ELECTRICAL SYSTEM

The wiring diagrams, Fig. 1 and 3 show the general arrangement of all chassis electrical circuits, together with units in correct relation to position in which they will be found on the chassis.

Regular inspection of all electrical connections avoids failures in the electrical system. When tracing any one particular circuit refer to Wiring Harness, Page 59 for color of wire and tracer.

Radio Interference Suppression

The vehicle is equipped with filters in several of the electrical circuits and resistor type suppressors have been placed in the ignition high tension system, which together with bonding and shielding prevents interference with radio communication. (See Page 72.)

Filterettes, consisting of a coil in series with the line and two condensers across the line to ground, have been placed in the line from the primary of the high tension coil to the ignition switch; from ammeter to the "B" terminal of the voltage regulator and, from ammeter to the battery. Condenser type filters have been placed from the generator armature terminal to ground, and, from the regulator field terminal to ground. See detail wiring diagram in Fig. 1, Page 58.

Failure of the ignition or charging system because of open circuit filters can be checked by shorting across the terminals of the suspected filterette unit. If operation is not restored filterette may be considered to be in proper condition. These filterettes are combined in a container on the drivers side of the dash. There are two types of containers. Terminals are exposed on one type by opening cover which is held by a latch on the top, and on the other type by removing the cover. In an emergency, operation of the vehicle can be resumed by placing a shorting wire across the open circuit of the filterette.

To check filterette for short to ground, remove case of unit from dash. If short is NOT removed filterette may be considered satisfactory. If short IS removed filterette is defective. Temporary operation can be obtained by leaving case of the filterette ungrounded.

The regulator field filter (condenser type) which is mounted on the regulator itself can be checked by the same procedure as in the test for a shorted filterette.

Broken suppressors (resistor type) will affect the operation of the vehicle. Temporary operation can be obtained by removing the broken suppressor and making direct connection.

On vehicles equipped with radio suppression, the letter "S" appears on the cowl between the rear end of the hood and the windshield, 1¼" above bottom edge of hood.

Battery

The battery is a 6 Volt, 15 Plate, 116 Ampere Hour battery. It is located under the hood on a bracket attached to the right hand side rail of the frame and held solidly on the base with a battery hold down assembly over the top of the battery by two studs and wing nuts.

The battery should be checked once a week with a hydrometer and at the same time check the electrolyte level in each cell; add distilled water if necessary. Do not fail to replace filler caps and tighten securely. Battery fumes or acid coming in contact with any metal parts causes corrosion and eating away of these parts. To safeguard against this difficulty avoid overfilling.

The negative terminal of the battery (smallest post) is grounded by a cable bolted to the frame.

The engine ground cable located on the right hand side of engine, which connects the front engine support plate with the frame, is required due to the engine being mounted on rubber insulators.

If the terminal connections of this cable are loose or dirty, it will cause hard starting of the engine. Attention should be given to this ground cable during each inspection, and also at the time the engine requires a tuneup.

Fuel Gauge

The fuel gauge circuit Fig. 2, is composed of two units. The indicating unit or dash unit which is mounted in the instrument panel, and the tank unit, which is mounted in the fuel tank. These units are connected by a single wire. The circuit for this instrument passes through the ignition switch, therefore, the fuel gauge operates only when the ignition switch is on.

The dash unit is of the balanced coil type and is designed so that its operation is not affected by variations in the voltage of the electrical system.

The tank unit consists of a resistance wire wound on an insulator and a contact arm which is moved by the float arm. As the depth of the fuel in the tank varies, the contact arm is moved across the resistance wire and so varys the resistance. As this resistance is varied, there results a proportionate variation of current in the coils of the dash unit which is calibrated to accurately indicate the fuel level in the tank.

If the gauge does not register properly, first check all wire connections to be sure that they are clean and tight. Then make sure that the dash unit is grounded to the dash and that the tank unit is grounded to the fuel tank.

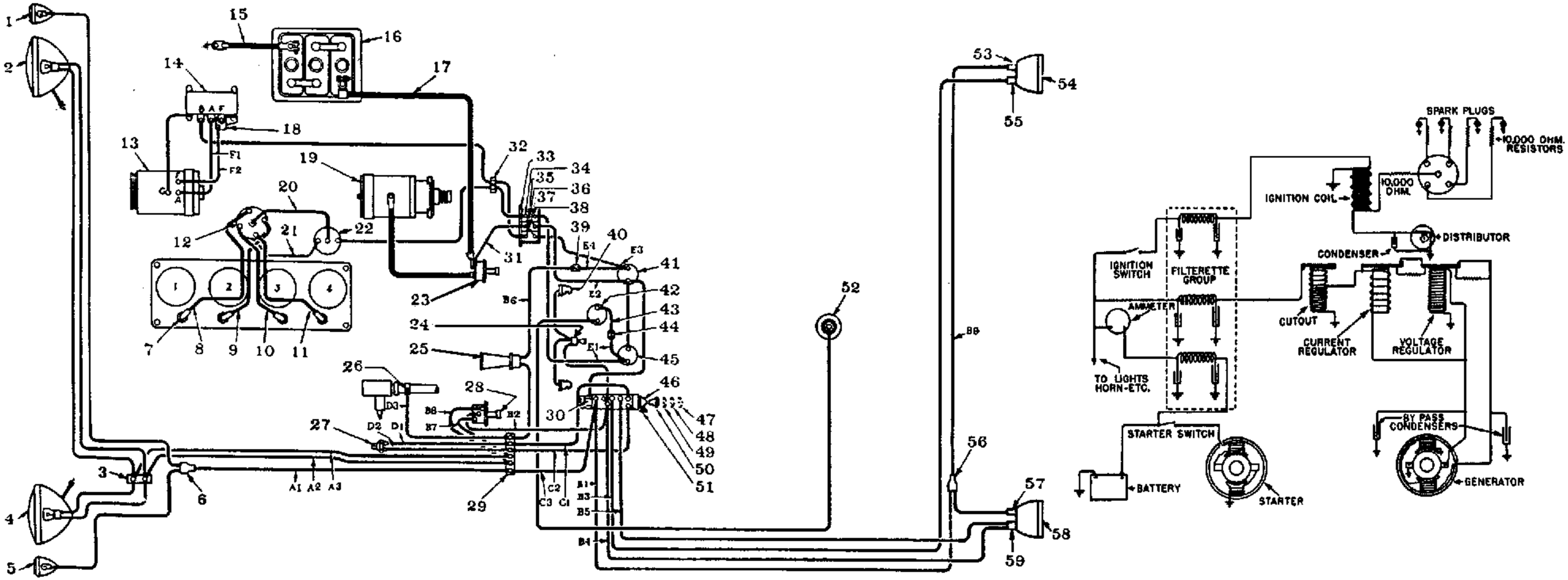

FIG. 1—WIRING DIAGRAM

No.	Willys Part No.	Ford Part No.	Name
1	A-1437	GPW-13200	Blackout Head Lamp—Right
2	A-1305	GPW-13005	Service Head Lamp—Right
3	639599	GPW-14448-A	Junction Block—2 post
4	A-1304	GPW-13006	Service Head Lamp—Left
5	A-1436	GP-13700-B	Blackout Head Lamp—Left
6	635985	GPW-14487-A	Connector
7	A-538	GPW-12405	Spark Plug and Gasket
8	A-1412	GPW-12287	Spark Plug Cable No. 1
9	A-1414	GPW-12284	Spark Plug Cable No. 2
10	A-1416	GPW-12283	Spark Plug Cable No. 3
11	A-1418	GPW-12286	Spark Plug Cable No. 4
12	A-1244	GPW-12100	Ignition Distributor
13	A-5992		Generator Assembly
14	A-1409	GPW-10505	Voltage Regulator and Circuit Breaker
15	A-1320	GPW-14301	Battery Ground Strap
16	A-1238	11AS-10655	Battery
17	A-1452	GPW-14300	Battery Positive Cable to Starter Switch
18	A-1287	GPW-18936-A	Radio Filter Unit (Generator Regulator)
19	A-1245	GPW-11001	Starting Motor
20	A-1420	GPW-12298-B	Ignition Coil Secondary Cable
21	A-5083	GPW-14321	Ignition Coil Primary Cable

No.	Willys Part No.	Ford Part No.	Name
22	A-1527		Ignition Coil
23	A-6181		Starter Switch
24	A-1333	GPW-13740	Instrument Lamp Switch
25	A-1312	GPW-13802	Horn
26	A-302	GPW-13836	Horn Button Contact (Steering Gear)
27	A-1271	11A-13480	Stop Lamp Switch
28	638979	GPW-13532	Head Lamp Foot Switch
29	A-1490	GPW-14448-B	Junction Block
30	A-1349	GPW-12250-C	Thermal Circuit Breaker—30 Amp.
31	A-5078	GPW-14457	Filter (Reg. Bat. Amm.) to Starter Switch Cable
32	639599	GPW-14448-A	Junction Block
33	A-5980		Filter Group and Bracket Assembly
34			Filter Terminal to Coil Primary
35			Filter Terminal to Battery
36			Filter Terminal to Regulator (B)
37			Filter Terminals to Ammeter
38			Filter Terminal to Ignition Switch
39	A-1734	GPW-12250-B	Circuit Breaker, 15 Amp—Horn
40	A-1411	GPW-13710	Instrument Lamp Socket and Cable

No.	Willys Part No.	Ford Part No.	Name
41	A-5231	GPW-10850	Ammeter
42	A-1268	GPW-9280	Gas Gauge Dash Unit
43	A-5080	GPW-14416	Gas Gauge Circuit Breaker to Gas Gauge Dash Unit Cable
44	A-1733	GPW-12250-A	Circuit Breaker, 5 Amp., Gas Gauge
45	A-2517	GPW-3686	Ignition Switch
46	A-1332	11TS-11654	Blackout Lighting Switch
47			Service Stop Light Position
48			Service Position
49			Blackout Position
50			Off Position
51			Service Position Lock
52	A-1292	GPW-9275	Fuel Gauge—Tank Unit
53			Blackout Tail Light
54	A-1065	GP-13404-B2	Tail and Stop Lamp—Right
55			Blackout Stop Light
56	635985	GPW-14487-A	Connector
57			Blackout Tail Light
58	A-1064	GP-13405-B2	Tail and Stop Lamp—Left
59			Service Tail and Service Stop Light

WIRING HARNESS

Willys Part No.	Ford Part No.	Name
A-1665	GPW-14425	Head lamp wiring harness The following (3) cables are included in this harness but not supplied individually: A-1 Blackout head lamp junction block cable (Yellow with two black tracings) A-2 Head lamp junction block to junction block cable (Upper beam) (Red, three white tracings) A-3 Head lamp junction block to junction block cable (Lower beam) (Black, white tracings)
A-5048	GPW-14401-B	Body wiring harness—Long The following (9) cables are included in this harness but not supplied individually: B-1 Light switch (Terminal marked B.H.T.) to blackout tail light Conn. Cable (Yellow, two black tracings) B-2 Light switch (Terminal marked H.T.) to foot dimmer switch center terminal cable (Blue, three white tracings) B-3 Light switch (Terminal marked B.S.) to blackout stop light cable (White, two black tracings) B-4 Light switch (Terminal marked H.T.) to service tail light and inst. lamp switch cable (Blue, two white tracings) B-5 Light switch (Terminal marked S.) to service stop light cable (Black, two white tracings) B-6 Horn circuit breaker to horn cable (Black, two red tracings) B-7 Junction block to foot dimmer switch (Lower beam) Cable (Black, two white tracings) B-8 Junction block to foot dimmer switch (Upper beam) Cable (Red, three white tracings) B-9 Connector to blackout tail light cable (Yellow, two black tracings)
A-1551	GPW-14402	Body wiring harness—Left side—Short The following (3) cables are included in above harness but not supplied separately: C-1 Junction block to light switch (Stop switch) (Red, two white tracings) C-2 Junction block to light switch cable (Stop switch) (Green, two black tracings) C-3 Junction block to light switch cable (Blackout head) (Yellow, two black tracings)
A-5061		Chassis wiring harness—Left side The following (3) cables are included in above harness but not supplied separately: D-1 Stop light switch to junction block cable (Red, two white tracings) D-2 Stop light switch to junction block cable (Green, two black tracings) D-3 Steering gear horn terminal to junction block cable (Three black, two white tracings)
A-5981		Filter wiring harness The following (4) cables are included in this harness but not supplied individually: E-1 Filter (Coil ign. switch) to ignition switch to gas gauge circuit breaker (Black, two white tracings) E-2 Filter (Battery, ammeter) to ammeter cable (Red, three white tracings) E-3 Filter (Reg. battery ammeter) to ammeter cable (Black, three white tracings) E-4 Ammeter to horn circuit breaker cable (Black, two red tracings)
A-5074	GPW-14305	Generator to voltage regulator and filter harness F-1 Generator to regulator armature cable (Red, three white tracings) F-2 Generator to regulator field cable (Green, two black tracings)
A-719	GPW-13410	Blackout tail lamp to connector cable, left
A-5072	GPW-14458	Ignition switch to ammeter to blackout switch cable
A-5080	GPW-14416	Fuel gauge to circuit breaker cable
A-1731	GPW-14436	Headlamp ground cable
A-5070	GPW-14406	Fuel gauge (Inst. board) to fuel gauge (Tank unit) cable
A-5081	GPW-14409	Horn to junction block cable
A-5073	GPW-14459	Filter (Reg. bat.) to junction block cable
A-5078	GPW-14457	Filter (Bat.) to starter switch cable
A-5079	GPW-14456	Filter (Coil pri.) to junction block cable
A-5041	GPW-18846	Voltage regulator to generator ("G") cable (Bond No. 8)
A-5082	GPW-14465	Voltage regulator to junction block cable
A-1733	GPW-12250-A	Circuit breaker (Between ignition switch and fuel gauge on inst. board)
A-1734	GPW-12250-B	Circuit breaker (Between ammeter and horn)
635985	GPW-14487-A	Connector (3 wire)

If, after checking all grounds and wire connections, gauge does not indicate properly, remove wire from tank gauge unit and ground it to frame while ignition switch is on. Gauge should then read FULL. Remove wire from frame (with ignition switch on) and gauge should read EMPTY. If this is not the case, dash gauge should be replaced with a new one. If the gauge indicates as described, the trouble is probably in the tank unit, which should be replaced. Do not attempt to repair either gauge or tank unit, replacement is the only practical procedure.

Lighting System

The wiring of the lighting system is shown in Fig. 3. The lights are controlled by switches within easy reach of the driver. The lighting circuit is protected by an overload circuit breaker, which clicks off and on in the event of a short circuit in the wiring. The circuit breaker is located at the rear end of the main light switch and no replaceable fuse is required.

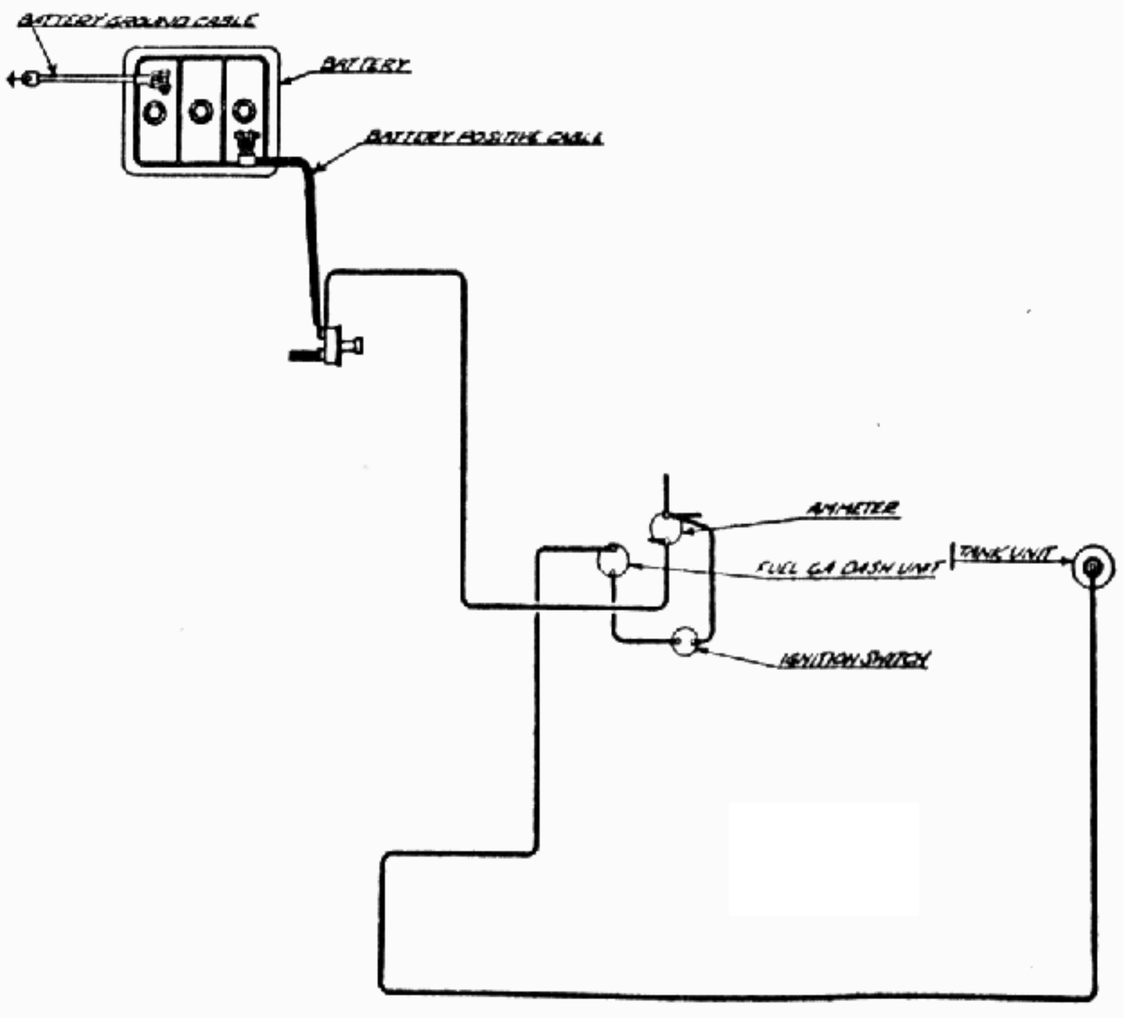

FIG. 2—FUEL GAUGE CIRCUIT

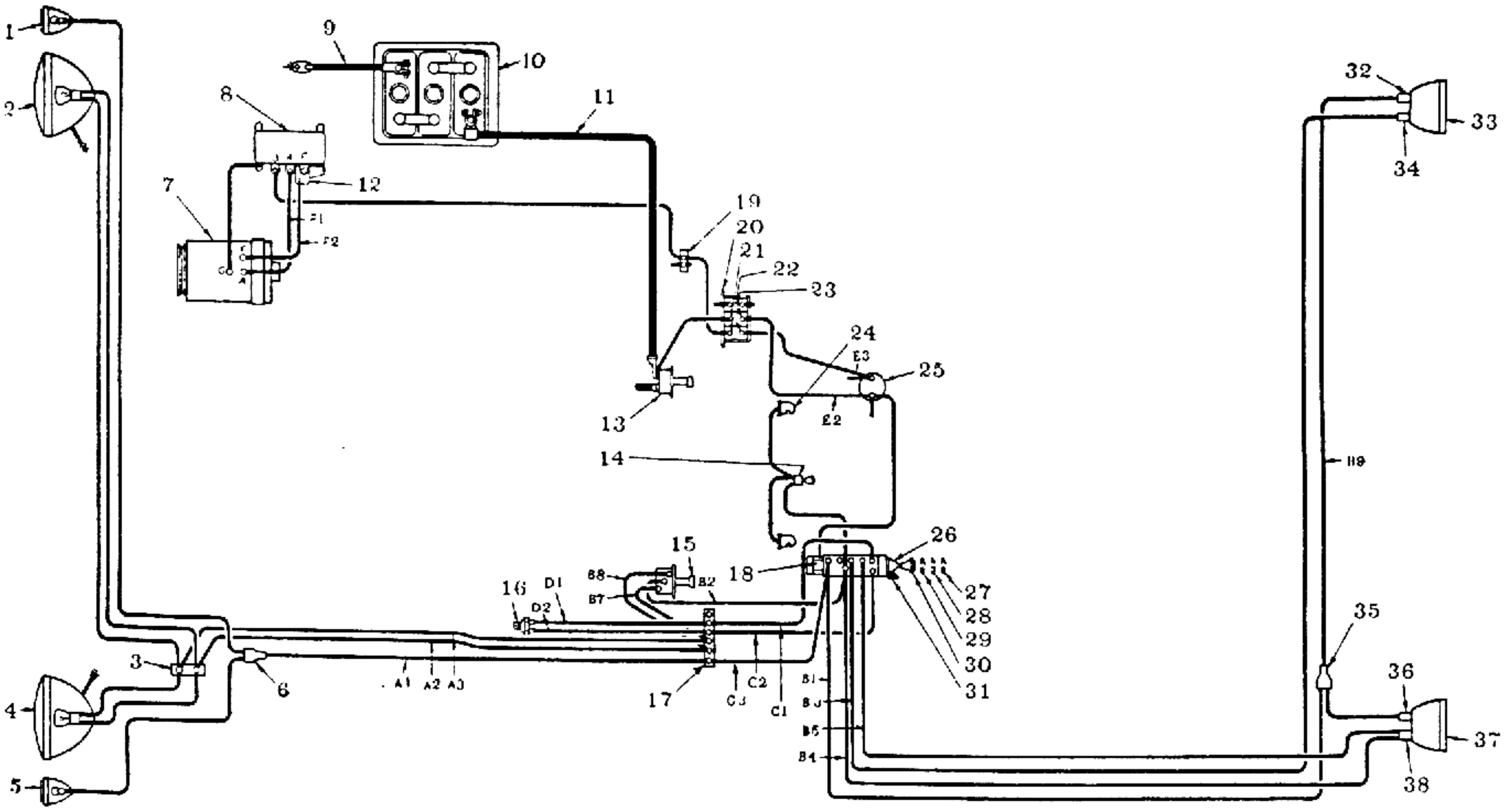

FIG. 3—LIGHTING SYSTEM

No.	Willys Part No.	Ford Part No.	Name
1	A-1437	GPW-13200	Blackout Head Lamp—Right
2	A-1305	GPW-13005	Service Head Lamp—Right
3	639599	GPW-14448-A	Junction Block—2 post
4	A-1304	GPW-13006	Service Head Lamp—Left
5	A-1436	GP-13700-B	Blackout Head Lamp—Left
6	635985	GPW-14487-A	Connector
7	A-5992		Generator
8	A-1409	GPW-10505	Voltage Regulator and Circuit Breaker
9	A-1320	GPW-14301	Battery Ground Strap
10	A-1238	11AS-10655	Battery
11	A-1452	GPW-14300	Battery Positive Cable
12	A-1287	GPW-18936-A	Radio Filter Unit (Generator Regulator)
13	A-6181		Starter Switch
14	A-1333	GPW-13740	Instrument Lamp Switch
15	638979	GPW-13532	Head Lamp Foot Switch
16	A-1271	11A-13480	Stop Lamp Switch
17	A-1490	GPW-14448-B	Junction Block—6 post
18	A-1349	GPW-12250-C	Thermal Circuit Breaker—30 Amp.
19	639599	GPW-14448-A	Junction Block—2 post
20	A-5980		Filter Group and Bracket Assembly
21			Filter Terminal to Battery
22			Filter Terminal to Regulator (B)
23			Filter Terminals to Ammeter
24	A-1411	GPW-13710	Instrument Lamp Socket and Cable
25	A-5231	GPW-10850	Ammeter
26	A-1332	11TS-11654	Blackout Lighting Switch
27			Service Stop Light Position
28			Service Position
29			Blackout Position
30			Off Position
31			Service Position Lock
32			Blackout Tail Light
33	A-1065	GP-13404-B2	Tail and Stop Lamp—Right
34			Blackout Stop Light
35	635985	GPW-14487-A	Connector
36			Blackout Tail Light
37	A-1064	GP-13405-B2	Tail and Stop Lamp—Left
38			Service Tail and Service Stop Light

Main Light Switch

The main light switch Fig. 4 has four positions. When the switch button is all the way in, all lights are turned off. Pulling the switch out to the first position turns on the blackout lamps, the blackout tail lamp and also connects the circuit with a blackout stop lamp on the right side which is operated through the stop light switch when the brakes are applied.

To turn on the service headlamps, it is necessary to push down on the lock-out control button and while holding it down, pull the switch button out to the next position.

During the day to cause the service stop light only, to operate upon brake application, pull the knob out to the last position. This should be done whenever the vehicle is used under ordinary driving conditions.

When installing a new light switch refer to Fig. 4 and wiring diagram, Fig. 3 which will be helpful in determining the proper wires to install on terminals as marked.

The upper and lower headlight beams are controlled by a foot switch located on the toe board at the left side.

The instrument panel lights can only be turned on when main light switch is in the service position.

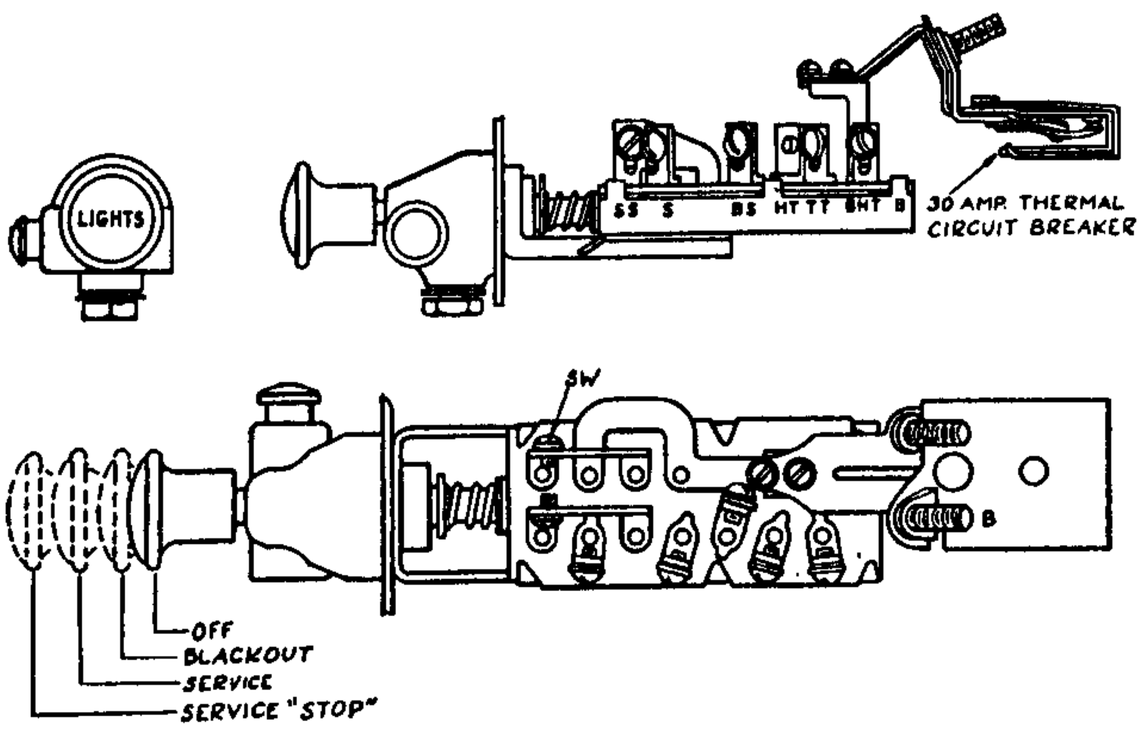

FIG. 4—MAIN LIGHT SWITCH

Stop Light Switch

Stop light switch is located in front end of brake master cylinder. The switch is a diaphragm type and closes the circuit when pressure is applied to the brakes forcing the fluid against the diaphragm which closes the circuit. When switch becomes inoperative it is necessary to install a new switch.

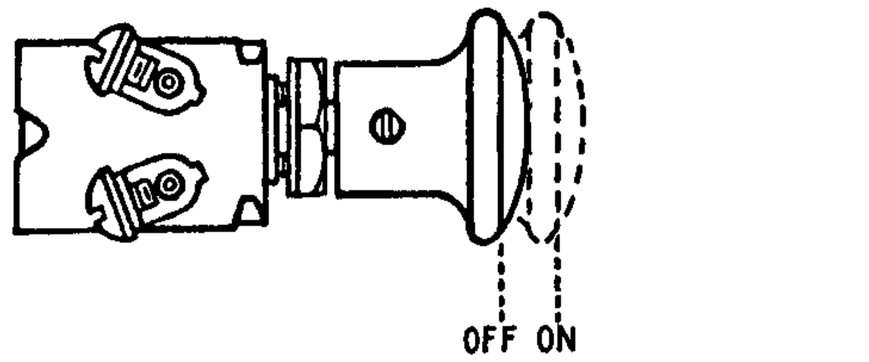

FIG. 5—PANEL LIGHT SWITCH

Panel Light Switch

The panel light switch, Fig. 5, controls the panel lights only when the main light switch is in "Service Position." Pull out on the switch knob to light the panel lights.

Head Lamps

The head lamps, Fig. No. 6, are the sealed beam type, in which the reflector, bulb and lens form a sealed unit and can only be replaced as a unit.

The lower beam filament is positioned slightly to one side of the focal point in the reflector, this results in deflecting the lower beam to the right side to illuminate the side of the road when meeting other vehicles on the highway.

To replace a burned out sealed beam unit remove door clamp screw and remove the door, No. 2, remove sealed beam assembly No. 1 and remove from connector at the rear of the unit. Install a new unit by reversing the above operations.

When a sealed beam unit has been replaced, check the aim of the head lamps.

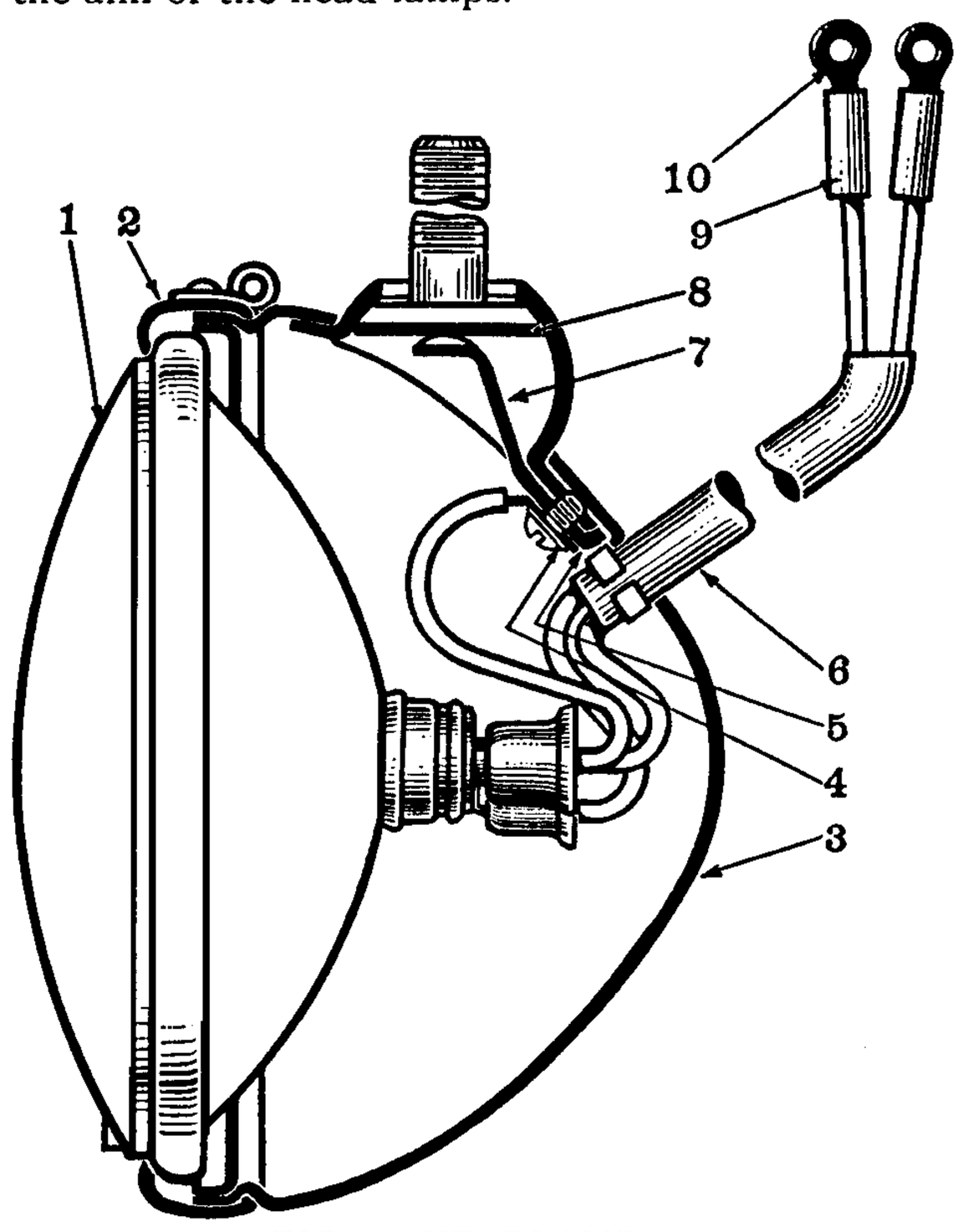

FIG. 6—HEADLAMP

No.	Willys Part No.	Ford Part No.	Name
1	A-1033	GPW-13007	Headlamp Seelite Unit Assembly
2	A-1036	GPW-13043	Headlamp Door Assembly
3	A-5586	GPW-13012	Headlamp Housing Sub—Assembly
4	A-1032	27693-S	Mounting Bolt Retainer Screw
5	52221	34803-S2	Mounting Bolt Retainer Lockwasher
6	A-1362	GPW-13076	Wire Assembly—Left (A-1363—Right)
7	A-1031	GPW-13015	Mounting Bolt Retainer
8	A-1361	GPW-13022	Mounting Bolt
9	306688	B-14455	Insulating Sleeve
10	307556	B-14463	Terminal

Head Lamp Aiming

Headlights may be aimed by use of an aiming screen or wall, Figure 7, providing a clear space of 25 feet from the front of the headlights to the screen or wall is available.

The screen should be made of a light colored material and should have a black center line for use in centering the screen with the vehicle. The screen should also have two vertical black lines, one on each side of the center line at a distance equal to lamp centers.

Place the vehicle on a level floor with the tires inflated to recommended specification. Set the vehicle 25 feet from the front of the screen or wall so that the center line of the truck is in line with the center line on the screen. To determine the center line of the vehicle, stand at the rear and sight through the windshield down across cowl and hood.

Measure from the floor to the center of the head lamp and mark a horizontal line on the screen 7″ less.

Turn on the headlight upper beam, cover one lamp and check the location of the upper beam on the screen. The center of the hot spot should be centered on the intersection of the vertical and horizontal lines on the screen as shown in Fig. 7.

If aim is incorrect, loosen the nut on the mounting bolt and move the head lamp body on its ball and socket joint until the beam is aimed as described, then tighten.

Cover the head lamp just aimed and adjust the other in the same manner.

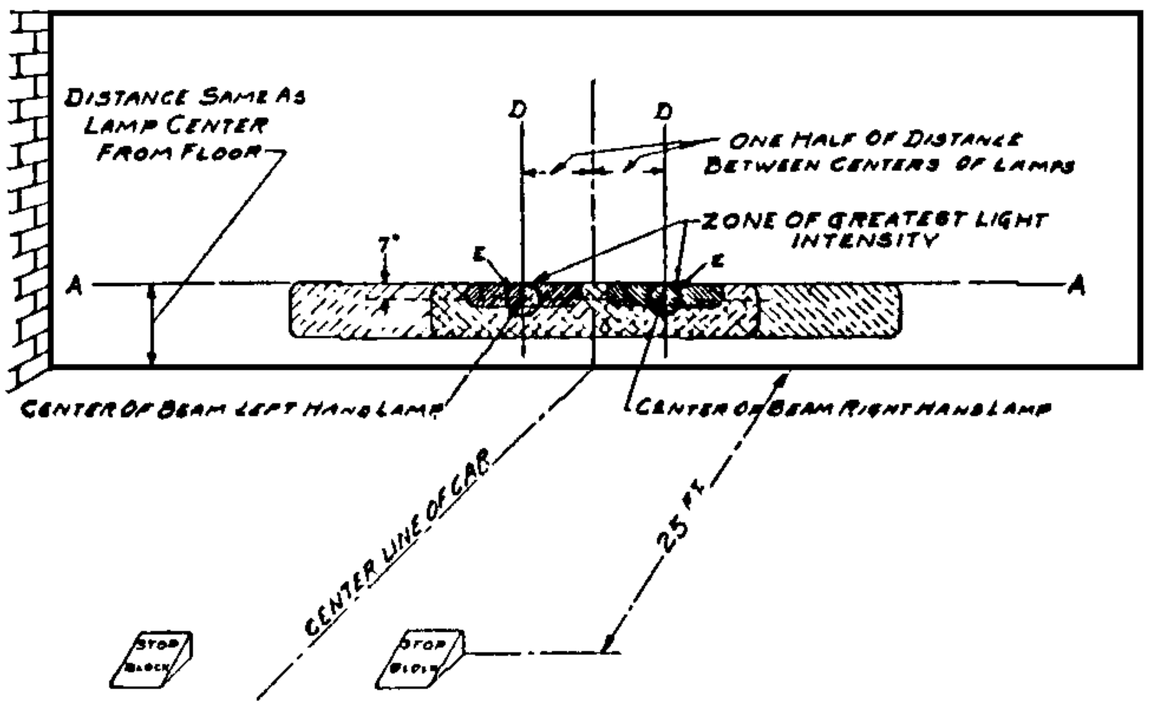

FIG. 7—HEADLIGHT AIMING CHART

Blackout Lamps

The blackout light, Fig. 8, is based on the principle of polarized light. The lens is so designed that only horizontal light beams are allowed to penetrate or pass thru the lens. This means the vertical light beams are blocked by the lens, therefore light rays cannot be seen from a point above the horizontal.

To replace lamp bulb remove door Screw No. 2 in lower side of rim—remove door No. 3 by slipping off bottom and tilt outward and up from lamp body. The door and lens are one unit. Replace Bulb (Mazda No. 63) and inspect gasket; if damaged replace and install door.

Tail and Stop Lamps

The tail and stop lamps, Fig. 9, consist of two separately sealed units placed in the Lamp Body.

The upper stop light or service unit consists of lens, gasket, reflector and (21-3 C.P. Bulb, L.H., No. 8, Fig. 9—R.H. 3 C.P., No. 4, Fig. 9) sealed as a unit. When Bulb fails entire Service unit must be replaced.

The Lower Tail lamp unit, No. 3 and 7, consists of lens, gasket, reflector and 3 C.P. Bulb sealed as a unit. When Bulb fails entire unit must be replaced.

To replace a unit remove the two screws in lamp door. Remove door then each unit can be pulled out of socket in lamp Body.

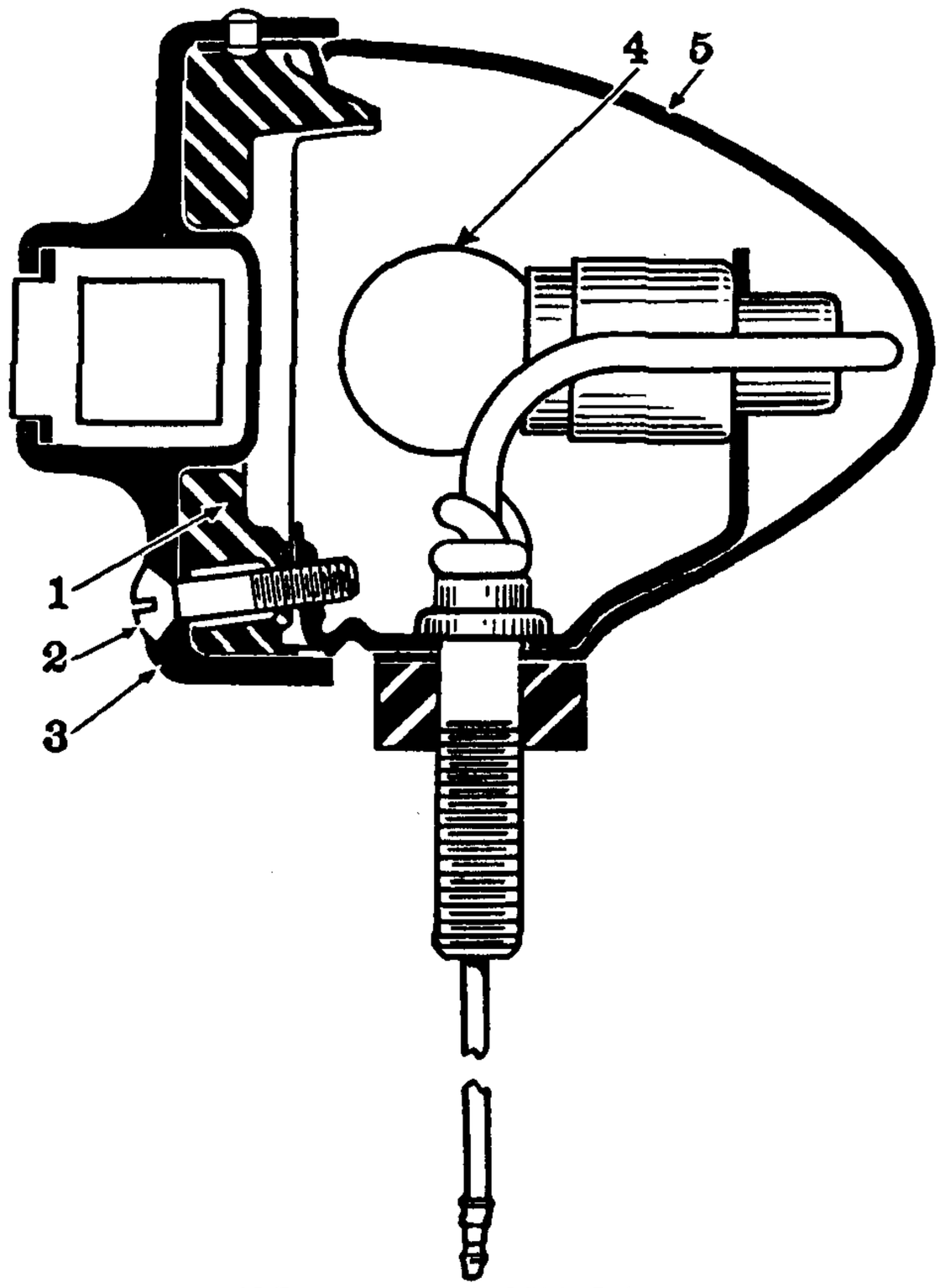

FIG. 8—BLACKOUT LAMP

No.	Willys Part No.	Ford Part No.	Name
1	A-1071	GP-13209-B2	Door Gasket
2	A-1072	28378-S2	Door Screw
3	A-1070	GP-13210-B	Door Assembly
4	51804	B-13466	Bulb
5	A-1439	GPW-13217	Housing Assembly—Left (Includes Wire Assembly) (Willys A-1440—Ford GPW-13216-B Right)

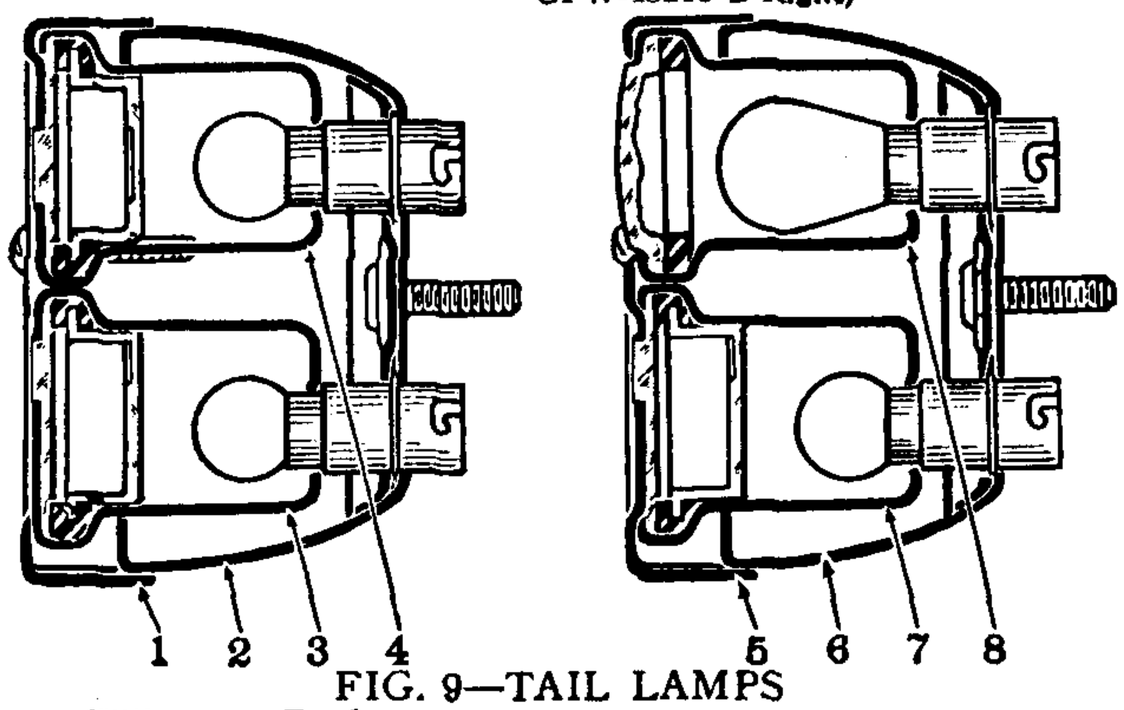

FIG. 9—TAIL LAMPS

No.	Willys Part No.	Ford Part No.	Name
1	A-1079	GP-13449-A	Door—Tail and Stop Lamp Assembly (Right)
2	A-1073	GPW-13408-B2	Housing Sub-assembly
3	A-1075	GP-13491-A2	Lower Tail Lamp Unit Assembly
4	A-1078	GP-13485-A2	Upper Stop Lamp Unit Assembly—Tail and Stop Lamp Assembly (Right)
5	A-1076	GP-13448-B2	Door—Tail and Stop Lamp Assembly (Left)
6	A-1073	GPW-13408-B	Housing Sub-assembly
7	A-1075	GP-13491-A	Lower Tail Lamp Unit Assembly
8	A-1074	GPW-13494-A2	Upper Service Assembly—Tail and Stop Lamp Assembly (Left)

IGNITION SYSTEM

The power in an internal combustion engine is derived from burning a fuel and air mixture in the engine cylinders under compression. In order to ignite these gases a spark is made to jump a small gap in the spark plug within each combustion chamber. The ignition system furnishes this spark. The spark must occur in each cylinder at exactly the proper time and the spark in the various cylinders must follow each other in sequence of firing order. To accomplish this the following parts are used:

The battery, which supplies the electrical energy;

The ignition coil, which transforms the battery current to high-tension current which can jump the spark plug gap in the cylinders under compression;

The distributor, which delivers the spark to the proper cylinders and incorporates the mechanical breaker, which opens and closes the primary circuit at the proper time;

The spark plugs, which provide the gap in the engine cylinders;

The wiring, Fig. 10, which connects the various units;

The ignition switch to control the battery current when it is desired to start or stop the engine.

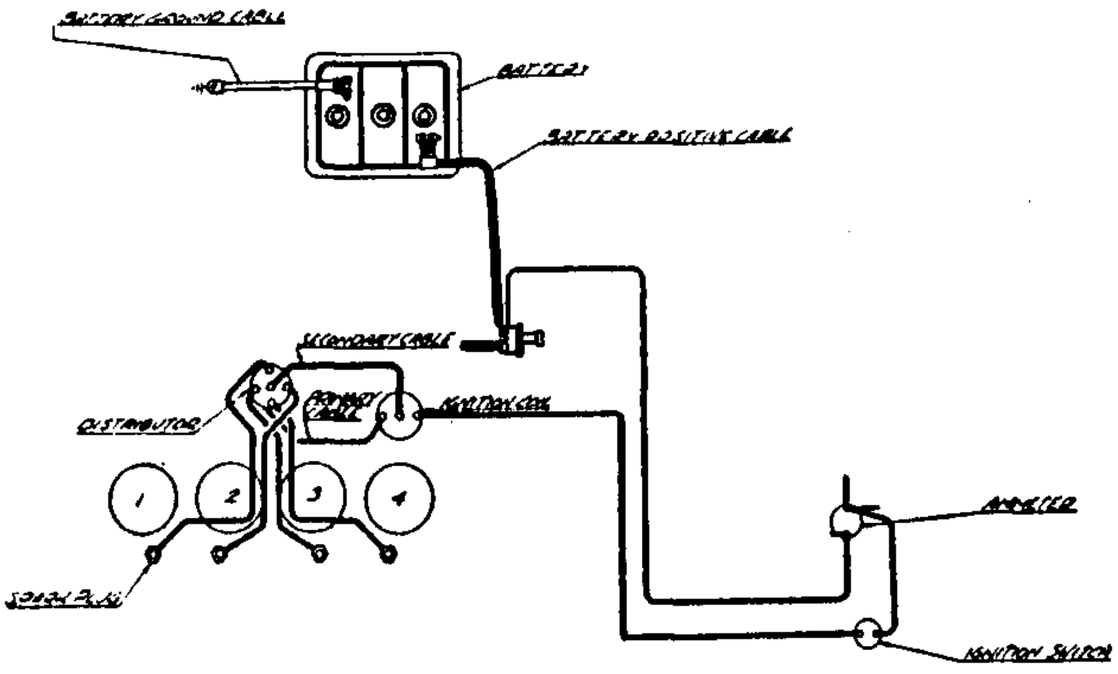

FIG. 10—IGNITION WIRING

Distributor

The distributor, Fig. 11 is mounted on the right hand side of the engine and is operated by a coupling on the oil pump shaft, driven by a spiral gear on the camshaft. The spark control is fully automatic, being operated by two counterweights pivoted on a plate which advances the timing automatically as the engine speed increases.

Distributor Overhaul

To remove distributor from engine the following procedure should be followed:

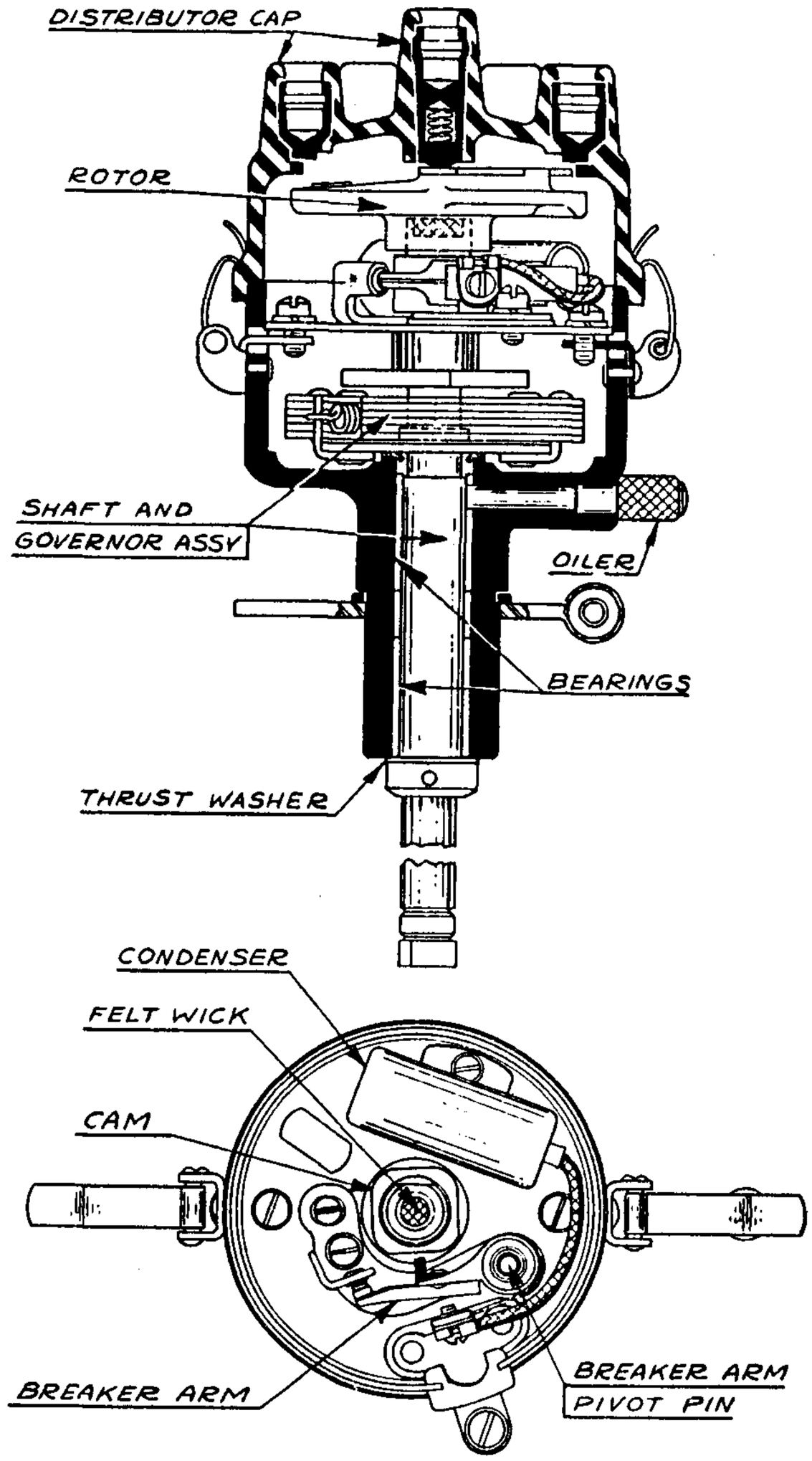

FIG. 11—DISTRIBUTOR

1. Remove high-tension wires from the distributor cap terminal towers, noting the order in which they are assembled to assure proper installation on reassembling. No. 1 spark plug terminal tower in distributor cap is the lower right hand tower at distributor cap spring clip. Starting with this tower the wires should be installed in a counter-clockwise direction 1-3-4-2.
2. Remove the primary lead from the terminal post at the side of the distributor.
3. Snap off the two distributor cap springs and lift the distributor cap off of the distributor housing.
4. Note the position of the rotor in relation to the base. This should be remembered to facilitate reinstalling and timing.
5. Remove the screw holding the distributor to the crankcase and lift the distributor from the engine.
6. Wash all parts thoroughly in a suitable cleaning fluid.

Distributor Cap

The distributor cap should be visually inspected for cracks, carbon runners, evidence of arcing, and corroded high-tension terminals. If any of these conditions exist, the cap should be replaced.

Rotor

Inspect the rotor for cracks or evidence of excessive burning at the end of the metal strip.

After a distributor rotor has had normal use, the end of the contact will become burned. If burning is found on top of the strip, it indicates the rotor is too short and needs replacing. Usually when this condition is found, the distributor cap insert will be burned on the horizontal face and the cap will also need replacing.

Distributor Points

The contacts should be clean and not burned or pitted. The contact gap should be set at .020" and should be checked with a wire gauge and re-adjusted if necessary by loosening the lock screw then turn the eccentric head screw. After adjusting, tighten the lock screw and then recheck the gap. If new contacts are installed they should be aligned so as to make contact near the center of the contact surfaces. Bend the stationary contact bracket to be sure of proper alignment and then recheck the gap.

The contact point spring pressure is very important and should be between 17 to 20 ounces. Check with spring scale hooked in the breaker arm at the contact and pull in a line perpendicular to the breaker arm. Make the reading just as the points separate. This pressure should be within the limits, too low a pressure will cause missing at high speeds, too high a pressure will cause excessive wear on the cam, block and points. Adjust the point pressure by loosening the screw holding the end of the contact arm spring and slide the end of the spring in or out as necessary. Retighten the screw and recheck the pressure.

Check the condenser, it should show a capacity of .18 to .26 microfarads. Check the condenser lead for broken wires or frayed insulation, clean and tighten the connections of the terminal posts. Be sure the condenser is firmly mounted to the distributor plate.

Governor Mechanism

The governor should be checked for free operation holding the distributor shaft and turn the cam to the left as far as it will go and release. The cam should immediately return to its original position with no drag or restrictions. Inspect the distributor shaft bearing in housing, also the shaft friction spring on end of shaft inserted into the coupling on the oil pump shaft; if damaged replace.

Setting Ignition Timing

Remove all spark plugs from engine, reinstall No. 1 spark plug finger tight. Loosen screw holding timing hole cover to flywheel housing which is located just under the starting motor on the right hand side of the engine, slide cover to side. Rotate engine crankshaft until No. 1 piston is coming up on the compression stroke, remove spark plug and rotate crankshaft slowly until the marking on flywheel "IGN" appears in the center of the timing hole in flywheel housing. Fig. 15 in Engine Section.

Place distributor rotor at No. 1 tower in distributor cap so that the points are just breaking.

Place the distributor in place on engine. When end of shaft enters driving collar on oil pump, rotate distributor shaft back and forth until driving lug on end of shaft enters the slot in coupling, then push distributor assembly down. Install holddown screw. Connect primary wire from coil to distributor. Rotate distributor body until points are just breaking, then lock in place by clamp screw. Install spark plugs and wires to distributor cap terminal towers starting with No. 1, installing in counter-clockwise direction, in the following order: 1-3-4-2. Start engine and run until it is fully warmed up, then recheck timing with Neon Timing Light. Accelerate engine and note automatic advance action.

Note: For 68 octane fuel (gasoline) set timing at top center (TC).

Generator

The generator, Fig. 12 is an air-cooled, 40 ampere, two brush type, and cannot be adjusted to increase or decrease output, as this is accomplished by use of a three-unit voltage regulator, consisting of a cutout relay, current limiting regulator and voltage regulator.

A periodic inspection should be made of the charging circuit. Under normal conditions an inspection of the generator should be made each 6,000 miles, however, the interval between these checks will vary depending upon the type of service. Dirt, dust and high speed operation are factors which contribute to increased wear of the bearings, brushes and commutator. Before assuming that any difficulty lies in the generator, a visual inspection should be made of all wiring, Fig. 13 to be sure that there are no broken wires and that all connections are clean and tight. Due attention should also be given to the Voltage Regulator, as covered under heading "Regulator" in this section. Bracket bolt torque wrench reading, 31-35 ft. lbs.

MAINTENANCE PROCEDURE

1. Commutator

If the commutator is dirty or discolored, it can be cleaned by holding a piece of No. 00 sandpaper against it while running the generator slowly. Blow the sand out of the generator after cleaning the commutator. If the commutator is rough or worn, the generator should be removed, the armature taken out, and the commutator turned down in a lathe. After turning the commutator, the mica should be undercut to a depth of 1/32".

To test the armature for ground connect one prod of test set to the core or shaft, (not on bearing surfaces) and touch a commutator segment with the other. If the lamp lights, the armature winding is grounded and the armature should be replaced.

To test for short in armature coils a growler is necessary. Place the armature on the growler and hold a thin steel strip on the armature core. The armature is then rotated slowly by hand, and if a shorted coil is present, the steel strip will vibrate.

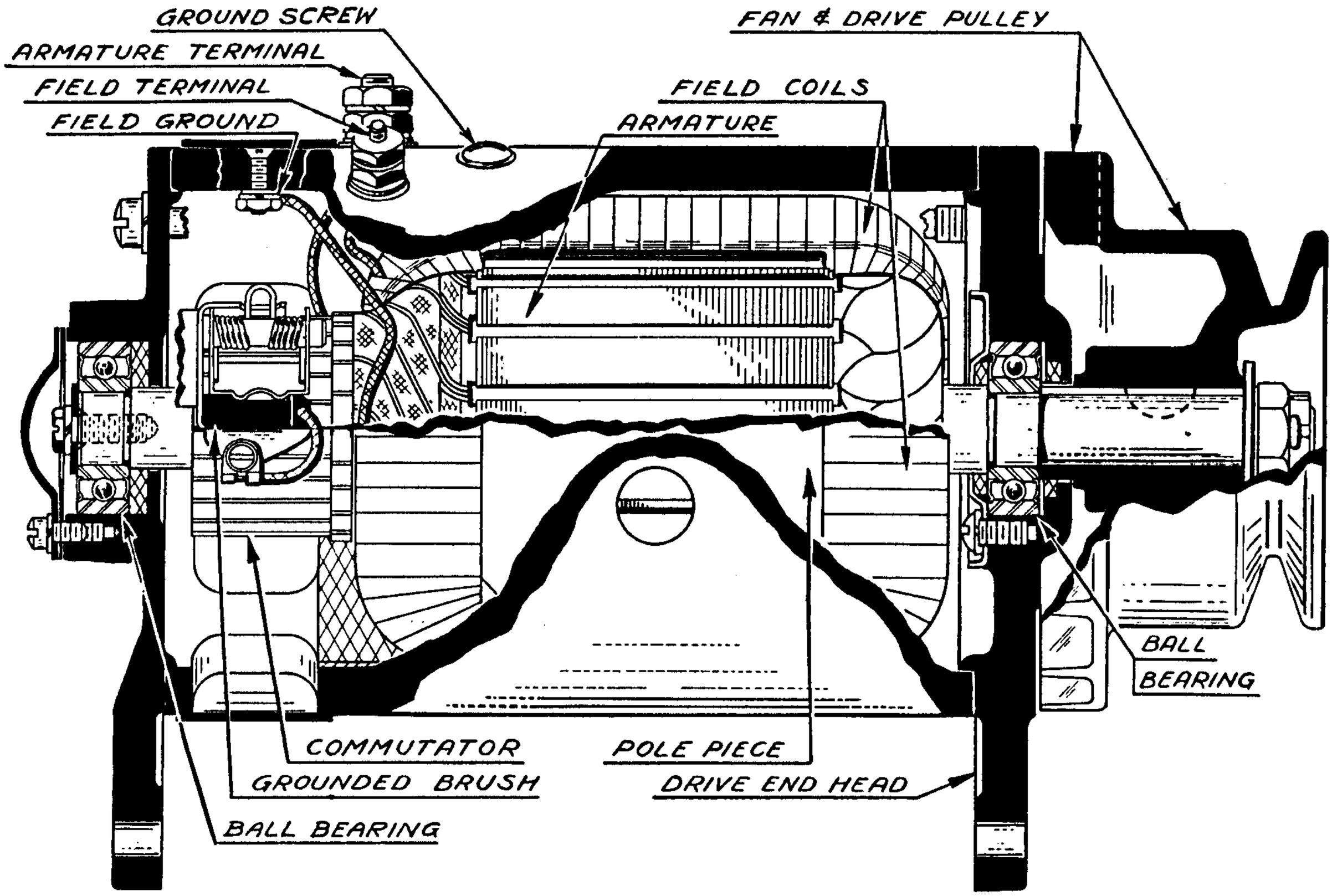

FIG. 12—GENERATOR

2. Brushes

The brushes should slide freely in their holders. If the brushes are oil soaked or if they are worn to less than one half of their original length, they should be replaced.

When replacing brushes, it is necessary to seat them so that they have 100% surface contact on the commutator. The brushes should be sanded to obtain this fit. This can be done by drawing a piece of No. 00 sandpaper around the commutator with the sanded side against the brush. After sanding the brushes, blow the sand and carbon dust out of the generator.

3. Brush Spring Tension

The brush spring tension should be checked. If the tension is excessive, the brushes and commutator will wear rapidly, while if the tension is low, arcing between the brushes and commutator will burn the commutator and reduce output. The brush spring tension is 64-68 ounces with new brushes.

4. Field Coils

Using test prods check the field coils for both open and ground. To test for open coil, connect the prods to the two leads of each coil. If the lamp fails to light, the coil is open and should be replaced.

To test for grounds, disconnect field coil ground terminal, place one prod on ground and the other on the field coil terminal. If a ground is present the lamp will light and the coil should be replaced.

5. Brush Holders

With test prods, check the insulated brush holder to be sure it is not grounded.

Touch the insulated brush holder with one prod and a convenient ground on the end plate, with the other prod. If the lamp lights, it indicates a grounded brush holder.

Inspect the brush holders for distortion and improper alignment. The brushes should swing or slide freely and should be perfectly in line with the commutator segments.

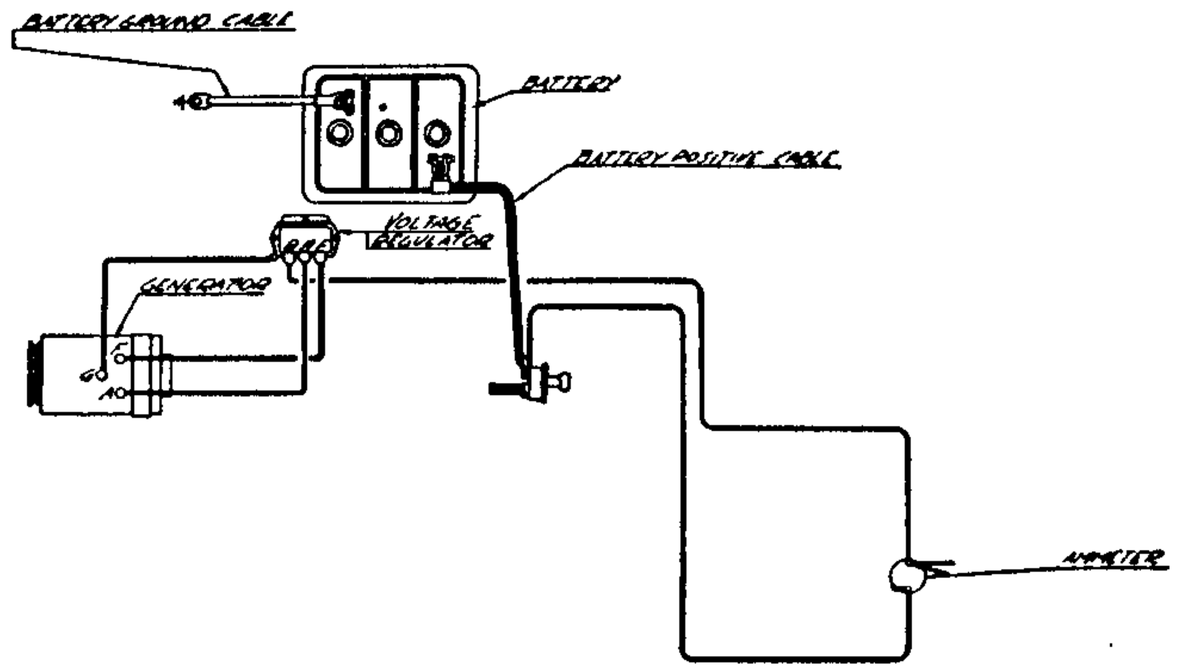

FIG. 13—GENERATOR WIRING CIRCUIT

REGULATORS

Regulators

The generator on this vehicle is controlled by a regulator unit, Fig. 14-15 which contains a voltage regulator, current limiting regulator, and circuit breaker.

The voltage regulator controls the generator voltage and does not allow it to rise above a value determined by the voltage regulator setting. This prevents overcharging of the battery.

The current regulator controls the maximum generator output of 40 amperes and does not allow the output to exceed the value determined by the current regulator setting. This prevents damage to the generator due to an overload.

The circuit breaker automatically closes the circuit between the generator and battery when the generator voltage rises above that of the battery, and automatically opens the circuit when the generator voltage falls below that of the battery.

The terminals of the regulator unit are marked and care should be used in making connections, otherwise serious damage may result.

Quick Check

The following checks may be made to determine whether or not the units are operating normally. If not, the checks will indicate whether the generator or regulator is at fault, so that proper correction can be made:

A Fully Charged Battery and a Low Charging Rate

A fully charged battery and a low charging rate indicate normal current regulator operation. To check the current regulator, remove the battery wire from the battery terminal of the regulator. Connect the positive lead of an Ammeter to the battery terminal of the regulator and the negative lead to the battery wire with the ignition switch in the off position. Push in on the starting switch and crank the engine about 30 seconds. Then start engine and with it running at a medium speed turn on the lights and other electrical accessories and note quickly the generator output, which should be the value for which the current regulator is set.

Turn off the lights and other electrical accessories and allow the engine to continue to run. As soon as the generator has replaced in the battery the current used in cranking, the voltage regulator, if operating properly, will taper the output down to a few amperes.

A Fully Charged Battery and a High Charging Rate

Disconnect the field wire from the field terminal of the regulator. This opens the generator field circuit and the output should immediately drop off. If it does not, the generator and field wires are shorted together in the wiring harness. If the output drops off to zero with the field lead disconnected, the trouble has been isolated in the regulator. Reconnect the field lead on the field terminal of the regulator.

Remove the regulator cover and depress the voltage regulator armature manually to open the points. If the output now drops off, the voltage regulator unit has been failing to reduce the output as the battery came up to charge, a voltage regulator adjustment is indicated.

If separating the voltage regulator contact points does not cause the output to drop off, the field circuit within the regulator is shorted and the regulator should be replaced.

With a Low Battery and Low or no Charging Rate

Check the entire generator wiring circuit for loose connections, corroded battery terminals, loose or corroded ground straps. High resistance resulting from these conditions will prevent normal charge from reaching the battery and possibly cause burned out lamp bulbs when in use. If the entire charging circuit is in good condition, then either the regulator or generator is at fault.

With a jumper wire connect the field and armature terminals together, increase the generator speed and check the output. If the output increases, the regulator requires attention. If the output does not increase, a further check is necessary.

If the generator output remains at a few amperes with the field and armature terminals connected together, the generator is at fault and should be checked.

If the generator does not show any output at all, either with or without the field and armature terminals together, flash the armature terminal on the generator to ground with a screw driver or a pair of pliers, with the generator operating at medium speeds. If a spark does not occur the trouble has been isolated in the generator and it should be removed and repaired. If a spark does occur, likely the generator can build up, but the circuit breaker is not operating to let the current flow to the battery, due to burnt points, points not closing, open voltage windings, or too high a voltage setting of the cutout.

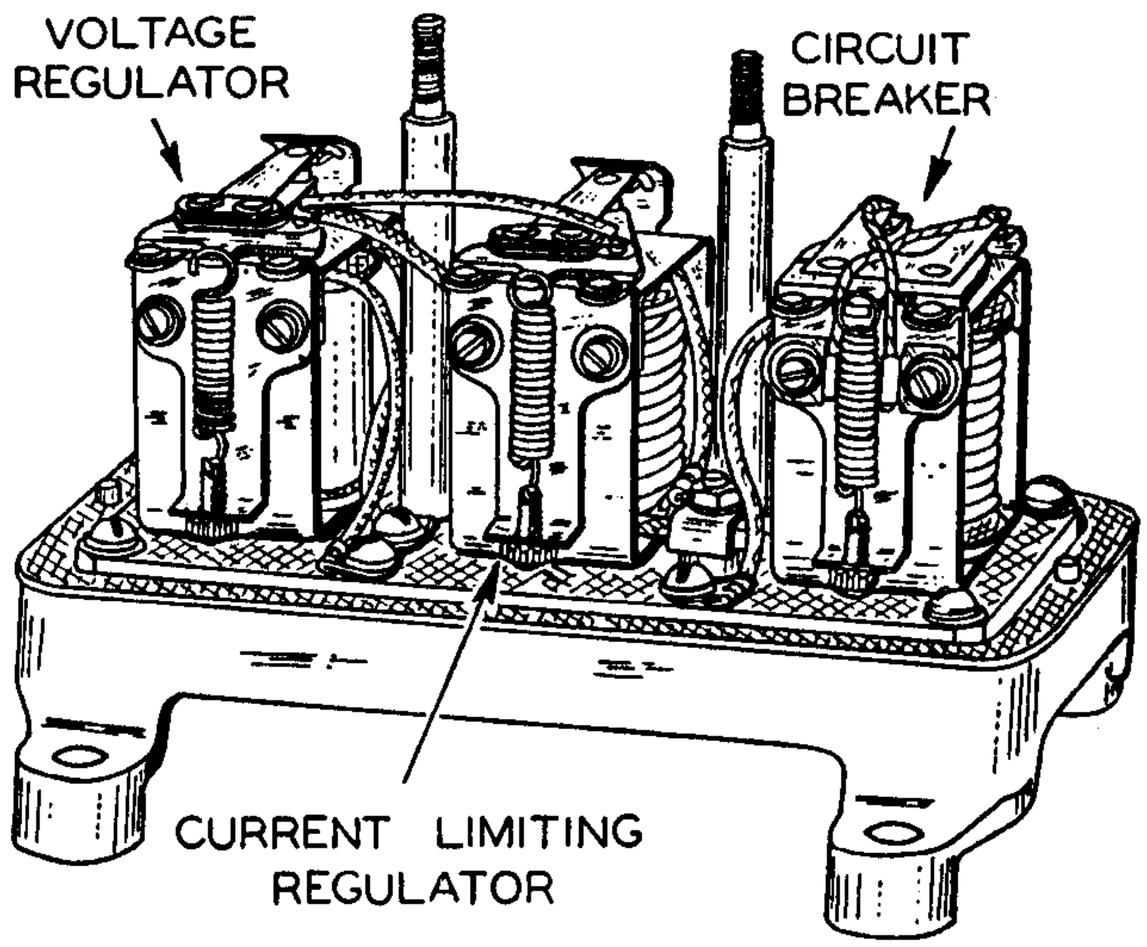

FIG. 14—VOLTAGE REGULATOR

Adjustment

To accurately adjust the regulator, it is essential to use a precision ammeter, voltmeter, thermometer and a fully charged battery. If battery in vehicle is not fully charged, it should be substituted with a fully charged battery in order to obtain a satisfactory setting of the unit.

The engine should be started and allowed to run for a period of fifteen minutes at approximately 25 to 30 miles per hour with the hood up before taking any meter readings.

The thermometer should be placed so that the bulb is approximately two inches from the side of the regulator so that the temperature can be taken while checking units. Set engine speed so that the generator charges 20 amperes, the voltmeter should show a reading according to the following specifications:

Temperature Fahr.	Volts
50°	7.41
60°	7.38
70°	7.35
80°	7.32
90°	7.29
100°	7.26
110°	7.23
120°	7.20

Tolerance—plus or minus .15 volts.

Circuit Breaker

Disconnect the battery wire from the battery terminal of the regulator. Connect the positive lead of the ammeter to the battery terminal of the regulator and the negative lead to the battery wire. Connect the positive lead of the voltmeter to the armature terminal of the regulator and the negative lead to the ground or regulator base. Gradually increase the engine speed, noting the voltage at which the points close. This should be 6.4 to 6.6 volts. Slowly decrease the engine speed, noting the discharge of current necessary to open the cutout points. This should be 0.5 to 6.0 amperes.

Check the armature air gap with the points open. Use a flat gauge .0595″ to .0625″. Insert between magnet core and the armature on contact side of brass pin in core. To adjust, bend armature stop.

Check the gap of the contact points when open. This should be .015″ minimum, but will possibly be more than this in actual adjustment. Adjust by bending the supporting arms of the stationary points, be sure that the points are perfectly aligned.

The closing voltage of the circuit breaker may be adjusted by adjusting the screw holding the lower end of the spring. The point opening amperage can be adjusted by raising or lowering the stationary points by bending the supporting arms of the points. Be sure that there is a minimum point gap of .015″.

Voltage Regulator

Connect the positive lead of voltmeter to the battery terminal and the negative lead to a ground on regulator base.

Run the engine at a speed equivalent to approximately 30 miles per hour and check the voltmeter reading, which should be in accordance with the specifications of temperature and volts (under

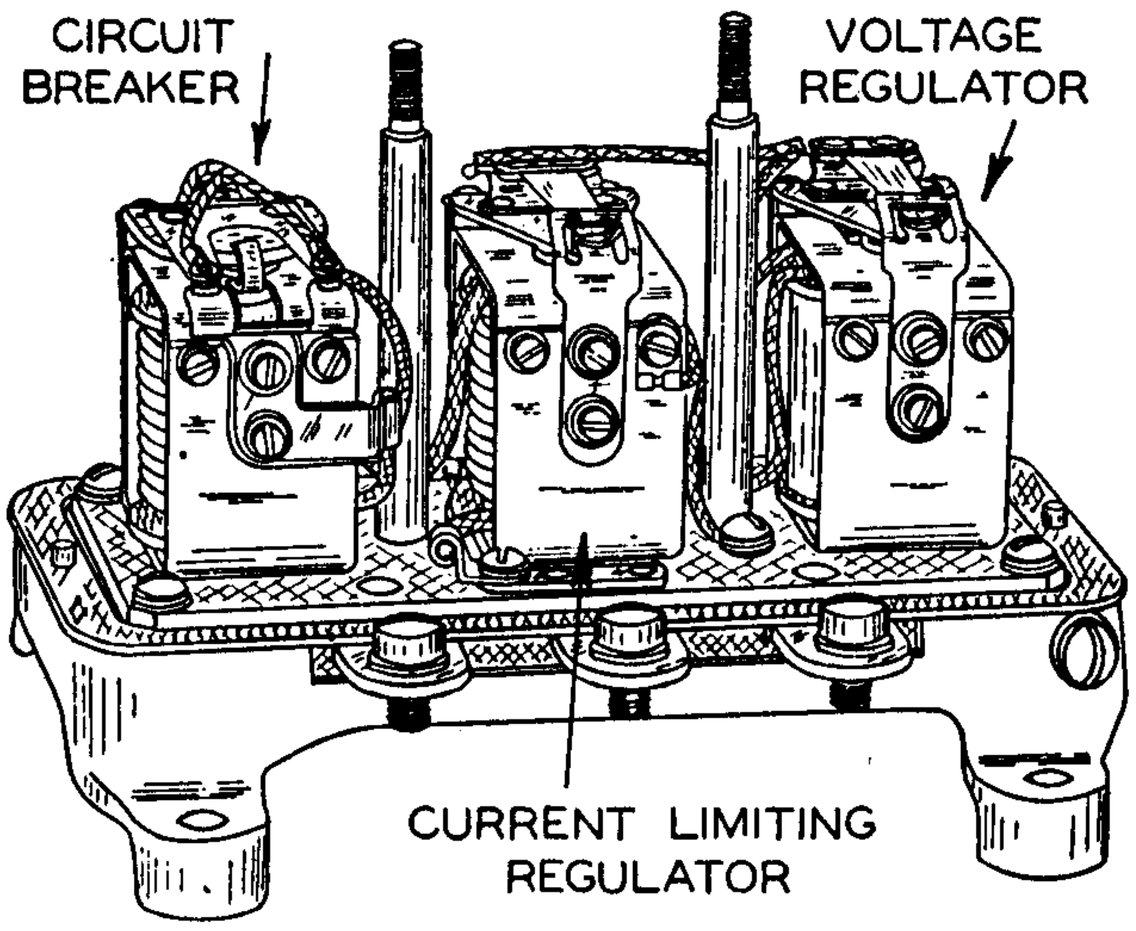

FIG. 15—VOLTAGE REGULATOR

heading "Adjustments") with a generator charging rate of 20 amperes.

Check armature air gap using .040″ to .042″ pin gauge. Test with pin gauge between magnet core and armature. This measurement should be taken on the contact side and next to the brass armature stop pin. To test connect a 3 candlepower test light in series with the armature and field terminals and a battery. With the low limit pin gauge in place depress the armature and the light should go out. With the high limit pin gauge in place depress the armature and the light should stay lit. To adjust slightly loosen the screw holding the upper point bracket, raise or lower bracket until correct gap is obtained. Keep points in perfect alignment when adjusting.

Check and see that the spring upon which the movable contact is mounted is straight and that it is approximately parallel with the armature.

The gap between the contact spring (upper) and armature stop is .010″ to .016″ with armature depressed.

Check the point gap with armature against stop pin. Hold the armature down with two fingers being careful not to apply pressure to the spring supporting the upper point. A .010″ (minimum) feeler gauge should be used between points. Too much variation indicates wrong length of the brass armature stop pin and a new unit will be required.

To adjust the regulator increase or decrease the armature spring tension by adjusting the screw which holds the lower end of the spring.

Current Limiting Regulator

To adjust current limiting regulator, remove the battery wire from the battery terminal of the regulator and connect the positive lead of ammeter to the battery terminal of the regulator and the negative lead to the battery wire. Turn on the lights and other electrical accessories, then increase the engine speed until output remains constant. The ammeter reading with the unit at operating temperatures should be 40 amperes.

To check the armature air gap and point gap—refer to instructions under heading "Voltage Regulator." The armature air gap is .047″ to .049″.

The contact point gap is .010″ minimum. The

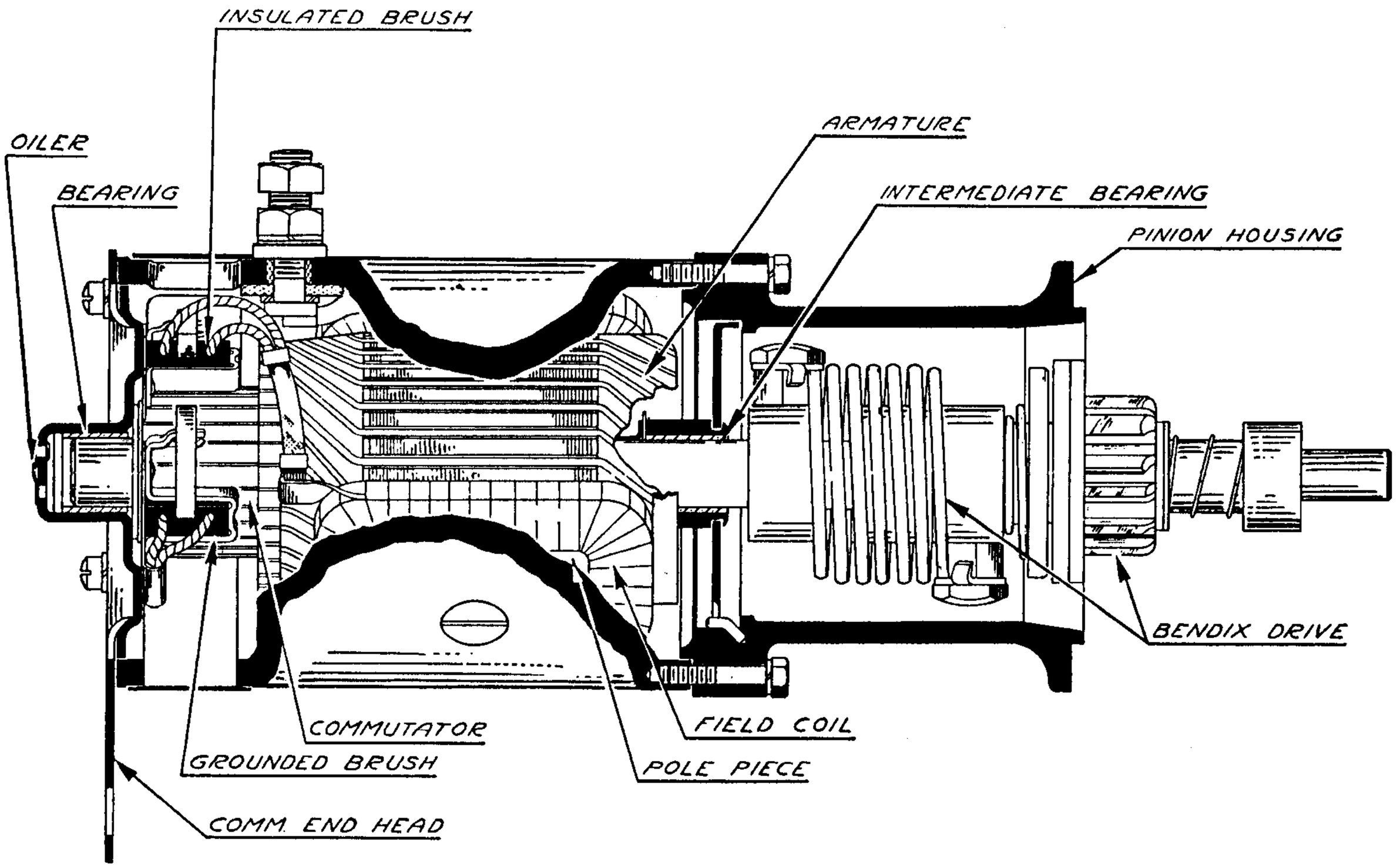

FIG. 16—STARTING MOTOR

gap between the contact spring and armature stop is .010" to .016" with armature depressed.

To adjust current setting vary the armature spring tension by adjusting the screw which holds the lower end of the armature spring.

STARTING MOTOR

The starting motor Fig. 16 is similar in construction and in appearance to the generator, but the design of the parts are different. Both motor and generator require a frame, field coils, armature, brushes.

A starting motor of this type requires very little attention except regular lubrication and periodic inspection of the brushes and commutator.

A visual inspection should be made of all wires and see that all connections in the circuit are clean and tight, Fig. 17. Mounting screws, torque wrench reading, 31-35 ft. lbs.

1. **Commutator**
   Check the commutator for wear or discoloration. If found to be dirty or discolored, it can be cleaned with No. 00 sandpaper. Blow the sand out of the motor after cleaning the commutator. If the commutator is rough or worn, the armature should be removed and the commutator turned down in a lathe.
2. **Brushes**
   The brushes should slide or swing freely in their holders and make full contact on the commutator. Worn brushes should be replaced.
3. **Brush Spring Tension**
   This tension should be 42 to 53 ounces with new brushes. Measure the tension with a spring scale hooked under the brush spring at end, and pull on a line parallel to the face of the brush taking the reading just as the spring leaves the brush.
4. **Armature**
   The armature should be visually inspected for mechanical defects before being checked for shorted or grounded coils.

   For testing armature circuits, it is advisable to use a set of test prods.

   To test the armature for grounds, touch one prod to a commutator segment and touch the core or shaft with the other prod. Do not touch the points or prods to the bearing or brush surface, as the arc formed will burn the smooth finish. If the lamp lights, the coil connection to the commutator segment is grounded.

   To test for shorted armature coils, a growler is necessary. Place the armature on growler with a steel strip held on the armature core, rotate the armature slowly by hand. If a shorted coil is present, the steel strip will become magnetized and vibrate.

   If an armature is shorted or grounded, it will be necessary to install a new armature.
5. **Field Coils**
   Using same test prods, check the field coils for both open circuit and ground. To test for grounds, place one prod on the motor frame or pole piece and touch the other to the field coil terminal. If a ground is present, the lamp will light.

   To test for open circuit, place the prods on the field coil terminal and across each coil separately. If the lamp does not light, the coil circuit is open.

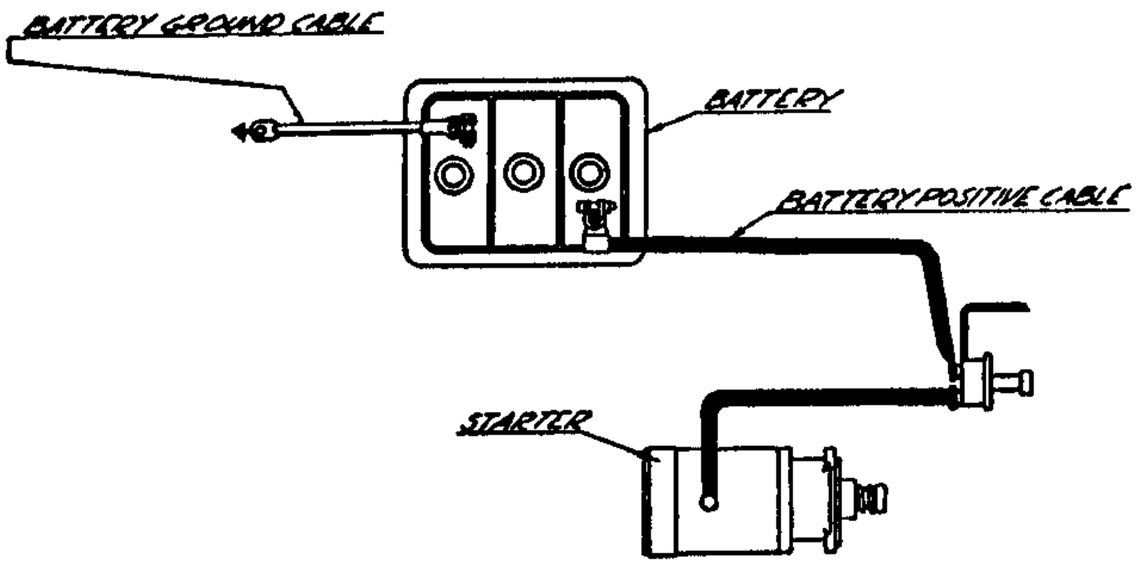

FIG. 17—STARTING MOTOR WIRING CIRCUIT

6. Brush Holder

Using test prods, touch the insulated brush holder with one prod and a convenient ground on the plate with the other. If the lamp lights, it indicates a grounded brush holder and a new brush holder will have to be installed.

Bendix Assembly

The Bendix Drive Fig. 18 is designed so that when the starting motor is energized, centrifugal force sends the counter-weighted drive pinion gear into engagement with the teeth on the flywheel. When the engine starts and the speed of the engine exceeds the comparable speed of the starting motor, the Bendix Drive pinion is forced out of engagement with the flywheel.

There are two types of Bendix Drives and springs, right hand and left hand. The type used on this starting motor is of the right hand type.

To determine right or left hand Bendix Drive, turn drive pinion so that the threads on shaft will show, note the spiral of the thread; right hand spiral, right hand drive; left hand spiral, left hand drive.

To determine a right or left hand spring, note the spiral of the coil; if to the right, it is a right hand spring; if to the left, it is a left hand spring.

If upon inspection of the Bendix Drive, the spring shows signs of being distorted, a new spring should be installed.

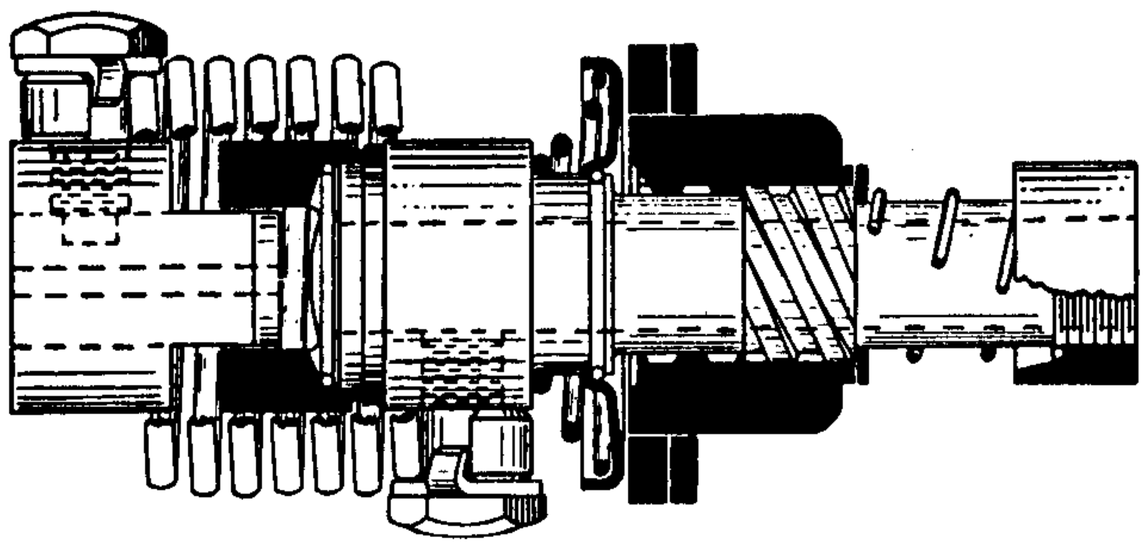

FIG. 18—BENDIX ASSEMBLY

Starting Switch

The starting switch is mounted on the toe board to the right of the accelerator pedal; pressing the starter switch closes the starter circuit and operates the starter. If the starting motor does not rotate, then the difficulty is probably a loose wire, poor ground, low battery or poor brush contact.

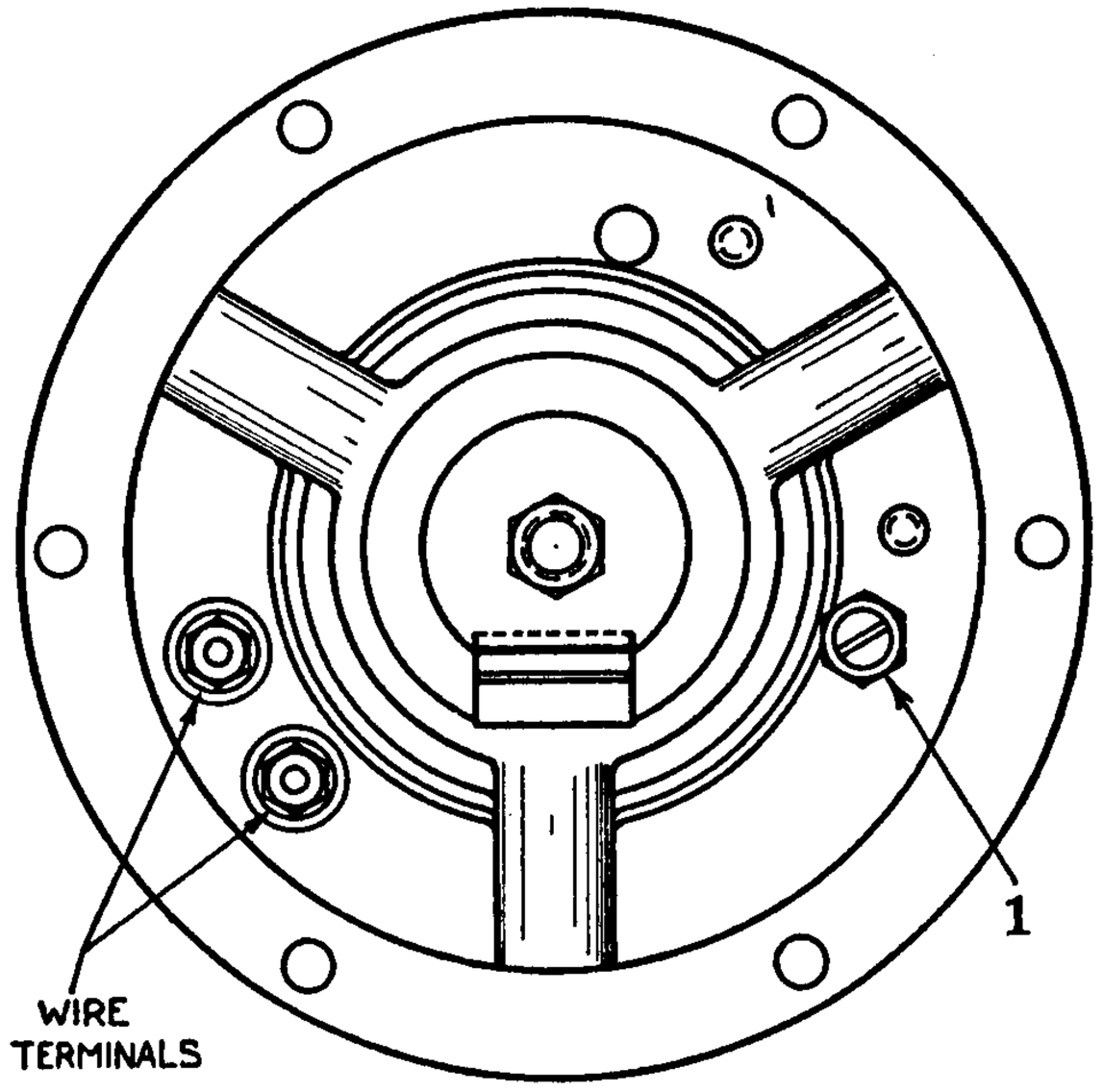

FIG. 19—HORN (Rear)

Horn and Horn Wire

The horn, Fig. 19 is the micro-vibrating type mounted on the dash under the hood. No. 1 indicates the horn adjusting screw. To adjust tone of horn, loosen the lock nut and turn the screw until the proper tone is obtained. It is best to have the engine running so the generator is charging when making this adjustment because the generator delivers 8 volts as compared to the battery 6 volts. This affects the horn tone.

The horn wire through the steering post connects to an insulator sleeve with brush contact where horn wire attaches to jacket tubing.

Whenever it is necessary to replace the horn wire, it will be necessary to remove the steering post jacket tubing. The wire may be removed by unsoldering it from the contact sleeve on the steering tube. When replacing the wire be sure to use a non-corrosive soldering flux when soldering the wire to the contact sleeve.

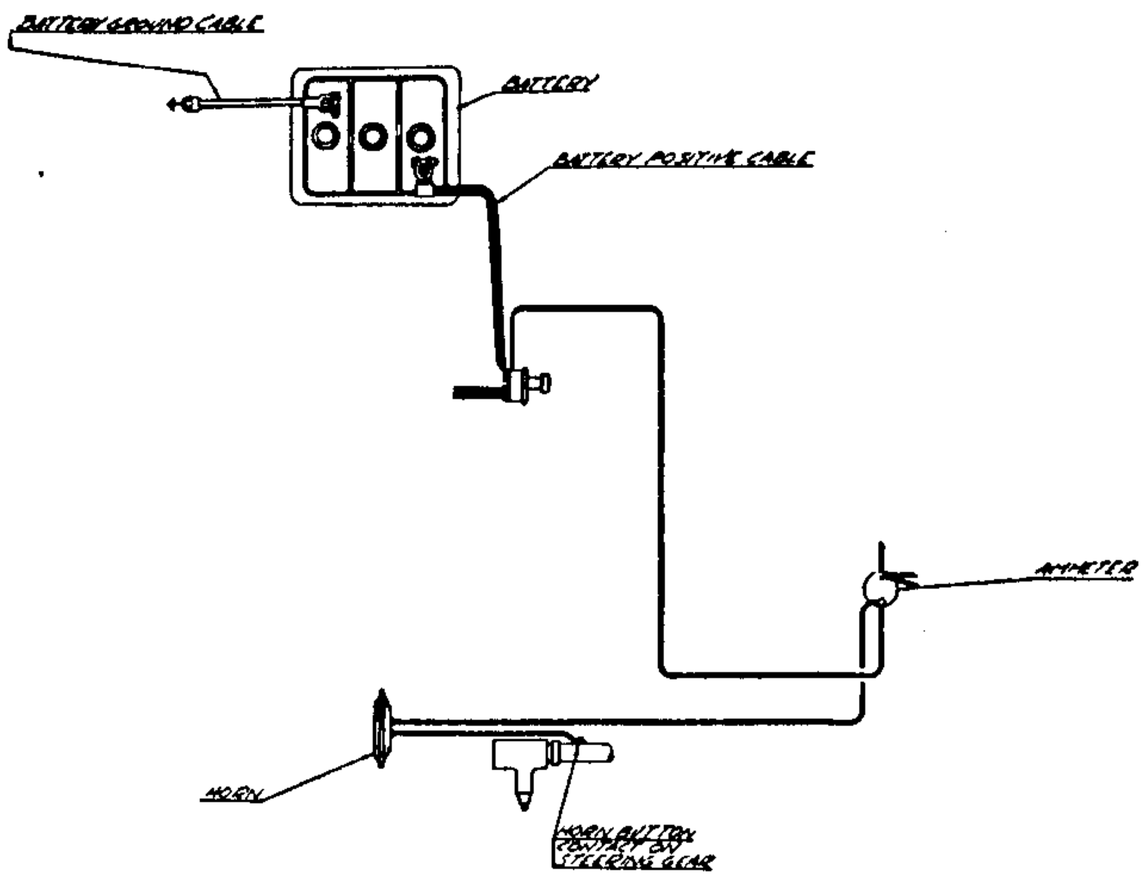

FIG. 20—HORN WIRING CIRCUIT

ELECTRICAL TROUBLES AND REMEDIES

SYMPTOMS	PROBABLE REMEDY
Battery Discharged:	
Short in Battery Cell	Replace Battery
Short in Wiring	Check Wiring Circuit
Generator Not Charging	Inspect Generator and Fan Belt
Loose or Dirty Terminals	Clean and Tighten
Excessive Use of Starter	Tune Engine
Excessive Use of Lights	Check Battery
Generator:	
Low Charging Rate—	
Dirty Commutator	Clean Commutator
Poor Brush Contact	Install new Brushes
Voltage Regulator Improperly Adjusted	Adjust
High Resistance in Charging Circuit	Clean and Tighten Terminals
Ground Strap Engine to Frame Broken	Replace
Loose or Dirty Terminals	Clean and Tighten
Too High Charging Rate	
Current Regulator Improperly Adjusted	Adjust
Short in Armature	Replace
Starting Motor:	
Slow Starter Speed	
Discharged Battery or Shorted Cell	Recharge
Ground Strap Engine to Frame	Clean Terminals and Tighten
Loose or Dirty Terminals	Clean and Tighten
Dirty Commutator	Clean With No. 00 Sand Paper
Poor Brush Contact	Install New Brushes
Worn Bearings	Replace
Burnt Starter Switch Contacts	Replace Switch
Distributor:	
Hard Starting:	
Distributor Points Burnt or Pitted	Clean Points or Replace
Breaker Arm Stuck on Pivot Pin	Clean and Lubricate
Breaker Arm Spring Weak	Replace
Points Improperly Adjusted	Adjust .020"
Spark Plug Points Improperly Set	Adjust .030"
Spark Plug Wire Terminals in Distributor Cap Corroded	Clean
Loose Terminals	Check Circuit
Loose or Dirty Terminals Ground Strap Engine to Frame	Clean and Tighten
Condenser Defective	Replace Condenser
Improper Ignition Timing	Set Timing
Lights:	
Burn Dim	
Loose or Dirty Terminals	Clean and Tighten
Leak in Wires	Check Entire Circuit for Broken Insulation
Poor Switch Contact	Install New Switch
Poor Ground Connection	Clean and Tighten
Aim Headlamp Beams	Use Chart

Horn Fails to Blow			
1.	Broken or loose electrical connection	1.	Check wiring and connections at horn button and battery, making sure all are clean and tight.
2.	Battery low or dead	2.	Check battery with hydrometer, should read at least 1200.
3.	Contact points in horn not adjusted	3.	Loosen locknut and turn adjusting screw to right or left until a clear steady tone is obtained, then tighten locknut, holding screw in proper position.
4.	Contact points burnt or broken off	4.	Replace parts necessary and adjust horn.

Horn Blows Unsatisfactory Tone

1. Poor electrical connection	1.	Check wiring and connections at horn, horn button and battery.
2. Battery low	2.	Check with hydrometer, should read 1200.
3. Loose cover and bracket screws	3.	Draw cover screws and center nut tight, tighten bracket screws solidly both at horn and dash.
4. Voltage at horn too high or too low	4.	Check with voltmeter, should measure 5.5-6.5 volts at horn with horn sounding and engine running so generator is charging battery.
5. Contact points are not properly adjusted	5.	Loosen locknut and turn contact adjusting screw to right or left until a clear steady tone is obtained, then tighten locknut.

Excessive Radio interference

1. Due to Ignition	1.	Check distributor, spark plugs and suppressors.
	2.	Tighten braided bonding straps.
	3.	Tighten radiator and fender supporting bolts.
2. Due to Generator	1.	Tighten regulator to generator bond.
	2.	Defective commutator, brushes or holders.
	3.	Discharge battery causing high discharging rate.
3. Due to Erratic Noises	1.	Failure of high tension insulation.
	2.	Loose wiring connections or corroded distributor cap towers.
	3.	Defective switches or gauges.

ELECTRICAL SYSTEM SPECIFICATIONS

Battery:

Make.....Auto-Lite or Willard
Model.....TS-2-15 or SW-2-119
Plates per Cell.....15
Capacity.....116 Amp. Hr.
Volts.....6
Length.....Approx. 10″
Width.....Approx. 7″
Height.....Approx. 8 5/16″
Specific Gravity:
Fully Charged.....1225-1300
Recharge at.....1175
Ground Terminal.....Negative
Location.....Under Hood Right Side

Starting Motor:

Make.....Auto-Lite
Model.....MZ-4113
Drive.....Right hand outboard Bendix
No Load Draw.....70 amps. max.; 5.5 volts—4300 R.P.M. Min.
Stall torque....420 amps.; 3.0 volts—7.8 ft. lbs.
Volts.....6
Armature End Play.....1/16″ Max.
Brushes.....4
Brush Spring Tension.....42-53 Oz.
Normal Engine Cranking Speed....185 R.P.M.
Bearings.....3 absorbent bronze

STARTER SWITCH:

Make.....Auto-Lite Model.....SW-4001

Generator:

Make.....Auto-Lite
Model.....GEG-5002D
Volts.....6-8
Ground Polarity.....Negative
Controlled Output.....40 Amps.
Rotation (Drive End).....Clockwise
Control. Vibrating type current-voltage regulator
Air Cooled.....Yes
Armature End Play.....010″ Max.
Brushes.....2
Brush Spring Tension.....64-68 Oz.
Bearings.....Ball
Field Coil Draw..1.60 to 1.78 Amps.—6.00 V.
Motorizing Draw..4.7 to 5.2 Amps.—6.0 volts (Have field and armature terminals connected).
Output.8.0 amps.; 7.6 volts; 955 Max. R.P.M.
40.0 amps.; 7.6 volts; 1460 Max. R.P.M.
40.0 amps.; 8.0 volts; 1465 Max. R.P.M.

Current—Voltage Regulator

Make.....Auto-Lite Model..VRY-4203A
Volts.....6
Amperes.....40
Ground Polarity.....Negative

Voltage Regulator:

Voltage Setting Open Circuit.....7.20-7.41
Air Gap.....040″-.042″
Point Gap.....010″-.012″

Circuit Breaker:

Points Close (Hot).....6.4-6.6 Volts
Points Open—Reverse Current...0.5-6.0 Amps.
Air Gap.....0595″-.0625″
Points Gap.....015″

Current Limiting Regulator:

Air Gap.....047″-.049″
Point Gap.....030″-.033″

ELECTRICAL SYSTEM SPECIFICATIONS

(Continued)

Distributor:

Make.....Auto-Lite
Model.....IGC-4705
Type Advance.....Centrifugal
Firing Order.....1-3-4-2
Breaker Point Gap.....020"
Breaker Arm Spring Tension.....17-20 Oz.
Cam Angle (Time points are closed).....47°
Max. Automatic Advance 1500 R.P.M. (dist.).11°
Condenser Capacity.....18-.26 Mfd.
Timing—72 octane fuel (gasoline)
5° BTC Flywheel (.0103" Piston travel)
Timing—68 octane fuel (gasoline)
TC Flywheel (Zero Piston travel)
Timing Mark.....Flywheel
Location..Right Side Bell Housing under Starter
Ignition Switch (Lock).....Douglas No. 5941

Coil:

Make.....Auto-Lite
Model.....IG-4070-L
Draw Engine Stopped.....5 Amps. @ 6.4 Volts
Draw Engine Idling.....2.5 Amps.

Gauges:

Fuel Gauge.....Auto-Lite
Oil Pressure.....Auto-Lite
Temperature.....Auto-Lite
Ammeter.....Auto-Lite

Spark Plugs:

Make.....Champion QM-2
Size.....14MM
Gap.....030"

Radio Filters:

Generator Filter Unit.....Tobe Deutschmann
Regulator Filter.....Tobe Deutschmann
Filter Group.....Tobe Deutschmann

Lamps:

Light Switch Make.....Douglas
Foot Beam Switch Make.....Clum No 9654
Head Lamps.....Corcoran-Brown Sealed Beam
Black Out Lamps.....Corcoran-Brown
Tail and Stop Lamp.....Corcoran-Brown
Head Lamp Bulbs (Seelite unit).6-8V-45 C.P. DC. Mazda No. 2400
Blackout Bulbs... 6-8V-3C.P. SC Mazda No. 63
Tail and Stop Lamp Bulbs.6-8V 3-21CP Mazda No. 1154
Instrument Lamp Bulbs... 6-8V 3CP SC Mazda No. 63

Horn:

Type.....Micro-Vibrator
Make.....Sparks-Withington
Model.....B-9427

BONDED POINTS

Bond No.	Name
1.	Hood to Dash—Right Hand
2.	Hood to Dash—Left Hand
3.	Cylinder Head Stud to Dash
4.	Brake Cable, Speedometer Cable, Heat Indicator Cable to Dash
5.	Gas Line to Dash
6.	Choke Control, Throttle Control and Oil Gauge Line to Dash Stud
7.	Generator Mounting Bolt to Starting Motor Bracket
8.	Generator Voltage Regulator Filter & Ground
9.	Coil to Cylinder Block
10.	Right Hand Front Motor Bracket to Frame
11.	Left Hand Front Motor Bracket to Frame
12.	Exhaust Pipe to Frame
13.	Radiator Right Hand to Frame
14.	Radiator Left Hand to Frame
15.	Rear Engine Support to Frame Cross Member Stud
16.	Transfer Case to Body Floor Stud
17.	Right Hand Body Bracket Ground to Frame
18.	Left Hand Body Bracket Ground to Frame
19.	Right Hand Fender Ground to Frame
20.	Left Hand Fender Ground to Frame
21.	Left Hand Hood Ground to Grill
22.	Right Hand Hood Ground to Grill
23.	Headlamp Wiring Harness to Left Fender
24.	Cylinder Head Stud—Front
25.	Left Hand Fender to Cowl—Lower
26.	Right Hand Fender to Cowl—Lower

IMPORTANT: Where parts are grounded, particular attention must be given to any special position of lockwashers on bolts and screws. Tinned spots should be clean but not painted, to assure satisfactory bond.