Instructions

FOR THE CARE OF

1915

Standard

Delco Systems

The

Dayton Engineering Laboratories Co.

Dayton, Ohio, U. S. A.

Instructions for the Care of 1915

STANDARD DELCO SYSTEMS

These systems are used on the following cars:

1915 Auburn Model 6-40

1915 Buick Models C-36-37-54 and 55

1915 Cadillac Model 51

1915 Cole Model 6-50

1915 Hudson Model 6-40

1916 Hudson Model 6-40

1915 Jackson Model 6-48

1915 Moon Models 4-38 and 6-40

1915 Oakland Models 37 and 49

1915 Oldsmobile Model 42

1915 Paterson Models 4-32 and 6-48

1915 Westcott Models U-6 and 0-35

Description

The system includes a two pole motor-generator having a single field coil with two separate windings; one for cranking, the other for generating; an armature with two separate and electrically distinct windings, one commutator being on each end of the armature. The distributor and timer and the regulating spool and arm are assembled in the front end frame of the motor-generator. A combination lighting and ignition switch, ignition coil and motor clutch assembly complete the Delco system proper. The system does not include the storage battery, dry cells, horn, lamps, spark plugs or wiring, although these are connected to and depend upon the Delco system. This is a one-wire system with the negative side of the system and storage battery grounded to the frame of the car, with the exception of the Cadillac Model 51, which has the positive side of the system and storage battery grounded.

Motor Generator

The motor generators are all of similar design, illustrated by Figures 5, 6, 7 and 8, which show sectional views of this type. The construction should be evident upon inspection. There is a single large field coil, and leads are brought out on the forward side of the coil from both ends of the shunt field windings. The two generator brushes and one motor brush are on the commutators continuously, suitable switching arrangement being provided to lower and raise the grounded motor brush. When the starting pedal is depressed,, the long phosphor bronze contact switch blade shown in Figures 5 and 7, attached to the grounded motor brush arm is opened when the motor brush is dropped down on the commutator. The generating circuit is broken through this switch during the cranking operation, and is closed when the engine is running or at rest. There are no other switching arrangernents on this type of motor generator. The driving clutch is secured to the front end of the armature shaft by a clamping washer with lugs that fit into slots in the clutch shell and armature shaft. This clamping washer is fastened to the shaft by a screw and lock washer.

Operation

Figures 1 and 8 show a typical circuit and wiring diagram of this system. The method of electrically connecting the various parts is clearly indicated. Figure 2 is the circuit diagram of the system used on the Model 51 Cadillac, and Figure 3 is the circuit diagram of the system used on the 1916 Model 6-40 Hudson.

The cycle of operation of getting the gasoline motor started is as follows:

Pull out the "M" or "B" button on the combination switch, Figure 8. Either of these buttons closes the circuit between the storage battery and the generator and the ignition circuit. The "M" button should be used for all normal starting. The dry cell ignition is closed by pulling out the "B" button and should be used only in cases of emergency.

In operating the "M" or "B" button, care should be taken to see that they are out as far as they will come; if not pulled out far enough the ignition circuit will not be closed, which will prevent the engine from firing, though the starter will crank the engine over.

The generator now revolves as a shunt motor; the current during the cycle of the operation will flow through the circuits shown in red Figure 4. The armature revolves in a clockwise direction when viewed from the front end. This makes it possible to mesh the starting gears. The operation of the generator clutch, (Figure 6), causes a clicking sound

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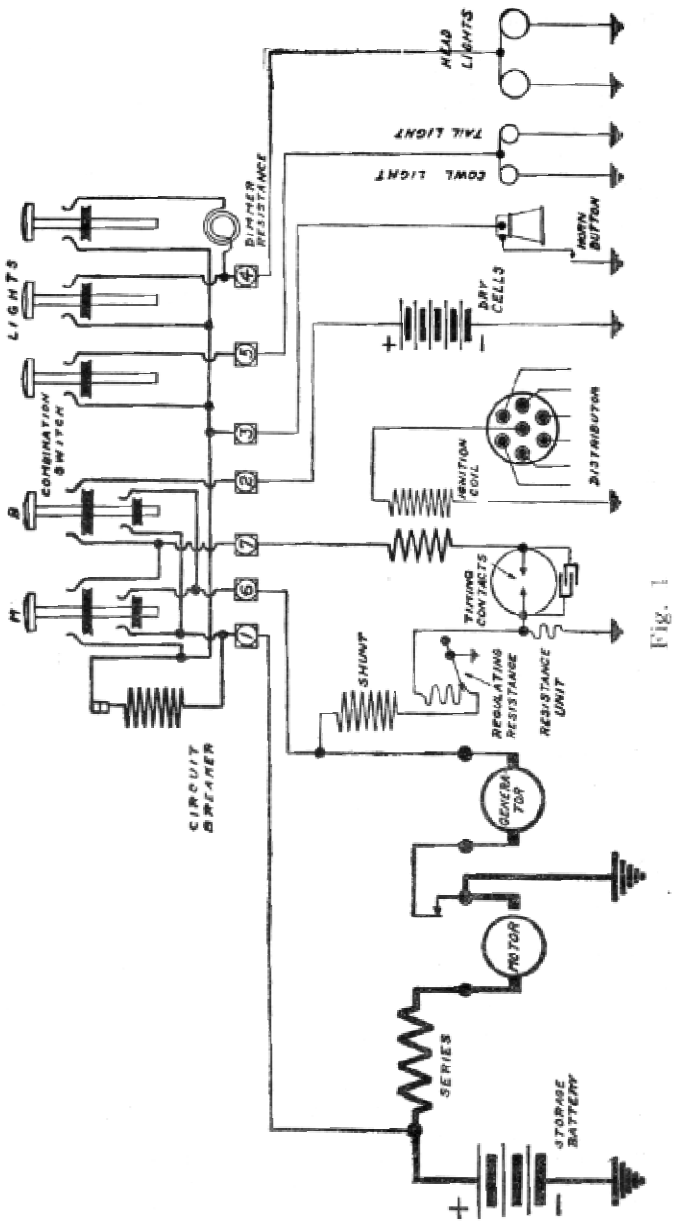

Fig. 1

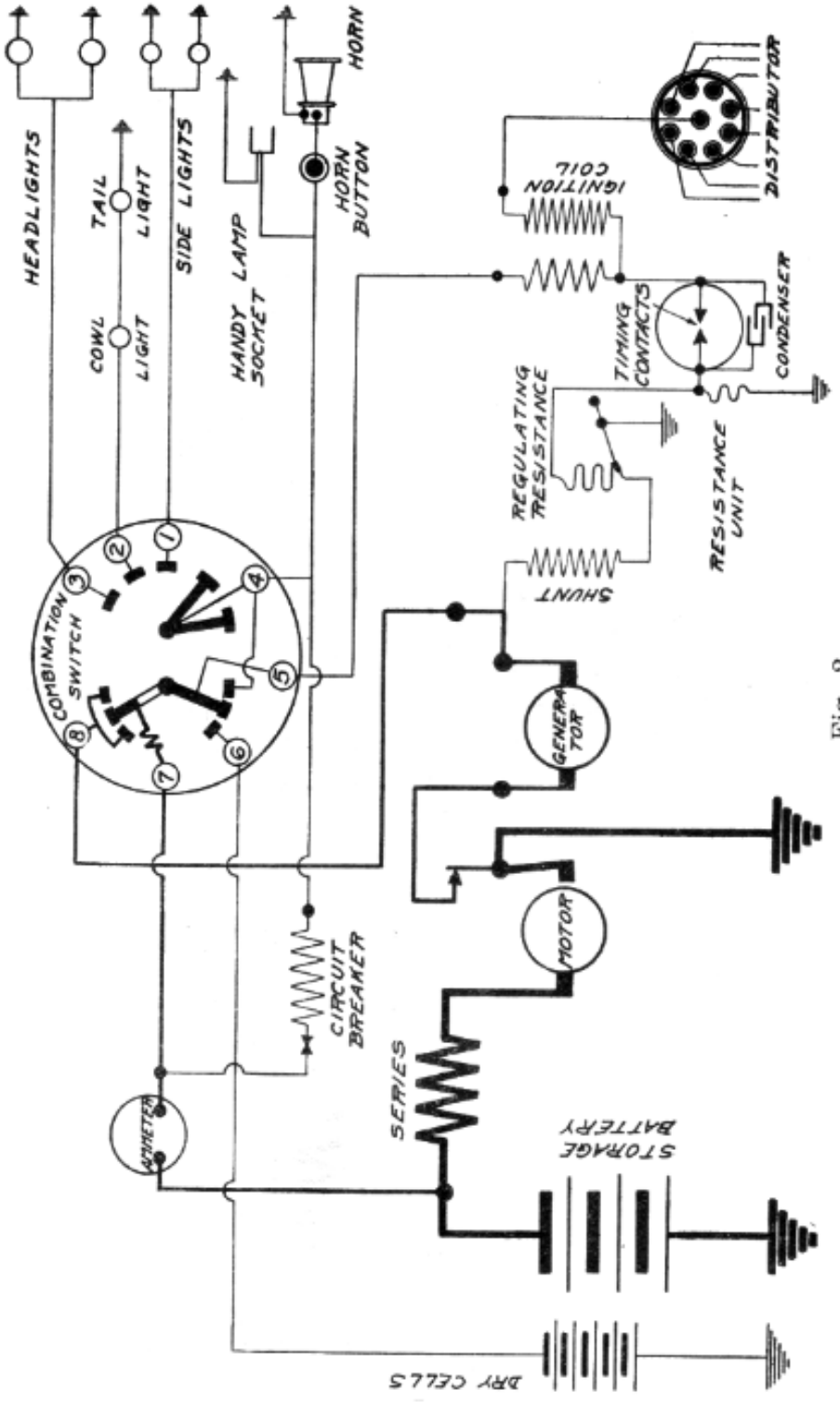
HEADLIGHTS
TAIL LIGHT
SIDE LIGHTS
COWL LIGHT
HANDY LAMP SOCKET
HORN BUTTON
HORN
IGNITION COIL
DISTRIBUTOR
TIMING CONTACTS
CONDENSER
REGULATING RESISTANCE
RESISTANCE UNIT
SHUNT
COMBINATION SWITCH
GENERATOR
MOTOR
CIRCUIT BREAKER
SERIES
STORAGE BATTERY
DRY CELLS

Fig. 2

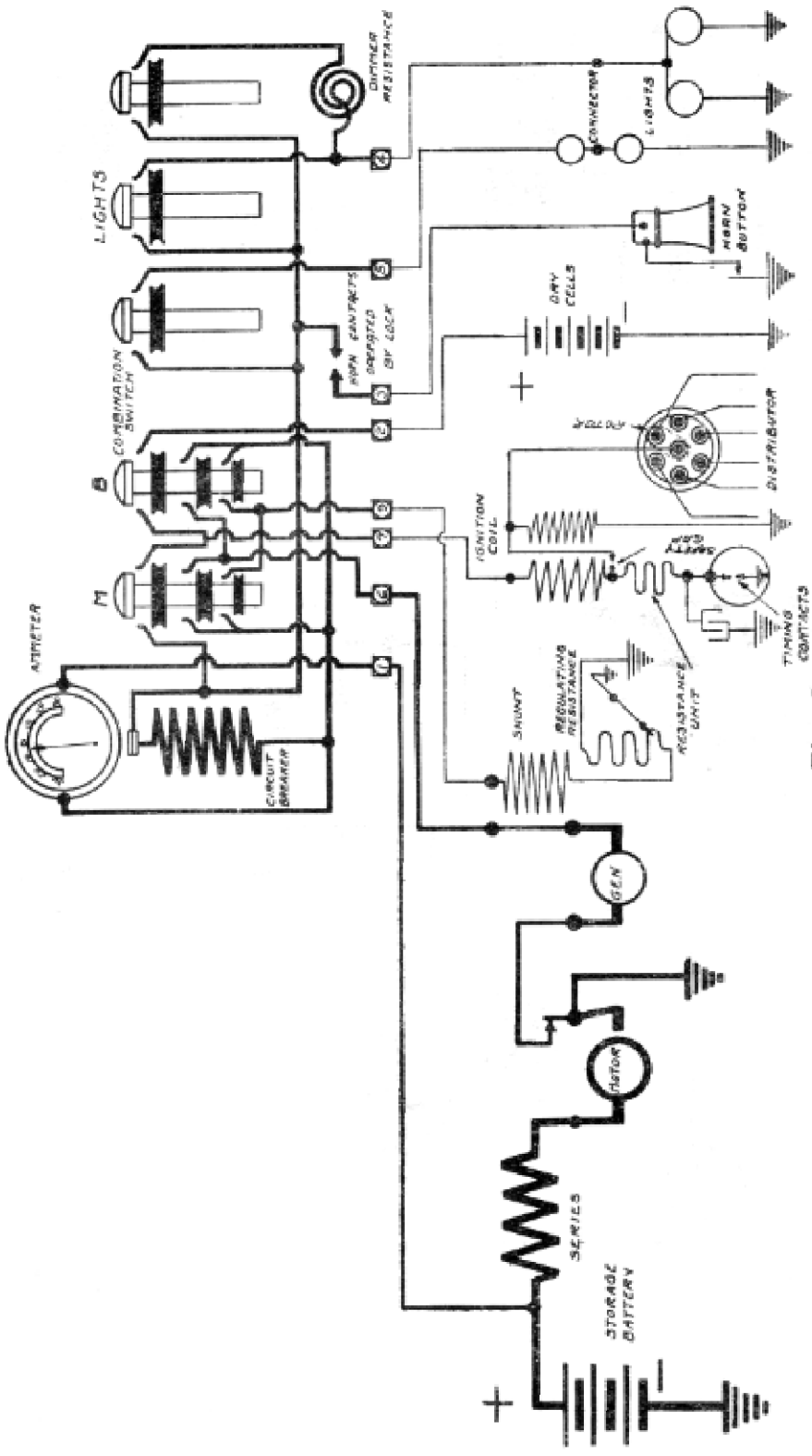
LIGHTS
COMBINATION SWITCH
B
H
AMMETER
CIRCUIT BREAKER
DIMMER RESISTANCE
CONNECTOR
LIGHTS
HORN BUTTON
DRY CELLS
DISTRIBUTOR
IGNITION COIL
TIMING CONTACTS
SHUNT
REGULATING RESISTANCE
RESISTANCE UNIT
GEN
MOTOR
SERIES
STORAGE BATTERY

Fig. 3

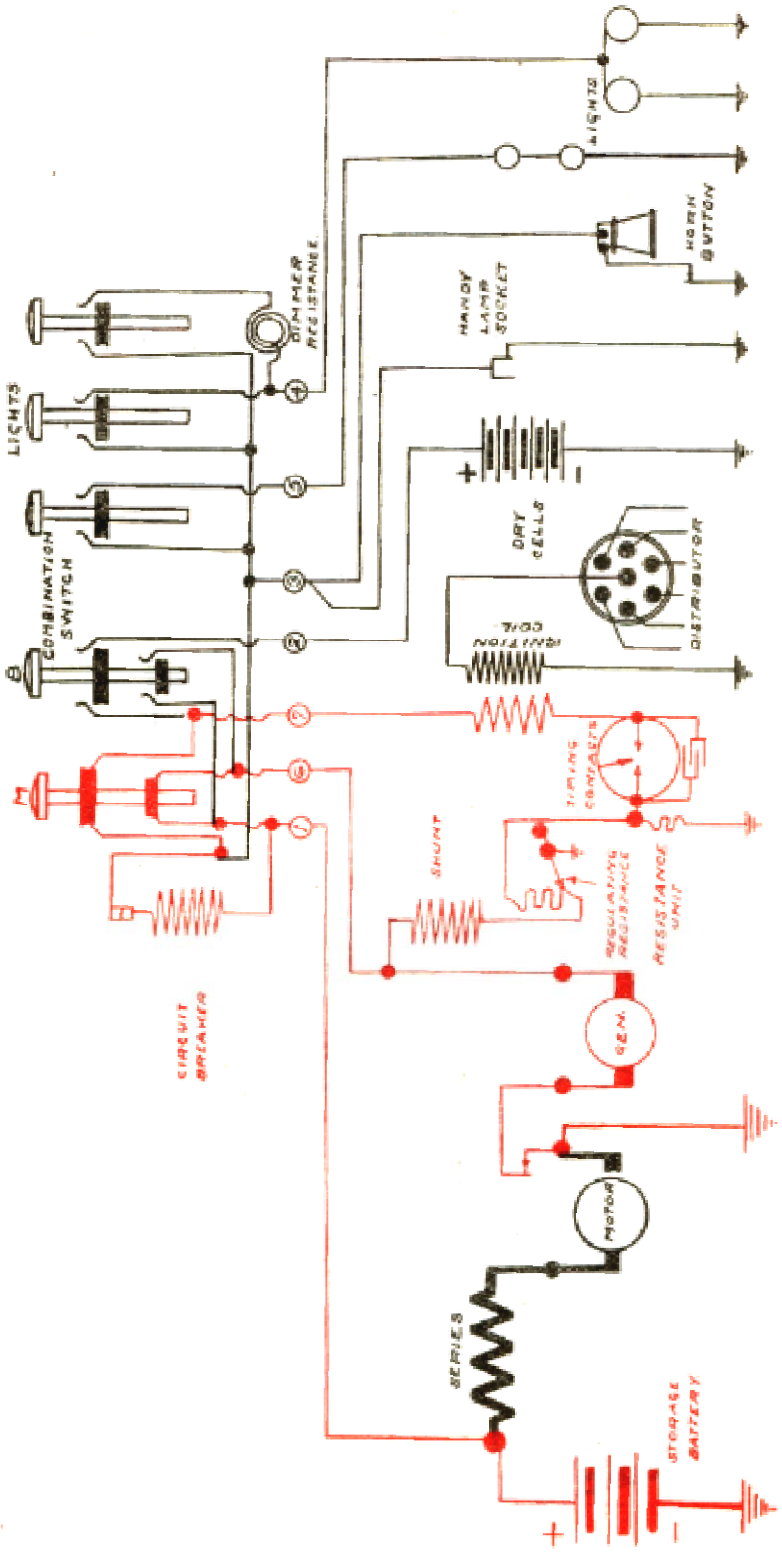
LIGHTS
HORN BUTTON
HANDY LAMP SOCKET
DIMMER RESISTANCE
LIGHTS
COMBINATION SWITCH
DRY CELLS
DISTRIBUTOR
IGNITION COIL
TIMING CONTACTS
SHUNT
REGULATING RESISTANCE
RESISTANCE UNIT
CIRCUIT BREAKER
GEN.
MOTOR
SERIES
STORAGE BATTERY

Fig. 4

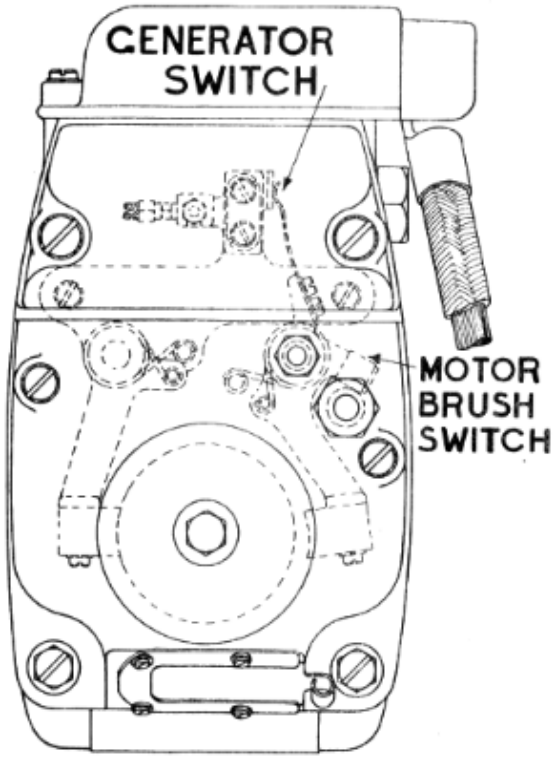

Fig. 5

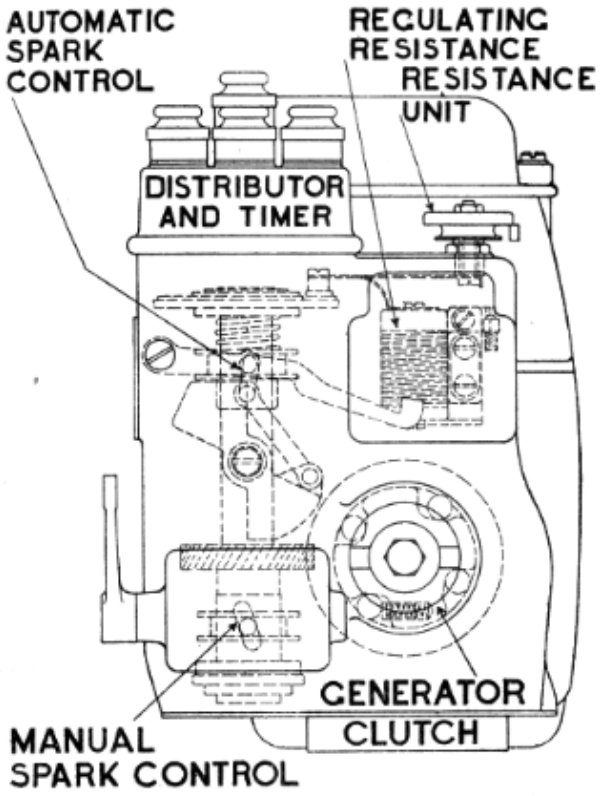

Fig. 6

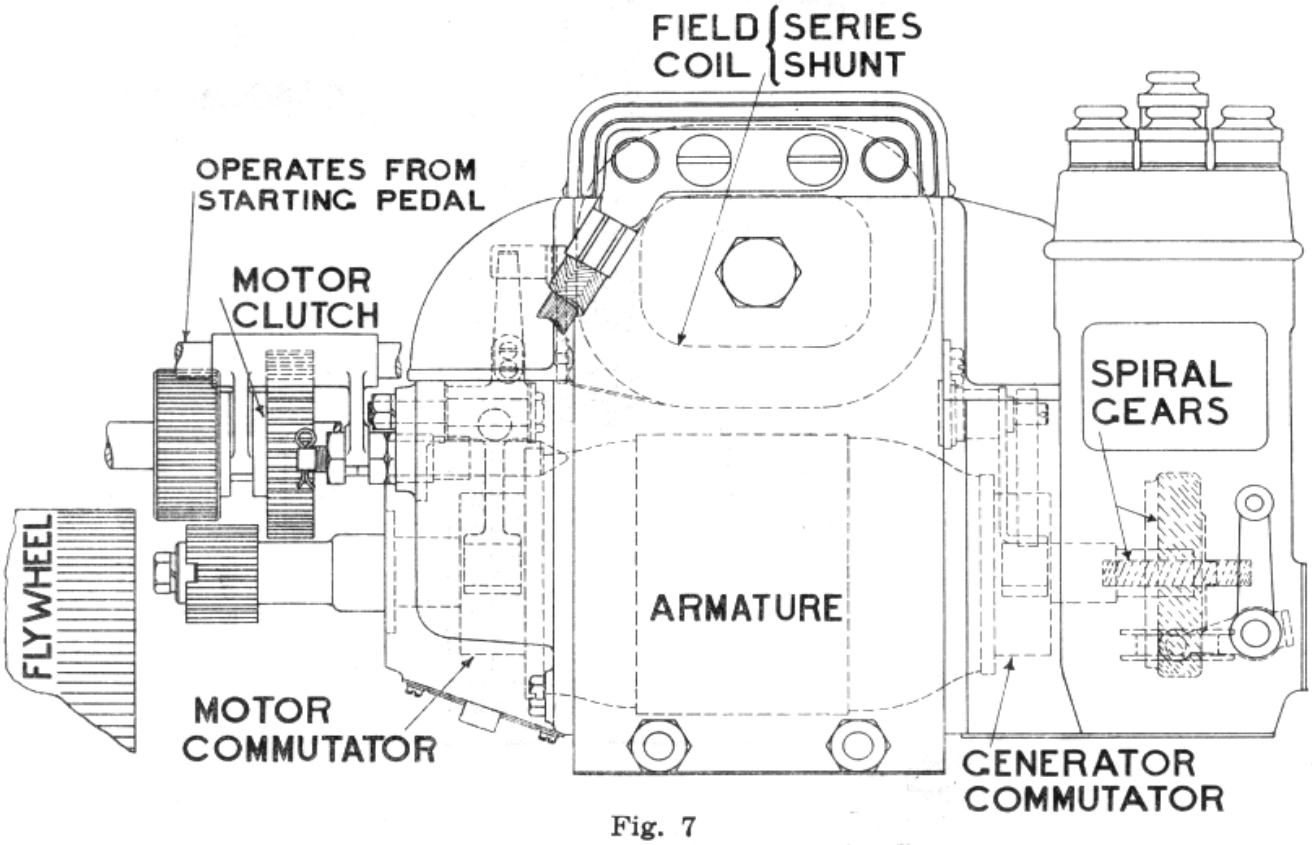

Fig. 7

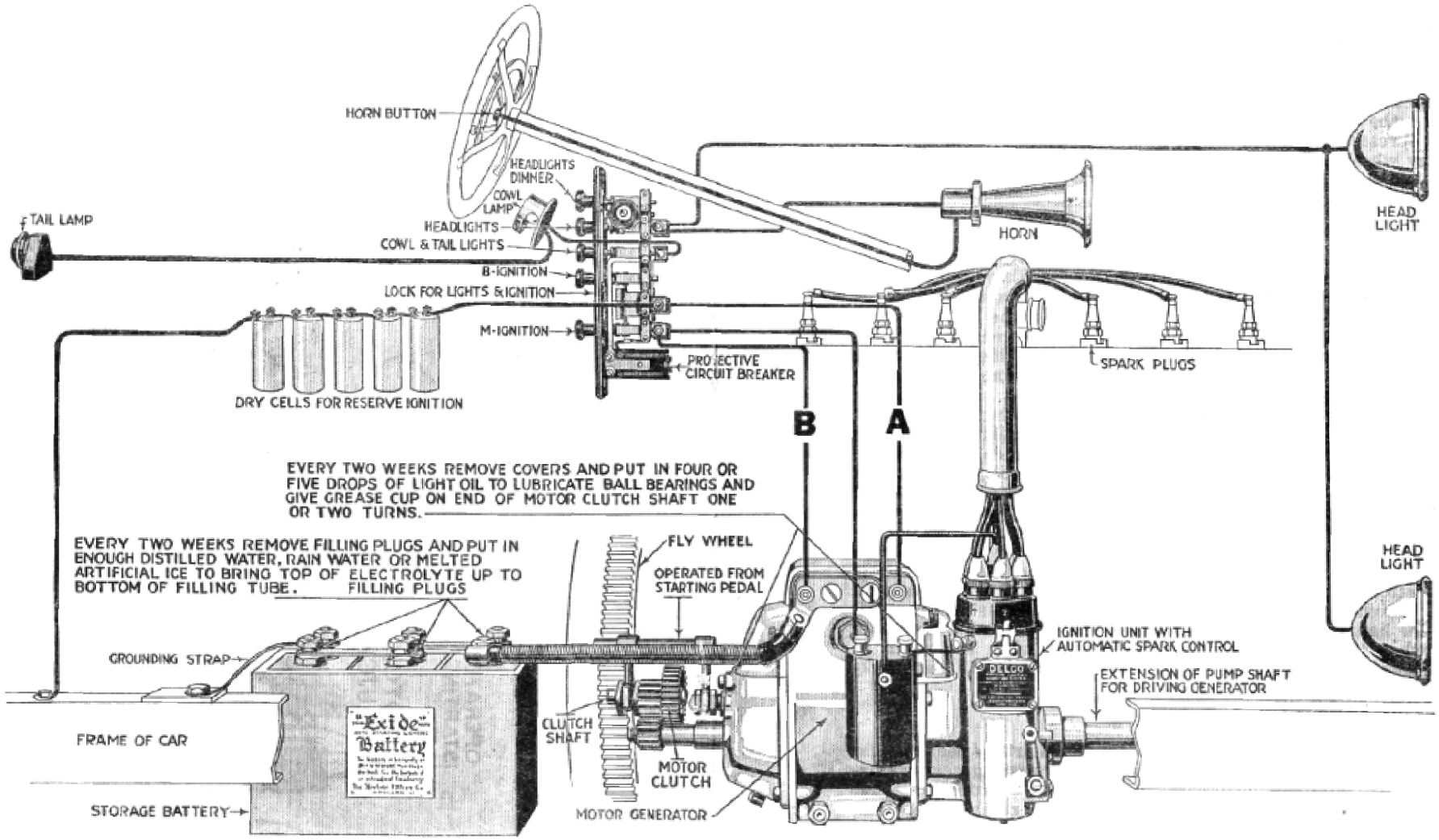
HORN BUTTON
HEADLIGHTS DIMMER
COWL LAMP
HEADLIGHTS
COWL & TAIL LIGHTS
B-IGNITION
LOCK FOR LIGHTS & IGNITION
M-IGNITION
TAIL LAMP
DRY CELLS FOR RESERVE IGNITION
PROTECTIVE CIRCUIT BREAKER
HORN
HEAD LIGHT
SPARK PLUGS
B
A
EVERY TWO WEEKS REMOVE COVERS AND PUT IN FOUR OR FIVE DROPS OF LIGHT OIL TO LUBRICATE BALL BEARINGS AND GIVE GREASE CUP ON END OF MOTOR CLUTCH SHAFT ONE OR TWO TURNS.
EVERY TWO WEEKS REMOVE FILLING PLUGS AND PUT IN ENOUGH DISTILLED WATER, RAIN WATER OR MELTED ARTIFICIAL ICE TO BRING TOP OF ELECTROLYTE UP TO BOTTOM OF FILLING TUBE.
FILLING PLUGS
FLY WHEEL
OPERATED FROM STARTING PEDAL
HEAD LIGHT
IGNITION UNIT WITH AUTOMATIC SPARK CONTROL
EXTENSION OF PUMP SHAFT FOR DRIVING GENERATOR
GROUNDING STRAP
"Exide" Battery
FRAME OF CAR
CLUTCH SHAFT
MOTOR CLUTCH
STORAGE BATTERY
MOTOR GENERATOR

Fig. 8

during the motoring operation and serves as a reminder that the ignition button is pulled out. Should the car be left standing with the ignition button pulled out the generator will continue running as a motor until the storage battery becomes discharged.

Referring to Figure 7, it will be fully understood how the first movement of the starting pedal causes the ring gear teeth on the motor clutch, Figure 9, to mesh with the pinion on the armature shaft, and as the starting pedal is further depressed, the teeth of the stub gear go into mesh with the fly wheel teeth.

When the gears are fully in mesh the movable motor brush (Figure 5) is lowered upon the commutator and at the same time the generator switch (Figure 5) breaks contact. This cuts out the generator elements during the cranking operation. As soon as the motor brush makes contact on the commutator, a heavy current passes through the motor winding (shown in heavy lines in circuit diagrams, Figures 1, 2 and 3), causing the motor to crank the engine over. Cranking speed will be reduced 60% if the generator circuit remains closed at the generator switch or due to improper connection at some other point in the charging circuit.

When pressing the starting pedal, if it should happen that the motor clutch (Figures 7 and 9) which is mounted on a shaft within the flywheel housing, should be in such a position that the starting gears do not mesh, do not force the starting pedal, but simply allow it to come back a little and try again. By this time the gears will have changed their relative position and will go into mesh when the starting pedal is again depressed.

The cranking operation requires a heavy current from the storage battery. This heavy discharge from the storage battery causes a slight drop in the battery voltage, should the lights be turned on when the starting pedal is first pressed, the lights will grow slightly dim. This is noticable especially when the battery is nearly discharged; when the motor is stiff; and when a loose or poor connection exists in the cranking circuit.

Clutches

When the engine begins to fire, the starting pedal should be released immediately to disengage the starting gears. During the cranking operation the armature is running about twenty times engine speed, and therefore much faster than the pump shaft. While cranking, the generator clutch at the front of the motor generator is slipping. Should the starting pedal not be released when the engine begins firing, the motor clutch will begin slipping. On account of the fly wheel running at a higher rate of speed than the starting motor armature, the clutch will heat, due to the friction, and burn out the lubricant. Should the clutch stick, serious damage would result.

At the instant the engine speed becomes greater than the generator armature, the armature will be driven through the generator clutch from the pump shaft. This explains the necessity of a starting and driving clutch on systems of this type. When the car reaches a speed of approximately seven miles per hour, the generator voltage will be greater than that of the storage battery, and begins to charge the battery.

To Remove the Generator Clutch

After removing the screw in the end of the armature shaft, together with the lock washer and key washer, the generator clutch can be removed from the armature and end frame assembly by placing in an arbor press or cutting a hole in a work bench about 1/2 inch larger in diameter than the armature, insert the armature through this hole and allow the armature and end frame to drop about 2 inches, being careful to have the end frame come squarely in contact with the bench. Hold armature from below so that it will not be injured by striking the floor when pulled from the clutch.

Regulator Spool & Arm

This is a special resistance wire wound on a spool of noninflammable material and mounted in the distributor housing back of the condenser as shown in Figure 6. It is for the purpose of regulating the charging current. The regulation is effected through an arm operated from the distributor shaft. This arm is caused to move by the centrifugal force of the weight to which it is connected, and when the arm is in the raised position, the regulating resistance is in the series with the shunt field, thus decreasing the amount of current in the shunt field and consequently cutting down the charging rate at high speeds. The circuit of this is very clearly shown in the circuit diagram on Figure 1,

There are six different sizes of Nichrome wire (this is special resistance wire and must not be replaced by wire of different material) on these spools, which are as follows:

Piece No.	Size B, & S. Gauge	Diameter of Wire
633	21	.028"
703	22	.025"
702	23	.022"
701	24	.020"
817	25	.017"
955	26	.015"

The above lot of spools, together with the different length brass caps on the ends of the spools, are the adjustments for the output of the generator.

On leaving the factory each generator is fitted with a spool which gives the proper output. The necessity of this is caused by the differences in the manufacturing, and the different windings of the armatures to compensate for the different speeds at which they are driven.

On the generators which are driven at or near engine speed, spool No. 702 is most often used, 701 and 703 sometimes being used. On generators Nos. 52 and 58, which are driven at one and one-half times engine speed, spools Nos. 817 and 955 are often used.

The generator begins to charge the battery at approximately seven miles per hour on all cars and reaches the maximum charging rate of 16 to 20 amperes from 18 to 25 miles per hour on all generators (excepting No. 52, which is from 16 to 22 amperes.) At higher speed the current decreases to 10 or 15 amperes.

By installing a spool of a larger size wire, the charging rate is slightly increased at car speed of twenty miles or higher.

By installing the spool with the wide cap at the bottom, the maximum charging rate is increased with a corresponding increase at higher speeds.

The contact arm should have a tension of not less than six ounces on the spool but it should not be enough to cause the arm to stick upon the wire when raised with the fingers.

A poor contact between the arm and spool causes the generator to run at a higher speed when the ignition button is pulled out, and results in excessive clicking of the driving clutch when the engine is operated at low speeds.

The contact arm should be adjusted to rest on the lower brass cap when the generator is not driven, or standing idle. The spool bracket can be raised or lowered by loosening the two screws through the bracket; the holes in the bracket being slotted for this purpose.

The holding spring at top of the spool should be sprung down before replacing the spool so as to have sufficient tension to hold it firmly.

After making any adjustments, always check the charging rate by connecting a reliable ammeter in the line to the forward terminal on the generator.

Serious damage will be caused by allowing the charging rate to exceed 25 amperes, as this is above the capacity of the generator.

Installing the Ammeter

The original equipment does not include an ammeter for indicating the net charging rate of the generator. In selecting an ammeter for this purpose, a "zero" center type should be chosen, reading at least 10 amperes discharge and 30 amperes charge. The meter should be connected in the charging circuit as follows: Remove wire from No. 1 terminal on the back of the combination lighting and ignition switch; connect this wire to the negative terminal on the back of the ammeter and from the positive terminal on the back of the ammeter, connect a similar wire to No. 1 terminal on the switch. An ammeter connected in this manner will show both the charging and discharge rate of the storage battery.

Combination Switch

The combination switch is located on the cowl board and makes the necessary connections for ignition and lights.

The "M" button controls the magneto type ignition and -the "B" button, the dry cell ignition. In addition to this both the "M" and "B" buttons control the circuit between the generator and the storage battery. When the circuit between the generator and the storage battery is closed by either the "M" or "B" button on the combination switch the generator runs as a shunt motor. At engine speed less than 300 R. P. M. the storage battery is being discharged, but the current is so small that it is negligible.

The lighting circuits are controlled by the three buttons on the left.

Circuit Breaker Relay

The circuit breaker is mounted on the combination switch as shown in Figure 8. This unit is a protective device, which takes the place of fuses. It prevents the discharging of the battery or damage to the wiring,

lamps, horn or ignition, in case any of the wires leading to these parts become grounded. As long as the lamps, horn and ignition are using the normal amount of current, the circuit breaker is not affected. But in the event of any of the wires becoming grounded, an abnormally heavy current is conducted through the circuit breaker, thus producing a strong magnetic field around the core which attracts the armature and opens the contacts. This cuts off the flow of current which allows the contacts to close again and the operation is repeated causing the circuit breaker to pass an intermittent current and give forth a clicking sound.

It requires 25 amperes to start the circuit breaker vibrating, but once vibrating, a current of three to five amperes will cause it to continue to operate.

In case the circuit breaker vibrates repeatedly, do not attempt to increase the tension of the springs, as the

vibration is an indication of a ground in the system. Remove the ground and the vibration will stop.

If the circuit breaker continues to vibrate when all of the buttons on the combination switch are depressed, the ground is almost invariably in the horn or its circuit.

Dimmer Resistance

The headlights are dimmed by cutting the dimmer resistance into the headlight circuit (Figures 1 and 8). This resistance checks the flow of current to the lamps, causing them to operate at a lower candle power.

By cutting off a small amount of the dimmer resistance coil, the lights from the dimmer can be made brighter if desired.

Ignition

The ignition system used on the cars listed, requires little attention other than occasional adjustment and replacement of such parts as may wear out from time to time.

The timing of the ignition of these systems is accomplished by loosening the screw in the top of the distributor shaft and turning the fibre cam to the proper position and then tightening the screw so as to hold the cam in any desired position. With regards to the exact directions for timing any particular motor, the manufacturers of that motor car should be consulted.

Contact Points

The type of breaker used in the distributors of these systems requires careful adjustment not only for the gap between the contacts when open, but also the pressure between the contacts when closed. When open, the gap between the contacts should be approximately .010" (inches), and when closed the contact arm blade on which one contact point is mounted should be depressed about .015" (inches), from the outside clip. These adjustments will be made clear by referring to Figure 10.

When making any adjustments on this type breaker, particular attention must be given to the little flexible copper wire pigtail on the contact arm. If this is broken it will cause arcing between the contact arm and stud on which the arm works, causing the arm to stick on the stud, making a poor connection, and will cause the contact arm operating spring to heat and lose its temper, as well as the blade on the contact arm. en the temper is withdrawn from these parts, the current in the primary of the ignition coil may be reduced to 50% of its normal value, and this will cause a very serious missing at high speed.

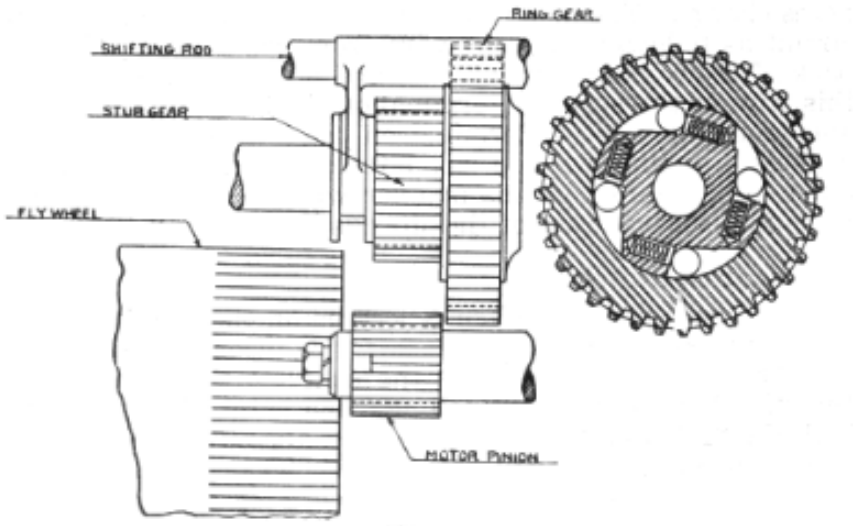

Fig. 9

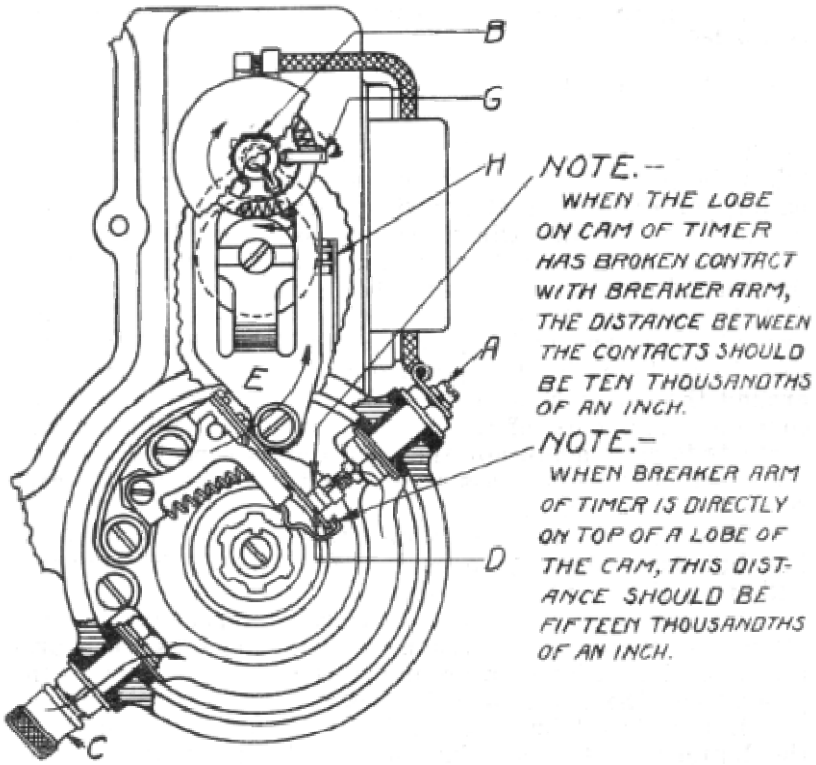

Fig. 10

Spark Advance

The same weight which operates the arm on the regulating resistance spool, also operates the automatic spark control. The action of this can be understood by referring to Figure 6. As the engine speed increases this weight tends to assume a position in a horizontal plane and in doing so has the effect of automatically advancing the spark to position in proportion to the engine speed.

The compression of the engine and the gas mixture are factors in the time required for the timing to be correct, and in order to secure the proper timing of the ignition due to these variations, the distributors have a manual control, to retard the spark for starting, idling and carburetor adjustments.

Ignition Coil

The ignition coil is of the round type mounted on the dash on some cars and on the top of the motor generator on others, and it requires no attention except occasional inspection to insure that there are good connections between the wires and terminals.

An open or short circuit in the coil winding will interfere with its operation.

A short circuit in the secondary winding of the ignition coil will cause the spark obtained from a wire, removed at the spark plug, to be much weaker and will cause missing when the engine is pulling, especially at low speed. A good coil should deliver a steady spark through a 1/4" (inch) air gap when the wire is removed from the high tension terminal on the coil while the engine is running.

Condenser

At the instant the contact points in the distributor break the condenser discharges through the primary winding of the Ignition coil in the reverse direction from which it was charged causing the iron core of the coil to be quickly demagnetized and remagnetized in the reverse direction, resulting in a very rapid change of magnetism within the secondary winding, and produces in the secondary winding the high voltage necessary for ignition purposes. Therefore, when the condenser is weak, a very weak spark results at the plugs and the timer contacts burn readily.

The best test to make in the field for doubtful condenser or ignition coil, is to substitute a new condenser or coil, taken from a car on which the ignition is working perfectly and note the effect of the new condenser or coil on the ignition of the engine in question.

Resistance Unit

The resistance unit is a coil of resistance wire wound on a porcelain spool as shown at G in Figure 10. Under ordinary conditions it remains cool and offers little resistance to the passage of current. If for any reason the

ignition circuit remains closed for any length of time, the current passing through the coil heats the wire, increasing its resistance to a point where very little current passes, and insuring against a waste of current from the battery and damage to the ignition coil and timer contacts. By referring to the circuit diagram, (Figure 1), it can be seen that when the arm that cuts the regulating resistance in the shunt field circuit is at the top position (that is at high speeds), the resistance unit is cut out of the ignition circuit. This increases the intensity of the spark at high speeds. The unit also causes a more uniform spark to be delivered by the coil at all speeds.

Lubrication

There are oil holes in each of the end frames which are exposed when the covers are removed. A few drops of oil placed in these holes every month will lubricate the ball bearings on each end of the armature shaft.

By removing the distributor head and rotor, it will be possible to apply a few drops of light cylinder oil in the top distributor shaft ball bearing. The cup grease in the distributor housing properly lubricates the ball bearing at the lower end of the distributor shaft.

The spiral gears for driving the distributor shaft are lubricated by filling the distributor housing through the window at the lower front side of the distributor housing. Grease should never be put in the housing through the window at the upper, outer side of the distributor. Should this be done, the grease will work into the regulating arm and spool compartment causing a poor connection between the contact arm and spool, thus reducing the charging rate of the generator.

Care should be taken not to put in too much grease, as if this is done, an excessive quantity will be forced through the front armature bearing and gum up on the generator commutator, and thus reduce the charging rate. The starting clutch and shaft (Figure 7) on which it slides are both lubricated by a grease cup which forces grease through the hollow shaft. It will be necessary to repack the starting clutch from time to time. The grease used for lubrication should be the best grade of light cup grease.

"Lubrication insures long life."