that the break is no more nor less than one-thirty-second of an inch. This adjustment is necessary only about once in every ten thousand miles of travel.

### **Timing the Motor**

In case the motor has been entirely disassembled for overhauling or repair, great care should be exercised in assembling parts in proper position. Particularly is this true of the fly-wheel, correct position of which is determined by key in the crank shaft. The "O" mark on crank shaft gear should be set between two "O" marks on cam shaft gear. Then rotate crank shaft until tooth marked "M" on opposite side of cam shaft gear enters tooth-space marked "M" on pump-shaft gear.

After assembling the pistons, rods and cylinders on the crank case see that the valves open and close at the right moments, these being governed by the indicator lines

on the fly-wheel. To accomplish this operation insert a piece of tissue paper between valve-stem and push-rod of No. 1 cylinder, the forward one. Rotate the crank shaft to such a position that the plunger will exert a very slight pressure on the valve, testing the meantime by the tissue paper held in contact. Then at this position, the line marked "In O" (Inlet open) on the fly-wheel should point directly toward the center of the cylinder. If, with the valve in this position, the line does not point to the center, it will be necessary either to lengthen or shorten the valve stem, choice of the operations being determined by the direction in which it becomes necessary to rotate the fly-wheel. Rotate crank shaft until the plunger reaches a point of slight contact. Test with tissue paper as before. When the line on fly-wheel marked "In C" (Inlet closed) points directly toward center of cylinder, valve is closed.

Treat all inlet valves in similar manner. Treat exhaust valves in same manner as above, except that line marked "Ex O" (Exhaust open) on fly-wheel should point directly toward center of cylinder when exhaust valve begins to open. Similarly the line marked "Ex C" (Exhaust closed) should point directly toward center of cylinder when exhaust valve is closed.

In rewiring care should be taken that the connections are made according to number, the wire from No. 1 on the magneto communicating with cylinder No. 1 and so on. Similar care should also be exercised in the case of the wires leading from the magneto to the coil, the key being found in the corresponding letters.

### Spark Plugs

Four spark plugs are used, one in each cylinder. These are located directly over corresponding inlet valves. Their purpose is to carry the insulated electro to the interior of combustion chamber. The plug is constructed to form a gap or break about one thirty-second of an inch in the electric circuit. The gap is located at lower end of spark plug and within the combustion chamber. The gap effects a spark or electric flash, which causes the gas to explode within the combustion chamber at the proper time and sequence. The use of too much oil or too rich a mixture may cause the spark plug insulation within the cylinder to become sooted or carbonized and, as carbon is a conductor of electricity the deposit will short-circuit the current, not allowing it to jump the gap. This will result in engine missing or no ignition. **To remedy**, remove plug (with engine stopped) and clean insulator with gasoline or a small brush. The only plug adjustment is that of the gap between the electrodes which should be no more nor less than one thirty-second of an inch.

### Electric Wiring

All wiring should be kept clean, dry and free from oil, and all terminals securely fastened to the binding posts.

### Spark Lever

The spark lever (inner) is located, with the throttle, above steering column, its purpose being to advance or retard the spark. It controls the time at which the electric

spark occurs in the cylinders. Its retard position is back; its advanced position is forward. See Starting Motor.

### **Retard Position**

In retard or back position the spark lever causes the spark to occur late or after the piston has passed its highest point of travel, well down on its power stroke and the crank well past dead center. The purpose of this retard position is to prevent back-firing when motor is being started and before it has gained momentum. Do not run car with spark lever at retard position, as it will decrease the motor's efficiency, and may cause overheating. After motor is started, the spark lever should be advanced half-way or to the highest possible point that will not cause the motor to knock.

### **Advanced Position**

The advanced or forward position of the spark lever causes the spark to occur earlier in the stroke before the crank has passed dead center. While the gas explodes quickly, the explosion is not instantaneous. Early ignition, brought about by advanced position of spark lever, causes ignition to take place before the crank has passed its dead center on upper or compression stroke and gives the gas sufficient time to become fully ignited. The explosion will therefore deliver its maximum pressure immediately after the crank has passed the dead center, which, of course, results in a maximum motor efficiency.

## **Water System**

The radiator should always be kept full of clean, clear water, soft water being preferable as it is free from lime and other impurities that might accumulate on radiating surface and interfere with the cooling.

### **Water Pump**

This is located at the left side of motor on magneto driving shaft. It is of the centrifugal type and is provided with stuffing boxes at either end that require little or no attention. Should the stuffing boxes require repacking, use graphited self-lubrication packing. The purpose of the pump is to circulate the water in cooling system through cylinder water jackets to radiator, where it is cooled and forced back again, thereby keeping the motor at a constant temperature.

### **Poor Circulation**

In event the water passages are obstructed or the pin that holds the pump fan to the shaft becomes sheared, poor circulation will result, and the motor will overheat. To remedy, examine all water connections, and see that they are free from dirt and obstructions; examine pin in circulating pump. See Over-Heating.

### **Care of Water System in Cold Weather**

Do not allow water in water system to freeze, as it may cause damage to radiator, cylinders, water jackets and connections. An anti-freezing solution should be

used in cold weather. In event such a mixture is not obtainable and it becomes necessary to use pure water, be sure to drain water system through drain cocks provided at bottom of radiator and pump, as soon as motor is stopped.

### Anti-Freezing Solution

There are numerous anti-freezing solutions on the market, but the ones we know to give satisfactory results are as follows:

1. For temperature not lower than 10 degrees below zero:

Wood Alcohol.....	20%
Glycerine.....	10%
Water.....	70%
2. For temperature not lower than 20 degrees below zero:

Wood Alcohol.....	20%
Glycerine.....	20%
Water.....	60%
3. For temperature not lower than 25 degrees below zero:

Wood Alcohol.....	50%
Water.....	50%

## Crank Case

The crank case is the aluminum engine-base that contains crank-shaft and bearings, and on which the engine cylinders are mounted. See Lubrication and Cleaning Crank Case.

## Cylinders

The cylinders are cast in pairs and mounted on crank case. They form the combustion chamber in which the explosion takes place. They require no attention other than being kept well lubricated and occasionally cleaned. See Motor Lubrication.

### Cleaning Cylinders

By the use of poor cylinder oil or after long usage, the cylinder heads will become corroded with carbon that should be scraped out by removing cylinders. While cylinder casting is removed, scrape or clean off any carbon that may have accumulated on piston heads. Also clean piston rings with kerosene oil and see that both piston and piston rings are thoroughly lubricated with cylinder oil before replacing cylinders. In replacing cylinders care should be taken not to **break or damage the piston rings.**

### To Prevent Corroding

To prevent corroding use good lubricating oil and, once a week, inject into cylinders, through cocks provided, four ounces of a 50% mixture of kerosene and cylinder oil, allowing this to remain in cylinders all night. This will tend to soften the carbon and cause it to be discharged through the exhaust, upon starting the motor. It will also free the piston rings, should they become sticky or gummed.

## Valves

These are located on left side of motor and regulate the admission and exhaust of gases.

### Inlet Valves

The inlet valves, or admission valves, regulate the admission of live or unburned gas from carburetor into cylinders. Should they leak, poor compression will result, which may cause back fire through carburetor. To remedy, see Grinding Valves.

### Exhaust Valves

These regulate the exhaust of dead or burned gases from cylinders to exhaust pipes and thence into muffler. Should they leak, loss of compression, lack of power, and over-heating will result. To remedy, see Grinding Valves.

### Grinding Valves

The exhaust and inlet valves occasionally become gummed with oil, especially after car has been left standing for some time, and should be cleaned with kerosene by removing exhaust valve caps at top of cylinders. Should either the exhaust or inlet valve seats become pitted after long usage, the valves will leak. They should be reground with powdered glass and oil. To do this it will be necessary to remove the valve caps and disconnect springs at bottom of valve stems. During the operation fill valve ports leading into the cylinders with waste or cloth to prevent any powdered glass from getting into the cylinders. Remove valves and carefully clean all carbon and corrosion that may have accumulated. Apply the powdered glass and oil to valve and valve seat; replace valve and turn with special valve-grinding brace, pressing down lightly about ten revolutions in one direction, then reverse, lifting valve slightly occasionally to allow the oil and powdered glass to flow between valve and seat. Remove valve, clean off oil and powdered glass for inspection, and note whether valve seat has a continuous ring of contact. If not, repeat the operation until it has. After which clean valve and seat thoroughly with kerosene. Polish the valve and seat by grinding with tripoli and kerosene. When valve is finished lubricate stem before replacing.

## Cam Shaft

This is located within the crank case and is oiled by the motor lubricator. It has no adjustments and requires no attention. Its construction is a hardened shaft with eight cams, forged integral. Its purpose is to open and close the inlet and exhaust valves at the proper times and in regular sequence. If the cams become worn, the fact can be determined by the height of the valve lifts, which should at all times be one-quarter of an inch.

## Engine Bearings

A pronounced knock in the motor, while car or motor is cool, often indicates a loose bearing which can be



examined by removing drip pan and hand-hole coverings at bottom of crank case. In event any of the bearings are found to be loose they should be tightened at once.

### **Over-Heating**

If the motor shows a disposition to knock, smoke, lose power or cause the water in the radiator to boil, it is over-heated and should be shut down at once. Over-heating is usually caused by lack of water in radiator or insufficient lubrication. It is sometimes caused by too rich a mixture or by forcing a motor too hard while new. To remedy, open hood and allow over-heated motor to cool off. Examine motor oiler and see that it contains a sufficient supply of oil. If water is low, refill radiator. In case of too rich a mixture, give carburetor more air, as described in Carburetor Adjustments.

## **Running Gear**

### **Foot and Hand Brakes**

The foot or service brake operates the outer pair of contracting brakes, mounted on both rear wheels. The hand or set brake operates the outer expanding brakes mounted on both rear wheels. Adjustments for both are provided on the pull rods that extend from brake actuating levers to the brake proper.

### **To Adjust Brakes**

Jack up both rear wheels and shorten pull rods, being careful to note that both wheels turn with the correct resistance.

### **Operation of Brakes**

The foot brake is the ordinary service brake and should be used while running. The hand or set brake is used in cases of emergency or when car is left standing. Either brake in proper adjustment is sufficient to slide wheels, though such practice is far from the most efficient method of stopping the car and is particularly destructive to the tires.

### **Spring Clips**

Examine spring clips occasionally to see that they are kept tight, as a loose spring clip is often the cause of a broken spring.

### **Torque Arm**

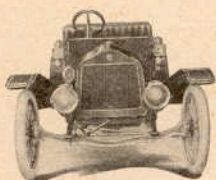
This is a steel arm running from end of transmission case to the frame center cross-member. Its purpose is to take the torque of the axle caused by the driving pinion. As it is subject to considerable vibration it should be examined occasionally to see that the four nuts that hold it to the transmission case are tight.

## Tires

All tires are guaranteed by their respective manufacturers. In case of defect, claims should be taken up with them direct.

## Care of Tires

See that tires are kept inflated with the pressure inscribed on side of casings. Do not allow tires to stand in oil or gasoline, as either will dissolve the rubber. For full instructions apply to manufacturers.



## Driving Hints

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Do not expect your motor car to give 365 days of service in a year without attention from you. Give it half the attention you would to a horse and it will do the work of many horses.

A locomotive running on two ballasted steel rails is thoroughly looked over at the end of each day's run. A motor car must traverse all manner of roads, yet many owners expect it to live forever without oil or adjustment.

The wise driver is the one that drives two or three blocks ahead, i. e., always keeps his eye on the road ahead instead of just in front of his wheels, and so gauges the speed and the distance that the car is stopped without jar to the mechanism or strains on the rubber and fabric of the tires. Some drivers have the habit of letting the car go full tilt until within a few feet of an object or a turn, then abruptly slacking the pace by a severe application of the brakes. This causes unnecessary wear on the brake shoes, requiring frequent adjustment, excessive use of gasoline—for the car would have coasted several yards on its own momentum had the throttle been closed earlier—and grinds off rubber very rapidly because of the severe stresses set up in stopping the momentum of the car.

Do not be afraid to use the horn—a pedestrian has some rights to consideration, and nothing is more unpleasant to the man on foot than the sensation of having an automobile unexpectedly shoot past him. Though you may know he was not in danger, he will never know it, and many a motor-hater has been developed by this kind of treatment on the part of the automobilist.

When touring through strange towns it is always well to inquire for the dealer who sells the car you drive. He won't owe you anything on that account, but nineteen times out of twenty he will treat you just a little better than any other dealer would. Besides, he will give you tips where the other fellow naturally will give you knocks.

Your car won't run without gasoline, oil and water. It is a good practice to always make sure yourself that you have these before starting, even on a short trip.

The best investment a motorist can make is a reliable speedometer. You never realize how many miles you go or how far you drive in a day until you have an accurate record before you. Keep an account of the miles traveled, of the dates when the car was inspected and oiled, and of the fuel used.

Every time the gears clash noisily there is harm done. And the harm is not confined to the gears alone—it extends to motor clutch, universal joint, rear axle and even to the tires. Study the theory and principle of the selective sliding gear—the ratios and relative speeds of

primary and secondary gear sets—and master the art of noiselessly slipping from one gear to another. If you will do this you will never have any gear or axle trouble.

Don't permit your motor to "race" when changing gears—it is most harmful. Master the art of gently accelerating the motor as you let in the clutch—also gently.

If your front tires wear excessively on the tread it is a sure indication that one or both of your front steering knuckles, or steering knuckles cross rod, is bent—probably caused by miscalculating the radius when turning and hitting the curb—perhaps by a skid. Take your car to the nearest repair shop and have the steering knuckles straightened so the wheels will stand parallel. It is best to straighten them without heating, as, if heated to more than a dull red, the heat treatment to which all forged parts of E-M-F "30" and Flanders "20" cars are subjected, will have been nullified and the quality of steel impaired. Do not make the mistake of thinking that because your front wheels are closer together at the bottom than at the top, there must be something wrong. This is as intended; it is a correct design, and for making the car turn more easily and minimizing wear on front tires.

A squeak anywhere in the car is a warning that something needs oil—quickly. It probably indicates that more than one part has been neglected, so it is a good plan to go over everything.

A loose fender or drip pan will cause an unpleasant squeak or grating sound—one or more nuts need tightening.

No matter how tight nuts are turned at the factory, bolts will stretch slightly in use. Once every thirty days every nut in the car should be gone over and tightened one-eighth to one quarter turn—until they "feel" right. Be sure the cotter pins are correctly replaced.

When trouble develops after the car has been in a repair shop do not blame the manufacturers. Repair men are not infallible, and nine times out of ten it was due to carelessness or oversight in replacing a part that has caused the new trouble.

The average motorist is often easy prey for the carburetor salesman—the fellow who always has some better carburetor than the automobile manufacturer has developed. The reason they find so many victims is because it is so easy to adjust any old kind of carburetor to meet certain conditions on a certain day and in a certain climate. They will give you more speed or better touring qualities—but not both, and you have no way of accurately determining the results such as we have. Hundreds of owners buy other carburetors and write us about their superiority—and a few weeks later we find they have the original carburetor back on the car again.

If solid tires were adaptable to touring car service every manufacturer in the world would use them. They are not. Millions of dollars have been spent in determining this, and it useless for you to spend any more unless you have money to throw away. And then please don't blame the car when it shakes to pieces—it was designed to ride on air.

Proper care of the tires will double their life. Read the Morgan & Wright booklet on this subject and profit by it.

Gasoline economy is mostly up to the driver. Drive with the spark well up, and you will use less gasoline. If you do not want excessive speeds you can adjust the carburetor so that it will be very economical.

Do not carelessly turn your switch over to the battery side and leave the car standing and then blame the coil for breaking down. The word "off" on the switch is there for a purpose—be sure your switch plug points straight up and down when you leave the car—better still, put in your pocket.

Do not bore holes in the frame to attach accessories without first noting where there are other holes already. Many a frame is weakened to the breaking point by this oversight.

A top is much better up than down. Even if you do not like to drive with the top up it is a good plan to put it up at night to keep the cloth stretched and aired.

A good wind shield such as we list is one of the greatest luxuries in motoring. It saves the eyes from dust and gnats and avoids many an accident when driving in the rain or snow.

Your E-M-F "30" car will climb any hill on high gear any other good car will climb, but that is no reason why you should climb them that way. The intermediate gear is there for a purpose, and it lengthens the life of your motor by enabling you to climb all heavy grades on intermediate. As soon as a motor begins to "labor" or knock, the bearings are suffering a severe pounding, and the habit of keeping the high gear in as long as she will stand, results in loose connecting rods and other troubles.

If every owner of a car understood all the mechanical principles involved in its construction it would be a splendid thing for the maker. The car would give much more satisfaction under intelligent usage and care. The trouble is, the average man as soon as he becomes at all familiar with the mechanism of his car, begins to tinker in the effort to "improve" on the maker. His chances of success are about as great as that of the vivisectionist on his victim. The doctor may learn something, but the patient will never be quite as good afterward.

Your radiator should be drained and cleaned once a month and oftener if the water you use contains alkali or sediment. It is conducive to long life in a radiator to use nothing but rain water.

Bumping the bumps at high speed and over rough roads is expensive fun. The car will stand it for a time, but you may be sure trouble will develop later, in the most unexpected places and at the most unexpected time.

It is a bad practice for several different people to drive the same car. Things happen to it that never can be accounted for or the responsibility properly fixed.

Familiarize yourself with the rules of the road—they are the same as rules for navigation—vehicles coming from the left always have the right of way.

The observance of one cardinal rule of the road or its non-observance indicates that the driver is a gentleman—or selfish. This rule is: If you overtake any vehicle on the road you have the right to pass him, but a proper consideration for the rights and pleasure of others dictates that you must maintain the same speed at which you passed until you are well in front, so that he does not have to eat your dust.

In case of unfair or discourteous treatment of Studebaker Corporation customers on the part of dealers we should like to be informed. Please give us an exact statement of the facts with as little bias as you can. The case will be investigated quickly and thoroughly.

If you are ever in Detroit we will esteem it a favor to have you call; we will be glad to take you through the factory and show you how the car is made. You will be more enthusiastic and better satisfied with your purchase ever after. When the owner or agent for some competing car tells you that his car is better made than E-M-F "30," get him to specify in what particular. Then write us and we will give you the exact answer. We do not make a practice of knocking other cars, but we will tell you some facts about how the Studebaker Corporation makes cars that he cannot controvert—nor equal.

If you smell a gasoline odor and think it is a leak, do not look for it with a match or with a cigar in your mouth. Cars are sometimes burned up and their owners badly scorched by this thoughtless act. Push the car out of its position so it will not rest over the pool of gasoline that has leaked out. Then with the bare hand run along the gasoline system, from tank to carburetor, until you have located the leak.

When filling the gasoline tank always extinguish the lamps and be sure your cigar is not lighted.



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# E-M-F 30

## LUBRICATION DIAGRAM EXPLANATION OF KEY LETTERS

OD—OIL DAILY

OW—OIL WEEKLY

OM—OIL MONTHLY

GW—GREASE WEEKLY

GM—GREASE MONTHLY

HGW—HEAVY GREASE WEEKLY

HGM—HEAVY GREASE MONTHLY

