

CHALMERS-DETROIT FORTY

INSTRUCTION BOOK
1909

Chalmers-Detroit Motor Co.

Formerly E. R. Thomas Detroit Co.

Detroit, Michigan

OWNER'S REPORT

THIS blank properly filled in and mailed immediately after receipt of your car to the Chalmers-Detroit Motor Company, Detroit, Michigan, will constitute a registration of address at the factory and will insure your receiving copies of all circular letters, instructions, suggestions and general communications of interest, as well as many courtesies upon the part of the Home Office. Please cover the following items:

Car No. (see plate upon dash).....

Operation of car.....

Motor No. (see boss upon right hand crank case arm).....

Finish of car.....

From whom purchased.....

Equipment (the checking list which accompanies each car should be carefully checked and any shortages or discrepancies reported below.)

REMARKS:

.....
.....
.....

Name of purchaser..... Occupation.....

Street and number.....

City..... County..... State.....

Be sure and lubricate your machine thoroughly before putting it into service.

Chalmers-Detroit Forty

Instruction Book

1909 Model E 40-h.p.

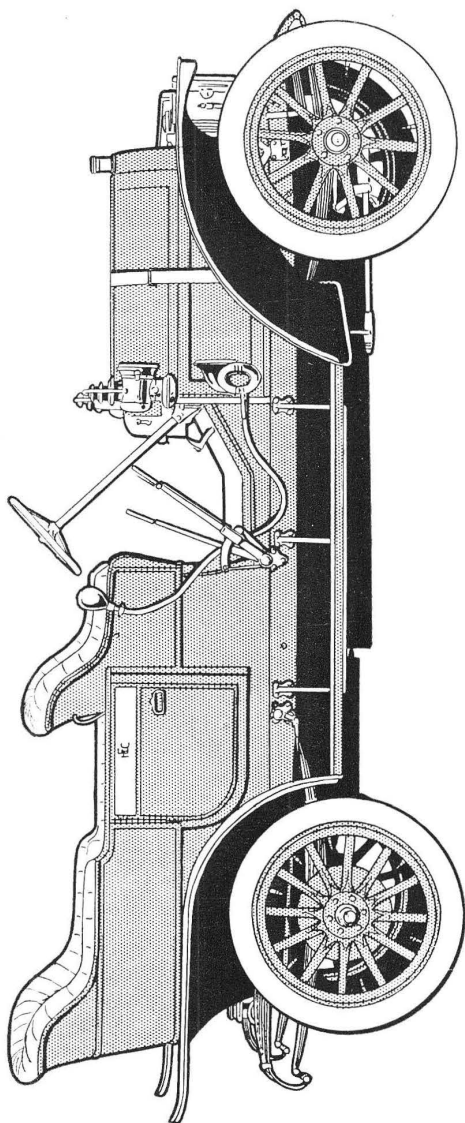
Price \$2750.00

Touring Car or Runabout

Chalmers-Detroit Motor Company

Formerly E. R. Thomas Detroit Co.

Detroit, Michigan, U. S. A.



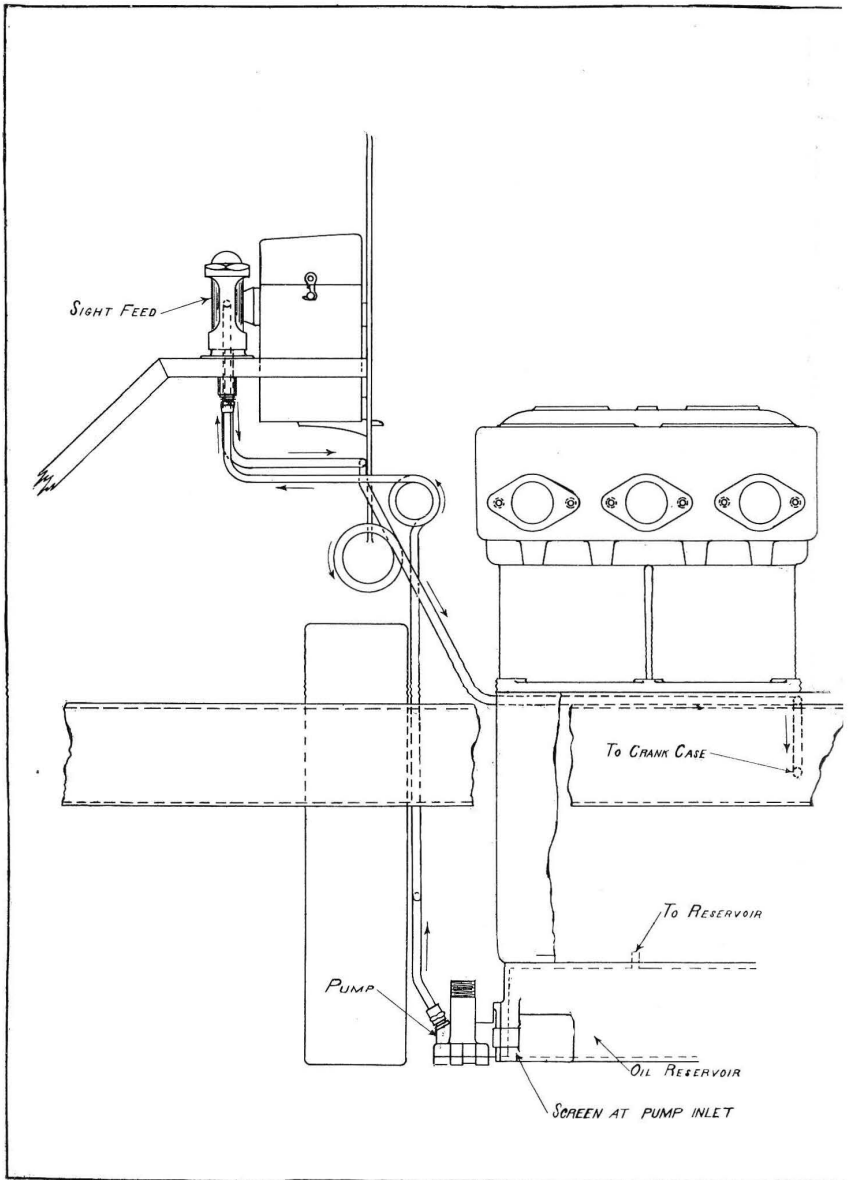
Chalmers-Detroit Forty Touring Car. Price \$2,750

Inspection of a Car when Received from Factory

WHILE it is the aim of our Manufacturing Department that every car shall be placed in the hands of the customer in such condition as to be ready for the road, it is always advisable that a car be looked over thoroughly immediately upon receipt from the Dealer or the Transportation Company, to check up any damage which may have been received in transit. We send with each car (inside front cover of this book) a blank upon which we request that a report be made covering the result of such inspection, this report to be filled in immediately after receipt of the car. This blank, properly filled in and mailed to the Chalmers-Detroit Motor Company, Detroit, Michigan, will constitute a registration of address with the factory and will insure to the owners copies of all circular letters, instructions, suggestions, general communications and many courtesies direct from the Home Office.

¶ Careful attention to the points covered in the following pages is earnestly requested, as we have outlined herein that information which will be found of the greatest value in the care, adjustment and operation of our Cars.

Chalmers-Detroit Motor Co.



Chalmers-Detroit Forty Oiling System

LUBRICATION

Warning.

A car leaving our factory is sufficiently lubricated for at least twenty-five (25) miles of road work. We do not, however, assume responsibility for any damage traceable to lack of attention to this item upon the part of the operator. All grease cups, oil cups and the motor crank case should be given attention before starting the car.

Motor.

Open the upper of the two try cocks which are found upon the left hand side (looking forward) of the oil tank bolted to the bottom of the crank case, and through the breather tube upon the front left hand crank case arm add the best grade (the cheapest in the end) of gas engine oil until the try cock level is reached. Do not forget to close try cock. The oiling system will be found to hold from $1\frac{1}{2}$ to 2 gallons. The sight feed upon the dash will show at all times the flow from the pump into the crank case.

The lubrication of the entire motor is by means of a constant level splash system.

From the oil compartment beneath the crank case, a gear pump, driven by the commutator shaft, forces a stream of oil through a sight feed glass upon the dash and thence into the crank case of the motor. The oil within the crank case is permitted to rise to such a depth that the connecting rods just dip into it in their travel, and this depth is insured and maintained by means of small stand pipes of proper height through which the oil overflows into the oil compartment, whence it is again removed in due time by the gear pump. Two try cocks will be found on the left hand side of the oil compartment below the water pump, these being for convenience in testing the amount of oil in the tank.

Additional Oil.

Additional oil may be added after from one hundred to two hundred miles running as may be found necessary. Excess of oil may be remedied by the slight lowering of the oil level within the crank case, accomplished by a reduction in the height of the stand pipes. (These pipes being threaded into the case for this purpose.)

Draining Crank Case.

Drainage of oil from the four compartments of the crank case may be accomplished by the removal of the four $\frac{1}{8}$ " pipe plugs which will be found in a row along the top of the oil compartment upon water pump side of engine. After 500 miles drain out old oil and replace with a fresh supply. Crank case should be flushed out with kerosene when drained.

Time Gears.

The lubrication of the timing gears is taken care of by the oil working through the front main bearing from the crank case and through the ball bearing of the cam shaft. Experience has taught that this is entirely ample. A drain hole is drilled back from this time case into the crank case at such a height that the crank shaft gear just dips in the oil. Should an operator so desire, this time gear case may be packed in K No. 4, a mixture of non-fluid oil and graphite, having a melting point of 488° and manufactured by the New York & New Jersey Lubricant Co., of New York. Before putting this heavy grease into the gear case, be sure and plug the drain hole into the crank case. Otherwise the heavy grease will work through into the lubricating oil in the crank case.

Commutator.

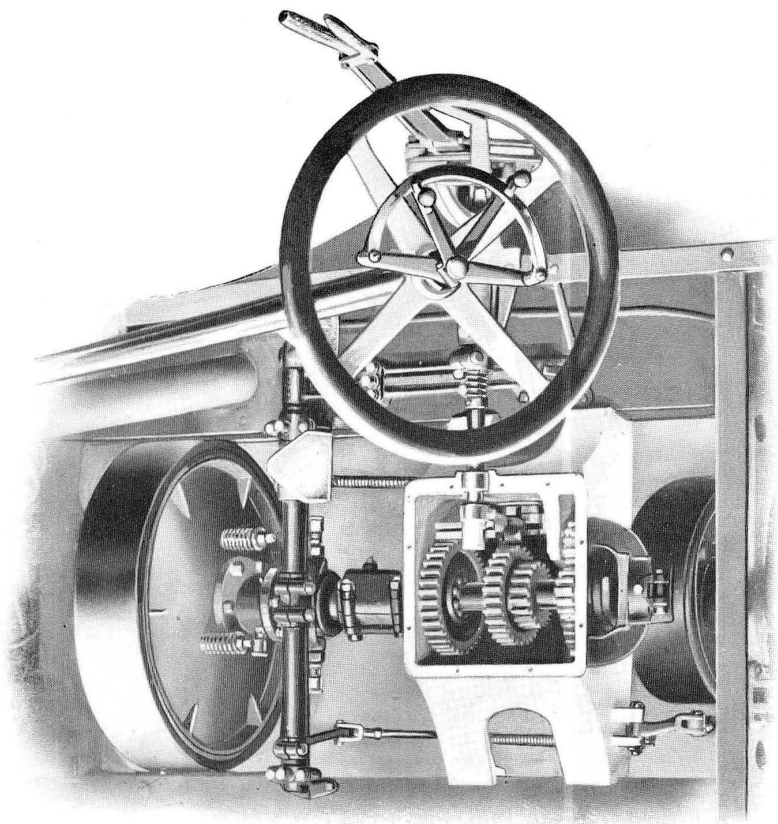
Remove the cover of the commutator occasionally for an examination of the contacts. Remove the old lubricant and pack with a little vaseline. Add a little thin oil occasionally.

Clutch Hub and Throwout Mechanism.

The clutch hub and throwout mechanism is provided with grease cups and oil cups, which should be turned down each day. Use No. 3 Arctic grease in grease cups. The clutch thrust ball bearing is reached through plug in cone and should be lubricated with oil occasionally.

Transmission.

Keep the transmission case one-quarter full of lubricant. Use No. 3 Arctic grease together with a quantity of thin oil (ordinary cheap steam engine cylinder oil may be used). This thin oil will thoroughly lubricate the bearings of the internal shaft within the squared shaft. In cold weather more thin oil should be added than in warm weather and in fact in winter a heavy, cheap steam engine cylinder oil may be used exclusively. Cold has a tendency to stiffen grease and the oil will be found to be the best lubricant for this reason. The stuffing boxes with felt packing rings may be adjusted to prevent leakage. Remove the gear case cover for inspection after each 1,000 miles of use.



Chalmers-Detroit Forty Clutch and Transmission

Fan Bearings.

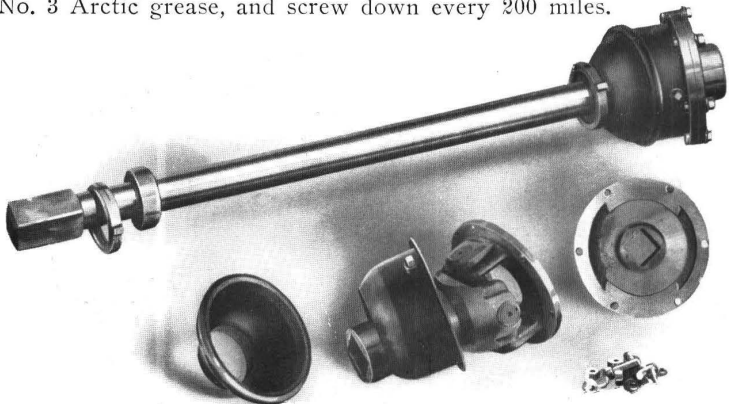
Oil freely and frequently through oil cup on fan hub.

Steering Gear.

The steering gear should be oiled freely. Add No. 3 Arctic grease and oil through plug in cover of case and turn down grease cup upon ball-arm-shaft bearing occasionally. Oil thrust-bearings freely through oil cup at top of case.

Steering Connections.

Keep boots upon fore and aft ball joints and cross rod clevises in order and packed with grease or grease mixed with graphite. Fill grease cups on wheel pivots and cross rod clevis bolts with No. 3 Arctic grease, and screw down every 200 miles.



Propeller Shaft and Universal Joint

Dust proof brass caps and dust proof slip joint are shown. Both front and rear joints are flange-coupled, so that shaft and joints may be removed readily, leaving the flanges against which they bolt upon the shafts. Bushings are of hardened steel. These joints should be kept packed in a mixture of Albany grease No. 3 and a little graphite. The addition of a little lubricating oil occasionally will be found beneficial.

Timken Roller Bearings.

Timken roller bearings are used in the rear axle and front wheels. Use No. 3 Arctic grease. Put grease on rollers, cones and spindles. Look at the bearings once a month. Pack rear axle gear case one-third full of No. 3 Arctic grease and a little graphite. Add a little thin oil through oilers in wheel hubs occasionally. If too much thin oil is used, the grease will work out upon the braking surfaces, and destroy their efficiency.

Clutch.

The three main clutch springs should be kept at approximately even tension. This tension should be just sufficient to prevent the clutch from slipping, for if too tight, unnecessary strength must be exerted to throw it out.

Clutch leather should have an occasional treatment of castor oil or neatsfoot oil and, if desired, a little powdered soap stone. Such treatment, together with a proper adjustment of the flat cushion springs beneath the clutch leather, will give the smoothest possible clutch action. For extreme service the clutch springs may be tightened. A slipping clutch may be remedied temporarily by the use of a little powdered resin.

This clutch is more than ample for the transmission of the power of this motor and if slippage cannot be stopped by a slight adjustment of the clutch springs, it may be found that the clutch hub bearing bushing is bottoming against the fly-wheel nut, or the clutch spring pockets may be bottoming on the thrust spider.

Grease cups on clutch throw-out mechanism should be turned down daily. Clutch to transmission coupling should be packed in No. 3 Arctic grease and graphite once a week.

Springs.

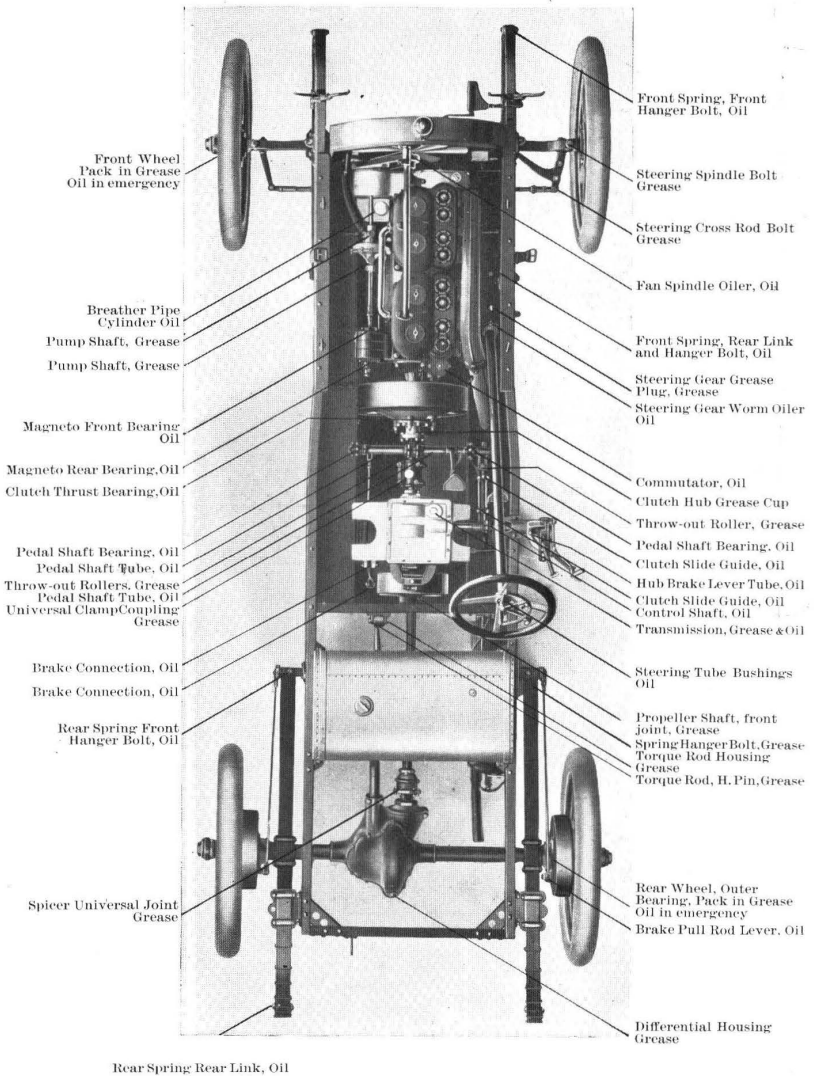
The spring leaves are coated with graphite paint before leaving factory. Spring eyes and shackle bolts should be oiled freely. Springs may be made *very easy riding* by an occasional liberal application of oil at the edges of the leaves throughout their entire length. To insure the best results, the spring clips should be loosened up before applying the oil. Particular care should be taken, however, to insure that the nuts are afterward drawn up absolutely tight. The *very best insurance* against spring breakage is the occasional setting up hard of spring clip nuts.

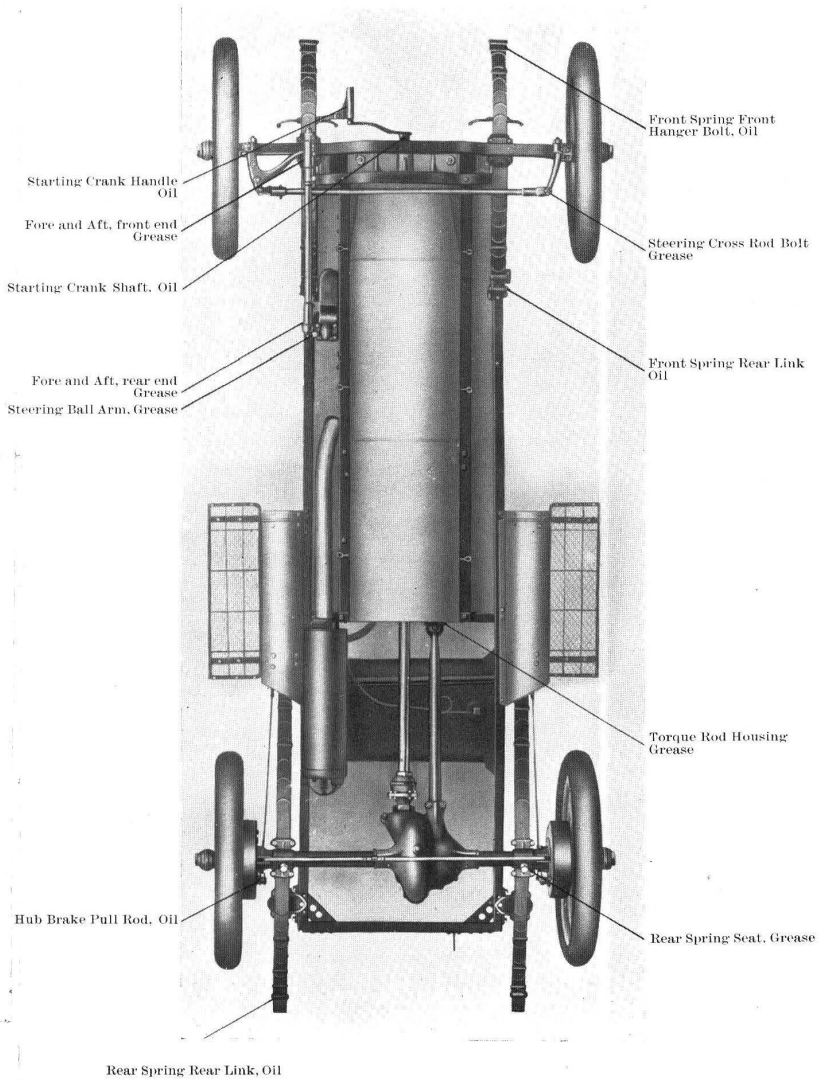
Rear Spring Seats.

Grease cups upon the spring seats on the rear axle should be turned down occasionally.

Squeaks.

Should be located and remedied at once. They are usually caused by lack of lubrication at some point or by movement of the body where attached to the frame. The use of an oil can will remedy the former and a tightening down of body-to-frame bolts will fix the latter. Leather or rubber liners or washers are used





between the body and frame. Any binding of the tonneau doors may always be remedied by the use of an additional leather washer about the middle body-to-frame bolts.

REMEMBER that "proper lubrication and attention will minimize your repair bills."

WE RECOMMEND THE FOLLOWING OILS AND CUP GREASES FOR USE ON OUR CARS.

Crank Case.—Use only best grade of gas engine oil. Avoid any oil that causes a serious carbon deposit in the cylinders, no matter under what brand it may be sold.

An analysis of one good gas engine cylinder oil is as follows:

Specific Gravity.....	.870
Baume	31.0
Viscosity at 100° Fahr.....	181 seconds
Viscosity at 210° Fahr.....	45 seconds
Flash Point	405° Fahr.
Fire Test	460° Fahr.
Carbon Residue32%

Pump Shaft.—New York and New Jersey Lubricant Company's K No. 1 non-fluid oil.

Time Gear Case.—Gears are lubricated by oil from crank case. Should grease be added to the time gear case, use K No. 4 non-fluid oil, melting at 488° and manufactured by the New York & New Jersey Lubricant Co., of New York. Addition of this grease should not be necessary, but if used, be sure and plug the ¼" drain hole between timer gear case and crank case.

Front Wheels.—Use Standard Oil Co.'s No. 3 Arctic Grease.

Transmission.—Use No. 3 Arctic Grease and oil or K-oo special, manufactured by New York and New Jersey Lubricant Co. Heavy cheap steam engine cylinder oil may be used in cold weather.

Transmission to Clutch Coupling.—No. 3 Arctic Grease and graphite.

Rear Axle.—Should be packed one-third full of No. 3 Arctic Grease and a little graphite and thin oil.

Driving Shaft Universal Joints.—Pack with No. 3 Arctic Grease mixed with a little graphite. Add thin oil.

Steering Gear.—No. 3 Arctic Grease with occasional liberal addition of thin oil for softening up the heavier lubricant.

Grease Cups.—Standard Oil Co.'s No. 3 Arctic Grease (except for pump shaft).

Steering Connections.—No. 3 Arctic Grease to be packed in all leather boots. Graphite can be added.

OPERATION

Starting the Motor.

Throw on the hand brake; throw the gear shift lever into its middle or neutral position; place spark lever at letter C stamped on sector; insert switch plug, and if the motor does not start of its own accord after spark lever has been moved slightly backward and forward, it will be necessary to use the starting crank. Ordinarily motor will not start upon the spark unless warm.

Cranking the Motor.

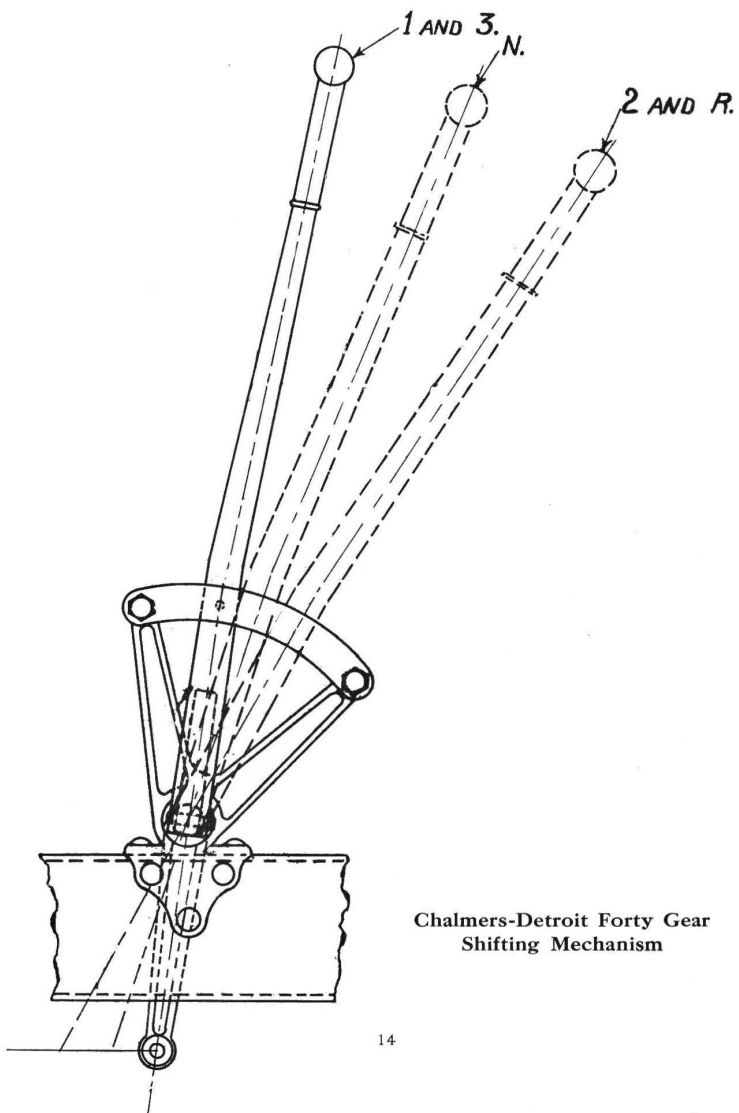
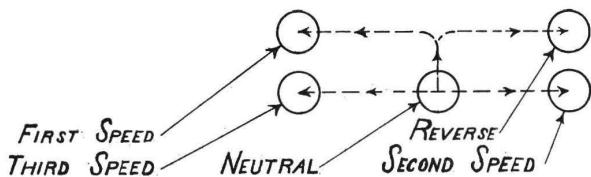
Always when cranking the motor, see that the spark lever (the shorter one) is placed upon the letter C. The "cranking" should always be accomplished by turning the motor over compression by means of a quick upward pull. **Never under any condition push down on the crank.** If the motor has been standing for some length of time, pull out the priming rod ring two or three times. This will be found beneath the lower right-hand corner of the radiator. Next turn the motor over two or three compressions with the sharp, upward pull as above. The throttle lever should stand during this operation in a slightly "open" position. The motor should start readily, and if it does not do so, repeat the operations described.

Priming.

Should the motor, however, owing to the extreme cold or other cause, refuse to start with ease, do not tire yourself out with cranking—lift the bonnet upon the right side of the motor, take the smaller of the two oil cans found there and "prime" the cylinders with gasoline through the small brass priming cocks in the top. This small oil can should be kept filled with gasoline for this purpose, and its supply may be at any time replenished from drain cock in the gasoline line near the shut-off valve under left side of gasoline tank.

Starting Car in Motion.—Shifting Gears.

With the motor turning over slowly under a nearly closed throttle, take the operator's seat, putting the left foot upon the clutch pedal and the left hand upon the steering wheel. Holding the clutch disengaged with the foot, release the emergency brake with the right hand and shift the gears into first speed also with this hand. Starting with the gear shift lever in neutral position, first speed will be reached by swinging the lever inward and pulling



Chalmers-Detroit Forty Gear Shifting Mechanism

it to the rear. The clutch may now be eased into engagement with the flywheel, the spark and throttle levers on the steering wheel being slightly advanced by the right hand as experience may dictate. Reverse may be had from the neutral position by swinging the lever inward and pushing it forward. A safety shoulder upon the gate within the gear box prevents the unintentional throwing in of the reverse when changing from low to intermediate. Always disengage clutch when shifting gears. From first, the lever may be moved into neutral, swung over to the right and pushed forward into second. The movement from second to high is straight backward.

The gear shifts from first to second and from second to third (high) speed may now be made as the car accelerates.

Clutch.

Never under any condition permit the clutch to drop in so quickly as to cause the motor to knock and pound. Do not start the car with a jerk. Allow the clutch to enter gradually and smoothly, removing the foot from the clutch pedal only when the car is under way.

Never throw open the throttle or advance the spark lever so quickly as to cause the car to "jump" or the motor to pound. Such a proceeding may give a feeling of great power, but is unnecessarily hard upon the motor and driving gear and is a mark of the inexperienced driver.

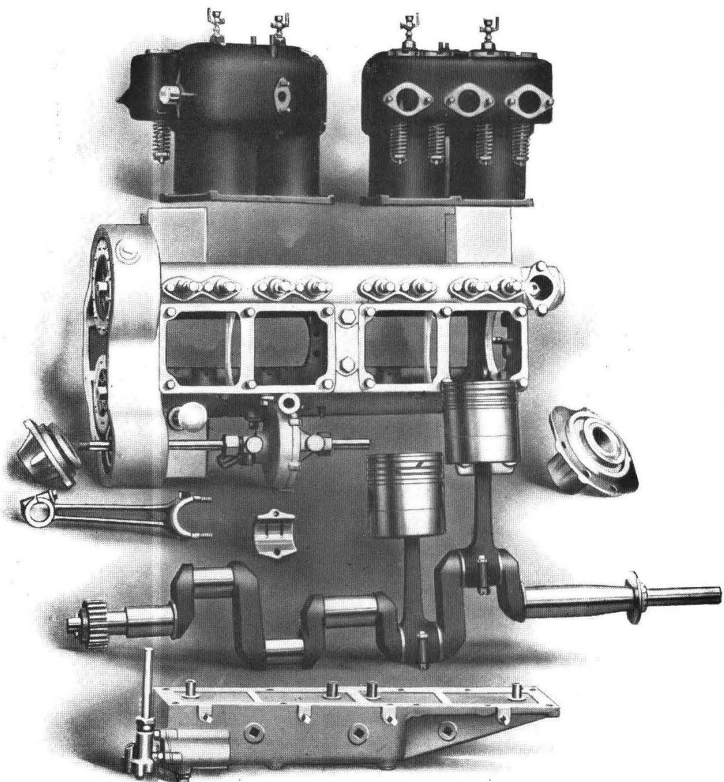
Especial care should be exercised in this respect where the foot accelerator is used.

Brakes.

Upon long hills especial care should always be taken to save the brakes. Wear on the brake shoes may be largely prevented by alternating from the foot to the hand brake, thus giving each an opportunity to cool off. Also it is frequently advisable to throw into the intermediate or low speeds and allow the motor to act as a brake. Under this latter condition the clutch may, of course, be handled with the foot, permitting the car to coast freely upon long grades as may be desired. In extremely mountainous sections some operators prefer to remove the emergency clutch throw-out connection so that the motor, foot brake and the emergency brake may be used either separately or at the same time. Brakes are lined with "Thermoid," a lining which experiments have proved to be the best suited for the purpose. It is made by the Trenton Rubber Mfg. Co., Trenton, N. J.

To Stop Car.

To stop the car, close the throttle, bring spark lever back to C, throw out the clutch by pressing on left foot pedal, at the same time using transmission brake, or, if intending to stop for some time, use the hub brakes. To stop the motor, pull out the switch plug. When leaving car, *always leave gears in the neutral position* and set the hub brakes.



Chalmers-Detroit Forty Motor Disassembled

CARE AND ADJUSTMENTS

Valve Timing.

Valve timing and dead centers will be found stamped upon the flywheel. A small pointer at the rear of the crank case adds much to the convenience of retiming. A combined tool for the removal of valve and clutch springs will be found in the kit. Among the outfit will be found special wrenches for the adjustment of bearings and for the removal of valve caps.

Bearings.

The adjustment of the connecting rods and middle main bearing is accomplished in the usual manner, by the removal of liners. The end main bearings are made non-adjustable, but of large size and replaceable, and these and all other bushings are die-cast from special bearing material. All other bearings upon the motor are Hess-Bright Annular Ball Bearings and require no adjustment.

The fan belt tightening device is simple and needs no explanation.

Removing Crank Shaft.

To remove the crank shaft, drain oil compartments and remove oil reservoir. Remove connecting rod bearing caps. Then remove crank shaft drive gear and starting stub. (Flywheel may be removed if desired). Loosen middle main crank shaft bearing support by removing large cap screws which hold it in position. Loosen rear crank case door which carries rear main bearing. Then pull entire crank shaft assembly back through rear door.

Cleaning Oil Pump Screen.

Occasionally, especially if the sight feed shows that the pump is not working well, it may be necessary to clean the oil pump screen. To accomplish this, remove the oil pump by loosening the coupling and removing the holding-down nuts. The pump may then be removed and the cylindrical oil screen removed and washed with gasoline. Reassemble in the reverse manner.

To Remove Time Gear Case Cover.

To remove the time gear case cover, disconnect the hose clamps in the water piping to and from the radiator, disconnect the radiator distance rod, remove nuts from radiator studs, and lift off the radiator. Remove the starting crank (this may be slipped out by the removal of the one locating cotter pin beneath radiator support) and unscrew starting stub. Remove the fan driving pulley. The gear case studs and screws may now be removed and cover lifted off.

To Remove the Cam Shaft.

To remove the cam shaft, remove gear case cover, as above, also valves. Remove locking device on collar behind time gear, unscrew this collar and pull the cam shaft out.

To Remove Valves.

To remove valves, remove the valve plugs, using the special spanner wrench provided for this purpose, raise each spring with the special spring tool (see kit) and pull out the key under the spring seat. This allows spring to drop down. The valve is then removable through the plug hole.

Pressure Regulator.

The reducing pressure valve for the gasoline feed is used as regular equipment on runabout, and will be found upon the dash just behind the exhaust manifold.

To adjust the pressure regulator, place the car, with tank nearly empty, upon an extreme up-grade and regulate until the engine runs satisfactorily. Be sure that the lower valve on the regulator unseats with the impulses of the engine, and that the three-way cock under the driver's seat is so turned that the tank is closed to the outside air.

When oiling up, it is well to twist the pressure regulator valves on their seats a few times, using the valve stems, to insure that no soot is holding the valves open.

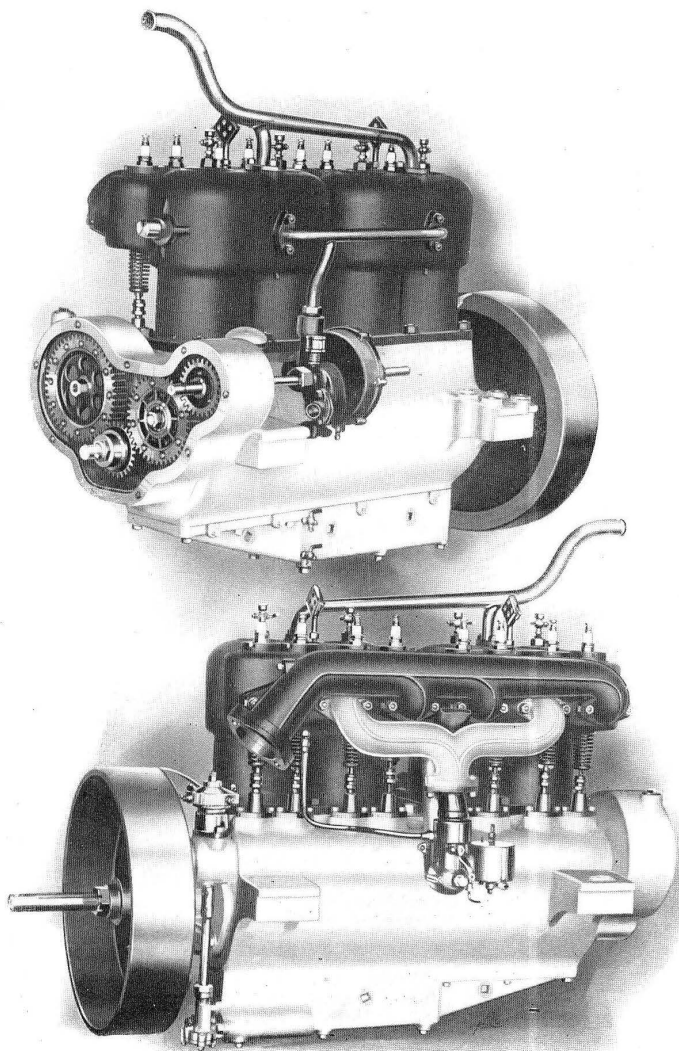
The drain cock should be opened once each week, thus removing the water of condensation which may have collected.

Transmission Brake.

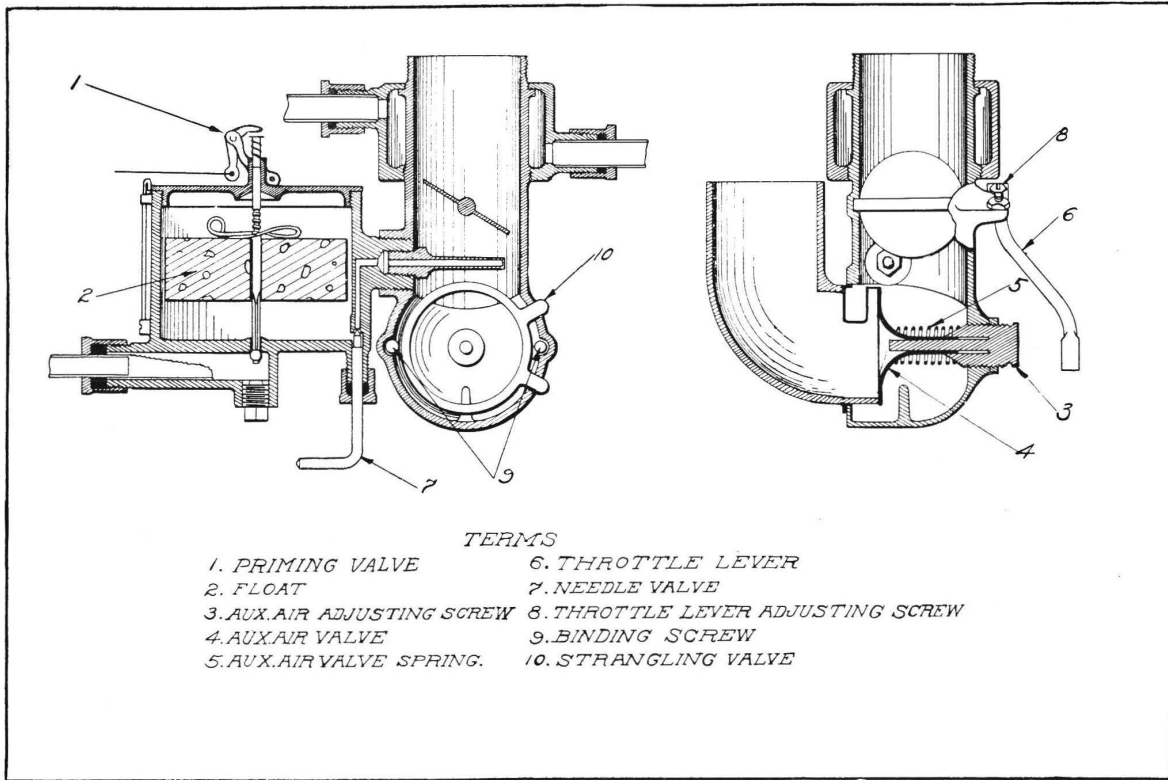
Adjustment of the transmission brake is exceedingly simple, consisting merely of screwing up on the hand grip beneath the band. A turn or two of this grip is generally sufficient to take up wear. Care should be taken that band does not drag on the drum. Do not adjust so tightly that band does not entirely free itself from drum.

Hub Brakes.

Hub brakes may be adjusted by removing clevis pins at rear end of side pull rods and screwing in or out as may be desired. These brakes may be relined with "Thermoid" made by the Trenton Rubber Mfg. Co., of Trenton, N. J.



Chalmers-Detroit Forty Motor



Sectional Drawing of Mayer Carburetor

Doctoring the Motor.

Frequently at night while motor is still hot a few spoonfuls only of kerosene should be added to each cylinder through the priming cocks. This kerosene, if allowed to stand in the cylinders over night, will loosen any carbon deposit from the heads of the pistons and will prevent the sticking of the piston rings in their grooves. This practice of the addition of kerosene will be found to have a very beneficial effect upon the operation of the motor.

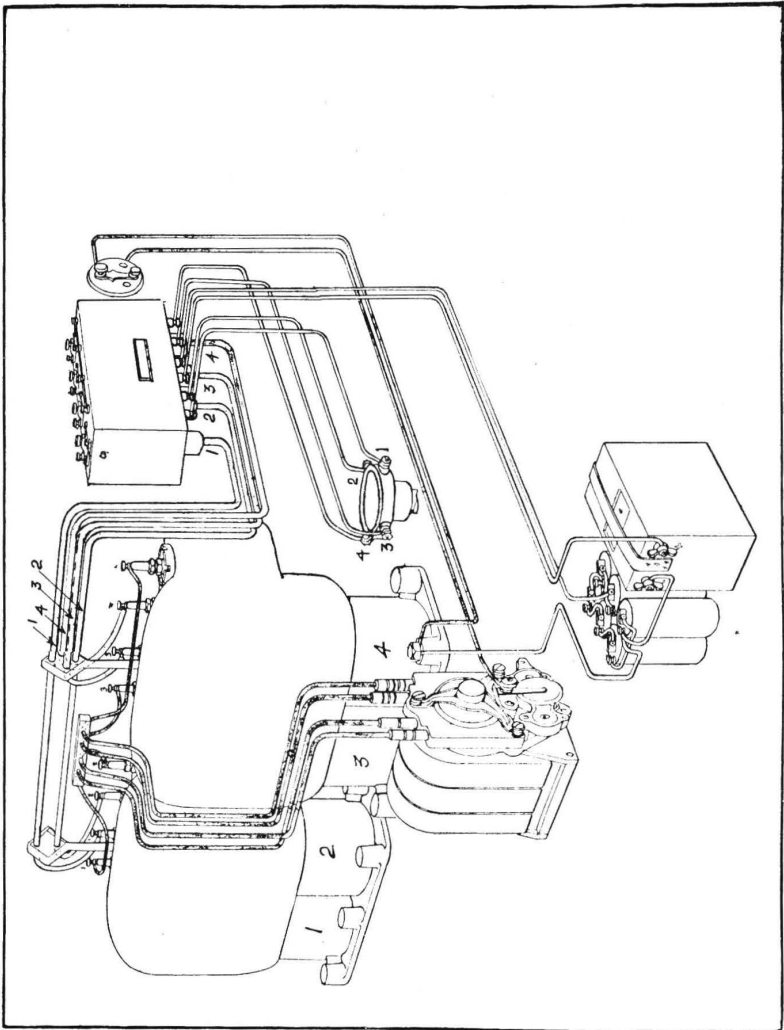
Directions for Adjusting the Mayer Carburetor.

1. Connect small rod to primer (1), and run it to front of radiator, so that operator may flood float chamber.
2. Adjust float (2) so that level of gasoline will come about 1 inch from top of float chamber.
3. Screw down auxiliary air adjusting screw (3) until auxiliary air valve (4) begins to seat, but be careful not to have pressure on spring (5) when valve is seated.
4. Open throttle lever (6).
5. Open needle valve (7) from $\frac{1}{2}$ to $\frac{3}{4}$ of a turn. Now motor is ready to start.
6. Pull rod which operates primer (1) two or three times and crank motor until it starts.
7. Now adjust needle valve (7).
8. Close throttle lever (6).
9. Adjust throttle lever adjusting screw (8).
10. Loosen binding screws (9).
11. Adjust strangling valve (10) to get the proper mixture on low speed.
12. In adjusting this carburetor, the needle valve should be adjusted only when throttle is open in order to get the proper mixture for high speed; and strangling valve (10) should be adjusted when motor is throttled, the auxiliary valve taking care of the intermediate speeds.

NOTE:—Care must be taken not to have a pressure on auxiliary air valve spring (5) when valve is down.

13. Back off on auxiliary air valve adjusting screw (3) while motor is throttled, until motor begins to skip; this shows that valve (4) is leaving its seat, then screw up until motor runs smoothly.

14. Should the motor show a tendency to spit back through the carburetor, the mixture will be found too weak. Extremely high water jacket temperature will cause the same result. Shut off water in hot weather.



Ignition Connections of Chalmers-Detroit Forty

Setting Commutator.

To set the commutator, put the motor on dead center, throw on the switch and raise spark lever until the coil vibrates. This should occur when the lever reaches "C" upon the sector. If the coil does not buzz, disconnect the commutator lever, running near the steering gear case, and adjust the length of this rod until the coil vibrates at the proper point; let the control lever remain at "C." With the commutator so adjusted that the charge is fired at this point, there is no danger from a "kick back" when starting the motor.

Spark Coil.

Directions for adjusting the spark coil are found inside of cover of coil box.

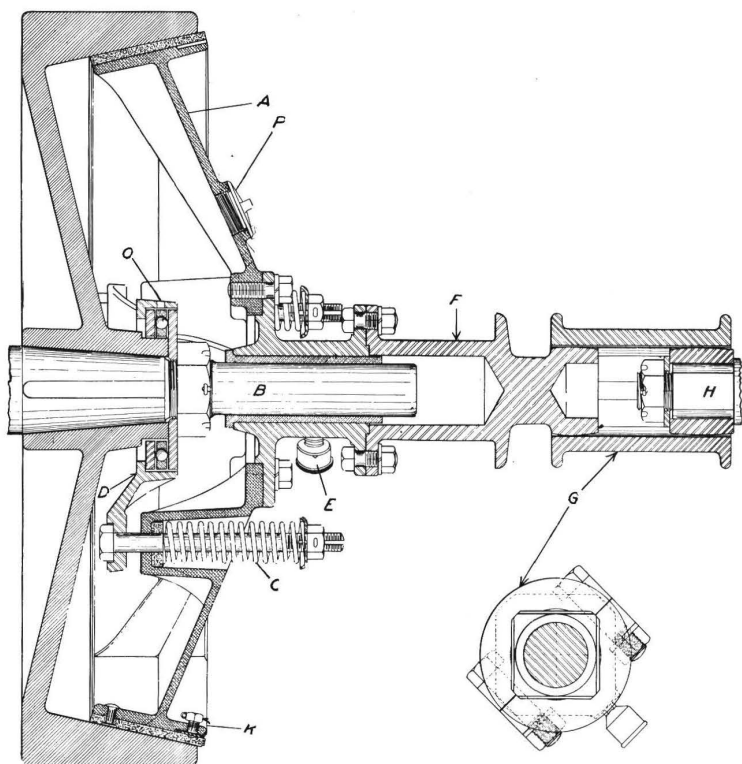
Charging Storage Batteries.

Charge only from direct current, always connecting the positive of the line to the positive of the battery and the negative of the line to the negative of the battery. To determine positive or negative, dip both ends of the line in water to which a little salt has been added. The negative side will give off the greatest quantity of bubbles. The charging rate is usually given on the box containing the storage battery. If not, use a current not exceeding 5 amperes until each cell shows a voltage of $2\frac{1}{2}$. Then charge at $2\frac{1}{2}$ amperes until each separate cell shows $2\frac{1}{2}$ volts. It is inadvisable for one not familiar with electricity to set up and operate a storage battery charging installation without advice from an expert on the subject.

The battery solution should reach above the plates (seen through filler caps). For temporary filling up after some evaporation has taken place, use distilled water. Directions for the care of the battery are found upon the battery box.

Magneto.

Upon the Chalmers-Detroit Forty car, the magneto ignition point is fixed. The point of ignition being about $15\frac{1}{2}$ degrees, or 2 inches measured upon the flywheel before dead center. To accomplish this adjustment, set the pointer upon the crank case, 2 in. before the line indicating dead center. Remove the bonnet over the magneto primary timer and set the magneto by means of the gears in the case on the forward end of motor so that the primary contact is just broken. After this has been accomplished, the magneto should operate satisfactorily. The cylinders fire in the order, one, three, four, two, number one being the front cylinder.



Chalmers-Detroit Forty Cone Clutch Assembly

A shows aluminum clutch cone.

P a plug through which may be inserted the spout of an oil can for oiling thrust bearing at O.

K shows one of the 10 adjustable flat cushion springs which insure easy engagement. These springs are inserted at the point of greatest clutch diameter and may be removed, adjusted or replaced when clutch is thrown out.

E is a grease cup for lubrication of the bearing of the clutch hub upon the spindle B.

F is the hardened steel portion carrying flange against which bear the throwout rollers.

C is one of the three adjustable clutch springs.

G is an adjustable clamp coupling which transmits the drive of the clutch to the transmission shaft H. This coupling is supplied with liners for adjustment should it develop a rattle after a season's wear.

Clutch may be removed from car without disturbing either motor or transmission by unclamping coupling G, loosening clutch springs C and removing flanged portion F.

To Remove Clutch.

To remove the clutch, take out the pedal shaft by removing the bearing caps. Remove the clamped slip-coupling connecting with the transmission, disconnect and remove the small flange carrying the throw-out roller flange and the squared end, release clutch springs by the removal of the adjusting nuts, and clutch may be taken out without disturbing either motor or transmission.

When clutch is engaged, the clutch pedal should always be free; that is, the set screw for emergency throw-out adjustment should always have about $\frac{1}{8}$ inch clearance between it and the boss on the clutch pedal.

Improper (tight) adjustment at this point will throw continuous wear upon the throw-out rollers and the clutch hub and will also keep clutch from engaging. The clutch leather should have an occasional treatment of a small quantity of Castor oil. Any appreciable clutch slippage should be remedied by tightening up the main clutch springs or temporarily by the sprinkling of a little powdered resin upon the leather.

Clutch Action.

Easy engagement is assured by means of adjustable springs beneath clutch leather at the back of the cone.

Should the clutch show a tendency to jerk when starting, slack away a turn or two upon the adjusting nuts of the small clutch leather springs around the clutch and thus allow these cushion springs more arch. However, do not release so much as will cause the leather to drag upon the flywheel when clutch is disengaged.

Back Lash in Steering Wheel.

To overcome back lash in the steering gear, loosen clamp screw at top of case and with special spanner tool (in kit) adjust thrust collar down until no lost motion remains.

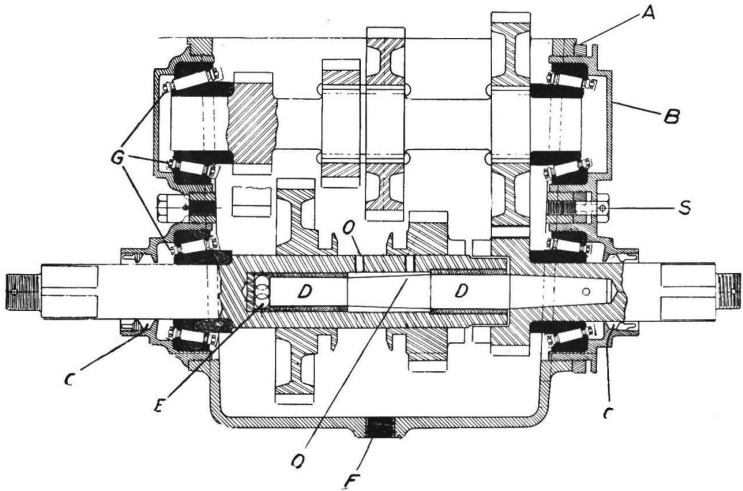
Any wear of the bushings after long service may be eliminated by the renewal of these small and inexpensive parts.

Cross Rod.

Cross rod adjustment should be such that the front wheels "toe in" about $\frac{1}{2}$ inch at a point 17 inches above the ground.

Spring Clips.

Tighten up the spring clip nuts hard and often to avoid spring breakage.



Sectional Drawing of Transmission

In order that the operator may thoroughly understand the construction of our transmission, we give herewith a sectional drawing. The Timken Roller Bearings are shown at G. To adjust these bearings, remove locking screw S, loosening up spanner rings A, and screw cap B inward or outward as it may be desired to tighten or loosen the bearing adjustment. A very little end play (barely noticeable) should be permitted. After adjusting, set the spanner lock nuts A down hard and replace locking screw S. Be sure to replace through the head of the locking screw S the long cotter pin which prevents this screw backing out under any condition.

Stuffing boxes will be seen indicated at C-C. These boxes may be re-packed at any time with felt washers or hemp rope.

All steel parts of this gear set are of nickel steel properly heat-treated.

Oil holes will be seen at O-O permitting oil to feed freely into the bearing of the internal shaft shown at D-D. A ball thrust bearing is inserted at E for receiving the end thrust of the taper Timken bearing at the ends of this divided shaft. The advisability of adding a portion of thin oil to the lubricant within this transmission case may be easily understood, as this thin oil will work through the oil holes at O-O much easier than will a heavy grease.

After making adjustment or inspection be very sure that all cotter pins and locking devices have been replaced and that all lock nuts have been set down tight.

Ratio of gearing in the transmission itself is 1 to 1 on high, 1.5 to 1 on the intermediate, 3.36 to 1 upon the low and 4.32 to 1 upon the reverse. This ratio, of course, has nothing to do with the reduction through the bevel gears of the rear axle.

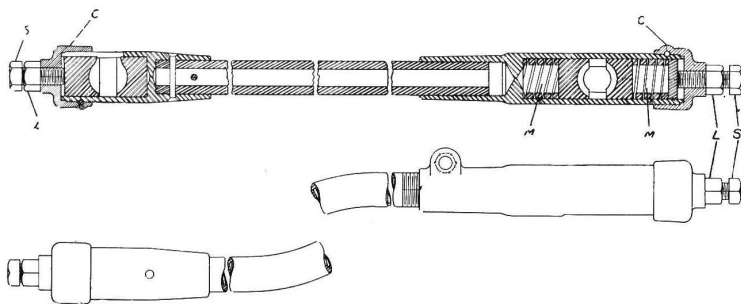
Front Wheel Bearings.

Before making a new adjustment of the front wheel bearings, jack up the axle, screw nut up tight, then try wheel and see if it revolves freely without end play of the hub to and from you. If so, no new adjustment should be made, for the adjustment is perfect, and if an adjusting washer is inserted, the bearings will be damaged.

If, on the other hand, there is end play of the hub as you pull it to and from you, take off the nut, insert in the nut only one of the thin steel adjusting washers, which we will send you when called for, and again screw the nut up tight, using considerable force. Now try wheel again and see if it revolves quite freely. If it does not so revolve, it is conclusive evidence the adjusting washer just inserted in the nut was not required and unless same is removed, the bearing will be damaged. If, however, the wheel revolves quite freely without end play of the hub, to and from you, the adjustment is perfect.

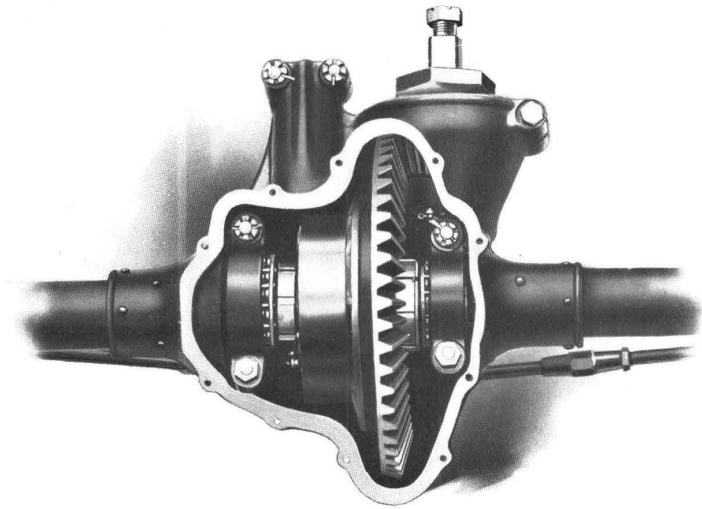
Your particular attention is called to the fact that if an adjusting washer is inserted in the nut when not required, the bearings will be damaged or destroyed.

No leather or felt washers are to be used under any circumstances.



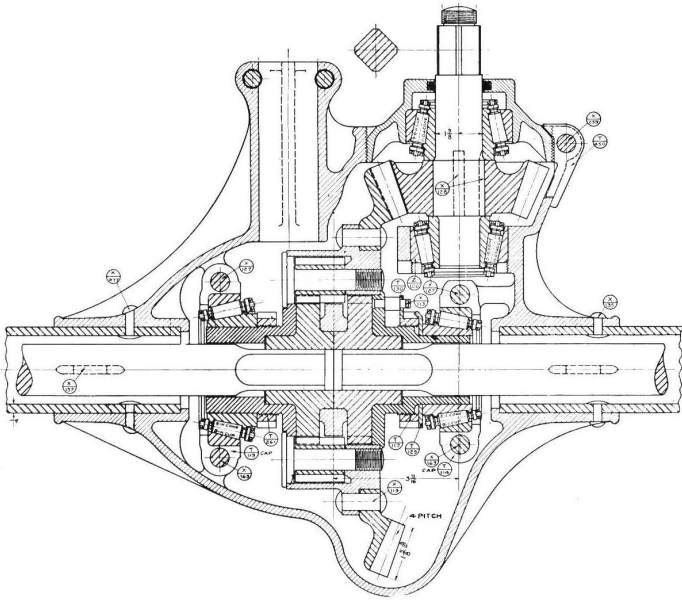
Fore and Aft Connection

This connection is extremely heavy and is well constructed. The caps C-C at the ends are screwed on and then pinned permanently in place, all adjustment being made by means of the set screws S-S and lock nuts LL shown. Even though this adjustment should become loose, it will be impossible for the cap to come off and allow the ball end to escape from the housing. Double springs MM are used in the front end of this connection. These springs are placed in the front end in order that road vibrations may be taken up as near the wheel as possible.

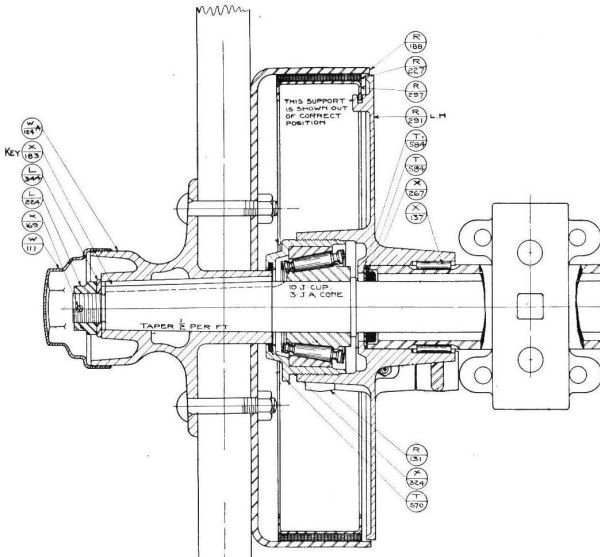


Chalmers-Detroit Forty Rear Axle Gear Case

Cover shown removed. Adjustment of large bevel gear to right or left made by means of spanner nuts shown just inside the Timken roller bearings upon either side. Loosening up on one side and tightening on the other will carry the entire differential housing with gear to right or left as may be desired. For pinion adjustment, loosen clamp bolt at the right of pinion housing, remove locking device and screw inward or outward as may be desired upon the large nut carrying the pinion bearing. Replace locking device and tighten down hard upon the clamp bolt when finished. Be sure that all locking devices and cotter pins are kept in place. Adjustment of bearing on inner end of pinion shaft may be clearly seen in sectional cut on next page.



Sectional drawing showing semi-floating rear axle construction of Chalmers-Detroit Forty. Differential gear housing with large bevel attached is shown supported in its own bearings entirely independent of the driving shafts, these latter being squared and slipped into the differential gears. Pinion and pinion adjustment is clearly shown. Adjustment of rear wheel bearing is also shown. Wheel hub is attached to shaft pin taper and with long key.



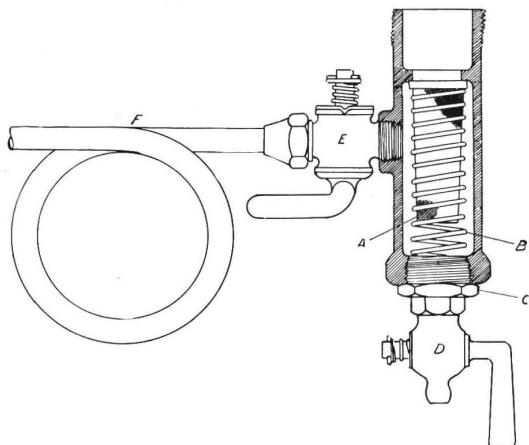
Chalmers-Detroit Forty Rear Wheel Bearings

Rear Wheel Bearings.

To adjust bearings adjacent to rear wheels, remove wheel and set up on spanner nut until lost motion can be scarcely noticed. Care should be taken that bearing is not adjusted too tightly, also that locking device is replaced after making the adjustment. Bearings within the rear axle gear case may be adjusted after the removal of gear case cover. Screw down the spanner nuts until the lost motion disappears.

Tires.

The tires should be kept pumped up hard at all times. A soft tire may ride easier but will cause much tire trouble.



Sectional Drawing of Gasoline Strainer, Drain and Sediment Cup

Beneath the gasoline tank will be found the sediment strainer and cup shown in section above. Strainer A is held in place by spring B and both strainer and spring may be removed by the taking out of pipe plug C. Drain cock D may be used for withdrawing any water deposit through the sediment cup or for draining off gasoline slowly. Should it be desired to drain the gasoline tank quickly, for instance before loading the car either upon a boat or for railway shipment, the plug C may be unscrewed, permitting an inch stream of gasoline to flow. Shut-off valve E is in the carburetor pipe line F. Valve E is of the taper seat spring variety and snaps into either closed or open position. Handle of drain cock D hangs downward when cock is in closed position, thus preventing by gravity any possibility of this cock becoming open by the jars of the road.

LOCATION AND REMEDY OF TROUBLE

Knocks or Pounds.

A pound in a motor may be caused by the improper adjustment of some part, whether too loose or too tight. Some of the most common causes are: Connecting rod bearing or bearings too loose or too tight, the carrying of the spark too far advanced, lack of proper lubrication with the motor, a stiff motor (a new motor not yet thoroughly worked in), a faulty carburetor adjustment, a loose piston in the cylinder. A very infrequent cause of pound will sometimes be found in a loose fly-wheel upon the crank shaft. This is one of the hardest for the operator to locate, as it may be so tight as to not be noticeable with the hands, but yet sufficiently loose to be perceptible under the force of the explosions. Another source of knock which should always be investigated is the carbon deposit upon the head of the piston within the combustion space. This carbon becoming heated may produce premature ignition. With the interior of the combustion space thoroughly cleaned by the use of kerosene oil and by scraping, any pound remaining may be charged up against improper adjustment at some point.

Lack of Good Compression.

Lack of good compression is generally due to leaky valves. These should be reground, using oil and fine emery powder or ground glass. Special care should be taken that emery does not get into the cylinder or remain under the valve, when through grinding, as this abrasive material would certainly ruin these parts. Insertion of a bunch of waste in the exhaust passage will keep emery out of the cylinders. Wash out valves and cylinders with gasoline when through grinding. Very infrequently loss of compression may be traced to faulty piston rings or to cutting of the cylinder walls due to running the motor without oil.

Oil Leaks Around Motor.

Oil leaks around the motor are generally due to a worn out paper gasket or leather washer. Such gaskets should be carefully renewed and shellaced to one of the two parts which they are between.

Noisy Two to One Cam Shaft Gears.

Gears are lubricated by oil from the crank case. In case of extreme noise in the gear, fill the cam shaft gear case with heavy grease, first plugging the oil drain hole from cam gear case to crank case.

Squeaks.

Squeaks in the motor or running gear are generally due to lack of lubrication and should be located and remedied at once.

Overheating Motor.

The cooling system of the Forty has been proven extraordinarily efficient during two seasons' use. For racing we even recommend the removal of the fan. Therefore overheating trouble may be charged at once to some irregular condition.

1. Inspect all water passages, making sure that the gaskets at flange joints have not swollen in such a way as to cut down the effective opening.

2. Lack of oil. Use only very highest grade gas engine oil in motor. It is always cheaper in the end.

3. A motor is sometimes caused to overheat on account of a slipping clutch.

4. A motor will sometimes continue to fire after spark has been shut off when the water is not at all overheated or boiling. This fire is occasioned either by carbon deposit in the cylinders which becomes incandescent or by some sharp metallic edge or point within the combustion space which becomes incandescent.

5. The addition through the relief cocks of a few spoonfuls of kerosene to each combustion space occasionally when leaving the car for the night, will have a tendency to dissolve the carbon deposit and will have a very beneficial effect upon the behavior of the motor. The muffler will emit dense volumes of smoke when started next morning but this will very soon disappear.

6. Overheating of a motor may be caused by running with an open throttle and a retarded spark. The spark lever should be kept well up on the quadrant—experience will soon dictate at what point it can be carried without causing the motor to knock. It is also much more economical in fuel consumption to carry this spark lever as high as possible.

7. The angle of fan blades or a slipping fan belt may sometimes cause the water to overheat in the radiator. These items should be checked up when looking for trouble of this kind.

8. Black smoke at the exhaust will indicate too rich a mixture at the carburetor (too much gasoline). Popping back through the carburetor shows too little gasoline, due either to needle valve adjustment or to clogged gasoline passages. Popping may also be caused by excessive temperature of the water within the carburetor water jacket, especially in hot weather. See under "Carburetor."

Missing.

Missing of the motor may be traced to weak batteries, faulty wiring, dirty spark plugs, imperfect contacts in commutator, coil adjustment or carburetor adjustment.

To detect trouble in the electrical circuit, it will be found of great help to remove the spark plugs from the cylinders and lay them with wires attached on top of the motor so that the character or absence of the spark may be observed at the points.

Failure to Start.

Failure of motor to start easily may be due to lack of gasoline, lack of igniting current, dirty spark plugs, incorrect carburetor or coil adjustment, or to the fact that the operator has neglected something in the routine of starting. See that the gasoline tank cock is open and that gasoline supply pipe is free from obstruction. Lack of igniting current is due to run-down storage battery or dry cells, neglect to switch on current, a broken wire, or incorrect coil adjustment. Dirty spark plugs are due to the use of an excessive amount of oil (or very long use whereby the insulation may become coated with carbon) and they should be either exchanged or cleaned at once, as it is neither pleasant to have an engine "running on three legs" nor good for the engine or any other part of the car.

Noisy Rear Axle.

Noise from the rear axle is due to loose roller bearings, a loose gear or lack of lubrication. Bearings should be adjusted in a manner described in the Section on Adjustments, and gears should be inspected to be sure that they are in proper alignment.

Noisy Transmission.

Noisy transmission gear is due to lack of lubrication, or improper alignment of gears due to looseness of the transmission bearings. For remedy see Section on Adjustments. Inside the transmission case is a positive interlock mechanism which prevents absolutely the sliding of one set of gears while another is in mesh.

Radiator.

A leaky radiator is generally due to looseness in the connections between radiator and supporting bracket (causing a constant jarring). The hose clamps connecting the radiator to the engine and the pump should be carefully inspected to see that there is no leakage of water at these points.

Leaky Transmission.

Leaky transmission is due to failure of the operator to keep transmission cover bolts tight, or to loose stuffing boxes.

Clutch Slippage.

Clutch slipping is due to weak spring tension, too much lubrication of the leather, or to the fact that the clutch "bottoms" before the leather friction surface comes sufficiently in contact with fly-wheel. A gripping clutch is due to lack of lubrication or too tight clutch spring adjustment. Back off adjusting nuts or apply castor or neatsfoot oil as may be necessary. Flat cushion springs may be adjusted to insure easy engagement without dragging when clutch is released.

Propeller Shaft.

Noise or squeaking of this part will be due entirely to lack of lubrication (see directions for lubrication of universal joints).

Torque Tube.

Noise or squeaking of the torque tube anchorage will always be due to lack of lubrication of the surfaces between ball end and cups. Screw up grease cups. Any rattle may be cured by tightening up on bolt carrying buffer spring housing or by the insertion of a washer.

Draining Car.

If the car is to be laid up during cold weather in a freezing atmosphere, it is necessary to drain off the cooling water. To accomplish this, open up cock underneath radiator, remove pipe plugs from bottom of pump casing and cylinder water jackets (left side); open cock in carburetor hot water line, if closed. Radiator filler cap may be removed if desired. Rock the body a few times. The motor may be started up and run a few minutes to evaporate any residue. **Take care not to run motor long enough to overheat it, as there is no cooling water in the jackets.**

Anti-Freeze Mixture.

A good anti-freeze mixture for ordinary temperatures consists of a mixture by volume of $\frac{1}{3}$ wood alcohol and $\frac{2}{3}$ water. This mixture should not freeze until the temperature is about 10 to 15 degrees Fahr. The use of a larger percentage of alcohol makes this mixture applicable to still lower temperature.

Running Gear.

All squeaks in the running gear are due to lack of lubrication, or to looseness. See that all bolts and nuts are tight, spring clips carefully tightened and all nuts are provided with either lock washers or cotter pins. If the springs squeak, loosen up the clips, apply graphite and oil between the leaves and **tighten the clips again hard.**

Commutator.

If the commutator fails to operate satisfactorily, see that the cam makes perfect contact with the metal contacts in the periphery of the commutator and that there are no loose wires. At the end of the season it may be advisable to take commutator off and true up the strip upon which the roller bears.

Spark Plugs.

The Chalmers-Detroit valve caps are tapped to receive $\frac{7}{8}$ -inch spark plugs, tapped 18 U. S. Standard threads per inch. This is the standard thread adopted by the Association of Licensed Automobile Manufacturers.

RULES OF THE ROAD

Do not be a "road hog." Give another motorist or any other user of the public highway his lawful half of it and give the man with the heavy load or nervous horse all the road you can without going into the ditch yourself.

Keep both within the spirit and the letter of the law when driving your car. It is much better to say "Good morning" to a farmer than it is to "cuss him" for not getting out of your way just as quickly as you could wish. Maybe he was deaf and didn't hear you.

Don't run by a cow at a forty-mile clip, as she is dead sure to turn the wrong way.

Don't drive through a crowded street at high speed nor around a corner, as someone is liable to step out directly in your path.

Always be careful and considerate in your dealings with all the users of the public highways. It is the very best missionary work you can do to increase the popularity of the motor car.

DON'T

Don't start on a trip without attention to oil, gasoline and water.

Don't take someone's else word for it that you have supplies and tools.

Don't allow the motor to race. It is bad for the motor.

Don't ride on soft tires. Soft tires make punctures, and blow-outs are more liable to occur. Tires cost money, to say nothing of the aggravation of having to repair them upon the road.

Don't try to run up a steep hill on the high speed. The second speed will take you up faster and with less strain on the car.

Don't "jump" the car by quick opening of the throttle.

Don't drive with the spark so much advanced that the engine pounds. It is hard on the bearings and is evidence of a poor driver.

Don't light a match to see how much gasoline there is in the tank. It seems foolish to mention this, but people do it every year.

Don't go on an extended trip without testing your battery.

Don't neglect to lubricate the car.

Don't think that if a six-volt igniting current is good an eight-volt is better. It isn't.

Don't fail to keep your brakes adjusted. It is more necessary to be able to stop the car than to start it.

Don't neglect to keep your lamps filled. You may need the light badly some time.

Don't leave the car alone with the motor running idle.

Don't stop the car on the wrong side of the street. In all of the larger cities ordinances provide for this, and anyway, it is much more convenient when you start to start **with** the traffic than **against** it.

Don't drive faster than the law allows.

Don't leave the car with the control lever anywhere but in the neutral position.

Don't do anything either in adjusting or operating the car that is not entirely sane and logical. It is much better to be slow and sure than to be swift and careless.

Don't forget, above all else, that an automobile is the finest piece of machinery in the world and that you will be repaid in excellence of service many times over for the care and attention given it.

GENERAL DIRECTIONS

NOTICE:—To insure prompt attention to correspondence, whether relating to the shipment of repairs or not, *always give your car number*, which will be found upon the brass plate on dash.

We wish our customers to make their troubles ours, for in this way only will we be able to realize our ambition—to place the CHALMERS-DETROIT CARS at the head of their class.

Kindly order repairs through your agent.

Correspondence should be addressed to the Company, not to individuals.