

Overland

Models 69 and 71 (1913)
Auto-Lite Lighting System
Remy Magneto Ignition

Battery.—Battery is 6 volt, 80 ampere-hour. The two wire system is used.

Ignition.—Magneto breaker contacts should separate .018 inch to .022 inch. Should they become badly burned or pitted, affecting the ignition, resurface with a very fine, flat jeweler's file or a strip of worn No. 00 sand paper.

Timing.—Contacts should begin to separate when the top dead center mark "U. P. 1 and 4" on the flywheel is 1-3/16 inches past the indicator, spark control lever and breaker assembly in the fully retarded position.

Firing Order.—The firing order is 1, 3, 4, 2.

Spark Plug Gaps.—Spark plug gaps should be .020 inch to .025 inch.

Oiling.—Put 4 or 5 drops of light machine oil in each of the magneto bearing oilers every month. At the same time put a very small trace of vaseline on the fiber bumper of the contact arm, applying with a toothpick. If car is driven more than 1000 miles in a month these attentions must be given every 1000 miles.

Starter.—These cars were not equipped with electric starter as standard equipment. If car possesses electric starter, it has been added by the owner.

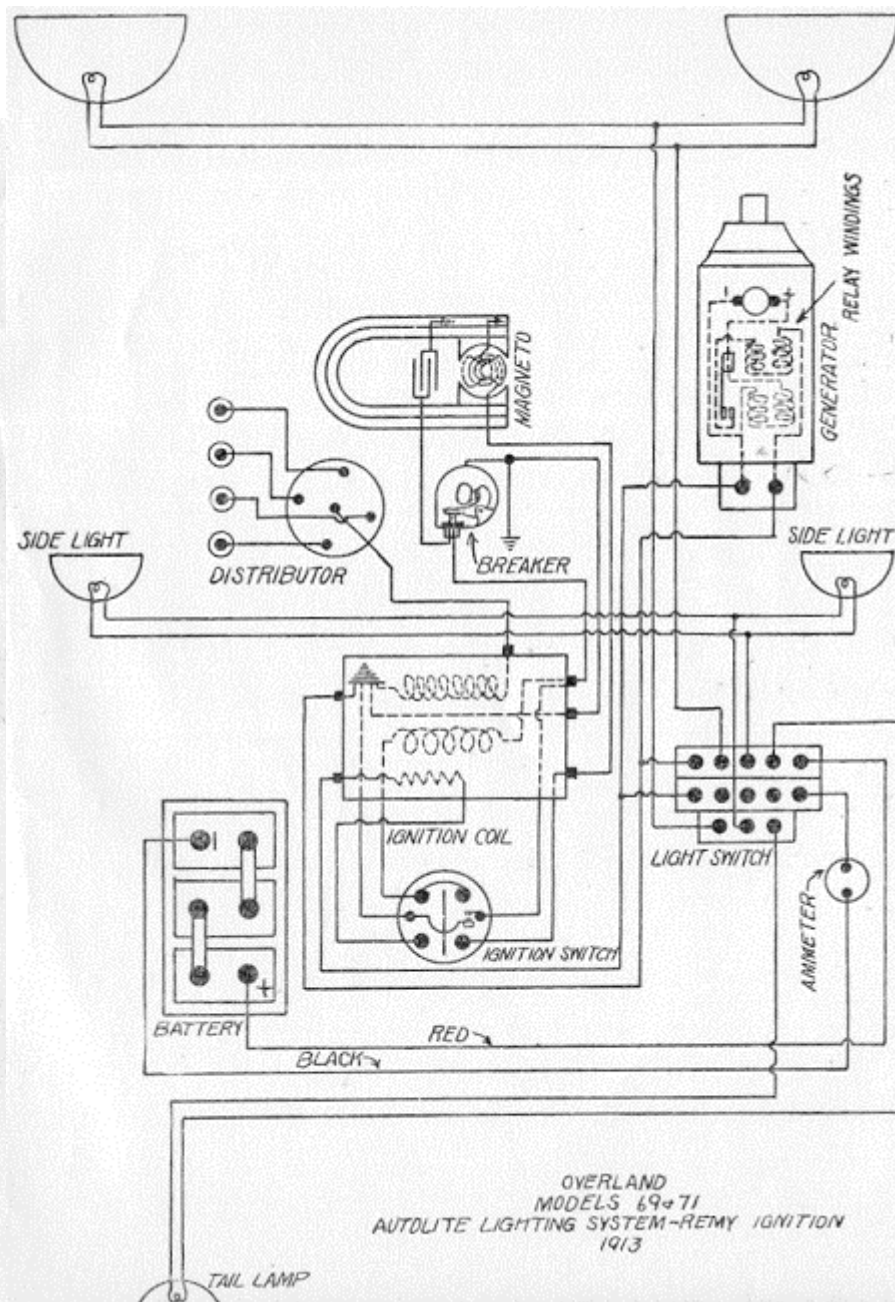
Generator.—The generator is of the permanent field type. Output regulation is by a mechanical governor. With proper adjustment of the governor the maximum armature speed should be 1850 R. P. M., and the output 12 amperes. The generator should deliver 5 amperes at 1100 R. P. M., and 10 amperes at 1620 R. P. M. If output falls considerably below 12 amperes, first clean out any oil or grease which may have collected within the governor drum. If that does not increase the output, move the weights on the governor arm inward until the desired output is obtained.

Oiling.—Generator bearings are packed with soft cup or ball bearing grease. They should be thoroughly cleaned out and repacked with grease every six months.

Relay.—Relay is mounted under the arch of the generator magnets. Relay should close at 800 R. P. M. of generator armature. Charging current should be .5 to 1.5 amperes at closing, and discharge current 0 to 1 ampere at opening of relay contacts. The relay may be removed from the generator for adjustment by removing the brush covers, taking the leads off the brush connections, taking out the screws in the end plate that carries the generator terminals, and then drawing the relay and the brush leads out from under the magnets. Clean relay contacts by drawing a piece of unglazed paper between them. If badly burned or pitted, resurface with a piece of well worn No. 00 sand paper, drawing a piece of unglazed paper between them to remove all grit. Adjust before again putting into service.

Lamps.—Head lamps are 6-7 volt, 5 cp. Side lamps are 6-7 volt, 4 cp. Dash lamp is 6-7 volt, 2 cp. Tail lamp is 6-7 volt, 2 cp.

Model Number.—Generator is No. C-60.



Willys-Knight

Model 84 (1916)

Auto-Light Starting and Lighting System. Dixie Magneto Ignition.

Battery.—Battery is 6 volt, 115 ampere-hour. The positive (+) terminal is grounded at the starting motor.

Ignition.—Instructions for the care of the magneto are given on Page No. 189.

Timing.—Contacts should open .020 inch. Magneto should be timed so that when the mark $\frac{1+4}{T.C.}$ on the flywheel is $2\frac{1}{4}$ inches past the indicator, spark control lever and breaker assembly in the fully retarded position, breaker contacts will be just beginning to separate.

Care.—Should they become badly burned or pitted, resurface them with a very fine flat jeweler's file, or a small strip of worn No. 00 sand paper.

Spark Plug Gaps.—Spark plug gap should be .020 inch.

Firing Order.—The firing order is 1, 3, 4, 2. A simple change to aid starting is described on Page No. 51.

Oiling.—Put 3 or 4 drops of light machine oil in each of the magneto oilers once every two weeks or 500 miles. Put one or two drops of oil on the contact lever pivot at the same time. Apply this oil with a toothpick so as not to get on too much.

Starter.—The starter is connected to the engine through a Bendix drive. Motor bearings are packed with a soft cup grease. The bearings should be cleaned and repacked with grease once every season. Should the pinion jam and remain meshed with the flywheel gear, close starting switch for an instant and then turn engine quickly by hand crank. This method will nearly always loosen pinion after several trials. Use only the special copper-carbon composition brushes furnished by the manufacturers. Ordinary carbon brushes will cause trouble.

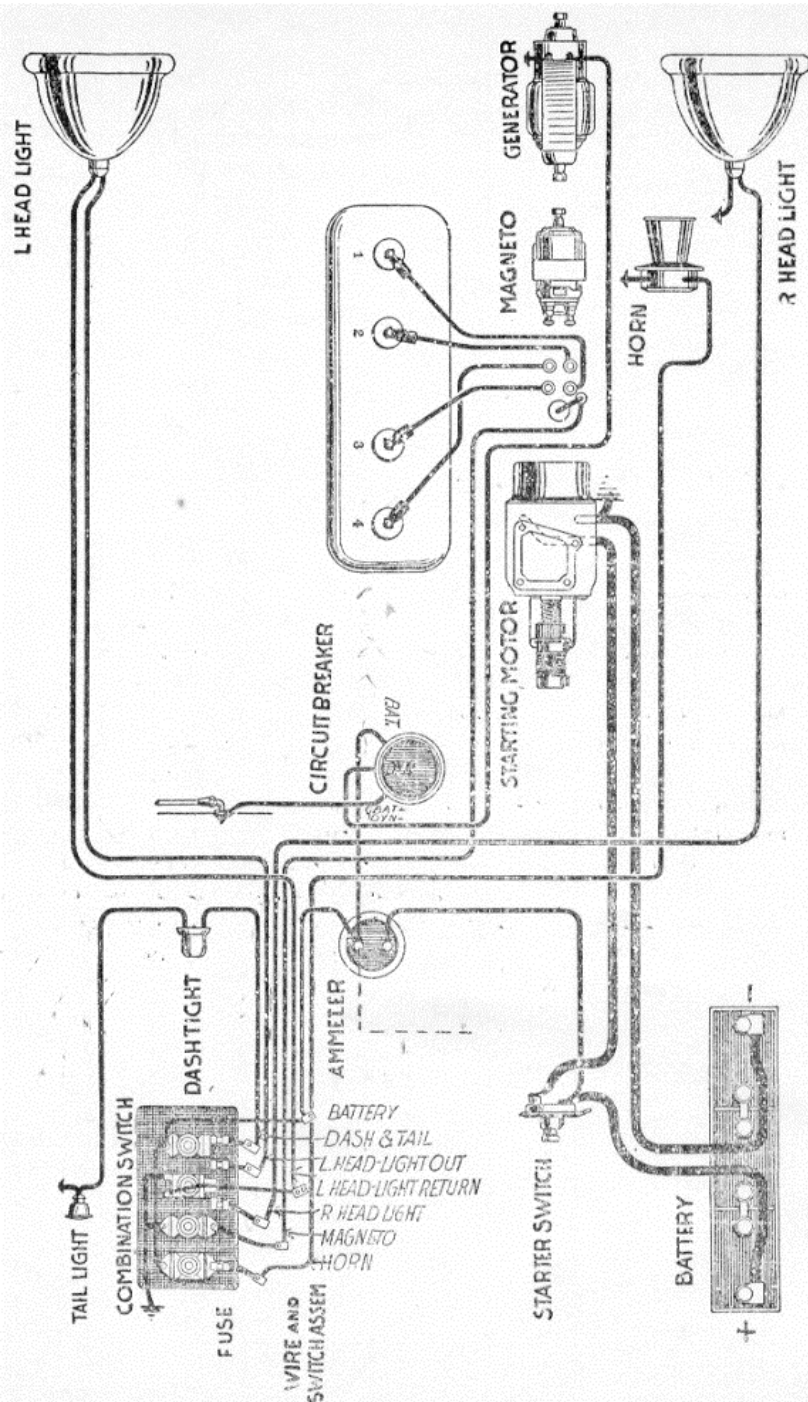
Generator.—Generator voltage regulation is by reverse series winding. Relay should close at $7\frac{1}{2}$ miles per hour.

Output.—The maximum generator output should be about 14 amperes reached at 20 miles per hour. The output should be about 10 amperes at 15 miles per hour.

Oiling.—Generator bearings are packed with soft cup grease. The bearings should be thoroughly cleaned and repacked with grease at least once a season. Every two weeks or 1000 miles put a drop of oil in each of the bearings to keep the grease soft. Use only the special copper-carbon composition brushes furnished by the manufacturer. Ordinary carbon brushes will cause trouble. Spring should have just enough tension on brushes to ensure a good contact with the commutator. Generator terminals must be connected if generator is to be operated with battery disconnected.

Lamps.—Head lamps are 6-8 volts, 15 cp. Side lamps are 6-8 volts, 4 cp. Dash and tail lamps are in series. They are each 3-4 volts, 2 cp. All other lamps are 6-8 volts, 4 cp.

Fuses.—Fuses are of 20 amperes capacity.



The dotted line leading from the ammeter leads to body lighting circuit

Battery.—Battery is 6 volt, 120 ampere-hour. The negative (—) terminal is grounded at the starting motor.

Ignition.—Breaker contacts should separate .016 inch to .018 inch. They are made of tungsten. They will operate properly even though quite rough. Should they become badly worn, affecting the ignition, the inner breaker mechanism must be renewed as directed on Page 50. In an emergency, contacts may be resurfaced enough to give service for 300 or 400 miles by drawing a piece of fine emery cloth between them.

Timing.—Contacts should begin to separate when the mark "1-4 U-P" on the flywheel is $2\frac{1}{2}$ inches past the indicator, spark control lever and breaker assembly in the fully retarded position.

Firing Order.—The firing order is 1, 3, 4, 2.

Spark Plug Gaps.—Spark plug gaps should be about .023 inch.

Ignition Thermostat.—There is a thermostat in the switch case to open the ignition, preventing battery discharging through the ignition apparatus should ignition switch be left "On" with engine idle, contacts closed. This device is fully described on Page 41.

Oiling.—Refill the cup under the breaker head with pure vaseline and turn down every month. If car is driven more than 1000 miles in a month, this must be done every 1000 miles. Do not put grease or oil in the cup.

Starter.—Starter is connected to the engine through a Bendix drive. Cold engine, tight bearings, heavy oil or other obstructions will cause a high current flow and low speed during cranking operation. When running free, armature should revolve at about 4200 R. P. M., taking 50-55 amperes. Greater speed indicates grounded, short circuited or damp field windings. Greater current or vibrating of the ammeter needle indicates grounded or short circuited armature coils or commutator. Damp armature windings will cause high current or slow speed.

Oiling.—Clean and repack starter bearings with soft cup grease every six months. Put in one or two drops of oil every month to keep grease soft. Do not oil the Bendix drive. Should pinion stick, clean shaft with gasoline.

Generator.—Generator current regulation is by reverse series field. Relay should close at 7-10 M. P. H., or 230-265 R. P. M., of generator armature. Charging current should be .5 to 1.5 amperes at closing and discharge current 0 to 1 at opening.

Amperes	GENERATOR DATA, MODEL GF	R. P. M.
5	430- 490
10	730- 870
12.5	945-1180
15	1225-1660
16-19	2200-2800

A variation of 1.5 amperes from these amounts is allowable. Output may be varied slightly by adjusting brush pressure on commutator. The pressure should be 1 to $1\frac{1}{4}$ pounds. If operated freely as a motor, armature should revolve at 200 R. P. M., taking 1.8 amperes. Much higher speed indicates damp, grounded or short circuited field coils. Greater current or lower speed indicates tight bearings or damp, grounded or short circuited armature windings or commutator. Periodic swinging of ammeter needle indicates grounded or short circuited armature coils or commutator bars. Shunt field should take about 1 ampere.

Oiling.—Put 5 or 6 drops of light engine oil in each of the generator oilers every two weeks. If car is driven more than 500 miles in two weeks, the oiling must be done every 500 miles.

Lamps.—Head lamps are 6-7 volts, 16 cp. Dimmer lamps are 6-7 volts, 4 cp. Dash and tail lamps are in series. They are each 3-4 volts, 2 cp.

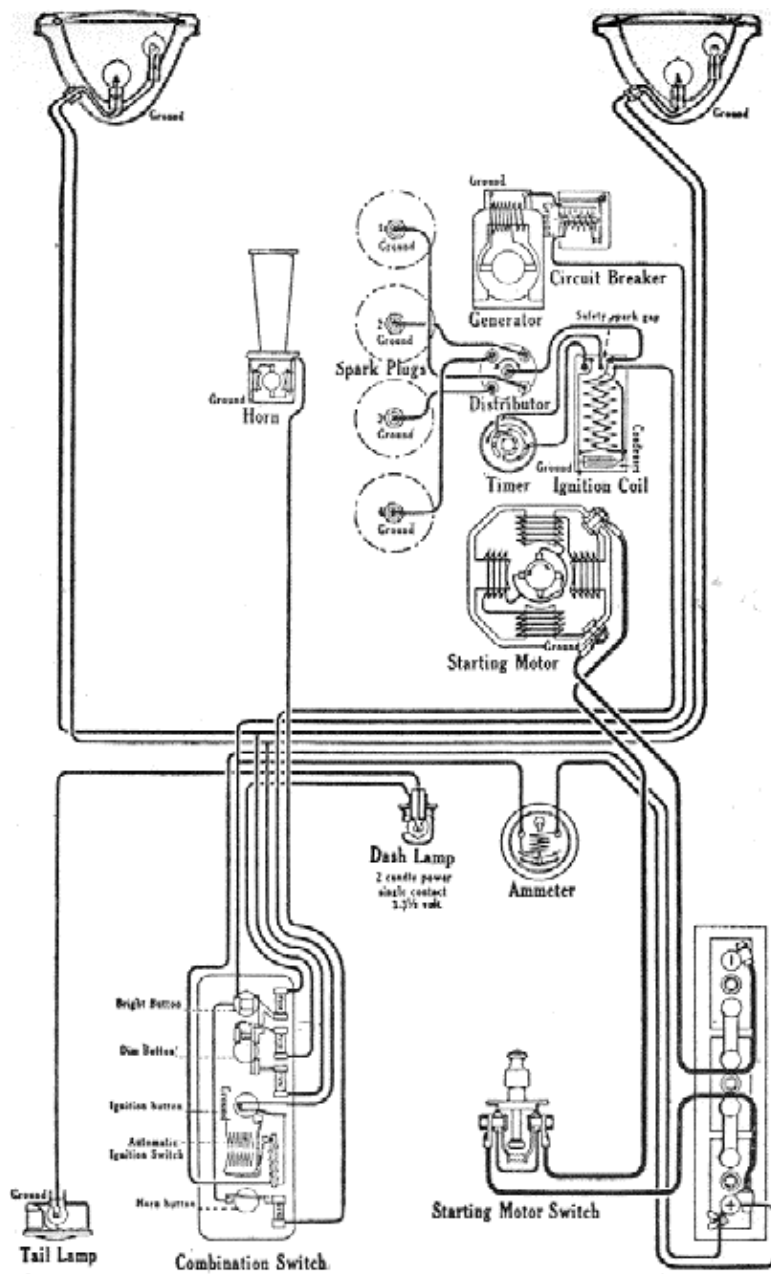
Fuses.—Fuses are 20 ampere.

Model Numbers.—Generator is Model GF 1176. Starter is Model MC 1019 on the first 2400 cars and MC 1126 on later cars. On early cars a Willard OLBA battery was used. On later cars a USL CD 315 D battery is used.

Willys-Knight

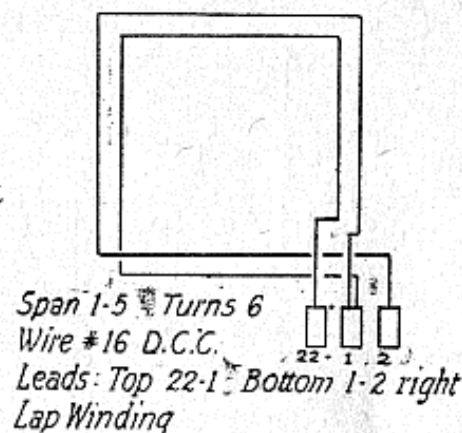
Model 88-4 (1916-17)

Auto-Lite Starting and Lighting System
Connecticut Ignition

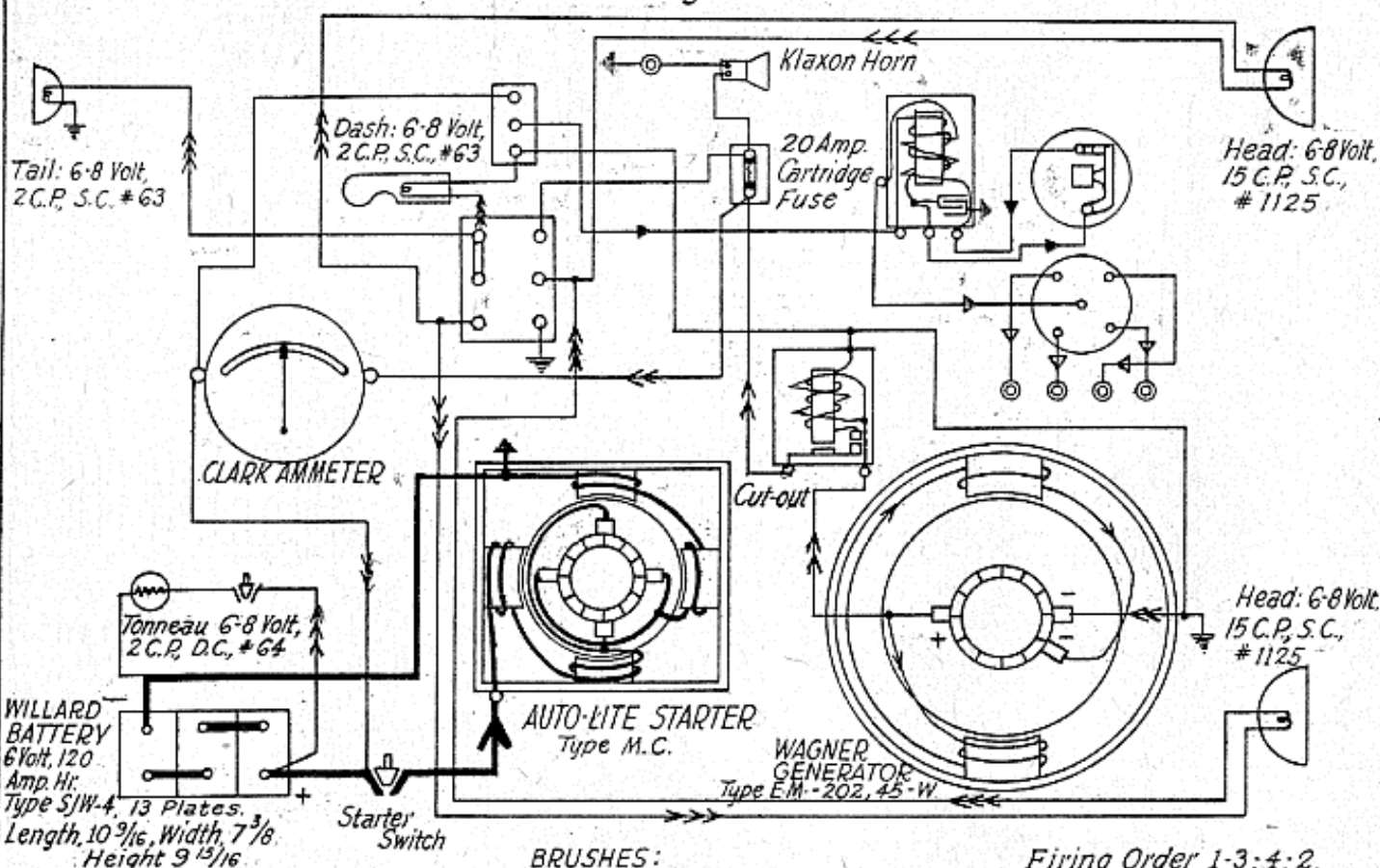
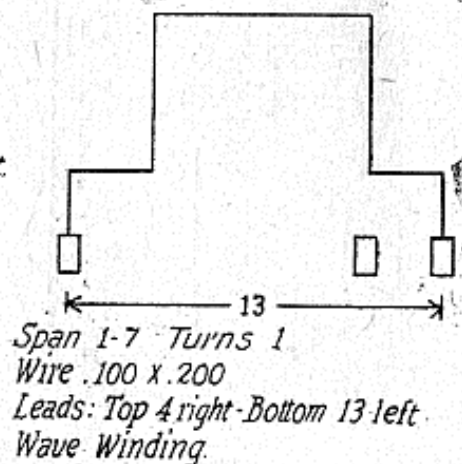


MOLINE KNIGHT, 1919, Model G, Wagner Generator, Auto-Lite Starter, Connecticut Ignition

GENERATOR ARMATURE DIAGRAM



STARTER ARMATURE DIAGRAM



BRUSHES:

GENERATOR: Carbon, 7/8 x 1 x 1/4
STARTER: Metal, 5/8 x 1 1/4 x 5/16

GENERATOR OUTPUT:

R.P.M.	Amperes
700	7
1000	13
1300	16
1500	17
2000	14
2500	10.5

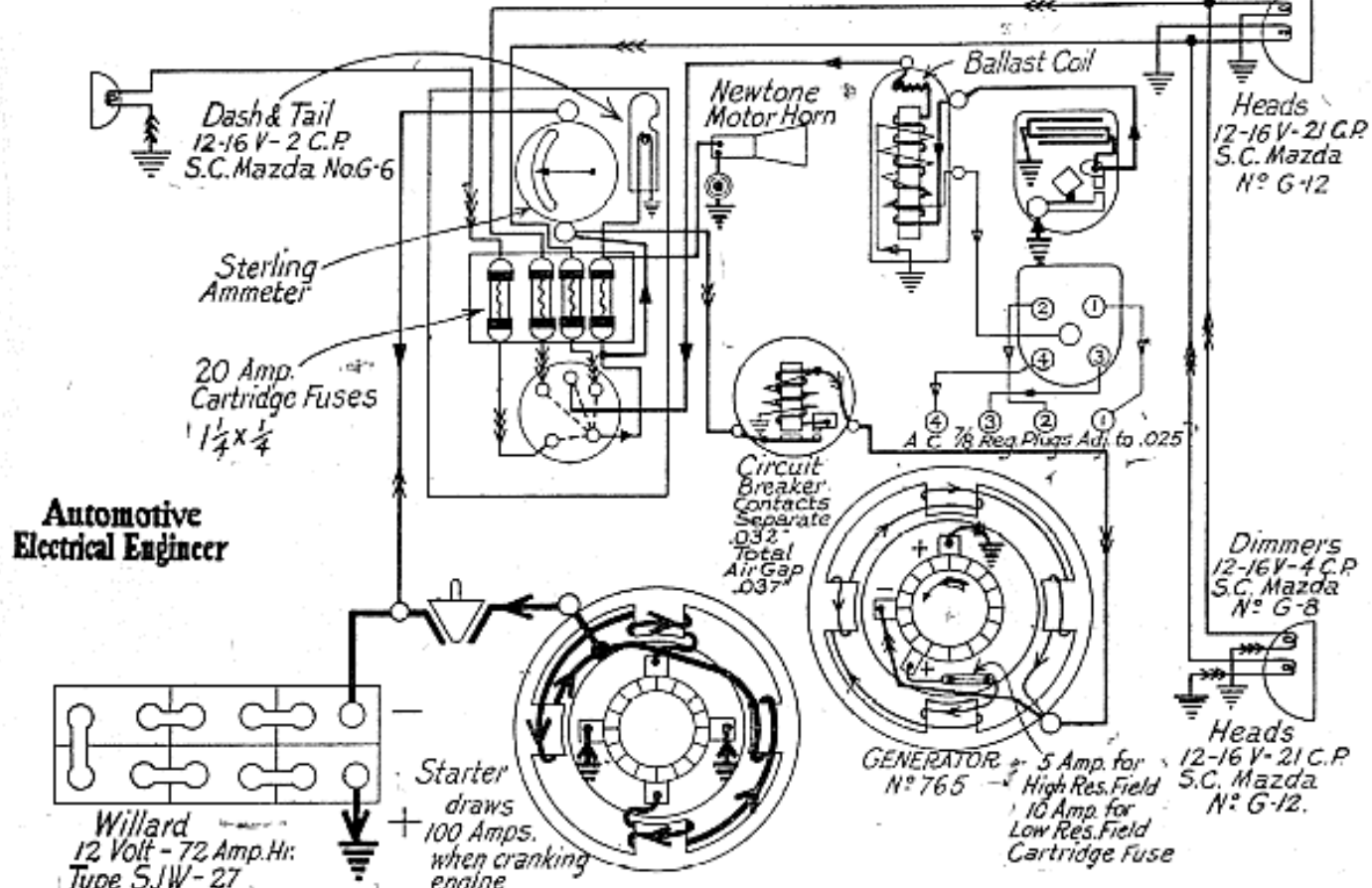
Firing Order 1-3-4-2.

Set A.C. Spark Plugs to .025 inch

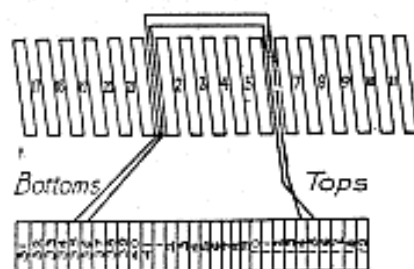
Timing: Points open when piston is on top D.C.
Spark fully retarded.

Cut-out points close at 8-10 miles per hour
and open at 6-8 miles per hour.

STEARNS KNIGHT-MODEL SKL-4-1920-WESTINGHOUSE SYSTEM ATWATER KENT IGNITION

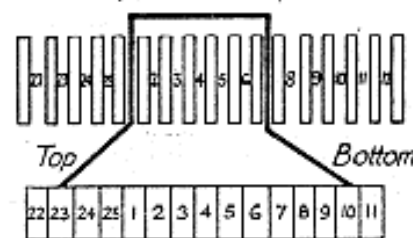


GENERATOR ARMATURE WIRING DIAGRAM



Coils per slot 2
Turns per coil 8
D.C.C. Wire No. 19
Top Leads 7, 8 L of S1
Bottom Leads 14, 15 R of S1
Dead Coils 1
Winding Quadrant Balance

STARTER ARMATURE WIRING DIAGRAM



Coils per slot 1
Turns per coil 1
Wire bare, size 50 x 150 mils
Top Leads 4 L of S1
Bottom Leads 10 R of S1
Winding 1, 2, 3 etc.

SPECIFICATIONS

GENERATOR

Controlled by third brush

OUTPUT

Speed	Low Res. Field Amps.	High Res. Field Speed	High Res. Field Amps.
420	0	390	0
660	6	560	5
2000	5-9	2000	4-6

STARTER

Speed	Amps.	Volts	Torque
3000-4000	90	12.5	0
1250	150	10.5	3.5 lbs. feet
Lock	500	5.5	20.0 lbs. feet

BRUSHES

Carbon Composition

BEARINGS

Bronze

IGNITION

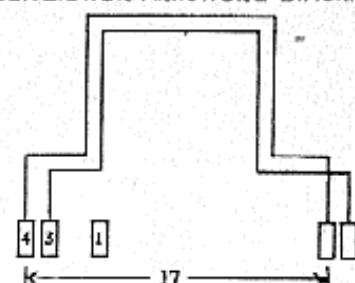
Atwater Kent Type CC
Manual Control
Tungsten contacts separate .006 inch
Points open when D.C. mark on flywheel is 2 past indicator spark fully retarded.

- ▲ Starting
- ▲ Charging
- ▲ Shunt
- ▲ Lights
- ▲ Ignition Primary
- ▲ Ignition Secondary
- + Wires Insulated
- + Wires Connected

STEPHENS, 1920, Model 80, Series 2 - Auto-Lite System.

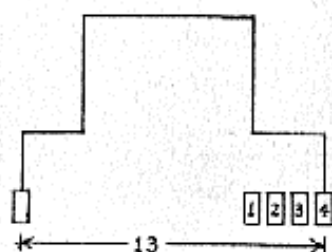
Connecticut Ignition

GENERATOR ARMATURE DIAGRAM

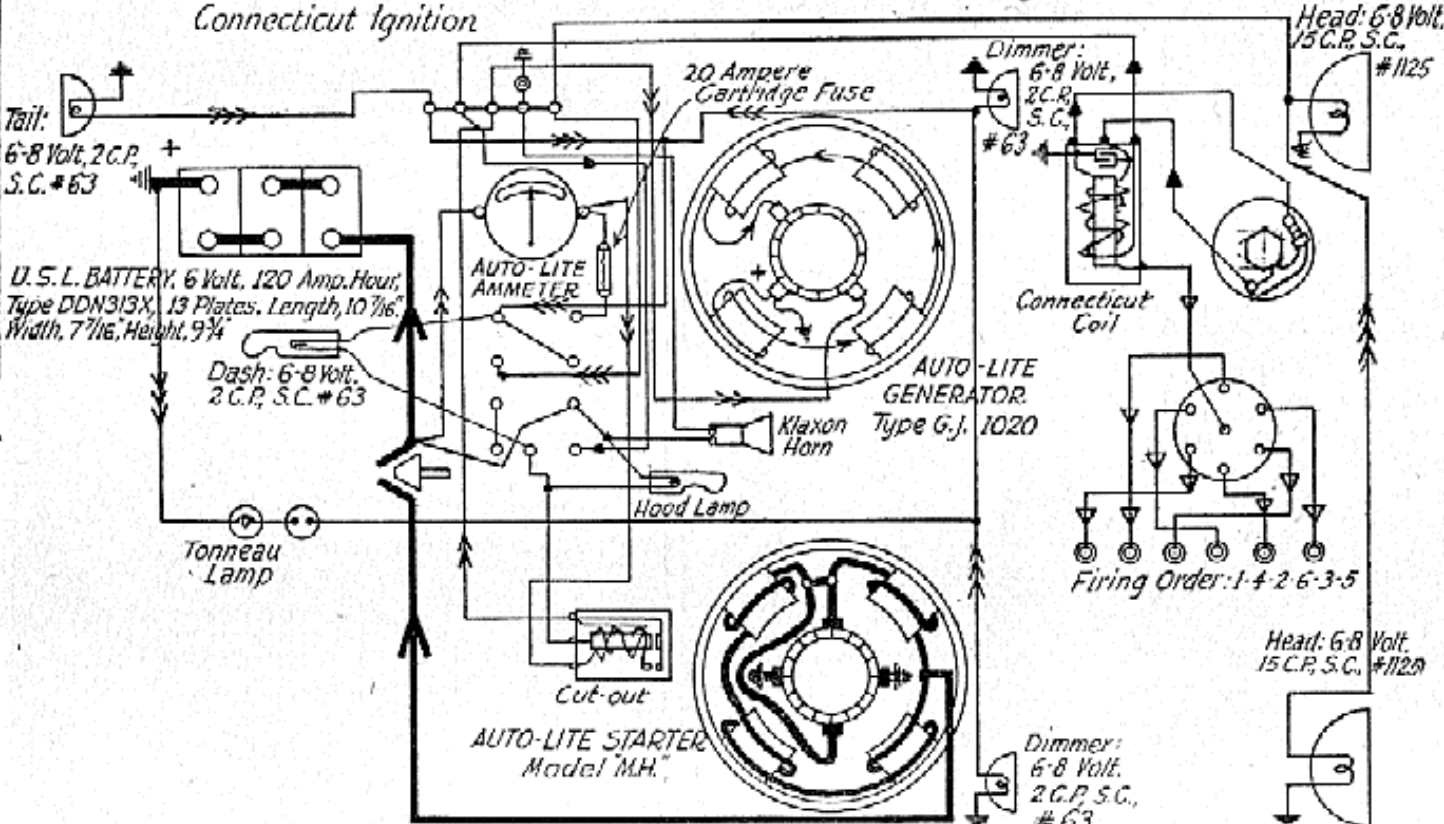


Coil Pitch 1-5 Turns 6
Wire #17 S.C.E.
Leads: Top 3-4 left, Bottom 17 right
Wave Winding

STARTER ARMATURE DIAGRAM



Coil Pitch, 1-7 Turns 1
Wire .110 x .225
Leads: Top 4 right, Bottom 13 left
Wave Winding



SPECIFICATIONS

BRUSHES:

GENERATOR: Graphite, $\frac{3}{4} \times \frac{7}{8} \times \frac{9}{32}$ "
THIRD BRUSH: Graphite, $\frac{3}{4} \times \frac{7}{8} \times \frac{3}{16}$ "

Tungsten Contacts open .025"

Set Breaker Points so that they open
when piston is at top dead center:
spark fully retarded

GENERATOR OUT-PUT:

Cold Test

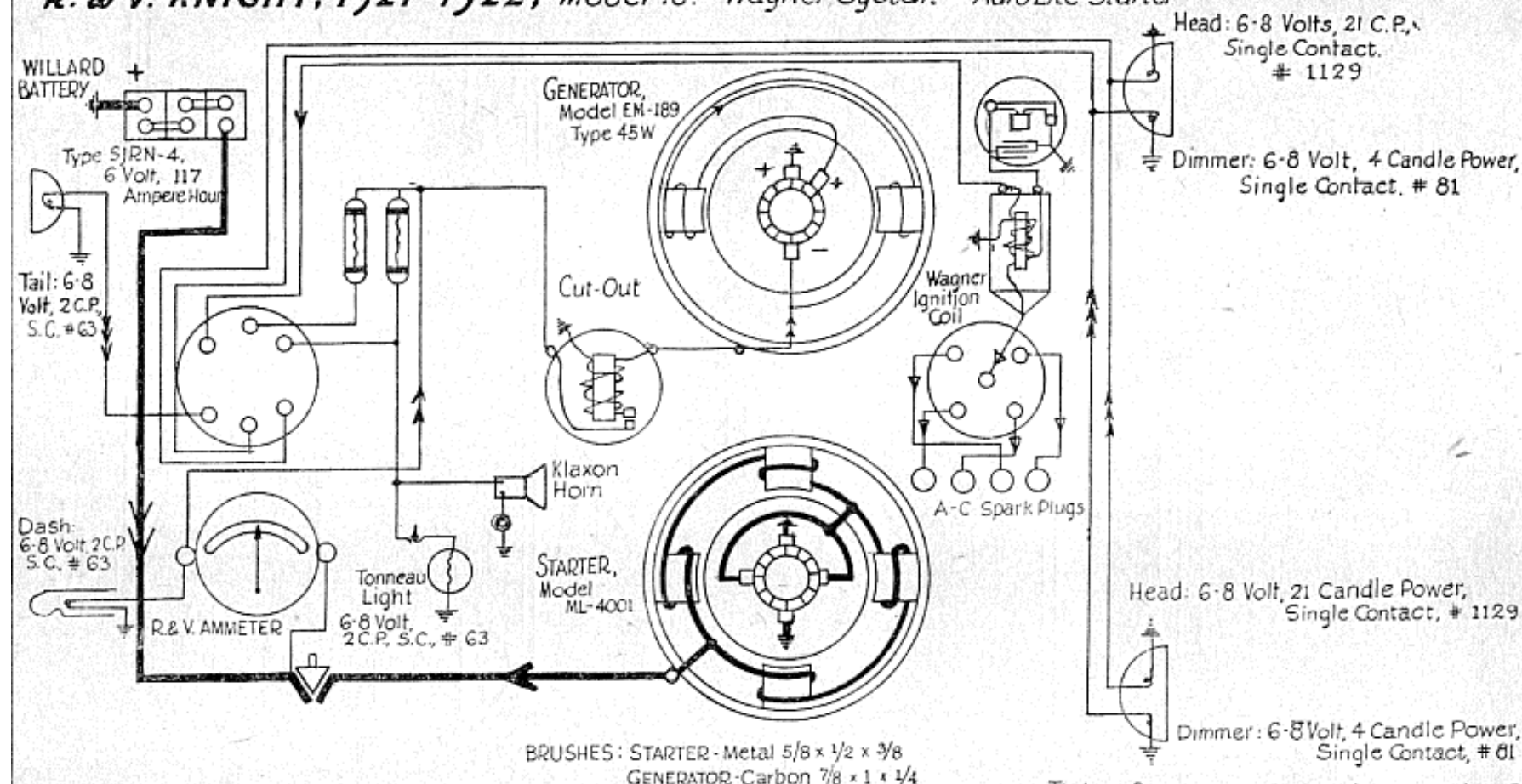
R.P.M.	Amp.
500	0
750	8
960	12
1400	16
1700	16 $\frac{1}{2}$
3400	12

Hot Test

R.P.M.	Amp.
460	0
840	6
1050	9
1360	12
1700	12.7
3400	10

Cut-out points close at 9 miles per hour and
open at 7 miles per hour.

R. & V. KNIGHT, 1921-1922, Model R. Wagner System - AutoLite Starter



BRUSHES: STARTER - Metal $5/8 \times 1/2 \times 3/8$
GENERATOR - Carbon $7/8 \times 1 \times 1/4$

GENERATOR OUTPUT:

Hot Test		Cold Test	
Amperes	R.P.M.	Amperes	R.P.M.
2.25	740	0	500
5.80	800	6	670
11.20	1142	12	950
12.00	1600	15	1180
9.00	2100	16-18	1500
7.50	2368	10	2500

Timing: Set contacts so that they open when D.C. mark on flywheel is $1\frac{1}{2}$ inches before indicator; spark lever fully advanced.

Firing Order: - 1-3-4-2

Set A-C. Spark Plugs to .025 inch

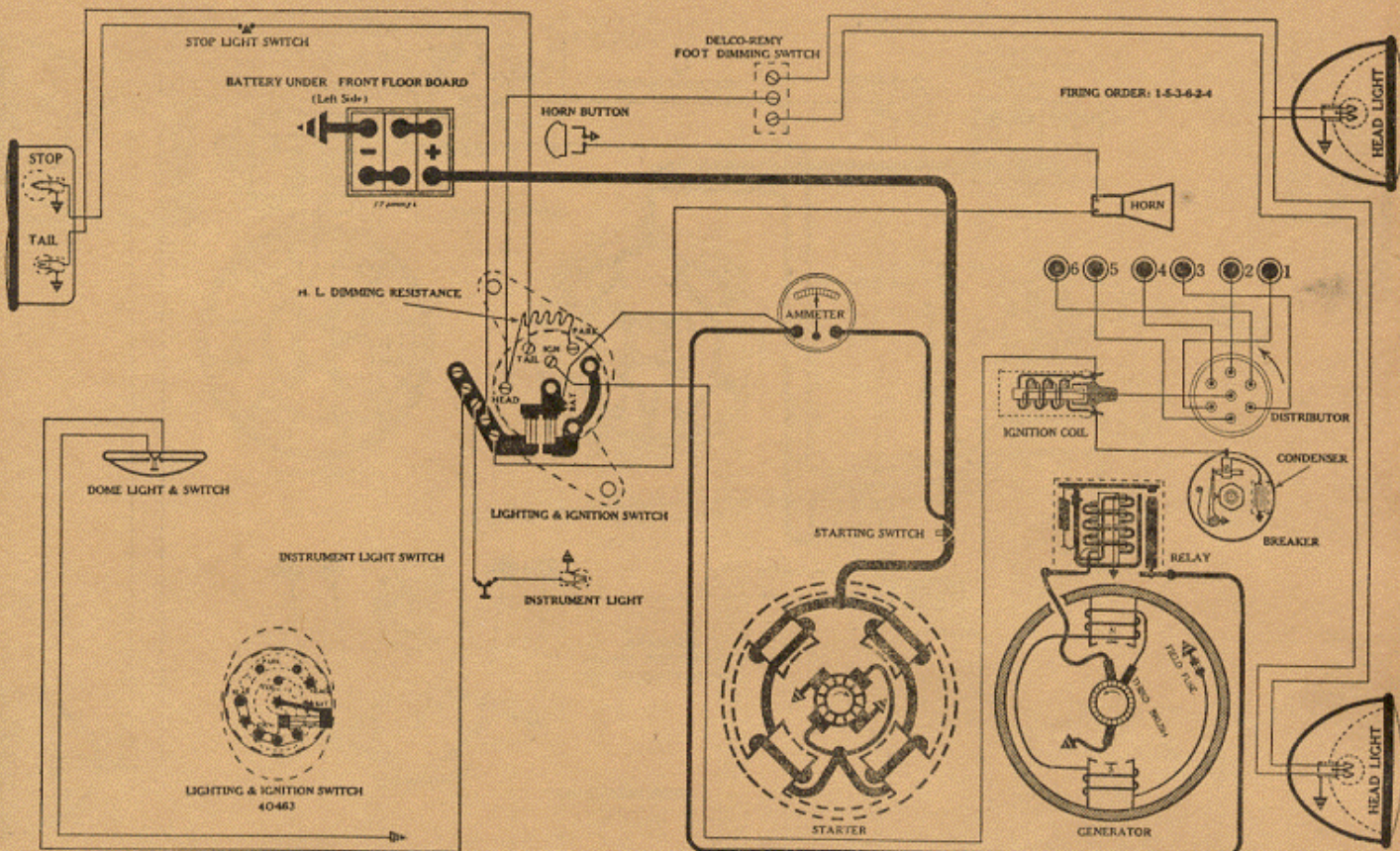
Tungsten Contacts open .020 to .025 inch.

- △ Starting
- △ Charging
- △ Shunt
- △ Lights
- ▲ Ignition Primary
- △ Ignition Secondary
- + Wires Insulated
- + Wires Connected

Compiled and Edited
Automotive Electrical Engineer
- 1 9 2 3

FALCON-KNIGHT

1927-28



BATTERY

U. S. L., 3-HVX-7X, 6 volts. Negative Terminal Grounded
Starting Capacity—148 amps. for 20 minutes.
Lighting Capacity—5 amps. for 28 hours.
Box—Length, 11 3/4; width, 7 7/16; height, 9 3/4 inches.

STARTER

Rotation, R. H., Com. End
Auto-Lite, MAB-4002

Connection to Engine—Bendix drive.
Running Free—60 amps. at 6 volts.
Cranking Engine—160-170 amps. at 5 volts.
Lock Torque—17 pound-feet, 520 amps. at 3 volts.
Brush Spring Tension—24-28 oz. on each.
Starting Switch—Auto-Lite, SW-4001.

IGNITION

Rotation, L. H., Top View
Auto-Lite, Dist. No. IG-4107B

(Semi-Automatic Spark Advance)

Breaker—Contact separation .020 to .024 inch.
Contact Spring Tension—18-20 oz.
Timing—See detailed instructions P. 1, Sec. AA.
1—Locate T. D. C. 2—Locate rotor. 3—Set spark.
Spark Plugs—3/8 inch regular; Gap .025 inch.
Firing Order—1-5-3-6-2-4.
Manual Advance—20 degrees (on Flywheel).
Automatic Advance—20 degrees (on Flywheel).

Eng. R.P.M.	Degrees Advance (on flywheel)	Dist. R.P.M.	Degrees Advance (on cam)
600	0-1	300	0-5
1300	8	650	4
2000	16	1000	8
2400	20	1200	10

Coil—Auto-Lite, IG-4065.

GENERATOR

Rotation, L. H., Com. End
Auto-Lite, Type GYA-4202

Performance Data—Gen. cold.

Amps.	R.P.M.	Volts
2	620	6.6
5	700	7.
10	860	7.3
14	1050	7.7
16	1200	7.9

Maximum Charging Rate (cold)—19 amps. at 8 volts or 17.75 amps. at 7.5 volts.

Motoring Freely—5 amps. at 6 volts.

Max. Stall Current—18 amps. at 6 volts.

Field Test—3.8 amps. at 6.2 volts directly across field coils in series.

Field Fuse—5 amps.

Brush Spring Tension—1 1/4-1 1/2 lbs. on each.

Third Brush Adjustment—Loosen cover band. See Fig. 13, P. 7, Sec. AA.

RELAY

Auto-Lite, CB-4007

Closes—7-7.5 volts.

Opens—1/2-2 1/2 amps. discharge.

Contact Gap—.025-.035 inch.

Core Gap—.010-.030 inch, contacts closed.

LIGHTING

Switch—Briggs & Stratton No. 40463 (used with 1129 bulbs, 1927).

Fuses—Single 20 amp. fuse mounted on switch back.

Switch—Briggs & Stratton No. , (used with 1110 Bifocal bulbs, 1928).

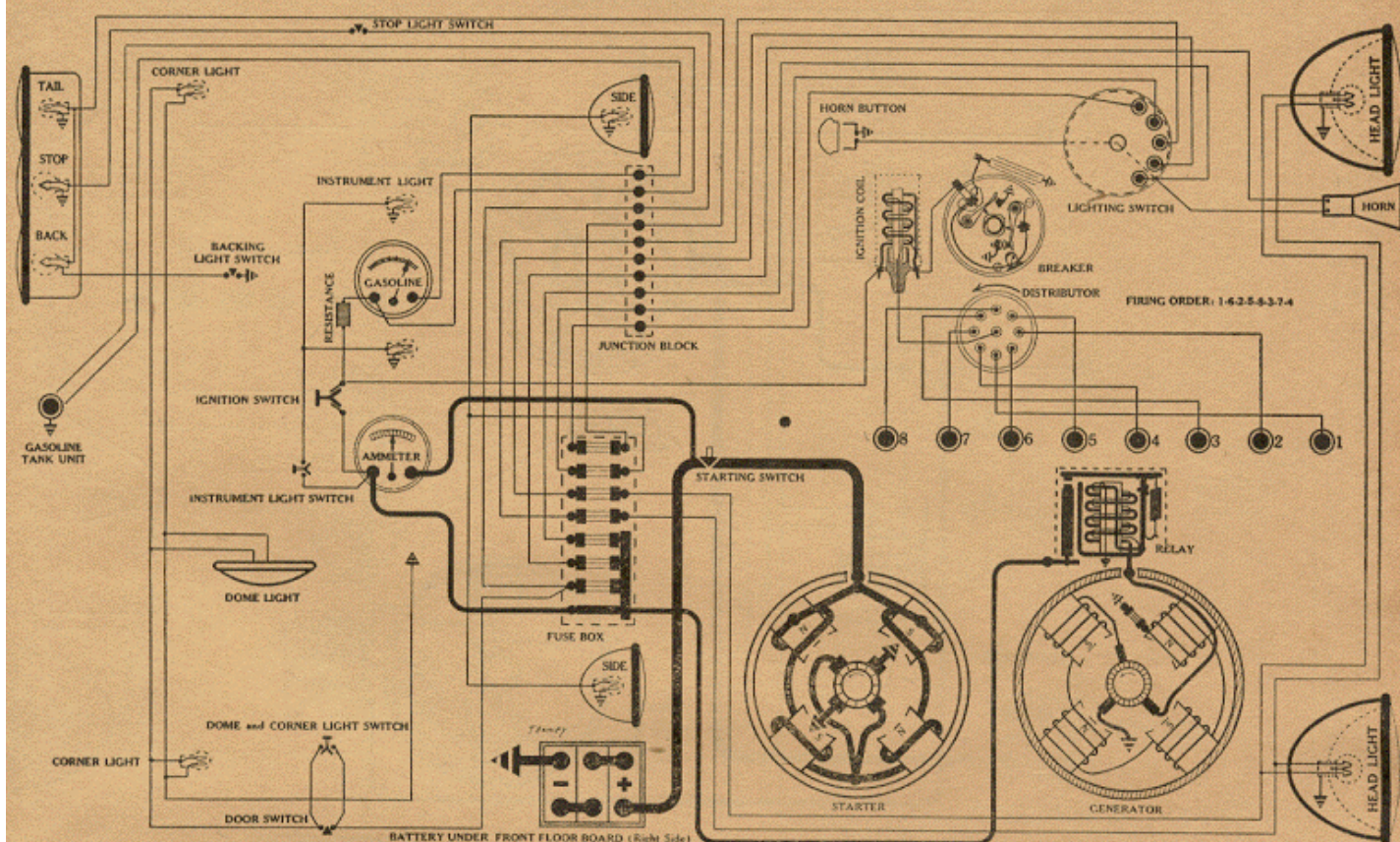
Fuses—Two, 20 amp. fuses mounted on switch back.

Foot Dimming Switch—Delco-Remy, 465-B.

Lamps—See P. 3, Sec. AA. HEAD—1110 (Bifocal) or 1129; TAIL—63; INSTRUMENT—63; DOME—81; STOP—87.

STEARNS-KNIGHT

De Luxe Series, (1929)
Models, H-8-90 and J-8-90



BATTERY

U. S. L., 3-CVX-10X, 6 volts. Negative Terminal Grounded
Starting Capacity—192 amps. for 20 minutes.
Lighting Capacity—5 amps. for 38 hours.
Box—Length, 16 $\frac{3}{8}$; width, 7 $\frac{7}{16}$; height, 9 $\frac{3}{8}$ inches.

STARTER

Rotation, L. H., Com. End
De' Jon, SD-4102

Connection to Engine—Bendix drive, type L-11-X-V.
Running Free—70 amps. at 5.8 volts, 1750 R. P. M.
Cranking Engine—270 to 290 amps. at 4.3 volts.
Lock Torque—29 pound-feet, 720 amps. at 3 $\frac{1}{2}$ volts.
Starting Switch—De' Jon, SW-4201.

IGNITION

Rotation, L. H., Top View
De' Jon, IAB-4001

IMPORTANT NOTE: This unit uses a four-lobe cam with two breaker arms connected in parallel. Cam is so designed that one point is open when other is just breaking but closes few degrees after break occurs. The arms must be accurately synchronized to operate at intervals of exactly 45 degrees of distributor travel, corresponding to 90 degrees on flywheel. An eccentric adjusting screw is provided which moves one breaker point assembly. For detailed instructions on synchronizing see P. 22, Sec. AA.

Breakers—Contact separation .018 to .022 inch.

Contact Spring Tension—18-22 oz. on each.

Timing—See detailed instructions, P. 1, Sec. AA.

1—Locate T. D. C. 2—Locate rotor. 3—Set spark.

Spark Plugs—SAE regular (AC type E); Gap .025 inch.

Firing Order—1-6-2-5-8-3-7-4.

Manual Advance—30 degrees (on Flywheel).

Automatic Advance—31 degrees (on Flywheel).

Eng. R.P.M.	Degrees Advance (on flywheel)	Dist. R.P.M.	Degrees Advance (on cam)
400	0	200	0
800	5	400	2.5
1200	10.4	600	5.2
1600	16	800	8
2000	21	1000	10.5
2400	26	1200	13

Coil—De' Jon, CA-4023.

Ignition Switch—Soreng Manegold, 1080-A.

GENERATOR

Rotation, L. H., Com. End
De' Jon, DA-4016

Performance Data—Gen. cold.

Amps.	R.P.M.	Volts	Amps.	R.P.M.	Volts
0	375	6.5	12	1100	7.8
3	500	7.	15	1200 (Max.)	8.
6	700	7.1	14	1500	8.
10	900	7.6			

Motoring Freely—4-4 $\frac{1}{2}$ amps. at 6 volts.

Max. Stall Current—16-18 amps. at 6 volts.

Field Test—2.5 amps. at 6 volts across field coils in series.

Field Fuse—5 amps.

Brush Spring Tension—20 to 24 oz. on each.

Third Brush Adjustment—Not necessary to loosen cover band. See Fig. 18, P. 7, Sec. AA.

RELAY

De' Jon, RA-4001-A, 6 volts

Closes—7-8 volts.

Opens— $\frac{1}{2}$ -2 $\frac{1}{2}$ amps. discharge.

Contact Gap—.025 to .035 inch.

Core Gap—.015 inch, contacts closed.

LIGHTING

Switch—Briggs & Stratton.

Location—Foot of steering column. Lights controlled by lever on steering wheel.

Fuses—All 20 amp. mounted in fuse box under engine hood (right side).

Lamps—See P. 3, Sec. AA. HEAD—1110 (Bifocal); SIDE—63; INSTRUMENT—63; TAIL—63; STOP—

The Tillotson Mfg. Co.

Toledo, Ohio

SERVICE BULLETIN

No. 1203

Every Carburetor shipped from the Tillotson factory is 100% inspected and given a gasoline test of several hours duration. The passing of this test insures that the carburetor functions perfectly without leaking at the time of shipment.

Regardless of rugged construction and our diligent efforts, service irregularities may occur which although beyond the control of the manufacturers, cause inconvenience and misunderstanding.

The object of this bulletin is to reflect useful information compiled from our service records. We have chosen in this instance the subject of—

CARBURETOR LEAKING TROUBLE

Regardless of whatever else may occur to the usually faithful automobile, a gasoline leak, when discovered, will always excite some uncomplimentary expression concerning the carburetor. It is quite a natural thing for the otherwise unperturbed motorist to desire burning his fuel without needless waste. There are, however, several conditions which contribute to the development of leaks, the most common of which we will here call to your notice.

Our service stations are very well informed on leaks and their causes but a brief review of the subject may serve as a helpful medium to everyone concerned.

DIRT AND ITS INFLUENCE ON CARBURETOR LEAKING

No single factor is more responsible for leaking trouble than dirt in the fuel system. A very careful check over a period of one year shows us that practically all carburetors returned to us for leaking correction is caused from dirt and its abrasive action at the inlet needle and seat.

Gritty substances such as particles of rust, sand, and scale will carry through the fuel lines into the inlet mechanism where it gathers at the screen. Substances of a size sufficiently small to pass the strainer will often times impinge under the needle. If so, the needle will remain open so that when the engine is stopped, gasoline will overflow the nozzle and often the float bowl itself. Such a leak is not uncommon and will cease immediately upon the washing through of the impinged particle.

Injury may result to the needle or seat from this very cause and a permanent abrasion will of course cause a slow leak.

It may occur to you that the manufacturer should use a finer screen to insure stoppage of all foreign substances. If we were to use a screening finer in mesh than 75 strands to the inch—and *this specification is only about half the size necessary to retard the really fine particles*—the inlet connection would need to be of a size so large as to be out of all reasonable proportions. Care must be used not to stop water for in so doing, fuel would be retarded, if not completely closed off, and in the colder seasons of the year continuous freezing and breakage result.

Any approach to gasoline filtration must be accomplished by a unit entirely separate from the carburetor.

In the process of bleaching gasoline, it is a common practice to use flour of sulphur and sulphuric acid; the acid being the bleaching agent and the flour of sulphur the neutralizing medium. Much depends upon the thoroughness of the washing process as to how clean and free from acid content the fuel may finally become.

When high acidity is encountered, metallic corrosion occurs at the seat and this condition results in many leaks.

THE NEEDLE AND SEAT

The only method of controlling fuel level, an all important factor in carburetor design, is the use of a valve or needle and a seat with which the needle forms contact.

It is, of course, needless to emphasize the importance of holding all needles to an absolute perfection in conical roundness. No process as yet devised entirely compensates for the variations in the best available materials. A powerful microscope seems to indicate that a needle which varies as much as .0001 (one ten-thousand) of an inch from perfect will cause a slow leak. Inspection is therefore of no practical value. Every carburetor must be given an actual gasoline test.

It is our practice to install from two to three hundred carburetor units on pressure lines and observe fuel levels over a period of from three to twenty-four hours. These units which develop leaks are removed from the line and the inlet mechanism examined for irregularities.

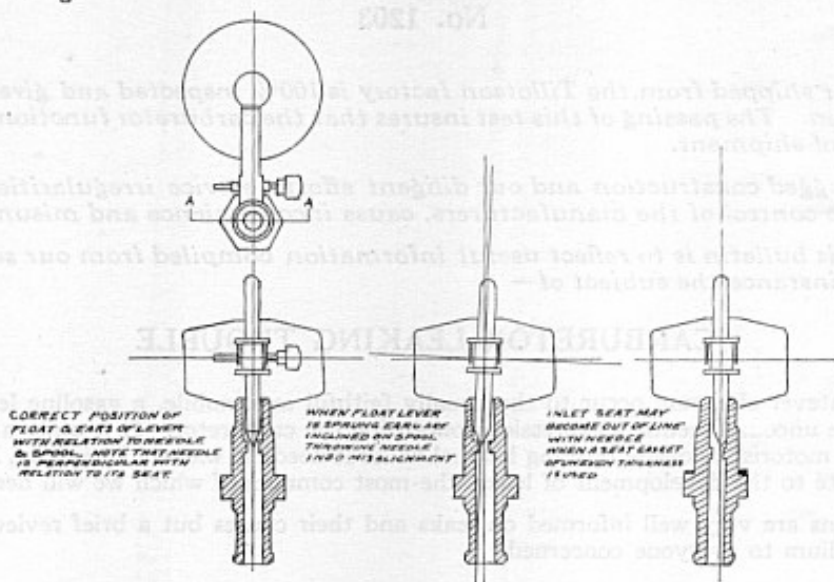
ELIMINATING A LEAK

First, a close inspection is given the operation of the float.

Does the float touch the inside of the bowl, thus holding the needle from seating?

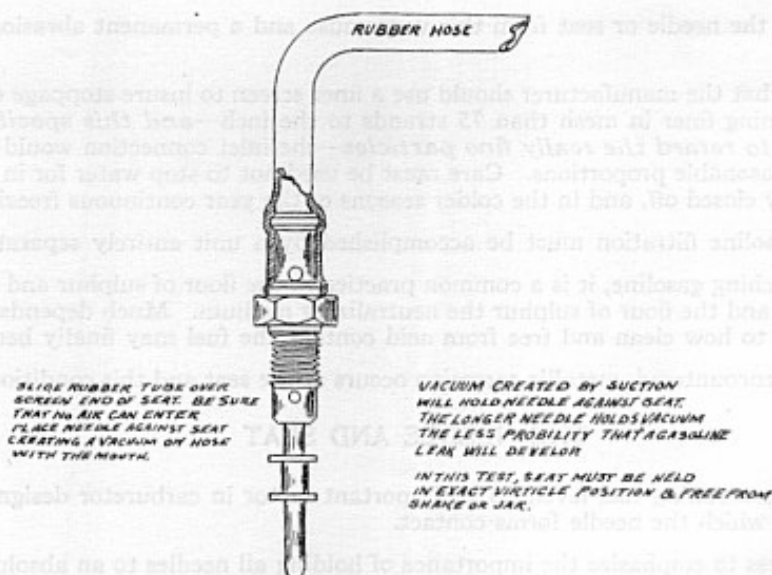
Are the ears of the float lever square or are they sprung so as to raise the needle from only one side of the spool, thus cocking the needle in the guide.

Has the carburetor been dropped, bending the float lever bearing screw? If so, this condition will cause a binding of the pin in its bearing.



TO PROPERLY TEST

To properly test—test it in the following manner. Procure a small, *very flexible rubber hose*. Insert the bottom end of the inlet seat in one end of the hose sufficiently far as to cover the gasoline inlet holes. Now insert a needle, tapping it gently against the seat and place the other end of the hose in the mouth. Exhaust the air from the hose. The needle will remain held tightly in place by the vacuum created. Should the needle leak gradually, the vacuum will decrease and the needle will fall out. This is a very severe test and any needle which will hold vacuum for a reasonable length of time (10 to 15 seconds) should function very satisfactorily as an inlet needle and seat. Always use a needle and seat complete in pairs. Never test any needle except the one to be used with the seat with which it is tested.



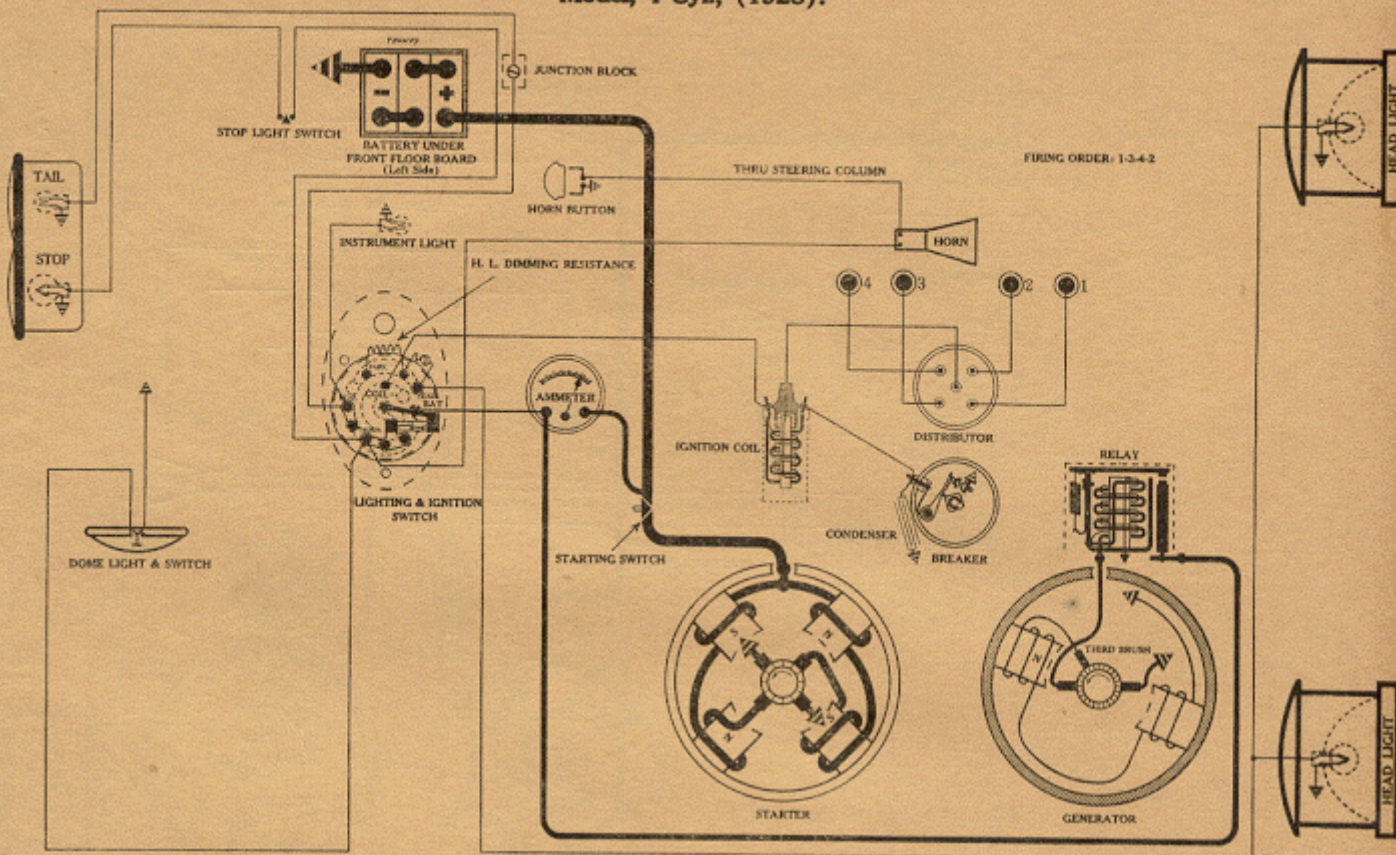
TO PROPERLY INSTALL

One other cause for leaking which occasionally comes under observation is a misaligned seat. The threads in the body casting into which the inlet seat is screwed are made purposely slightly oversize. Whenever an inlet seat gasket is used that is slightly thicker on one side than the other, it is only natural that the seat will be thrown out of perpendicular alignment. The corrective measure is, of course, to install a gasket of uniform thickness. Keep the gaskets absolutely dry.

THE TILLOTSON MANUFACTURING COMPANY.

WHIPPET

Model, 4 Cyl., (1928).



BATTERY

U. S. L., 3-CVX-5X-6, 6 volts. Negative terminal grounded
Starting Capacity—96 amps. for 20 minutes.
Lighting Capacity—5 amps. for 17 hours.
Box—Length, 9 1/16; width, 7 1/4; height, 9 1/4 inches.

STARTER

Rotation, L. H., Com. End
Auto-Lite, MZ-4001

Connection to Engine—Bendix drive.
Running Free—60 amps. at 5.5 volts.
Cranking Engine—180 amps. at 5.2 volts, 200 R. P. M.
Lock Torque—10 pound-feet, 490 amps., 3.6 volts.
Brush Spring Tension—1 1/4-1 1/2 lbs. on each.
Starting Switch—Auto-Lite SW4001.

IGNITION

Rotation, R. H., Top View
Auto-Lite, Dist. Type IGB-4001-A

Breaker—Contact separation .020 to .024 inch.
Contact Spring Tension—18-20 oz.
Timing—See detailed instructions P. 1, Sec. AA.
1—Locate T. D. C. 2—Locate rotor. 3—Set spark.
Spark Plugs—7/8 inch regular type A; Gap .025 inch.
Firing Order—1-3-4-2.
Manual Advance—(None).
Automatic Advance—28 degrees (on Flywheel).

Eng. R.P.M.	Degrees Advance (on Flywheel)	Dist. R.P.M.	Degrees Advance (on cam)
550	0-1	225	0-5
800	4-6	400	2-3
1200	12-14	600	6-7
1800	18-20	900	9-10
2200	22-24	1100	11-12
2600	26-28	1300	13-14

Coil—Auto-Lite, IG-4065.

GENERATOR

Rotation, L. H., Com. End
Auto-Lite, GAL-4102

Performance Data—Gen. cold.

Amps.	R.P.M.	Volts
0	650	6.5
2	720	6.6
5	850	7.
10	1075	7.3
14	1340	7.7
16	1800	8.

Motoring Freely—5-5 1/2 amps. at 6 volts.
Max. Stall Current—16-19 amps. at 6 volts.
Field Test—4.7 amps. at 6 volts across field coils in series.
Field Fuse—(None).
Brush Spring Tension—1 1/4 to 1 1/2 lbs. on each.
Third Brush Adjustment—Loosen cover band. See Fig. 13, P. 7, Sec. AA.

RELAY

Auto-Lite, CB-4007

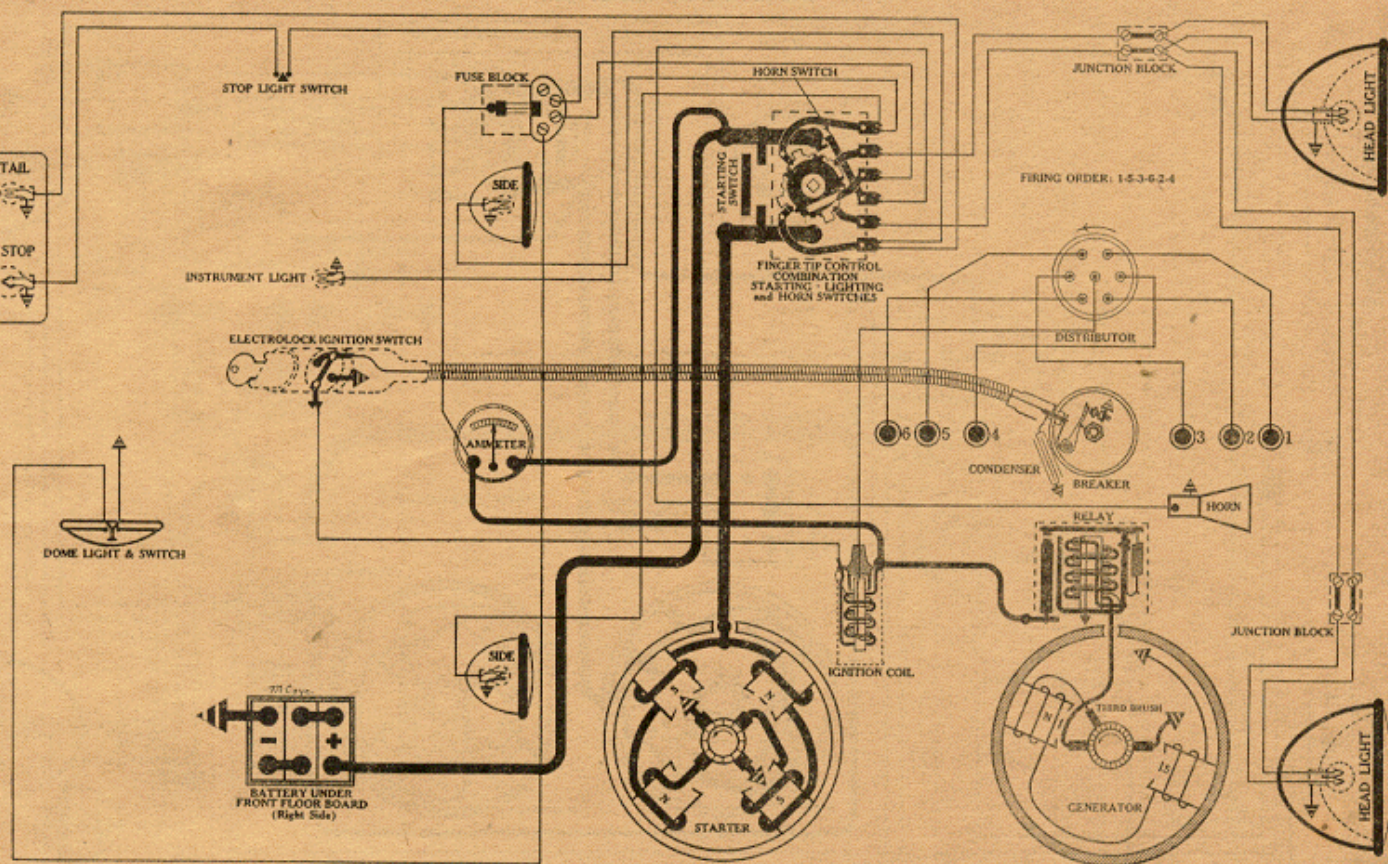
Closes—7-7.5 volts.
Opens—1/2-2 1/2 amps. discharge.
Contact Gap—.025-.035 inch.
Core Gap—.010-.030 inch, contacts closed.

LIGHTING

Switch—Briggs & Stratton, No. 40097.
Fuses—Single 20 amp. fuse mounted vertically on switch back.
Lamps—See P. 3, Sec. AA. HEAD—1129; INSTRUMENT—63; DOME—63; TAIL—63.

WHIPPET

Model, 98-A, 6 Cyl., (1929)



BATTERY

U. S. L., 3-CVX-5X-6A, 6 volts. Negative Terminal Grounded

Starting Capacity—96 amps. for 20 minutes.

Lighting Capacity—5 amps. for 17 hours.

Box—Length, 9 1/16; width, 7; height, 9 1/4 inches.

STARTER

Rotation, L. H., Com. End

Auto-Lite, MZ-4011

Connection to Engine—Bendix drive.

Running Free—60 amps. at 5.5 volts.

Cranking Engine—180 amps. at 5.2 volts, 200 R. P. M.

Lock Torque—10 pound-feet, 490 amps., 3.6 volts.

Brush Spring Tension—20 to 24 oz. on each.

Starting Switch—Located foot of steering column. Operated by pulling up on horn button.

IGNITION

Rotation, L. H., Top View

Auto-Lite, ICB-4021

NOTE: This unit is of the full automatic type; however, the spark may be retarded for starting, and on heavy grades, by pulling out on spark knob.

Breaker—Contact separation .020 to .024 inch.

Contact Spring Tension—18-20 oz.

Timing—See detailed instructions P. 1, Sec. AA.

1—Locate T. D. C. 2—Locate rotor. 3—Set spark.

Spark Plugs—7/8" long (AC type Z); Gap .025 inch.

Firing Order—1-5-3-6-2-4.

Manual Retard—14 degrees (on Flywheel).

Automatic Advance—24 degrees (on Flywheel).

Eng. R.P.M.	Degrees Advance (on flywheel)	Dist. R.P.M.	Degrees Advance (on cam)
800	0-1	400	0-5
1200	4	600	2
2400	16	1200	8
2800	20	1400	10
3200	24	1600	12

Coil—Auto-Lite, IG-4065.

Ignition Switch—"Electrolock", Type 9-A. For theory of operation and instructions on servicing see P. 21, Sec. AA.

GENERATOR

Rotation, L. H., Com. End

Auto-Lite GAL-4106

Performance Data—Gen. cold.

Amps.	R.P.M.	Volts	Amps.	R.P.M.	Volts
0	650	6.5	10	1075	7.3
2	720	6.6	14	1340	7.7
5	850	7	16	1800	8

Motoring Freely—5-5 1/2 amps. at 6 volts.

Max. Stall Current—16-19 amps. at 6 volts.

Field Test—4.7 amps. at 6 volts across field coils in series.

Field Fuse—(None).

Brush Spring Tension—20 to 24 oz. on each.

Third Brush Adjustment—Loosen cover band. See Fig. 13, P. 7, Sec. AA.

RELAY

Auto-Lite, CB-4014

Closes—7-7.5 volts.

Opens—1/2-2 1/2 amps. discharge.

Contact Gap—.025-.035 inch.

Core Gap—.010-.030 inch, contacts closed.

LIGHTING

Switch—Briggs & Stratton 40941.

Location—Foot of steering column. This unit is a combination starting switch, lighting switch, and horn switch, all being controlled by horn button on steering wheel. For details of construction and instructions on servicing see P. 28, Sec. AA.

Fuses—Single 20 amp. fuse mounted on block under engine hood (left side).

Lamps—See P. 3, Sec. AA. HEAD—1110 (Bifocal); INSTRUMENT—63; DOME—63; STOP AND TAIL (Single Socket)—1158.

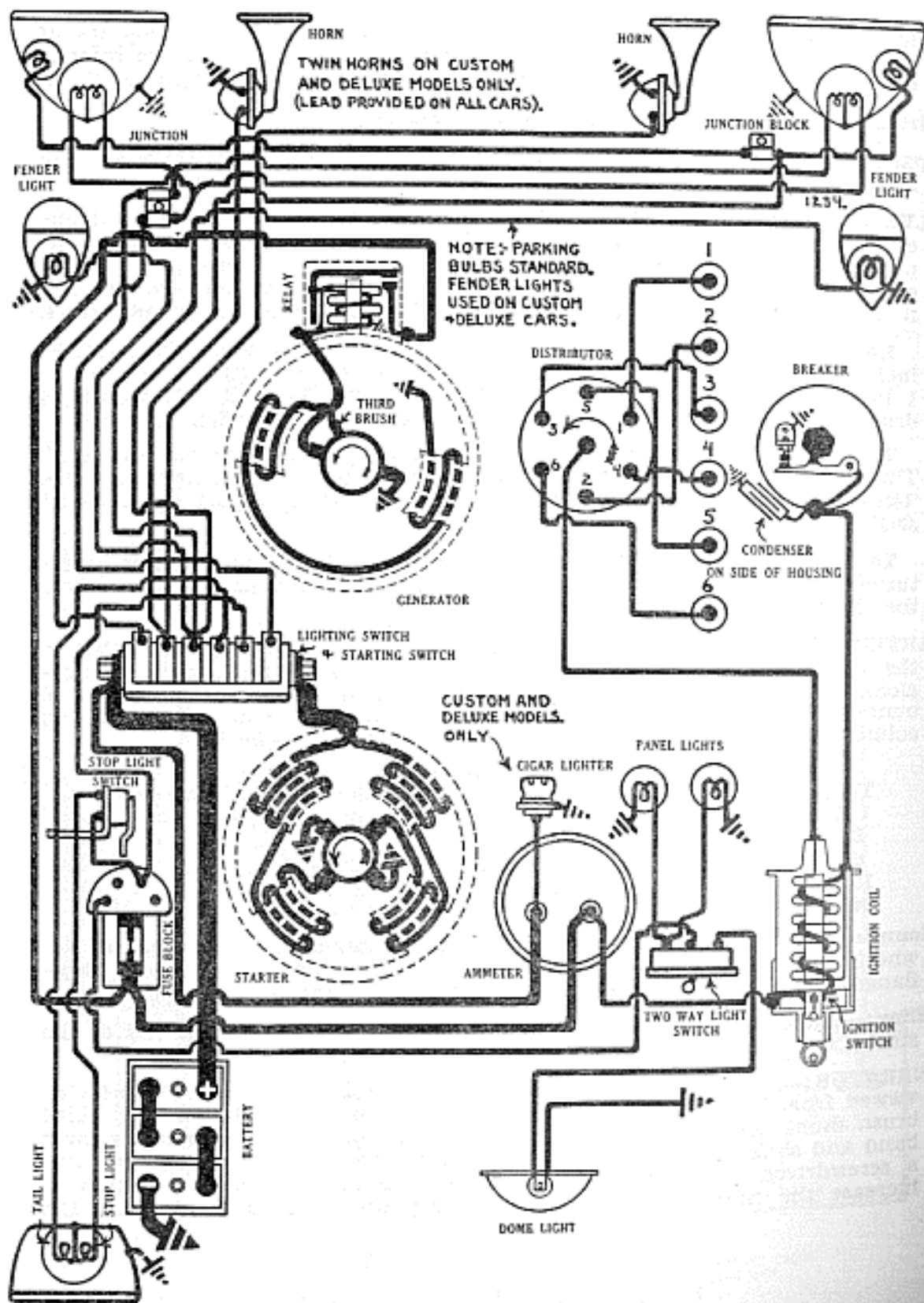
NOTE: This is the old style Ford headlight bulb with two filaments; make sure the 3 C. P. filament burns for tail light.

WILLYS OVERLAND SIX

SIX CYLINDER MODEL 6-90 (1932), SERIAL NUMBERS 1001 UP

STREAM LINE MODEL 6-90A—AFTER JUNE, 1932

AUTO-LITE SYSTEM



CAR SERIAL NUMBER:—Stamped on plate on left hand frame side rail in front of left front spring rear shackle and on plate under driver's seat cushion. First serial number of this model—14201.

ENGINE NUMBER:—Stamped on left hand upper front of engine block.

ENGINE:—Six cylinder, 'L' head type, $3\frac{1}{4} \times 3\frac{3}{4}$ " bore and stroke, 193 cubic inch displacement, rated at 25.35 H.P., develops 65 H.P. at 3400 R.P.M. Standard compression ratio—5.26-1.

BATTERY:—U.S.I., Type XY-13X-7A, 6 volt, 13 plate, 87.5 ampere hour capacity (5 ampere rate). Starting capacity 102 amperes for 20 minutes.

Grounded Terminal:—Negative (—) terminal grounded to frame.

Mounting:—On left hand frame side rail under front floor boards.

Dimensions:—Width, $7\frac{1}{4}$ ". Length, 9". Height, $8\frac{5}{8}$ ".

IGNITION:—Coil Model IG-4305 (Std.), IG-4602 (Clsd. Cars), IG-4502 (Sport Rdstr.), IG-4501 (Std. Rdstr.). IG-4035, 4501, 4502 are coil lock types mounted on back of instrument board (switch in base). IG-4602 mounted on dash and connected to special Mitchellock by armored cable (see Electrical Equipment Section for Mitchellock data).

Ignition Current:— $1\frac{1}{2}$ amperes at 6 volts (engine running), 3.4-5 amperes at 6 volts (engine stopped).

Distributor Model IGB-4032. Single breaker arm, 6 lobe cam, semi-automatic advance type. Manual advance controlled by button on dash. Distributor is retarded by pulling out button for hand cranking or heavy pulling. Pushing button in toward dash advances distributor 20° (engine).

Breaker Gap:—Set contact at .018". Hold within limits of .018-.020".

Breaker Arm Spring Tension:—16-22 ounces (measured at tip of breaker arm with spring scale centered on arm and at right angles to breaker arm).

Cam Angles:—Closed 34° . Open 26° (distributor degrees).

Automatic Advance					
Degrees Start	Distributor	R.P.M.	Degrees	Engine	R.P.M.
3	300	0	.....	600
6	640	6	.....	1280
9	1010	12	.....	2040
11	1350	18	.....	2700
	1600	22	.....	3200

Mounting:—Distributor mounted at left center of engine and driven by an inclined shaft from the camshaft. To remove, disconnect primary lead, disconnect manual spark control, take off distributor cap, take out hold-down screw in advance arm, lift out.

Oiling:—250 Miles. Put 6 drops SAE #20 engine oil in oiler on side of shaft. Take off distributor cap and rotor, put 6 drops oil in wick oiler in center of shaft.

5000 Miles. Apply thin film vaseline to face of breaker cam.

IGNITION TIMING:—Standard Setting—top dead center with manual control advanced.

To Set Ignition Timing:—Take off cover plate over inspection hole in left hand front face of flywheel housing, advance manual spark control (push button in toward dash), see that distributor is rotated clockwise to end of advance arm slot. With No. 1 piston on compression turn engine over until piston reaches top dead center with flywheel mark '1-6 CYL./IGN.TC' directly opposite indicator on housing, loosen advance arm clam bolt, rotate distributor until contacts begin to open, tighten clamp bolt, see that rotor is opposite No. 1 terminal in distributor cap (see diagram), connect spark plugs as indicated.

Note on Cars with Startix:—The Electrolock ignition switch used on all cars with Startix automatic starting switch has two 'On' positions. The first 'On' position (approximately $\frac{1}{4}$ turn from the vertical 'Off' position) turns on ignition and gasoline gauge circuit but does not connect Startix. This switch position should be used in checking ignition to avoid automatic

cranking. The second 'On' position (approximately $\frac{1}{4}$ turn of switch key) is the normal operating position of the switch with Startix operative.

Firing Order:—1-5-3-6-2-4. No. 1 cylinder nearest radiator.

Spark Plugs:—18 MM. Metric. Champion Type C-7. Set spark plug gaps at .027".

VALVE TIMING:—Camshaft Setting:—Camshaft at right of engine is driven from crankshaft by two-sprocket non-adjustable chain drive. Sprockets are marked. Mesh chain with sprockets turned so that punch marks are adjacent and in line with straightedge across shaft centers. With correct setting, mark on rim of camshaft sprocket should be in line with mark on edge of front engine support with piston No. 1 on top dead center and flywheel mark 'IGN.TC./CYL.1-6' at indicator.

To Check Valve Timing:—Set tappet clearance No. 1 intake valve at .008", No. 1 exhaust valve at .009" (cold). With No. 6 piston on compression turn engine over until flywheel mark 'IO/' is opposite pointed screw on edge of inspection hole in left front face of flywheel housing. No. 1 intake valve should begin to open at this point. Turn engine over 5° to point where flywheel mark 'EC/' registers with pointer. No. 1 exhaust valve should close at this point. Reset tappet clearance at .004" (intake), .005" (exhaust) with engine hot.

Valve Specifications

Valve	Head Diameter	Stem Diameter	Seat Angle	Lift
Intake	1 5/8"	.372"	45°	5/16"
Exhaust	1 15/32"	.371"	45°	5/16"

Tappet Clearance

Operating Timing

Intake	.004" (hot) .003" (cold)	Closed	46 pounds—2 1/4"
Exhaust	.006" (hot) .009" (cold)	Open	85 1/2 pounds—1 15/16"

Intake Valve

Timing

Exhaust Valves

Open—7° before top dead center.	Open—49° before lower dead center.
Close—39° after lower dead center.	Close—2° before top dead center.

CARBURETION:—Tillotson Updraft Carburetor, Model J1B. See Carburetor Section for complete data. Intake manifold heat control automatic.

Fuel Pump:—A.C. Mechanical Fuel Pump mounted on right side of crankcase (see Carburetion Section for complete data). Remove glass sediment bowl when necessary, empty water and sediment, clean filter screen (located above bowl) before reassembling.

Gasoline Gauge:—K-S Telegauge hydrostatic type gauge (see Carburetion Section).

STARTER:—Model MZ-4030 (Custom and Sport Models), (MZ-4024 Standard Models). Starter drive—inboard Bendix with Startix automatic starting switch on Custom models and Pines 'Finger Tip Control' switch on Standard models. See Equipment Section for complete data on Startix and Pines switches. Rotation counter-clockwise at commutator end. Brush spring tension 44-56 ounces.

Starter Data

Torque	R.P.M.	Volts	Amperes
0 lb. ft.	4902	5.5	47 (with Bendix)
.65 "	2500	5.5	100
2.55 "	1325	5.0	200
4.95 "	750	4.5	300
7.65 "	220	4.0	400
10.1 "	Lock	3.5	470
12.25 "	Lock	4.0	545

Mounting:—Flange mounted on left hand front face of flywheel housing. To

remove, disconnect cable, take out 3 flange mounting screws, pull starter forward to clear Bendix, lift out.

Oiling:—500 Miles. Put 6 drops SAE. No. 20 engine oil in oiler at each end.

GENERATOR:—Model GAL-4331. Third brush regulation. Rotation counter-clockwise at commutator end. Maximum charging rate (standard setting) is 17.2 amperes (cold) at 8.0 volts reached at 1900 R.P.M.

Charging Rate Adjustment:—Take off commutator cover band, shift third brush by prying on brush mounting stud counter-clockwise to increase, or clockwise to decrease charging rate. Brush held in position by friction.

Generator Data

Cold Test			Hot Test		
Amperes	Volts	R.P.M.	Amperes	Volts	R.P.M.
0	6.3	600	0	6.4	700
4	6.7	740	4	6.9	900
8	7.1	900	8	7.4	1150
12	7.4	1120	10	7.7	1340
17	8.0	1900	12.4	8.0	2150
12	7.4	3200	9.5	7.7	3200

Brush Spring Tension:—8-13 ounces on each brush.

Field Current:—4.08-4.52 amperes at 6 volts across field terminals.

Motoring:—4.27-4.73 amperes at 6.0 volts.

Mounting:—Pivot mounting on bracket at left front of engine with fan belt drive. To remove, disconnect lead, loosen adjustment clamp bolt, swing generator toward engine and slip off drive belt, take out bolt forming bracket hinge, lift generator out.

Belt Adjustment:—Loosen adjustment clamp bolt and mounting bolt, pull generator away from engine until fan can just be turned with belt held stationary, tighten adjustment bolt and mounting bolt before slacking off on generator.

Oiling:—250 Miles. Put 6 drops SAE. No. 20 engine oil in oiler at each end. 1000 Miles. Remove grease cup under bearing retainer on commutator end, clean out old grease, fill cup with vaseline, dip wick in oil and replace.

RELAY:—Model CB-4014, 4021 (With Startix terminal). Mounted on generator field frame. Relay contacts close at 675 R.P.M. with generator voltage of 7-7.5 volts and charging current of approximately 2 amperes and open with discharge current of .5-2.5 amperes.

Contact Gap:—.025-.035 inch. **Air Gap:**—.010-.030 inch (contacts closed).

LIGHTING:—Pines Switch, Model A-805 (Standard Models), 6700 (Custom and Sport Models). Lighting switch 'Finger Tip Control' type mounted at lower end of steering column and controlled by knob on steering wheel. Type A-805 on Standard models includes starting switch. Type 6700 on Custom models is used with Startix and does not include starting switch. See Equipment Section for complete data. Lighting system 'depressed beam' dimming with standard double filament headlight bulbs.

Lamp Sizes

Position	Voltage	Candlepower	Base	Mazda No.
Headlights	6-8.....	21-21.....	D.C.....	1110
Parking Lights	6-8.....	3	S.C.....	63
Instrument Lights	6-8.....	3	S.C.....	63
Stop and Tail Lights	6-8.....	21-2	D.C.....	1158

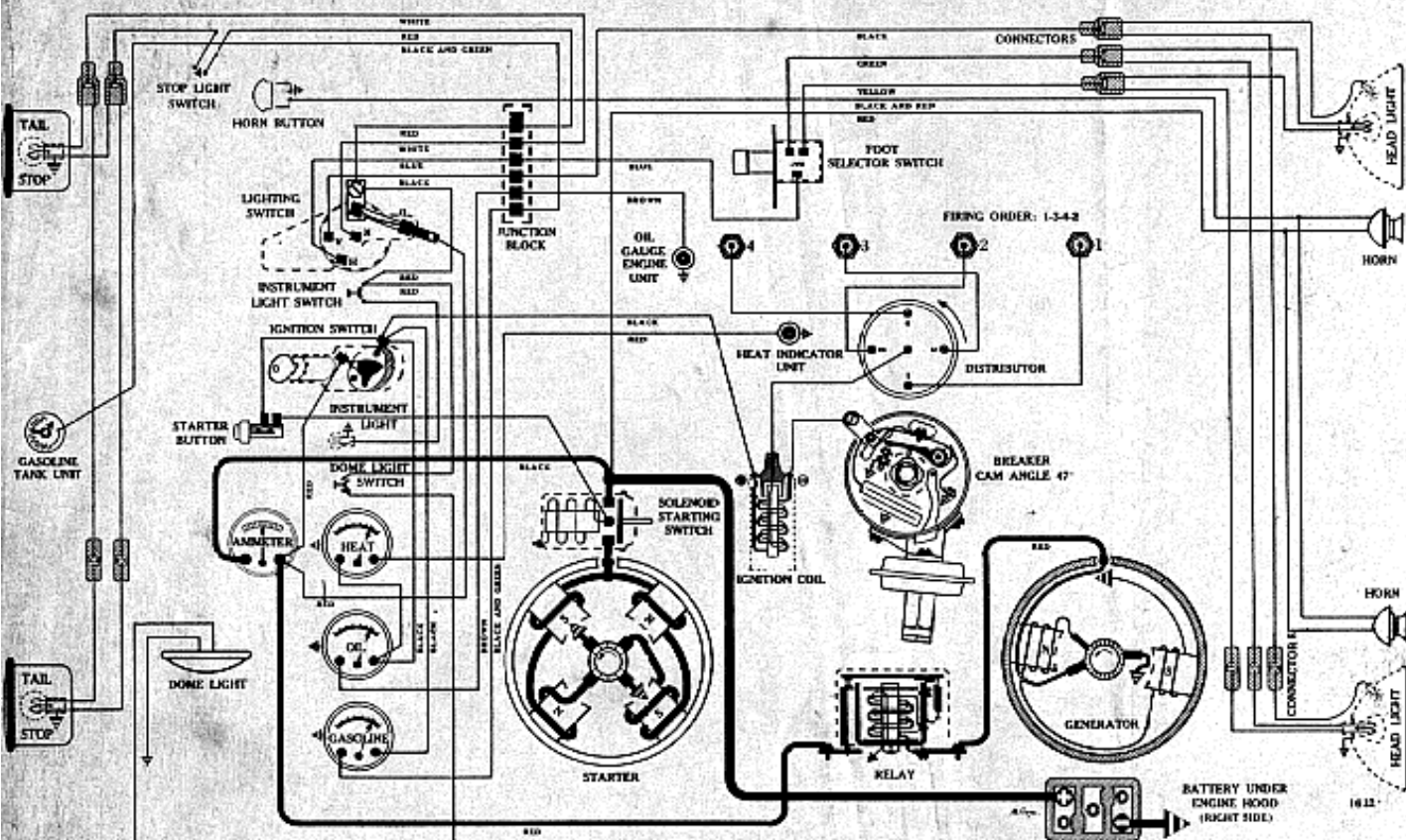
Custom and Sport models have parking lights mounted on fenders. Standard models have parking bulbs in headlights. Stop and tail light has special double filament bulb and tail light lead must be connected to 2 cp. filament.

FUSES:—One 20-ampere capacity fuse mounted on left front of dash.

WILLYS

Engine { Bore 3-1/8
Stroke 4-3/8

Model 38, 4 cyl., (1938)



BATTERY

U.S.L., A-13-A, 6 volts.
Negative Terminal Grounded.

Starting Capacity—96 amps. for 20 minutes.
Minutes of Discharge at 300 Amps., Zero Degrees F.—1.9
Lighting Capacity—3.9 amps. for 20 hours (7B amp. hour).
Case—Length, 8-7/8; width, 7; height, 8-5/8 inches.

STARTER

Rotation, L. H., Com. End
Auto-Lite, MZ-4049

Connection to Engine—Bendix Drive, Type RC10HD.
Running Free—70 amps. at 5-1/2 volts, 4300 R.P.M.
Stall Data—7.8 pound-feet, 420 amps. at 3 volts.
Brush Spring Tension—42 to 53 ounces on each (new brushes).
Push Button Starting Switch—H. A. Douglas Mfg. Co., No. 5617.
Solenoid Starting Switch—Auto-Lite, SS-4001.
Armature—Auto-Lite, MZ-2099.

IGNITION

A-L Test 486 Rotation, L. H., Top View
Auto-Lite, IG3-4007

(Full Automatic Spark Advance in conjunction with Integral Vacuum Chamber).
Breaker—Contact separation .020 inch.

Cam Angle—47 degrees.

Contact Spring Tension—16 to 20 ounces.

Timing—5 degrees or .0103 inch piston travel past top dead center. Loosen screw holding flywheel inspection hole cover, located in left top side of flywheel housing, and swing cover to one side. Flywheel mark "IGN" (located 5 degrees after T.D.C.) should register with the pointed end of inspection plate screw.

Spark Plugs—18-MM (Champion type C-7); Gap .025 inch.

Firing Order—1-3-4-2.

Vacuum Chamber (Auto-Lite, IG1-1028-AS; Test No. 467)—10 degrees advance (Dist.). Starts with vacuum of 3-1/2 inches of mercury. Requires a vacuum of 15 inches for full travel.

Vacuum Chamber Advance Table—

Inches of Mercury	Degrees Dist. Advance
3.50.....	Start
4.65.....	1
5.80.....	2
6.95.....	3
8.10.....	4
9.25.....	5
10.40.....	6
11.55.....	7
12.70.....	8
13.85.....	9
15.00.....	10

WILLYS

Model 38, 4 cyl., (1938)

Automatic Advance—degrees (Distributor).		
Eng. R.P.M.	1st. R.P.M.	Degrees Advance (Dist.)
500.....	250.....	Start
550.....	275.....	1
600.....	300.....	2
650.....	325.....	3
700 (Intermed.)	350.....	4
970.....	485.....	5
1240.....	620.....	6
1510.....	755.....	7
1780.....	890.....	8
2050.....	1025.....	9
2320.....	1160.....	10
2590.....	1295.....	11
2860.....	1430.....	12
3130.....	1565.....	13
3400 (Max.).....	1700.....	14

Breaker Plate—Auto-Lite, IGS-2044 (stamped with the figure 10)

Condenser—Auto-Lite, -2671-K.

Contact Point—Auto-Lite, IGP-33.

Breaker Lever and Point—Auto-Lite, IGP-3028-L.

Rotor—Auto-Lite, IG-17.

Distributor Cap—Auto-Lite, IG-1324.

Flexible Lead (Insulate)—Auto-Lite, IGS-49.

Ignition Coil—Auto-Lite, IG-4090.

Ignition Switch—H. A. Douglas Mfg. Co., No. 2975.

GENERATOR

Rotation, H., Com. End

Auto-Lite, GAM-501-A or GAM-4501-B

Performance Data—Gen. d.

Amps.	R.P.M.	Volts
0.....	700.....	6.40
2.....	785.....	6.60
6.....	960.....	6.90
10.....	1100.....	7.20
12.....	1320.....	7.40
16.....	2400 (Max.).....	8.00

Motoring Freely—4.08 to 4.52 amps. at 6 volts.

Max. Stall Current—18 to 20 amps. at 6 volts.

Field Test—3.89 to 4.31 amps. at 6 volts across field coils in series.

Brush Spring Tension—18 to 22 ounces (max.) on each (new brushes).

Armature—Auto-Lite, GAM-2055.

Third Brush Adjustment—Loosen cover band. Shift third brush by hand. Mounting plate held in any position by friction clamp washers.

RELAY

Auto-Lite, CB-4025 (Mounted on Sub Frame)

Points Close—6.5 to 7.25 volts.

Points Open—.5 to 3.0 amps. discharge.

Contact Gap—.015 inch minimum (points open).

Armature Air Gap—.034 to .038 inch (points open).

LIGHTING

Switch—H. A. Douglas Mfg. Co., No. 5400-C.

Location—Behind instrument board.

Fuse—Single 20 amp. fuse (type 3A-20) on switch back. Protects all lighting circuits.

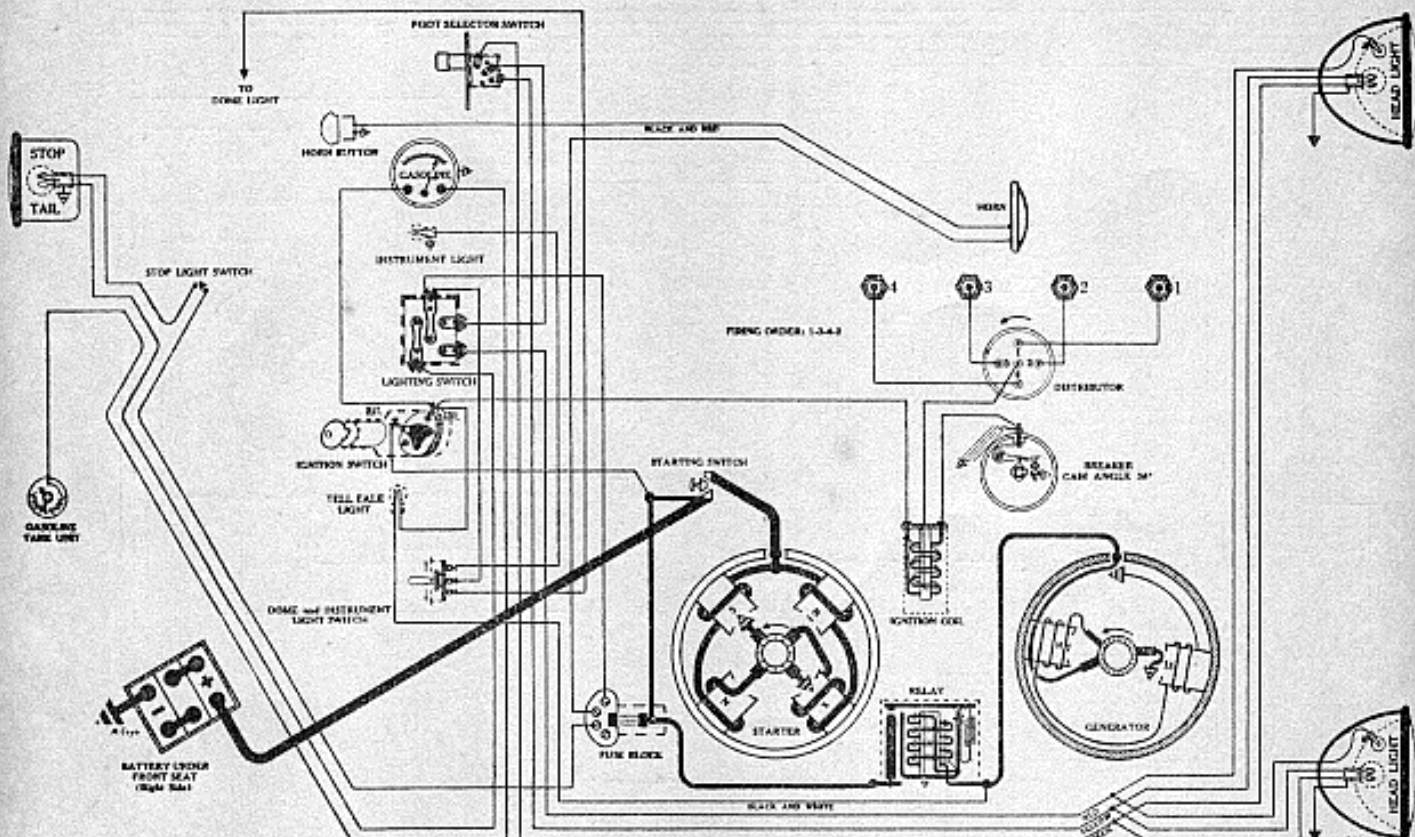
Foot Selector Switch—H. A. Douglas Mfg. Co., No. 5530.

Lamps—HEAD—2320; PARK—55; INSTRUMENT—63; DOME—63; STOP AND TAIL—1158.

WILLYS

Model 77, 4 cyl., (1934)

Engine { Bore 3-1/8
Stroke 4-3/8



BATTERY

U.S.L., A-13-A, 6 volts. Negative Terminal Grounded.
Starting Capacity—36 amps. for 20 minutes.
Lighting Capacity—3.9 amps. for 20 hours (78 amp. hour).
Box—Length, 9; width, 7 1/4; height, 8 3/4 inches.

STARTER

Rotation, L. H., Com. End
Auto-Lite, MZ-4033

Connection to Engine—Bendix Drive, Type RC10HD.
Running Free—47 amps. at 5 1/2 volts, 4902 R.P.M.
Cranking Engine—135 to 150 amps. at 4.2 volts.
Lock Torque—10 pound-feet, 470 amps. at 3 1/2 volts.
Brush Spring Tension—44 to 56 oz. on each (new brushes).
Starting Switch—Auto-Lite, SW-4001.
Armature—Auto-Lite, MZ-2089.

IGNITION

Rotation, L. H., Top View
Auto-Lite, IGB-4078
(Full Automatic Spark Advance)

Breaker—Contact separation .020 inch.
Cam Angles—Points closed 36 degrees; open 54 degrees.
Contact Spring Tension—17 to 19 oz.
Timing—Loosen screw holding flywheel inspection hole cover, located in left top side of flywheel housing, and swing cover to one side. Slowly turn engine until No. 1 piston is coming up on compression stroke. Stop when flywheel mark "Ign" is directly under pointed end of inspection plate screw. With rotor under No. 1 Dist. Cap Terminal, breaker points should just open.
Timing with MOTOR GAUGE—Remove No. 4 spark plug, and attach MOTOR GAUGE, using adapter No. 104 and rod No. 2. Slowly turn engine until No. 4 piston is coming up on compression stroke. Stop when .006 inch before T.D.C., as indicated on Gauge.
Spark Plugs—18-MM (Champion type C-7); Gap .027 inch.
Firing Order—1-3-4-2.
Automatic Advance—12 1/2 degrees (Distributor).

Eng. R.P.M.	Dist. R.P.M.	Degrees Advance (Dist.)	Start
600	300		2
1040	520		4
1500	750		6
1940	970		8
2400	1200		10
2850	1425		12 1/2
3400 (Max.)	1700		

Ignition Coil—Auto-Lite, IG-4406.

Lock Ignition Switch—Mitchell Specialty, Type 17.

GENERATOR

Rotation, L. H., Com. End
Auto-Lite, GAM-4504, (Belt Drive)

Performance Data—Gen. cold.

Amps.	R.P.M.	Volts	Amps.	R.P.M.	Volts
0	700	6.4	10	1100	7.2
2	785	6.6	12	1320	7.4
6	960	6.9	16	2400 (Max.)	8

Motoring Freely—4 1/2 to 5 amps. at 6 volts.

Max. Stall Current—18 to 20 amps. at 6 volts.

Field Test—4.2 amps. at 6 volts across field coils in series.

Brush Spring Tension—18 to 22 oz. on each (new brushes).

Armature—Auto-Lite, GAM-2055.

Third Brush Adjustment—Loosen cover band. Shift third brush by hand. Mounting plate held in any position by friction clamp washers.

RELAY

Auto-Lite, CB-4008, (Mounted on Sub Frame)

Closes—4 1/2 to 7 1/2 volts.

Opens—1/2 to 2 1/2 amps. discharge.

Contact Gap—.025 to .035 inch.

Core Gap—.010 to .020 inch, contacts closed.

LIGHTING

Switch—Culver-Stearns.

Location—Lower edge of instrument board, above steering wheel.

Fuses—Single 20 amp. fuse (type 3A-20) mounted on block under engine hood (right side).

Foot Selector Switch—Soreng-Manegold, No. A2100-A.

Lamps—See Lamp Table, Sec. AA. HEAD—1110; PARK—63;

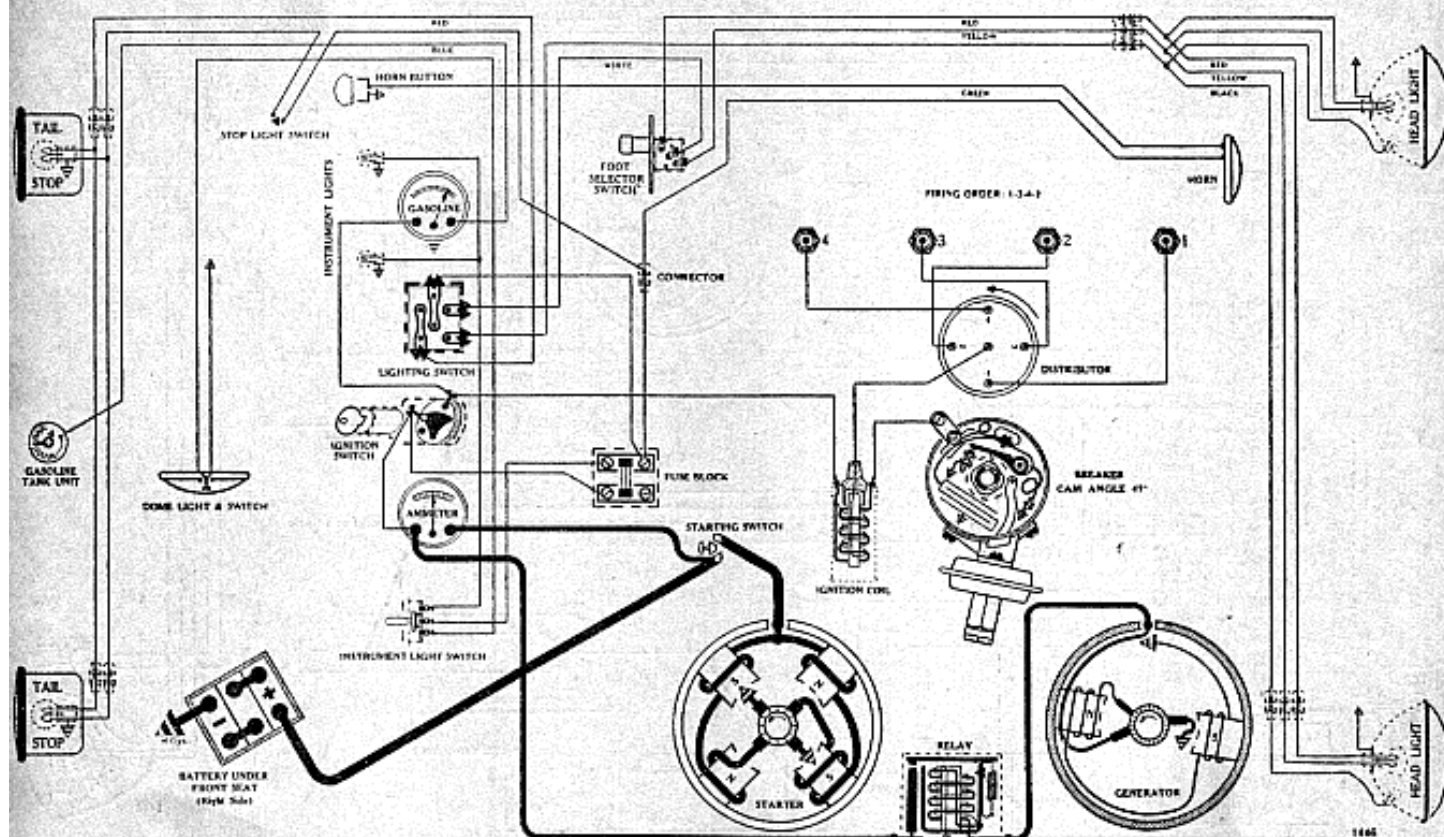
INSTRUMENT—63; GENERATOR SIGNAL—64; DOME—63;

STOP AND TAIL—1158.

WILLYS

Model 77, 4 cyl., (1936)

Engine (Bore 3-1/8
Stroke 4-3/8)



BATTERY

U.S.L., A-13-A, 6 volts. Negative Terminal Grounded
Starting Capacity—96 amps. for 20 minutes.
Minutes of Discharge at 300 Amps., Zero Degrees F.—
1.9
Lighting Capacity—3.9 amps. for 20 hours (78 amp.
hour).
Box—Length, 9; width, 7; height, 8 5/8 inches.

STARTER

A-L Test CU-162 Rotation, L. H., Com. End
Auto-Lite, MZ-4033

Connection to Engine—Bendix Drive, Type RC10HD.
Running Free—47 amps. at 5 1/2 volts, 4902 R.P.M.
Cranking Engine—96 amps. at 5.1 volts.
Engine Cranking Speed—120 R.P.M.
Stall Data (on car)—300 amps. at 2.9 volts.
Lock Torque (for test bench use)—10 pound-feet, 470
amps. at 3 1/2 volts.
Brush Spring Tension—44 to 56 oz. on each (new
brushes).
Starting Switch—Auto-Lite, SW-4001.
Armature—Auto-Lite, MZ-2089.

IGNITION

A-L Test 466 Rotation, L. H., Top View
Auto-Lite, IGS-4007

(Full Automatic Spark Advance in conjunction with
Auto-Lite IGT-1028-AS Vacuum Chamber. This
chamber controls position of Breaker Plate Assembly
No. IGS-2044, which is stamped with the figure 10).
Breaker—Contact separation .020 inch.
Cam Angles—Points closed 47 degrees; open 43 de-
grees.

Contact Spring Tension—18 to 20 oz.

Timing—5 degrees past top dead center. Loosen screw
holding flywheel inspection hole cover, located in left
top side of flywheel housing, and swing cover to one
side. Slowly turn engine until No. 1 piston comes up
on compression stroke and starts down on the power
stroke. Stop when the flywheel mark "IGN" (located
5 degrees after T.D.C.) is directly under pointed end
of inspection plate screw. With rotor under No. 1
Dist. Cap Terminal, breaker points should just open.

Spark Plugs—18-MM (Champion type C-7); Gap .025
inch.

Firing Order—1-3-4-2.

Vacuum Chamber (Auto-Lite, IGT-1028-AS; Test No.
467)—10 degrees (Dist. advance). Starts with
vacuum of from 2 1/2 to 4 1/2 inches of mercury. Re-
quires a vacuum of 15 inches for full travel.

Vacuum Advance Table (Auto-Lite, IGT-1028-AS Vac-
uum Chamber).

3.5	Start
4.65	1
5.80	2
6.95	3
8.10	4
9.25	5
10.40	6
11.55	7
12.70	8
13.85	9
15.00	10

Automatic Advance—14 degrees (Distributor).

Eng. R.P.M.	Dist. R.P.M.	Degrees Advance (Dist.)
500	250	Start
600	300	2
700 (Intermediate)	350	4
1240	620	6
1780	890	8

WILLYS

Model 77, 4 cyl., (1936)

2320.....	1160.....	10
2860.....	1430.....	12
3400 (Max.)	1700.....	14

Condenser—Auto-Lite, IG-2671-K.

Ignition Coil—Auto-Lite, IG-4090.

Lock Ignition Switch—Mitchell Specialty, Type 17.

GENERATOR

Rotation, L. H., Com. End

Auto-Lite, GAM-4504 (Belt Drive)

Performance Data—Gen. Cold.

0.....	700.....	6.4
2.....	785.....	6.6
6.....	960.....	6.9
10.....	1100.....	7.2
12.....	1320.....	7.4
16.....	2400 (Max.)	8.

Motoring Freely—4½ to 5 amps. at 6 volts.

Max. Stall Current—18 to 20 amps. at 6 volts.

Field Test—4.2 amps. at 6 volts across field coils in series.

Brush Spring Tension—22 oz. Max. on each (new brushes).

Armature—Auto-Lite, GAM-2055.

Third Brush Adjustment—Loosen cover band. Shift third brush by hand. Mounting plate held in any position by friction clamp washers.

RELAY

Auto-Lite, CB-4008 (Mounted on Sub Frame)

Points Close—6.5 to 7.25 volts.

Points Open—.5 to 3.0 amps. discharge.

Contact Gap—.015 inch minimum (points open).

Armature Air Gap—.034 to .038 inch (points open).

LIGHTING

Switch—Culver-Stearns.

Location—Lower edge of instrument board, above steering post.

Fuses—Single 20 amp. fuse (type 3A-20) in fuse block on dash board under cowl (driver's side).

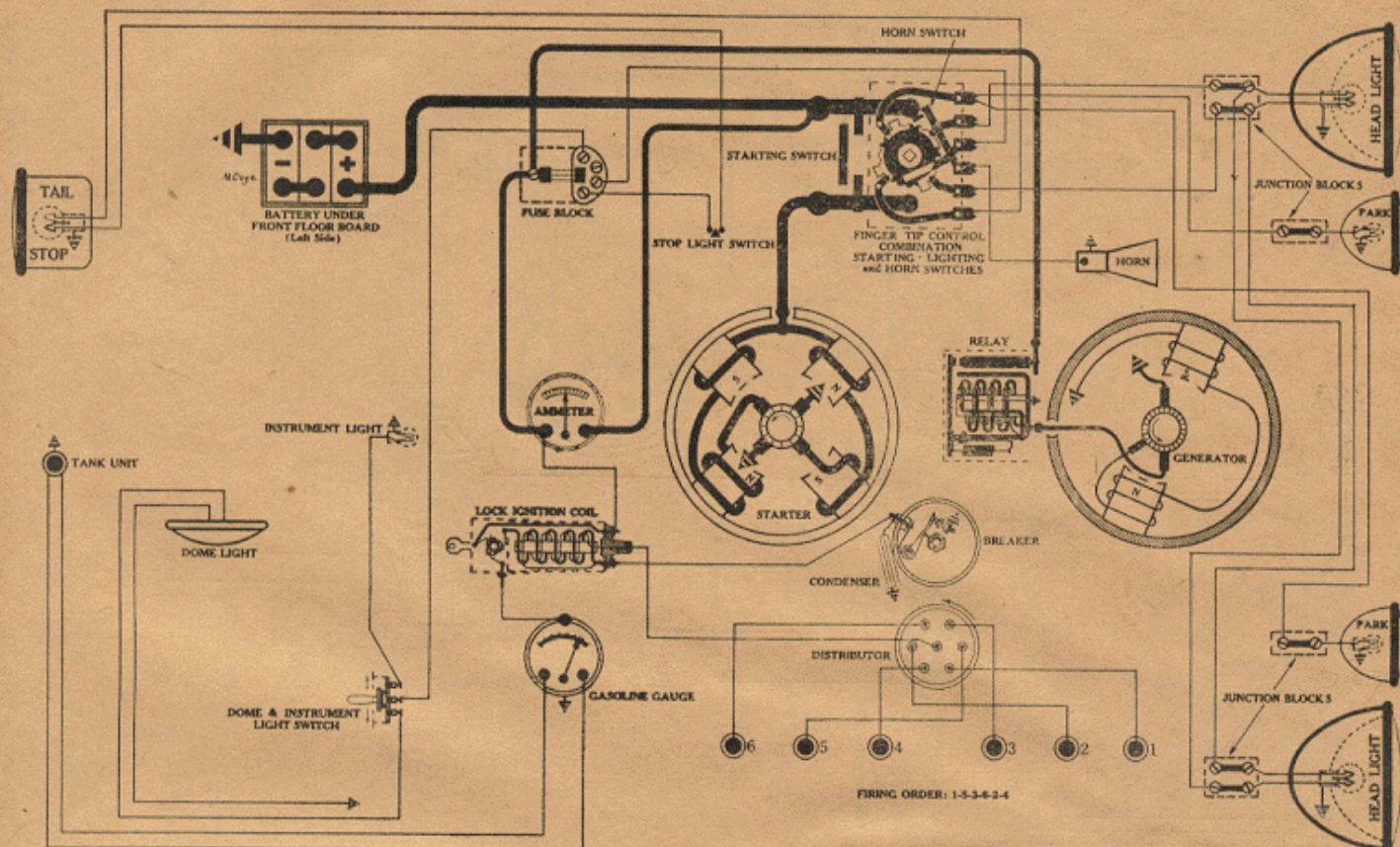
Foot Selector Switch—Soreng-Manegold, No. A2100-A.

Lamps—Refer to "Lamp Data" in Technical Section.

HEAD—1110; PARK—63; INSTRUMENT—63;
DOME—63; STOP AND TAIL—1158.

WILLYS

Model, 98-B, 6 cyl., (1930)



BATTERY

U. S. L., 3-CVX-6X-7A, 6 volts. Negative Terminal Grounded

Starting Capacity—115 amps. for 20 minutes.

Lighting Capacity—5 amps. for 21 hours.

Box—Length, 10 7/16; width, 7 7/16; height, 9 1/4 inches.

STARTER

Rotation, L. H., Com. End
Auto-Lite, MAJ-4002

Connection to Engine—Bendix drive.

Running Free—60 amps. at 5.5 volts.

Cranking Engine—180 amps. at 5.2 volts, 200 R.P.M.

Lock Torque—10 pound-feet, 490 amps., 3.6 volts.

Brush Spring Tension—20 to 24 oz. on each.

Starting Switch—Located foot of steering column. Operated by pulling up on horn button.

IGNITION

Rotation, L. H., Top View
Auto-Lite, IGB-4032

Breaker—Contact separation .020 inch.

Contact Spring Tension—17 to 19 oz.

Timing—With No. 1 Piston on T.D.C. power stroke, spark fully advanced, rotor opposite No. 1 Dist. Cap Terminal; breaker points should just open.

Spark Plugs—Metric (Champion No. 11); Gap .025 inch.

Firing Order—1-5-3-6-2-4.

Manual Advance—14 degrees (on Flywheel).

Automatic Advance—22 degrees (on Flywheel).

Eng. R.P.M.	Degrees Advance (on Flywheel)	Dist. R.P.M.	Degrees Advance (on cam)
400	0	200	0
800	3	400	1.5
1200	6	600	3
2000	12	1000	6
2400	16	1200	8
3200	22	1600	11

GENERATOR

Rotation, L. H., Com. End

Auto-Lite, GAL-4131 (Belt Drive)

Performance Data—Gen. cold.

Amps.	R.P.M.	Volts	Amps.	R.P.M.	Volts
0	650	6.5	10	1075	7.3
2	720	6.6	14	1340	7.7
5	850	7	16	1800 (Max.)	8

Motoring Freely—5-5 1/2 amps. at 6 volts.

Max. Stall Current—16-19 amps. at 6 volts.

Field Test—4.7 amps. at 6 volts across field coils in series.

Field Fuse—(None).

Brush Spring Tension—20 to 24 oz. on each.

Third Brush Adjustment—Loosen cover band. See Fig. 13, P. 7, Sec. AA.

RELAY

Auto-Lite, CB-4014

Closes—7 to 7 1/2 volts.

Opens—1/2 to 2 1/2 amps. discharge.

Contact Gap—.025 to .035 inch.

Core Gap—.010 to .012 inch, contacts closed.

LIGHTING

Switch—Briggs & Stratton No. 50160.

Location—Foot of steering column. This unit is a combination starting switch, lighting switch, and horn switch, all controlled by horn button on steering wheel.

Fuses—Single 20 amp. fuse mounted on block under engine hood (left side).

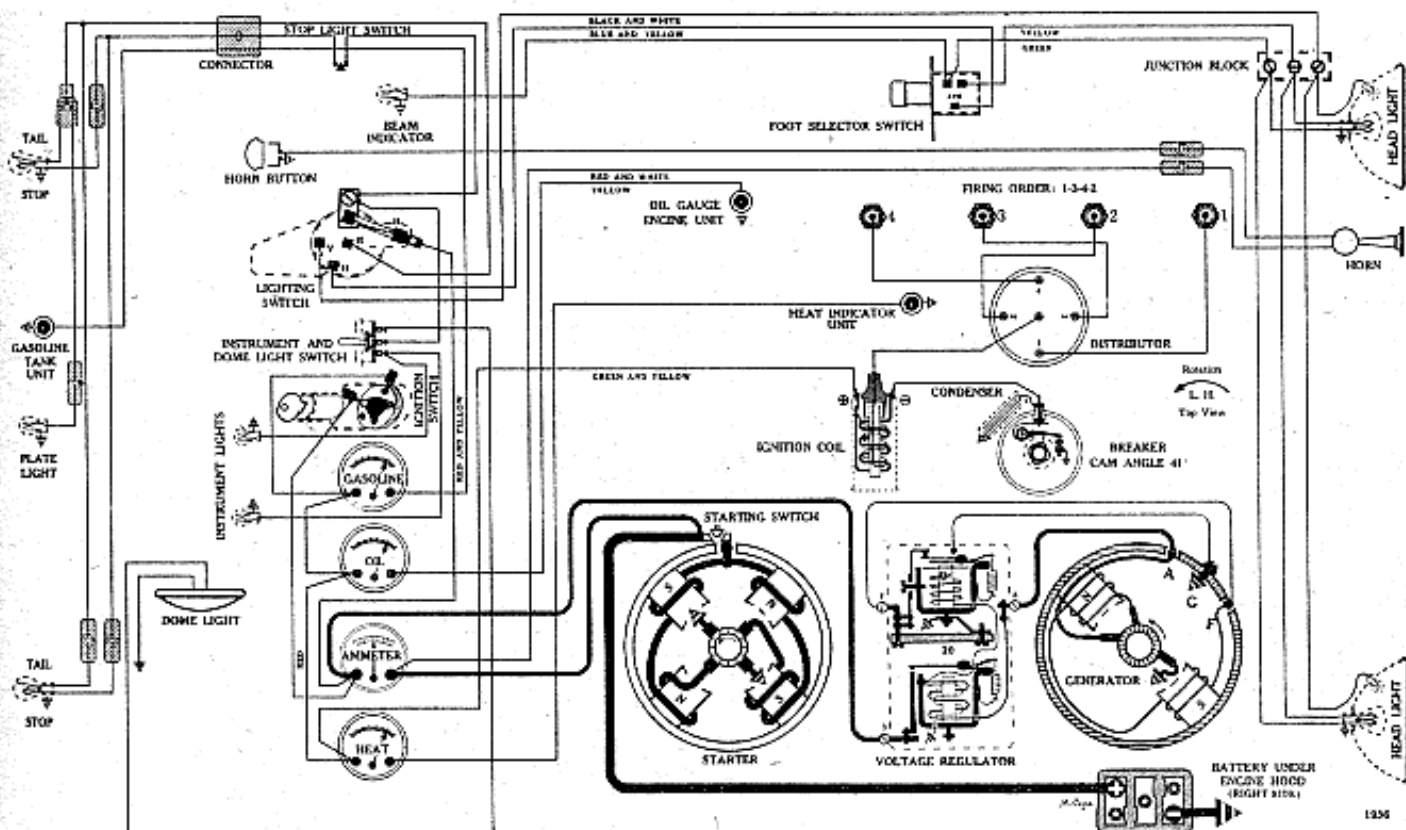
Lamps—See P. 3, Sec. AA. HEAD—1110 (Bifocal); PARK—63; INSTRUMENT—63; DOME—63; STOP and TAIL—1158.

NOTE: This is the old style Ford headlight bulb with two filaments. Make sure the 3 C.P. filament burns for tail light.

WILLYS

Engine { Bore 3-1/8
Stroke 4-3/8

Model 442, "Americar", 4 cyl., (1942)



BATTERY

Auto-Lite, AB-13, 6 Volts
Negative Terminal Grounded

Starting Capacity—96 amps. for 20 minutes.
minutes of Discharge at 300 Amps., Zero Degrees F.—2.0
Lighting Capacity—4 amps. for 20 hours (80 amp. hour).
Case—Length, 8-5/8; width, 7; height, 8-5/8 inches.

STARTER

A-L Test 162 Rotation, L. H., Com. End
Auto-Lite, MZ-4109

Connection to Engine—Bendix Drive, Type A-2233.
Running Free—70 amps. at 5-1/2 volts, 4300 R.P.M.
Stall Data—7.8 pound-feet, 420 amps. at 3 volts.
Brush Spring Tension—42 to 53 ounces on each (new brushes). Brush spring tension should be measured by a scale hooked under the brush spring at the bend just beyond the brush, and the reading taken at moment spring leaves the brush. The pull should be exerted at right angles to force exerted by the brush spring.
Starting Switch—Auto-Lite, SW-3737-S, mounted on starter. Switch should not close with less than 2.3 pounds pull, applied at right angles to hole in end of lever.
Armature—Auto-Lite, MZ-2089.

IGNITION

A-L Test 618 Rotation, L. H., Top View
Auto-Lite, IGW-4129

(Full Automatic Spark Advance in conjunction with Vacuum Chamber which moves the entire Distributor.)

Breaker—Contact separation .020 inch.

Cam Angle—41 degrees.

Percentage of Dwell—46%.

Contact Spring Tension—18 to 20 ounces.

Timing—Exact top dead center. Standard engines have cast iron cylinder heads with compression ratio of 6.48 to 1; optional high altitude iron heads available with ratio of 6.8 to 1. Aluminum heads have compression ratio of 7.0 to 1. Flywheel mark "TC-IGN", located at exact top dead center on flywheel, should register with center of timing hole in engine rear plate right side (below starting motor).

Spark Plugs—14-MM (Champion type J49); Gap .030 inch.

Firing Order—1-3-4-2.

Vacuum Distributor Control—Two used—(Auto-Lite, VC-4007; Test No. 626)—7 degrees advance (Dist.). Starts with vacuum of 3.60 inches of mercury. Requires a vacuum of 15 inches for full travel.

Vacuum Chamber Advance Table—Auto-Lite, VC-4007.

Inches of Mercury	Degrees Dist. Advance
3.60	Start
5.22	1
6.85	2
8.48	3
10.11	4
11.74	5
13.37	6
15.00	7

Vacuum Distributor Control (Auto-Lite, VC-4010; Test No. 467)—10 degrees advance (Dist.). Starts with vacuum of 3.50 inches of mercury. Requires a vacuum of 15 inches for full travel.

WILLYS

Model 442, "Americar", 4 cyl., (1942)

Inches of Mercury Degrees Dist. Advance

3.50	Start
4.65	1
5.80	2
6.95	3
8.10	4
9.25	5
10.40	6
11.55	7
12.70	8
13.85	9
15.00	10

Automatic Advance— $9\frac{1}{2}$ degrees (Distributor).

Eng. R.P.M. Dist. R.P.M. Degrees Advance (Dist.)

600	300	Start
852	426	1
1104	552	2
1356	678	3
1608	804	4
1862	931	5
2114	1057	6
2366	1183	7
2618	1309	8
2870	1435	9
3000 (Max.)	1500	$9\frac{1}{2}$

Condenser—Auto-Lite, IGB-1025. Capacity .20 to .25 microfarads.

Contact Point—Auto-Lite, IGP-33.

Breaker Lever and Point—Auto-Lite, IGW-3028.

Distributor—Auto-Lite, IGB-1239.

Distributor Cap—Auto-Lite, IGB-1241.

Ignition Coil—Auto-Lite, IG-4090-A.

Ignition Switch—H. A. Douglas Mfg. Co., No. 2980.

GENERATOR

Rotation, L. H., Com. End

Auto-Lite, GCJ-4811-A

Performance Data—Gen. cold.

Amps.	R.P.H.	Volts
0	825	6.20
2	870	6.38
4	915	6.55
6	960	6.70
8	1020	6.89
10	1075	7.05
12	1135	7.22
14	1200	7.38
16	1270	7.53
18	1340	7.70
20	1545	7.89
22	1545	8.05
24	1720	8.20
25	1850	8.30

Motoring Freely—4.0 to 4.4 amps. at 6 volts.

Max. Stall Current—28 to 30 amps. at 5.2 volts.

Field Test—1.9 to 2.1 amps. at 6 volts.

Brush Spring Tension—53 ounces max. on each (new brushes).

Brush spring tension should be measured by a scale hooked in hole at end of brush arm, and the pull exerted at right angles to force exerted by brush spring.

Main Brush Setting—The main brushes should be set 1 to $1\frac{1}{2}$ commutator bars ahead of neutral.

Third Brush Adjustment—Loosen cover band. Shift third brush by hand. Mounting plate held in any position by friction clamp washers. The third brush should be set 2 bars less 2 microns (min.) to 2 bars less 1 mica (max.) from the insulated main brush.

Armature—Auto-Lite, GCJ-2006-F.

RELAY REGULATOR

Auto-Lite, VRR-4004-A Neg. Ground

A combination of Cut-Out Relay and Vibrating Point Voltage Regulator.

CUT-OUT RELAY

Resistance of Voltage Winding—29.8 to 33.0 ohms.

Points Close—6.4 to 6.6 volts.

Points Open—4.2 to 4.8 volts (points open with a discharge of approximately 4 to 6 amperes).

Contact Point Gap—.015 inch minimum.

Armature Air Gap—.031 to .034 inch.

Armature Spring—12- $\frac{3}{4}$ turns.

VOLTAGE REGULATOR

Resistance of Voltage Winding—10.8 to 12.0 ohms.

Resistance Unit—Auto-Lite, TC-51-T, marked "20"; Ohms 19 to 21.

Armature Air Gap—.048 to .052 inch (the distance between core and underside of armature when contacts just open).

Contact Point Gap—.012 inch minimum (armature pressed down against stop pin).

Operating Voltage—7.3 to 7.6 (70° F.).

Armature Spring—14- $\frac{1}{2}$ turns.

LIGHTING

Switch—H. A. Douglas Mfg. Co., No. 5400.

Location—Behind instrument board.

Fuses—Single 20 amp. fuse (type SFE-20) on switch back protects all lighting circuits.

Instrument Light Switch—H. A. Douglas Mfg. Co., No. 5922.

Foot Selector Switch—H. A. Douglas Mfg. Co., No. 5530.

Lamps—HEAD—2320; PARKING—55; BEAM INDICATOR—51; INSTRUMENT—51; DOME—63; LICENSE PLATE—63; STOP AND TAIL—1158.