

Instruction Bulletin, 053

Test and Adjustment

Instructions for

Electrical Equipment

Manufactured for



DODGE BROTHERS



By the

NORTH EAST ELECTRIC CO.

ROCHESTER

N.Y., U.S.A.



August, 1922

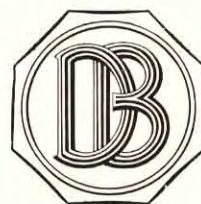
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Genuine North East Service Parts are put out in yellow boxes that distinguish them unmistakably from substitutes.

Use Only Genuine North East Parts

THERE are three essentials for good automotive electrical repair work. Proper knowledge of the equipment. Adequate tools and test apparatus. *Genuine* service parts.

The purpose of this book is to supplement these three essentials in handling North East service work. It does not therefore go into detailed explanations of operation and construction, but deals mainly with test and repair methods.

Any work that cannot be taken care of with aid of these instructions should be referred to an Authorized North East Service Station.

A directory of the world-wide organization of Branches and Service Stations maintained by North East Service Inc. for officially handling service on North East Apparatus is issued monthly in separate bulletin form. A copy may be had at any time by requesting Bulletin 1041 from the nearest Branch of North East Service Inc.

NORTH EAST SERVICE INC.

Rochester, N. Y., U. S. A.

ATLANTA, Ga.	55 W. Peachtree Street
CHICAGO, Ill.,	2701 S. Wabash Avenue
DETROIT, Mich.,	4473 Cass Avenue
KANSAS CITY, Mo.,	1819 McGee Street
NEW YORK CITY,	355 West 52nd Street
ROCHESTER, N. Y.,	391 Lyell Avenue
SAN FRANCISCO, Cal.,	941 Geary Street
WINDSOR, Ont., Can.,	425 Pierre Avenue
LONDON, W. 1, Eng.,	10 Little Portland Street
PARIS, France,	10 Rue Labie

The Electrical System

on

Dodge Brothers Motor Vehicles

Dodge Brothers Motor Vehicles are equipped with a 12 volt electrical system. The North East Units which go to make up this system are the starter-generator, the starting switch and cut-out, the ignition unit, and the horn. The speedometer is also of North East manufacture. Their general arrangement is shown in the diagram on the opposite page.

The Starter-Generator

The Starter-generator should cut in at 15 volts at 1000 R.P.M. (approx. 9 miles per hour). Its output should reach a maximum of $6\frac{1}{2}$ amperes hot (8 amps. cold) at 1800 R.P.M., and taper down again as the speed rises above 2100 R.P.M.

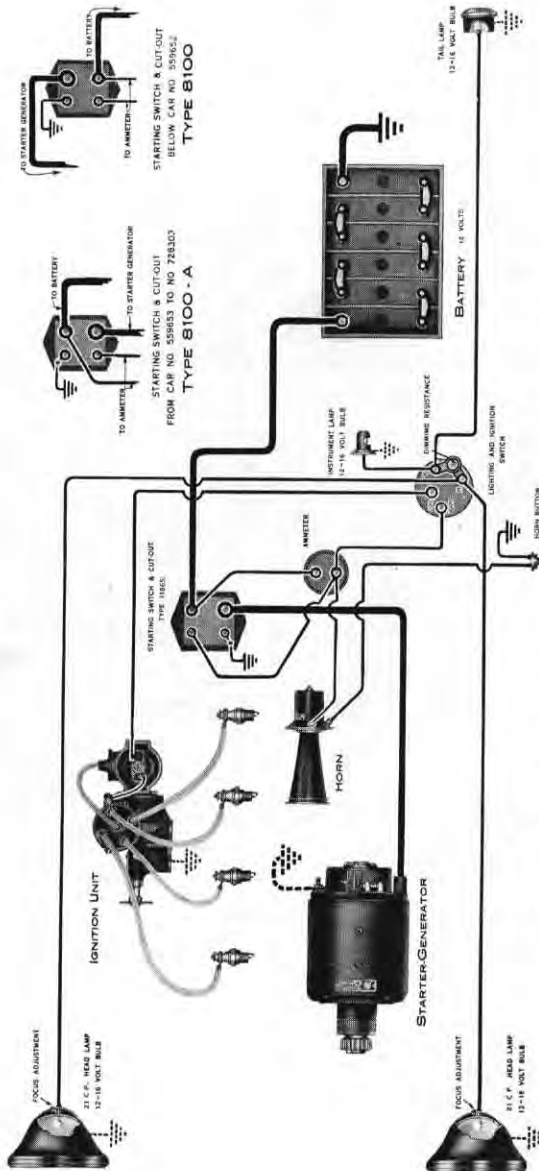
The output setting can be adjusted by shifting the position of the 3rd brush. The 3rd brush adjusting screw and the adjustment lock are located at the commutator-end.

Output Adjustment

Do not change the standard setting except where the special conditions that make it necessary are permanent. Where the abnormal conditions are temporary, advise daylight burning of lights or running of starter with ignition off to prevent overcharging; or give an occasional extra charge from an outside source to take care of undercharging.

To readjust the output:

1. Connect ammeter in circuit at starter-generator terminal so as to register full output (charging current plus ignition current). Short circuit ammeter terminals while starting switch is closed in starting engine. Connect voltmeter across starter-generator terminals.
2. Run machine at 1800 R.P.M. (Equivalent to approx. 20 miles per hour.) Note am-



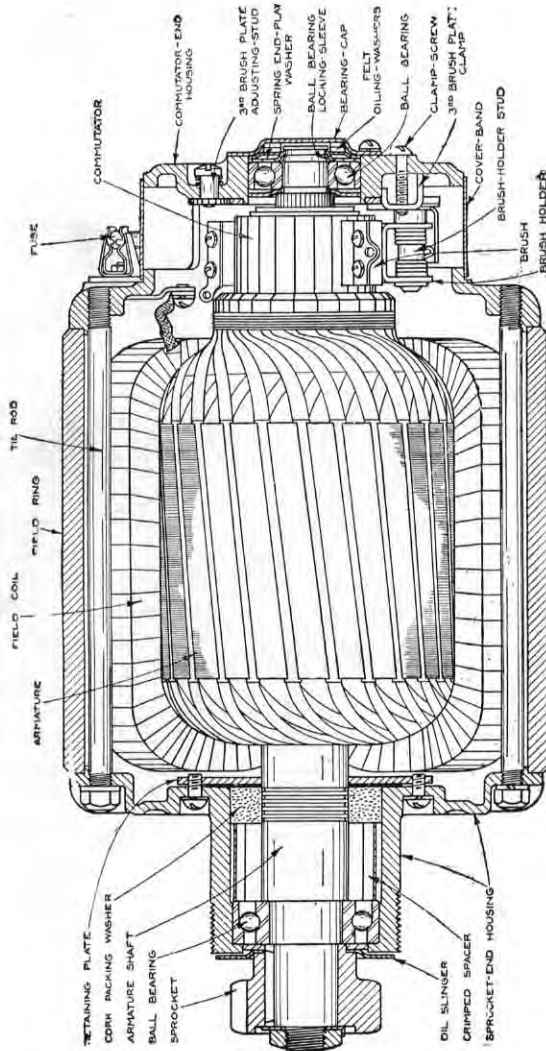
The North East Electrical System on Dodge Brothers Motor Vehicles



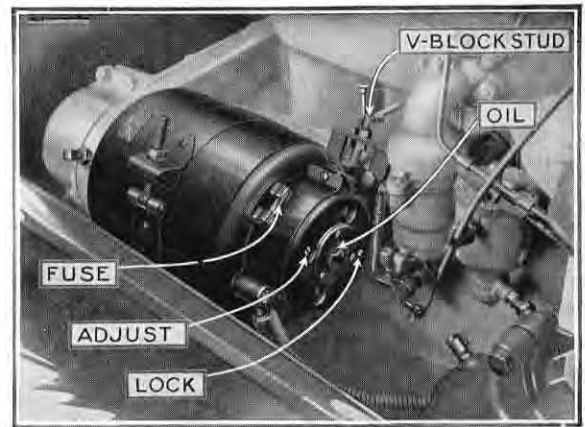
meter and voltmeter readings. Note whether starter-generator is hot or cold. Before proceeding with readjustment, refer to following table and make due allowance for effect of voltage and temperature on observed readings. Determine with aid of table what new setting should be.

Variations in Charging Rate Due to Changes in Battery Counter-Electromotive Force.

Charging Rate		Battery C.E.M.F.		Starter-Generator
Amps. (hot)	Amps. (cold)	Volts	R.P.M.	R.P.M.
5.5	6	12	1800	1800
6	7	13	1800	1800
6.5	7.5	14	1800	1800
7	8	15	1800	1800
7.5	9	16	1800	1800



North East Model G, Type 3566, Starter-Generator



The North East Starter-Generator

- Loosen lock screw and turn adjusting screw slowly to the right or to the left until ammeter reading shows that rate has been raised or cut down to the desired new setting point.
- Tighten lock screw. Note ammeter readings again to make sure that setting has not been disturbed.
- Test out new setting by running engine at different speeds from 10 miles per hour, up to 40 or 50.

In every case where the output is readjusted keep the equipment under observation as closely

as possible for at least two or three weeks, and take frequent hydrometer readings to determine whether the new setting is keeping the battery in proper condition. If the battery is in a discharged condition, give it a good charge to bring it up before letting the equipment go into service again.

Field Fuse

Practically the only thing that will blow the fuse is a poor connection in the generating circuit. When a fuse blows don't simply put in a new fuse, but look over the whole system carefully for loose or open connections in the car wiring. Also look at the brushes and commutator to make sure they are not at fault. Never use anything but a standard 10 ampere fuse, and always make sure that it fits tightly in the clips.

Brushes

Burned brushes or a rough commutator usually mean a loose connection somewhere in the charging circuit. In every such case go over the car wiring thoroughly and tighten up all connections, especially at the ammeter and cut-out terminals. Also make sure that the ground connection from the cut-out to the steering column or the engine is tight and is making good contact.

If the brushes are worn or the commutator is very rough, it is always best to take the starter-generator off. After resurfacing the commutator check it to make sure that it runs true, and polish it with No. 00 sandpaper.

In replacing the brushes note that the 3rd brush is different from the main brushes and should never be interchanged with them. Make sure that they all work freely and that they make good contact with the commutator.

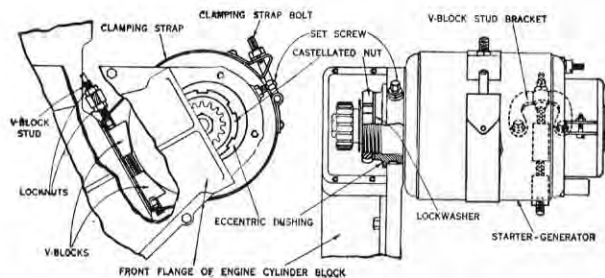
It is very important to use only Genuine North East Brushes. Avoid substitutes. Genuine North East Brushes come in sealed yellow boxes and always bear the North East trade mark together with the part identification number.

Bearings

If the bearings ever have to be replaced use only such bearings as are furnished by the North East Electric Co. Be sure inner races make a snug fit on the shaft. Outer races should fit in the housings so they can just creep around. Use one or more spring endplay washers at commutator-end to keep outer and inner races in alignment and to hold endplay between .010" and .020". Whenever drive-end housing has to be taken off armature shaft, always put in a new cork packing washer to insure proper oil seal.

Lubrication of the Starter-Generator

The drive-end bearing is kept lubricated by oil from the crankcase. The commutator-end bearing should be repacked with a small quantity of good acid-free ball bearing grease (Keystone No. 4 or its equivalent) at least once a year. Also give it a few drops of oil through the oiler in the bearing cap every 2000 or 3000 miles.



Application of Starter-Generator

Chain Adjustment

Keep the chain adjusted so as to have about one-half inch up and down play in the free portion between the sprockets.

To adjust the Chain:

1. Remove chain inspection cover, taking care not to injure gasket under it.
2. Loosen clamping strap bolts.
3. Back V-blocks away from starter-generator.



4. Pry up ears of locking washer behind castellated nut.
5. Back off castellated nut two or three turns.
6. Loosen set screw which holds eccentric ring in timing-gear case.
7. Turn eccentric ring to get proper chain tension—one-half inch up and down play in free part.
8. Put in new locking washer if necessary. Lock eccentric ring in new position and tighten set screw locknut.
9. Draw castellated nut up tight and lock it by bending down ears of lockwasher.
10. Screw V-blocks up so they just support starter-generator but do not force it out of position. Tighten clamping strap. **Be careful in readjusting V-blocks and tightening strap not to force the body of the starter-generator out of alignment with the sprocket-end housing, because such a strain is liable to injure bearings and shaft.**
11. Replace chain inspection cover, putting on new gasket if original is injured.
12. Run engine at a number of different speeds and make sure chain is not noisy.

Starting Switch and Reverse Current Cutout

If the starting switch contact blocks have to be resurfaced, be careful to keep their faces smooth and level so they will make full contact. If the movable contactor needs to be renewed, do not try to put in new laminations but replace the whole contactor and push rod assembly.

The cut-out should close at 15 volts. Its closing can be adjusted by changing the tension of the contact armature spring. To raise the cut-in point, increase the tension on the spring by bending the lugs that hold it. To lower the cut-in, decrease the tension by stretching the spring slightly. Be careful not to get the contacts out of alignment because if their faces do not make full contact with each other they are liable to heat up.

TROUBLE DIAGNOSIS

STARTING AND GENERATING

If Starter-generator Output is Low or Irregular

Look for:

- Dash ammeter out of order.
- Output setting low.
- Fuse loose in clips.
- Loose or corroded connections in charging circuit.
- Poor brush contact, or commutator dirty.
- Brush rigging grounded.
- Battery in run-down condition, or cells shorted.
- Car being operated at too low speed.
- Cut-out out of adjustment.
- Armature or field coils grounded or shorted.
- Failure to generate at high speed—brush springs weak or brushes not free, or commutator out of round.
- High mica—commutator needs undercutting.

If No Current is Registered by Dash Ammeter

Look for:

- Dash Ammeter not registering.
- Fuse Blown.
- Brushes worn down or sticking.
- Cut-out ground connection loose or open.
- Cut-out not working.
- “Open” in charging circuit.
- Ground in charging circuit.
- Armature or field coils open, grounded or shorted.

If Fuse Blows

Look for:

- Fuse loose in clips.
- Wrong capacity fuse (should be 10 amps).
- Open, loose or corroded connections in charging circuit (especially at battery).
- Cut-out ground connection loose or open.
- Cut-out not working properly.
- Battery sulphated or electrolyte low.



If Commutator and Brushes are Burned

Look for:

- Loose or corroded connection in generating circuit.
- Fuse loose in clips.
- Wrong Brushes used.
- Weak brush springs or brushes not free, or commutator out of round.
- Battery sulphated or electrolyte low.
- Open coil in armature.

If Starter-generator is Weak or Fails to Start

Look for:

- Engine stiff.
- Battery discharged, cells shorted or sulphated, or electrolyte low.
- Loose, open, or corroded connection, or ground in starting circuit.
- Poor contact in starting switch.
- Poor brush contact.
- Loose or open connection, short, or ground, in armature or in series field coils.

If Starting Switch and Cut-out is Out of Order

Look for:

- Starting contacts burned or worn.
- Dirt between switch contacts.
- Cut-out ground connection loose or open.
- Connections reversed at cut-out terminals.
- Loose or open connection in charging circuit.
- Cut-out out of adjustment.
- Dirt or chips between cut-out contacts or armature core.
- Ground, short or loose or open connection in shunt or series circuit.
- Short between cut-out shunt and series windings.

If Battery Runs Down

Look for

- Electrolyte low, weak, or impure.
- Battery worn out or in need of cleaning.
- Ground in car wiring or in battery box.
- Starter or lights used too much.
- Ignition left on while standing.



Starter-generator not delivering current or output too low or irregular.

If Lamps Flicker or Fail

Look for:

- Lamp bulbs loose.
- Bulbs wrong voltage (should be 12-16 volts).
- Loose or open connections or ground in lamp circuits, lighting switch, or generating circuit.
- Fuse loose in clips.
- Battery sulphated or electrolyte low.
- Cut-out not working properly.

TESTS

STARTER-GENERATOR—STARTING SWITCH AND CUT-OUT

Starting and generating tests cannot be carried out satisfactorily without the following apparatus—Adjustable Speed Test Bench—Armature Growler—Ammeter with 30 and 300 amp. ranges—Voltmeter with 3 and 30 Volt ranges—Test Leads with Lamp or Buzzer.



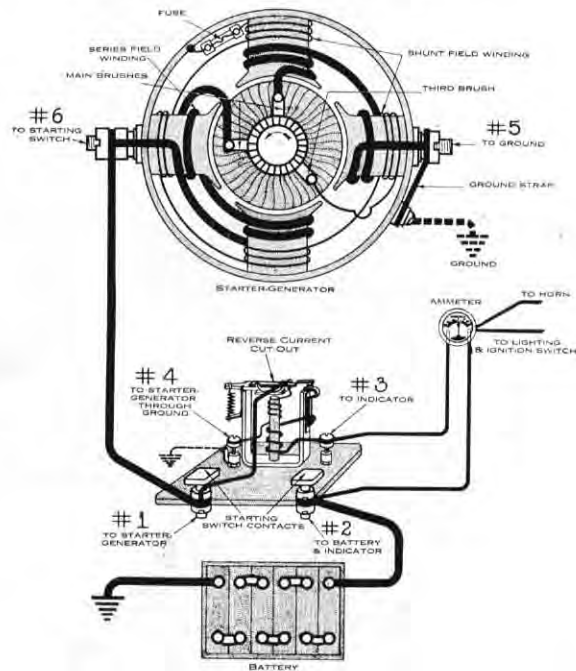
North East Test Bench

Starter-generator

Before making any of the following tests on the starter-generator disconnect it from the car wiring, take out the fuse, take off the ground strap.

To Locate Ground in Brush Rigging or Field Coils:

1. Insulate all three brushes from commutator by slipping paper under brushes.



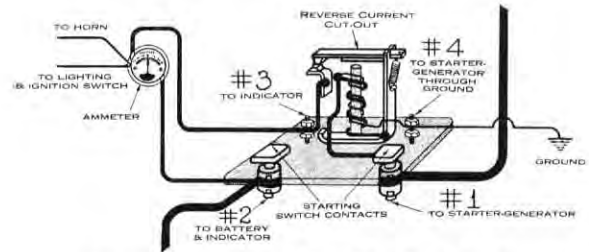
Model G Starting and Generating System on Dodge Brothers Motor Vehicles.

(With type 11865 switch and cut-out used above car No. 728303)

2. Hold one test lead on field frame, touch the other (a) to No. 6 binding post—light indicates a ground in positive half of series field or positive brush holder. (b) to No. 5 binding post—light indicates ground in negative half of series field or negative brush holder. (c) To the ungrounded fuse clip—light indicates ground in shunt field or 3rd brush holder.

To Locate Ground in the Armature:

1. Insulate all three brushes from commutator.
2. Hold one test lead on field frame, touch other to commutator—light indicates a ground in armature or in commutator.

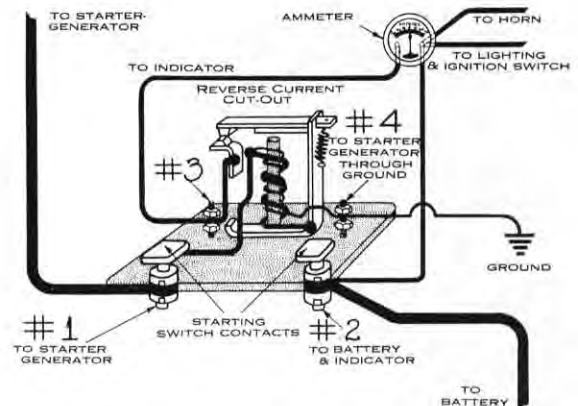


Starting Switch and Cut-Out Type 8100

Used Below Car No. 559652

To Locate Open in Field Coils or Brushes:

1. Hold one lead on No. 6 binding post; touch other to No. 5 binding post. Light indicates open in series field circuit or main brushes.



Starting Switch and Cut-Out Type 8100A

Used on Cars Between No. 559653 and 728303

2. Hold lead on No. 6 binding post; touch other to ungrounded fuse clip. Light indicates circuit O.K. Failure to light indicates open in shunt field circuit or 3rd brush.

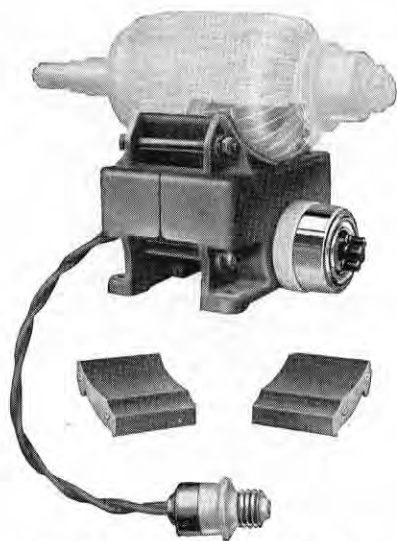


To Locate Short-Circuit between Shunt and Series Field Coils:

1. Insulate 3rd brush from commutator.
2. Hold one lead on No. 6 binding post; touch other to ungrounded fuse clip. Light indicates short-circuit between shunt and series field coils.

Test for Short-circuit in Armature:

1. Remove armature from machine and place in armature growler.
2. Turn on growler current and hold thin strip of steel about an eighth of an inch above armature core half way between growler pole pieces.
3. Turn armature slowly through at least one full revolution. A short will be indicated by steel strip being strongly attracted to armature core at one or more places.



North East Armature Test Growler

Starting Switch and Cut-out

Before making any test on the starting switch or cut-out, disconnect all wires from the terminals and remove the ground strap if one is used.

To Locate Ground in Starting Switch:

1. Close switch by pressing down button. Hold one test lead on case; touch other



to either No. 1 or No. 2 binding post. Light indicates ground.

To Locate Short-circuit in Starting Switch:

1. Keep switch open. Hold one lead on No. 1 binding post; touch other to No. 2. Light indicates short-circuit.

To Locate Open Circuit in Starting Switch:

1. Close switch. Test from No. 1 binding post to No. 2. Failure to light indicates open circuit.

To Locate Ground in Cut-out:

1. Hold one lead on case; touch other to No. 3 binding post, then to No. 4. Light indicates ground.

To Locate Short between Shunt and Series Cut-out Windings:

1. With cut-out contacts open hold one lead on No. 1 binding post; touch other to No. 4. Dim light indicates circuits O.K. Bright light indicates short between windings.

To Locate Short around Cut-out Contacts:

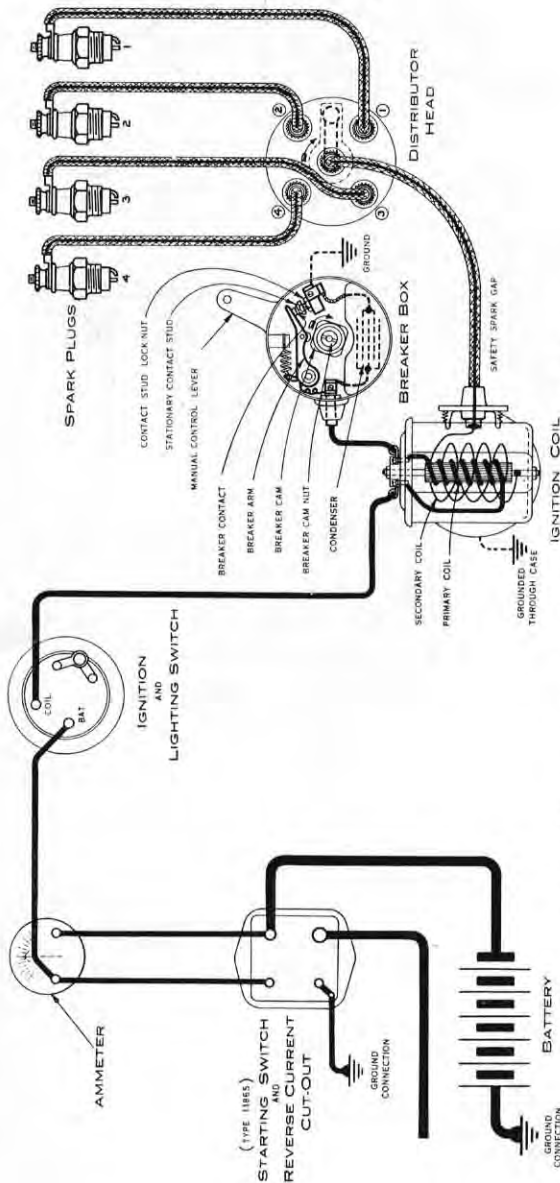
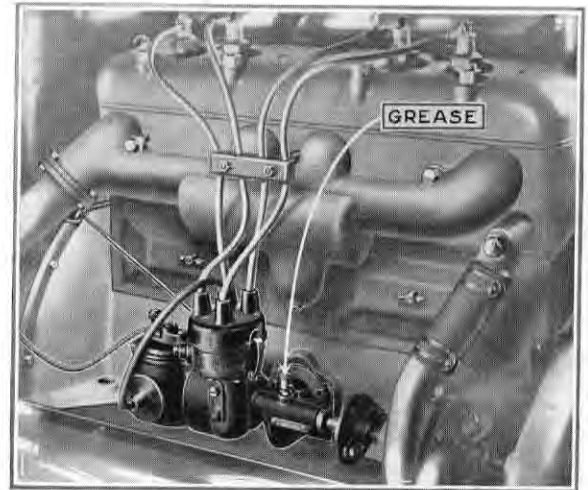
1. With contacts open hold one lead on No. 1 binding post; touch other on No 3. Light indicates short-circuit.

To Locate Open circuit in Cut-out Shunt Winding:

1. Hold one lead on No. 1 binding post; touch other to No. 4. Dim light indicates circuit O.K. Failure to light indicates open in shunt circuit.

To Locate Open Circuit in Cut-out Series Winding:

1. Remove case and close cut-out contacts by hand.
2. Hold one lead on No. 1 binding post; touch other to No. 3. Light indicates circuit O.K. Failure to light indicates open in series winding or contacts.



Model O Ignition System on Dodge Brothers Motor Vehicles.

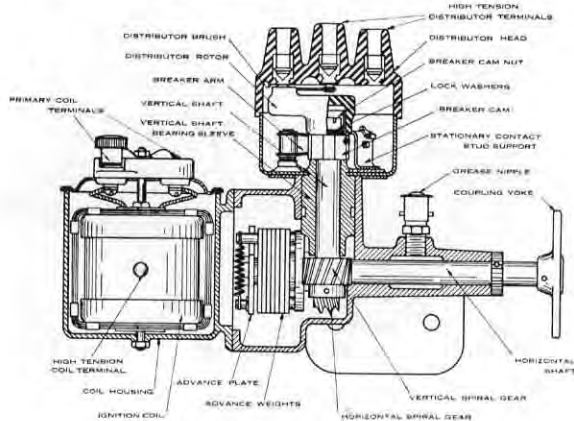
Ignition

If the ignition unit has to be taken off the engine, first remove the distributor cap and mark the location of the rotor-arm so that the same setting can be kept without retiming the unit when it is put back. Be careful not to turn the engine while the ignition unit is off. When re-installing the ignition unit be sure that it is in correct alignment with the water pump shaft so that the coupling disc has free play between the coupling yokes throughout the entire revolution. Use shims, if necessary, between ignition unit base and mounting pad on engine to secure the proper alignment. Be sure to put on again a retainer for the camshaft thrust block which is held by the two upper base screws.

To Time the Ignition

1. Pull spark lever down to full retard position and make sure ignition switch is turned off.
2. Take out spark plugs and hold thumb over spark plug hold in No. 1 cylinder. Crank engine by hand until the No. 1 piston comes up on compression stroke as indicated by pressure on thumb. As soon as pressure is

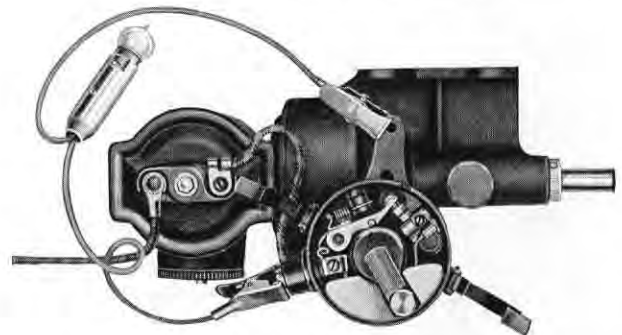
felt, turn crank very slowly until No. 4 exhaust valve is just at point of closing. If No. 4 exhaust valve push-rod is correctly adjusted, No. 1 piston will then be in desired position—just ready for spark.



Model O Ignition Unit

3. Take off ignition distributor-cap and rotor-arm. Loosen breaker-cam by unscrewing its lock nut a turn or two.
4. Put back rotor-arm and turn it around carrying cam with it until distributor brush is brought into position to make contact with No. 1 terminal in distributor-cap.
5. Now move rotor arm and cam forward until breaker points just begin to separate. Take off rotor-arm again and lock cam in this position by screwing down lock nut.
6. Put rotor-arm on again; turn on ignition switch; rock rotor-arm back and forth as far as slack in gear will permit and watch dash ammeter. Ammeter should keep registering "on" and "off" as cam and rotor-arm are rocked. The accuracy of the setting can also be checked by using a timing test lamp connected as shown in the illustration. The lamp lights when the breaker contacts are open. It goes out when they are closed. If the contacts are properly adjusted lamp will flicker on and off as cam is rocked back and forth. Turn off ignition switch when test is finished.

7. Put back all the parts that have been removed. Test operation of engine at various speeds, both idling and driving car. If engine fails to run properly look over spark plugs and spark plug connections, breaker contacts, carburetor, and valve timing, before further readjusting timing.



Ignition Unit with Test Lamp Attached

Rotor in position for Spark to occur in No. 1 Cylinder

To Adjust Breaker Contacts

1. Use .02" gauge on North East contact wrench to check the distance between the breaker contacts when they are fully separated. If the gap is not in accordance with the gauge loosen the locknut from the contact stud and screw the stud in or out until the correct adjustment is obtained. Be sure to lock the stud by drawing the locknut up tight, and then check the gap once more to be sure that it is not changed by locking. Examine the contacts to see



North East Contact Adjusting Wrench

that they are reasonably clean and smooth and that they make contact with each other over their entire faces. Resurface, if necessary, with a contact file or a moderately coarse oil stone. Both breaker-arm and contact stud should be taken out for resurfacing to insure a good job. The sim-



plest way to remove the breaker-arm is to disconnect the pigtail from the binding post and then push the spring off the breaker-arm lug. The breaker-arm can then be lifted out. To replace the breaker-arm, insert the lug in the spring, then holding the spring taut, work the arm down over its post.

Condenser

If the condenser is ever at fault, in an emergency the car can be run temporarily with the condenser disconnected, provided the spark plug points are re-adjusted to a smaller gap. Under such circumstances, however, a new condenser should be installed as soon as possible to avoid injury to the breaker contacts. It is held in place by two nuts on the underside of the breaker-box.

Distributor

The firing order is 1, 3, 4, 2. Whenever the spark plug leads are removed from the distributor cap, be sure to put them back in this order. The cap and the rotor-arm should be kept clean and dry. They need no lubrication because the carbon brush is self-lubricating.

Automatic Advance

The automatic advance mechanism is designed in exact accordance with the operating characteristics of the engine and is non-adjustable. If it ever needs repairs it is best to replace the entire shaft and advance assembly.

Ignition Coil

The coil is made up as a unit assembly and is completely impregnated with insulating compound. Repairs on it are therefore impracticable. Before replacing a coil that appears to be faulty be sure that the fault does not lie elsewhere, because the North East coil with its substantial construction is practically trouble-proof.

Lubrication of the Ignition Unit

The advance mechanism and the vertical shaft and gears are lubricated by grease in the advance compartment. The horizontal shaft is lubricated



by grease from the Alemite grease nipple or grease cup on the horizontal shaft bearing. In units above Serial No. 566,800 grease introduced through the Alemite grease nipple will make its way into the advance compartment. A liberal supply of grease should be forced in with an Alemite grease gun every 2000 or 3000 miles. In all earlier units it is also necessary to apply grease directly into the advance compartment. This should be done at least once a year and the compartment filled about one-half or two-thirds full of No. 4 Keystone grease or its equivalent.

Spark Plugs

Watch for cracked or fouled plugs. In cleaning be careful not to scratch the glaze on the porcelain. Keep the gap between the spark points as near to .03" as possible (.03" gauge on North East contact wrench gives the correct gap measurement). Always adjust gap by means of outer point, being careful not to bend center spark point because it is liable to crack the insulator around it.

TROUBLE DIAGNOSIS

IGNITION

If No Spark is produced in Secondary, but Current is Flowing in Primary Circuit

Look for:

- Breaker contacts do not open.
- Short, ground, or open in high tension wiring, distributor, or ignition coil.
- Condenser short-circuited.

If Spark in Secondary is Weak or Irregular

Look for:

- Loose connections in either primary or secondary circuit.
- Battery run down—sulphated—short-circuited cells.
- Primary winding on coil partially grounded or shorted.
- Loose or corroded connection.



Ignition switch contacts burned or worn.
Breaker contacts coated or irregular.
Secondary winding partially shorted.

If No Current is Flowing in Primary Circuit

Look for:

Open, ground, or short in primary circuit.
Battery completely discharged or electrolyte too low.

Breaker contacts do not close or are coated.
Ignition switch contacts fail to close circuit.

If Operation of Engine is Irregular

Look for:

Spark plugs fouled, cracked, or out of adjustment.

Partial ground or short either in primary or secondary circuits.

Ignition out of time with engine.

Breaker contacts out of adjustment.

Faulty contact in ignition switch.

Mechanical trouble in engine or carburetor out of adjustment.

TESTS

IGNITION SYSTEM

To Locate Ground in Secondary Winding.

1. Hold one lead on case, touch other lead to each of the four spark plug terminals. Have rotor-arm in contact with one of the spark plug leads. Light indicates a ground.

To Locate Ground in Primary Circuit of Ignition Unit:

1. Disconnect wire from switch to ignition coil. Separate breaker contacts by means of a piece of paper placed between them.
2. Hold one test lead on breaker-box binding post; touch other to case. Light indicates ground.

To Locate Open Circuit in Secondary:

1. Connect one lead of a voltmeter—30 volt range or higher—to core of coil (Center stud on low tension terminal block.) Connect other voltmeter lead to one test lead. Touch other test lead to high tension button terminal on coil. Failure of voltmeter to regis-



ter any reading at all indicates open in secondary winding.

To Locate Open Circuit in Primary:

1. Disconnect wire from switch to coil. Turn engine so breaker contacts close.
2. Hold one lead on coil terminal from which wire was removed. Touch other to case. Light indicates circuit O.K. Failure to light indicates open circuit.

To test for Short-Circuit in Ignition Coil Primary Winding:

1. Insert ammeter between wire removed from ignition coil and terminal from which wire was removed—close contacts—Turn on Ignition switch. Current should not exceed $2\frac{1}{2}$ amps. Higher indicates short in winding (or ground in primary circuit).

To Test for Short-Circuit in Condenser:

1. Separate breaker contacts with a piece of paper. Hold one test lead on each contact. Light indicates short in condenser. (Be sure ignition switch is off or coil lead disconnected.)

To Test for Open Circuit or Loss of Capacity in Condenser:

1. Separate breaker contacts with a piece of paper.
2. Hold one test lead on one of the condenser terminals. Make contact several times between the other test lead and other condenser terminal and note nature of spark. A snapping bright spark indicates condenser O.K. An ordinary spark same as when test leads are touched together indicates condenser not functioning.

To Test for Short Circuit in Secondary Winding:

1. The only satisfactory test for a short circuited secondary is to make sure that all other parts of equipment are O.K. and then substitute another coil known to be in good condition and note whether a good spark is produced. If new coil operates properly it is an indication of a fault in the original coil.



The Horn

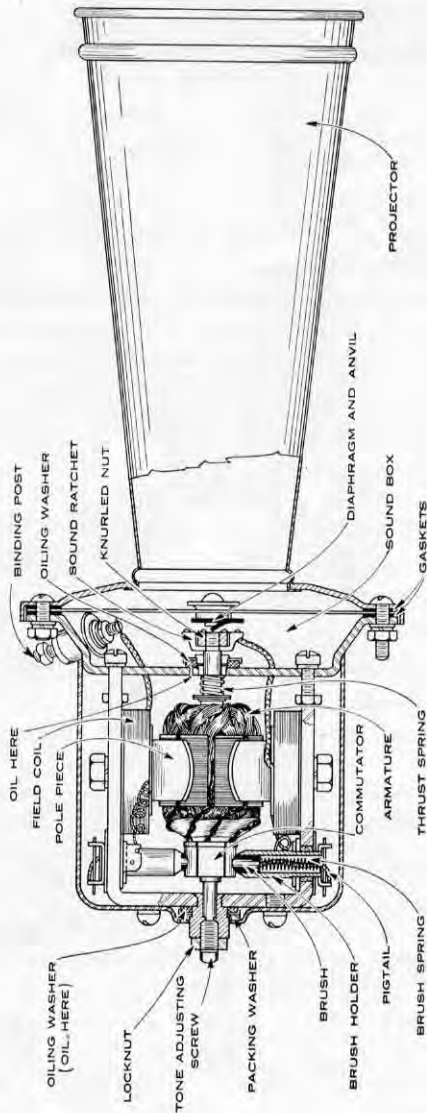
The horn should be lubricated at least once a year. Take off the horn motor cover and oil both ends of the armature shaft with a few drops of oil applied at the points indicated in the diagram. Wipe away any excess of oil on the commutator or in the motor compartment because free oil will be liable to gum the brushes and injure the insulation.

In mounting the horn always be sure that all six of the flange screws are drawn up tight. Also be sure that the nuts on the three longer flange screws holding the horn to the mounting bracket are drawn up tight.

In case the diaphragm has to be replaced always apply a gasket on each side using new ones if original gaskets are spoiled in removal. Tighten up nuts on the flange screws as tight as they can be safely drawn then bump the horn, projector down, several times on a piece of felt or a wad of waste laid on a bench. Draw up any extra slack that the bumping may have given the flange screws. Readjust the tone in accordance with the instructions given below.

Tone Adjustment

If a horn appears to need readjusting, first make sure that the irregularity in the tone is not caused by some external condition. Check up battery voltage. Test out horn button. Inspect horn wiring for loose connections or partial grounds or short circuits. Check up horn flange screws to see that they are all tight. Also make sure there is good ground connection (in case of grounded type horn) between horn frame and mounting bracket.



Model X Horn

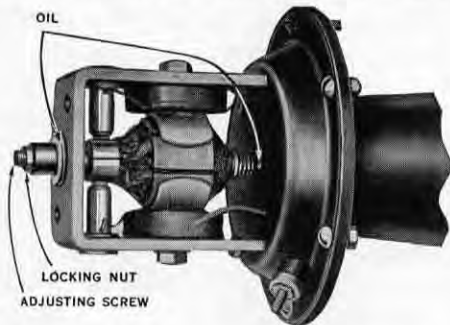


To readjust tone use two North East horn wrenches (No. 11419) or any similar thin wrench. Do not use pliers because they are liable to bruise



North East Horn Wrench

thread on adjusting stud. Slack off locknut and hold it a part turn away from bearing. With other wrench turn adjusting stud a very small amount in or out to tighten or to loosen adjust-



ment as case may require. Hold adjusting stud in new position and tighten locknut. Try out horn several times by pressing horn button, both while engine is running and while it is standing. If tone is not vigorous and even, change adjustment still further. Repeat tests and readjustments (with locknut locked each time) until correct tone is obtained.

TROUBLE DIAGNOSIS

HORN

If Horn Tone is Irregular or Weak

Look for:

- Battery low.
- Loose connection or partial ground or short circuit in horn wiring.
- Poor ground connection (in ground type of Horn) between horn frame and mounting bracket.
- Flange screws loose.
- Bearings need oil.



Brushes gummy or making poor contact on commutator.

Horn button not making good contact.

Readjustment of tone needed.

Armature thrust spring too stiff or too weak.

If Horn Fails to Blow

Look for:

- Battery voltage too low.
- Ground in wiring, button, or horn terminals.
- Open circuit in horn wiring or button.
- Brushes not making contact.
- Readjustment of tone needed.
- Field coil lead broken.
- Armature binds; cannot turn.
- Ground in brush-holder, field coil or armature.
- Open or short circuit in armature.

If Horn Blows Continuously

Look for:

- Horn Button stuck.
- Short circuit in horn button or horn button wiring.
- Ground in horn or wiring between horn and button (in two wire type of horn).

TESTS

HORN

Before making any tests, disconnect the leads from horn terminals.

To Test for Ground in Brush-holder or Field Coil:

1. Insulate brushes from commutator. (In grounded type of horn remove ground connection before test is made.)
2. Test from each brush-holder to frame. Light indicates ground.

To Test for Ground in Armature:

1. Insulate brushes from commutator.
2. Test from commutator to Frame. Light indicates ground.



To Test for Short Circuit in Armature :

1. Use Growler—See Page 16.

To Locate Open in Field Coils :

1. Insulate brushes from commutator.
2. Test from positive terminal to positive brush-holder and from negative terminal to negative brush-holder. Failure to light indicates open circuit between points tested.



The Speedometer

If a speedometer is noisy, inspect the driving mechanism and look especially at the ends of the flexible drive shaft to make sure the coupling nuts have not loosened up.

If the miles per hour reading fluctuates while the car speed is constant, look for a kink or a bind in the drive shaft.

If the flexible shaft is found to be broken always make sure the speedometer operates freely before installing a new shaft.

In replacing a shaft, make sure it is in the tube right end up. The shoulder end of the shaft should be at the top or speedometer end. In handling shafts, never bend them into a coil less than one foot in diameter and always keep them straight end out in storage, preferably hung up by the end.

In any case where the speedometer itself is found to be out of order, take it out and send it to a North East Service Station.

Once a year new oil should be applied to the oil wicks in the bearings and new grease put into the flexible drive shaft tube. Always have this done at an Authorized North East Service Station in order to insure the use of the right lubricant.

WARRANTY

(In conformity with the Standard Warranty of the National Automobile Chamber of Commerce.)

We warrant each new piece of apparatus manufactured by us, to be free from defects in material and workmanship under normal use and service. Our obligation under this Warranty is limited to the furnishing at our factory of any part of said equipment which shall within ninety (90) days after delivery to the original purchaser, be returned to us with transportation charges prepaid, and which our examination shall disclose to our satisfaction to have been thus defective.

This Warranty is in lieu of all other warranties, expressed or implied: and we do not authorize any person to assume for us any other liability in connection with the sale of our equipment.

This Warranty shall not apply to any apparatus which has been subjected to misuse, neglect or accident, nor shall it apply to any apparatus which has been repaired or altered outside of our Factory so as in our judgment to affect its stability or reliability.

North East Electric Co.

SERVICE INSTRUCTIONS

Whenever there is reason to believe that damaged or inoperative apparatus of North East manufacture comes within the conditions of the North East Warranty, the following procedure should be adopted for obtaining adjustment.

USED APPARATUS

If the apparatus has been in actual service before the damage occurs, the Owner should submit it to the nearest North East Branch or Authorized Service Station, and make a formal request for an adjustment on the Service Report Blank, Form 184, which will be provided for the purpose at any of these places.

If the claim is made through a Service Station, the Owner should upon completion of repairs make out a Service Report and deposit with the Station an amount to cover the full charge for all material and labor involved. The Service Station will thereupon send the Report, together with the damaged parts, transportation charges prepaid to the nearest North East Branch. Upon receipt of the parts and the Service Report covering them, North East Service Inc., will give the claim careful consideration. If upon inspection the parts are found to come under the terms of the Warranty, adjustment will be made as follows:

1. New parts will be sent to the Service Station to replace all parts covered by the Warranty, both, the Owner and the Service Station being notified of the exact terms of the adjustment.
2. The Service Station will upon receipt of the new parts retain them in stock, and refund to the Owner the amount charged him for the replacement parts, less transportation expenses. No refund will be allowed for labor charges on USED apparatus, the adjustment always being confined to the replacement of material only.

LABOR performed on used apparatus is always charged for because the responsibility of the North East Electric Co. is limited, as specified in the Warranty, to the replacement of material only.

NEW APPARATUS

If new apparatus that has never been in service is found to be inoperative when received by the purchaser, the North East Electric Co. will make good such imperfections as may exist at no charge for material or for NORTH EAST LABOR, provided the faulty condition is due to causes for which the Company is responsible. Apparatus coming within these conditions should always be referred direct to a North East Branch rather than to a Service Station, because labor charge adjustments are confined strictly to work performed under the immediate control of North East Service Inc.

North East Service Inc.