INSTRUCTIONS

FOR THE CARE OF

1914

Large Single Coil

Delco Systems



The
Dayton Engineering Laboratories Co.
Dayton, Ohio

Instructions for the Care of 1914 Large Single Coil Systems

THESE SYSTEMS ARE USED ON THE FOLLOWING CARS

1914 Buick Model B-55
1914 Cole Series 9
1915 Cole Series 10
1914 Moon Model 42
1914 Moon Model 6-50
1914 Oakland Model 43
1914 Oakland Model 6-48
1914 Oakland Model 6-60
1914 Oldsmobile Model 54
1915 Oldsmobile Model 55

DESCRIPTION—The system includes a two-pole motor generator having a single field coil; an armature with two windings, one commutator being on each end; all four brushes being in constant contact with their commutators (with the exception of the motor generator Model 54, described later), a motor switch assembly which makes the necessary connections for cranking and generating; an apparatus box with a cut-out relay, an ignition relay and a mercury tube type of voltage regulator; a distributor, ignition coil and combination ignition and lighting switch; a 6-volt storage battery. These systems are grounded on the negative side to the frame of the car. The system on the Model 55 Oldsmobile, including the MG-54 mentioned above, is a slight modification of the above, the generator having a motor brush lifting device in place of a motor switch. Since these systems were built, certain changes have been made in the apparatus to do away with the mercury tube type of voltage regulator, consisting of rebuilding the motor generator with a field coil having a reverse series winding in it. In these rebuilt motor generators the reverse series winding gives sufficient regulation to enable the mercury tube regulator to be dispensed with and on the rebuilt system, therefore, no mercury regulator is used.

OPERATION—Figures 1 and 2 show typical wiring and circuit diagrams of these systems and also show how the various parts of the systems are electrically connected together. The cycle of operation in getting the gasoline motor started, is as follows:

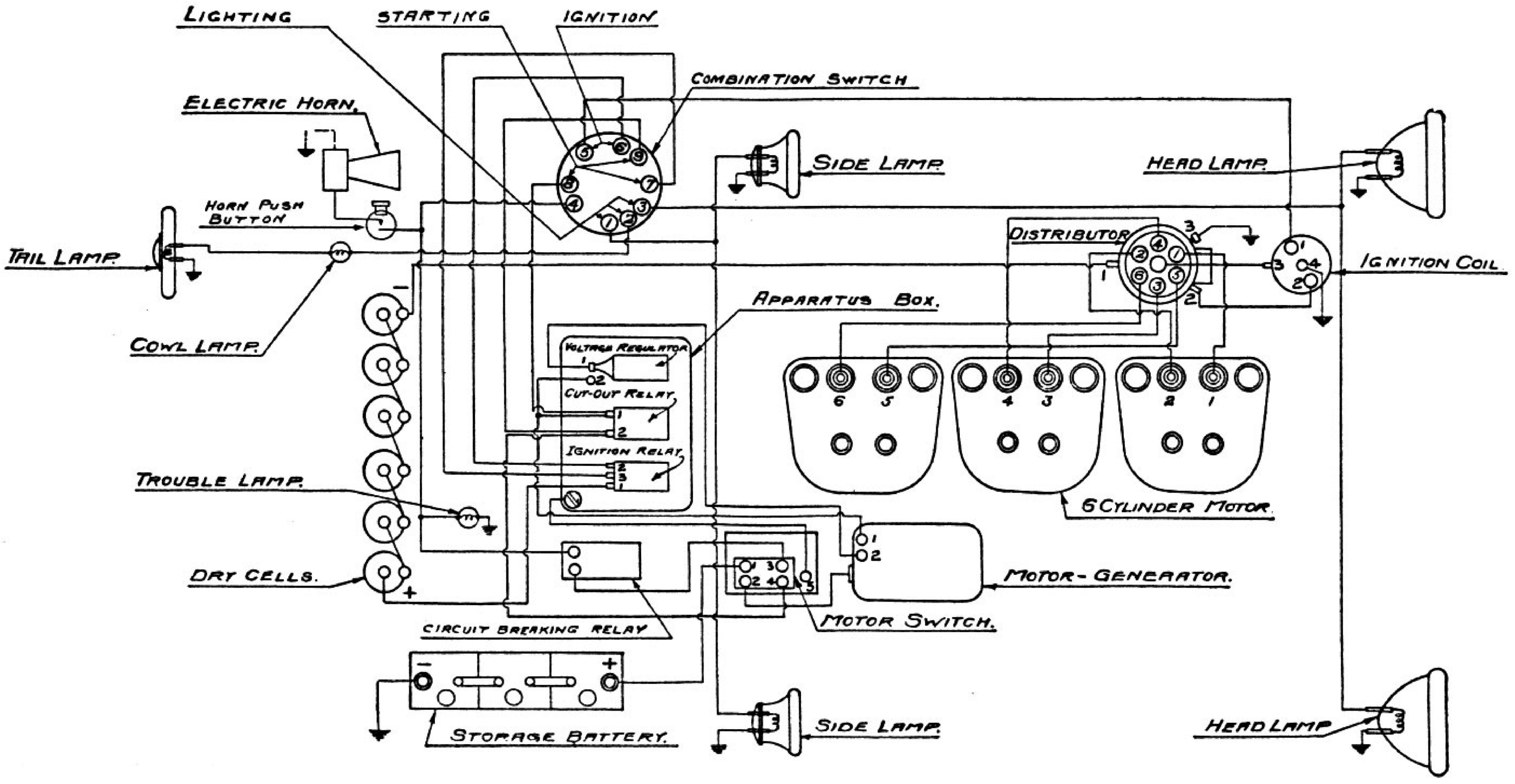

LIGHTING
STARTING
IGNITION
COMBINATION SWITCH
ELECTRIC HORN.
HORN PUSH BUTTON
TAIL LAMP.
COWL LAMP.
SIDE LAMP.
HEAD LAMP.
DISTRIBUTOR
IGNITION COIL
APPARATUS BOX.
VOLTAGE REGULATOR
CUT-OUT RELAY
IGNITION RELAY
TROUBLE LAMP.
DRY CELLS.
CIRCUIT BREAKING RELAY
MOTOR-GENERATOR.
MOTOR SWITCH.
6 CYLINDER MOTOR.
STORAGE BATTERY.
SIDE LAMP.
HEAD LAMP

Fig. 1

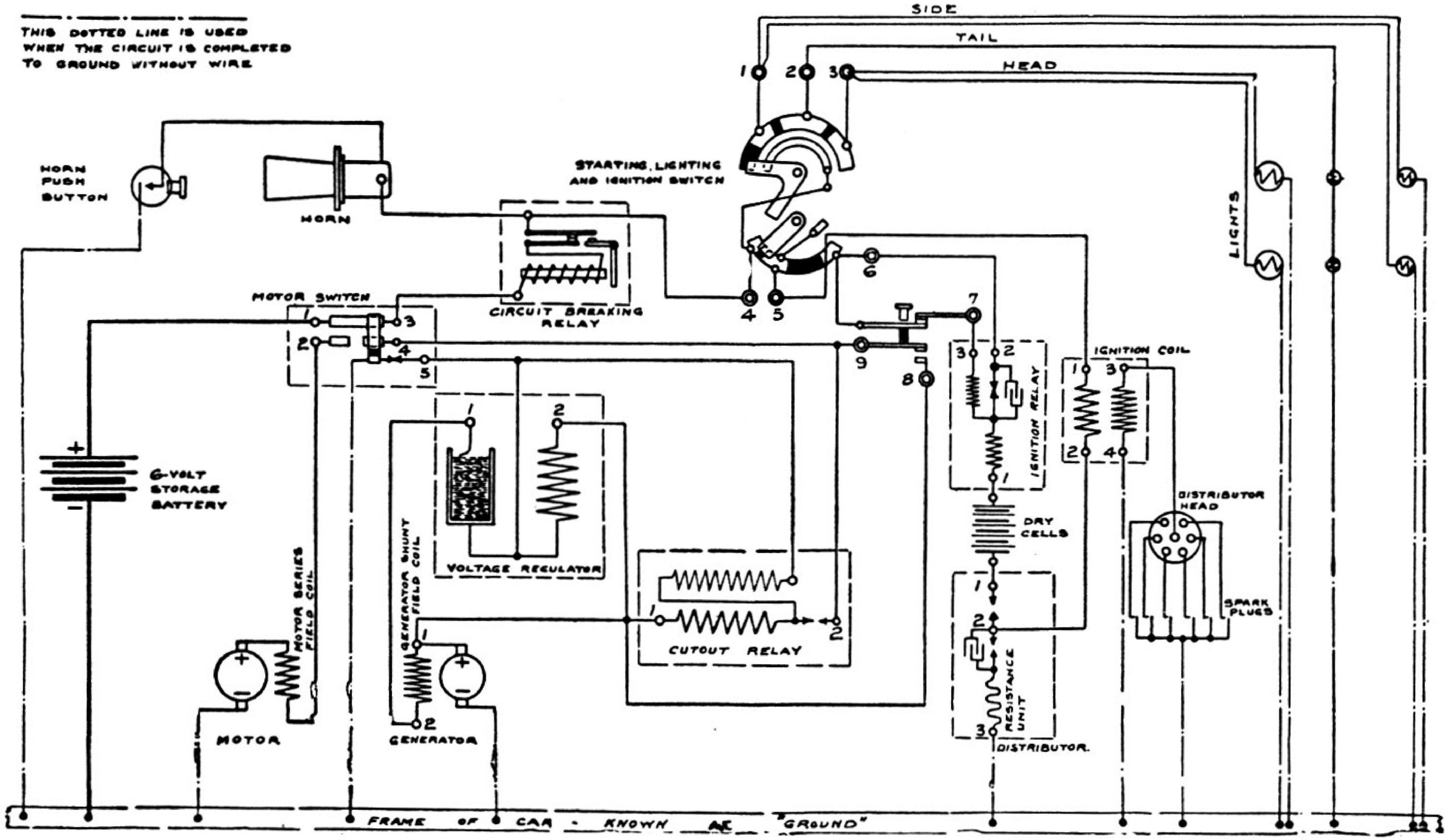

THIS DOTTED LINE IS USED WHEN THE CIRCUIT IS COMPLETED TO GROUND WITHOUT WIRE
SIDE
TAIL
HEAD
LIGHTS
HORN PUSH BUTTON
HORN
STARTING, LIGHTING AND IGNITION SWITCH
CIRCUIT BREAKING RELAY
MOTOR SWITCH
IGNITION COIL
IGNITION RELAY
DRY CELLS
DISTRIBUTOR HEAD
SPARK PLUGS
RESISTANCE UNIT
DISTRIBUTOR
6-VOLT STORAGE BATTERY
MOTOR SERIES FIELD COIL
MOTOR
GENERATOR SHUNT FIELD COIL
GENERATOR
VOLTAGE REGULATOR
CUTOUT RELAY
FRAME OF CAR - KNOWN AS "GROUND"

Fig. 2

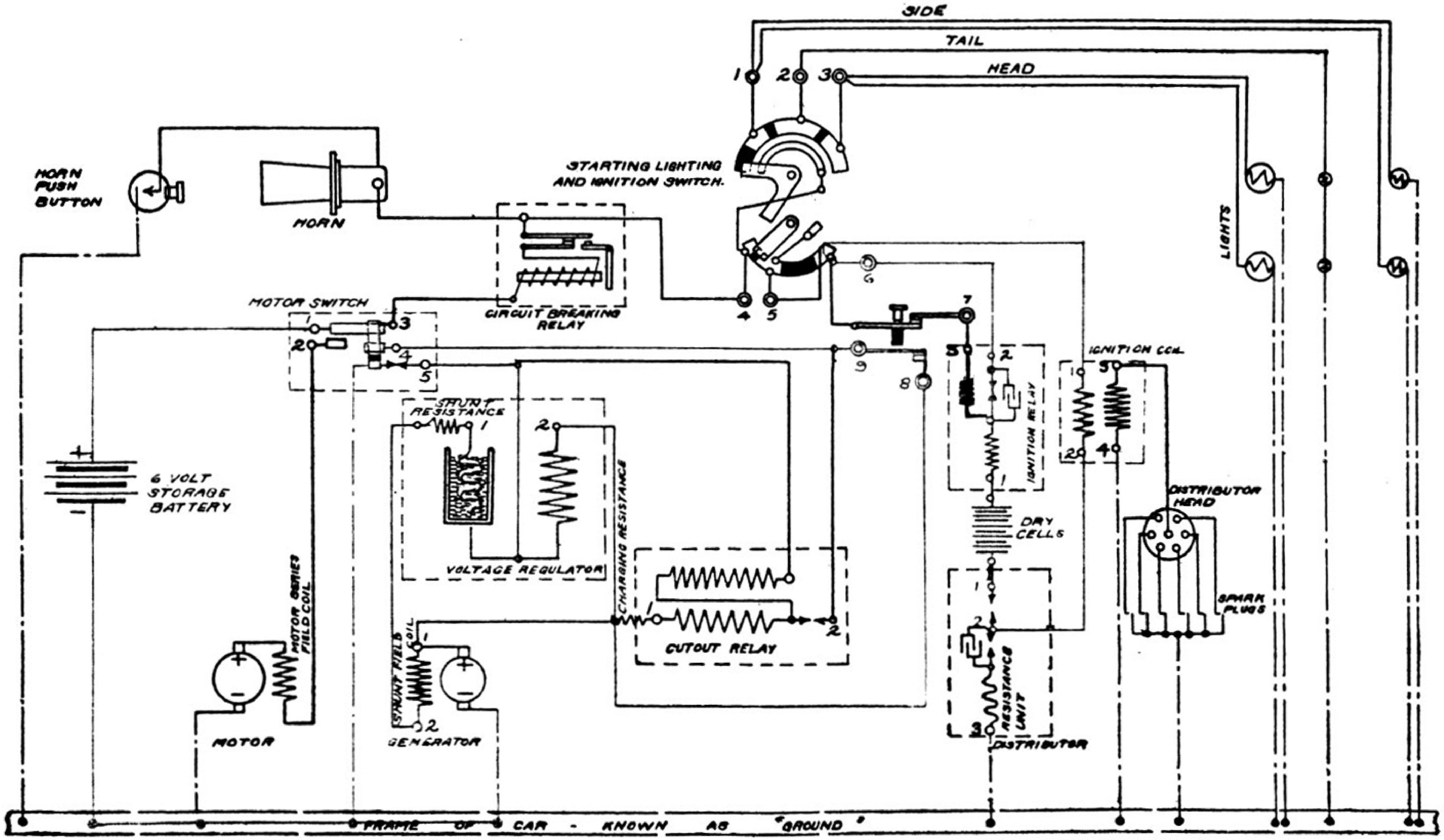

SIDE
TAIL
HEAD
1
2
3
LIGHTS
HORN PUSH BUTTON
HORN
STARTING LIGHTING AND IGNITION SWITCH.
MOTOR SWITCH
CIRCUIT BREAKING RELAY
4
5
6
7
8
9
IGNITION COIL
IGNITION RELAY
SHUNT RESISTANCE
VOLTAGE REGULATOR
CHARGING RESISTANCE
CUTOUT RELAY
DRY CELLS
DISTRIBUTOR HEAD
SPARK PLUGS
RESISTANCE UNIT
DISTRIBUTOR
6 VOLT STORAGE BATTERY
MOTOR SERIES FIELD COIL
SHUNT FIELD COIL
MOTOR
GENERATOR
FRAME OF CAR - KNOWN AS "GROUND"

Fig. 2

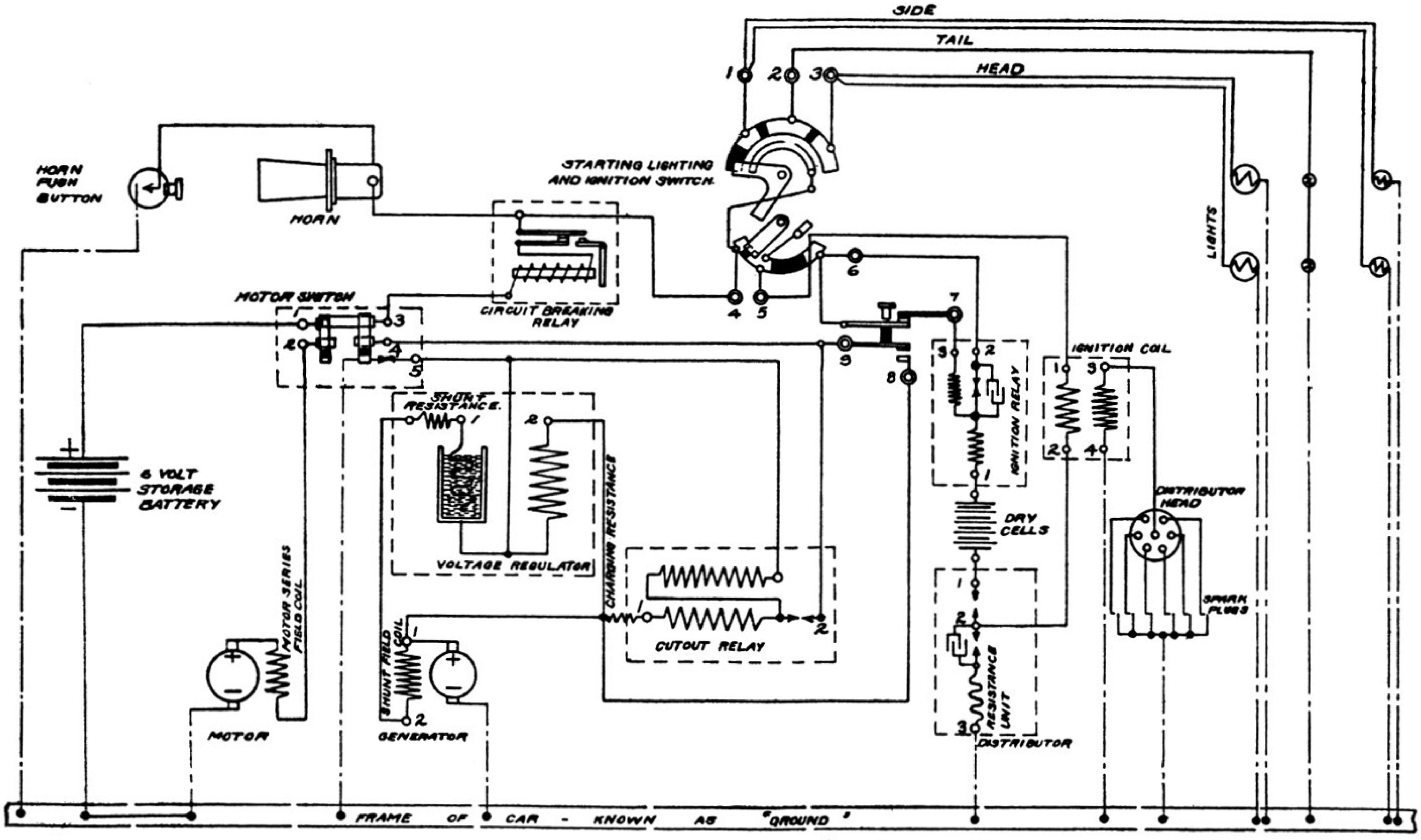

SIDE
TAIL
HEAD
1
2
3
HORN PUSH BUTTON
HORN
STARTING LIGHTING AND IGNITION SWITCH.
LIGHTS
6
MOTOR SWITCH
CIRCUIT BREAKING RELAY
4
5
7
8
9
IGNITION COIL
IGNITION RELAY
SHUNT RESISTANCE.
VOLTAGE REGULATOR
CHARGING RESISTANCE
DRY CELLS
DISTRIBUTOR HEAD
6 VOLT STORAGE BATTERY
MOTOR SERIES FIELD COIL
SHUNT FIELD COIL
CUTOUT RELAY
SPARK PLUGS
RESISTANCE UNIT
MOTOR
GENERATOR
DISTRIBUTOR
FRAME OF CAR - KNOWN AS "GROUND"

Fig. 4

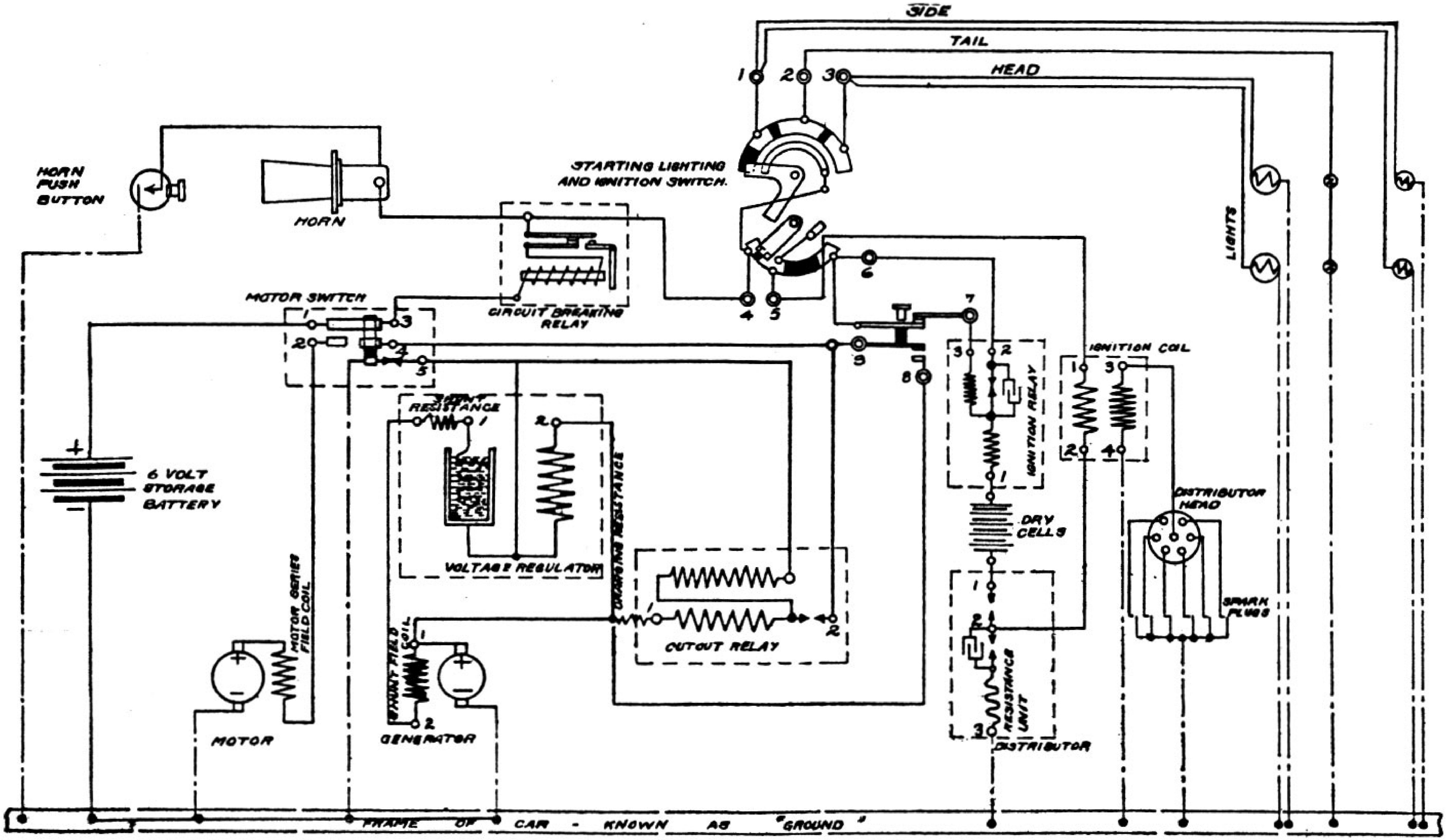

SIDE
TAIL
HEAD
1
2
3
HORN PUSH BUTTON
HORN
STARTING LIGHTING AND IGNITION SWITCH.
LIGHTS
MOTOR SWITCH
CIRCUIT BREAKING RELAY
4
5
6
7
8
9
IGNITION COIL
IGNITION RELAY
JOINT RESISTANCE
VOLTAGE REGULATOR
CUTOUT RESISTANCE
CUTOUT RELAY
DRY CELLS
DISTRIBUTOR HEAD
SPARK PLUGS
6 VOLT STORAGE BATTERY
MOTOR SERIES FIELD COIL
SHUNT FIELD COIL
MOTOR
GENERATOR
RESISTANCE UNIT
DISTRIBUTOR
FRAME OF CAR - KNOWN AS "GROUND"

Fig. 5

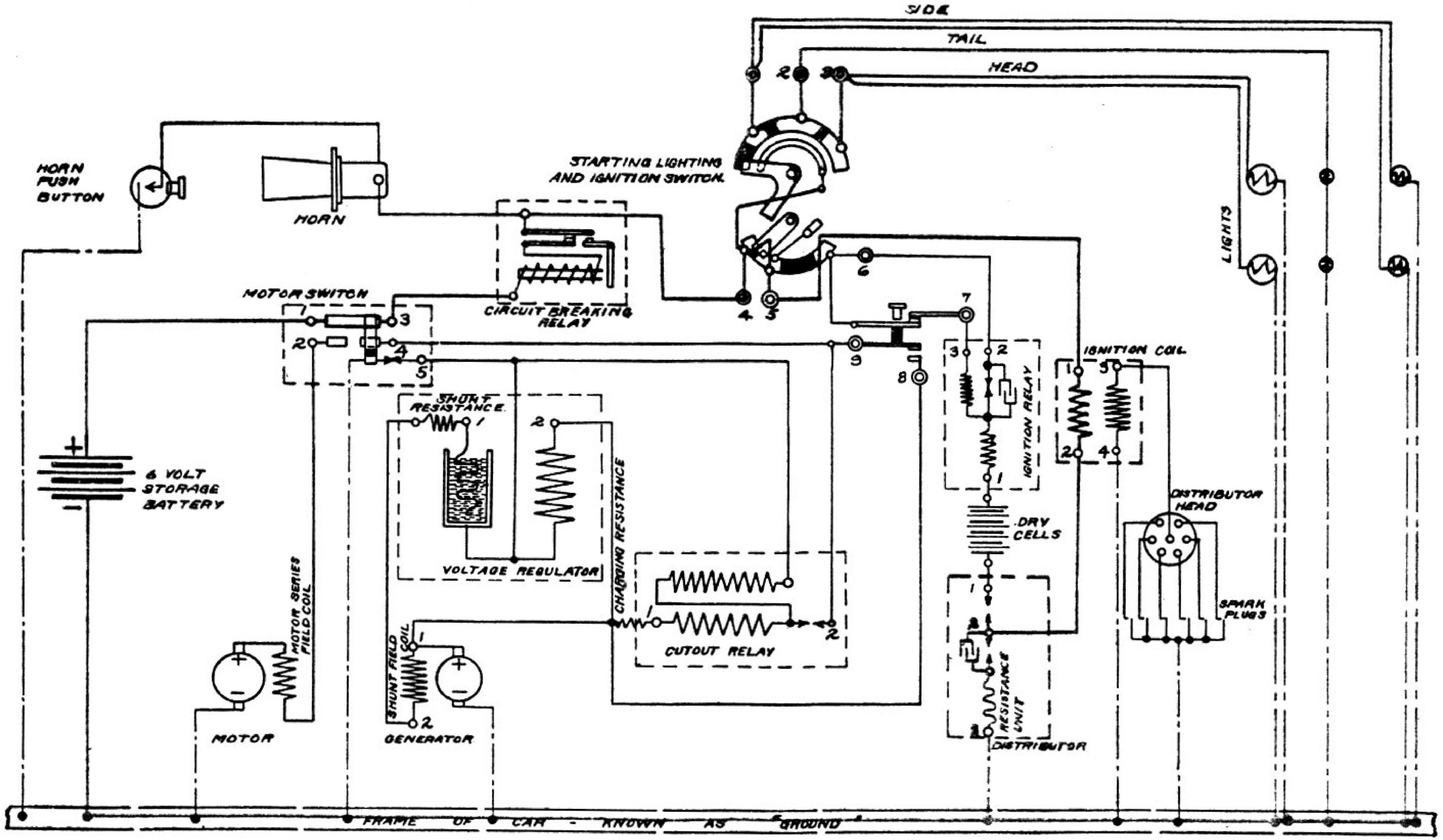

SIDE
TAIL
HEAD
LIGHTS
HORN PUSH BUTTON
HORN
STARTING LIGHTING AND IGNITION SWITCH
MOTOR SWITCH
CIRCUIT BREAKING RELAY
IGNITION COIL
IGNITION RELAY
SHUNT RESISTANCE
VOLTAGE REGULATOR
CHARGING RESISTANCE
CUTOUT RELAY
DRY CELLS
DISTRIBUTOR HEAD
SPARK PLUGS
6 VOLT STORAGE BATTERY
MOTOR SERIES FIELD COIL
MOTOR
SHUNT FIELD COIL
GENERATOR
RESISTANCE UNIT
DISTRIBUTOR
FRAME OF CAR - KNOWN AS "GROUND"

Fig. 6

The ignition lever on the combination ignition and lighting switch (see Fig. 16) is turned to battery position. This connects the dry cells through the ignition relay to the distributor and ignition coil and will give a single spark type of ignition. Now, if the "Start" button on the switch be pressed, it opens the circuit between terminals Nos. 6 and 7 on the switch, thus opening the holding coil circuit of the ignition relay and permitting it to vibrate rapidly during the period when the timer contacts are together. The path of the current from the dry cells through the distributor and coil is shown in Red in the circuit diagram, Fig. 3. The depressing of the starting button also closes the circuit between terminals 8 and 9 on the combination ignition and lighting switch, thus completing a circuit around the cut-out relay and causing the current from the storage battery to flow through the generator windings, the circuit being indicated in red on the circuit diagram in Fig. 3. The motor generator now operates as a shunt motor and the armature revolves in a clockwise direction when viewed from the front end. This makes it possible to mesh the starter gears. The starter pedal is now pressed down and the starting gears meshed first with the armature pinion and then with the flywheel. When the teeth are all fully in mesh, the trigger on the motor-switch assembly is released, with the result that the motor-switch contacts are snapped back and electrically connect the No. 1 and No. 2 terminals on top of the motor-switch cover (see Fig. 9). Current then flows through the motor windings, as indicated in red in the circuit diagram, Fig. 4. When the contacts are in the rear position it will be noted that the generator is disconnected electrically between 3 and 4 from the storage battery and also that the apparatus box is no longer grounded through 5 and 2 in the switch (Fig.--). When in the generating position, the generator lead is connected by the contacts to the storage battery and the apparatus box is grounded through the terminal immediately in front of the bakelite motor switch cover by means of the brass clip and rod shown in Fig. 9. When the engine begins to fire, the armature is driven through the generator clutch by the pump shaft, and at a suitable speed, begins to charge the storage battery. The charging circuit is shown in red in Fig. 5. After the engine has been started the "mag" ignition should be switched on.

CLUTCHES—As long as the starting gears are in mesh, the armature is geared to the flywheel by about a 20 to 1 ratio and hence, when the engine is running under its own power, the starting clutch must slip. The section of the clutch and its arrangement is shown in Fig. 16. During the cranking operation, the armature is running faster than the pump shaft and so the generator clutch is slip-

ping. The construction of this clutch is shown in the section of view in Fig. 7. If these facts are kept in mind, the necessity for clutches and their use should be plain.

MOTOR-GENERATOR—The motor-generators are all of similar design, illustrated in Fig. 7 which shows a sectional view of one of them. The construction should be evident upon inspection. The driving clutch is held in place by a Woodruff key in the shaft and by a clamping washer, lock washer and screw, in the front end of the armature shaft. There is a single large field coil and leads are brought out for grounding the field and connecting the positive generator terminal to the cut-out relay as shown. All four brushes are on the commutator continuously, suitable switching arrangement being accomplished by means of the motor switch. A view of the generator with the motor switch showing the relative arrangement of parts is shown in Fig. 9. (The motor-generator on the Model 55 Oldsmobile MG-54 has a somewhat different switching arrangement, a view of the brush-lifting device being shown in Fig. 8. Attached to the motor brush arm is a long phospor bronze contact which is opened when the motor brush is dropped down on the motor commutator so that the generating circuit is broken through this switch during the cranking operation and is closed when the engine is running or at rest. There is no other switching arrangement on this model of car, and in this respect the generator differs from the others previously described. On the Buick Model B-55 the MG-28 has a distributor mounted on it, differing in this respect from the other motor-generators).

MOTOR SWITCH—With regard to the motor switch, little need be said of its construction, which will be evident on referring to Fig. 9. Particular care should be used to prevent oil collecting on the contact blocks "M" and the bakelite cover, which would tend to cause arcing at this point and consequently the burning of the bakelite on the block. If the block burns, it should be replaced with another one. The contacts "M" can be resurfaced. If either the blocks or contacts "M" burn, it will cause sufficient heat to draw the temper from the spring cradle which holds the contacts against the bakelite cover and this cradle should be entirely replaced every time the switch contacts or the bakelite cover show any signs of serious arcing.

VOLTAGE REGULATOR DESCRIPTION—Regulation on these systems was originally obtained by what is known as the mercury tube type of voltage regulation. It consists of a coil of wire surrounding a mercury tube, this regulator being shown in section of Fig. 12. The tube consists of a hollow cylinder of german silver lined with insulating varnish, and having two pools of mercury inside, separated from each other by an insulating cylinder of bakelite. The steel plunger which also is hollow moves up and down in the tube. The plunger itself moves in the outer well and the long steel needle moves in the inner pool of mercury. 0n inspection of Fig. 12 it will be seen that the two pools of mercury are connected by means of the resistance wound on the lower portion of the steel plunger, this resistance wire being insulated from the plunger by means of sheet mica insulation. One end of the resistance wire is connected to the needle and the other to the steel tube.

OPERATION OF REGULATOR—Now, any portion of the resistance wire that is above the surface of the mercury will be inserted in the shunt field circuit. One terminal of the shunt field of the motor-generator is connected to the bottom terminal of the mercury tube and the outer cylinder of the tube is grounded to the base of the apparatus box so that the shunt field is grounded through the mercury tube to the base of the apparatus box and thence, excepting during the cranking operation, to the frame of the car. The tube, the plunger and the coil of wire are all calculated so as to hold the voltage within certain limits. Whenever the voltage of the motor-generator rises above this value, the attraction of the coil for the steel plunger causes the latter to rise in the tube, thus inserting more resistance between the two pools of mercury and hence in the shunt field circuit which in turn weakens the shunt field and causes the voltage of the generator to be reduced. This action continues until the voltage of the generator assumes a steady value.

CORRECTING REGULATOR FOR TEMPERATURE—An increase in temperature will have the effect of cutting down the current through the voltage coil of the regulator and therefore of reducing the attraction of the coil for the plunger which would cause the voltage of the system to rise. To enable the necessary corrections to be made for temperature, a rheostat is provided which can be adjusted to cut the terminal voltage and keep it at a normal value. This rheostat is mounted directly below the voltage coil and is shown in illustration, Fig. 12. The indicator

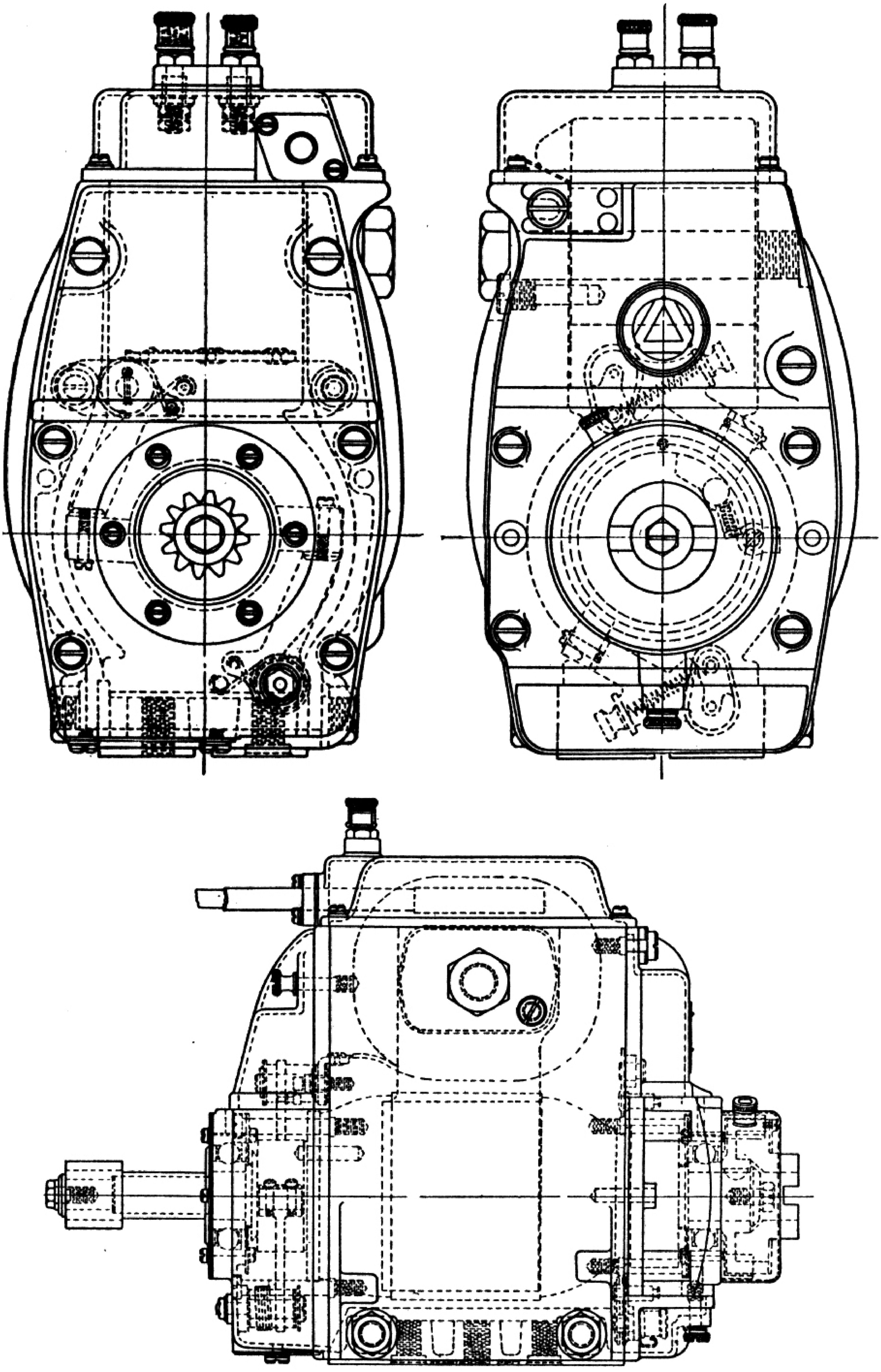


Fig. 7

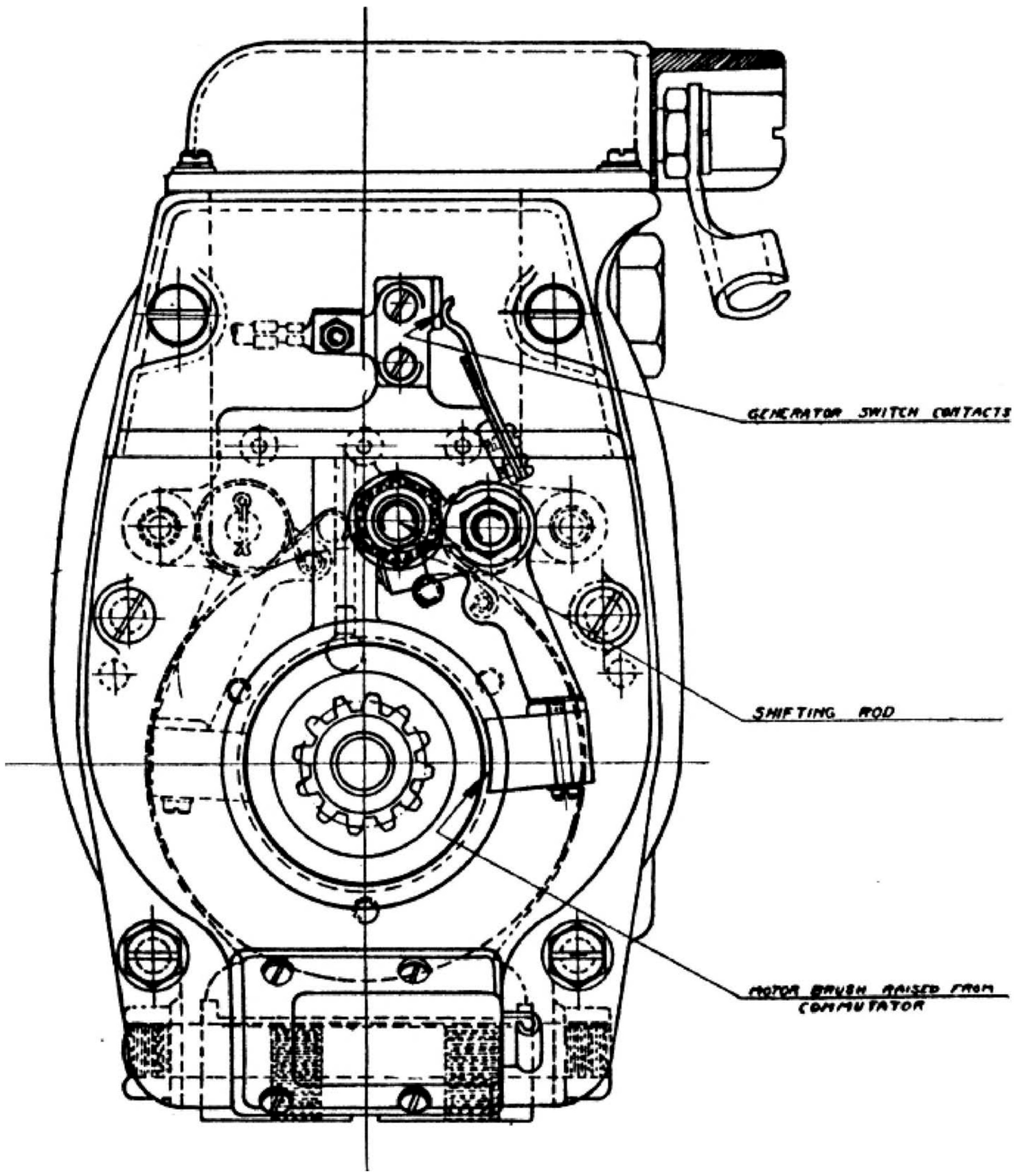


Fig. 8

should be turned in a clockwise direction when viewed from top to increase the charging rate.

If there is a loose connection between the generator and the storage battery, or if the battery is removed or disconnected, the work which the tube is to do, may be too great for its capacity, and in this event the voltage will rise above its normal value and cause the voltage coil of the regulator to be burned out, together with some other portions of the systems, such as the cut-out relay and the shunt field of the generator.

If, for any reason, the tube becomes open circuited, as for instance it does when the resistance winding on the plunger breaks, the generator will not charge and this condition can be readily told if it is found that the generator is not charging, by temporarily bridging across the red fiber gasket near the bottom of the tube with a piece of metal. If under these conditions, the generator will charge, the trouble will be found in the mercury tube, which should be replaced. Another way by which an open circuited tube, or any other open circuit in the

shunt field can be told, will be found by pressing the starter button on the ignition and lighting switch. If the shunt field is open the armature will attempt to revolve in a counter clockwise direction when viewed from the front end instead of a clockwise direction as normally.

APPARATUS BOX—A view of the apparatus box showing the voltage regulator, cut-out relay and ignition relay is shown in Fig. 10. The voltage regulator has been described above and the ignition relay and cut-out relay are discussed in other articles and their adjustments described therein, so that if information is needed on these subjects, it can be obtained on application to the Dayton Engineering Laboratories Company.

REBUILT SYSTEMS—It has been previously stated that a portion of these systems have been rebuilt so as to enable the voltage regulator to be eliminated. On these rebuilt systems the field coil of the motor-generator has been provided with a reverse series winding so that on these machines the voltage regulator is no longer used. The apparatus box used with these rebuilt systems is shown in Fig. 11, and is the same as the one shown earlier with the exception that the voltage regulator has been removed and the connections slightly changed. Figs. 13 and 14 show the wiring diagrams of that portion of the wiring which has to do with the voltage regulator and the apparatus box, and show the changed connections required when these rebuilt systems are installed.

OVERHAULING—The motor-generator should be overhauled about once a year at least in order to clean out all the old grease and dirt which will collect, and to put in a fresh supply of grease. Undercut the mica on the generator commutator if necessary; replace the generator or motor brushes if they are unduly worn
and true up the motor or generator commutator if these are burned badly or are eccentric. If instructions are needed to cover the work of undercutting the mica and seating the brushes, they can be had on application.

CHARGING RATE—It is impracticable to indicate the net charging rate of these systems, owing to the fact that there are two connections to the motor switch cover (with the exception of the Oldsmobile Model 55, where an ammeter inserted in the line going from the generator terminal to the No. 4 terminal of the combination ignition and lighting switch will indicate the net charging rate).

In the case of the other systems, however, the gross charging rate can be told by inserting the ammeter in the lead going from the main or larger of the two terminals on top of the motor-generator to the left-hand terminal of the cut-out relay.

IGNITION—The ignition systems used on cars listed under these instructions require little attention aside from occasional adjustments and replacements of such parts as may wear out from time to time. The timing of the ignition on these systems is accomplished by loosening the screw in the top of the distributor shaft and turning the fiber timing cam to the proper position and then tightening the screw down so as to hold the cam in the proper position. With regard to the exact directions for timing any particular car, the manufacturers of that motor car should be consulted. If ignition trouble occurs, or if information is needed regarding the ignition systems, application should be made for the article covering Delco Ignition Systems.

COMBINATION IGNITION AND LIGHTING SWITCH—The combination ignition and lighting switch is shown in Fig. 15. The operation of the starting button has been previously explained. If the insulation between the two sets of contacts "A" and "B" used in connection with the starting button should burn it would cause the ignition relay to operate when the "mag" ignition is turned on, and if this occurs, the switch should be inspected and the insulation replaced or, if necessary, the entire switch repaired.

LUBRICATION—As regards lubrication of this apparatus, a few points should be kept in mind. The motor-generators are provided with oil holes by which the front and rear armature ball bearings can be lubricated, and a few drops of oil should be put here every week in order to keep these bearings in condition. The starting clutch and the shaft on which it rides are both lubricated by the grease cup screwed into the shaft and particular pains should be taken to see that an ample supply of grease is kept on this clutch, and the shaft to prevent its sticking. The distributor is packed with grease and this will lubricate the distributor shaft itself and the lower distributor bearing, but it is necessary to place a few drops of oil on top distributor bearing from time to time in order to keep the latter properly lubricated.

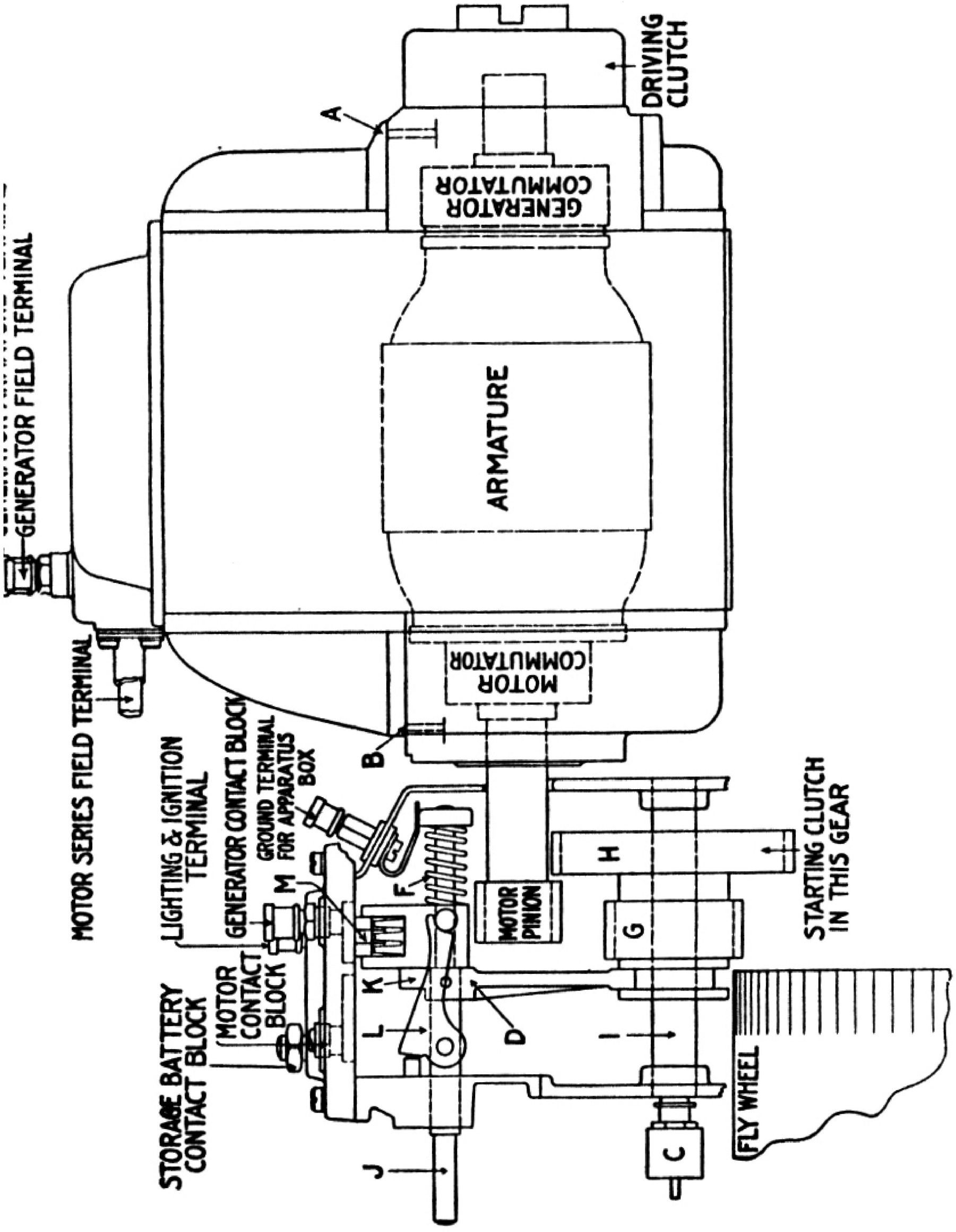

DRIVING CLUTCH
A
GENERATOR COMMUTATOR
ARMATURE
GENERATOR FIELD TERMINAL
MOTOR SERIES FIELD TERMINAL
LIGHTING & IGNITION TERMINAL
GENERATOR CONTACT BLOCK
GROUND TERMINAL FOR APPARATUS BOX
B
MOTOR COMMUTATOR
MOTOR PINION
STARTING CLUTCH IN THIS GEAR
STORAGE BATTERY CONTACT BLOCK
MOTOR CONTACT BLOCK
FLY WHEEL
M
F
H
G
K
L
D
I
J
C

Fig. 9

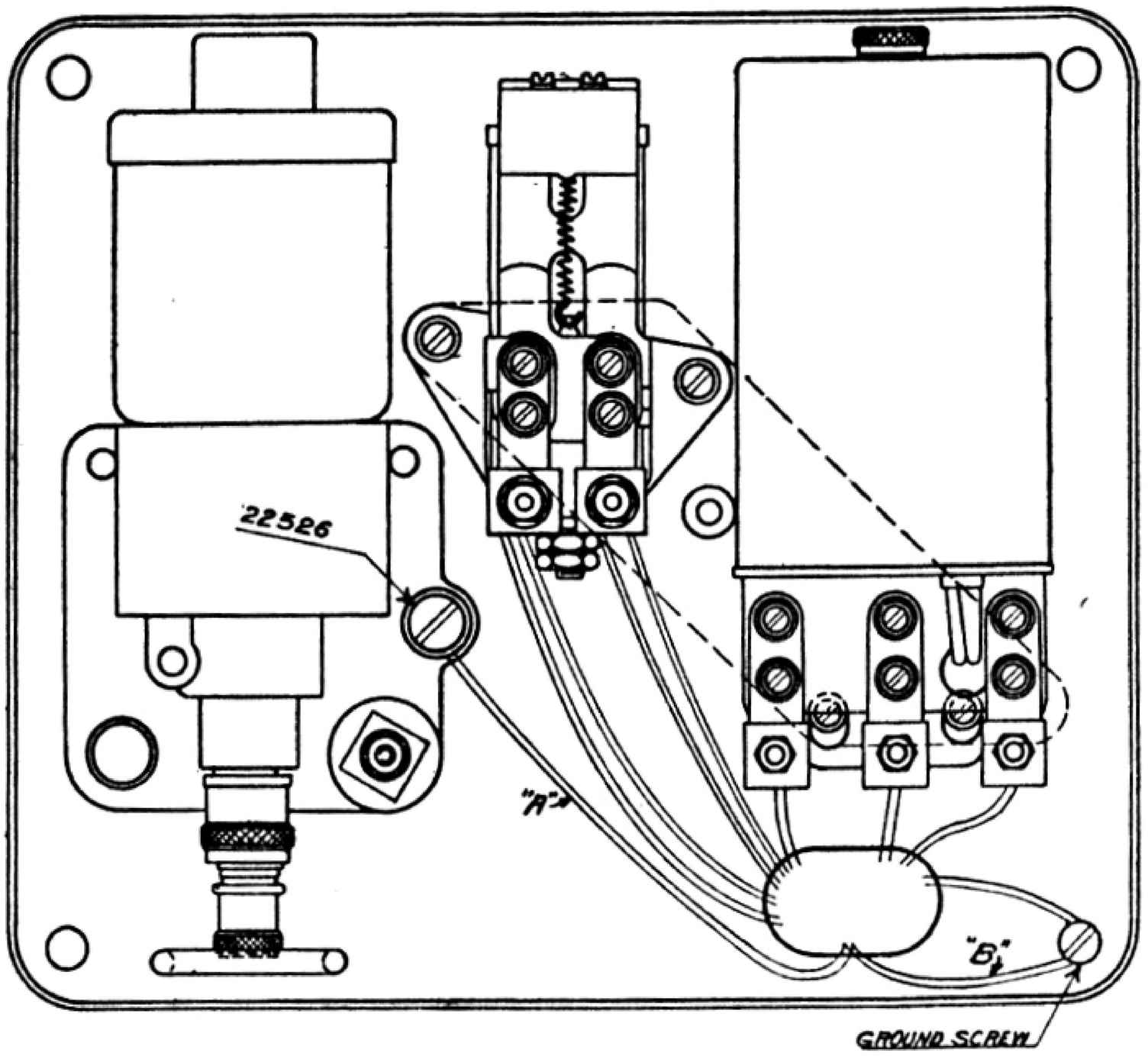


Fig. 10

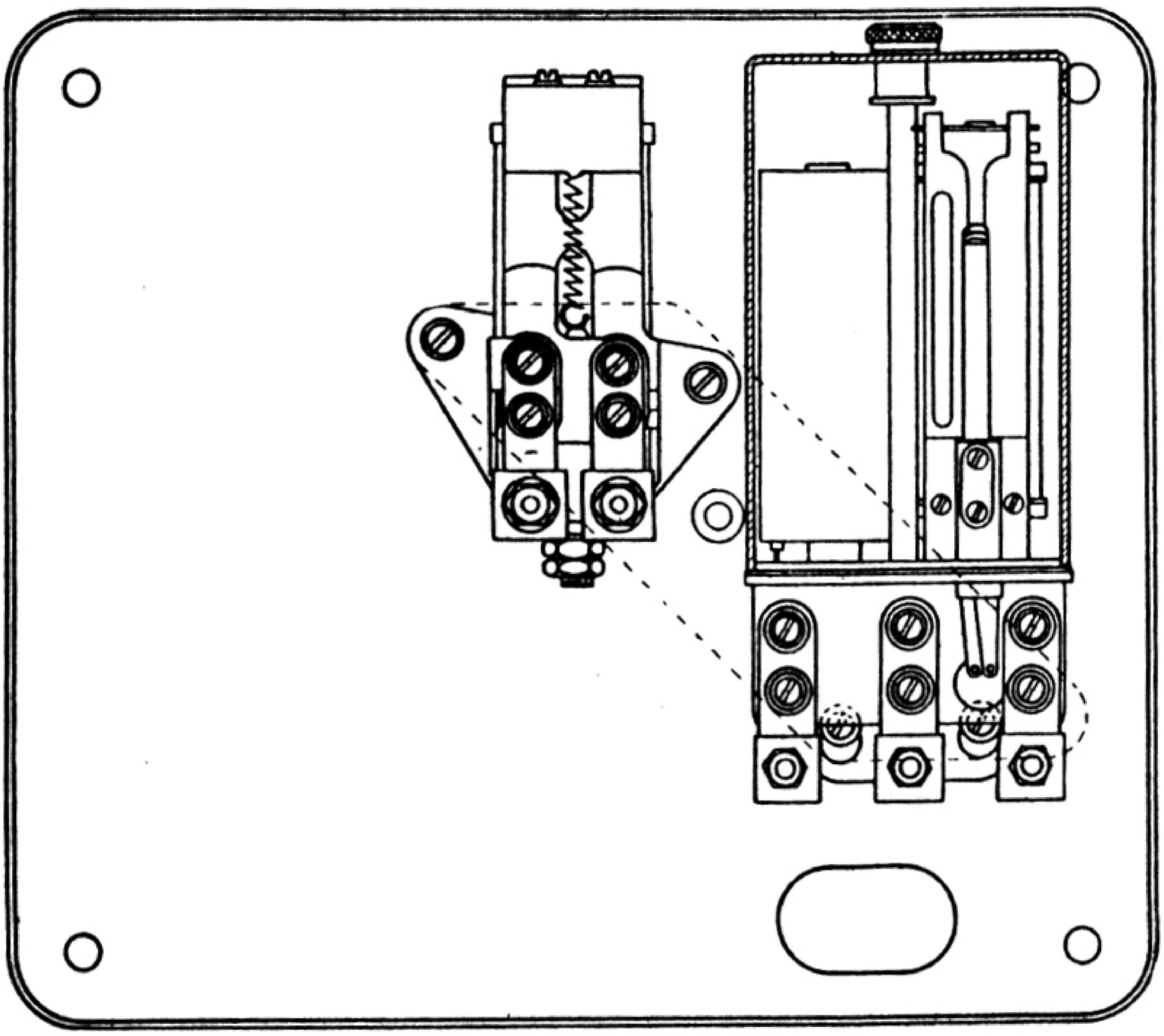


Fig. 11

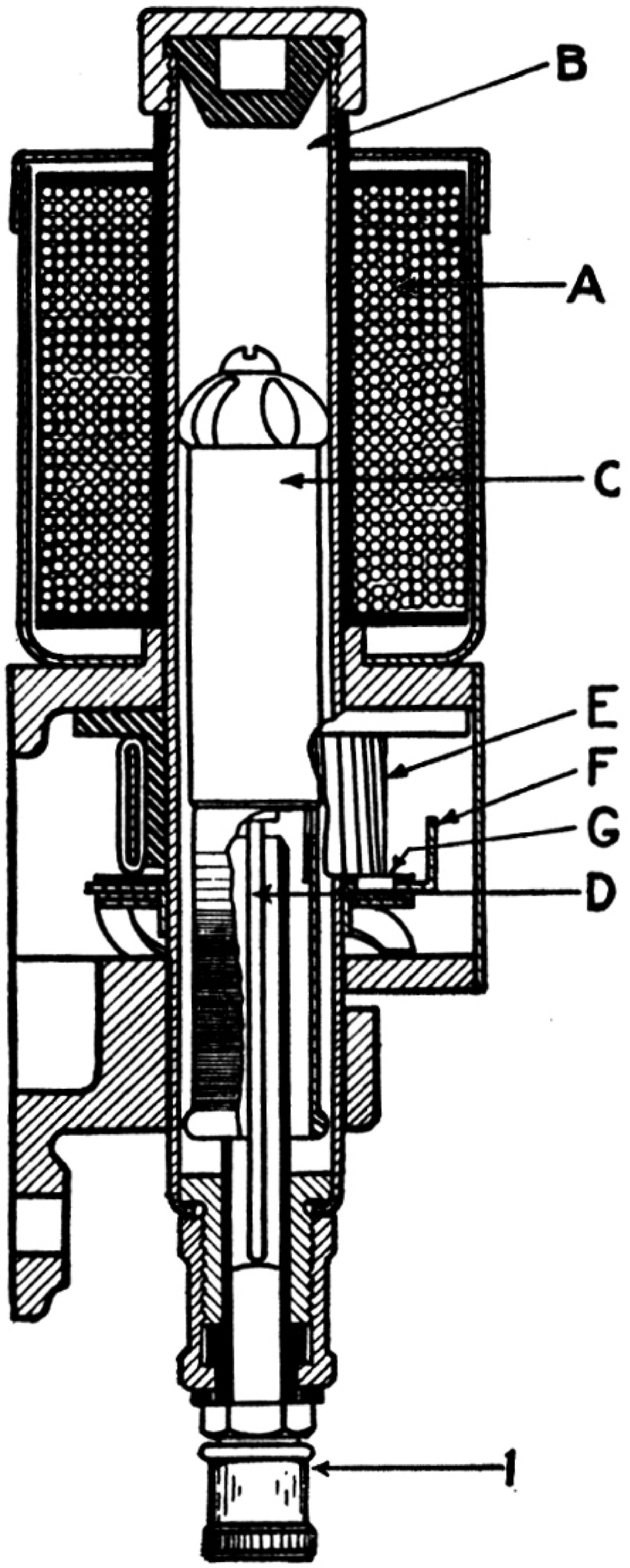


Fig. 12

SHOWING CONNECTIONS AFTER REBUILT MOTOR GENERATOR HAS BEEN INSTALLED

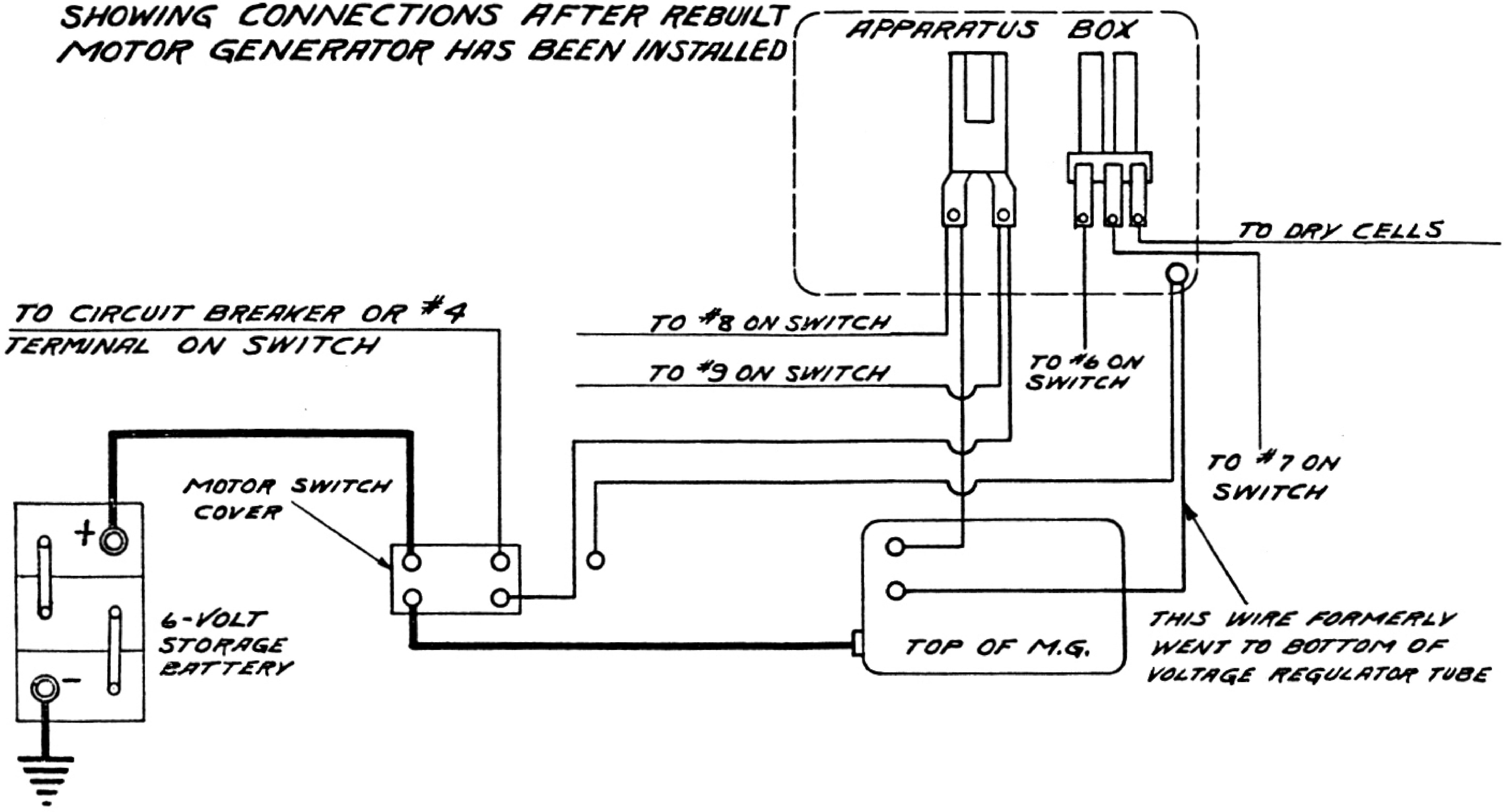


Fig. 13

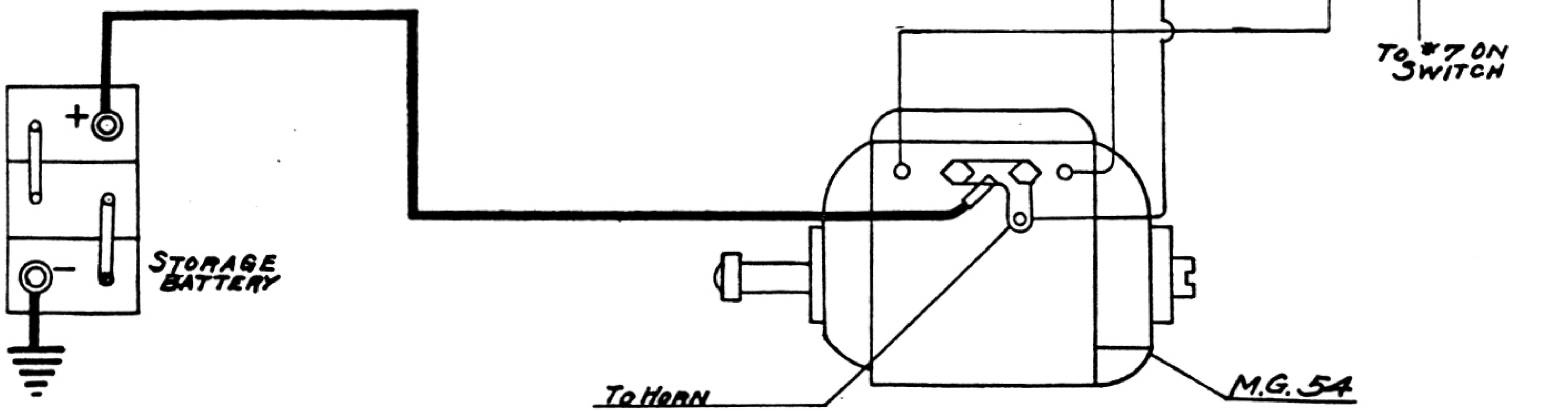

APPARATUS BOX
TO DRY CELLS
TO #8 ON SWITCH
TO #4 ON SWITCH
TO #6 ON SWITCH
TO #7 ON SWITCH
STORAGE BATTERY
TO HORN
M.G. 54

Fig. 14

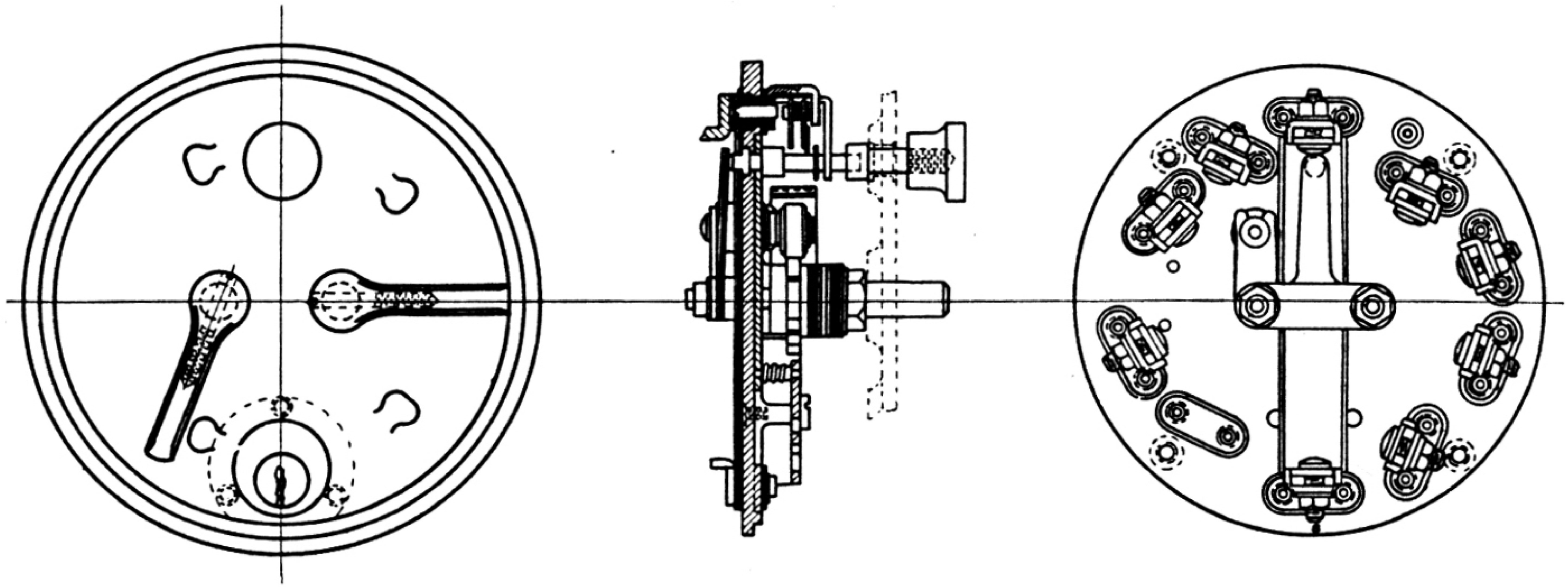


Fig. 15

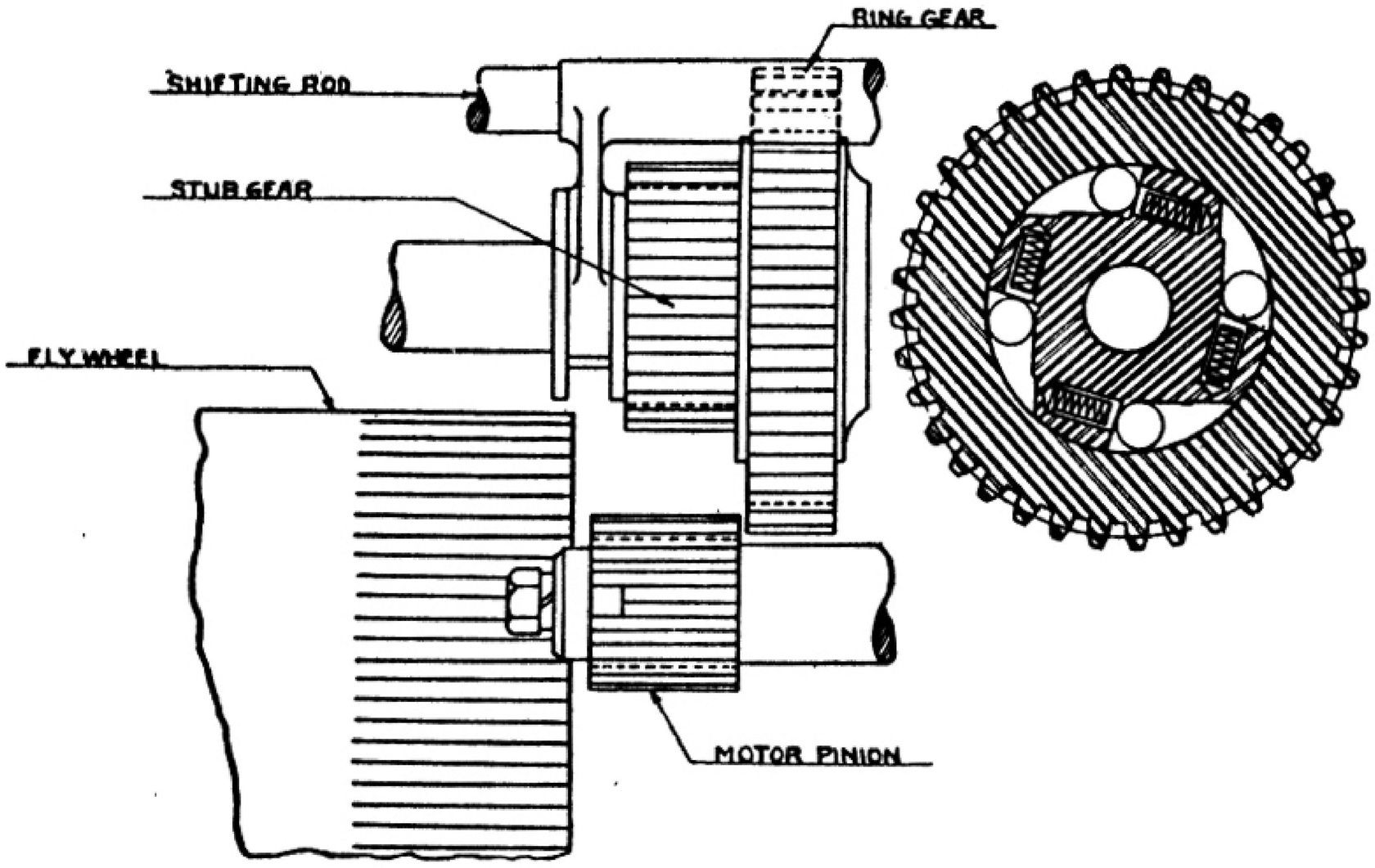


Fig. 16