lock nut. See adjustment for Automatic Clutch linkage below.

Automatic Clutch Control—On cars with Automatic Clutch, check control linkage whenever clutch pedal is adjusted. Depress accelerator pedal, pull back on clutch control unit cable (left side of engine), check clearance between back of slot in cable yoke and clevis pin which attaches it to operating lever. This clearance should be 7/8".

Clutch Lubrication—Oil in clutch should be drained and replaced at 5000-15000 mile intervals. To drain oil, turn flywheel until filler plug is visible in inspection hole (left hand front face of flywheel housing), remove plug, turn flywheel until star stamped on flywheel is visible in inspection hole, allow at least one minute in this position for draining, turn flywheel until filler plug hole is visible, insert 1/3 pint Hudsonite Clutch Compound, replace filler plug.

Clutch Facings—Driven plate is 5 3/8" I.D., 8 5/8" O.D., .203" thick. Facing consists of 90 cork inserts mounted on driven plate.

STEERING:—Front Suspension—Conventional 'I' beam section front axle with Elliott type ends and semi-elliptic springs (standard), or Axle-flex articulated axle (optional). Data and adjustments for both types are the same.

Kingpin Inclination—7° crosswise.

Caster—3 1/4-3 3/4°. Adjust by inserting wedge shims between springs and spring pad on axle.

Camber—1/2°. No adjustment. Axle may be bent cold to correct camber.

Toe In—1/8" measured 10" above ground. Adjust by loosening tie rod end clamp bolts and rotating tie rod in direction that wheels revolve to increase toe-in, or in opposite direction to decrease toe-in.

NOTE—End thrust on kingpin is taken by five ball bearings in plug above kingpin. Bearing lower race is machined directly in kingpin end.

AUTOMATIC SHIFT (ELECTRIC HAND):—Bendix electro-pneumatic type optional on these cars. See article in Equipment Section for complete description, wiring diagram, and trouble shooting.

IGNITION:—Coil Model IG-4616. Resistance unit mounted on distributor connected in primary circuit.

Ignition Current—2.5 amperes idling, 4.5 stopped.

Ignition Switch—Electrolock. Connected to coil by armored cable.

Distributor Model IGB-4301-A (first 3790 cars), IGB-4301-B (Eng. No. 73791 up). Single breaker, 6 lobe cam, full automatic advance type.

Breaker Gap—Set at .020". Limits .018-.020".

Breaker Arm Spring Tension—16-22 ounces.

Cam Angles—Closed 40.5°. Open 19.5° (distributor).

Automatic Advance—IGB-4301-A

Distributor Degrees	R.P.M.	Engine Degrees	R.P.M.
Start	400	0	800
3	720	6	1440
6	1040	12	2080
9	1360	18	2720
12	1680	24	3360
15	2000	30	4000

Automatic Advance—IGB-4301-B

Start	300	0	600
3	400	6	800
5	615	10	1230
10	1150	20	2300
14.5	1630	29	3260

Removal:—Mounted on right side of crankcase. To remove, take out hold-down screw in advance arm, lift out.

IGNITION TIMING:— Flywheel Deg. Piston Pos.
First 3790 cars.....4 1/2° or 1/2° BTDC. .... .0101" BTDC.
Eng. No. 73791 up.....At TDC. .... .0000" TDC.

Timing Initial Setting)—With #1 piston on compression, turn engine over until piston reaches top dead center, stop when flywheel mark 'UDC.-1-6/' lines up with pointer on edge of inspection hole in left front face of flywheel housing above starter after Eng. No. 73791, or 1/2" before this point on first cars. Loosen hold-down screw in advance arm, turn distributor clockwise to limit of advance arm slot, then turn distributor slowly counter-clockwise until contacts just open, tighten hold-down screw, see that rotor is opposite #1 segment in distributor cap. Car should then be road-tested and spark advanced as much as operating conditions and fuel will allow.

Timing (Final Setting)—With engine at normal operating temperature, and running at 8 M.P.H. in high gear on level road, accelerate engine rapidly and note performance from 10-15 M.P.H. A slight spark knock should be noticed. If no knock is heard, loosen hold-down screw and advance distributor one graduation on scale (turn distributor counter-clockwise). If knock is too severe, retard distributor one graduation (clockwise). Repeat test until satisfactory setting is secured. Final setting must not be beyond maximum advance mark on flywheel (3/4" before mark 'UDC.1-6/).

Firing Order:—1-5-3-6-2-4. See diagram.

Spark Plugs:—Champion Type J-7-S. 14MM. Metric

Spark Plug Gaps—Set at .022".

BATTERY:—National, Type ST-3-17X. 6 volt, 17, plate, 96 A.H. capacity (20 hour rate).

Starting Capacity—120 amperes for 20 minutes.

Grounded Terminal—Positive (+) terminal.

Location—On left hand side under front floor boards.

STARTER:—Model MAB-4060. Armature MAB-2114.

Starter Drive—Inboard Bendix, Type A-1588.

Rotation—Counter-clockwise at commutator end.

Brush Spring Tension—44-56 ozs. (new brushes).

Cranking Performance—150 R.P.M.

Performance Data

Torque	R.P.M.	Volts	Amperes
0 ft. lbs.	3700	5.5	60
.6 "	1910	5.5	100
3.4 "	1100	5.0	200
6.6 "	695	4.5	300
10.15 "	420	4.0	400
15.8 "	Lock	3.0	582
22.5 "	Lock	4.0	775

Lock torque figures correct without switch.

Starting Switch:—Type SS-4001. Solenoid type switch mounted on starter field frame controlled by pushbutton switch on instrument panel. See Equipment Section.

Removal:—Starter flange mounted on left front face of flywheel housing. To remove, take out flange mounting bolts.

GENERATOR:—Model GBK-4602-1. Armature No. GBK-2055. Ventilated, third brush control type with external voltage regulation (two-step charging rate). See Equipment Section for complete data on Regulator.

Charging Rate Adjustment—Use test meters to check generator output. Short out voltage regulator by connecting jumper wire from 'F' terminal on generator to ground. Take off commutator cover band, shift third brush by hand, counter-clockwise to increase, or clockwise to decrease charging rate. Remove jumper wire.

Maximum Charging Rate—22 amperes (cold) or 18 amperes (hot), 8.0 volts, 2400 R.P.M., 28 M.P.H.

Performance Data

Cold—Regulator Inoperative—Hot

Amperes	Volts	R.P.M.	Amperes	Volts	R.P.M.
0	6.4	800	0	6.4	840
4	6.7	980	4	6.8	1025
8	7.0	1085	8	7.15	1200
12	7.3	1300	12	7.5	1450
16	7.55	1500	16	7.85	1760
22	8.0	2200	18	8.0	2400

Rotation—Counter-clockwise at commutator end.

Brush Spring Tension—18-22 ozs. (new brushes).

Motoring—4.46-4.94 amperes at 6.0 volts.

Field Current—3.75-4.15 amperes at 6.0 volts.

Field Fuse—5 amperes in knurled cup on side of regulator case.

Removal:—Pivot mounted at left front of engine with fan belt drive. To remove, take out two pivot bolts, one clamp bolt.

Belt Adjustment:—Loosen pivot bolts and clamp bolt, pull generator out from engine until slack on belt midway between crankshaft and generator pulleys is 1 1/4" (measure from straightedge across pulleys), tighten mounting bolts.

REGULATOR:—Model TC-4304-A. Consists of Cutout Relay and Current Regulator (Two-rate relay) in a single case on the dash. See Equipment Section for complete article on these units. Cutout relay has extra set of ground contacts for generator charging tell-tale signal light control.

Cutout Relay

Cuts in—6.4 volts, 750 R.P.M., 8 M.P.H.

Cuts out—.5-2.5 ampere discharge current.

Relay Contact Gap—.015-.045" (with upper or ground contacts closed—ground contacts must be open with main contacts closed).

Air Gap—.010-.030" with contacts closed.

Current Regulator

Contacts Open—8.45-8.95 volts at 70°F.

Contacts Close—1.1-1.3 volts below opening point.

Contact Gap—.005" minimum.

Air Gap—.045" with contacts closed.

LIGHTING:—Soreng-Manegold Switch Model 5770-A. R.B.M. Foot Control Switch, Model 1076, A. Foot switch used to control Country Driving (high) and City (low) beams with lighting switch in driving or second position. Headlight bulbs are pre-focused type.

Bulb Specifcations

Postion	Candlepower	Mazda No.
Headlights	32-21	2320-C
Parking, Instrument	3	63
Signal Lights	3	64 (DC)
Stop & Tail	21-2	1158
Dome	15	87

SIGNAL LIGHTS:—Battery Charge Tell-tale and Oil Pressure Tell-tale lights mounted on instrument panel. See Equipment Section for complete data.

HORNS:—Auto-Lite Type HA-4003, 4004 (Std), Klaxon Model KQ-26-M, Type 1716 (high note), 1717 (low note) matched tone, twin horns (optil.).

FUSES:—Lighting—Two 20 ampere capacity on switch.

Generator Field—5 ampere in regulator.

SERIAL NUMBER:—First number, (HT) 54-101, (HU) 55-101, (HHU) 56-101. On plate on engine side of dash. All model numbers will carry these prefixes: '54', '55', or '56'.

ENGINE NUMBER:—First number, 55,000. Stamped on left side of cylinder block opposite #8 cylinder.

ENGINE:—Own. Eight cylinder, In line, 'L' head type. **Bore**—3". **Stroke**—4½".
Piston Displacement—254.47 cubic inches.
Rated Horsepower—28.8.
Developed Horsepower—113 at 3800 R.P.M. (std. 6.0-1 head), 124 at 4000 R.P.M. (optl. 7.0-1 head).
Compression Ratio—6.0-1 (std. cast-iron head), 7.0-1 (optional aluminum-iron composite head).
Compression Pressure—110 lbs. at 150 R.P.M. (6.0-1 head), 128 lbs. at 150 R.P.M. (7.0-1 head) with all spark plugs removed and throttle wide open.
NOTE—High Octane type fuel must be used in engines with 7.0-1 ratio composite head.

Pistons:—Own Lo-Ex, silicon-aluminum alloy, 'T' slot, cam ground type. Refinish cylinders to take finished replacement pistons furnished in following sizes: B, D, F, J—standard bore (3.000-3.004"), BO, DO, FO, JO—ten-thousandths oversize (3.010-3.014"), BB, DD, FF—twenty-thousandths over size (3.020-3.022"). Piston length, 3 3/16".
Weight—10.88 ozs. stripped, 12.99 ozs. with rings and pin.
Removal—Pistons and rods removed from above.
Clearance—Top .016". Bottom .001"
Fitting New Pistons—Use feeler stock .0015-.002" thick to check clearance. It should be possible to withdraw feeler from between piston and cylinder bore on side opposite slot when grasped between thumb and forefinger.
Installing Pistons—Slot should be to left or away from valves.

Piston Rings:—Two compression rings, one oil control ring above pin, one oil control ring below pin. Lower ring groove drilled radially with oil drain holes.

Ring	Width	End Gap.	Wall Thickness
Comp.	.093"	.006-.016"	.123"
Oil Cont.	.187"	.006-.016"	.128"

Piston Pin:—Diameter ¾". Length 2 7/16". Pin floats in piston and rod. Held by retaining rings.
Pin Fit in Piston—Snug fit with piston at 200°F.
Clearance in Rod Bushing—.0003".

Connecting Rod:—Weight 28.96 ozs. Length 8 3/16".
Lower Bearing—Spun-babbitt lined type.
Crankpin Journal Diameter—1 15/16".
Clearance—.001". Sideplay, .006-.010".
Adjustment—Laminated shims. Do not file caps.
Installing Rods—Connecting rod lower bearings offset. Install rods with right hand offset (widest half of bearing toward rear) in cylinders #1, 3, 5, 7 and rods with left hand offset (widest half toward front) in cylinders #2, 4, 6, 8.

Crankshaft:—Five bearings. Eight counterweights.
Journal Diameters—#1, 2 9/32"; #2, 2 5/16"; #3, 2 11/32"; #4, 2⅝"; #5, 2 13/32".
Bearing Type—Removable bronze-backed, babbitt-lined.
Clearance—.001".
Adjustment—Laminated shims. Do not file caps.
End Thrust—Taken by #3 center bearing. Endplay, .006-.012".

Camshaft:—Five bearing. Gear driven.
Timing Gears—Crankshaft gear Steel. Camshaft gear GE. Bakelite.
End Thrust—Taken by spring-loaded plunger in camshaft gear and thrust plate on gear cover.
Camshaft Setting—Gears are marked. Mesh marked tooth on crankshaft gear between two marked teeth on camshaft gear.

Valves:—	Head Diameter	Stem Diameter	Length
Intake	1½"	5/16"	5 3/32"
Exhaust	1⅜"	5/16"	5 3/32"

	Seat Angle	Lift	Stem Clearance
Intake	45°	11/32"	.0015-.003"
Exhaust	45°	11/32"	.003-.005"

Tappet Clearance—.006" Int., .008" Exh. engine hot.
Valve Springs—Cages installed on all springs at bottom. Install with open side toward cylinder.

	Spring Pressure	Length
Valve Closed	44 lbs.	2"
Valve Open	102 lbs.	1 21/32"

Valve Timing—See Camshaft Setting (above).
Intake Valves—Open 10°40' BTDC. Close 60° ALDC.
Exhaust Valves—Open 50° BLDC. Close 18°44' ATDC.
To Check Valve Timing—Set tappet clearance #1 intake valve at .010". This valve should open with piston 10°40' or .0494" before top dead center when a point in the flywheel approximately 3.97 teeth before the dead center mark 'UDC.1-8' lines up with the indicator on the housing.

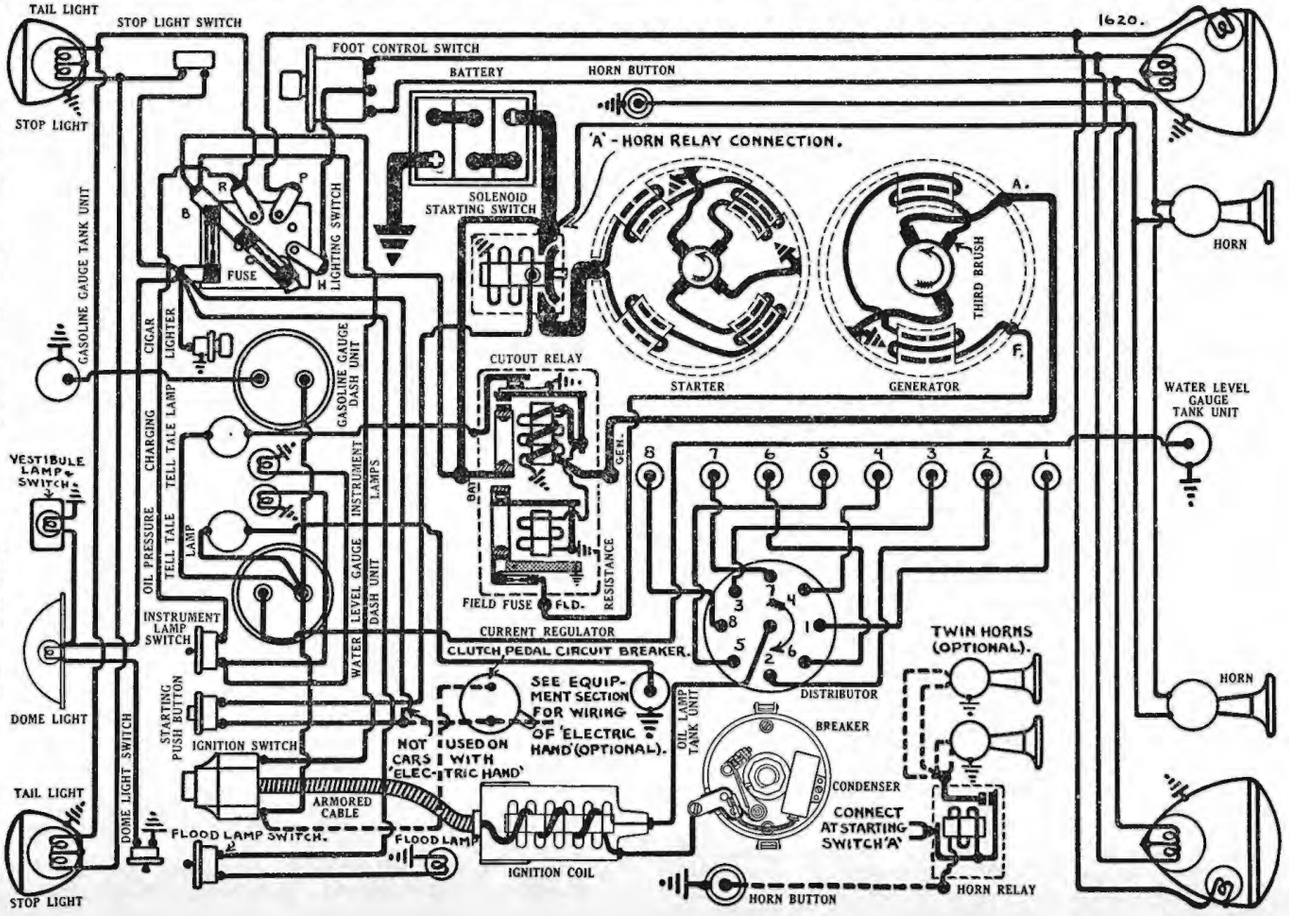
Lubrication:—Duo-flow (splash) system with positive pump feed to oil troughs and timing gears. Oscillating plunger type oil pump mounted on right side of crankcase.
Normal Oil Pressure—3 lbs.
Oil Pressure Relief Valve—Operates at 3 lbs. Located on right hand side of crankcase at rear (combined with oil pressure signal light switch). See Signal Lights in Equipment Section. No adjustment required.
Capacity and Oil—7 qts. (refill), 9 qts. (dry). Use SAE. #30 (above 40°F.), #20-W (40° to 0°F.), #10-W (0° to —15°F.).

CARBURETION:—See Carburetion Section for data.
Carburetor:—Carter, Model 310-S, 1¼" downdraft type with drop-bar type Fast Idle.
Automatic Choke—Carter Climatic Control.

Fuel Pump:—A.C., Type R-1521540 diaphragm type.

Gasoline Gauge:—King-Seeley electric type.

CLUTCH:—Own make. Single plate type operating in oil. No adjustment for wear required.
Clutch Pedal Adjustment—Free movement of clutch pedal must be 1½". To adjust, loosen lock nut on clutch pedal connecting link, remove clevis pin at lower end of link, turn clevis until free movement of pedal is 1½", replace pin and tighten lock nut. See adjustment for automatic clutch linkage below.
Automatic Clutch Control—On cars with automatic clutch, check control linkage whenever



clutch pedal is adjusted. Depress accelerator pedal, pull back on clutch control unit cable (left side of engine), check clearance between back of slot in cable yoke and clevis pin which attaches it to operating lever. This clearance should be ⅞".

Clutch Lubrication—Oil in clutch should be drained and replaced at 5000-15000 mile intervals. To drain oil, turn flywheel until filler plug is visible in inspection hole (left hand front face of flywheel above starter), remove plug, turn flywheel until star stamped on flywheel face is visible in inspection hole, allow at least 1 minute in this position for draining, turn flywheel until filler plug is visible, insert 1/3 pint Hudsonite Clutch Compound, replace filler plug.

Clutch Facings—Driven plate is 6⅜" I.D., 9¾" O.D., .203" thick. Facing consists of 108 cork inserts mounted on driven plate.

STEERING:—Front Suspension—Conventional 'I' beam section front axle with Elliott type ends and semi-elliptic springs, or Axleflex articulated axle. Data and adjustment for both types are the same.

Kingpin Inclination—7° crosswise.

Caster—4-4½°. Adjust by inserting wedge shims between spring and spring pad on axle. Caster on both front wheels must be equal within ½°.

Camber—1-1½°. No adjustment. Axle may be bent cold to correct camber.

Toe In—⅛" measured 10" from ground. Adjust by loosening tie rod end clamp bolts and rotating tie rod.

NOTE—End thrust on kingpin is taken by five ball bearings in plug above kingpin. Bearing lower race is machined directly in kingpin end.

AUTOMATIC SHIFT: (ELECTRIC HAND):—Bendix electro-pneumatic type optional on Models HT, HU, standard on Model HHU. See article in Equipment Section for complete description, wiring diagram and trouble shooting on this unit.

IGNITION:—Coil Model CE-4606. Resistance mounted on distributor connected in primary circuit.

Ignition Current—2.5 amperes idling, 4.5 stopped.

Ignition Switch—Electrolock. Connected to coil by armored cable.

Distributor Model IGP-4001-A (first 10246 cars), IGP-4001-B (Eng. No. 65247 up). Single breaker, 8 lobe cam, full automatic advance type.

Breaker Gap—Set at .020". Limits .018-.020".

Breaker Arm Spring Tension—18 ozs. minimum, 20 ozs. maximum.

Cam Angles—Closed 29°. Open 16° (distributor).

Automatic Advance—IGP-4001-A

Distributor		Engine	
Degrees	R.P.M.	Degrees	R.P.M.
Start	400	0	800
4	760	8	1520
8	1120	16	2240
12	1500	24	3000
17½	2000	35	4000

Automatic Advance—IGP-4001-B

Start	300	0	600
3	400	6	800
5	575	10	1150
10	1025	20	2050
15	1475	30	2950
17.5	1700	35	3400

Removal:—Mounted on right hand side of crankcase. To remove, take out hold-down screw in advance arm.

IGNITION TIMING:— Flywheel Degs. Piston Posi.
First 10246 cars.....4½° or ½" BTDC. .....0089" BTDC.
Eng. No. 65247 up.....At TDC. .0000" TDC.

Timing (Initial Setting)—With #1 piston on compression, turn engine over until piston reaches top dead center, stop when flywheel mark 'UDC.1-8/' lines up with pointer in inspection hole in left front face of flywheel housing above starter (after 10247 cars, or ½" before this point on first cars). Loosen hold-down screw in advance arm, rotate distributor clockwise to limit of advance arm slot, then turn distributor slowly counter-clockwise until contacts just open, tighten hold-down screw, see that rotor is opposite #1 segment in distributor cap. Car should then be road-tested and spark advanced as much as operating conditions and fuel will allow.

Timing (Final Setting)—With engine at normal operating temperature, and running at 7 M.P.H. in high gear on level road, accelerate engine rapidly and note performance from 10-15 M.P.H. A slight spark knock should be noticed. If no knock is heard, loosen hold-down screw and advance distributor one graduation on scale (turn distributor counter-clockwise). If knock is too severe, retard distributor one graduation (turn distributor clockwise). Repeat test until satisfactory setting is secured. Final setting must not be beyond maximum advance mark on flywheel ¾" before mark 'UDC.1-8/').

Firing Order:—1-6-2-5-8-3-7-4. See diagram.

Spark Plugs:—Champion Type J-7-S. 14 MM. Metric.

Spark Plug Gaps—Set at .022".

BATTERY:—Exide, Type XTL-19-17-F. 6 volt, 19 plate, 108 A.H. capacity (20 hour rate).

Starting Capacity—130 amperes for 20 minutes.

Grounded Terminal—Positive (+) terminal.

Location—On left hand side under front floor.

STARTER:—Model MAB-4061. Armature MAB-2113.

Starter Drive—Inboard Bendix, Type A-1678.

Rotation—Counter-clockwise at commutator end.

Brush Spring Tension—44-56 ozs. (new brushes).

Cranking Performance—150 R.P.M.

Performance Data

Torque		R.P.M.	Volts	Amperes
0	ft. lbs.	3700	5.5	60
.6	"	1910	5.5	100
3.4	"	1100	5.0	200
6.6	"	695	4.5	300
10.15	"	420	4.0	400
15.8	"	Lock	3.0	582
22.5	"	Lock	4.0	775

Lock torque figures correct without switch.

Starting Switch:—Type SS-4001. Solenoid type switch mounted on starter field frame controlled by pushbutton switch (see Equipment Section).

Removal:—Starter flange mounted on left front face of flywhel housing. To remove, take out flange mounting bolts.

GENERATOR: — Model GBK-4602-1. Armature No. GBK-2055. Ventilated, third brush control type with external voltage regulation (two-step charging rate). See Equipment Section for complete data on Regulator.

Charging Rate Adjustment—Use test meters to check generator output. Short out voltage regulator by connecting jumper wire from 'F' terminal on generator to ground. Take off commutator cover band, shift third brush by hand, counter-clockwise to increase, or clockwise to decrease charging rate. Remove jumper wire.

Maximum Charging Rate—22 amperes (cold or 18 amperes (hot), 8.0 volts, 2400 R.P.M., 28 M.P.H.

Performance Data

Cold—Regulator			Inoperative—Hot		
Amperes	Volts	R.P.M.	Amperes	Volts	R.P.M.
0	6.4	800	0	6.4	840
4	6.7	980	4	6.8	1025
8	7.0	1085	8	7.15	1200
12	7.3	1300	12	7.5	1450
16	7.55	1500	16	7.85	1760
22	8.0	2200	18	8.0	2400

Rotation—Counter-clockwise at commutator end.

Brush Spring Tension—18-22 ozs. (new brushes).

Motoring—4.46-4.94 amperes at 6.0 volts.

Field Current—3.75-4.15 amperes at 6.0 volts.

Field Fuse—5 ampere in knurled cup on side of regulator case.

Removal:—Pivot mounted at left front of engine with fan belt drive. To remove, take out two pivot bolts, one clamp bolt.

Belt Adjustment—Loosen pivot bolts and clamp bolt, pull generator out from engine until slack on belt midway between crankcase and generator pulleys is 1¼" (measure from straightedge across pulleys), tighten mounting bolts.

REGULATOR:—Model TC-4304-A. Consists of Cut-out Relay and Current Regulator (Two-rate relay) in a single case on the dash. See Equipment Section for complete article on these units. Cutout relay has extra set of ground contacts for generator charging tell-tale signal light control.

Cutout Relay

Cuts In—6.4 volts, 750 R.P.M., 8 M.P.H.

Cuts Out—.5-2.5 ampere discharge current.

Relay Contact Gap—.015-.045" (with upper or ground contacts closed—ground contacts must be open with main contacts closed).

Air Gap—.010-.030" with contacts closed.

Current Regulator

Contacts Open—8.45-8.95 volts at 70°F.

Contacts Close—1.1-1.3 volts below opening point.

Contact Gap—.005" minimum.

Air Gap—.045" with contacts closed.

LIGHTING:—Soreng-Manegold Switch Model 5770-A. R.B.M. Foot Control Switch, Model 1076, A. Foot switch used to control Country Driving (high) and City (low) beams with lighting switch in driving or second position. Headlight bulbs are pre-focused type.

Bulb Specifications

Position	Candlepower	Mazda No.
Headlights	32-21	2320-C
Parking, Instrument	3	63
Signal Lights	3	64(DC)
Stop & Tail	21-2	1158
Dome	15	87

SIGNAL LIGHTS:—Battery Charge tell-tale and Oil Pressure tell-tale lights mounted in instrument cluster. See Equipment Section for complete data.

HORNS:—Auto-Lite Type HA-4003, 4004 (Std. on HT, HU). Klaxon Model K-33-C, Type 1901 high note, 1902 low note, (Optl. on HT, HU, Std. on HHU). Klaxon horns are matched tone, twin horns, operated by horn relay.

Horn Relay:—Model 268-T. Current draw .8 amps.

Contact Gap—.015-.025".

Air Gap—.012-.017 with contacts closed.

FUSES:—Lighting—Two 20 ampere on switch.

Generator Field—5 ampere in regulator.

SERIAL NUMBER:—First number, D-5001. On left hand frame side rail or on plate on right side of dash under the engine hood.

ENGINE NUMBER:—Stamped on left hand side of crankcase.

ENGINE:—Own Model D. Six cylinder, 'L' head type.
Bore—3½". **Stroke**—4¼".
Piston Displacement—245.3 cubic inches.
Rated Horsepower—29.42.
Developed Horsepower—101 at 3600 R.P.M.
Compression Ratio—5.75-1 Std. 6.20-1 Optl.
Compression Pressure—145 lbs. at 3100 R.P.M. or 110 lbs. at 150 R.P.M. (cranking speed) for Std. 5.75-1 ratio head.

Pistons:—Bohn, aluminum alloy, Invar strut, split skirt type. Piston length 4 3/32".
Weight—21.7 ozs. stripped, 28.1 ozs. with rings and pin.
Removal—Pistons and rods removed from above.
Clearance—.0205-.0260" top, .0025" skirt.
Fitting New Pistons—Use .002" feeler stock to check clearance. Pull required to withdraw feeler from between piston and cylinder wall on side opposite slot must be between 10-13 lbs.
Installing Pistons—Slot should be toward left or away from camshaft side. Pin hole in piston offset 1/16" toward camshaft side.

Piston Rings:—Two compression, two oil control rings per piston, all above pin. Both oil ring grooves drilled radially with oil drain holes.

Ring	Width	End Gap	Wall Thickness
Comp.	⅛"	.007-.012"	.150"
Oil Cont.	.1545-.1550"	.007-.015"	.150"

Piston Pin:—Diameter ⅞". Length 2 15/16". Pin floats in piston and rod. Held by retaining rings.
Pin Fit in Piston—Hand push fit with piston heated to 150°F.
Pin Clearance in Rod Bushing—.0005".
NOTE—Pin hole in piston is offset 1/16".

Connecting Rod:—Weight 35 ozs. Length 8¼".
Crankpin Journal Diameter—2⅛".
Lower Bearing Type—Steel-backed, babbitt-lined.
Clearance—.0005-.001". Sideplay .005-.010".
Adjustment—None (no shims). Replace bearings.
Installing Rods—Lower bearings are offset. Install rods with narrow half of bearing toward nearest main bearing or pointing toward front of engine for #1, 3, 5 and toward rear for #2, 4, 6.

Crankshaft:—Four bearing. Integral counterweights.
Journal Diameters—#1, 2.580"; #2, 2.560"; #3, 2.540"; #4, 2.520" (first cars); 2.560"—all bearings (later cars).
Bearing Types—Bronze-backed, babbitt-lined (first cars), steel-backed, babbitt-lined (later cars).
Clearance—.0015"-.002".
Adjustment—Solid shims provided on first cars. No shims used on later cars. Replace bearings when necessary. Do not file bearing caps.
End Thrust—Taken by #2 bearing. Endplay .004-.005".

Camshaft:—Four bearing. Non-adjustable chain drive.
Timing Chain—Morse #1866. Width 1". Pitch .500". Length 25½" or 51 links.
Camshaft Setting—Sprockets are marked. Mesh chain with sprockets turned so that marks are adjacent and in line with a straightedge across the shaft centers.

Valves:—

	Head Diameter	Stem Diameter	Length
Intake	1 21/32"	.3405-.3415"	4 7/16"
Exhaust	1 17/32"	.3405-.3415"	4 7/16"

	Seat Angle	Lift	Stem Clearance
Intake	45°	11/32"	.0015" max.
Exhaust	45°	11/32"	.0015" max.

Tappet Clearance—.010" Int., .013" Exh. running clearance with engine warm. Clearance for timing is .014" Int. opening, .018" Int. closing, .017" Exh. opening, .021" Exh. closing.

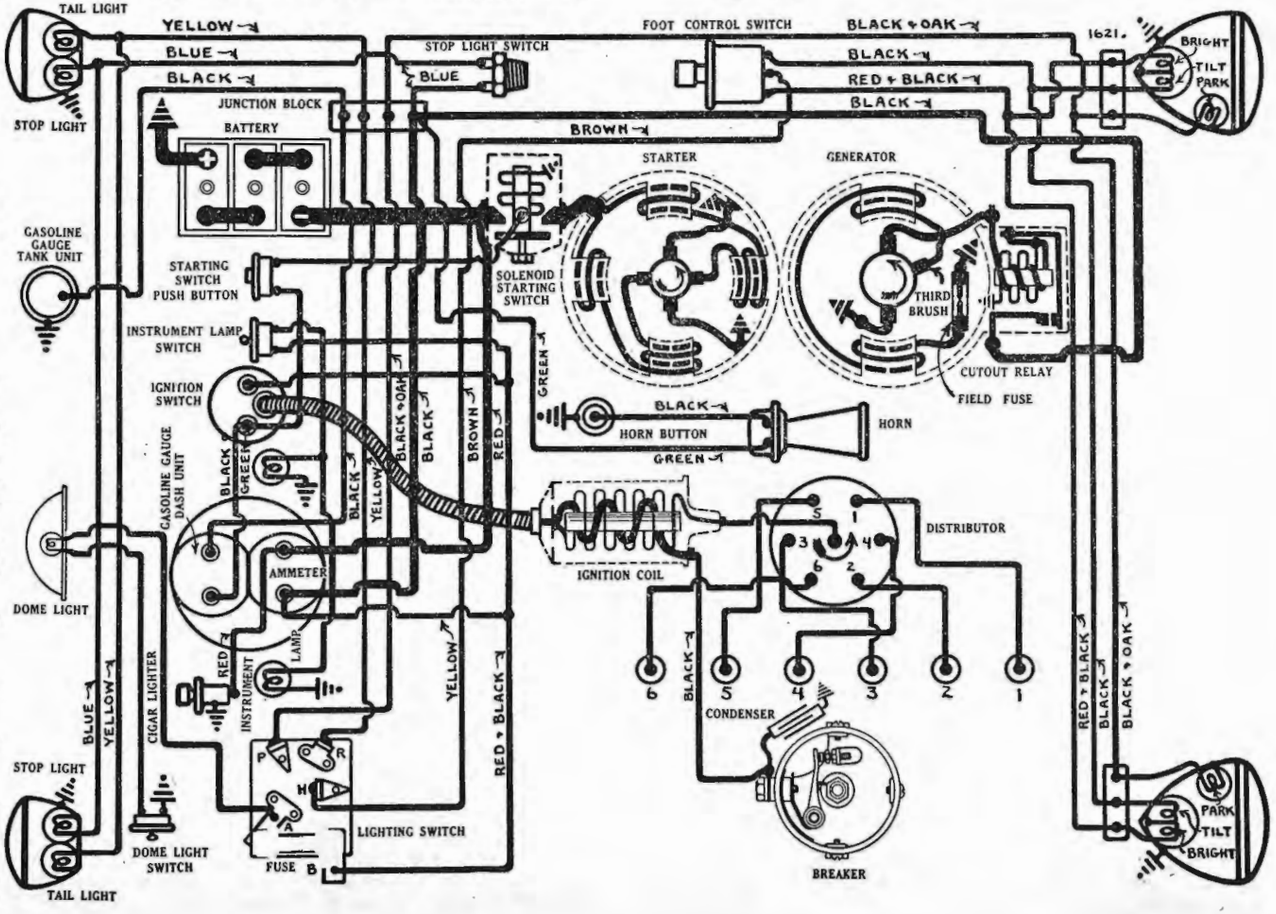
Valve Springs:—	Spring Pressure	Length
Valve Closed	40 lbs.	1 13/16"
Valve Open	100 lbs.	1 15/32"

Valve Timing—See Camshaft Setting above.
Intake Valves—Open 2° BTDC. Close 51° ALDC.
Exhaust Valves—Open 44° BLDC. Close 3° ATDC.
To Check Valve Timing:—Set tappet clearance of #1 valves at .014" Int., .021" Exh. With #6 piston on top dead center entering power stroke and flywheel mark 'DC/1-6' lined up with finished bosses on right front face of flywheel housing, #1 intake and exhaust valves should be closed. Reset tappet clearance at .010" Int., .013" Exh.

Lubrication:—Pressure. Gear type oil pump located on right hand side of crankcase.
Normal Oil Pressure—3-5 lbs. idling, 30 lbs. at 30 M.P.H. with engine warm.
Oil Pressure Relief Valve—Located on oil pump cover. Operates at 45 lbs. Adjustable by turning screw on relief valve cover in or clockwise to increase pressure, and out or counter-clockwise to decrease pressure.
Capacity and Oil—6 qts. Use SAE. #30 (normal summer temperatures), #40 (extremely warm temperatures), #20 (winter).

CARBURETION:—See Carburetion Section for complete data on Carburetor, Fuel Pump, and Gasoline Gauge.
Carburetor:—Stromberg, Model EX-32, 1½" downdraft type (first cars), Carter, Model 316-S (later cars).
Fuel Pump:—A.C., Type T-1521811 diaphragm type.
Gasoline Gauge:—Stewart electric type.

CLUTCH:—Borg & Beck, Model 10A6. Single plate, dry disc type. No adjustment required for wear.
Clutch Pedal Adjustment—Free movement of clutch pedal should be ¾-1". Check at 1000-mile intervals. To adjust, loosen clutch pedal adjusting bolt.



Clutch Facings—Moulded type, 2 required, 6⅛" I.D., 9⅞" O.D., ⅛" thick.

NOTE—Use gauge plate to set up release levers when reassembling clutch. Release lever heights must be equal within .005".

STEERING:—Front Suspension—Conventional tubular section front axle with Reverse-Elliott ends and semi-elliptic springs.
Kingpin Inclination—7½° crosswise.
Caster—1½°. Adjust by installing wedge shims between spring and spring pad on axle.
Camber—1½°. No adjustment provided.
Toe In—1/16-3/16". Adjust in usual manner by changing length of tie rod.

IGNITION:—Coil Model IG-4619.
Ignition Current—2½ amperes idling, 4-5 stopped.
Ignition Switch—Part of coil assembly (connected to coil by armored cable).

Distributor Model IGB-4319. Single breaker, 6 lobe cam, full automatic advance type. Manual advance consists of adjustment at distributor.
Breaker Gap—Set at .018-.020".
Breaker Arm Spring Tension—16-22 ounces.
Cam Angles—Closed 40°. Open 20° distributor.
Manual Advance—12° (engine). Slot in advance arm permits distributor to be advanced or retarded 6° from center '0' position.

Automatic Advance

Distributor		Engine	
Degrees	R.P.M.	Degrees	R.P.M.
Start	400	0	800
2	680	4	1360
4	970	8	1940
6	1260	12	2520
7	1400	14	2800

Removal:—Distributor mounted on left side of crankcase. To remove, take out hold-down screw in advance arm.

IGNITION TIMING:— Flywheel Degs. Piston Position
All engines ..... 7° BTDC. ..... .022" BTDC.
Timing—With piston #1 on compression, turn engine over until piston is 7° or .022" before top dead center, stop when ignition mark on flywheel lines up with finished bosses on right hand front face of clutch housing. This mark is 7° before the top dead center mark 'DC/1-6'. Loosen hold-down screw in advance arm, center pointer on scale, tighten hold-down screw. Loosen advance arm clamp bolt and rotate distributor until contacts begin to open, tighten clamp bolt, see that rotor is opposite #1 segment in distributor cap, check spark plug connections (see diagram).

Firing Order:—1-5-3-6-2-4 (see diagram).

Spark Plugs:—Champion Type C7-A. 18 MM. Metric.
Spark Plug Gaps—Set at .0275-.030".

BATTERY:—Willard, Type WS-2-15, R-2-15 (export). 6 volt, 15 plate, 100 A.H. capacity (20 hour rate).
Starting Capacity—122 amperes for 20 minutes.
Grounded Terminal—Positive (+) terminal.
Location—On left side under front floor boards.

STARTER:—Model MAJ-4039. Armature No. MAJ-2048.
Starter Drive—Inboard Bendix Type LCD-11FX-10.
Rotation—Counter-clockwise at commutator end.
Brush Spring Tension—31-42 ozs. (new brushes).
Cranking Performance—160 R.P.M.

Performance Data

Torque	R.P.M.	Volts	Amperes
0 ft. lbs.	4100	5.5	67
.3 "	2500	5.5	100
2.25 "	1450	5.0	200
4.6 "	960	4.5	300
7.3 "	575	4.0	400
10.3 "	225	3.5	500
12.0 "	Lock	3.0	550
17.0 "	Lock	4.0	750

Starting Switch:—Model SS-4002. Solenoid type mounted on starter and controlled by pushbutton on instrument panel. See Equipment Section for complete data.

Removal:—Starter flange mounted on left front face of flywheel housing. To remove, take out two flange capscrews.

GENERATOR: — Model GBK-4604. Armature No. GBK-2055. Air cooled. Third brush control type.
Charging Rate Adjustment—Take off commutator cover band, shift third brush by hand counter-clockwise to increase, or clockwise to decrease charging rate. Third brush held in position by friction.
Maximum Charging Rate—20 amperes (cold), 17 amperes (hot), 8.0 volts, 2200 R.P.M., 29-30 M.P.H.

Performance Data

Cold			Hot		
Amps.	Volts	R.P.M.	Amps.	Volts	R.P.M.
0	6.4	840	0	6.4	850
4	6.7	1000	4	6.8	1040
8	7.05	1160	8	7.2	1200
12	7.4	1325	12	7.55	1480
16	7.7	1550	16	7.95	2000
20	8.0	2200	17	8.0	2400

Rotation—Counter-clockwise at commutator end.
Brush Spring Tension—18-22 ozs. (new brushes).
Field Current—3.94-4.36 amperes at 6.0 volts.
Field Fuse—5 amperes under cover on generator field frame.
Motoring Current—4.56-5.04 amperes at 6.0 volts.

NOTE—Commutator end bearing cannot be serviced due to special construction of commutator end plate. Install new Part No. GAM-2050E.

Removal:—Generator pivot mounted at left front of engine with fan belt drive. To remove, take out two pivot bolts and one clamp bolt.
Belt Adjustment—Inspect at 1000-mile intervals. Adjust in usual manner by loosening pivot and clamp bolts and swinging generator away from engine to take up all slack in belt.

CUTOUT RELAY:—Model CB-4023. Mounted on generator. See Equipment Section for complete data on this unit.
Cuts In—6.75-7.5 volts, 10 M.P.H.
Cuts Out—.5-2.5 ampere discharge current.
Contact Gap—.025-.035".
Air Gap—.010-.030" with contacts closed.

LIGHTING:—Cole (Hersee) Switch. R.B.M., Type 1050A Foot Control Switch. Foot operated switch is used to control headlamp upper and lower beams. Headlamp bulbs are pre-focused type.

Bulb Specifications

Position	Candlepower	Mazda No.
Headlamps	32-21	2320-C
Parking, Instr., Tail	3	63
Stop	15	87
Dome	6	81

FUSES:—Lighting—20 amperes on back of lighting switch.
Generator Field—5 amperes under fuse cover on generator field frame.

HORNS:—Auto-Lite Vibrator type. Horn current 12 amperes.

SERIAL NUMBER:—First number, O-5001. On plate on right side of dash under engine hood.

ENGINE NUMBER:—Stamped on left side of crankcase.

ENGINE:—**Own Model O.** Eight cylinder, In Line, 'L' head type.
Bore—3 3/16". **Stroke**—4¾".
Piston Displacement—303.2 cubic inches.
Rated Horsepower—32.51.
Developed Horsepower—120 at 3500 R.P.M.
Compression Ratio—5.80-1. No optional ratios.
Compression Pressure—142 lbs. at 2300 R.P.M. or 105 lbs. at 150 R.P.M. (cranking speed).

Pistons:—Bohn, aluminum alloy, Invar Strut, split skirt type. Piston length 3⅞". Standard cylinder bore is 3.1875" and second standard bore is .020" oversize.
Weight—18.4 ozs. stripped, 23.7 ozs. with rings and pin.
Removal—Pistons and rods removed from below.
Clearance—Skirt .002". See Fitting Pistons.
Fitting New Pistons—Use .002" feeler stock to check clearance. Pull required to withdraw feeler from between piston and cylinder wall on side opposite slot must be between 8-10 lbs.
Installing Pistons—Slot should be toward left or away from camshaft side. Pin hole in piston is offset 1/16" toward camshaft.

Piston Rings:—Two compression, two oil control rings per piston, all above pin. Both oil ring grooves drilled radially with oil drain holes.

Ring	Width	End Gap	Wall Thickness
Comp.	⅛"	.007-.012"	.140"
Oil Cont.	5/32"	.007-.015"	.140"

Piston Pin:—Diameter ⅞". Length 2 23/32". Pin floats in piston and rod. Held by retaining rings.
Pin Fit in Piston—Hand push fit with piston heated to 150°F.
Clearance in Rod Bushing—.0005".

Connecting Rod:—Weight 39.4 ozs. Length 9½".
Crankpin Journal Diameter—2⅜".
Lower Bearing Type—Steel-backed, babbitt-lined.
Clearance—.0015-.002". Sideplay .005-.010".
Adjustment—None (no shims). Replace bearings.
Installing Rods—Lower bearings are offset. Install rods with narrow half of bearing toward nearest main bearing or pointing toward front of engine for #1, 3, 5, 7 rods and toward rear for #2, 4, 6, 8.

Crankshaft:—Five bearing. Integral counterweights.
Journal Diameters—2.665" all bearings.
Bearing Type—Steel-backed, babbitt-lined.
Clearance—.001-.003".
Adjustment—None (no shims). Replace bearings. Do not file bearing caps.
End Thrust—Taken by center bearing. Endplay .004-.008".

Camshaft:—Six bearing. Non-adjustable chain drive.
Timing Chain—Morse Type 766. Width 1¼". Pitch .375". Length 24¾" or 66 links.
Camshaft Setting—Sprockets are marked. Mesh chain so there are exactly 15 links between marks on sprockets or 16 teeth inclusive of teeth meshed opposite marks.

Valves:—

	Head Diameter	Stem Diameter	Length
Intake	1 17/32"	.3405-.3415"	5⅛"
Exhaust	1 13/32"	.3405-.3415"	5⅛"

	Seat Angle	Lift	Stem Clearance
Intake	45°	.325"	.0015" Max.
Exhaust	45°	.325"	.0015" Max.

Tappet Clearance—.006" Int., .013" Exh., running clearance with engine warm. Clearance for timing is .010" intake, .017" exhaust.

Valve Springs:—

	Spring Pressure	Length
Valve Closed	40 lbs.	1 13/16"
Valve Open	100 lbs.	1 15/32"

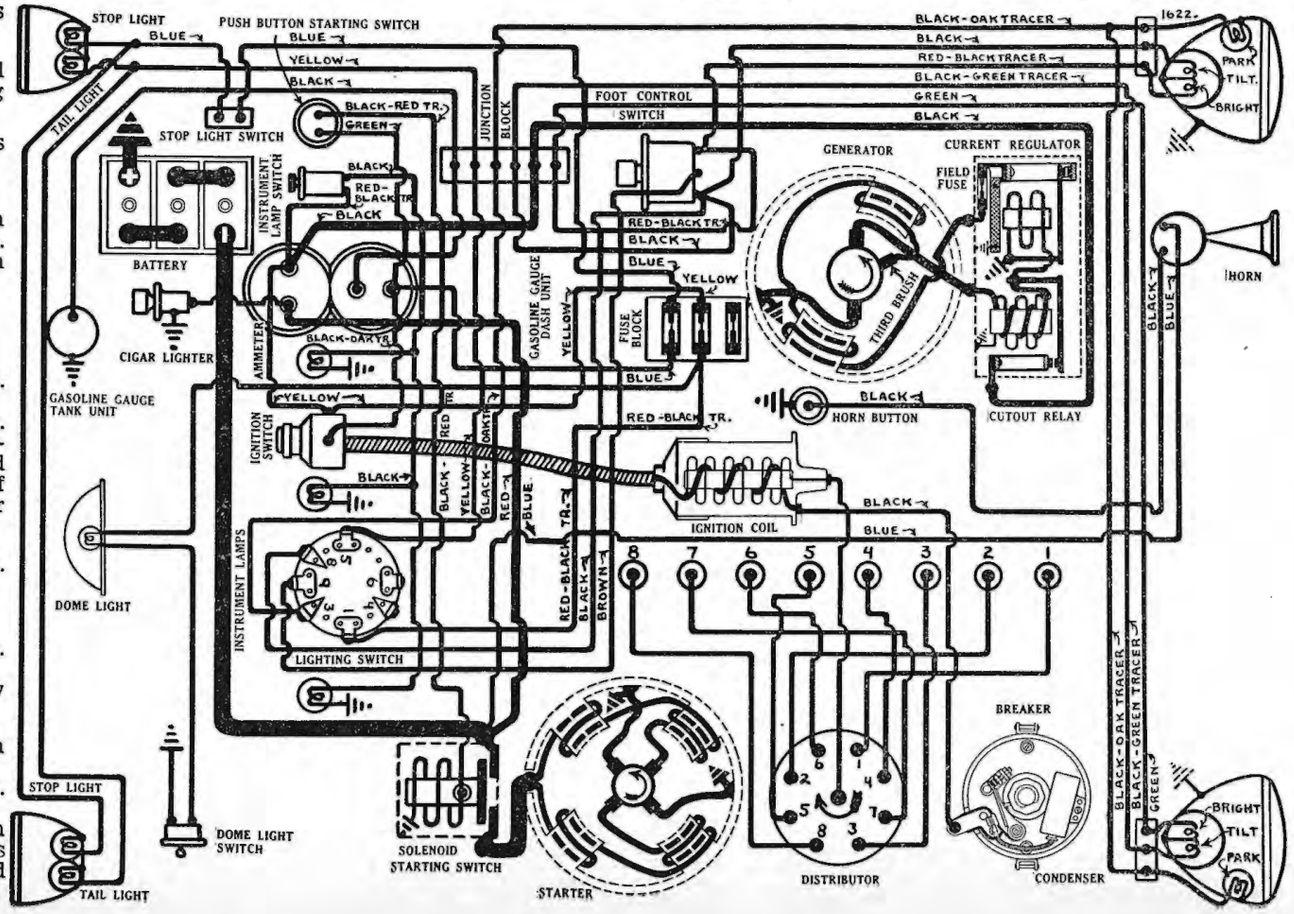
Valve Timing:—See Camshaft Setting above.
Intake Valves—Open 1° ATDC. Close 49° ALDC.
Exhaust Valves—Open 45° BLDC. Close 3° ATDC.
To Check Valve Timing—Set tappet clearance of #1 valves at .010" Int., .017" Exh. With #8 piston on top dead center entering power stroke and flywheel mark '1° 8' lined up with indicator in inspection hole in right hand top face of flywheel housing, #1 intake and exhaust valves should be closed. Reset tappet clearance at .006" intake, .013" exhaust, engine warm.

Lubrication:—Pressure. Gear type oil pump located in crankcase.
Normal Oil Pressure—3-5 lbs. idling, 30 lbs. at 50 M.P.H. with engine warm.
Oil Pressure Relief Valve—Operates at 45 lbs. Adjustable by turning screw on relief valve cover in or clockwise to increase pressure, and out or counter-clockwise to decrease pressure.
Capacity and Oil—8 qts. Use SAE. #30 (normal summer temperatures), #40 (extremely warm temperatures), #20 (winter).

CARBURETION:—See Carburetion Section for complete data on Carburetor, Fuel Pump, and Gasoline Gauge.
Carburetor:—Carter, Model WDO, 1" dual, downdraft type.
Fuel Pump:—A.C., Type T-1521811 diaphragm type.
Gasoline Gauge:—Stewart electric type.

CLUTCH:—**Long.** Single plate, dry disc type. No adjustment required for wear.
Clutch Pedal Adjustment—Free movement of clutch pedal must be ¾-1". Check at 1000-mile intervals. To adjust, loosen clutch pedal adjusting bolt.
Clutch Facings—Moulded type, 2 required, 6" I.D., 10" O.D., .137" thick.

STEERING:—**Front Suspension**—Conventional 'T' beam



section front axle with Reverse-Elliott ends and semi-elliptic springs.
Kingpin Inclination—8½° crosswise.
Caster—1½°. Adjust by installing wedge shims between spring and spring pad on axle.
Camber—1¼° with car loaded. No adjustment.
Toe In—1/16". Adjust in usual manner by changing length of tie rod.
Kick Shackle—Clearance between spring eye and stopscrew on kick shackle should be .125" or 2½ turns. Check if steering is unsteady or car wanders. To adjust, loosen locknut on stop screw and turn screw in or out.

IGNITION:—Coil Model CE-4611.
Ignition Current—2-3 amperes idling, 4½-5½ amperes stopped.
Ignition Switch—Part of coil assembly (connected by armored cable).

Distributor Model IGP-4003. Single breaker, 8 lobe cam, full automatic advance type. Manual advance consists of adjustment at distributor.
Breaker Gap—Set at .015-.017".
Breaker Arm Spring Tension—18 ozs. minimum, 20 ozs. maximum.
Cam Angles—Closed 29°. Open 16° (distributor).

Automatic Advance

Distributor Degrees	R.P.M.	Engine Degrees	R.P.M.
Start	400	0	800
2	750	4	1500
4	1150	8	2300
6	1500	12	3000
6.5	1600	13	3200

Removal:—Distributor mounted on right hand side of cylinder head. To remove, take out hold-down screw in advance arm.

IGNITION TIMING:— Flywheel Degs. Piston Position
All engines ..... 7° BTDC. ..... .0221" BTDC.
Timing—With #1 piston on compression, turn engine over until piston is 7° before top dead center, stop when straight line mark '/' on flywheel lines up with indicator in inspection hole in right front face of flywheel housing. This mark is 7° before the dead center mark '1°8'. Loosen advance arm clamp bolt, rotate distributor until contacts begin to open, tighten clamp bolt, see that rotor is opposite #1 segment in distributor cap, check spark plug cable connections.

Firing Order:—1-4-7-3-8-5-2-6 (see diagram).

Spark Plugs:—Champion Type C-7A. 18 MM. Metric.
Spark Plug Gaps—Set at .0275-.030".

BATTERY:—Willard, Type WH-2-15, RH-2-15 (export). 6 volt, 15 plate, 119 A.H. capacity (20 hour rate).
Starting Capacity—140 amperes for 20 minutes.
Grounded Terminal—Positive (+) terminal.
Location—On left side under driver's seat.

STARTER:—Model MAB-4066. Armature MAB-2046.
Starter Drive—Outboard Bendix.
Rotation—Counter-clockwise at commutator end.
Brush Spring Tension—33-45 ozs. (new brushes).
Cranking Performance—160 R.P.M.

Performance Data

Torque	R.P.M.	Volts	Amperes
0 ft. lbs.	3700	5.5	60
.6 "	1910	5.5	100
3.4 "	1100	5.0	200
6.6 "	695	4.5	300
10.15 "	420	4.0	400
15.8 "	Lock	3.0	582
22.5 "	Lock	4.0	775

Lock torque figures correct without solenoid switch.

Starting Switch:—Type SS-4002. Mounted on starter field frame and controlled by push button on instrument panel. See Equipment Section for complete data.

Removal:—Starter sleeve mounted in right front face of flywheel housing. To remove, take out pilot mouting screw in top of flywheel housing.

GENERATOR: — Model GAR-4620-5. Armature No. GAR-2116-B. Air cooled. Third brush control type in conjunction with Current Regulator (two-rate charge control). See Equipment Section for complete data on Regulator.
Charging Rate Adjustment—Use test meters to check generator output. Short out Regulator by connecting jumper wire between fuse cup on regulator case and ground on generator frame. Shift third brush by hand counter-clockwise to increase or clockwise to decrease charging rate. Third brush held in position by friction. Remove jumper wire.
Maximum Charging Rate—22 amperes (cold), 19 amperes (hot), 8.75 volts, 2200 R.P.M., 28 M.P.H.

Performance Data

Cold — Regulator Contacts Closed — Hot					
Amps.	Volts	R.P.M.	Amps.	Volts	R.P.M.
0	6.4	720	0	6.4	760
4	6.8	860	4	6.8	925
8	7.25	1000	8	7.25	1125
12	7.7	1160	12	7.7	1350
16	8.1	1360	16	8.1	1680
20	8.5	1660	19.2	8.4	2600
22.4	8.8	2200			

Rotation—Counter-clockwise at commutator end.
Brush Spring Tension—24-36 ozs. (new brushes).
Field Current—3.51-3.89 amperes at 6.0 volts.
Field Fuse—5 amperes in knurled cup on side of regulator case.
Motoring Current—5.03-5.57 amperes at 6.0 volts (½ ampere additional if relay and regulator in circuit).

Removal:—Generator pivot mounted at left front of engine with fan belt drive. To remove, take out two pivot bolts and one clamp bolt.

Belt Adjustment—Inspect at 1000-mile intervals. Adjust in usual manner by loosening pivot and clamp bolts and swinging generator away from engine to take up all slack in belt.

RELAY-REGULATOR:—Model TC-4302-A. Mounted on generator. Consists of Cutout Relay and Current Regulator in a single case. See Equipment Section for complete data on these units.

Cutout Relay

Cuts In—6.75-7.5 volts, 7-9 M.P.H.
Cuts Out—.5-2.5 ampere discharge current at 6.5 volts.
Contact Gap—.025-.035".
Air Gap—.010-.030" with contacts closed.

Current Regulator

Contacts Open—8.45-8.95 volts at 70°F.
Contacts Close—1.1-1.3 volts below opening point.
Contact Gap—.005" minimum.
Air Gap—.045" with contacts closed.

LIGHTING:—Clum Switch, Model 9526. R.B.M. Foot Control Switch Type 1050A. Foot operated switch used to control headlamp upper and lower beams. Headlamp bulbs are pre-focused type.

Bulb Specifications

Position	Candlepower	Mazda No.
Headlamps	32-21	2320-C
Parking, Tail	3	63
Instrument, Dome	6	81
Stop	15	87

FUSES:—Lighting—Two 20-ampere fuses on fuse block behind instrument panel.
Generator Field—5 amperes in knurled cup on side of regulator case.

HORN:—Sparton. Vibrator type. Horn current 15 amperes.

SERIAL NUMBER:—First number, (3510) L-13,701, (3610) L-23,001.

ENGINE NUMBER:—On plate on right side of crankcase at front of engine below valve cover plate.

ENGINE:—Own. Six cylinder, 'L' head type.
Bore—3¼". Stroke—4⅜".
Piston Displacement—217.7 cubic inches.
Rated Horsepower—25.35 S.A.E.
Developed Horsepower—80 at 3200 R.P.M.
Compression Ratio—5.54-1. High compression aluminum head optional.

Pistons:—Nelson Bohnalite, aluminum alloy, Invar strut, split skirt type. Length 3⅞".
Weight—18¼ ounces.
Removal—Pistons and rods removed from above.
Clearance—Skirt .002". See Fitting Pistons.
Fitting New Pistons—Use .002" feeler stock to check clearance.
Installing Pistons—Slot should be toward left or opposite side from valves.

Piston Rings:—Two compression, two oil control rings per piston, all above pin.

Ring	Width	End Gap
Comp. All	⅛"	.010-.025"
Oil Cont. (#3)	⅛"	.010-.025"
Oil Cont. (#4)	3/16"	.010-.025"

Piston Pin:—Diameter ⅞". Pin floats in piston and rod. Pin hole in rod is bronze bushed.
Pin Fit in Piston—Light push fit with piston heated.
Pin Clearance in Rod Bushing—.0001" or light push fit with both parts at normal temperature.

Connecting Rod—Weight 36½ ozs. Length 8¾".
Crankpin Journal Diameter—2".
Lower Bearing—Interchangeable steel-backed, babbitt-lined type. One shim on camshaft side.
Clearance—.001-.003". Sideplay .008-.012".
Adjustment—One shim. Replace bearings. Do not file rods or caps.

Crankshaft:—7 bearing. Integral counterweights.
Journal Diameters—2 31/64" all bearings.
Bearing Type—Interchangeable steel-backed, babbitt lined. No shims.
Clearance—.002".
Adjustment—None (no shims). Replace bearings. Do not file bearing caps.
End Thrust—Taken by center bearing. Endplay .004-.007".

Camshaft:—Six bearing. Non-adjustable chain drive.
Bearing Type—Removable steel-backed, babbitt-lined type.
Timing Chain—Diamond 'double strand' roller chain. Pitch ⅜". Length 22½" or 60 links.
Camshaft Setting:—Sprockets are marked. Mesh chain with sprockets turned so that marks are adjacent and in line with a straightedge across the shaft centers. Remove and install chain 'endless'. Use special gear pullers and pushers, keep sprockets lined up so as to avoid sidestrain on chain or sprockets.

Valves:—	Head Diameter	Seat Angle	Seat Width
Intake	1 21/32"	45°	1/16"
Exhaust	1 17/32"	45°	1/16"

Tappet Clearance—.015" all valves—engine hot or cold.
Valve Timing—See Camshaft Setting above.

Lubrication:—Pressure. Gear type oil pump located in crankcase.
Normal Oil Pressure—25 lbs. (10 lbs. idling).
Oil Pressure Relief Valve—Located on oil pump. Operates at 25 lbs. Adjustable by turning screw.
Capacity & Oil—Use SAE. #30 (warm and hot weather), #20-W (cold weather).

CARBURETION:—See Carburetion Section for complete data on Carburetor, Fuel Pump, and Gasoline Gauge.
Carburetor:—Marvel, Model B-2 10-1603, 1¼" downdraft type.
Fuel Pump:—A.C., Type R-1521454 diaphragm type.
Gasoline Gauge:—Stewart electric type.

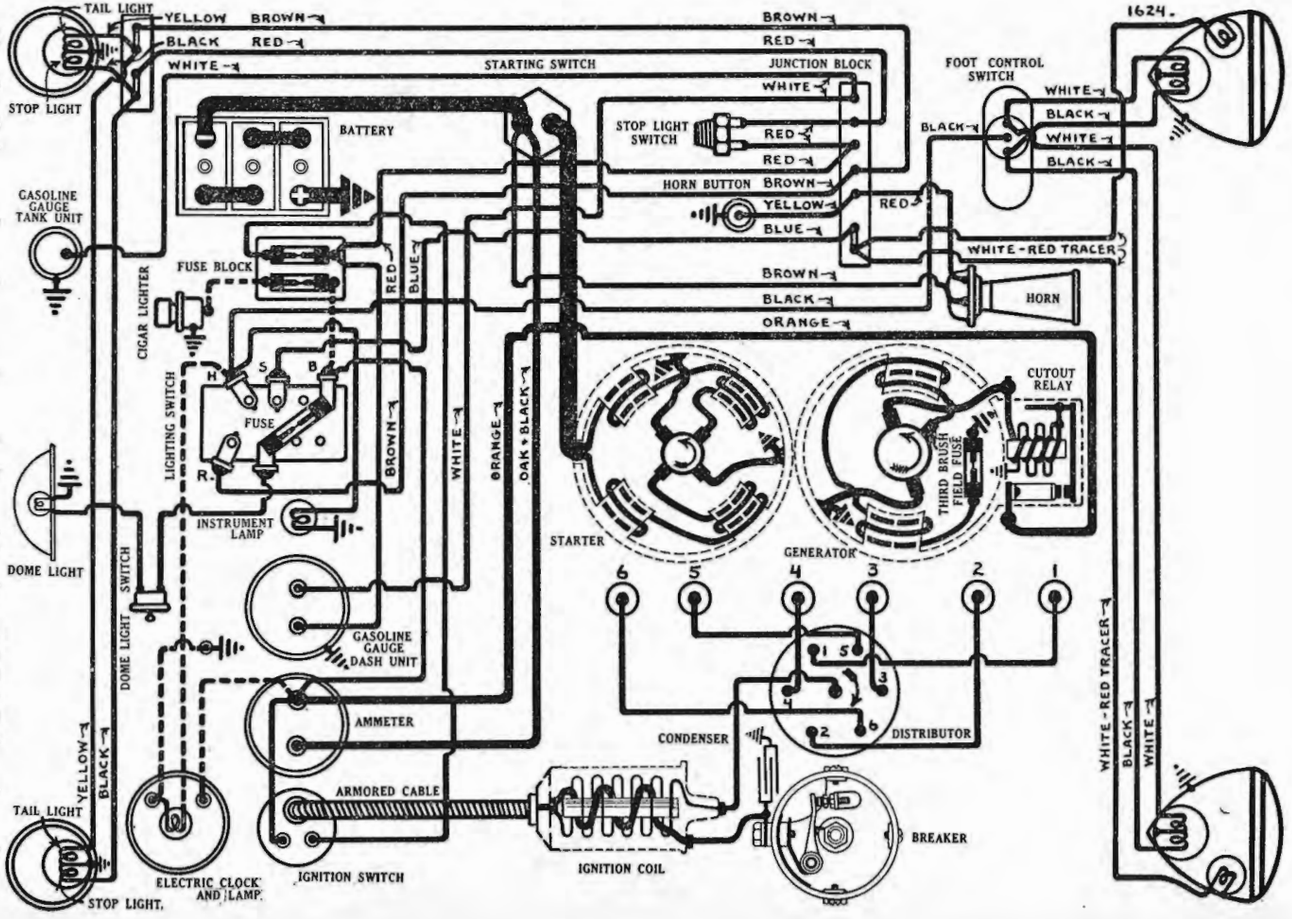
CLUTCH:—Borg & Beck Model 9A6. Single plate, dry disc type. No adjustment required for wear.
Clutch Pedal Adjustment—Free movement of clutch pedal must be ½-1". Adjust whenever free movement is less than ½". To adjust, loosen nut on lower end of clutch pedal. Setscrew on throwout shaft at right end of clutch housing should not contact stop on case.
Clutch Facings—Moulded type, 2 required, 5¾" I.D., 9" O.D., .133" thick.

NOTE—Gauge plate should be used in setting up release levers when clutch is reassembled. Release lever heights must be equal within .005".

STEERING:—Conventional 'I' beam section front axle with Reverse-Elliott ends (Std.), or articulated axle (Optl.). Semi-elliptic springs used with both types.
Kingpin Inclination—7° crosswise.
Caster—1-2°. Adjust by inserting wedge shims between spring and spring pad on axle.
Camber—0-1½°. No adjustment.
Toe In—0-⅛". To adjust, loosen clamp at right end of tie rod, turn tie rod in or out of this end joint, tighten clamp.

IGNITION:—Coil Model CE-4401 (3510), IG-4626 (3610).
Ignition Current—2.5 amperes idling, 4 stopped.
Ignition Switch—Oakes Hershey type co-incidental ignition switch and steering post lock on Model 3510 only. Switch on Model 3610 is part of coil assembly (Electrolock type connected to coil by armored cable).

Distributor Model IGB-4317, IGB-4317-A (aluminum head engines). Single breaker, 6 lobe cam, full automatic advance type.



Breaker Gap—Set at .020". Limits .018-.020".
Breaker Arm Spring Tension—16-20 ounces.
Cam Angles—Closed 40.5°. Open 19.5° (distributor).

Automatic Advance—IGB-4317

Distributor Degrees	R.P.M.	Engine Degrees	R.P.M.
Start	300	0	600
2	500	4	1000
4	700	8	1400
6	900	12	1800
8	1100	16	2200
10	1300	20	2600

Automatic Advance—IGB-4317-A

Start	300	0	600
2	600	4	1200
4	900	8	1800
5	1050	10	2100

Removal:—Distributor mounted on right side of cylinder head. To remove, loosen locknut and take out mounting screw on side of cylinder head.

IGNITION TIMING:—With #1 piston on compression, turn engine over until 'IGN' mark (first line) on vibration dampener at front of engine lines up with pointer on chain case cover, loosen locknut and mounting setscrew on side of cylinder head, rotate distributor until contacts begin to open, tighten setscrew and locknut. See that rotor is opposite #1 segment in distributor cap and check spark plug connections (see diagram). The second line on the vibration dampener is the top dead center mark for cylinders #1 and 6.
Firing Order:—1-5-3-6-2-4 (se diagram).
Spark Plugs:—Champion, Type #7. 18MM. Metric.
Spark Plug Gaps—.025" (.030" on cars with radio).

BATTERY:—**(3510) Globe, Type #71,** 6 volt, 13 plate, 102 A.H. capacity (20 hour rate).
Starting Capacity—120 amperes for 20 minutes.
(3610) U.S.L., Type KW-13A, 6 volt, 13 plate, 96 A.H. capacity (20 hour rate).
Starting Capacity—106 amperes for 20 minutes.
Grounded Terminal—Positive (+) terminal. Is grounded to frame and to transmission cover bolt.
Location—On left side under driver's seat.

STARTER:—**MAB-4068 (3510, 3610—first). MAB-4076 (3610—later). Armature MAB-2057.**
Starter Drive—Inboard Bendix Type LCD11FX-10.
Rotation—Counter-clockwise at commutator end.
Brush Spring Tension—31-42 ozs. (new brushes).

Performance Data

Torque	R.P.M.	Volts	Amperes
0 ft. lbs.	3700	5.5	60
.6 "	1910	5.5	100
3.4 "	1100	5.0	200
6.6 "	695	4.5	300
10.15 "	420	4.0	400
15.8 "	Lock	3.0	582
22.5 "	Lock	4.0	775

Starting Switch:—**Type SW-4001.** Mounted at left of engine, operated by depressing clutch pedal.

Removal:—Starter flange mounted on left front face of flywheel housing. To remove, take out two flange mounting capscrews.

GENERATOR:—**Model GAR-4601-3 (first), GAR-4601-5 (later). Armature No. GAR-2214.** Air-cooled, third brush control type.
Charging Rate Adjustment—Take off commutator cover band, shift third brush by hand counter-clockwise to increase, or clockwise to decrease charging rate. Third brush held in position by friction.
Maximum Charging Rate—20 amperes (cold), 18 amperes (hot), 8.0 volts, 2400 R.P.M.

Performance Data

Cold Amps.	Volts	R.P.M.	Hot Amps.	Volts	R.P.M.
0	6.4	760	0	6.4	800
4	6.75	920	4	6.8	950
8	7.05	1100	8	7.15	1140
12	7.35	1300	12	7.5	1400
16	7.7	1560	16	7.85	1840
20	8.0	2300	18	8.0	2400

Rotation—Counter-clockwise at commutator end.
Brush Spring Tension—24-36 ounces.
Field Current—4.46-4.94 amperes at 6.0 volts.
Field Fuse—7½amperes under cover on generator.
Motoring Current—4.89-5.41 amperes at 6.0 volts.

Removal:—Generator cradle mounted at left front of engine with fan belt drive. Water pump driven by generator shaft extension. To remove, disconnect water pump drive coupling, slack off belt adjustment, loosen mounting clamp band, lift generator out.

Belt Adjustment—Adjust when belt sideplay exceeds 1½" midway between generator and fan pulleys. To adjust, loosen two capscrews on fan bracket, raise bracket up (bracket pivots on one screw) until belt sideplay is approximately 1", tighten mounting screws.

CUTOUT RELAY:—**Model CB-4021.** Mounted on generator. See Equipment Section for complete data.
Cuts In—6.75-7.5 volts, 750 R.P.M.
Cuts Out—.5-2.5 ampere discharge current.
Contact Gap—.025-.035".
Air Gap—.010-.030" with contacts closed.

LIGHTING:—**(3510) Delco-Remy Switch, Model 478-N, Foot Control Switch Model 465-Z.** Foot operated control switch controls upper and lower headlamp beams.
(3610) Soreng-Manegold Switch, Model 5820-A. R.B.M. Foot Control Switch. Foot operated control switch used to control headlamp upper and lower beams.

NOTE—See wiring diagram for Model 110 (1934) for Delco-Remy switch and connections.

Bulb Specifications

Position	Candlepower	Mazda No.
Headlamps	32-21	2320C
Parking, Instrument	3	63
Stop and Tail	21-3	1158
Dome	3	64 (DC.)

FUSES:—**Lighting**—20 ampere on back of switch.
Generator Field—7½ ampere on generator.
Accessory—One or two 20 ampere fuses on fuse block on steering column brace behind instrument panel.

SERIAL NUMBER:—Same as engine number. On top of left frame side member in front of dash.

ENGINE NUMBER:—First number, 2,106,175. On left top front corner of cylinder block (below head).

ENGINE:—Own Model 350. Eight cylinder, In Line, 'L' head type.
Bore—3". Stroke—4¼".
Piston Displacement—240 cubic inches.
Rated Horsepower—28.8.
Developed Horsepower—95 at 3600 R.P.M.
Compression Ratio—6.5-1 (std.), 5.75-1 (optl).
Compression Pressure—162 lbs. at 1000 R.P.M. or 183 lbs. at 2700 R.P.M. (std. head).

Pistons:—Lynite Lo-Ex, aluminum alloy, 'T' slot, cam ground type with Anodized finish (special hard oxide deposited on bearing surface). Pistons cannot be ground. Refinish cylinders to take replacement pistons furnished .003", .005", .015", .030" oversize. Piston length, 3 11/16".
Weight—12.128 ozs. (stripped), 18.192 ozs. (with rings, pin, and locking screw).
Removal—Pistons and rods removed from below.
Clearance—Top .016". Bottom .0018" (at 70°F.).
Fitting New Pistons—Check piston with micrometer at point just below and to the left of 'T' slot junction midway between pin bosses with piston at 70°F. Finish cylinder bore to size giving correct clearance. Feeler gauges can be used on side opposite slot. Piston should fall of own weight with .0015" feeler and should lock on .002" feeler.
Installing Pistons—Install pistons with slot to left (away from camshaft and valves).

Piston Rings:—Two notched or stepped compression rings, two oil control rings per piston, all above pin. Lower ring grooves drilled radially with oil drain holes. Compression rings installed with notch or step downward.

Ring	Width	End Gap	Wall Thickness
Comp. (all)	.1235-.1240"	.007-.012"	.130"
Oil Cont. (3)	.1235-.1240"	.007-.015"	.130"
Oil Cont. (4)	.1545-.1550"	.007-.015"	.130"

Piston Pin:—Diameter ⅞". Length 2 11/16". Pin is locked in piston. Heat piston in hot water to remove or install pins.
Pin Fit in Piston—Locking screw end .0005" press fit or light thumb push fit with piston at 200-210° F. Free end .0003" clearance or light thumb push fit with piston at 70°F.
Pin Clearance in Rod Bushing—.0002-.0009".

Connecting Rod:—Weight 30.448 ozs. Length 9".
Lower Bearing Type—Removable steel-backed, babbitt-lined type. No shims.
Clearance—.0015". Sideplay .005".
Adjustment—None. Replace bearings. Do not file rods or caps.
Installing Rods—See that oil hole in top of lower bearing is toward right (camshaft side) of engine on all rods.

Crankshaft:—Five bearings with eight counterweights.
Journal Diameters—#1—2⅜", #2—2 9/16", #3—2⅝", #4—2 11/16", #5—2¾".
Bearing Type—Removable bronze-backed, babbitt-lined type.
Clearance—.002".
Adjustment—None (no shims). Replace bearings. Do not file bearing caps.

End Thrust—Taken by #1 (front) bearing. Upper half of bearing flanged and steel thrust washer installed on shaft behind sprocket. Endplay .004".

Camshaft:—Non-adjustable chain drive.
Timing Chain—Whitney #CL-205. Width, 1¼". Pitch ½". Length, 23" or 46 links.
Camshaft Setting—Sprockets are marked. Install chain with sprockets turned so that marks are adjacent and in line with a straightedge across the shaft centers.

Valves:—	Head Diameter	Stem Diameter	Length
Intake	1 9/16"	11/32"	5 9/32"
Exhaust	1 7/16"	11/32"	5 9/32"

	Seat Angle	Lift	Stem Clearance
Intake	30°	.291"	.002"
Exhaust	30°	.289"	.003"

Tappet Clearance—Running .006" Int., .008" Exh.
Timing—.015" all valves—engine cold.

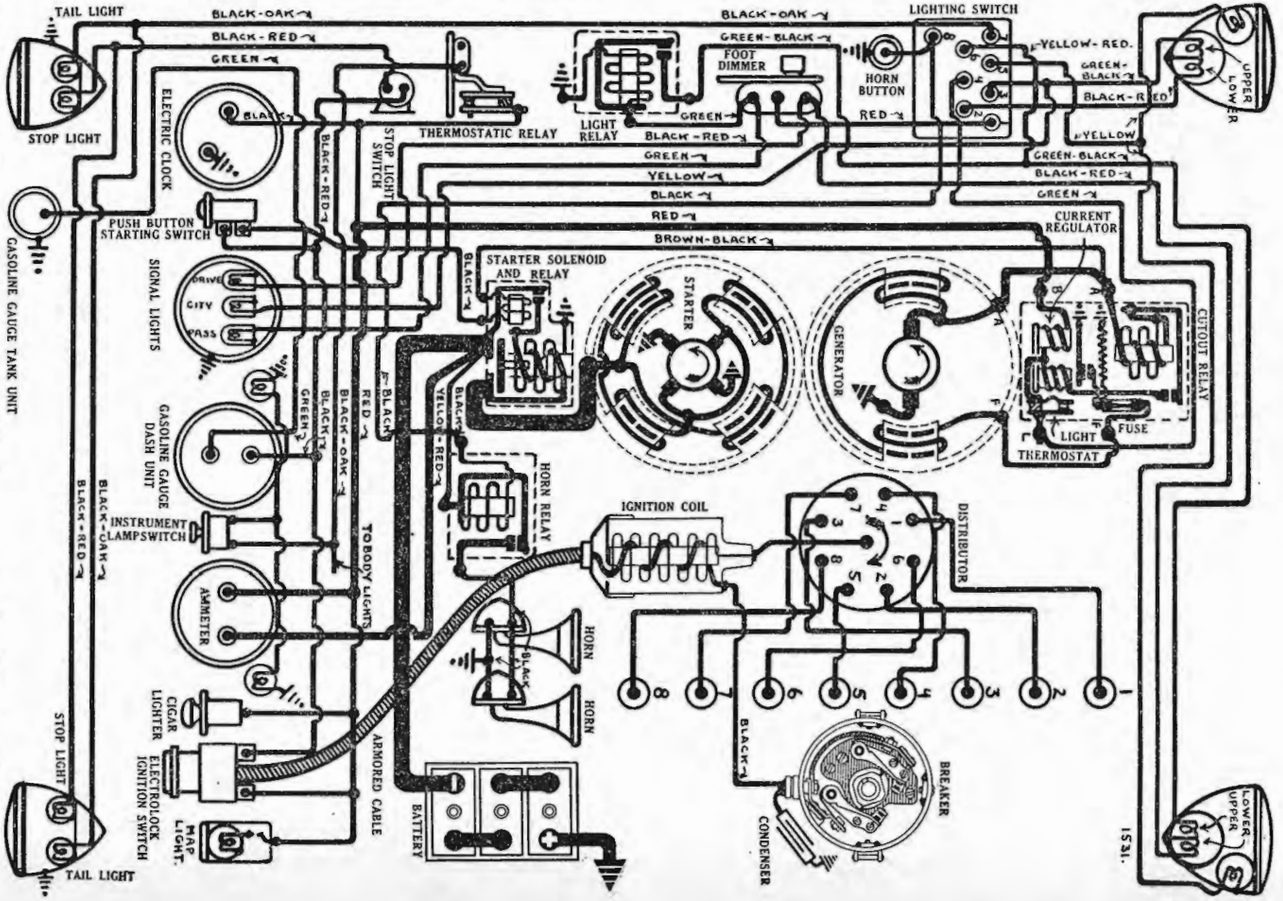
Valve Springs—	Pressure	Length
Valve Closed	43 lbs.	2.25" Int., 2.248" Exh.
Valve Open	96 lbs.	1.906" Int., 1.904" Exh.

Spring cages installed on top of valve spring exert slight pressure on springs (pressure required to withdraw cages should be 3-6 lbs.). Use new cages with new valve springs.
Valve Timing—See Camshaft Setting above.
Intake Valves open 6° ATDC. Close 37° ALDC.
Exhaust Valves open 34° BTDC. Close 5° ATDC.
To Check Valve Timing—No. 1 intake valve should open with piston on top dead center with tappet clearance set at .0118".

Lubrication:—Pressure type. Gear type pump located in oil pan.
Oil Pressure—30 lbs. at 60 M.P.H.
Oil Pressure Relief Valve—Operates at 30 lbs.
Capacity and Oil—7 qts. Use SAE. #30 (summer), 20-W or 10-W (winter).

CARBURETION:—(Fuel System). See Carburetion Section for complete data on Carburetor, Fuel Pump, Gasoline Gauge, and Automatic Choke.
Carburetor:—Stromberg, Model EE-23, 1¼" dual, downdraft type.
Automatic Choke—Stromberg.
Fuel Pump:—A.C., Type I combination fuel and vacuum pump.
Gasoline Gauge:—A.C., Electric type.

CLUTCH:—**Borg & Beck.** Single plate, dry disc type. No adjustment of clutch necessary for wear.
Clutch Pedal Adjustment—Free movement of clutch pedal should be 1-1½". Adjust by loosening lock nut and turning stop screw on auxiliary cross shaft. Clearance between pedal and under side of toeboard should be ⅜-⅝" with clutch engaged.



Adjust by changing length of clutch release rod (free rod at front end, turn rod in or out of clevis).

Clutch Facings—Moulded type, 2 required, 6⅛" I.D., 9⅞" O.D., .133" thick.

NOTE—Mark flywheel, cover and spring pressure plate before disassembling clutch and install in same relative position. Clutch can be removed from below after taking off clutch housing pan without disturbing clutch housing. Install driven plate with mark 'Flywheel Side' toward flywheel.

STEERING:—Front Suspension—Independent, linked parallelogram type with helical springs.

Caster—2° with car weight on wheels. To adjust, loosen retaining nuts fastening steering knuckle support yokes to upper and lower suspension arms, and clamp screw at upper end of support, remove lubrication fitting in front bushing of upper support yoke, insert Allen wrench and turn threaded pin clockwise to increase caster, or counter-clockwise to decrease caster angle, tighten yoke retaining nuts and clamp screw, replace lubrication fitting.

Camber—1° with car weight on wheels. No adjustment provided. Crosswise inclination of kingpin 4° 51'.

Toe In—⅛". To adjust, increase or decrease length of each tie rod equally. Turn tie rods in same direction that wheels revolve to increase toe-in, or in opposite direction to decrease toe-in.

IGNITION:—Coil Model 539-B. Lock coil type.

Ignition Current—2.2 amperes (idling), 4.4 amperes (engine stopped).

Ignition Switch—Model 431-G (part of coil assembly). Switch and coil connected by armored cable protecting primary lead.

Distributor Model 662-P. Two breaker, 4 lobe cam, semi-automatic advance type (manual advance adjustable at distributor only). Contacts must be synchronized as part of timing operation (see Ignition Timing).

Breaker Gap—Set gap at .020". Limits, .018-.024".

Breaker Arm Spring Tension—17-21 ounces.

Manual Advance—20° (engine) adjustment only.

Cam Angles (Distributor Degrees)—Closed 34°. Open 11°. Both sets together when properly synchronized.

Automatic Advance

Distributor		Engine	
Degrees	R.P.M.	Degrees	R.P.M.
Start	500	1	1000
4.75	1200	9.5	2400
14	1850	28	3700

Mounting—On top of cylinder head. To remove, take out hold-down screw.

IGNITION TIMING:—

	Flywheel Degrees	Piston Position
All engines	8° BTDC	.0255" BTDC.

To Set Timing:—Crank engine by placing transmission gears in 'high', jack up one rear wheel, turn wheel by hand. With No. 1 piston on compression, turn engine over until 'IGA' mark on harmonic balancer at front of engine (which is 8° before TDC. mark for cylinder #1) is directly under pointer on chain case, loosen advance arm clamp bolt, rotate distributor until stationary contacts (mounted directly on breaker plate), begin to open, tighten clamp bolt, see that rotor is directly opposite #1 segment in distributor cap, check spark plug connections (see diagram). Second or movable set of contacts checked by synchronizing.

Synchronization of Contacts—After timing stationary contacts (above), turn engine over 90° or ¼ revolution to firing point for cylinder #6, stop when 'IGA #6' mark on harmonic balancer registers with pointer, loosen lock screws on movable sub-plate, turn eccentric adjusting screw until contacts just open, tighten lock screws.

Synchronization (using Tool)—Use Delco-Remy synchronizing tool, Part No. 1838182. See Equipment Section for complete data.

Firing Order:—1-6-2-5-8-3-7-4 (see diagram).

Spark Plugs:—A.C., Type G-6. 18 MM. Metric type.

Spark Plug Gaps—Set at .026". Limits, .025-.027".

BATTERY:—Delco, Type 17-D, 17-DF (Export), 6 volt, 17 plate, 130 A.H. capacity (20 hour rate).

Starting Capacity—156 amperes for 20 minutes.

Grounded Terminal—Positive (+) terminal.

Location—Under right front seat.

STARTER:—Model 727-N. Armature No. 823881. Four pole mechanical shift (solenoid type).

Rotation—Counter-clockwise at commutator end.

Brush Spring Tension—24-28 ounces.

Performance Data

Torque	R.P.M.	Volts	Amperes
0 ft. lbs.	5500	5.0	65
15 "	Lock	3.0	600

Starting Switch:—Solenoid Switch, Model 1514. Pushbutton Switch, Model 1379. Solenoid (starting switch and pinion shift) mounted on starter field frame. Controlled by relay (on switch case) operated by pushbutton switch on instrument panel. Operative only with ignition 'on'. See Equipment Section 'Starter Controls' for complete data.

Mounting:—Starter flange mounted on left hand front face of flywheel housing. To remove, take out flange mounting screws.

GENERATOR:—Model 961-C. Armature No. 1836971. Straight shunt type with external current regulation (regulator mounted on generator field frame). Generator is air cooled by fan incorporated in drive pulley. Lamp load capacity, 11 amperes (do not exceed this figure).

Adjustment—See Control Unit paragraph and complete data in Equipment Section. Generator is two brush type—no third brush used. Lamp load must not exceed 11 amperes. Do not connect lamps or accessories in excess of this amount to 'L' terminal of generator or lighting switch.

Charging Rate—Constant rate at all speeds above 1200 R.P.M. or 16 M.P.H.

Performance Data

	Amperes Lamps off	Amperes Lamps on	Volts	R.P.M.
Cold	13-16	19-22	7.7-8.1	1300
Hot	9-11	14-16	7.3-7.55	1400

Rotation—Counter-clockwise at commutator end.

Shunt Field Current—1.7-1.9 amperes at 6.0 volts.

Brush Spring Tension—22-26 ounces.

Field Fuse—6 ampere capacity (in control unit).

Mounting:—Pivot mounted at left front of engine. Driven by fan belt. To remove, take out two pivot bolts and one clamp bolt.

Belt Adjustment:—Loosen pivot bolts and clamp bolt, swing generator away from engine, tighten clamp bolt before slacking off on generator, tighten pivot bolts.

RELAY REGULATOR (CONTROL UNIT):—Model 5541. Consists of relay cut-out, current regulator, field fuse, field resistance, and thermostat. See Equip- Section for complete data.

Adjustment—Increase current regulator spring tension to increase generator output, decrease spring tension to decrease output.

Setting—13-16 amperes at 7.7-8.1 volts (cold—lamps off), 19-22 amperes (cold—lamps on). 'Lamps on' figure correct with 11 ampere lamp load. Setting must be checked with cover on unit.

Relay Cut-out

Cut in—6.75-7.25 volts or 12 M.P.H.

Cuts out—2.5 amperes discharge current at 6.3 volts.

Relay Contact Gap—.015-.025".

Air Gap—.012-.017" (contacts closed).

Current Regulator

Contact Gap—.015-.025".

Contact Spring Tension—2.0-2.5 ounces.

Air Gap—.055-.060" between armature and center of core (armature down and fibre bumper just touching stop).
.006-.008" between fibre bumper and stop (armature up).

LIGHTING:—Delco-Remy Switch, Model 487-J, 487-G (RHD.). Foot Control Switch Model 465-Z. Lighting switch mounted at lower end of steering columnn, foot control switch on toeboard at left of clutch pedal.

Headlight Indicator—Illuminated dial on instrument panel indicates position of lighting switch —'Pass' (see below), 'City' (lower beam—upper filaments), 'Drive' (high beam—lower filaments). Assymetrical passing beam (depressed beam from left hand headlight only) controlled by foot switch in 'Country' or Driving Position.

Headlight Adjustment—Pre-focused type bulb with flanged base. No focusing operation required. Headlamps aimed straight forward (with lenses removed), adjustable by turning lamps on ball and socket mounting. Lenses marked 'Right' and 'Left' are not interchangeable.

Headlight Thermostat Relay:—Thermostatic arm type current limit relay (no winding) in control unit. Contacts open with current of 20 amperes at210°F. (air thermostatic arm temp., 375°-385°F.).

Bulb Specifications

Lamps	Candlepower	Mazda No.
Headlights (Pre-focused type)	32-32	2330-L
Rear Signal (Stop)	15	87
Rear (Tail), Map, Park., Inst.	3	63
Dome, Quarter, Deck, Tonneau	6	81
Headlight Indicators		40

THERMOSTAT RELAY:—Model 411-A. New type current limit relay operated by thermostatic arm (no winding). Adjustment is sealed and complete unit should be replaced if found to be defective. Contacts will remain closed with current of 25 amperes but will open in one minute with current of 38 amperes at temperature of 70-80°F.

FUSES:—Generator field fuse, 6 ampere capacity (in Control Unit case on generator).

HORNS:—Klaxon, Model 33-B. Matched set air-tone type. Current draw, 24-28 amperes. Horns operated by horn relay.

Horn Relay, Model 266-T. Relay requires .25 amperes at 2.0 volts (min.) to close contacts. Current draw .8 amperes.

Relay Contact Gap—.015-.025".

Air Gap—.012-.017" (contacts closed).

SERIAL NUMBER:—Same as engine number.

ENGINE NUMBER:—First number, 2,200,001. On left hand top front corner of cylinder block (below head).

ENGINE:—Own Model 35-50. Eight cylinder, In line, 'L' head type.
Bore—3". **Stroke—4⅜".**
Piston Displacement—248 cubic inches.
Rated Horsepower—28.8.
Developed Horsepower—105 at 3600 R.P.M.
Compression Ratio—6.25-1 Std. 5.75-1 Export.
Compression Pressure—160 lbs. at 1000 R.P.M. or 180 lbs. at 2600 R.P.M. (Std. 6.25-1 head).

Pistons:—Lynite, Lo-Ex aluminum alloy, Trans-slot, Anodized finish type. A transverse slot on each side of the piston directly below the ring grooves is used. Piston skirts are not slotted vertically. Pistons are interchangeable in sets on previous La Salle models. Anodized finish consists of special hard oxide deposited on bearing surface after piston is finished. Pistons cannot be ground and cylinders should be reconditoned to take replacement pistons furnished .003", .005", .015", .030" oversize. Length 3 11/16".
Weight—11.872 ozs. (stripped), 17.936 ozs. (with rings, pin and locking screw).
Removal—Pistons and rods removed from below.
Clearance—Top .015". Top of skirt .0016-.002". Bottom of skirt .0011-.0015".
Fitting New Pistons—Do not use feeler gauges to check clearance. Check piston size with micrometer at right angles to pin bosses and finish cylinder to size giving correct clearance.

Piston Rings:—Two compression, two oil control rings per piston, all above pin. Lower ring groove drilled radially with oil drain holes.

Ring	Width	End Gap	Wall Thickness
Comp. All	.1235-.1240"	.007-.012"	.130"
Oil Cont. (#3)	.1235-.1240"	.007-.015"	.130"
Oil Cont. (#4)	.1545-.1550"	.007-.015"	.130"

Piston Pin:—Diameter 55/64". Length 2 11/16". Pin is locked in piston. Heat piston in hot water to remove or install pins.
Pin Fit in Piston—Locking screw end .0003" press fit. Free end .0001" clearance.

Connecting Rod—Weight 34.384 ozs. Length 9".
Crankpin Journal Diameter—2¼".
Lower Bearing Type—Removable steel-backed, babbitt-lined. No shims.
Clearance—.0015". Sideplay .005".
Adjustment—None (no shims). Replace bearings. Do not file rods or caps.
Installing Rods—Oil hole in top of lower bearing must be toward right or camshaft side on all rods.

Crankshaft:—Five bearing. Eight counterweights.
Journal Diameters—#1, 2⅜"; #2, 2 9/16"; #3, 2⅝"; #4, 2 11/16"; #5, 2¾".
Bearing Type—Removable bronze-backed, babbitt-lined. No shims.
Clearance—.002".
Adjustment—None (no shims). Replace bearings. Do not file bearing caps.
End Thrust—Taken by front bearing. Endplay .004". Upper half of bearing is flanged and steel thrust washer assembled on shaft behind sprocket

Camshaft:—Non-adjustable chain drive.
Timing Chain—Whitney #CL-205. Width 1¼". Pitch ½". Length 23" or 46 links.
Camshaft Setting—Sprockets are marked. Install chain with sprockets turned so that marks are adjacent and in line with a straightedge across the shaft centers.

Valves:	Head Diameter	Stem Diameter	Length
Intake	1.562"	.342"	5 9/32"
Exhaust	1.405"	.341"	5 9/32"

	Seat Angle	Lift	Stem Clearance
Intake	30°	.306"	.002"
Exhaust	45°	.303"	.003"

Tappet Clearance—Running .006" Int., .009" Exh. Timing .015" all valves.
Valve Springs—New type springs with three closely spaced coils. Install springs with close-coils at top. Valve spring surge dampeners or cages are not used with these new springs.

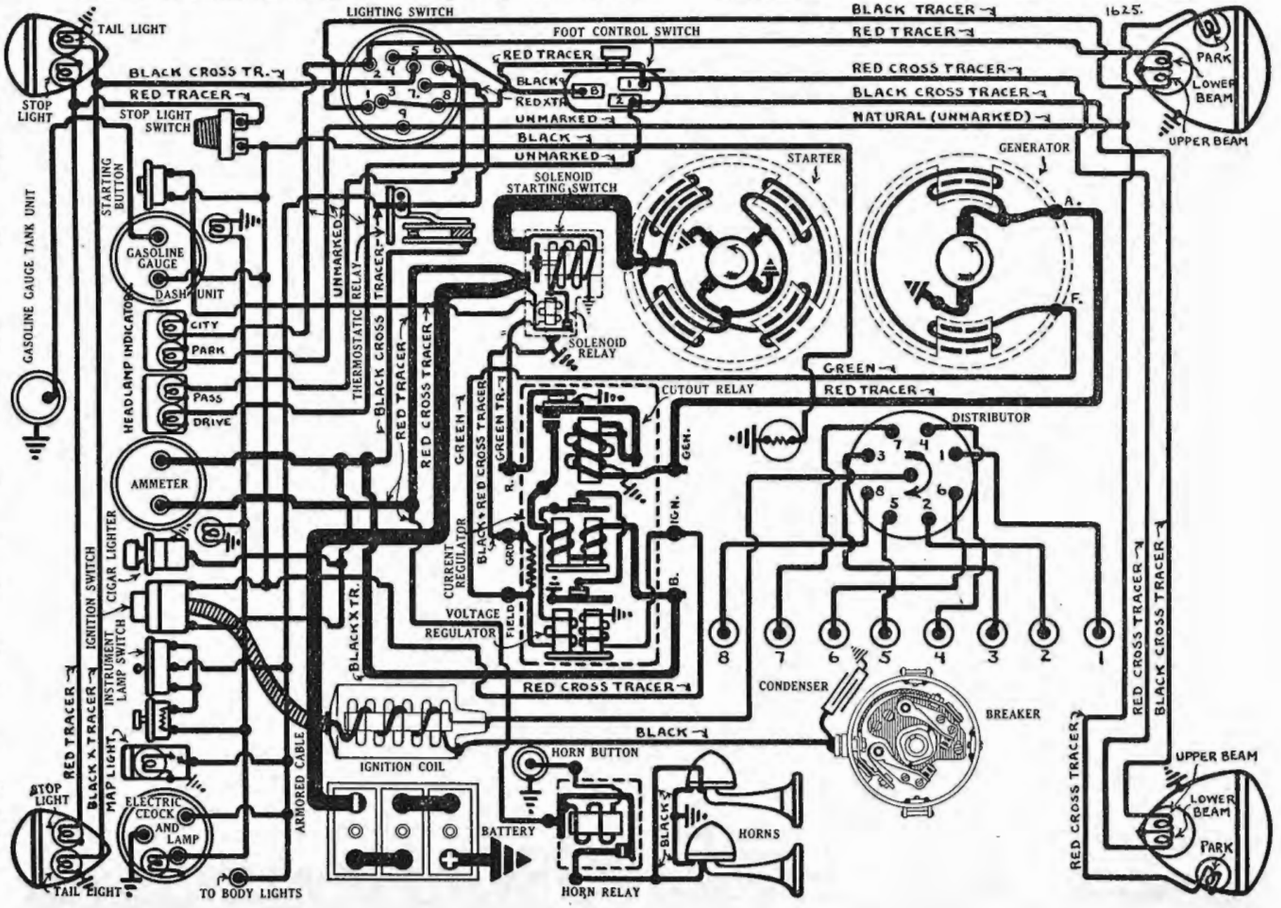
	Spring Pressure	Length
Valve Closed	49 lbs.	2.255"
Valve Open	115 lbs.	1.943"

Valve Timing—See Camshaft Setting above.
Intake Valves—Open 6° ATDC. Close 37° ALDC.
Exhaust Valves—Open 34° BLDC. Close 5° ATDC.
To Check Valve Timing:—#1 intake valve opens with piston on top dead center with .0118" tappet clearance.

Lubrication:—Pressure. Gear type oil pump located in crankcase. Pump is larger than previous type and is not interchangeable. Capacity has been increased by redesigning gear teeth. Oil pan has also been redesigned.
Normal Oil Pressure—25 lbs. at 60 M.P.H.
Oil Pressure Relief Valve—Operates at 25 lbs.
Capacity & Oil—7 qts. Use SAE. #40 (summer), #20 (winter).

CARBURETION:—See Carburetion Section for complete data on Carburetion, Automatic Choke, Fuel Pump, and Gasoline Gauge.
Carburetor:—Stromberg Model EE-15, 1" dual downdraft type.
Automatic Choke—Stromberg 'Triple Range' combination automatic and manual choke control.
Fuel Pump:—AC. Type I-1521673 combination fuel pump and vacuum pump.
Gasoline Gauge:—AC. electric type.

CLUTCH:—Borg & Beck with Long Driven Member. Single plate, dry disc type. No adjustment required for wear.
Clutch Pedal Adjustment—Free movement of clutch pedal should be ⅞-1⅛". Adjust by lossening locknut and turning stopscrew on auxiliary cross shaft. Clearance between pedal and underside of toeboard should be ⅜-⅝". Adjust by changing length of clutch release rod. Free rod at front end, turn rod in or out of clevis.



Clutch Facings—Woven type, 2 required, 6″ I.D., 10″ O.D., .133″ thick.

NOTE—Driven disc is new type and not interchangeable with earlier type. Lining diameters have been changed and only one set of metal segments (behind rear facing) are used. Pressure spring pressure has been increased. Install driven disc with long shank of hub toward flywheel and cushion spring assembly toward transmission.

STEERING:—Front Suspension—Independent, linked parallelogram type with helical springs. Lower suspension arm inner ends are now carried on a solid shaft mounted in brackets bolted on underside of front cross member. Intermediate steering arm has also been redesigned.

Caster—2° (1-2°) with car weight on wheels. To adjust loosen retaining nuts fastening steering knuckle support yokes to upper and lower suspension arms, loosen clampscrew at upper end of support, remove lubrication fitting in front bushing of upper support yoke, insert Allen wrench in lubrication fitting hole, turn threaded pin clockwise to increase caster, or counter-clockwise to decrease caster angle. Tighten yoke retaining nuts and clampscrew, replace lubrication fitting.

Camber—1° (¼-1°) with car weight on wheels. No adjustment provided. Crosswise inclination of kingpin 4°51′.

Toe In—⅛″ (0-⅛″). To adjust, increase or decrease length of each tie rod equally. Turn tie rods in same direction wheels revolve to increase, or in opposite direction to decrease toe-in.

IGNITION:—Coil Model 539-C. Mounted on front of dash.

Ignition Current—Idling 2.2 amperes, 4.4 stopped.

Ignition Switch—Model 431-L. Connected to coil by armored cable.

Distributor Model 662-P. Double breaker, 4 lobe cam, full automatic advance type. Contacts open alternately at 45° firing intervals corresponding to 90° firing interval of engine and must be synchronized—See Timing.

Breaker Gap—Set at .020″. Limits .018-.024″.

Breaker Arm Spring Tension—17-21 ounces.

Cam Angles—Closed 34°. Open 11° (distributor). Both sets together when properly synchronized.

Automatic Advance

Distributor Degrees	R.P.M.	Engine Degrees	R.P.M.
Start	500	1	1000
4.75	1200	9.5	2400
14	1850	28	3700

Removal—Distributor mounted on cylinder head. To remove, take out hold-down screw in advance arm.

IGNITION TIMING:—

	Flywheel Deg.	Piston Pos.
All engines	8° BTDC	.0264″ BTDC.

Timing (Stationary Contacts)—Crank engine by placing transmission gears in 'high', jack up one rear wheel, turn wheel by hand. With #1 piston on compression, crank engine until piston is 8° before top dead center, and 'IGA' mark on vibration dampener at front of engine lines up with pointer on chain case. This mark is 8° before top dead center mark for cylinder #1. Loosen advance clamp bolt, rotate distributor until stationary contacts (mounted directly on breaker plate) begin to open, tighten clamp bolt, see that rotor is directly opposite #1 segment in distributor cap. Then synchronize movable contacts.

Synchronization (Movable Contacts) On Engine—Crank engine over 90° to firing position for piston #6, stop when 'IGA#6' mark on vibration dampener lines up with pointer, loosen lockscrews on movable sub-plate, turn eccentric adjusting screw until movable contacts begin to open, tighten lockscrews.

Synchronization (Using Tool)—Use Delco-Remy tool, Part #1838182, follow complete directions given in Equipment Section. Distributor firing intervals are regular 45-45-45 (distributor degrees).

Firing Order:—1-6-2-5-8-3-7-4. See diagram.

Spark Plugs:—AC. Type K-9. 14MM. Metric.

Spark Plug Gaps—Set at .026″. Limits .025-.027″.

BATTERY:—Delco, Type 17-K. 6 volt, 17 plate, 107 A.H. capacity (20 hour rate).

Starting Capacity—131 amperes for 20 minutes.

Grounded Terminal—Postive (+) terminal.

Location—Under right hand front seat.

STARTER:—Model 727-N. Armature No. 823881. Mechanical shift (solenoid operated) type. Drive through overrunning clutch.

Rotation—Counter-clockwise at commutator end.

Brush Spring Tension—24-28 ounces each.

Performance Data

Torque	R.P.M.	Volts	Amperes
0 ft. lbs.	5500	5.0	65
15 "	Lock	3.0	600

Starting Switch:—Solenoid Switch Type 1514. Push-button Switch Type 1389. Solenoid (switch and pinion shift) mounted on starter field frame, controlled by relay in switch case operated by pushbutton switch on instrument panel. See Equipment Section for complete data.

Removal:—Starter flange mounted on left front face of flywheel housing. To remove, take out flange mounting screws.

GENERATOR:—Model 961-D. Armature No. 1857866. Straight shunt type with external current control and voltage regulation (Current Regulator, Voltage Regulator, Cutout Relay mounted in sealed case on engine side of dash). Generator charges at maximum rate with discharged battery and charging current tapers off as battery becomes charged. Output is automatically increased to maintain charge when lights or other load is turned on.

Charging Rate Adjustment—No adjustment provided. Regulator case is sealed. See Equipment Section for complete article on this type generator and control unit.

Maximum Charging Rate—20 amperes with discharged battery. Constant at all speeds above 1700 R.P.M. or 20 M.P.H. Actual charging rate depends upon condition of battery.

Performance Data—Cold

Amperes	Volts	R.P.M.
7	7.0-7.2	900
22	8.1-8.3	1900

Rotation—Counter-clockwise at commutator end.

Field Current—1.7-1.9 amperes at 6.0 volts.

Brush Spring Tension—22-26 ozs.

Removal:—Pivot mounted at left front of engine with fan belt drive. To remove, take out two pivot bolts and one clamp bolt.

Belt Adjustment—Loosen pivot bolts and clamp bolt, swing generator away from engine to take up belt.

CONTROL UNIT:—Model 5559. Mounted on engine side of dash. Consists of Cutout Relay, Current Regulator, and Voltage Regulator in a single case. Cover of case is sealed and units are serviced on an exchange basis if seals are not broken. See Equipment Section for trouble shooting and complete data on this equipment.

Cutout Relay

Cuts In—6.75-7.5 volts or 12 M.P.H.

Cuts Out—0-3 amperes discharge.

Contact Gap—.018-.025″.

Air Gap—.018-.022″ with contacts closed.

Current Regulator

Setting—Contacts open at 20-22 amperes.

Contact Gap—.015-.025″.

Contact Spring Tension—2.7-3.5 ozs.

Air Gap—.070-.080″ (between armature and core with contacts closed), .008-.013″ (between fibre bumper and contract spring stop).

Voltage Regulator

Setting—Contacts open at 7.7-8.0 volts (72°F), or 7.45-7.55 volts (150°F.) with generator output of 8-10 amperes.

Contact Gap—.015-.025″.

Contact Spring Tension—2.7-3.5 ozs.

Air Gap—.050-.060″ between armature and core with contacts closed), .008-.013″ (between fibre bumper and contract spring stop).

LIGHTING:—Switch Model 487-L, M. Foot Control Switch Model 471-Z. Lighting switch now mounted at left of instrument panel. Lighting system similar to previous type except for Indicator bulbs. Assymetrical passing beam controlled by foot operated switch. Headlight bulbs are prefocused type.

Headlight Indicators—Four illuminated dials across the bottom of the instrument panel as follows:

City—Lower beam or upper filaments lighted.

Park—Parking bulbs lighted.

Pass—Assymetrical passing beam.

Drive—Upper beam or lower filaments lighted.

Bulb Specifications

Position	Candlepower	Mazda No.
Headlights	32-32	2330-L.
Parking, Clock	1.5	55.
Instrmt., Tail, Map	3	63.
Stop	15	87.
Indicators	....	51.

NOTE—An instrument dimmer switch (rheostat) is now mounted beside the instrument switch (see diagram).

THERMOSTAT RELAY:—Model 411-A. Thermostatic arm type current limit relay (no winding). Contacts will remain closed with current of 25 amperes but will open in one minute with load of 38 amperes at temperature of 70-80°F. Adjustment is sealed and unit should be replaced if defective.

HORNS:—Klaxon Model K-33-D. Type 1951 (low note), 1952 (high note). Vibrator type, matched tone, twin horns. Horn current 24-28 amperes (total). Operated by horn relay.

Horn Relay Model 266-TK:—Relay requires .25 amperes to close contacts. Current draw .8 amperes.

Relay Contact Gap—.015-.025″.

Air Gap—.012-.017″ (contacts closed).

SERIAL NUMBER:—On plate on front of dash.

ENGINE NUMBER:—Stamped on left hand side of crankcase below center of block.

ENGINE:—Twelve cylinder, 67° Vee, 'L' head type. cylinder bock for each bank cast Enbloc and separate from crankcase.
Bore—3⅛". **Stroke**—4½".
Piston Displacement—414 cubic inches.
Rated Horsepower—46.8 (SAE).
Developed Horsepower—150 at 3400 R.P.M.
Compression Ratio—6.38-1 Std. Aluminum head.
Compression Pressure—138 lbs. at 1000 R.P.M. or 105-110 lbs. at cranking speed.

Pistons:—Lynite, aluminum alloy, 'T' slot, elliptically (cam) ground, with oxidized bearing surface (special hard oxide deposited on skirt). Pistons cannot be ground. Refinish cylinders to take standard replacement pistons furnished .0025", .015", .030" oversize.
Weight—12½ ozs. (without rings, pin or locking screw).
Removal—Pistons and rods removed at bottom.
Clearance—Top Land .025". Bottom .002".
Fitting New Pistons—Use .002" feeler gauge to check clearance when fitting new pistons. Pull required to withdraw feeler from between piston and cylinder wall on side opposite slot must be between 3-4 lbs.
Installing Pistons—Install pistons with slot to left (viewed from drivers seat) in both banks.

Piston Rings:—Two compression rings, two oil control rings per piston.

Ring	Width	End Gap	Wall Thickness
Comp. (all)	⅛"	.008-.013"	.140"
Oil Cont. (all)	5/32"	.008-.013"	.140"

Piston Pin:—Diameter ⅞". Length 3". Pin is locked in piston.
Clearance in Rod Bushing—.0005".

Connecting Rod:—Weight 38 ozs. Length 10⅞".
Lower Bearing—Removable copper-lead type.
Journal Diameter—2½".
Clearance—.002". Sideplay .006-.015" (both bearings).
Adjustment—None (no shims). Replace bearings. Do not file caps.

Crankshaft:—Four bearing type with integral counterweights.
Journal Diameters—2⅝" (all bearings).
Bearing Type—Bohn Copper-lead type (except #4 which is bronze-backed, babbitt-lined type).
Clearance—.002".
Adjustment—Solid shims are used. Do not file caps.
End Thrust—Taken by #4 (rear) main bearing. Endplay .004-.007".

Camshaft:—Five bearing type. Duplex chain drive with automatic idler sprocket take-up. See Equipment Section for data on Morse automatic take-up idler.
Bearing Type—Babbitt-lined type.
Bearing Diameters—#1, 1½"; #2, 3, 4, 2¼"; #5, 1¼".
Timing Chain—Morse Duplex. Width 1½". Pitch ⅜". Length 104 links.
Camshaft Setting—Sprockets are marked. Mesh chain with sprockets turned so that marks are adjacent and in line with a straightedge across the shaft centers.

Valves:—

	Head Diam.	Stem Diam.	Length
All Valves	1 11/16"	5/16"	6¾"

	Seat Angle	Lift	Stem Clearance
All Valves	45°	11/32"	.003-.004"

Tappet Clearance—.004" Int., .006" Exh. cold.

Valve Springs—	Pressure	Length
Valve Closed	60-66 lbs.	2 11/16"
Valve Open	187-199 lbs.	2 11/32"

Valve Timing—See Camshaft Setting above.
Intake Valves—Open 21° BTDC. Close 49° ALDC.
Exhaust Valves—Open 57° BLDC. Close 11° ATDC.
To Check Valve Timing—No flywheel marks provided. No. 2 intake valve opens when a point on the flywheel approximately 5.77 teeth before dead center mark 'D2/12C' lines up with indicator on housing.

Lubrication:—Pressure. Gear type pump located in crankcase. Harrison oil temperature regulator located on right hand side of crankcase.
Normal Oil Pressure—40 lbs. at 50 M.P.H.
Oil Pressure Relief Valve—Located on outlet pipe from temperature regulator at right of crankcase. Operates at 40 lbs. Not adjustable. A second bypass valve is located in the crankcase on the oil header.
Capacity & Oil—12 qts. (refill). Use SAE. #40 (summer), #20-W (winter).

CARBURETION:—See Carburetion Section for complete data on Carburetor, Fuel Pump and Gasoline Gauge.

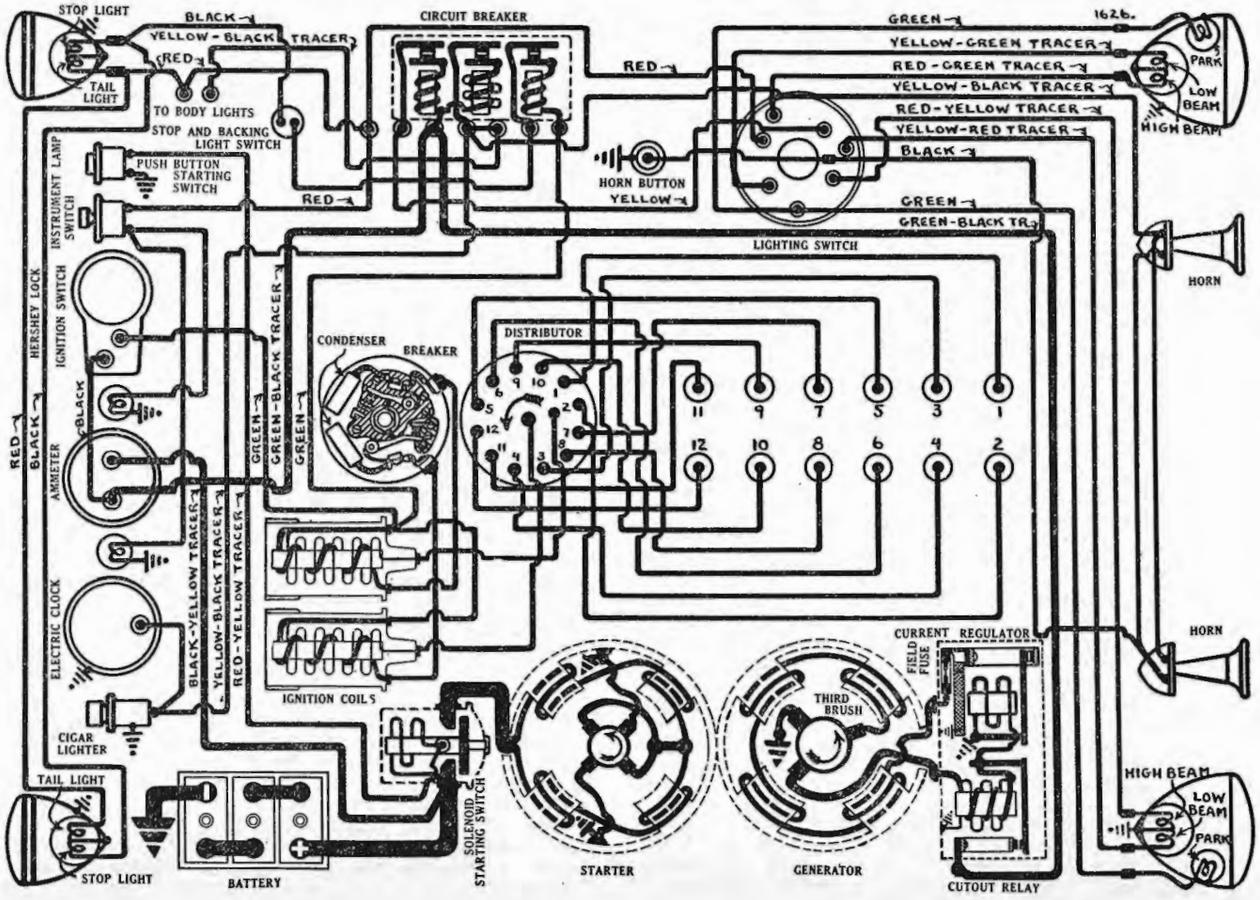
Carburetor:—Stromberg, Model EE-22, 1 7/16" dual downdraft type.

Fuel Pump:—AC. Type I-1521518 combination fuel and vacuum pump.

Gasoline Gauge:—K-S Telegauge hydrostatic type.

CLUTCH:—**Long Model 12C-B.** Single plate, dry disc type. No adjustment for wear required.
Clutch Pedal Adjustment—Free movement of clutch pedal should be 1". To adjust, loosen locknut and turn pedal adjusting screw on clutch arm below pedal shaft. Clearance between pedal and underside of toeboard is controlled by pedal stop screw on bracket above pedal shaft.
Clutch Facings—Woven type, 2 required. 9" I.D., 12" O.D., .137" thick.

STEERING:—**Front Suspension** — Conventional with semi-elliptic springs. Left spring shackled both front and rear.



Front Axle—Timken, 'I' beam section, reverse Elliot type ends.
Kingpin Inclination—7½° crosswise.
Caster—1½°. Use wedge shims inserted between spring and spring pad on axle to correct caster.
Camber—1°. Bending of axle to correct camber not recommended.
Toe In—1/16-⅛". To adjust, loosen clamps at each end of tie rod, turn rod (right and left hand threads).

IGNITION:—Coil Model CE-4001-L (2 used). Mounted on the dash above distributor.
Ignition Current—1.5 amperes (idling), 5 amperes (stopped) per coil.
Ignition Switch:—Oakes Hershey type co-incidental ignition switch and steering post lock.

Distributor Model IGM-4003. Double breaker, 6 lobe cam, semi-automatic advance type. Contacts open alternately at 33½° and 26½° intervals, corresponding to unequal 67° and 53° firing intervals of the engine. Caused by 67° included angle between cylinder banks. Contacts must be synchronized (see Timing).
Breaker Gap—Set at .020" (both sets).
Breaker Arm Spring Tension—20-22 ounces.
Cam Angles—Closed 36°. Open 24° distributor. Each set operates independently and controls one coil.
Manual Advance—20° (engine) adjustment only.

Automatic Advance

Distributor		Engine	
Degrees	R.P.M.	Degrees	R.P.M.
Start	300	0	600
2	660	4	1320
4	1000	8	2000
6	1365	12	2730
8	1720	16	3440
8.5	1800	17	3600

Removal:—Distributor mounted between cylinder banks at rear of engine. To remove, take off cable conduits and distributor cap, take out hold-down screws in advance arm.

IGNITION TIMING:—

Flywheel Degs.	Piston Position
All engines 7° BTDC.	.020" BTDC.

NOTE—Right hand (stationary) contacts control right hand coil and fire spark plugs in right cylinder bank. Left hand (movable) contacts control left hand coil and fire plugs in left bank.
Timing (Stationary Contacts)—With #2 piston front cylinder—right hand bank) on compression, turn engine over until piston reaches firing position, stop when flywheel mark 'A/2' lines up with pointer on housing in inspection hole in right top of flywheel housing. This mark is 7° before dead center mark 'D2/12C'. Then loosen taper lockscrew in center of breaker cam, carefully locate cam so that right hand or stationary contacts are beginning to open, tighten lockscrew, check rotor position and spark plug cable connections. Then synchronize movable contacts.
Synchronization (Movable Contacts)—Turn engine over 67° to firing position for piston #1 (front cylinder—left hand bank), stop when flywheel mark 'A/1' lines up with indicator. This mark is 7° before dead center mark 'D1/11C'. Then loosen lockscrews on movable sub-plate, shift plate by turning eccentric adjusting screw until movable contacts begin to open, tighten lockscrews. This will provide correct 33½° interval between opening of stationary and movable contacts.
Synchronization (Other Methods)—If distributor synchronized on rotary spark gap or other equipment, set movable contacts to open 33½° after stationary contacts. Firing intervals are unequal 33½-26½-33½ (distributor degrees).

Firing Order—1-4-9-8-5-2-11-10-3-6-7-12 with cylinders numbered as shown on diagram. Spark plugs not connected in accordance with firing order.

Spark Plugs:—Champion, Type 7. 18 MM. Metric.
Spark Plug Gaps—Set at .022".

BATTERY:—Exide, Type X-21-L. 6 volt, 21 plate, 147 A.H. capacity (20 hour rate).
Starting Capacity—175 amperes for 20 minutes.
Grounded Terminal—Negative (—) terminal.
Location—On right side under front floor.

STARTER:—Model MAO-4003-B. Armature MAB-2006.
Starter Drive—Outboard Bendix Type RB10FXXTD.
Rotation—Counter-clockwise at commutator end.
Brush Spring Tension—24-32 ounces with new brushes.
Cranking Performance—100 R.P.M.

Performance Data

Torque	R.P.M.	Volts	Amperes
0 ft. lbs.	2700 Min.	5.5	44 Max.
1.5 "	1360	5.5	100
5.7 "	740	5.0	200
11.1 "	500	4.5	300
16.8 "	320	4.0	400
22.3 "	180	3.5	500
34.0 "	Lock	3.0	715
48.5 "	Lock	4.0	975

Starting Switch:—Type SS-4004. Solenoid type switch mounted on starter field frame. Controlled by push button on instrument panel. See Equipment Section.

Removal:—Starter flange mounted on right front face of flywheel housing. To remove, take out three flange mounting screws.

GENERATOR:—Model GBC-4103. Armature No. GBC-2035. Air-cooled. Third brush control in conjunction with Current Regulator (two-step charging control). See Equipment Section for complete data on Regulator.
Charging Rate Adjustment—Third brush shifted by slotted screw on commutator end plate. Turn screw clockwise to increase, or counter-clockwise to decrease charging rate.
Maximum Charging Rate—18 amperes, 20-25 M.P.H.

Cold — **Performance Data** — Hot

Amps.	Volts	R.P.M.	Amps.	Volts	R.P.M.
0	6.4	460	0	6.4	525
4	6.7	525	4	6.8	640
8	6.95	600	8	7.2	750
12	7.25	680	12	7.6	940
16	7.55	800	16	8.0	1500
22	8.0	1300			

Rotation—Counter-clockwise at commutator end.
Brush Spring Tension—22-27 ounces with new brushes.
Field Current—2.47-2.73 amperes at 6.0 volts.
Field Fuse—5 ampere in knurled cup on side of regulator case.
Motoring Current—4.46-4.94 amperes at 6.0 volts.

Removal:—Generator flange mounted on right rear face of timing chain case. Water pump and oil temperature regulator mounted on commutator end of generator. To remove, drain radiator, disconnect hose couplings and oil leads or remove water pump, take out three flange mounting screws, pull generator to the rear to disengage drive coupling, do not disturb intermediate plate carrying drive sprocket.

RELAY-REGULATOR:—Model TC-4302-A, TC-4305-A. Mounted on generator. Consists of Cutout Relay and Current Regulator in a single case. See Equipment Section for complete data on these units.

Cutout Relay

Cuts In—6.75-7.5 volts, 10 M.P.H.
Cuts Out—.5-2.5 ampere discharge current.
Relay Contact Gap—.025-.035".
Air Gap—.010-.030" with contacts closed.

Current Regulator

Contacts Open—8.45-8.95 volts at 70°F.
Contacts Close—1.1-1.3 volts below opening point.
Contact Gap—.005" minimum.
Air Gap—.045" with contacts closed.

LIGHTING:—R.B.M. Switch Model 1301, 1315, 1316, 1317. Lincoln Part No. K-10335-B (complete assembly). Switch is mounted at lower end of steering column and controlled by lever on steering wheel. Headlamp upper and lower beams controlled by lighting switch. Headlamp bulbs are pre-focused type.

Bulb Specifications

Position	Candlepower	Mazda No.
Headlamps	32-21	2320-C
Parking	1½	55
Stop and Tail	21-2	1158
Dome	6	81

CIRCUIT BREAKER:—R.B.M. Model 1630. Consists of two vibrating and one lockout circuit breaker in a case on the dash (see diagram for circuits).
Vibrating Units—Begin to operate with current load of 30-40 amperes, limiting load to 10-15 amperes.
Lockout Unit—Begins to operate with current load of 30-40 amperes, limiting load to less than 1 ampere.
Contact Gap—.002".
Air Gap—1/16-⅛".

FUSES:—Generator Field—5 ampere in knurled cup on side of regulator case on generator.

HORNS:—Sparton Twin horns. Vibrator type. Horn current 20 amperes (total for both horns).

SERIAL NUMBER:—First number, R-294725. On right hand frame side rail under engine hood.

ENGINE NUMBER:—On plate on right side of crankcase.

ENGINE:—Own. Six cylinder, valve-in-head, twin-ignition type. Cylinders cast enbloc.
Bore—3⅜″. Stroke—4⅜″.
Piston Displacement—234 cubic inches.
Rated Horsepower—27.34 S.A.E.
Developed Horsepower—90 at 3200 R.P.M.
Compression Ratio—5.25-1. No optional ratios.

Pistons:—Nelson Bohnalite, aluminum alloy, Invar strut, split skirt type. Length, 3⅞″.
Weight—19⅛ ounces.
Removal—Pistons and rods removed from above.
Clearance—Skirt .002″ (see Fitting Pistons).
Fitting New Pistons—Use .002″ feeler stock to check clearance.
Installing Pistons—Slot should be toward left or opposite side from camshaft.

Piston Rings:—Two compression, two oil control rings per piston, all above pin.

Ring	Width	End Gap
Comp. All	⅛″	.010-.025″
Oil Cont. (3)	⅛″	.010-.025″
Oil Cont. (4)	3/16″	.010-.025″

Piston Pin:—Diameter ⅞″. Pin floats in piston and rod. Pin hole in rod is bronze-bushed.
Pin Fit in Piston—Light push fit with piston heated.
Pin Clearance in Rod Bushing—.0001″ or light push fit with both parts at normal temperature.

Connecting Rod:—Weight 35 ozs. Length 8¾″.
Crankpin Journal Diameter—2″.
Lower Bearing Type—Interchangeable steel-backed, babbitt-lined. One shim on camshaft side.
Clearance—.002″. Sideplay .006-.012″.
Adjustment—One shim. Replace bearings. Do not file rods or caps.

Crankshaft:—Seven bearing. Integral counterwts.
Journal Diameters—2 31/64″ all bearings.
Bearing Type—Interchangeable steel-backed, babbitt-lined type. No shims.
Clearance—.002″.
Adjustment—None (no shims). Replace bearings. Do not file bearing caps.
End Thrust—Taken by center bearing. Endplay .004-.007″.

Camshaft:—Non-adjustable double roller chain drive.
Timing Chain—Diamond double roller chain. Pitch ⅜″. Length 22½″ or 60 links.
Camshaft Setting—Sprockets are marked. Mesh chain with sprockets turned so that marks are adjacent and in line with a straightedge across the shaft centers. Chain should be removed and installed endless. Use special pullers and pushers, keep sprockets lined up to avoid sidestrain on chain and sprockets.

Valves:—

	Head Diameter	Seat Angle	Seat Width
Intake	1¾″	45°	1/16″
Exhaust	1 19/32″	45°	1/16″

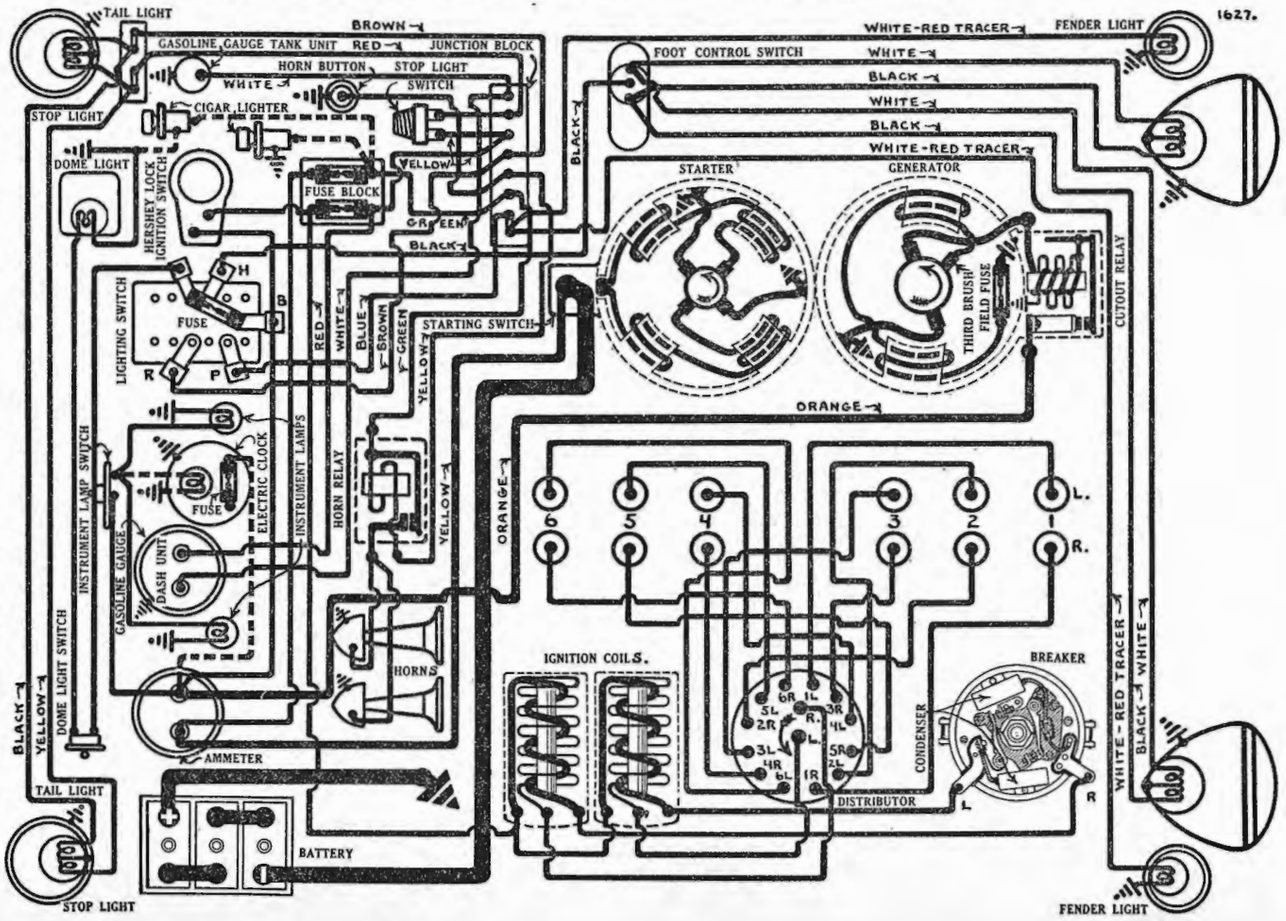
Tappet Clearance—.015″ with engine hot. Set clearance with engine idling.
Valve Timing—See Camshaft Setting above.

Lubrication:—Pressure type. Gear type oil pump located in crankshaft.
Normal Oil Pressure—25 pounds.
Oil Pressure Relief Valve—Located on oil pump cover. Operates at 25 lbs. Adjustable by turning screw.
Capacity & Oil—7 qts. Use SAE. #30 (warm and hot temperatures), #20W (cold temperatures).

CARBURETION:—See Carburetion Section for complete data on Carburetor, Fuel Pump, and Gasoline Gauge.
Carburetor:—Stromberg, Model EX-32, 1¼″ downdraft type.
Fuel Pump:—A.C., Type R-1521454 diaphragm type.
Gasoline Gauge:—Stewart Electric type.

CLUTCH:—Borg & Beck, Model 10A6. Single plate, dry disc type. No adjustment required for wear.
Clutch Pedal Adjustment—Free movement of clutch pedal must be ½-1½″. Adjust by loosening transverse bolt in link directly behind pedal and above clutch pedal shaft and shifting position of pedal. Setscrew on lever end of throw-out shaft at right of transmission must not contact stop on clutch housing. Check starting switch cable adjustment after adjusting clutch pedal.
Starting switch cable adjustment—Starting switch should make contact just after clutch is released. To check, engage transmission gears, depress clutch pedal, note when starter engages. If clutch is not completely released (car will tend to move) or if pedal travel is excessive, adjust by loosening two clamp bolts on clutch throw-out shaft lever to which switch cable is attached and move cable clamp in (for later engagement) or out (for earlier engagement) of starter.
Clutch Facings—Moulded type, 2 required, 6⅛″ I.D., 9⅞″ O.D., .133″ thick.
NOTE—Mark clutch cover, flywheel and pressure plate before disassembling and replace in same position. Install driven plate assembly with mark 'Flywheel side' toward flywheel (hub is offset). Use special gauge plate and adaptor to set up release levers when reassembling clutch. Release lever heights must be equal within .005″.

STEERING:—Front Suspension—Conventional 'I' beam section front axle with Reverse-Elliott ends, or 'Articulated' type independent springing. Semi-elliptic springs used with both type axles. Specifications for both types are same.
Kingpin Inclination—7° crosswise.
Caster—0-1½°. Adjust by inserting wedge shims between spring and spring pad on axle.
Camber—0-1½°. No adjustment.
Toe In—0-⅛″. Adjust in usual manner by changing length of tie rod.



IGNITION:—Coil Model CE-4402 (2 used). Coils are mounted on the dash.
Ignition Current—2 amperes (running), 4 amperes (stopped) for each coil.
Ignition Switch—Oakes Hershey type co-incidental ignition switch and steering post lock.

Distributor Model IGE-4012. Double breaker, 6 lobe cam, full automatic advance type. Contacts open simultaneously to fire both spark plugs in each cylinder at the same instant. Each set of contacts controls one coil and fires one spark plug in each cylinder. Contacts must be synchronized—see Timing.
Breaker Gap—Set at .020". Limits .018-.020" (.020-.024" for first 1000 miles with new contacts).
Breaker Arm Spring Tension—16-20 ounces.
Cam Angles—Closed 35°. Open 25° (distributor). Each set operates independently and controls one coil.

Automatic Advance

Distributor		Engine	
Degrees	R.P.M.	Degrees	R.P.M.
Start	200	0	400
3	360	6	720
6	520	12	1040
9	680	18	1360
12	840	24	1680
15	1000	30	2000

Removal:—Distributor mounted on right side of crankcase. To remove, take out hold-down screw in advance arm.

IGNITION TIMING:—Stationary Contacts—With #1 piston on compression, turn engine over until first line on vibration dampener at front of engine lines up with pointer on chain case cover. This line is the 'IGN' mark and the second line indicates top dead center. Loosen advance arm clamp bolt, rotate distributor until fixed contacts (mounted directly on breaker plate) begin to open, tighten clamp bolt. Then check synchronization of movable contacts.
Synchronization (Movable Contacts).—Movable contacts (mounted on sub-plate) should open at the same instant as the fixed set (see above). After timing stationary contacts, and without disturbing position of crankshaft or distributor, loosen lockscrews on movable sub-plate carrying the second set of contacts, shift plate by prying with a screwdriver inserted in the slot in the edge of the plate until contacts begin to open, tighten lockscrews. See Equipment Section for complete article on Synchronization of IGE type distributors.

Firing Order:—1-5-3-6-2-4. Spark plug cables are not connected in this order on distributor cap (see diagram).

Spark Plugs:—A.C., Type K-12. 14 MM. Metric. Type K-7 used on cars with overdrive.
Spark Plug Gaps—Set at .025" (.030" on cars with radio).

BATTERY:—U.S.L., Type KW-13A, 6 volt, 13 plate, 96 A.H. capacity (20 hour rate).
Starting Capacity—106 amperes for 20 minutes.
Grounded Terminal—Positive (+) terminal is grounded to frame and to transmission cover bolt.
Location—Under right front seat.

STARTER:—Model MAB-4053. Armature MAB-2057.
Starter Drive—Inboard Bendix Type LCD11FX-10.
Rotation—Counter-clockwise at commutator end.
Brush Spring Tension—44-56 ozs. (new brushes).

Performance Data

Torque	R.P.M.	Volts	Amperes
0 ft. lbs.	3700	5.5	60
.6 "	1910	5.5	100
3.4 "	1100	5.0	200
6.6 "	695	4.5	300
10.15 "	420	4.0	400
15.8 "	Lock	3.0	582
22.5 "	Lock	4.0	775

NOTE—Lock torque figures correct without switch

Removal:—Starter flange mounted on left front face of flywheel housing. To remove, take out two flange mounting screws.

Starting Switch:—Model VC-4002. Vacuum control type. Mounted on starter field frame and operated by clutch pedal. See Equipment Section for complete article and Clutch Pedal Adjustment (above) for adjustment.

GENERATOR:—Model GAR-4601-3. Armature GAR-2214. Air-cooled, third brush control type.
Charging Rate Adjustment—Take off commutator cover band, shift third brush by hand counter-clockwise to increase, or clockwise to decrease charging rate. Third brush held in position by friction.
Maximum Charging Rate—17 amperes (hot) at 8.0 volts reached at 2400 R.P.M.

Performance Data

Cold			Hot		
Amps	Volts.	R.P.M.	Amps.	Volts	R.P.M.
0	6.4	760	0	6.4	800
4	6.75	920	4	6.8	950
8	7.05	1100	8	7.15	1140
12	7.35	1300	12	7.5	1400
16	7.7	1560	16	7.85	1840
20	8.0	2300	18	8.0	2400

Rotation—Counter-clockwise at commutator end.
Brush Spring Tension—24-36 ounces.
Field Current—4.46-4.94 amperes at 6.0 volts.
Field Fuse—7½ ampere under cover on generator.
Motoring Current—4.89-5.41 amperes at 6.0 volts.

Removal:—Generator cradle mounted at left front of engine with fan belt drive. Water pump driven by extension of generator shaft. To remove, disconnect water pump drive coupling, slack off belt adjustment, loosen mounting clamp band, lift generator out.

Belt Adjustment:—Adjust belt when sideplay at point midway between generator and fan pulley exceeds 1½". To adjust, loosen two capscrews on fan bracket, raise bracket up (bracket pivots on one screw) until sideplay on belt is approximately 1", tighten screws.

CUTOUT RELAY:—Model CB-4021. Mounted on generator. See complete article on Relays in Equipment Section.
Cuts In—6.75-7.5 volts or 750 R.P.M.
Cuts Out—.5-2.5 ampere discharge current.
Contact Gap—.025-.035".
Air Gap—.010-.030" with contacts closed.

LIGHTING:—Soreng-Manegold Switch, Model A-5620-A. R.B.M. Foot Control Switch. Foot operated control switch used to control upper and lower headlamp beams. Headlamp bulbs are pre-focused type.

Bulb Specifications

	Candlepower	Mazda No.
Headlamps	32-21	2320
Fender, Instrument	3	63
Stop and Tail	21-3	1158
Dome	6	81

FUSES:—Lighting—20 ampere on back of lighting switch.
Body & Accessory—Two 20-ampere on fuse block mounted on steering column brace in back of instrument panel.
Generator Field—7½ ampere under cover on generator field frame.

HORNS:—Sparton Vibrator type twin horns. Operated by horn relay.
Horn Relay:—R.B.M., Type 10072. Current draw .4-.55 amperes at 6.0 volts. Coil resistance 11-14 ohms. Contacts must close with 4 volts across winding with relay in inverted position.

SERIAL NUMBER:—First number, C-1001. On plate on right frame side member under engine hood and on caution plate on left front door corner post.

ENGINE NUMBER:—On plate on right front side of crankcase below valve cover plate and on caution plate on left front door corner post.

ENGINE:—Own 'Monitor Sealed Motor'. Six cylinder, 'L' head type. Cylinders cast enbloc.

NOTE—The entire engine hood and radiator grill is a unit and is hinged at the cowl. It is lifted up at the front end to expose the motor. No intake manifold is used and intake passage is formed within the head and block castings.
Bore—3⅜". **Stroke**—4⅜".
Piston Displacement—234 cubic inches.
Rated Horsepower—27.34 S.A.E.
Developed Horsepower—90 at 3400 R.P.M.
Compression Ratio—5.58-1. No optional ratios.

Pistons:—Bohnalite, aluminum alloy, Invar strut, split skirt type.
Removal—Pistons and rods removed from above.
Clearance—.022" top. .002" skirt.
Fitting New Pistons—Use .002" feeler stock to check clearance.
Installing Pistons—Slot should be toward left or opposite side from valves.

Piston Rings:—Two compression, two oil control rings per piston, all above pin.

Ring	Width	End Gap
Comp. (all)	⅛"	.010-.025"
Oil Cont. (#3)	⅛"	.010-.025"
Oil Cont. (#4)	3/16"	.010-.025"

Piston Pin:—Diameter ⅞". Pin floats in piston and rod. Held by locking ring at each end. Pin hole in connecting rod bronze bushed.
Pin Fit in Piston—Light push fit with piston heated.
Pin Clearance in Rod Bushing—.0001" or light push fit with piston and pin cold.

Connecting Rod:—Length 8¾" (center-to-center).
Crankpin Journal Diameter—2".
Lower Bearing Type—Interchangeable steel-backed, babbitt-lined. One shim on camshaft side.
Clearance—.002-.003". Sideplay .008-.012".
Adjustment—One shim. Replace bearings. Do not file rods or caps.

Crankshaft:—7 bearing. Integral counterweights.
Journal Diameters—2 31/64" all bearings.
Bearing Type—Interchangeable steel-backed, babbitt-lined. No shims.
Clearance—.002".
Adjustment—None (no shims). Replace bearings. Do not file bearing caps.
End Thrust—Taken by center bearing. Endplay .004-.007".

Camshaft:—Six bearing. Non-adjustable chain drive.
Bearing Diameters—#1, 1⅞"; #2, 2 13/64"; #3, 2 11/64"; #4, 2 9/64"; #5, 2 7/64"; #6, 1¾".
End Thrust—Taken by front bearing (shoulder formed on shaft behind bearing, and shoulder in front of bearing formed by sprocket hub when bolted on camshaft).
Timing Chain—Whitney. Double strand roller chain. Width 9/16". Pitch ⅜". Length 22½" or 60 links.
Camshaft Setting—Sprockets are marked. Mesh chain with sprockets turned so that marks are adjacent and in line with a straightedge across the shaft centers. Install chain endless with camshaft sprocket off engine.

Valves:—

	Head Diameter	Seat Angle	Seat Width
Intake	1 21/32"	45°	1/16"
Exhaust	1 17/32"	45°	1/16"

Tappet Clearance—.015" all valves with engine hot or cold.
Valve Timing—See Camshaft Setting above.

Lubrication:—Pressure type. Gear type oil pump located in crankcase.
Normal Oil Pressure—25 lbs. (10 lbs. idling).
Oil Pressure Relief Valve—Located on oil pump. Operates at 25 lbs. Adjustable by turning screw.
Capacity & Oil—7 qts. Use SAE. #30 (summer), #20-W (winter).

CARBURETION:—See Carburetion Section for complete data on Carburetor, Fuel Pump, and Gasoline Gauge.

Carburetor:—Stromberg, Model EX-22, 1¼" downdraft type.

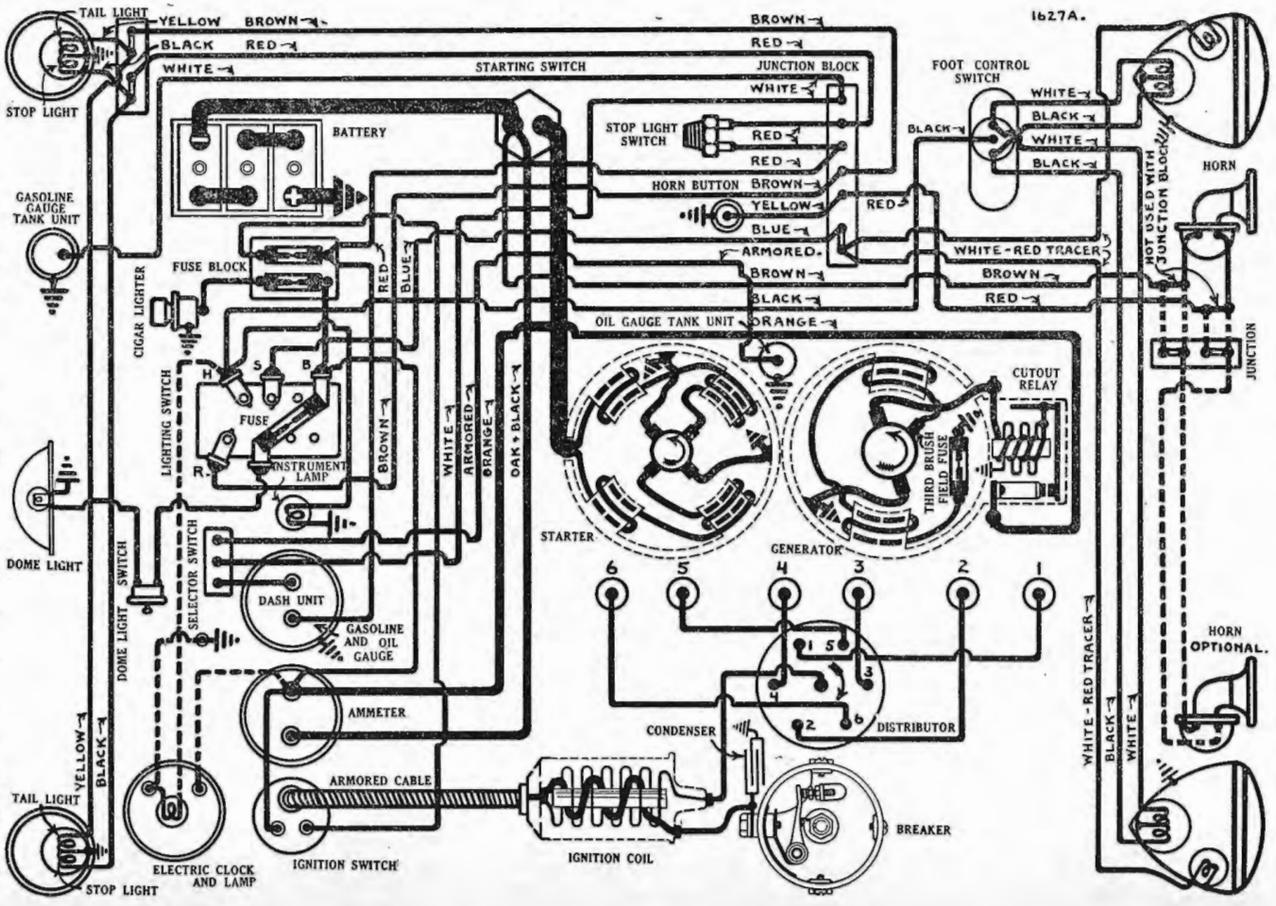
Fuel Pump:—A.C., Type R-1521454. Diaphragm type.

Gasoline Gauge:—Combination gasoline and oil gauge. Oil reading obtained by pressing button below and to left of instrument cluster. Operative only with ignition 'on'.

CLUTCH:—**Borg & Beck.** Single plate, dry disc type. No adjustment for wear required.
Clutch Pedal Adjustment—Free movement of the clutch pedal must be ½-1". Adjust whenever free movement decreases to ½". To adjust, loosen transverse bolt at lower end of clutch pedal, shift pedal position, tighten bolt.
Clutch Facings—Moulded type, 2 required, 5⅝" I.D., 9¼" O.D., .133" thick.

NOTE—Mark clutch cover and flywheel and reassemble clutch in same position. Use gauge plate in setting up release levers when reassembling clutch. Lever heights must be equal within .005".

STEERING:—**Front Suspension**—Conventional 'I' beam section front axle with Reverse-Elliott ends and semi-elliptic springs.
Kingpin Inclination—7° crosswise.
Caster—0-1°. Adjust by inserting wedge shims between spring and spring pad on axle.
Camber—0-1½°. No adjustment.



Toe In—0-⅛". Adjust by loosening clamp bolt at right end of tie rod and screwing tie rod in or out of end joint. Tighten clamp bolt.

IGNITION:—Coil Model IG-4626. Mounted on cowl.
Ignition Current—2½ amperes idling, 4 stopped.
Ignition Switch—Part of coil assembly (Electro-lock type connected to coil by armored cable).

Distributor Model IGB-4328. Single breaker, 6 lobe cam, full automatic advance type.
Breaker Gap—Set at .020". Limits .018-.020".
Breaker Arm Spring Tension—16-20 ounces.
Cam Angles—Closed 40.5°. Open 19.5° (distributor).

Automatic Advance

Distributor Degrees	Distributor R.P.M.	Engine Degrees	Engine R.P.M.
Start	300	0	600
2	500	4	1000
4	700	8	1400
6	900	12	1800
7	1000	14	2000

Removal:—Distributor mounted on right side of cylinder head. To remove, loosen locknut and take out mounting setscrew in side of cylinder head opposite distributor.

IGNITION TIMING:— Flywheel Degs. Piston Pos.
First Cars (see note) 10° BTDC. .0415" BTDC.
Later Cars At TDC. .0000" TDC.

NOTE—On all cars with a red plate reading "Caution—Set IGN. on DC." on the side of the distributor housing, the later ignition setting must be used regardless of the location of the 'IGN' line on the vibration dampener. On late cars the IGN. and DC. lines on the vibration dampener coincide.

Timing (first cars without 'Caution' Plate)—With #1 piston on compression, turn engine over until piston is 10° before top dead center, stop when 'IGN' line on vibration dampener at front of engine lines up with pointer on chain case cover. The 'IGN' mark is the first line, the second line indicates top dead center for pistons #1 and 6. Loosen locknut and setscrew on side of cylinder head, rotate distributor until contacts begin to open, tighten setscrew and locknut.

Timing (later cars with Caution Plate)—With #1 piston on compression, turn engine over until piston reaches top dead center, stop when 'DC' line on vibration dampener at front of engine lines up with pointer on chain case cover (if the dampener also marked 'IGN' at point 10° before 'DC' line, the 'IGN' line should be disregarded and the ignition set at the second or 'DC' line; on late cars the two lines coincide). Loosen locknut and set screw on side of cylinder head, rotate distributor until contacts begin to open, tighten setscrew and locknut.

Firing Order:—1-5-3-6-2-4 (see diagram).

Spark Plugs:—A.C., Type G-8. 18 MM. Metric.
Spark Plug Gaps—Set at .025" (.030" on cars with radio). In some cases performance has been improved by setting the gaps at .020" in the field.

BATTERY:—U.S.L., Type KW-13A, 6 volts, 13 plate, 96 A.H. capacity (20 hour rate).
Starting Capacity—106 amperes for 20 minutes.
Grounded Terminal—Positive (+) terminal is grounded to frame and to transmission cover bolt.
Location—On left side under driver's seat.

STARTER:—Model MAB-4068. Armature MAB-2057.
Starter Drive—Inboard Bendix type.
Rotation—Counter-clockwise at commutator end.
Brush Spring Tension—31-42 ozs. (new brushes).

Performance Data

Torque	R.P.M.	Volts	Amperes
0 ft. lbs.	3700	5.5	60
.6 "	1910	5.0	100
3.4 "	1100	4.5	200
6.6 "	695	4.0	300
10.15 "	420	3.5	400
15.8 "	Lock	3.0	582
22.5 "	Lock	4.0	775

Starting Switch:—Model SW-4001. Mounted at left of engine. Operated by depressing clutch pedal.

Removal:—Starter flange mounted on left front face of flywheel housing. To remove, take out two flange mounting capscrews.

GENERATOR:—Model GAR-4618-2. Armature No. GAR-2155. Air-cooled. Third brush control type.
Charging Rate Adjustment—Take off commutator cover band, shift third brush by hand counter-clockwise to increase, or clockwise to decrease charging rate. Third brush held in position by friction.
Maximum Charging Rate—18 amperes (cold), 16 amperes (hot), 8.0 volts, 2300 R.P.M.

Performance Data

Cold Amps.	Cold Volts	Cold R.P.M.	Hot Amps.	Hot Volts	Hot R.P.M.
0	6.4	800	0	6.4	800
4	6.8	940	4	6.85	960
8	7.15	1125	8	7.25	1160
12	7.5	1380	12	7.65	1500
16	7.85	1740	16	8.0	2300
18	8.0	2250			

Rotation—Counter-clockwise at commutator end.
Brush Spring Tension—24-36 ozs. (new brushes).
Field Current—3.7-4.1 amperes at 6.0 volts.
Field Fuse—5 ampere on generator frame.
Motoring Current—4.94-5.46 amperes at 6.0 volts.

Removal:—Generator cradle mounted at left front of engine with fan belt drive. Water pump impellor mounted on generator shaft. To remove, drain radiator, take out water pump mounting bolts or remove water pump cover screws. Slack off belt adjustment. Loosen mounting clamp band, lift out generator and water pump.

Belt Adjustment:—Adjust when slack or sideplay of belt midway between generator and fan pulleys exceeds 1½". To adjust, loosen two capscrews on fan bracket, lift bracket up (pivots on one screw) until sideplay is approximately 1", tighten capscrews.

CUTOUT RELAY:—Model CB-4014. Mounted on generator. See Equipment Section for complete article on this unit.
Cuts In—6.75-7.5 volts, 800 R.P.M.
Cuts Out—.5-2.5 ampere discharge current.
Relay Contact Gap—.025-.035".
Air Gap—.010-.030" with contacts closed.

LIGHTING:—Soreng-Manegold Switch, Model 5820-A. R.B.M. Foot Control Switch. Foot operated control switch used to control headlamp upper and lower beams. Headlamp bulbs are pre-focused type.

Bulb Specifications

Position	Candlepower	Mazda No.
Headlamps	32-21	2320C
Parking, Instrument	3	63
Stop and Tail	21-3	1158
Dome	3	64 (DC.)

FUSES:—Lighting—20 ampere on back of switch.
Generator Field—5 ampere on generator frame.
Accessory—One or two 20-ampere fuses on fuse block mounted on steering column support in back of instrument panel.

SERIAL NUMBER:—First number, B-75010. On right frame siderail under engine hood.

ENGINE NUMBER:—On plate on right side of crankcase.

ENGINE:—Eight cylinder, Valve-in-head, Twin-Ignition type.
Bore—3⅛". Stroke—4¼".
Piston Displacement—260.8 cubic inches.
Rated Horsepower—31.25 S.A.E.
Developed Horsepower—102 at 3200 R.P.M.
Compression Ratio—5.25-1. No optional ratios.

Pistons:—Nelson Bohnalite, aluminum alloy, Invar strut, split skirt type. Length 3 11/16".
Weight—19 ounces.
Removal—Pistons and rods removed from above.
Clearance—Skirt .002". See Fitting Pistons.
Fitting New Pistons—Use .002" feeler gauge to check clearance.
Installing Pistons—Slot should be toward left or opposite side from camshaft.

Piston Rings:—Two compression, two oil control rings per piston, all above pin.

Ring	Width	End Gap
Comp. All	⅛"	.010-.025"
Oil Cont. (#3)	⅛"	.010-.025"
Oil Cont. (#4)	3/16"	.010-.025"

Piston Pin:—Diameter ⅞". Pin floats in piston and rod. Pin hole in rod is bronze-bushed.
Pin Fit in Piston—Light push fit with piston heated.
Pin Clearance in Rod Bushing—.0001" or light push fit with both parts at normal temperature.

Connecting Rod:—Weight 34 ozs. Length 8¾".
Crankpin Journal Diameter—2".
Lower Bearing Type—Interchangeable steel-backed, babbitt-lined. One shim on camshaft side.
Clearance—.002". Sideplay .006-.012".
Adjustment—One shim. Replace bearings. Do not file rods or caps.

Crankshaft:—9 bearing. Integral counterweights.
Journal Diameters—2 31/64" all bearings.
Bearing Type—Interchangeable steel-backed, babbitt-lined. No shims.
Clearance—.002".
Adjustment—None (no shims). Replace bearings. Do not file bearing caps.
End Thrust—Taken by center bearing. Endplay .004-.007".

Camshaft:—Non-adjustable roller chain drive.
Timing Chain—Diamond double roller chain. Pitch ⅜". Length 22½" or 60 links.
Camshaft Setting—Sprockets are marked. Mesh chain with sprockets turned so that marks are adjacent and in line with a straightedge across the shaft centers. Chain should be removed and installed endless. Use special pullers and pushers, keep sprockets lined up to avoid sidestrain on chain and sprockets.

Valves:—	Head Diameter	Seat Angle	Seat Width
Intake	1 21/32"	45°	1/16"
Exhaust	1 15/32"	45°	1/16"

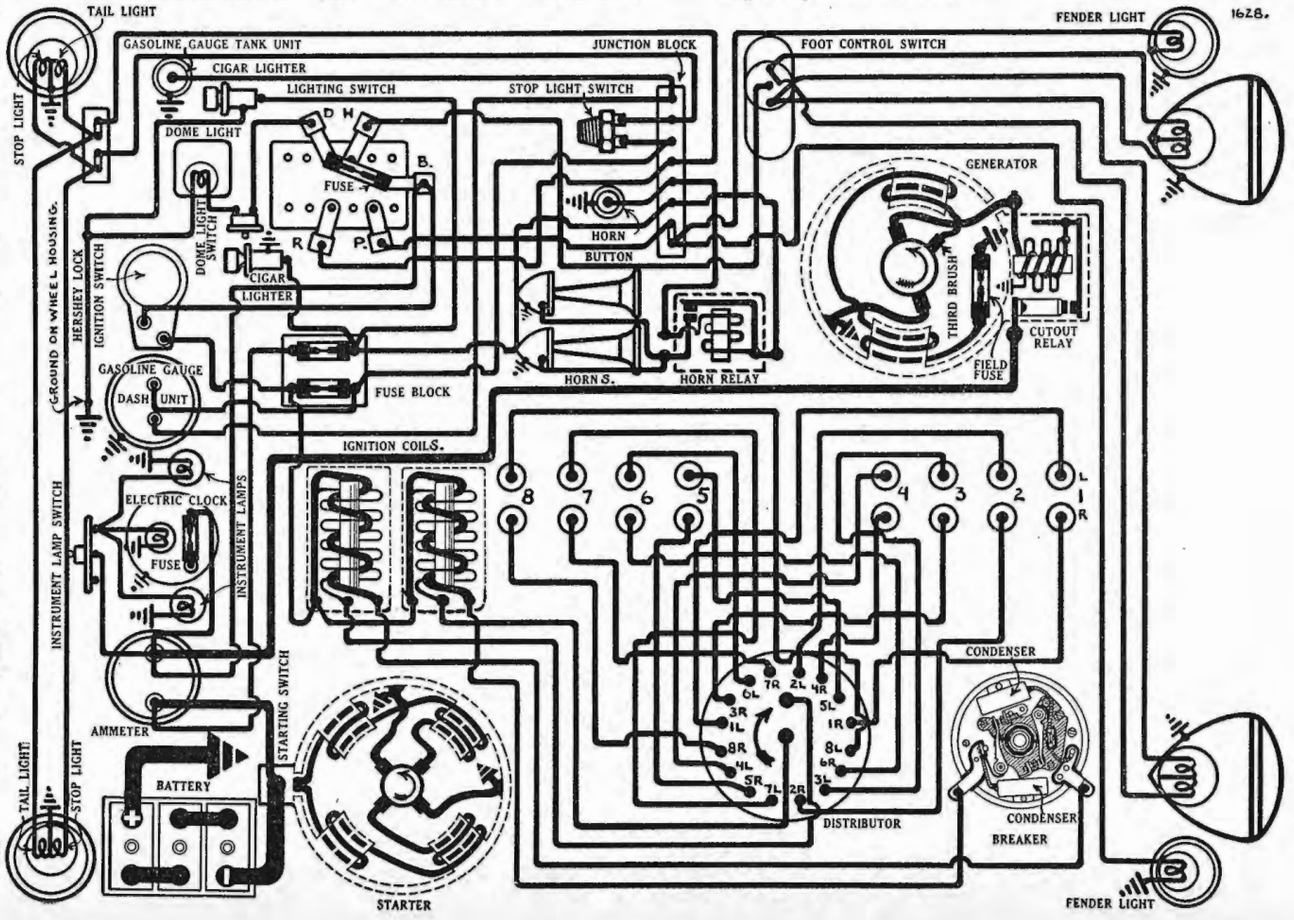
Tappet Clearance—.015" with engine hot. Set clearance with engine idling.
Valve Timing—See Camshaft Setting above.

Lubrication:—Pressure type. Gear type oil pump located in crankcase.
Normal Oil Pressure—25 pounds.
Oil Pressure Relief Valve—Located on pump cover. Operates at 25 pounds. Adjustable by turning screw.
Capacity & Oil—7 qts. Use SAE. #30 (warm and hot temperatures), #20-W (cold temperatures).

CARBURETION:—See Carburetion Section for complete data on Carburetor, Fuel Pump, and Gasoline Gauge.
Carburetor:—Stromberg, Model EE-22 1¼" dual, or Model EE-1 1" dual, downdraft type.
Fuel Pump:—A.C., Type R-1521457 diaphragm type.
Gasoline Gauge:—Stewart Electric type.

CLUTCH:—Borg & Beck Model 10A6. Single plate, dry disc type. No adjustment required for wear.
Clutch Pedal Adjustment—Free movement of clutch pedal must be ½-1½". Adjust by loosening transverse bolt directly behind pedal and above clutch pedal shaft and shifting position of pedal. Setscrew on lever on end of throw-out shaft at right of clutch housing must not contact stop on housing. Check starting switch cable adjustment after adjusting clutch pedal.
Starting Switch Cable Adjustment—Starting switch should make contact just after clutch is released. To check, engage transmission gears, depress clutch pedal, note when starter engages. If clutch is not entirely released (car will tend to move), or if pedal travel is excessive, adjust by loosening two clamp bolts on clutch throw-out shaft lever to which switch cable is attached and move cable clamp in (for later engagement) or out (for earlier engagement of starter).
Clutch Facings—Moulded type, 2 required, 6⅛" I.D., 9⅞" O.D., .133" thick.
NOTE—Mark clutch cover, flywheel, and pressure plate before disassembling clutch and replace in same position. Install driven plate assembly with mark 'Flywheel Side' toward flywheel (hub is offset). Use special gauge plate and adaptor to set up release levers when reassembling clutch. Release lever heights must be equal within .005".

STEERING:—Front Suspension—Conventional 'I' beam section front axle with Reverse-Elliott ends, or 'Articulated' type independent springing. Semi-elliptic springs are used with both axles. Specifications for both types are the same.
Kingpin Inclination—7° crosswise.
Caster—0-1½°. Adjust by inserting wedge shims between spring and spring pad on axle.
Camber—0-1½°. No adjustment.
Toe In—0-⅛". Adjust in usual manner by changing length of tie rod.



IGNITION:—Coil Model CE-4402 (2 used). Coils are mounted on dash.
Ignition Current—2 amperes (running), 4 amperes (stopped) for each coil.
Ignition Switch—Oakes Hershey type co-incidental ignition switch and steering post lock.

Distributor Model IGK-4101. Double breaker, 4 lobe cam, full automatic advance type. Contacts open simultaneously to fire both spark plugs in each cylinder at the same instant. Each set of contacts controls one coil and fires one spark plug in each cylinder. Contacts must be synchronized (see Timing).
Breaker Gap—.015". Limits .013-.017" (.015-.019" first 1000 miles with new contacts).
Breaker Arm Spring Tension—20 ounces.
Cam Angles—Closed 28°. Open 17° (distributor). Each set operates independently and controls one coil.

Automatic Advance

Distributor		Engine	
Degrees	R.P.M.	Degrees	R.P.M.
Start	200	0	400
3	360	6	720
6	520	12	1040
9	680	18	1360
12	840	24	1680
15	1000	30	2000

Removal:—Distributor mounted on right side of crankcase. To remove, take out hold-down screw in advance arm.

IGNITION TIMING:—Stationary Contacts—With #1 piston on compression, turn engine over until first line on vibration dampener at front of engine lines up with pointer on chain case cover. This line is the 'IGN' mark and the second line indicates top dead center. Loosen advance arm clamp bolt, rotate distributor until stationary contacts (mounted directly on breaker plate) begin to open, tighten clamp bolt. Then check synchronization of movable contacts.
Synchronization (Movable Contacts) — Movable contacts (mounted on sub-plate) should open at the same instant as the stationary set (see above). After timing stationary contacts, and without disturbing position of crankshaft or distributor, loosen lockscrews on sub-plate carrying the second set of contacts, shift plate by prying with a screwdriver inserted in the slot in the edge of the plate until contacts begin to open, tighten lockscrews. See Equipment Section for complete article on synchronization of IGK type distributors

Firing Order:—1-6-2-5-8-3-7-4. Spark plugs not connected in this order on distributor cap (see diagram).
Spark Plugs:—A.C., Type K-12. 14 MM. Metric. Type K-7 used on cars with overdrive.
Spark Plug Gaps—Set at .025" (.030" on cars with radio).

BATTERY:—U.S.L., Type KW-15A. 6 volt, 15 plate, 115 A.H. capacity (20 hour rate).
Starting Capacity—127 amperes for 20 minutes.
Grounded Terminal—Positive (+) terminal is grounded to frame and to transmission cover bolt.
Location—Under right front seat.

STARTER:—Model MAB-4054, MAB-4057 (Export). Armature No. MAB-2047.
Starter Drive—Inboard Bendix Type LCD11FX-10.
Rotation—Counter-clockwise at commutator end.
Brush Spring Tension—44-56 ozs. (new brushes).

Performance Data

Torque	R.P.M.	Volts	Amperes
0 ft. lbs.	3700	5.5	60
.6 "	1910	5.5	100
3.4 "	1100	5.0	200
6.6 "	695	4.5	300
10.15 "	420	4.0	400
15.8 "	Lock	3.0	582
22.5 "	Lock	4.0	775

NOTE—Lock torque figures correct without switch.
Removal:—Starter flange mounted on left front face of flywheel housing. To remove, take out two flange mounting screws.
Starting Switch:—Model VC-4002. Vacuum control type. Mounted on starter field frame and operated by clutch pedal. See Equipment Section for complete article and Clutch Pedal Adjustment (above) for adjustment.

GENERATOR:—Model GAR-4601-3. Armature GAR-2214. Air-cooled, third brush control type.
Charging Rate Adjustment—Take off commutator cover band, shift third brush by hand counter-clockwise to increase, or clockwise to decrease charging rate. Third brush held in position by friction.
Maximum Charging Rate—17 amperes (hot) at 8.0 volts reached at 2400 R.P.M.

Performance Data

Cold			Hot		
Amps.	Volts	R.P.M.	Amps.	Volts	R.P.M.
0	6.4	760	0	6.4	800
4	6.75	920	4	6.8	950
8	7.05	1100	8	7.15	1140
12	7.35	1300	12	7.5	1400
16	7.7	1560	16	7.85	1840
20	8.0	2300	18	8.0	2400

Rotation—Counter-clockwise at commutator end.
Brush Spring Tension—24-36 ounces.
Field Current—4.46-4.94 amperes at 6.0 volts.
Field Fuse—7½ ampere under cover on generator.
Motoring Current—4.89-5.41 amperes at 6.0 volts.

Removal:—Generator cradle mounted at left front of engine with fan belt drive. Water pump driven by extension of generator shaft. To remove, disconnect water pump drive coupling, slack off belt adjustment, loosen mounting clamp band, lift generator out.

Belt Adjustment: — Adjust belt when sideplay at point midway between generator and fan pulley exceeds 1½". To adjust, loosen two capscrews on fan bracket, raise bracket up (bracket pivots on one screw) until sideplay on belt is approximately 1", tighten screws.

CUTOUT RELAY:—Model CB-4021. Mounted on generator. See complete article on Relays in Eqiupment Section.
Cuts In—6.75-7.5 volts or 750 R.P.M.
Cuts Out—.5-2.5 ampere discharge current.
Contact Gap—.025-.035".
Air Gap—.010-.030" with contacts closed.

LIGHTING:—Soreng-Manegold Switch, Model A-5620-A. R.B.M. Foot Control Switch. Foot operated control switch used to control upper and lower headlamp beams. Headlamp bulbs are pre-focused type.

Bulb Specifications

	Candlepower	Mazda No.
Headlamps	32-21	2320
Fender, Instrument	3	63
Stop and Tail	21-3	1158
Dome	6	81

FUSES: — Lighting — 20 ampere on back of lighting switch.
Body & Accessory—Two 20-ampere on fuse block mounted on steering column brace in back of instrument panel.
Generator Field—7½ ampere under cover on generator field frame.

HORNS: — Sparton Vibrator type twin horns. Operated by horn relay.

Horn Relay:—R.B.M., Type 10072. Current draw .4-.55 amperes at 6.0 volts. Coil resistance 11-14 ohms. Contacts must close with 4 volts across winding with relay in inverted position.

SERIAL NUMBER:—First number, F103001. On frame siderail.

ENGINE NUMBER:—First number, F405001.

ENGINE:—Model F-35. Six cylinder, 'L' head type.
Bore—3 5/16". **Stroke**—4⅛".
Piston Displacement—213.3 cu. ins.
Rated Horsepower—26.3 (SAE).
Developed Horsepower—90 at 3400 R.P.M.
Compression Ratio—6.2-1. No optional ratios.
Compression Pressure—146 lbs. at 1000 R.P.M. or 111 lbs. plus or minus 5 lbs. at 100 R.P.M. (cranking speed).

Pistons:—Electro-plated cast-iron. Pistons are tin-plated after finishing and cannot be ground. Refinish cylinders to take replacement pistons furnished .003", .005", .0075", .010", .015", .020", .025", .030" oversize. Oversize pistons held to same weight as standard Piston length, 3 15/16" (approximately 1/16" higher above pin than 1934 and not interchangeable).
Weight—26.84 ozs. (stripped), 33.19 ozs. (with rings, pin and lock screw).
Removal—Pistons and rods removed from above.
Clearance—Top .0235-.0305". Bottom .0013-.0025".
Fitting New Pistons—Pistons and bore should be round within .0005". Use .002" feeler stock ½" wide inserted between piston and wall, spring tension required to withdraw feeler must be 4-15 lbs.
Installing Pistons—Pin hole in piston offset 3/32". Install pistons with mark 'V.S.' toward valve side.

Piston Rings:—Two compression, one oil control ring per piston, all above pin. Lower ring groove drilled with oil return holes. Compression rings installed with groove toward bottom.

Ring	Width	End Gap	Side Clearance	Wall Thickness
Comp. (all)	⅛"	.007-.012"	.0015-.003"	.148"
Oil Cont.	3/16"	.007-.012"	.001-.0025"	.145"

Piston Pin:—Diameter, .8554-.8558". Length, 3 1/32". Pin is locked in piston (opposite end slotted to allow boss to slide freely on pin).
Pin Fit in Piston—Press fit (see below).
Pin Fit in Rod Bushing—.0003-.0007" clearance.
Fitting Pins—Use special tool HM-412 to install pins (tool checks pressure required to press pin into place). Insert pin from lockpin side (slotted end first). Pressure should be 200-250 lbs. (first boss), 300-350 lbs (second boss). Check piston for out-of-round after pin is installed (maximum allowable, .0005").

Connecting Rod:—Weight, 30.7 ozs. Length, 7 13/16".
Upper Bearing—Split bushed type. New bushings should be burnished and then line-reamed to inside diameter of .8559-.8564". Oil hole in bushing must line up with rifle-drilled oil passage in rod.
Lower Bearing—Steel-backed, babbitt-lined type.
Clearance—.001-.003". Sideplay .0055-.0105".
Adjustment—No shims used. Replace bearings. Do not file rod or cap faces. Bearings assembled with slight projection above faces to insure contact.

Crankshaft:—Four bearings. Integral counterweights.
Journal Diameters—#1—2.478-2.479", #2—2.5405-2.5415", #3—2.6655-2.6665", #4—2.728-2.729".
Bearing Type—Interchangeable steel-backed, babbitt-lined type. Bearings halves are interchangeable (upper and lower) except rear (#4).
Clearance—.001-.003".
Adjustment—No shims used. Replace bearings. Do not file bearing caps. Bearing upper halves can be removed without removing crankshaft by using tool HM-J-173. This is a flat headed plug which is slipped into oil hole in crankshaft. The head engages the edge of the bearing and turns bearing out as crankshaft is rotated. Install new bearings in same manner (insert plain edge of bearing on indented side of upper bearing support).
End Thrust—Taken by #1 (front) bearing. End-play .004-.007". A bronze thrust plate .1205-.1235" thick (selective) is assembled at each end of front main bearing and is dowelled to bearing cap. There is a steel thrust collar on the crankshaft behind the crankshaft gear.

Camshaft:—4 bearing. Non-adjustable chain drive.
Journal Diameters—#1—1.9975-1.9970", #2—1.9350 1.9345", #3—1.8725-1.8720", #4—1.8100-1.8095".
Bearing Type—Metal-backed, babbitt-lined.
Clearance—.002-.004".
End Thrust—Taken by spring loaded plunger in forward end of camshaft and thrust plate on chain case cover.
Timing Chain—Whitney. Width, 1¼". Pitch, .500". Length, 23½" or 47 links.
Camshaft Setting—Sprockets are marked. Mesh chain with sprockets turned so that marks are adjacent and in line with a straightedge across the shaft centers. Use Sprocket Gauge HM-408-O.

Valves:—

	Head Diameter	Stem Diameter	Length
Intake	1 9/16"	11/32" (.3425-.3415")	5 51/64"
Exhaust	1 7/16"	11/32" (.3415-.3405")	5 55/64"

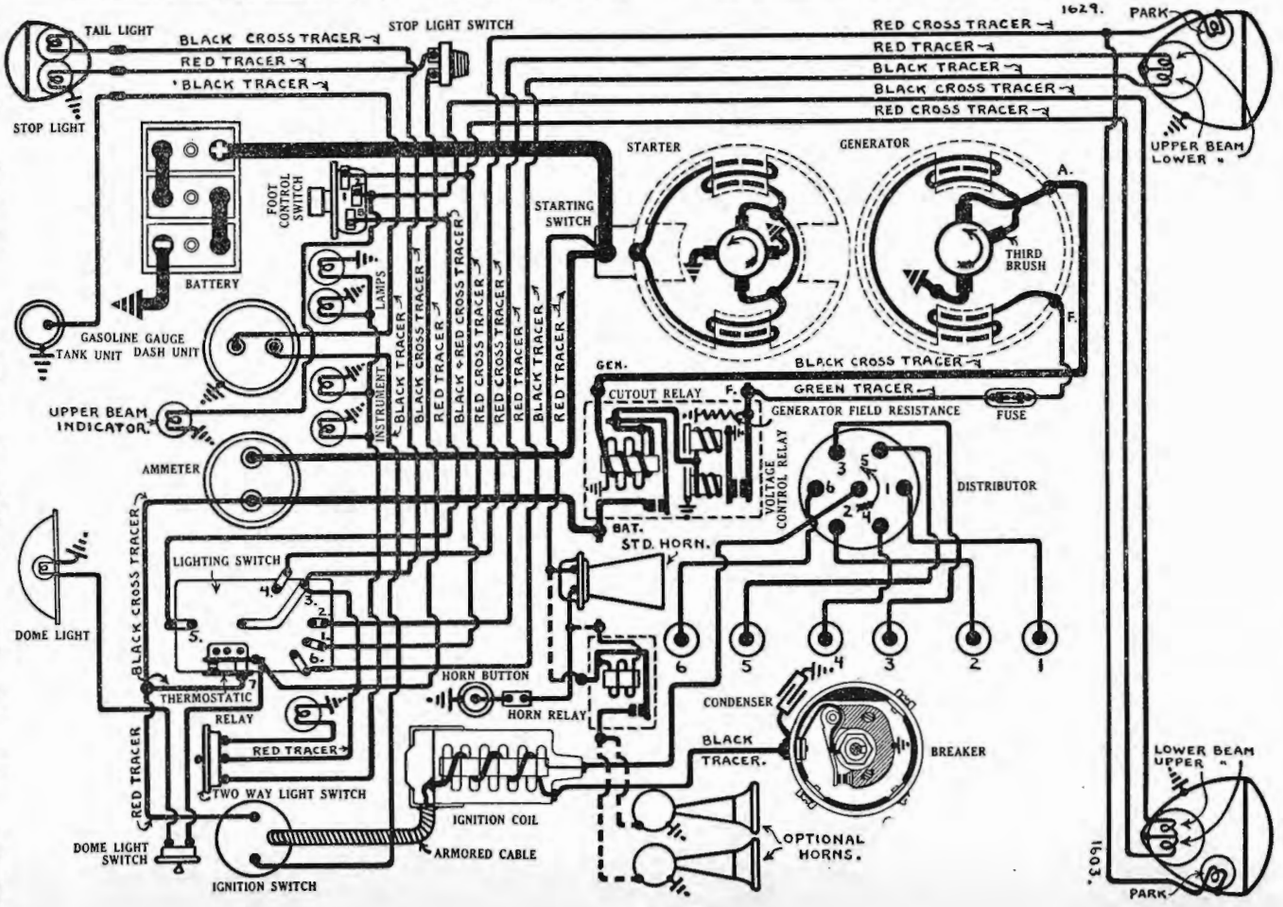
	Seat Angle	Lift	Stem Clearance
Intake	30°	.300"	.00125-.00325"
Exhaust	30°	.300"	.00225-.00425"

Tappet Clearance—.008" Int., .010" Exh., warm.
Installing New Guides—Install guides with turned portion toward bottom and finish ream to .34375-.34475" (inside diameter) after assembly. Top of guide must be 15/16" below top of block.
Valve Springs—New type with three close-coils at top. No valve cages used. Free length, 2 9/16".

	Pressure	Length
Valve Closed	43 lbs.	2 9/32"
Valve Open	116 lbs.	1 15/16"

NOTE—Springs are interchangeable (intake and exhaust) and may be used for service on 1933 and 1934 models by discarding cages used previously.
Valve Timing—See Camshaft Setting above.
Intake Valves—Open 5° BTDC. Close 45° ALDC.
Exhaust Valves—Open 45° BLDC. Close 5° ATDC.
To Check Valve Timing:—#1 intake valve should open when a point approximately 2 teeth before dead center mark 'TDC/' on flywheel lines up with indicator.

Lubrication:—Pressure. Gear type oil pump on right hand side of crankcase. Use new gasket whenever pump is taken off engine.
Oil Pressure—27 lbs. (25-30) at all speeds.



Oil Pressure Relief Valve—Operates at 27 lbs. Not adjustable. Located on oil pump cover plate.
Capacity and Oil—6 qts. (refill). Use SAE. #30 (summer—32 to 80°F—average driving), #40 (summer—above 80°—high speed driving), #20-W (winter 32° to 0°F.), #10-W (winter 0° to —15°F.).

CARBURETION:—See Carburetion Section for complete data on Carburetor, Automatic Choke (optional), Fuel Pump, and Gasoline Gauge.
Carburetor:—Stromberg, Model EX-22, 1¼" downdraft type. Fast idle used on carburetors with automatic choke.
Automatic Choke—Delco-Remy, Model 492-A.
Fuel Pump:—A.C., Type T-1521792 (Std.). Type 1521785 fuel and vacuum pump optional.
Gasoline Gauge:—A.C., Electric type.

CLUTCH:—Borg & Beck, Model 9A6. Single plate, dry disc type. No adjustment required.
Clutch Pedal Adjustment—Loosen locknut on lower end of clutch pedal pullrod, turn adjusting nut until lash or free movement of pedal is 1-1½", tighten locknut.
Clutch Facing—Woven type, 2 required. 5⅝" I. D., 9" O. D., .133" thick.
NOTE—New driven plates are recommended rather than relining. Facings are riveted individually (rivet goes through plate and one lining only). Each facing is riveted at outer row of holes (six) on convex side of plate segments, and at inner row of holes (six) to horseshoe tongues. Insert rivets with heads on plate side (if split), or on facing side (if rolled). Drill out old rivets as punching out rivets may damage tongues.
Clutch Assembly—Clutch can be removed from bottom without taking off flywheel housing. Cover and pressure plate should be punchmarked and installed in same position. In installing clutch assembly, place cover cap screws with longer shank in second hole on each side from locating dowel (these holes have deeper counterbore).

STEERING:—Front Suspension—Independent, linked parallelogram type with coil springs.
Kingpin Inclination—5° crosswise.
Caster—1½—2¼°. To adjust, loosen nuts holding yokes to upper and lower support arms, remove lubrication fitting on front bushing of upper support arm yoke, insert Allen wrench, turn clockwise to increase or counter-clockwise to decrease caster, tighten nuts holding support arm yokes, replace fittings.
Camber—⅛-1°. Camber is affected by caster adjustment and must be checked when caster angle is changed. To adjust, place shims between upper control arm yoke and upper control arm to increase camber, or between lower control arm yoke and lower control arm to decrease camber. A 1/16" shim will change camber approximately 1/3°.
Toe-in—⅛-3/16". To adjust, increase or decrease length of each tie rod equally.
NOTE—Before checking caster, camber, or toe-in, see that tires are properly inflated, check front wheel run-out (allowable maximum ⅛"), check front tire run-out (allowable maximum ⅛"), check front wheel balance, set front wheels in straight-ahead position, raise and lower front of car several times to allow frame to assume normal level.

IGNITION:—**Coil Model 536-E.** On engine side of dash.
Ignition Current—2 amperes (idling), 4.5 (stopped).
Ignition Switch—Model 431-R (switch and cable). Connected to ignition coil by armored cable.

Distributor Model 622-Y. Single breaker, 6 lobe cam, full automatic advance type.
Breaker Gap—Set at .022". Limits, .018-.024".
Breaker Arm Spring Tension—17-21 ounces.
Cam Angles—Closed 36°. Open 24° (distributor).
Manual Advance—20° (engine). Consists of manual adjustment at distributor (10° advance and retard from center '0' position). Set at '0' when checking or setting timing.

Automatic Advance

Distributor		Engine	
Degrees	R.P.M.	Degrees	R.P.M.
Start	400	2	800
2.5	500	5	1000
10.5	1350	21	2700

Removal—On left hand side of crankcase. Take out hold-down screw in advance arm, lift out.

IGNITION TIMING:— Flywheel Degs. Piston Position
All engines ..... 2° BTDC. ..... .002" BTDC.
Timing (using Synchroscope)—Use 'IGN' mark on flywheel lining-up mark with pointed end of inspection hole cover screw (left hand front face flywheel housing). See Equipment Section. This method recommended by manufacturer.
Timing (using Timing Light)—Connect timing light between distributor terminal and ground, turn on ignition, remove cover plate on inspection hole in left hand front face of flywheel housing. With #1 piston on compression, turn engine over until mark 'IGN' lines up with pointed end of cover screw, loosen hold-down screw in advance arm, center pointer on scale (arrow opposite '0' mark), tighten hold-down screw, loosen advance arm clamp bolt, rotate distributor until timing lamp lights (contacts opening), tighten clamp bolt, check spark plug connections.
Firing Order:—1-5-3-6-2-4 (see diagram).
Spark Plugs:—A.C., Type G-9. 18 MM. Metric.
Spark Plug Gap—.025". Limits .020-.025".

BATTERY:—**Delco, Type 15-T,** 6 volt, 15 plate, 94 A.H. capacity (20 hour rate).
Starting Capacity—115 amperes for 20 minutes.
Grounded Terminal—Negative (—) terminal.
Location—Under left hand front seat.

STARTER:—**Model 734-K. Armature No. 823881.**
Rotation—Counter-clockwise at commutator end.
Brush Spring Tension—24-28 ounces each.

Performance Data

Torque	R.P.M.	Volts	Amperes
0 ft. lbs.	5000	5.0	65
12 "	Lock	3.63	475

Removal—On left hand front face of flywheel housing. Take out flange cap screws.

GENERATOR:—**Model 935-X. Armature No. 1854856.** Air-cooled, third brush control with Voltage Control Relay (two-step charging rate). See article on Voltage Control Relay in Equipment Section.
Charging Rate Adjustment—Use ammeter connected in charging line at 'Bat' terminal of control unit, and voltmeter connected between same terminal and ground (generator frame). Short out Voltage Control Relay by connecting jumper wire from generator field (F) terminal to ground. Loosen lock screw on commutator end plate, shift third brush by hand, counter-clockwise to increase, or clockwise to decrease charging rate. Maximum charging rate must not exceed 22 amperes at 8.6 volts (generator cold). Tighten lock screw and remove jumper wire.

Performance Data

	Amperes	Volts	R.P.M.
Cold	20-23	8.5-8.8	2800
Hot	16-20	8.1-8.5	3100

Rotation—Counter-clockwise at commutator end.
Brush Spring Tension—22-26 ozs. (main), 16-20 ozs. (third brush).
Field Current—2.3-2.6 amperes at 6.0 volts.
Field Fuse—6 ampere capacity cartridge type in wiring harness directly below control unit.
Removal:—Pivot mounted at left front of engine with fan belt drive. Take out two pivot bolts and one clamp screw.
Belt Adjustment—Loosen pivot bolts and clamp screw, shift generator until belt deflection midway between fan and generator pulleys is ¾" (check with straightedge across pulleys, press lightly in on belt).

CONTROL UNIT:—**Model 5585.** On engine side of dash. Consists of Cutout Relay and Voltage Control Relay in a single case. See complete articles in Equipment Section.

Cutout Relay

Cuts in—6.4-6.8 volts, 9.5 M.P.H.
Cuts out—3 amperes maximum discharge at 6.3 volts.
Relay Contact Gap—.015-.025".
Air Gap—.012-.017" with contacts closed.

Voltage Control Relay

Contacts Open—8.35-8.65 volts (70°F.), 7.8-8.15 volts (150°F.).
Contacts Close—7.3-7.7 volts (70°F), 6.6-7.05 volts (150°F).
Contact Gap—.008-.013".
Contact Spring Tension—.7-.9 ounces.
Air Gap—.028-.040" between armature and core (armature down against lower stop). .028-.040" armature travel (between armature and lower stop).

LIGHTING:—**Model 479-U, 479-T (export). Foot Control Switch Model 471-Z.** Control switch on toeboard provides assymetrical passing beam (lower beam right hand headlamp, upper beam left hand headlamp). Headlight beams are crossed. Headlamp bulbs are pre-focused type. Headlight beam indicator bulb at bottom of speedometer is lighted with main driving beam (upper beam) in use.

Bulb Specifications

Position	Candlepower	Mazda No.
Headlights	32-21	2320-C
Parking	1½	55
Instrument, Compt., Beam	1	51
Tail	3	63
Stop	15	87
Dome	6	81

CURRENT LIMIT RELAY:—Thermostatic arm type (no winding) on back of lighting switch. Non-adjustable. Operates when current reaches 24-27 amperes, limits current to 18 amperes with direct short-circuit.

FUSES:—**Generator Field**—6 ampere in harness under Control Unit.

HORNS:—**Klaxon, Model K-26-L (Std.), K-33-D twin horns (Optional).** Vibrator type. Horn relay used with Model K-33-D.
Horn Relay:—Model 268-L. Relay requires .25 amperes to close contacts. Current draw, .8 amperes.
Contact Gap—.015-.025".
Air Gap—.012-.017" with contacts closed.

SERIAL NUMBER:—First number, L44001. On frame side rail.

ENGINE NUMBER:—First number, L45001.

ENGINE:—Model L-35. Eight cylinder, 'L' head type.
Bore—3". **Stroke,** 4¼".
Piston Displacement—240.3 cubic inches.
Rated Horsepower—28.8 (SAE).
Developed Horsepower—100 at 3400 R.P.M.
Compression Ratio—6.2-1. No optional ratios.
Compression Pressure—152 lbs. at 1000 R.P.M. or 121 lbs. plus or minus 5 lbs at cranking speed (100 R.P.M.).

Pistons:—Electro-plated cast-iron. Pistons are tin-plated after finishing and cannot be ground. Refinish cylinders to take replacement pistons furnished .003", .005", .0075", .010", .015", .020", .025", .030" oversize. Oversize pistons held to same weight as standard. Piston length 3¾" (approximately 1/16" higher above pin than 1934 and not interchangeable).
Weight—24.13 ozs. (stripped), 30.08 ozs. (with rings, pin, and lock screw).
Removal—Pistons and rods removed from below. Rotate crankshaft so that counterweights are crosswise and opposite to camshaft.
Clearance—Top .022-.029". Bottom .0013-.0025".
Fitting New Pistons—Pistons and bore should be round within .0005". Use .002" feeler stock inserted between piston and wall, pull required to withdraw feeler must be within 4-15 lbs.
Installing Pistons—Pin hole in piston offset 3/32". Install pistons with mark 'V.S.' toward valve side.

Piston Rings:—Two compression, two oil control rings per piston, all above pin. Both oil ring grooves drilled with oil return holes. Compression rings installed with groove toward bottom.

Ring	Width	End Gap	Side Clearance	Wall Thickness
Comp. (all)	⅛"	.007-.012"	.0015-.003"	.135"
Oil Cont. (3)	⅛"	.007-.015"	.0015-.003"	.138"
Oil Cont. (4)	3/16"	.007-.015"	.001-.0025"	.138"

Piston Pin:—Diameter .8554-.8558". Length 2 11/16". Pin is locked in piston (opposite end slotted to allow boss to slide freely on pin).
Pin Fit in Piston—Press fit (see below).
Pin Fit in Rod Bushing—.0003-.0007" clearance.
Fitting Pins—Use special tool HM-412 to install pins. See Model F-35 for complete instructions.

Connecting Rod:—Weight 34.5 ozs. Length 9".
Upper Bearing—Split bushed type. New bearings should be burnished and then line reamed to inside diameter of .8559-.8564". Oil hole in bushing must line up with rifle-drilled oil passage in rod.
Lower Bearing—Steel-backed, babbitt-lined type.
Clearance—.001-.003". Sideplay .0055-.0015".
Adjustment—No shims used. Replace bearings. Do not file rod or cap faces. Bearings assembled with slight projection to insure contact.

Crankshaft:—Five bearing. Integral counterweights.
Journal Diameters—#1—2.373-2.374", #2—2.5605-2.5615", #3—2.623-2.624", #4—2.6855-2.6865", #5—2.748-2.749".
Bearing Type—Interchangeable steel-backed, babbitt-lined type. Upper and lower bearing halves not interchangeable.
Clearance—.001-.003".
Adjustment—No shims used. Replace bearings. Do not file bearing caps. See Model F-35 for bearing removal.
End Thrust—Taken by #1 (front) bearing. End-play .004-.007". A bronze thrust plate .1205-.1235" thick (selective) is assembled at each end of front bearing and dowelled to bearing cap. There is a steel thrust washer on the crankshaft behind the crankshaft gear.

Camshaft:—Six bearing. Non-adjustable chain drive.
Bearing Type—Metal-backed, babbitt-lined type.
Clearance—.002-.004".
End Thrust—Taken by spring-loaded plunger in forward end of camshaft and thrust plate on chain case cover.
Timing Chain—Whitney. Width, 1¼". Pitch, .500". Length, 23" or 46 links.
Camshaft Setting—Sprockets are marked. Mesh chain with sprockets turned so that marks are adjacent and in line with a straightedge across the shaft centers. Use Sprocket Gauge HM-408-0.

Valves:—

	Head Diameter	Stem Diameter	Length
Intake	1 9/16"	11/32" (.3425-.3415")	5 9/32"
Exhaust	1 7/16"	11/32" (.3415-.3405")	5 11/32"

	Seat Angle	Lift	Stem-to-Guide Clearance
Intake	30°	.300"	.00125-.00325"
Exhaust	30°	.300"	.00225-.00425"

Tappet Clearance—.008" Int., .010" Exh., warm.
Installing New Guides—Install guides with longer turned portion toward bottom and finish ream to .34375-.34475" inside diameter after assembly. Top of guide must be 15/16" below top of block.

Valve Springs—New type with three close-coils at top. No valve cages used. Free length, 2 9/16".

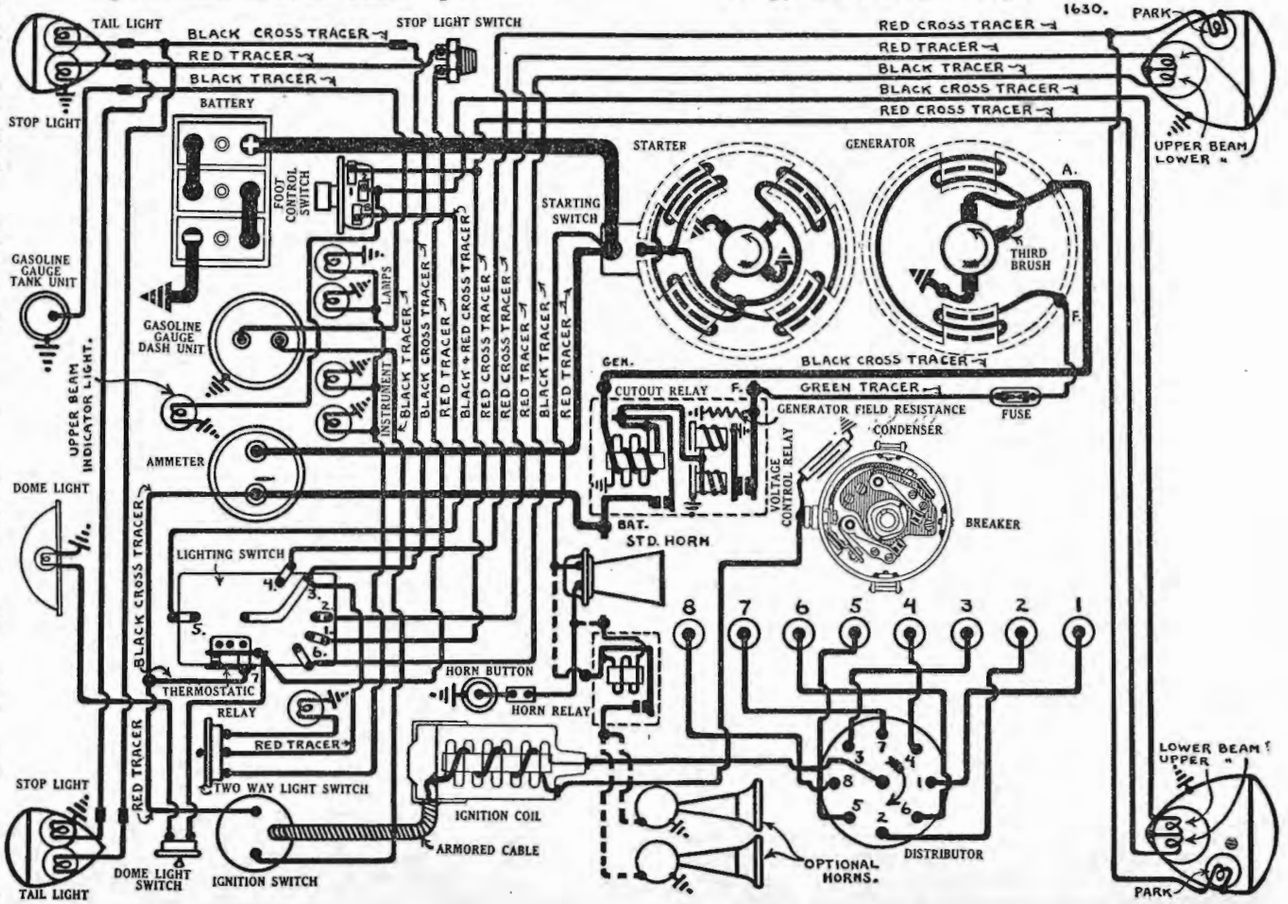
	Pressure	Length
Valve Closed	43 lbs.	2 9/32"
Valve Open	116 lbs.	1 15/16"

NOTE—Springs are interchangeable on both Six and Eight and for both intake and exhaust valves.

Valve Timing—See Camshaft Setting above.
Intake Valves—Open at TDC. Close 42° ALDC.
Exhaust Valves—Open 40° BLDC. Close 10° ATDC.
To Check Valve Timing—Check tappet clearance #1 intake valve. This valve should open with #1 piston on top dead center when flywheel mark 'TDC.#1' lines up with pointed end of inspection hole cover screw (left front face of housing).

Lubrication:—Pressure. Gear type oil pump located in oil pan.
Normal Oil Pressure—27 lbs. (25-30) at all speeds.
Oil Pressure Relief Valve—Operates at 27 lbs. Not adjustable. Located in oil pump body.
Capacity and Oil—7 qts. (refill). Use SAE. #30 (summer 32 to 80°F.—average driving), #40 (summer above 80°F.—high speed driving), #20-W (winter 45° to 10°F), #10-W (10° to —15°F).

CARBURETION:—See Carburetion Section for complete data on Carburetor, Automatic Choke, Fuel Pump, and Gasoline Gauge.



Carburetor:—Stromberg, Model EE-1, 1″ dual, downdraft type with fast idle and 'throttle-cracking' device (for starting).

Automatic Choke—Delco-Remy, Model 498-G.

Fuel Pump:—A.C., Type T-1521791 Std., or 1521784 Optl. fuel and vacuum pump.

Gasoline Gauge:—A.C., Electric type.

CLUTCH:—Borg & Beck, Model 104A. Single plate, dry disc type. No adjustment required.

Clutch Pedal Adjustment—Loosen lock nut on lower end of clutch pedal pullrod, turn adjusting nut until lash or free movement of pedal is 1½″, tighten lock nut.

Clutch Facing—Woven type, 2 required, 6⅛″ I.D., 9⅞″ O.D., .133″ thick.

NOTE—New driven plates are recommended rather than relining. Facings are riveted individually (rivet goes through plate and one facing only). Each facing is riveted at outer row of holes (six) on convex side of plate segments, and at inner row of holes (six) to horseshoe tongues. Insert rivets with heads on plate side (if split) or on facing side (if rolled). Drill out old rivets (punching out rivets may damage tongues).

Clutch Assembly—Clutch can be removed from bottom without removing flywheel housing. Cover and pressure plate should be punchmarked and installed in same position. In installing clutch assembly, place cover cap screws with longer shank in second hole on each side from locating dowel

STEERING:—Front Suspension—Independent, linked parallelogram type with coil springs.

Kingpin Inclination—5° crosswise.

Caster—1½-2¼°. To adjust, loosen nuts holding yokes to upper and lower support arms, remove lubrication fitting on front bushing of upper support arm yoke, insert Allen wrench, turn clockwise to increase, or counter-clockwise to decrease caster angle, tighten nuts holding support arm yokes, replace fittings.

Camber—¼-1°. Camber is affected by caster adjustment and must be checked when caster angle is changed. To adjust, place shims between upper control arm yoke and upper control arm to increase camber, or between lower control arm yoke and lower control arm to decrease camber. A 1/16″ shim will change camber approximately 1/3°.

Toe-in—⅛-3/16″. To adjust, increase or decrease length of each tie rod equally.

NOTE—Before checking caster, camber, or toe-in, see that tires are properly inflated, check front wheel run-out and front tire run-out (allowable maximum ⅛″ in each case), check front wheel balance, set front wheels in straight-ahead position, raise and lower front end of car several times to allow frame to assume normal level.

IGNITION:—**Coil Model 536-E.** On engine side of dash.

Ignition Current—2.0 amps. (idling), 4.5 (stopped).

Ignition Switch—Model 431-R (switch and cable). Connected to ignition coil by armored cable.

Distributor Model 662-R. Double breaker, 4 lobe cam, full automatic advance type. Contacts open alternately at 45° intervals corresponding to 90° firing interval of engine and must be synchronized (see Note and Timing).

Breaker Gap—Set at .022″. Limits .018-.024″.

Breaker Arm Spring Tension—19-23 ounces.

Cam Angles—Closed 34°. Open 11° (distributor). Both sets together when properly synchronized.

Manual Advance—20° (engine). Consists of manual adjustment at distributor (10° advance and retard from center '0' position). Set at '0' when checking or setting timing.

Automatic Advance

Distributor		Engine	
Degrees	R.P.M.	Degrees	R.P.M.
Start	300	1	600
4.5	600	9	1200
12	2200	24	4400

Removal:—On cylinder head. Take out hold-down screw in advance arm.

IGNITION TIMING:— Flywheel Degs. Piston Position
All engines.....3° BTDC. .....004″ BTDC.

NOTE—Movable points fire cylinders 1-2-7-8 and distributor should be synchronized before timing is set, unless engine is timed at #6 firing position first (stationary points) and then synchronized at #1 firing position (movable points).

Synchronization—Use Delco-Remy tool, Part No. 1838182. See Equipment Section for instructions.

Timing (using Synchroscope)—This method recommended by manufacturer. Use 'IGN' mark for cylinder #1 or second 'IGN' mark for cylinder #6, lining up mark with pointed end of inspection hole cover screw (left hand front face of flywheel housing). See Equipment Section.

Timing (using Timing Light)—Connect timing light between distributor terminal and ground, turn on ignition, remove inspection hole cover plate on left hand front face of flywheel housing. With #6 piston on compression (if distributor not previously synchronized), turn engine over until flywheel mark 'IGN' lines up with pointed end of cover screw, loosen hold-down screw in advance arm, center pointer on scale (arrow opposite '0'), tighten hold-down screw, loosen advance arm clamp bolt, rotate distributor until timing lamp lights (stationary points opening), tighten clamp bolt. Then synchronize by turning engine over 1¾ revolutions to firing position of piston #1, stop when 'IGN' mark lines up with pointer, loosen lock screws on sub-plate carrying movable points, turn eccentric adjusting screw until points open (timing lamp lights), tighten lockscrews.

Firing Order:—1-6-2-5-8-3-7-4 (see diagram).

Spark Plugs:—A.C., Type G-9. 18 MM. Metric type.

Spark Plug Gap—.025″. Limits .020-.025″.

BATTERY:—**Delco, Type 17-K,** 6 volt, 17 plate, 107 A.H. capacity (20 hour rate).

Starting Capacity—131 amperes for 20 minutes.

Grounded Terminal—Negative (—) terminal.

Location—Under left front seat.

STARTER:—**Model 725-Y. Armature No. 823881.**

Rotation—Counter-clockwise at commutator end.

Brush Spring Tension—24-28 ounces each.

Performance Data

Torque	R.P.M.	Volts	Amperes
0 ft. lbs.	6000	5.0	60
15 "	Lock	3.0	600

Removal:—On left hand front face of flywheel housing. Take out flange cap screws.

GENERATOR:—**Model 935-X. Armature No. 1854856.** Air-cooled, third brush control with Voltage Control Relay (two-step charging rate). See article on Voltage Control Relay in Equipment Section.

Charging Rate Adjustment—Use ammeter connected in charging line at 'Bat' terminal of control unit, and voltmeter connected between same terminal and ground (generator frame). Short out Voltage Control Relay by connecting jumper wire from generator field (F) terminal to ground. Loosen lock screw on commutator end plate, shift third brush by hand, counter-clockwise to increase, or clockwise to decrease charging rate. Maximum charging rate must not exceed 22 amperes at 8.6 volts (generator cold). Tighten lock screw and remove jumper wire.

Performance Data

	Amperes	Volts	R.P.M.
Cold	20-23	8.5-8.8	2800
Hot	16-20	8.1-8.5	3100

Rotation—Counter-clockwise at commutator end.

Brush Spring Tension—22-26 ozs. (main), 16-20 ozs. (third brush).

Field Current—2.3-2.6 amperes at 6.0 volts.

Field Fuse—6 ampere capacity cartridge type in wiring harness directly below control unit.

Removal:—Pivot mounted at left front of engine with fan belt drive. Take out two pivot bolts and one clamp screw.

Belt Adjustment—Loosen pivot bolts and clamp screw, shift generator until belt deflection midway between fan and generator pulleys is ¾″ (check with straightedge across pulleys, press lightly in on belt).

CONTROL UNIT:—**Model 5585.** On engine side of dash. Consists of Cutout Relay and Voltage Control Relay in a single case. See complete articles in Equipment Section.

Cutout Relay

Cuts In—6.4-6.8 volts, 9.5 M.P.H.

Cuts Out—3 amperes max. discharge at 6.3 volts.

Relay Contact Gap—.015-.025″.

Air Gap—.012-.017″ with contacts closed.

Voltage Control Relay

Contacts Open—8.35-8.65 volts (70°F).

Contacts Close—7.3-7.7 volts (70°F).

Contact Gap—.008-.013″.

Contact Spring Tension—.7-.9 ounces.

Air Gap—.028-.040″ between armature and core (armature down against lower stop). .028-.040″ armature travel (between armature and lower stop).

LIGHTING:—**Model 479-U, 479-T (export). Foot Control Switch Model 471-Z.** Control switch on toeboard provides assymetrical passing beam (lower beam right hand headlamp, upper beam left hand headlamp). Headlight beams are crossed. Headlamp bulbs are pre-focused type. Headlight beam indicator bulb at bottom of speedometer is lighted with main driving beam (upper beam) in use.

Bulb Specifications

Position	Candlepower	Mazda No.
Headlights	32-21	2320-C
Parking	1½	55
Instrument, Compt., Beam	1	51
Tail	3	63
Stop	15	87
Dome	6	81

CURRENT LIMIT RELAY:—Thermostatic arm type (no winding) on back of lighting switch. Non-adjustable. Operates when current reaches 24-27 amperes, limits current to 18 amperes with direct short-circuit.

FUSES:—**Generator Field**—6 ampere in harness under control unit.

HORNS:—**Klaxon, Model K-26-L (Std.), K-33-D twin horns (Optional).** Vibrator type. Horn relay used with Model K-33-D.

Horn Relay:—Model 268-L. Relay requires .25 amperes at 2 volts (min.) to close contacts. Current draw, .8 amperes.

Contact Gap—.015-.025″.

Air Gap—.012-.017″ with contacts closed.

SERIAL NUMBER:—Stamped on plate on left front side of dash.

ENGINE NUMBER:—First number, 1516. Stamped on boss on upper left hand corner of cylinder block.

ENGINE:—Own. 8 cylinder, In Line, 'L' head type.
Bore—3¼ . **Stroke**—3⅞".
Piston Displacement—257.16 cubic inches.
Rated Horsepower—33.8 A.M.A.
Developed Horsepower—110 at 3850 R.P.M.
Compression Ratio—6.5-1 Std., 7.0-1 Optl.
Compression Pressure—120 lbs. at 300 R.P.M. Std. 6.5-1 head.

Pistons:—Nelson Bohnalite, Invar Strut, Split skirt type. Replacement pistons furnished standard size and .005", .010", .020", .030", .040" oversize.
Weight—17¼ ozs. stripped, 23 ozs. with rings and pin.
Removal—Pistons and rods removed from above.
Clearance—Skirt .0015" (see Fitting Pistons).
Fitting New Pistons—Use .0015" feeler ½" wide to check clearance. Pull required to withdraw feeler from between piston and cylinder wall on side opposite slot must be within 3-5 lbs.
Installing Pistons—Slots should be toward left or opposite side from valves.

Piston Rings:—Two compression, one oil control ring per piston, all above pin. Lower groove drilled radially with oil drain holes.

Ring	Width	End Gap	Side Clearance
Comp	⅛"	.007-.012"	.002"
Oil Cont.	5/32"	.007-.015"	.0015"

Piston Pin:—Diameter ⅞". Length 2 51/64". Pin floats in piston and rod. Held by retaining rings at each end. Pin hole in connecting rod is bronze bushed. Pins furnished .003", .006" oversize.
Pin Fit in Piston—Palm push fit with piston at 160°F. Holes finish reamed to .87515-.87485".
Pin Fit in Rod Bushing—Thumb push fit with both parts at room temperature (70°F).

Connecting Rod:—Weight 29½ ozs. Length 7⅞".
Upper Bearing—Formed by two bronze bushings pressed in from opposite sides so as to form oil groove in center. Rifle-drilled piston pin oil passage in rod must open into this groove.
Crankpin Journal Diameter—2 3/32".
Lower Bearing—Interchangeable steel-backed, babbitt-lined type. No shims.
Clearance—.0005-.0015". Sideplay .004-.010".
Adjustment—None (no shims). Replace bearings. Do not file rods or caps.
Installing Rods—Identification mark on side of rod should be toward front of engine with oil bleed hole in lower bearing toward camshaft side.

Crankshaft:—Five bearing. Integral counterwights.
Journal Diameters—2¾" all bearings.
Bearing Type—Interchangeable steel-backed, babbitt-lined type. No shims.
Clearance—.001-.003".
Adjustment—None (no shims). Replace bearings. Do not file bearing caps.
End Thrust—Taken by center bearing. Endplay .003-.008".

Camshaft:—5 bearing. Non-adjustable chain drive.
Bearing Type—Steel-backed, babbitt-lined.
Clearance—.001-.003".
End Thrust—Taken by thrust plate in back of camshaft sprocket. Endplay .002-.004".

Timing Chain—Morse #1866RX. Width 1". Pitch .375". Length 21" or 58 links.
Camshaft Setting—With #1 piston on top dead center and #1 exhaust valve just closing, mesh chain with sprockets turned so that '0' marks are adjacent and in line with a straightedge across the shaft centers.

Valves:—	Head Diameter	Stem Diameter	Lgth.
Intake	1 17/32"	11/32"	5⅝"
Exhaust	1 15/32"	11/32"	5⅝"

	Seat Angle	Lift	Stem Clearance
Intake	30°	.300"	.0005-.0010"
Exhaust	45°	.300"	.0005-.0010"

Note on Stem Clearance—Stem clearance in guides should be measured at the bottom. New guides are finish reamed with a taper reamer after installation with .0035" greater clearance at top. Exhaust valve guides are counterbored ⅜" deep at top to provide .015" greater clearance.
Tappet Clearance—.007" Int., .009" Exh., Engine hot.

NOTE—Splasher in right front fender should be removed when valve adjustments are made.
Valve Springs—Intake and exhaust springs are interchangeable

	Spring Pressure	Length
Valve Closed	40 lbs.	1⅝"
Valve Open	110 lbs.	1 5/16" approx.

Valve Timing—See camshaft setting above.
Intake Valves—Open 5° BTDC. Close 39° ALDC.
Exhaust Valves—Open 45° BTDC. Close 5° ATDC.
To Check Valve Timing—Use gauge to measure #1 piston travel. Set tappet clearance #1 exhaust valve at .006". This valve should be fully closed with piston .006" ATDC. when 5° point on flywheel (midpoint between second and third graduation to the left of line marked '#1 UP D.C.') lines up with indicator in inspection hole in left front face of flywheel housing under starter. Reset tappet clearance at .009" with motor warm.

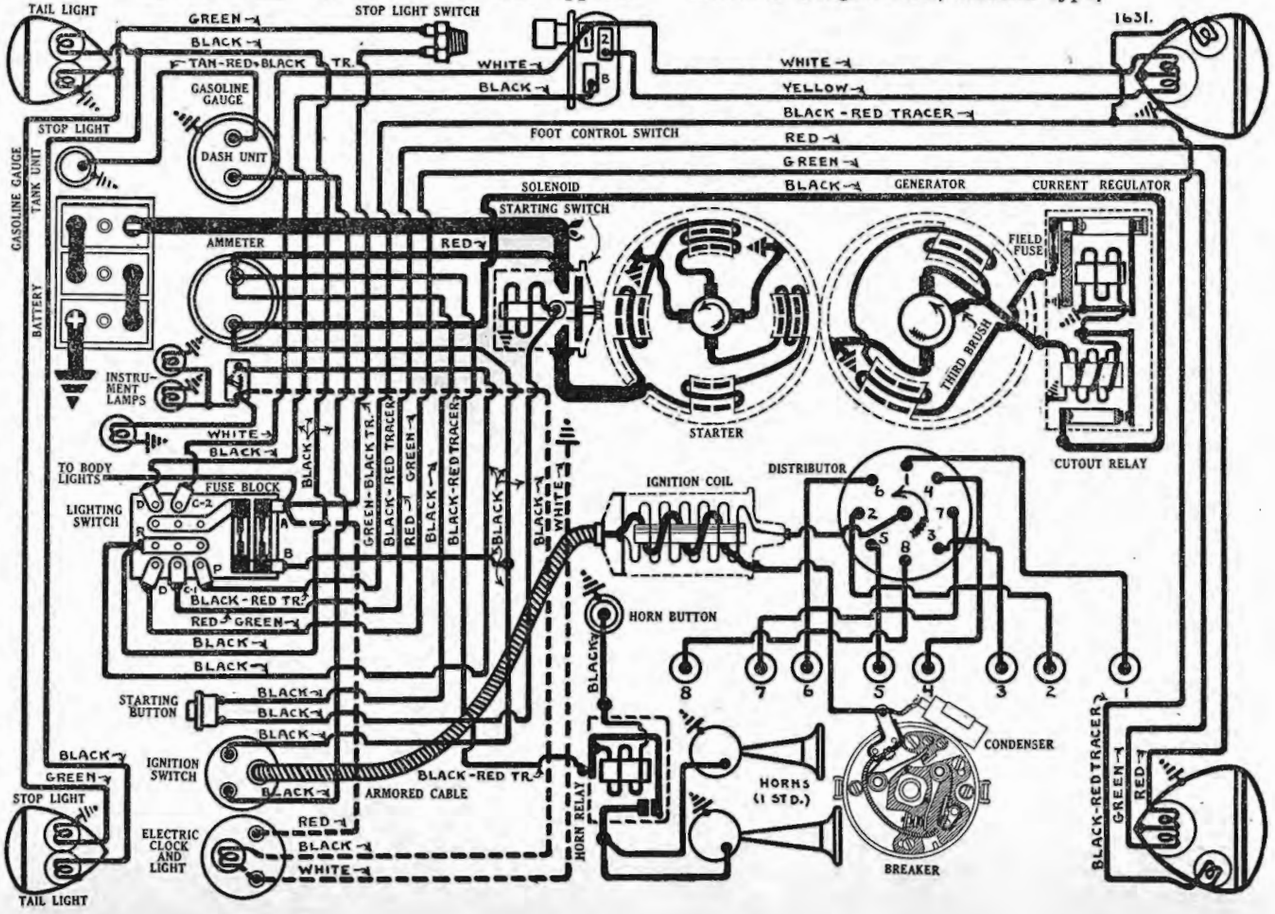
Lubrication:—Pressure. Gear type oil pump mounted on right side of crankcase.
Normal Oil Pressure—35 lbs.
Oil Pressure Relief Valve—Located on pump cover. Not adjustable. Replace relief valve spring if defective. Tension 6 lbs. compressed to 2".
Capacity and Oil—7 qts. Use SAE. #30 (60°F. and above), #20-W(32° to 75°F), #10-W(32° to —15°F).

CARBURETION:—See Carburetion Section for data.

Carburetor:—Stromberg, Model EE-14, 1" dual downdraft type with integral automatic choke.

Fuel Pump:—A.C., Type R-1521807 diaphragm type.

Gasoline Gauge:—A.C., electric type.



CLUTCH:—Long Model 10CF. Semi-centrifugal, single plate, dry disc type. No adjustment for wear required. Weights formed on outer ends of clutch release levers increase pressure on pressure plate approximately 137% at 4000 R.P.M.

Clutch Pedal Adjustment—Clearance between clutch pedal and toeboard must be ½" with clutch engaged. Free movement of clutch pedal must be 1½". To adjust, loosen locknut and turn nut on clutch pedal-to-lever connecting rod.

Clutch Facings—Woven asbestos, 2 required, 6" I.D., 10" O.D., .137" thick.

NOTE—Six crimped clock spring steel segments located bet. rear clutch facing and driven disc.

STEERING: — Front Suspension — Packard SafeTflex design, independent, linked parallelogram type with coil springs. Unlike other designs in that angle between two lower support arms is 90° with rear (torque) arm anchored to frame side rail at point slightly forward from dash. Upper support arms (shock absorber arms) are rubber bushed at outer ends and are positioned approximately midway between lower support arms.

Steering Knuckle Inclination—1°30' crosswise.

Caster—2°. No adjustment provided.

Camber—1°. No adjustment should be required. Adjustable by changing bushing in outer end of upper support arm (three interchangeable parts available providing five settings).

Toe In—0-⅛". Adjustable by changing length of tie rods. Each tie rod should be changed an equal amount and tie rods should be measured to make certain that lengths are equal.

IGNITION:—Coil Model CE-4607. At left of engine.

Ignition Switch—Electrolock connected to coil by armored cable.

Distributor Model IGH-4026, 4026-A. Double breaker, 4 lobe cam, full automatic advance type with 'Fuel Compensator' or manual adjustment at distributor. Contacts open alternately at 45° intervals corresponding to 90° firing interval of engine and must be synchronized (see Timing).

Breaker Gap—Set at .020". Limits .018-.022".

Breaker Arm Spring Tension—16-20 ounces.

Cam Angles—Closed 34.5°. Open 10.5° distributor. Both sets together when properly synchronized.

Automatic Advance—IGH-4026

Distributor Degrees	R.P.M.	Engine Degrees	R.P.M.
Start	300	0	600
2	525	4	1050
4	810	8	1620
6	1150	12	2300
8	1650	16	3300
10	2200	20	4400

Automatic Advance—IGH-4026-A

Start	300	0	600
2	660	4	1320
4	1100	8	2200
6	1460	12	2920
8	1830	16	3660
10	2200	20	4400

Fuel Compensator—Manual adjustment at distributor providing 10° maximum advance and retard from center '0' position. Should be set at '0' for fuel of approximately 68-70 octane rating and advanced or retarded for fuel of higher or lower rating to secure slight 'ping' pulling heavy load.

Removal:—Distributor mounted at left of crankcase. To remove, take out hold-down screw in advance arm.

IGNITION TIMING:— Flywheel Degs. Piston Position
All engines (6.5-1, 7.0-1) 5° BTDC. ..... .0093" BTDC.

Timing (Stationary Contacts)—Manufacturer recommends use of Neon timing light or Synchroscope. Remove cover over timing inspection hole in left front face of flywheel housing under starter, mark firing point for #1 piston on flywheel with chalk (midpoint between second and third graduations to right of line marked '#1 UP D.C.'), clip timing light lead to #1 spark plug, direct light on flywheel. Loosen thumbnut and set Fuel Compensator at '0'. Idle engine, loosen advance arm clamp bolt, rotate distributor until chalk mark on flywheel appears to line up with indicator on housing, tighten clamp bolt.

Synchronizing (Movable Contacts)—Synchronization may be checked with the Neon Timing Light by marking firing point for #6 piston on flywheel (midpoint between second and third graduations before lined marked '#6 UP D.C.'), and watching position of mark with engine idling. Engine must be stopped to set synchronization. To adjust, place #6 piston in firing position (turn engine over by rolling car with gears engaged), loosen lockscrews on movable sub-plate carrying second set of contacts, shift plate until contacts begin to open, tighten lockscrews.

Synchronization (Other Methods) — See Equipment Section for directions on synchronization using indicator and synchronizing marks on rotor fantail. If other methods used, firing intervals should be regular 45-45-45 distributor degrees.

Firing Order:—1-6-2-5-8-3-7-4 (see diagram).

Spark Plugs:—A.C., Type K-7. 14 MM. Metric.

Spark Plug Gap—Set at .028". Limits .028-.030".

BATTERY:—Delco, Type 17-K. 6 volt, 17 plate, 110 A.H. capacity (20 hour rate).

Starting Capacity—131 amperes for 20 minutes.

Grounded Terminal—Positive (+) terminal.

Location—On left side under driver's seat.

STARTER:—Model MAX-4006. Armature MAW-2006.

Starter Drive—Outboard barrel type Bendix.

Rotation—Counter-clockwise at commutator end.

Brush Spring Tension—31-42 ounces (new brushes).

Performance Data

Torque	R.P.M.	Volts	Amperes
0 ft. lbs.	5300	5.5	65
2.75 "	1630	5.0	200
5.5 "	970	4.5	300
8.7 "	600	4.0	400
12.0 "	300	3.5	500
16.5 "	Lock	3.0	640
25.0 "	Lock	4.0	880

Starting Switch:—Auto-Lite Solenoid Type SS-4001. Delco-Remy Control Switch Type 1400. Solenoid switch mounted on starter and controlled by switch on instrument panel. See Equipment Section for complete data.

Removal:—Starter flange mounted on left front face of flywheel housing. To remove, take out two flange capscrews.

GENERATOR:—Model GAR-4611-5. Armature GAR-2116. Air-cooled. Third brush control in conjunction with Current Regulator (two-rate charging control). See Equipment Section for complete data on Regulator.

Charging Rate Adjustment—Use test meters to check generator output. Short out regulator by connecting jumper wire between fuse cup on regulator case and ground on generator frame while adjustment is being made. Shift third brush by hand counter-clockwise to increase, or clockwise to decrease charging rate. Third brush held in position by friction. Remove jumper wire.

Maximum Charging Rate—23 amperes (cold), 2400 R.P.M.

Performance Data

Cold — Regulator Contacts Closed — Hot					
Amps.	Volts	R.P.M.	Amps.	Volts	R.P.M.
0	6.4	720	0	6.4	760
4	6.8	860	4	6.8	925
8	7.25	1000	8	7.25	1125
12	7.7	1160	12	7.7	1350
16	8.1	1360	16	8.1	1680
22.4	8.8	2400	19.2	8.4	2600

Rotation—Counter-clockwise at commutator end.

Brush Spring Tension—24-36 ozs. (new brushes).

Field Current—3.51-3.89 amperes at 6.0 volts.

Field Fuse—5 ampere in knurled cup on side of regulator case.

Motoring Current—5.03-5.57 amperes at 6.0 volts (½ ampere additional if relay and regulator in circuit).

Removal:—Pivot mounted at left front of engine with fan belt drive. To remove, take out two pivot bolts and one clamp bolt.

Belt Adjustment:—Loosen pivot bolts, clamp bolt, and lock bolt on link, pull generator away from engine by spring scale looped on generator lug parallel to link until scale reading is 25 lbs.

RELAY-REGULATOR:—Model TC-4302-A. Mounted on generator. Consists of Cutout Relay and Current Regulator in a single case. See Equipment Section for complete data on these units.

Cutout Relay

Cuts In—6.75-7.5 volts, 710 R.P.M.

Cuts Out—.5-2.5 ampere discharge at 6.5 volts.

Relay Contact Gap—.015-.045".

Air Gap—.010-.030" with contacts closed.

Current Regulator

Contacts Open—8.45-8.95 volts at 70°F.

Contacts Close—1.1-1.3 volts below opening point.

Contact Gap—.005" minimum.

Air Gap—.045" with contacts closed.

LIGHTING:—R.B.M. Switch Model 1500. Delco-Remy Foot Control Switch Model 471-Z, 471-U (R.H.D.). Foot operated control switch provides assymetrical 'Country Passing' beam with main switch in 'Country Driving' position (passing beam composed of lower beam left hand headlamp, upper beam right hand headlamp).

Bulb Specifications

Position	Candlepower	Mazda No.
Headlamps	32-32	2330-C
Parking	1	51
Instrument, Tail	3	63
Stop	15	87
Dome	6	81

FUSES:—Lighting—20 ampere on back of switch.

Accessory—20 ampere on back of lighting switch.

Generator Field—5 ampere in regulator.

HORNS:—Sparton. Vibrator type. One horn standard. Twin horns optl. Operated by horn relay.

Horn Relay:—Delco-Remy Type 266-TK. Relay requires .25 amperes at 2 volts minimum to close contacts. Current draw .8 amperes.

Contact Gap—.015-.025".

Air Gap—.012-.017" with contacts closed.

SERIAL NUMBER:—Stamped on plate on left front face of dash.

ENGINE NUMBER:—First number, 385,501 (1200, 1, 2), 1,755,101 (1203, 4, 5). Stamped on left side of crankcase at front end.

ENGINE:—Eight cylinder, In Line, 'L' head type.
Bore—3 3/16" (1200, 1, 2), 3½" (1203, 4, 5).
Stroke—5" (all models).
Piston Displacement—320 cu. ins. (1200, 1, 2), 284.8 cu. ins. (1203, 4, 5).
Rated Horsepower—32.5 (1200, 1, 2), 39.2 (1203, 4, 5).
Developed Horsepower—130 at 3200 R.P.M. (1200, 1, 2), 150 at 3200 R.P.M. (1203, 4, 5).
Compression Ratio—Standard and optional cylinder heads of aluminum used as follows:

Model	Std. Head	Optional Head
1200, 1, 2	6.5-1	6.0-1
1203, 4, 5	6.3-1	6.0-1

Compression Pressure—110 lbs. at cranking speed for standard heads.

Pistons:—Nelson Bohnalite, aluminum alloy, Invar Strut, split skirt type. Replacement pistons furnished in standard size and .003", .005", .010", .015", .020", .025", .030", .035", .045" oversize.
Weight—18.7 ozs. (1200, 1, 2), 21.9 ozs. (1203, 4, 5).
Removal—Pistons removed from top, rods from bottom on Model 1200, 1, 2 (push piston up until piston pin is exposed, remove locking ring and push out pin, remove piston, lower rod and remove from below. Use new locking rings when replacing pistons). Pistons and rods removed from above on Model 1203, 4, 5.
Clearance—Skirt .0015" See Fitting Pistons.
Fitting New Pistons—Use .0015" feeler stock ½" wide to check clearance. Pull required to withdraw feeler from between piston and cylinder wall on side opposite slot should be 6-8 lbs.
Installing Pistons—Slot should be on valve side of engine.

Piston Rings:—Three compression, one oil control ring per piston, all above pin. Lower ring groove drilled radially with twelve ⅛" oil drain holes.

Ring	Width	End Gap	Wall Thickness
Comp. All	⅛"	.007" min.	.145"
Oil Cont.	5/32"	.007" min.	.145"

Piston Pin:—Diameter ⅞". Length 2 47/64" (1200, 1, 2), 3 3/64" (1203, 4, 5). Pin floats in piston and rod. Held by locking rings at each end. Pins furnished for service .003", .006" oversize.
Pin Fit in Piston—Palm push fit with piston at 160°F.
Pin Fit in Rod Bushing—Thumb push fit with both parts at room temperature (70°F).

Connecting Rod:—Weight 41¼ ozs. (1200, 1, 2), 47½ ozs. (1203, 4, 5). Length 10⅞".
Crankpin Journal Diameters—2.1875".
Lower Bearing—Removable steel-backed, copper-lead alloy lined type. No shims.
Clearance—.0017-.0022". Sideplay .003" minimum.
Adjustment—None (no shims). Replace bearings. Do not file rods or bearing caps.

Crankshaft:—Nine bearing. Integral counterweights.
Journal Diameters—2.625" all bearings.
Bearing Type—Removable steel-backed, babbitt-lined type. No shims.
Clearance—.001" minimum.
Adjustment—None (no shims). Replace bearings. Do not file bearing caps.
End Thrust—Taken by #7 bearing. Endplay .003" minimum.

Camshaft:—Chain driven with manual adjustment.
Timing Chain—Morse #1866. Width 1½". Pitch .500". Length 32" or 64 links.
Chain Adjustment—See Generator Section.
Camshaft Setting—Sprockets are marked. Mesh chain with sprockets turned so that '00' marks are adjacent and are centered on a straightedge across the shaft centers.

Valves:—	Head Diam.	Stem Diam.	Lgth.
Intake (1200, 1, 2)	1 21/32"	.3405"	7⅜"
Exhaust " "	1 15/32"	.3405"	7⅜"
Intake (1203, 4, 5)	1 13/16"	.3405"	7⅜"
Exhaust " "	1 11/16"	.3405"	7⅜"

	Seat Angle	Lift	Stem Clearance
Intake	45°	.358"	.0025" min.
Exhaust	45°	.358"	.0045" min.

Tappet Clearance—.004" Int., .006" Exh. engine warm.

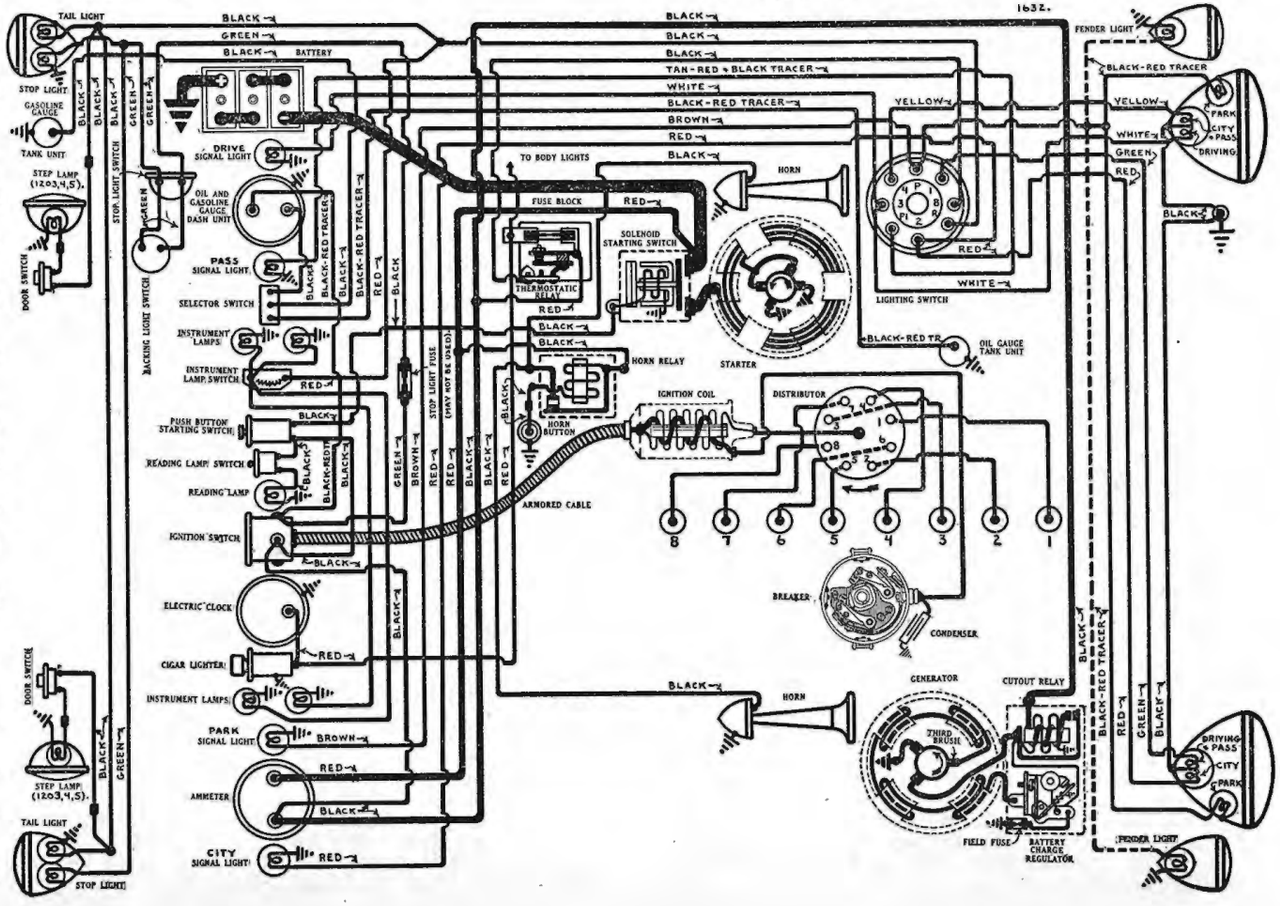
Valve Springs—	Spring Pressure	Length
Valve Closed	73 lbs.	3 1/16"

Valve Timing—See Camshaft Setting above.
Intake Valves—Open 30° BTDC. Close 65° ALDC.
Exhaust Valves—Open 65° BLDC. Close 30° ATDC.

Lubrication:—Pressure. Gear type oil pump located in crankcase.
Normal Oil Pressure—35 lbs. min. at 1000 R.P.M.
Oil Pressure Relief Valve—Located on left side of crankcase. Operates at 35 lbs. Adjustable by turning screw.
Capacity and Oil—8 qts. (1200, 1, 2), 9½ qts. 1203, 4, 5). Use SAE. #30 (30° to 100°F—use #40 for temperatures above 100°F)), #20-W (0° to 60°F), #10-W (—15° to 40°F).

CARBURETION:—See Carburetion Section for data on Carburetor, Automatic Choke, Fuel Pump, and Gasoline Gauge.
Carburetor:—Stromberg, Model EE-23, 1¼" dual, downdraft type with integral automatic choke.
Fuel Pump:—A.C., Type I-1521777 diaphragm type combination fuel and vacuum pump.
Gasoline Gauge:—A.C. electric combination gasoline and oil gauge.

CLUTCH:—Long, Model 12CB. Single plate, dry disc type. No adjustment required for wear.
Clutch Pedal Adjustment—Clearance between pedal and toeboard should be ½-1". Free movement of pedal should be 1½". Adjust by turning turnbuckle on connecting rod at lower end of pedal.
Clutch Facings—Moulded type, 2 required, 7" I.D., 12" O.D., .137" thick.



STEERING:—Front Suspension—Conventional 'I' beam section front axle with Reverse-Elliott ends and semi-elliptic springs.
Kingpin Inclination—9° crosswise.
Caster—1°. Adjustable by installing wedge shims between spring and spring pad on axle.
Camber—1°.
Toe In—0-1/16". Adjustable in usual manner by changing length of tie rod.

IGNITION:—Coil Model 539-K. Mounted on cylinder head at side of distributor.
Ignition Switch—Model 430-L. Connected to coil by armored cable. Switch has two 'on' positions (key turned to right or left). On cars with automatic starting, right hand 'on' position is regular running position. Left hand 'on' position is used to secure gasoline gauge reading with engine not running.

Distributor Model 662-W. Double breaker, 4 lobe cam, full automatic advance type. Contacts open alternately at regular 45° intervals corresponding to 90° firing interval of engine and must be synchronized (see Timing).
Breaker Gap—Set at .020". Limits .018-.022".
Breaker Arm Spring Tension—19-23 ounces.
Cam Angles—Closed 34°. Open 11° distributor. Both sets together when properly synchronized.

Automatic Advance

Distributor		Engine	
Degrees	R.P.M.	Degrees	R.P.M.
Start	300	1	600
8.75	1600	17.5	3200

Removal:—Distributor mounted on left side of cylinder head. To remove, take out hold-down screw in advance arm.

IGNITION TIMING:— Flywheel Degs. Piston Position
1200, 1, 2 (6.5-1 Head) 6° BTDC. .0168" BTDC.
1200, 1, 2 (6.0-1 Head) 10° BTDC. .0467" BTDC.
1203, 4, 5 (All) 6° BTDC. .0168" BTDC.
Timing (Stationary Contacts)—With #1 piston on compression, turn engine over until piston reaches firing position, stop when correct graduation on vibration dampener at front of engine lines up with pointer on chain case cover (vibration dampener has fifteen 1° graduations before the dead center mark 'DC/1-8'—see table above for setting for each type engine). Loosen advance arm clamp bolt, rotate distributor until stationary contacts (mounted directly on breaker plate) begin to open, tighten clamp bolt. Then synchronize movable contacts.
Synchronization (Movable Contacts)—Turn engine over 90° to #6 firing position (vibration dampener marked 'DC/2-6' with usual 1° graduations before this point—see table above). Loosen lockscrews on sub-plate carrying movable contacts, turn eccentric adjusting screw until contacts begin to open, tighten lockscrews.
Synchronization (Other Methods)—See Equipment Section for directions on use of Delco-Remy synchronizing tool #1838182. If distributor synchronized by using other types of equipment, set firing intervals at regular 45-45-45 (distributor degrees).
Firing Order:—1-6-2-5-8-3-7-4 (see diagram).
Spark Plugs:—A.C., Type K-7. 14 MM. Metric.
Spark Plug Gaps—Set at .025".

BATTERY:—Prest-O-Lite, Type A619-ST. 6 volt, 19 plate, 144 A.H. capacity (5 ampere rate).
Starting Capacity—170 amperes for 20 minutes.
Grounded Terminal—Positive (+) terminal.
Location—On left side under rear compartment floor boards.

STARTER: — Model DI-1272. Armature No. 13292 (1200, 1, 2), Model DN-1270. Armature No. 13409 (1203, 4, 5).
Starter Drive—Outboard Bendix Type RCD10FXTD.
Rotation—Counter-clockwise at commutator end.
Brush Spring Tension—26-28 ounces.

Performance Data—DI-1272

Torque	R.P.M.	Volts	Amperes
0 ft. lbs.	3500-4000	6.0	60
2 "	1600	5.5	128
3.6 "	1200	5.35	170
7.3 "	800	5.05	250
14.4 "	400	4.5	400
28 "	Lock	3.5	650
29.2 "	Lock	3.6	720

Performance Data—DN-1270

0 ft. lbs.	3000	6.0	50
2 "	1600	5.6	120
3.3 "	1200	5.45	150
6.3 "	800	5.2	210
15.0 "	400	4.65	360
35 "	Lock	3.5	650
39.0 "	Lock	3.6	810

Starting Switch:—Owen-Dyneto Solenoid Switch, Type 21518. Delco-Remy Control Switch 1398. Solenoid switch mounted on starter and controlled by push button switch on instrument panel. See Equipment Section for complete data on automatic starting for cars with this equipment.
Removal:—Starter sleeve mounted in left front face of flywheel housing. To remove, take out pilot mounting screw in flywheel housing.

GENERATOR:—Model CO-1240. Armature No. 23704. Air cooled by air horn on generator field frame. Third brush control in conjunction with Battery Charge Regulator. See Equipment Section for complete data on Regulator.
Charging Rate Adjustment—Third brush shifted through rack-and-pinion control by slotted screw on commutator end plate. Turn adjusting screw to right or clockwise to increase, and to left or counter-clockwise to decrease charging rate.
Maximum Charging Rate—30-33 amperes (cold), 24-27 amperes (hot) at 8.0 volts.

Performance Data—Regulator Inoperative

Cold			Hot (215°F.)		
Amps.	Volts	R.P.M.	Amps.	Volts	R.P.M.
0	6.5	600	0	6.6	690
4	6.7	660	4	7.05	760
8	7.0	720	8	7.4	840
12	7.2	800	12	7.7	925
16	7.5	900	16	7.9	1070
20	7.8	1000	20	8.0	1260
24	7.95	1100	24	8.0	1800
30	8.0	1600			

Rotation—Counter-clockwise at commutator end.
Brush Spring Tension—20 ounces each.
Field Current—2.3 amperes at 6.0 volts.
Field Fuse—3 amperes in knurled plug on side of regulator case.
Removal:—Generator flange mounted on right rear face of timing chain case. To remove, take out three mounting screws, pull generator to rear to disengage drive coupling, lift out. Do not disturb intermediate flange carrying drive sprocket.
Chain Adjustment:—Loosen generator flange mounting screw, pull generator out or away from engine until sideplay as measured at chain inspection plug hole in top face of chain case is ¼", tighten mounting screws. Adjust chain whenever sideplay exceeds ½".

RELAY-REGULATOR: — Model 40210. Mounted on generator. Consists of Cutout Relay and Battery Charge Regulator. See Equipment Section for complete data on these units.

Cutout Relay

Cuts In—6.8-7.0 volts, 600 R.P.M.
Cuts Out—1.5-3 ampere discharge current.
Relay Contact Gap—.020-.030".
Air Gap—.020-.030" with contacts closed.

Battery Charge Regulator

Setting—Contacts open at 8.0 volts. Limits are 7.8 volts minimum, 8.3 volts maximum.
Regulator Resistance—1.8 ohms.

LIGHTING:—R.B.M. Switch Model 1400. Located at lower end of steering column and controlled by lever on steering wheel. Pilot lights in right and left end instruments of instrument cluster indicate positions of lighting switch as follows:
Park—Parking and tail lamps lighted.
City—City Driving (lower headlamp beams).
Drive—Country Driving (upper headlamp beams).
Pass—Country Passing (passing beam).

Bulb Specifications

Position	Candlepower	Mazda No.
Headlamps	32-32	2330
Parking or Fender	3	63
Instr., Tail, Courtesy	3	63
Stop	15	87
Dome	6	81
Pilot (Tell-tales)	1	51

THERMOSTATIC RELAY:—(On Delco-Remy Model 1050-W Fuse Block). Thermostatic arm type current limit relay (no winding). Connected in lighting circuits. Contacts open with current load of 38 amperes at 70°F.

FUSES:—Body Lights—20 amperes on fuse block (see above).
Generator Field—3 amperes in knurled plug on side of regulator case.

HORNS:—Sparton Twin Horns. Vibrator type. Operated by horn relay.
Horn Relay:—R.B.M. Model 10072. Current draw .4-.55 amperes at 6.0 volts. Coil resistance 11-14 ohms. Contacts must close with 4 volts across winding with relay in inverted position.

SERIAL NUMBER:—Stamped on plate on left front side of dash.

ENGINE NUMBER:—First number, 903,101. Stamped on left cylinder block below head.

ENGINE:—Twelve cylinder, 67° Vee, modified 'L' head type. Both cylinder blocks and upper crankcase cast enbloc.
Bore—3 7/16". **Stroke**—4¼".
Piston Displacement—473 cubic inches.
Rated Horsepower—56.7 A.M.A.
Developed Horsepower—175 at 3200 R.P.M.
Compression Ratio—6.4-1 Std., 6.0-1 Optl. Both cylinder heads are aluminum.
Compression Pressure—110 lbs. at cranking speed (125 R.P.M.) for Std. 6.4-1 head.

Pistons:—Nelson Bohnalite, aluminum alloy, Invar Strut, split skirt type. Replacement pistons furnished in standard size and .003", .005", .010", .015", .020", .030", .045" oversize.
Weight—21.7 ounces.
Removal—Pistons removed through top, rods through bottom of engine (push pistons up until piston pin is exposed, take out locking rings, push out pin, lift out piston, lower rod and remove from below). Use new locking rings when installing pistons.
Clearance—Skirt .0015". See fitting pistons.
Fitting New Pistons—Use .0015" feeler stock ½" wide to check clearance. Pull required to withdraw feeler from between piston and cylinder wall on side opposite slot should be 6-8 lbs.
Installing Pistons—Slot should be toward left side (viewed from driver's seat) on all pistons.

Piston Rings:—Three compression, one oil control ring per piston, all above pin. Lower ring groove drilled radially with twelve ⅛" oil drain holes.

Ring	Width	End Gap	Groove Depth
Comp. All	⅛"	.007" min.	.158"
Oil Cont.	5/32"	.007" min.	.158"

Piston Pin:—Diameter ⅞". Length 2 63/64". Pin floats in piston and rod. Held by retaining ring at each end. Pins furnished for service .003", .006" oversize.
Pin Fit in Piston—Palm push fit with piston at 160°F.
Pin Fit in Rod Bushing—Thumb push fit with both parts at room temperature (70°F).

Connecting Rod:—Weight 40⅝ ozs. Length 9".
Crankpin Journal Diameter—2½".
Lower Bearing—Removable steel-backed, copper-lead alloy lined type. No shims.
Clearance—.0017-.0022". Sideplay .008" minimum.
Adjustment—None (no shims). Replace bearings. Do not file rods or caps.

Crankshaft:—Four bearing. Integral counterweights.
Journal Diameters—2¾" all bearings.
Bearing Type—Removable steel-backed, babbitt-lined type. No shims.
Clearance—.001" minimum.
Adjustment—None (no shims). Replace bearings. Do not file bearing caps.
End Thrust—Taken by front bearing. Endplay .003" minimum.

Camshaft:—Four bearing. Mounted between cylinder banks directly above crankshaft. Non-adjustable chain drive.
Timing Chain—Morse #1866. Width 1½". Pitch .500". Length 28" or 56 links.
Camshaft Setting—Sprockets are marked. Mesh chain with sprockets turned so that '00' marks are adjacent and centered on straightedge across the shaft centers.

Valves:—

	Head Diameter	Stem Diameter	Length
Intake	1 21/32"	.3405"	6 35/64"
Exhaust	1 21/32"	.338"	6 35/64"

	Seat Angle	Lift	Stem Clearance
Intake	45°	5/16"	.0025"
Exhaust	45°	5/16"	.005"

Tappet Clearance—None in service (automatic take-up).
Automatic Tappet Takeup (Valve Silencer)—See Equipment Section for complete data on bleeding the automatic takeup (necessary in order to grind valves) and initial clearance when installing valves (new or after grinding). Automatic takeup should not require attention at other times.

Valve Springs:—

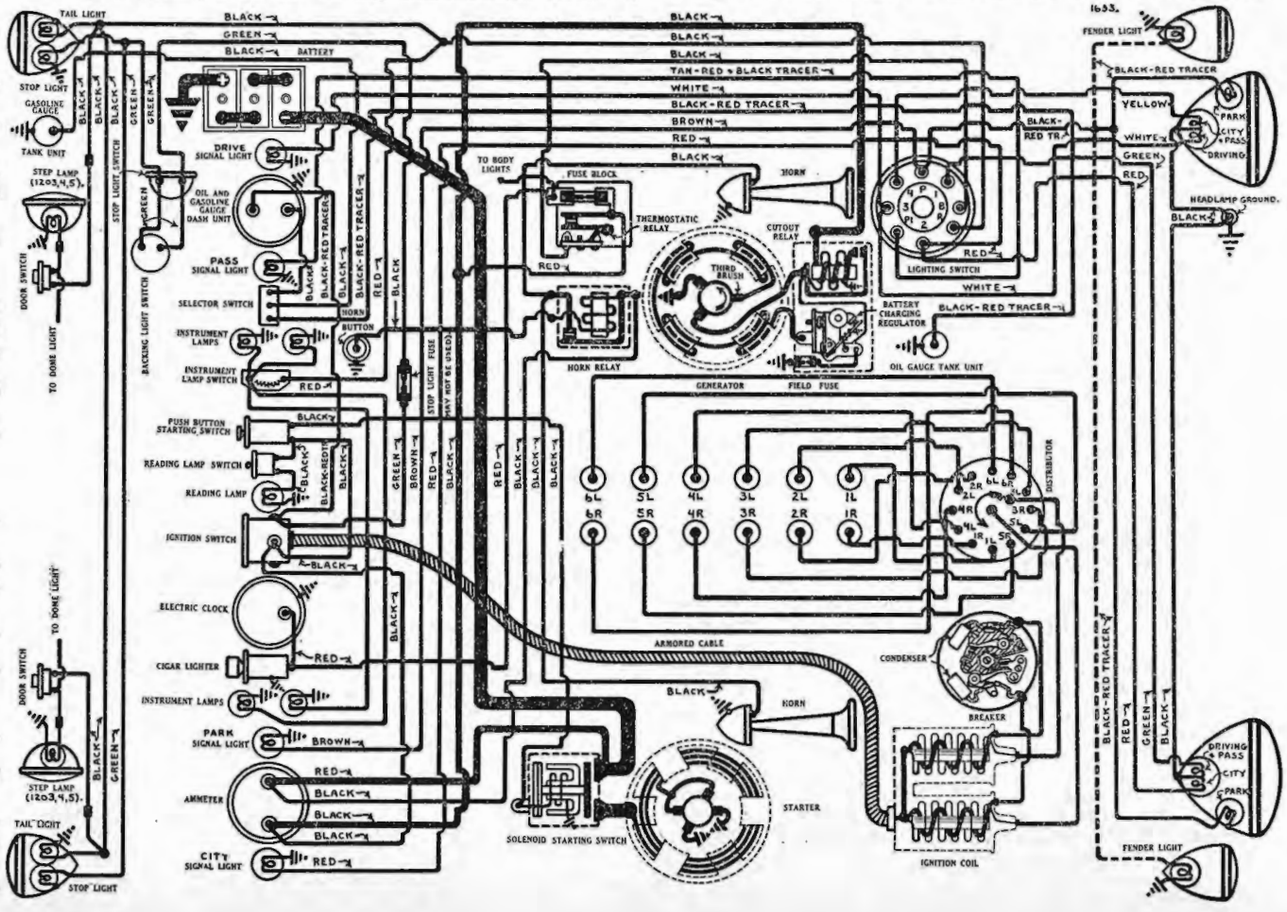
	Spring Pressure	Length
Valve Closed	70 lbs.	2 7/32"

Valve Timing—See Camshaft Setting above.
Intake Valves—Open at TDC. Close 45° ALDC.
Exhaust Valves—Open 35° BLDC. Close 10° ATDC.
To Check Valve Timing—Intake valve in #1 cylinder of right hand bank (1R) should begin to open with piston 6R on top dead center entering power stroke when mark '1R-UDC' on vibration dampener at front of engine lines up with pointer on chain case cover.

Lubrication:—Pressure. Gear type oil pump located in crankcase.
Normal Oil Pressure—35 lbs. minimum at 1000 R.P.M.
Oil Pressure Relief Valve—Under plug on left hand side of crankcase below oil filler. Adjustable by turning adjustment screw.
Capacity and Oil—10 qts. Use SAE. #30 (normal temperatures of 30° to 100°F), #40 (above 100°F), #20-W (0° to 60°F), #10-W (—15° to 40°F).

CARBURETION:—See Carburetion Section for complete data on Carburetor, Automatic Choke, Fuel Pump, and Gasoline Gauge.
Carburetor:—Stromberg, Model EE-3, 1½" dual, downdraft type.
Automatic Choke—Stromberg, Type C.
Fuel Pump:—A.C., Type I-1521778 diaphragm type combination fuel and vacuum pump.
Gasoline Gauge:—A.C. electric combination gasoline and oil gauge.

CLUTCH:—Long, Model 12CB. Single plate, dry disc type. No adjustment required for wear.
Clutch Pedal Adjustment—Clearance between pedal and toeboard should be ½-1". Free move-



ment of pedal should be 1½". To adjust, turn turnbuckle on connecting rod at lower end of clutch pedal.
Clutch Facings—Moulded type, 2 required, 7" I.D., 12" O.D., .137" thick.

STEERING:—Front Suspension—Conventional 'I' beam section front axle with Reverse-Elliott ends and semi-elliptic springs.
Kingpin Inclination—9° crosswise.
Caster—1°. Adjustable by installing wedge shims between spring and spring pad on axle.
Camber—1°.
Toe In—0-1/16". Adjustable by changing length of tie rod in usual manner.

IGNITION: — Coil Model CE-4022 (1207), CE-4023 (1208). Two coil unit mounted at front of engine.
Ignition Current—6 amperes idling, 10 amperes stopped (total for both coils).
Ignition Switch:—Delco-Remy, Type 430-M. Connected to coil unit by armored cable. Switch has two 'on' positions (key turned to left or right). On cars with automatic starting, right hand 'on' position is regular running position. Key should be turned to left to secure gasoline gauge reading with engine not running.
Distributor Model IGO-4002-A. Double breaker, 6 lobe cam, full automatic advance type. Contacts open alternately at 33½ and 26½ degree intervals corresponding to unequal 67 and 53 degree firing intervals of engine (caused by 67° included angle between banks) and must be synchronized (see Timing).
Breaker Gap—Set at .020". Limits .018-.022".
Breaker Arm Spring Tension—20 ozs. at tip of arm.
Cam Angles—Closed 40°. Open 20° distributor. Each set operates independently and controls one coil.

Automatic Advance

Distributor		Engine	
Degrees	R.P.M.	Degrees	R.P.M.
Start	300	0	600
2	525	4	1050
4	750	8	1500
6	975	12	1950
8	1200	16	2400

Removal:—Distributor mounted between cylinder banks at front of engine and driven through offset tongue-and-slot coupling from camshaft. To remove, take out screws in mounting bracket.

IGNITION TIMING:— Flywheel Degs. Piston Position
6.4-1 and 6.0-1 Heads ..... 8° BTDC. ..... .0256" BTDC.
Timing (Stationary Contacts)—With #1R piston (front piston—right hand bank) on compression, turn engine over until piston reaches firing position, stop when correct graduation on vibration dampener at front of engine lines up with pointer on chain case cover (vibration dampener has fifteen 1° graduations before the dead center mark '1R-UDC'—see table above for correct setting). Loosen clamp screw on mounting bracket, rotate distributor until stationary contacts (mounted directly on breaker plate) begin to open, tighten clamp screw. Then synchronize movable contacts.
Synchronization (Movable Contacts)—After timing distributor (above), turn engine over 67° to firing position for piston #6L, stop when correct graduation on vibration dampener lines up with pointer (vibration dampener marked '6L-UDC' with fifteen 1° graduations before this point). Loosen lockscrews on movable sub-plate, shift plate by turning eccentric adjusting screw until movable contacts begin to open, tighten lockscrews.
Synchronization (Other Methods)—If distributor synchronized by other methods, set movable points to open 33½° after fixed points. Distributor firing intervals are unequal 33½-26½-33½ distributor degrees.
Firing Order: — 1R-6L-5R-2L-3R-4L-6R-1L-2R-5L-4R-3L with cylinder banks right (R) and left (L) as viewed from driver's seat and #1 cylinder nearest radiator. Spark plugs not connected in this order on distributor cap (see diagram).
Spark Plugs:—A.C., Type K-7. 14 MM. Metric.
Spark Plug Gaps—Set at .025".

BATTERY:—Prest-O-Lite, Type A619-ST. 6 volt, 19 plate, 144 ampere hour (5 ampere rate).
Starting Capacity—170 amperes for 20 minutes.
Grounded Terminal—Positive (+) terminal.
Location—On left side under rear compartment floor boards.

STARTER:—Model DN-1273. Armature No. 13409.
Starter Drive—Outboard Bendix Type RCD10FXTD.
Rotation—Counter-clockwise at commutator end.
Brush Spring Tension—26-28 ounces.

Performance Data

Torque	R.P.M.	Volts	Amperes
0 ft. lbs.	3000	6.0	50
2 "	1600	5.6	120
3.3 "	1200	5.45	150
6.3 "	800	5.2	210
15.0 "	400	4.65	360
35 "	Lock	3.5	650
39.0 "	Lock	3.6	810

Starting Switch:—Owen-Dyneto Solenoid Switch, Type 21676. Delco-Remy Control Switch, Type 1398. Solenoid switch mounted on starter and controlled by push button switch on instrument panel. See Equipment Section for complete data on automatic starting for cars with this equipment.
Removal:—Starter sleeve mounted in right front face of flywheel housing. To remove, take out pilot mounting screw in flywheel housing.

GENERATOR:—Model CO-1271. Armature No. 23709. Air-cooled type. Third brush control in conjunction with Battery Charge Regulator. See Equipment Section for complete data on Regulator.
Charging Rate Adjustment—Third brush shifted through rack-and-pinion control by slotted adjusting screw on commutator end plate. Turn adjusting screw to right or clockwise to increase, and to left or counter-clockwise to decrease charging rate.
Maximum Charging Rate—30-33 amperes (cold), 24-27 amperes (hot) at 8.0 volts.

Performance Data—Regulator Inoperative

Cold			Hot (215°F.)		
Amps.	Volts	R.P.M.	Amps.	Volts	R.P.M.
0	6.5	600	0	6.6	690
4	6.7	660	4	7.05	760
8	7.0	720	8	7.4	840
12	7.2	800	12	7.7	925
16	7.5	900	16	7.9	1070
20	7.8	1000	20	8.0	1260
24	7.95	1100	24	8.0	1800
30	8.0	1600			

Rotation—Counter-clockwise at commutator end.
Brush Spring Tension—20 ounces each.
Field Current—2.3 amperes at 6.0 volts.
Field Fuse—3 amperes in knurled plug on side of regulator case.

Removal:—Generator mounted on special sliding bracket at left front of engine with fan belt drive. To remove, loosen nuts on two studs on mounting slide, slide generator toward engine, slip off drive belts, take off nuts on studs.

Belt Adjustment:—Loosen nuts on studs on slide bracket, pull generator out or away from engine until reading on spring scale attached to generator frame is 180 lbs., tighten nuts.

RELAY-REGULATOR: — Model 40210. Mounted on generator. Consists of Cutout Relay and Battery Charge Regulator in a single case. See Equipment Section for complete data on these units.

Cutout Relay

Cuts In—7.8-8.0 volts, 600 R.P.M.
Cuts Out—1.5-3 ampere discharge current.
Relay Contact Gap—.020-.030".
Air Gap—.020-.030" with contacts closed.

Battery Charge Regulator

Setting—Contacts open at 8.0 volts. Limits are 7.8 volts minimum, 8.3 volts maximum.
Regulator Resistance—1.8 ohms.

LIGHTING:—R.B.M. Switch, Model 1400. Located at lower end of steering column, controlled by lever on steering wheel. Pilot lights in right and left end instruments of instrument cluster indicate positions of lighting switch as follows:
Park—Parking and Tail lamps lighted.
City—City Driving (lower headlamp beams).
Drive—Country Driving (upper headlamp beams).
Pass—Country Passing (passing beam).

Bulb Specifications

Position	Candlepower	Mazda No.
Headlamps	32-32	2330
Parking or Fender	3	63
Instr., Tail, Courtesy	3	63
Stop	15	87
Dome	6	81
Pilot (Tell-tales)	1	51

THERMOSTATIC RELAY:—(On Delco-Remy Model 1050-W Fuse Block). Thermostatic arm type current limit relay (no winding). Connected in lighting circuits. Contacts open with current load of 38 amperes at 70°F.

FUSES:—Body Lights—20 amperes on fuse block (see above).
Generator Field—3 amperes in knurled plug on side of regulator case.

HORNS:—Sparton Twin Horns. Vibrator type. Operated by horn relay.

Horn Relay:—R.B.M. Model 10072. Current draw .4-5.5 amperes at 6.0 volts. Coil resistance 11-14 ohms. Contacts must close with 4 volts across winding with relay in inverted position.

NOTE—See following article on Model 845 (Delco-Remy Equipment) for complete data on Engine, Clutch, Steering, Carburetion, and Ignition for these models. Specifications and equipment are identical except for Starter and Generator as given below.

SERIAL NUMBER:—First number (138″WB) 2,090,001, (144″WB) 2,590,001. On plate at right side of frame at rear of right front spring rear shackle.

ENGINE NUMBER:—Stamped on left side of cylinder block below head at center.

STARTER:—Model DI-1237. Armature No. 16437. Six pole type with a single field coil. Coil is constructed so that it winds around three sides of each field pole (see diagram).

Starter Drive—Outboard Bendix Type R-11SXT-10.

Rotation—Counter-clockwise at commutator end.
Brush Spring Tension—26-28 ounces each.
Cranking Performance—100-105 R.P.M., 640 amperes, 3.6 volts.

Performance Data

Torque	R.P.M.	Volts	Amperes
0 ft. lbs.	4500	6.0	60
2 "	1600	5.5	130
3.6 "	1200	5.35	170
7.4 "	800	5.05	250
14.4 "	400	4.5	400
28.0 "	Lock	3.5	650
29.24 "	Lock	3.6	720

Starting Switch:—Startix automatic starting controlled by ignition switch. See Equipment Section for complete data.

Removal:—Starter flange mounted on left front face of flywheel housing. To remove, take out three flange mounting capscrews.

GENERATOR:—Model CO-1236. Armature No. 23691. Air-cooled. Third brush control type with Battery Charge Regulator (two-step charging rate). See Equipment Section for complete data on Battery Charge Regulator.

Charging Rate Adjustment—Third brush shifted through rack-and-pinion control by slotted adjusting screw on commutator end plate. To adjust, turn adjusting screw to right or clockwise to increase, and to left or counter-clockwise to decrease charging rate.

Maximum Charging Rate—32 amperes (cold), 8.0 volts, 1600 R.P.M., 20-25 M.P.H. Charging rate (hot) with Battery Charge Regulator operative is 15 amperes at 2800 R.P.M.

Performance Data—Regulator Inoperative

Cold			Hot (133°F.)		
Amps.	Volts	R.P.M.	Amps.	Volts	R.P.M.
0	6.5	560	0	6.5	580
4	6.7	620	4	6.7	630
8	7.0	680	8	7.1	700
12	7.4	750	12	7.5	790
16	7.6	840	16	7.7	880
20	7.8	920	20	7.9	1000
24	8.0	1040	24	8.0	1180
28	8.0	1200	26.4	8.0	1600
32	8.0	1600			

Rotation—Counter-clockwise at commutator end.
Brush Spring Tension—20 ounces each.
Field Current—2.3 amperes at 6 volts.
Field Fuse—3 ampere capacity in knurled plug in side of regulator case.

Removal:—Generator cradle mounted at left front of engine with fan belt drive (double Vee belt). To remove, slack off drive belt, disconnect water pump drive coupling, loosen mounting clamp band.

Belt Adjustment:—To adjust, loosen clamp bolt on fan bracket, turn eccentric shaft spindle until 10 lb. pull on belt midway between pulleys causes 1″ deflection, tighten clamp bolt. Additional range of adjustment secured by taking bracket off engine and moving bracket up until mounting bolts engage lower holes.

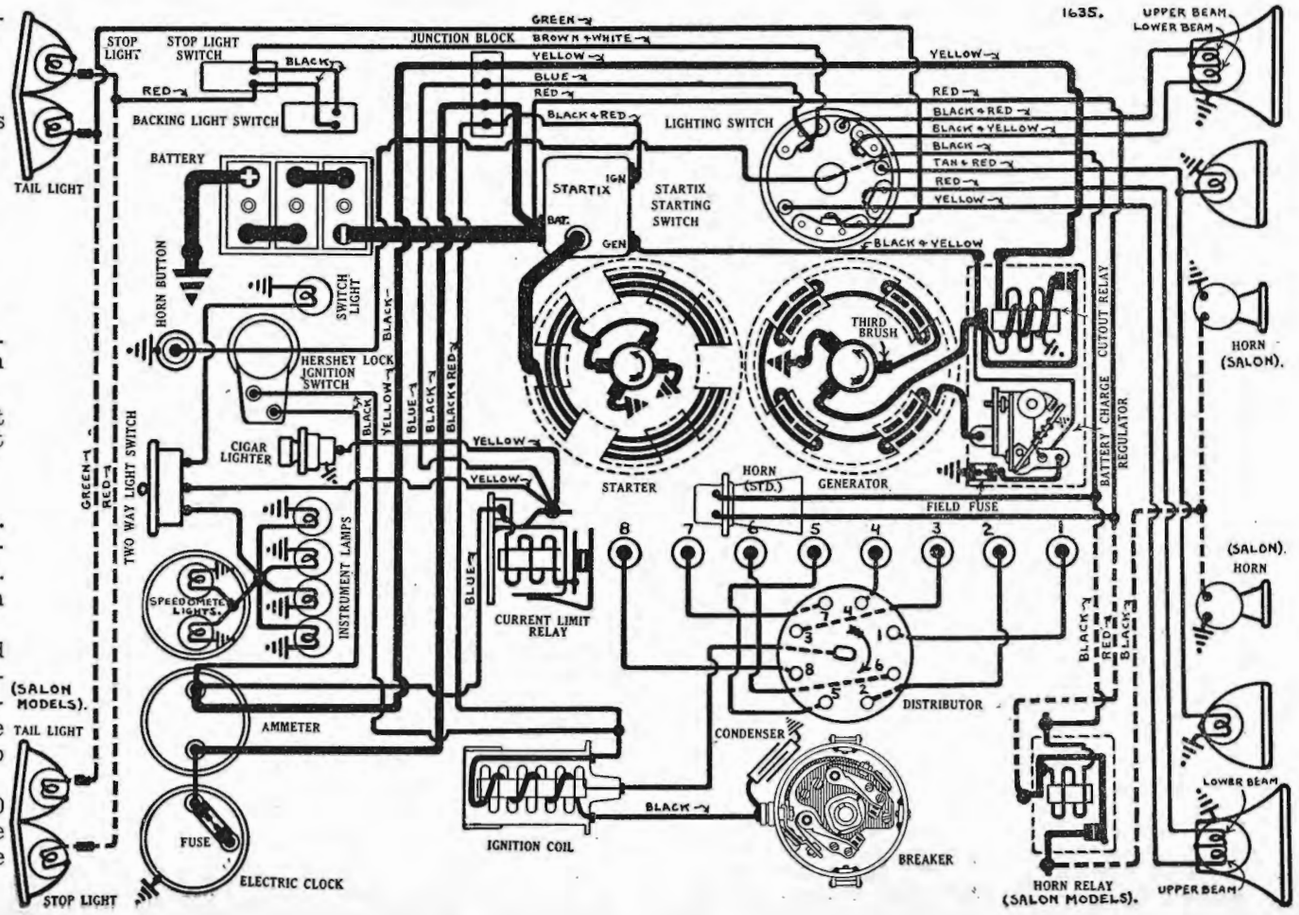
RELAY-REGULATOR:—Model 21262. Consists of Cut-out Relay and Battery Charge Regulator in a single case on the generator field frame. See Equipment Section for complete data on Battery Charge Regulator.

Cutout Relay

Cuts In—6.8-7.0 volts, 600 R.P.M., 8-10 M.P.H.
Cuts Out—1.5-3 ampere discharge current.
Relay Contact Gap—.020-.030″.
Air Gap—.020-.030″ (contacts closed).

Battery Charge Regulator

Setting—Contacts open at 8.0 volts. Limits are 7.8 volts minimum, 8.3 volts maximum.
Regulator Resistance—2.15 ohms.



NOTE—See following article on Model 1245 and 1255 (Delco-Remy Equipment) for complete data on Engine, Clutch, Steering, Carburetion, and Ignition for these models. Specifications and equipment are identical except for Starter and Generator as given below.

SERIAL NUMBER:—First number (1245-138"WB) 3,120,001, (1245-144"WB) 3,540,001, (1255) 3,570,001. On right plate on right side of frame at rear of right front spring rear shackle.

ENGINE NUMBER:—Stamped on left side of left cylinder block below head at center.

STARTER:—Model DY-1242. Armature No. 16439. Six pole type. Coils are constructed individually and grounded by fitting the coil lead into a slot in the pole piece. Coils are connected in parallel in two sets of three each (see diagram).

Starter Drives—Outboard Bendix type R-11FSXT-10.

Rotation—Counter-clockwise at commutator end.

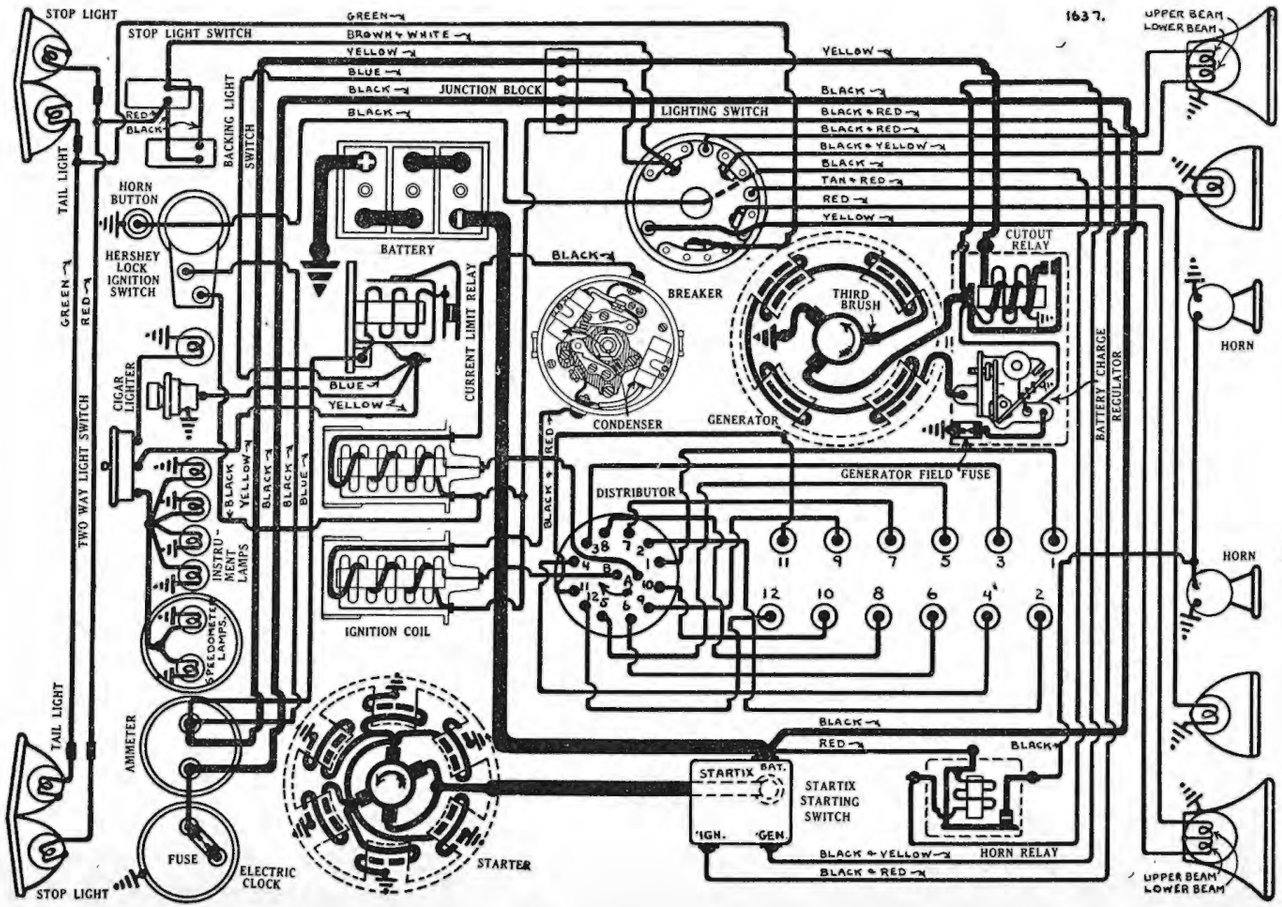
Cranking Performance—95-100 R.P.M., 645 amperes, 3.8 volts.

Performance Data

Torque	R.P.M.	Volts	Amperes
0 ft. lbs.	3000	6.0	50
7.4 "	800	5.2	245
10.2 "	600	4.9	320
15.2 "	400	4.45	435
21.8 "	200	4.0	575
30.0 "	Lock	3.5	720

Starting Switch:—Startix automatic starting controlled by ignition switch. See Equipment Section for complete data.

Removal:—Starter flange mounted on right front face of flywheel housing. To remove, take out three flange mounting screws.



GENERATOR:—Model CO-1236. Armature No. 23691. Air-cooled. Third brush control type with Battery Charge Regulator (two-step charging rate). See Equipment Section for complete data on Battery Charge Regulator.

Charging Rate Adjustment—Third Brush shifted through rack-and-pinion control by slotted adjustment screw on commutator end plate. To adjust, turn adjusting screw to right or clockwise to increase, and to left or counter-clockwise to decrease charging rate.

Maximum Charging Rate—32 amperes (cold), 8.0 volts, 1600 R.P.M., 20-25 M.P.H. Charging rate (hot) with Battery Charge Regulator operative is 15 amperes at 2800 R.P.M.

Performance Data—Regulator Inoperative

Cold			Hot (133°F.)		
Amps.	Volts	R.P.M.	Amps.	Volts	R.P.M.
0	6.5	560	0	6.5	580
4	6.7	620	4	6.7	630
8	7.0	680	8	7.1	700
12	7.4	750	12	7.5	790
16	7.6	840	16	7.7	880
20	7.8	920	20	7.9	1000
24	8.0	1040	24	8.0	1180
28	8.0	1200	26.4	8.0	1600
32	8.0	1600			

Rotation—Counter-clockwise at commutator end.
Brush Spring Tension—20 ounces each.
Field Current—2.3 amperes at 6 volts.
Field Fuse—3 ampere capacity in knurled plug in side of regulator case.

Removal:—Generator cradle mounted at left front of engine with fan belt drive (double Vee belt). To remove, slack off drive belt, disconnect water pump drive coupling, loosen mounting clamp band.

Belt Adjustment:—To adjust, loosen clamp bolt on fan bracket, turn eccentric shaft spindle until 10 lb. pull on belt midway between pulleys causes 1" deflection, tighten clamp bolt. Additional range of adjustment secured by taking bracket off engine and moving bracket up until mounting bolts engage lower holes.

RELAY-REGULATOR:—Model 21262. Consists of Cutout Relay and Battery Charge Regulator in a single case on the generator field frame. See Equipment Section for complete data on Battery Charge Regulator.

Cutout Relay

Cuts In—6.8-7.0 volts, 600 R.P.M., 8-10 M.P.H.
Cuts Out—1.5-3 ampere discharge current.
Relay Contact Gap—.020-.030".
Air Gap—.020-.030" (contacts closed).

Battery Charge Regulator

Setting—Contacts open at 8.0 volts. Limits are 7.8 volts minimum, 8.3 volts maximum.
Regulator Resistance—2.15 ohms.

SERIAL NUMBER:—On plate on right side of frame at rear of right front spring rear shackle under fender.

ENGINE NUMBER:—Stamped on left side of cylinder block below head at center.

ENGINE:—Own. Eight Cylinder, In line, 'L' head type.
Bore—3½". **Stroke—5".**
Piston Displacement—385 cubic inches.
Rated Horsepower—39.2.
Developed Horsepower—140 at 3400 R.P.M.
Compression Ratio—5.5-1. No optional ratios.
Compression Pressure—100 lbs. at 350 R.P.M. or 80-85 lbs. at cranking speed.

Pistons:—Bohn, Bohnalite aluminum alloy, Invar Strut, split skirt type. Replacement pistons furnished in standard oversizes of .002", .004", .010", .020". Piston length, 4¼".
Weight—22.61 ozs. minimum, 22.73 ozs. maximum without rings or pin.
Removal—Pistons and rods removed from above.
Clearance—Top .019-.026". Bottom .000-.005" at right angles to bosses, .001-.007" across bosses. See Fitting New Pistons.
Fitting New Pistons—Pistons should be snug on .0015" feeler and locked on .002" feeler.
Installing Pistons—Slot should be toward left viewed from driver's seat).

Piston Rings:—Four rings per piston, three compression rings, one oil control ring, all above pin. Oil ring groove drilled radially with oil drain holes.

Ring	Width	End Gap	Side Clearance
Comp. All	.1235-.1240"	.013-.018"	.001-.002"
Oil Cont.	.1860-.1865"	.013-.018"	.001-.002"

Piston Pin:—Diameter .9355-.9359". Length 3 1/16". Pin is locked in rod.
Clearance In Piston—.0005-.0008" or thumb push fit.

Connecting Rod:—Weight ⅛ oz. variation allowed in entire set. Length 8.904-8.905".
Crankpin Journal Diameter—2.251-2.2515".
Lower Bearing—Centrifugally cast, babbitt-lined type. No shims used.
Clearance—.001-.0025". Sideplay, .004-.007".
Adjustment—None. Replace rods. Do not file caps.
NOTE—Oil spray holes drilled in both sides of connecting rod lower bearing upper half. Rods are installed at factory with piston pin clamp on same side as piston slot (left side).

Crankshaft:—Nine bearings. Integral counterweights.
Journal Diameters—2⅝" all bearings.
Bearing Type—Steel or bronze backed, babbitt-lined type. No shims used.
Clearance—.0015-.003".
Adjustment—None. Replace bearings. Do do not file caps.
End Thrust—Taken by front bearing. Endplay, .002-.004". Adjustable by adding or removing shims.

Camshaft:—Six bearings. Non-adjustable chain drive.
Bearing Type—Steel-backed, babbitt-lined.
Clearance—.002". Endplay, .003-.009".
Timing Chain—Whitney #CL-206. Width 1½", Pitch ½", Length 25" or 50 links.
Camshaft Setting—Sprockets are marked. Mesh chain with sprockets turned so that a straight-edge across the shaft centers splits the 'O' mark on the crankshaft sprocket and is midway between the two 'O' marks on the camshaft sprocket.

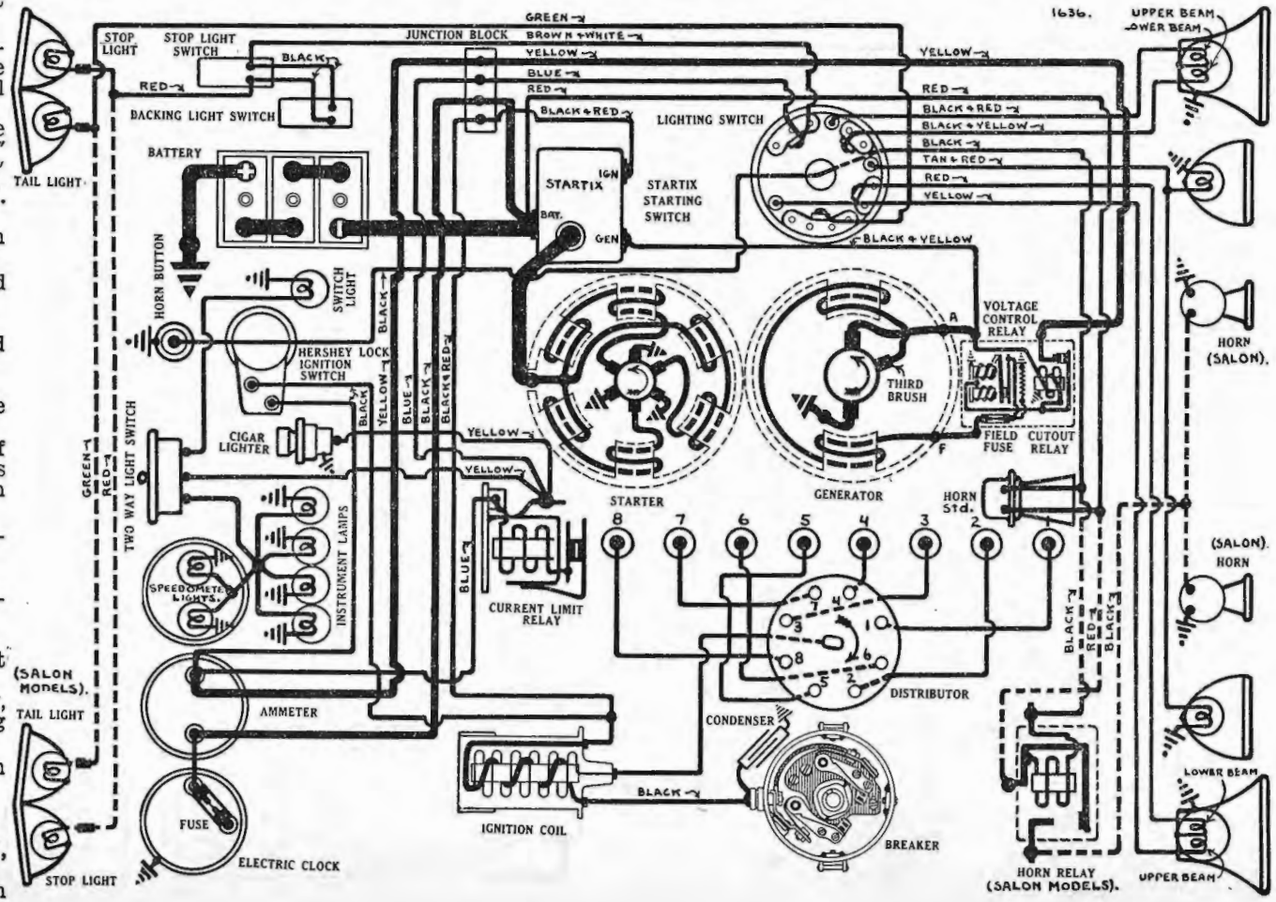
Valves:—	Head Diameter	Stem Diameter	Length
Intake	1 21/32"	.3725-.3735"	4¾"
Exhaust	1 9/16"	.3715-.3725"	4¾"

	Seat Angle	Lift	Stem Clearance
Intake	45°	.355"	.0015-.0025"
Exhaust	45°	.355"	.0025-.0035"

Tappet Clearance—None in service. See data below on hydraulic valve lifters.
Valve Springs—Install springs with small end up. Flat coil spring type dampener assembled on outside of all springs at top.

	Spring Pressure	Spring Length
Valve Closed	60-65 lbs.	2 3/32"
Valve Open	120-128 lbs.	1 25/32"

Valve Timing—See Camshaft Seeting above.
Intake Valves—Open 5° ATDC. Close 45° ALDC.
Exhaust Valves—Open 40° BLDC. Close 12° ATDC.
To Check Valve Timing—Remove #1 intake hydraulic valve lifter, pull out plunger, remove spring, wash lifter assembly in gasoline, replace plunger, install lifter in bracket. Check clearance between end of plunger and valve stem (valve closed—clearance will be about .070"). Insert sufficient feeler stock to take up all except .010" clearance. Turn engine over until piston #1 slightly past top dead center, stop when flywheel mark 'IN.OP./1-8' lines up with indicator on housing. #1 intake valve should begin to open at this point. Remove feeler stock, reassemble hydraulic valve lifter as directed below.
Installing Hydraulic Valve Lifters — Hydraulic valve lifters should always be installed without oil. Oil in lifter will retard escape of air and delay quieting of lifter when engine is operated. Remove plunger from lifter body, wash out all oil with gasoline. Do not interchange plungers—they are selective fit in lifter bodies—this is important. When lifters are installed (new or after grinding valves), check mechanical clearance with lifter dry (all oil removed from assembly). To check clearance, compress plunger spring by prying between plunger cap and valve stem, use feeler to check clearance. Clearance at this point must be .015". If clearance is insufficient, remove lifter from bracket, grind end of plunger slightly. Do not grind into check ball retaining pin.
Servicing Hydraulic Valve Lifters—See article in



Equipment Section for complete data on servicing these units.

Lubrication:—Pressure. Gear type oil pump located in crankcase.
Normal Oil Pressure—35 lbs. at 40 M.P.H.
Oil Pressure Relief Valve—Located at pump. Adjustable by adding or removing spacer washers.
Capacity & Oil—10 qts. (dry), 9 qts. (refill). Use SAE #30 (above 30°F), #20-W (30° to 0°F), #10-W (temperatures below 0°F).

CARBURETION:—See Carburetion Section for complete data on Carburetor, Automatic Choke, Fuel Pump, and Gasoline Gauge.

Carburetor:—Stromberg, Model EE-3, 1 11/16" downdraft type, with Fast idle.
Automatic Choke—Stromberg.

Fuel Pump:—A.C., Type D-1522112 diaphragm type. Supersedes Stewart-Warner Type 407-BW, used on first cars.

Gasoline Gauge:—K-S Telegauge hydrostatic type.

CLUTCH:—Long. Double plate, dry disc type. No adjustment for wear required.
Clutch Pedal Adjustment—Free movement of clutch pedal must be ¾-1¼".
Clutch Facings—Moulded type, 4 required, 6¼" I.D., 9¾" O.D., .130" thick.

STEERING: — Front Suspension — Conventional axle with Reverse-Elliott ends and semi-elliptic springs.
Kingpin Inclination—8° crosswise.
Caster—¾° **Camber**—1°
Toe In—¼" (⅛-3/16").

IGNITION:—Coil Model 537-E. Mounted on dash.
Ignition Current—2 amperes (idling), 4 (stopped).
Ignition Switch—Oakes Hershey type co-incidental steering post and ignition switch lock.

Distributor Model 662-J. Double breaker, 4 lobe cam, semi-automatic advance type. Contacts open alternately at 45° intervals corresponding to 90° firing interval of engine, and must be synchronized. See Timing.
Breaker Gap—Set at .018". Limits .018-.024".
Breaker Arm Spring Tension—17-21 ounces.
Cam Angles—Closed 34°. Open 11° (distributor). Both sets together when properly synchronized.
Manual Advance—33° (engine—maximum). Consists of retard operated by pulling out button on dash. Used for hand cranking or heavy pulling.

Automatic Advance

Distributor		Engine	
Degrees	R.P.M.	Degrees	R.P.M.
Start	300	2	600
9	1550	18	3100

Removal:—Mounted on right hand side of cylinder head. Take out hold-down screw in advance arm.

IGNITION TIMING:—

	Flywheel Deg.	Piston Pos.
All engines	5° BTDC.	.0123" BTDC.

Timing (Stationary Contacts) — Advance spark control button (push button in), disconnect and tape wire on 'IGN' terminal of Startix (to avoid automatic cranking if ignition turned on), remove cover over inspection hole in flywheel housing. With #4 piston on compression, turn engine over until flywheel mark 'IGN/5-4' lines up with indicator on housing (mark is 5° before top dead center mark 'UDC/5-4'), loosen advance arm clamp bolt, rotate distributor until stationary contacts (mounted directly on breaker plate) begin to open, tighten clamp bolt, then check synchronization.
Synchronization (movable contacts) on engine—Turn engine over 90° or ¼ revolution to firing position for piston #1, stop when flywheel mark 'IGN./1-8' lines up with indicator (mark is 5° before top dead center mark 'UDC./1-8'), loosen lockscrews on movable sub-plate, turn eccentric adjusting screw until contacts begin to open, tighten lockscrews, check spark plug connections.
Synchronization (Using Tool) — Use special synchronizing tool, Delco-Remy Part No. 1838182, and follow complete directions in Equipment Section.

Firing Order:—1-6-2-5-8-3-7-4. See Diagram.

Spark Plugs:—AC. Type K-10 or Champion Type J-5-C. 14 MM. Metric type.
Spark Plug Gaps—.025". Limits .022-.025".

BATTERY:—Willard, Type WH-4-17. 6 volt, 136 A.H. capacity (20 hour rate).
Starting Capacity—160 amperes for 20 minutes.
Grounded Terminal — Positive (+) terminal grounded to transmission cover bolt.
Location—Left hand side under front floor.

STARTER:—Model 497. Armature No. 1843420.
Starter Drive—Outboard Bendix Type R11SXT-10.
Rotation—Counter-clockwise at commutator end.
Brush Spring Tension—36-40 ounces each.
Cranking Performance—100-105 R.P.M.

Performance Data

Torque	R.P.M.	Volts	Amperes
0 ft. lbs.	3000	5.0	70
19 "	Lock	3.0	500

Starting Switch:—Startix automatic starting system controlled by ignition switch. See Equipment Section for complete data.

Removal:—Starter flange mounted on right front face of flywheel housing. To remove, take out three flange mounting capscrews.

GENERATOR:—Model 929-A. Armature No. 1856943. Air-cooled. Third brush control type with external voltage regulation (two-step charging rate). Voltage Control Relay combined with Cutout Relay in case on generator field frame. See Equipment Section for complete data on Voltage Control Relay.
Charging Rate Adjustment—Use test ammeter and voltmeter to check generator output. Connect jumper wire between 'F' terminal on generator and ground on generator frame. This is important as voltage regulator must be shorted out when adjustment is being made. Loosen lockscrew on commutator end plate, shift third brush by hand counter-clockwise to increase,, or clockwise to decrease charging rate. Tighten locking screw and remove jumper wire.
Maximum Charging Rate—23-26 amperes, 2200 R.P.M., 20-25 M.P.H.

Performance Data

	Amperes	Volts	R.P.M.
Cold	23-26	8.8-9.1	2200
Hot	17-20	8.1-8.5	2400

Rotation—Counter-clockwise at commutator end.
Brush Spring Tension—22-26 ozs. (main), 16-20 ozs. (third brush).
Shunt Field Current—1.8-2.3 amperes at 6.0 volts.
Field Fuse—6 ampere capacity in regulator case.

Removal:—Cradle mounted at left front of engine with fan belt drive (double Vee belt). To remove, slack off belt, disconnect water pump drive coupling, loosen mounting clamp band.

Belt Adjustment:—To adjust, loosen clamp bolt on fan bracket, turn eccentric shaft spindle until 10 lb. pull on belt midway between pulleys causes 1" deflection, tighten clamp bolt. Additional range of adjustment secured by taking bracket off engine and moving bracket up until mounting bolts engage lower holes.

CONTROL UNIT:—Model 5540. Consists of Cutout Relay and Voltage Control Relay in case on generator field frame. See special article in Equipment Section for complete data on these units.

Cutout Relay

Cuts In—6.4-6.8 volts, 8-10 M.P.H.
Cuts Out—0-3 ampere discharge current.
Relay Contact Gap—.015-.025".
Air Gap—.012-.017" (contacts closed).

Voltage Control Relay

Contacts Open—8.35-8.65 volts at 70°F.
Contacts Close—7.3-7.7 volts at 70°F.
Contact Gap—.008-.013".
Contact Spring Tension—.7-.9 ounces.
Air Gap—.028-.040" between armature and core (armature down against lower stop), .028-.040" armature travel (between armature and lower stop).

LIGHTING:—R.B.M. Switch Model 1451 (body), 1450 (plate), 1452 (cover). Lighting switch provides 'Country Passing' assymetrical beam (upper beam left hand headlamp, lower beam right hand headlamp).

Bulb Specifications

Position	Candlepower	Mazda No.
Headlights	32-32	1000.
Auxiliary headlights	6	81.
Tail	6	81.
Stop and Backing	21	1129.
Dome	15	87.
Instrument, Lock	3	63.

FUSES:—Electric Clock—5 ampere on back of clock.
Generator Field—6 ampere in regulator case.

CURRENT LIMIT RELAY:—Model 410-F. Vibrating type. Starts to operate with current load of 30-35 amperes, limiting load to 5-18 amperes.
Contact Gap—.012-.030".
Air Gap—.015-.030" (contacts closed).
Spring Tension—5 ozs. min. measured at brass button.

HORNS:—Klaxon Model K-26-G. Type 1775 (low note). 1776 (high note). Vibrator type, blended tone, twin horns operated by horn relay.

Horn Relay:—Model 266-TK. Relay requires .25 amperes to close contacts. Current draw .8 amperes.
Contact Gap—.015-.025".
Air Gap—.012-.017" (contacts closed).

SERIAL NUMBER:—On plate on right side of frame at rear of right front spring rear shackle under fender.

ENGINE NUMBER:—Stamped on left side of left cylinder block below head at center.

ENGINE:—Twelve cylinder, 80° included angle Vee, 'L' head type. Cylinders cast Enbloc for each bank.
Bore—3½". **Stroke**—4".
Piston Displacement—462 cubic inches.
Rated Horsepower—58.8.
Developed Horsepower—175 at 3400 R.P.M.
Compression Ratio—6.0-1 (std.), 6.5-1 and 7.0-1 (optional). High compression heads are formed by milling off face of standard head to reduce combustion chamber.
Compression Pressure—115 lbs. at 350 R.P.M. or 80-85 lbs. at cranking speed (std. 6.0-1 head).

Pistons:—Bohn, Bohnalite aluminum alloy, Invar Strut, split skirt type. Replacement pistons furnished .002", .004", .010", .020" oversize. Piston length 4¼".
Weight—22.70 ozs. minimum, 22.82 ozs, maximum.
Removal—Pistons and rods removed from above.
Clearance—Top .019-.026", Bottom .000-.005" at right angles to bosses, .001-.007" across bosses. See Fitting new pistons.
Fitting New Pistons—Pistons should be snug on .0015" feeler and locked on .002" feeler.
Installing Pistons—Slot should be toward left on both banks (viewed from driver's seat).

Piston Rings:—Four rings per piston, three compression rings, one oil control ring, all above pin. Oil ring groove drilled radially with oil drain holes.

Ring	Width	End Gap	Side Clearance
Comp. All	.1235-1240"	.013-.018"	.001-.002"
Oil Cont.	.1860-.1865"	.013-.018"	.001-.002"

Piston Pin:—Diameter .8749-.8751". Length 3.031-3.041". Pin floats in piston and rod. Pin hole in rod is bronze-bushed.
Pin Fit in Piston—Thumb push fit with piston at 160°F.
Clearance in Rod Bushing—.0004-.0006".

Connecting Rod:—Weight, ⅛ oz. variation allowed in entire set. Length 9.936-9.939".
Crankpin Journal Diameter—2.2160-2.2165".
Lower Bearing—Centrifugally-cast, babbitt-lined type. No shims used.
Clearance—.001-.0025".. Sdieplay, .006-.010".
Adjustment—None. Replace rods. Do not file caps. Bearings .010" and .020" undersize furnished for service.

NOTE—Oil spray holes are drilled in both sides of connecting rod lower bearing upper half. Rods are installed at factory with chamfer in crank pin bore next to crankshaft cheek (rods mounted side by side).

Crankshaft:—Seven bearings. Integral counterweights.
Journal Diameters—2½" all bearings.
Bearing Type—Steel or bronze backed, babbitt-lined type. No shims used.
Clearance—.0015-.003".
Adjustment—None. Replace bearings. Do not file caps.
End Thrust—Taken by front bearing. Endplay, .002-.004". Adjustable by adding or removing shims.

Camshaft:—Four bearings. Non-adjustable chain drive.
Bearing Type—Steel-backed, babbitt-lined.
Clearance—.002". Endplay, .003-.009".
Timing Chain—Whitney #CLG-206. Width 1½", Pitch ½", Length 26½" or 53 links.
Camshaft Setting—Sprockets are marked. Mesh chain with sprockets turned so that marks are adjacent and in line with a straightedge across the shaft centers.

Valves:—

	Head Diameter	Stem Diameter	Length
Intake	1 21/32	.3725-.3735"	4¾"
Exhaust	1 9/16	.3715-.3725"	4¾"

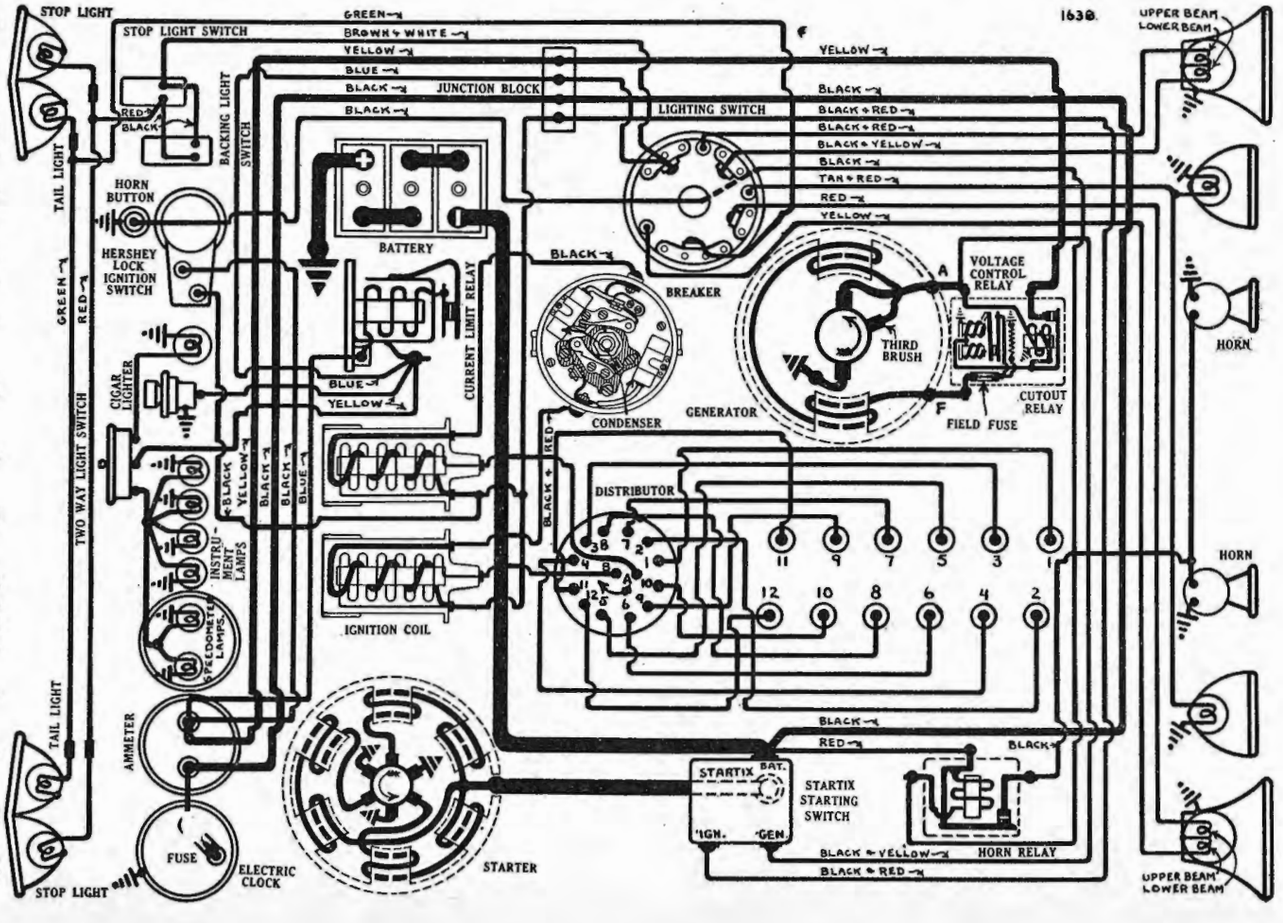
	Seat Angle	Lift	Stem Clearance
Intake	45°	.324"	.0015-.0025"
Exhaust	45°	.324"	.0025-.0035"

Tappet Clearance—None in service. See data below on hydraulic valve lifters.
Valve Springs—Install springs with small end up. Flat coil spring type dampener installed on all springs at top.

	Spring Pressure	Length
Valve Closed	60-65 lbs.	2 3/32"
Valve Open	120-128 lbs.	1 25/32"

Valve Timing—See Camshaft Setting above.
Intake Valves—Open 19° BTDC. Close 69° ALDC.
Exhaust Valves—Open 56° BLDC. Close 28° ATDC.
To Check Valve Timing—Remove #1 intake hydraulic valve lifter, pull out plunger, remove spring, wash lifter assembly in gasoline to remove all oil, replace plunger, install lifter in bracket, check clearance between end of plunger and valve stem (valve closed—clearance will be about .070"). Insert sufficient feeler stock to take up all except .004" clearance, turn engine over with #11 piston on compression, stop when flywheel mark 'IN.OP.#1/' lines up with indicator on housing, #1 intake valve should begin to open at this point. Remove feeler stock, reassemble hydraulic valve lifter.
Installing and Servicing Hydraulic Valve Lifters—See article in Equipment Section for complete data. Hydraulic valve lifters are interchangeable between 8 and 12 cylinder models except for plunger cap or plug. Short or thin caps are used on 12 cylinder models and a longer or thick cap on 8 cylinder models.

Lubrication:—Pressure. Gear type oil pump located in crankcase.
Normal Oil Pressure—40 lbs. at 40 M. P. H.
Oil Pressure Relief Valve—Located at oil pump. Adjustable by adding or removing spacing washers.



Capacity & Oil—14 qts. (dry), 12 qts. (refill). Use SAE #30 (above 30°F), #20-W (30° to 0°F), #10-W (temperatures below 0°F).

CARBURETION:—See Carburetion Section for complete data on Carburetor, Automatic Choke, Fuel Pump, and Gasoline Gauge.

Carburetor:—Stromberg, Model EX-3, 1½" downdraft type. One carburetor used for each bank of cylinders (throttles must be synchronized).

Automatic Choke—Stromberg.

Fuel Pump:—A.C., Type D-1522113 diaphragm type. Supersedes Stewart-Warner Type 407-BZ, used on first cars.

Gasoline Gauge:—K-S Telegauge, hydrosatic type.

CLUTCH:—Long. Double plate, dry disc type. No adjustment for wear required.

Clutch Pedal Adjustment—Free movement of clutch pedal must be ¾-1¼".

Clutch Facings—Moulded type, 4 required, 6¼" I.D., 9¾" O.D., .130" thick.

STEERING:—Front Suspension — Conventional axle with Reverse-Elliott ends and semi-elliptic springs.

Kingpin Inclination—8° crosswise.

Caster—¾°. **Camber** 1°.

Toe In—¼" (⅛-3/16").

IGNITION:—Coil Model 537-E (2). Coils mounted on dash.

Ignition Current—2 amperes (idling), 4 amperes (stopped), for each coil.

Ignition Switch—Oakes Hershey type co-incidental steering post and ignition switch lock.

Distributor Model 4105. Double breaker, 6 lobe cam, semi-automatic advance type. Contacts open alternately at 20° and 40° intervals corresponding to 40° and 80° firing intervals of engine (unequal firing interval caused by 80° included angle of cylinder banks). Contacts must be synchronized—See Timing.

Breaker Gap—Set at .018". Limits .018-.024".

Breaker Arm Spring Tension—17-21 ounces.

Cam Angles—Closed 39°. Open 21° (distributor). Each set operates independently.

Manual Advance—33° (engine—maximum). Consists of a retard operated by pulling out button on dash. Used for hand cranking or heavy pulling.

Automatic Advance

Distributor Degrees	Distributor R.P.M.	Engine Degrees	Engine R.P.M.
Start	400	2	800
7	1400	14	2800

Removal:—Mounted at rear of engine between cylinder banks. Take out distributor bracket screws.

IGNITION TIMING:—

	Flywheel Deg.	Piston Pos.
All engines	5° BTDC.	.0091" BTDC.

Timing (Stationary Contacts)—Advance spark control (push button in), disconnect and tape wire on 'IGN' terminal of Startix (to avoid automatic cranking when ignition is turned on), remove cover over inspection hole in flywheel housing. With #1 piston on compression, turn engine over until flywheel mark 'IGN. #1/' lines up with indicator on housing (mark is 5° before top dead center mark 'UDC/No. 1'). Loosen locking screw in center of breaker cam, carefully locate cam so that stationary contacts (mounted directly on breaker plate) are just opening, tighten locking screw, check rotor position. Then check synchronization.

Synchronization (movable contacts) on engine—Turn engine over 40° or exactly 1/9 revolution to firing position of piston #4 (#2 on right hand bank), stop when flywheel mark 'IGN. #4/' lines up with indicator on housing (mark is 5° before top dead center mark 'UDC/No. 4'). Loosen lockscrews on movable sub-plate turn eccentric adjusting screw until contacts open. Tighten lockscrews.

Synchronization—other methods—Use synchornizing tool or rotary spark gap, set movable contacts to open exactly 20° after first or stationary contacts (adjust by loosening lockscrews and turning eccentric adjusting screw on sub-plate). Firing intervals are 20-40-20 (distributor degrees).

Firing Order:—1-4-9-8-5-2-11-10-3-6-7-12 with cylinders numbered as shown on diagram (Right bank—1, 3, 5, 7, 9, 11; Left bank—2, 4, 6, 8, 10, 12 with #1 and 2 cylinders nearest radiator). Spark plug cables not connected in this order on distributor cap (see diagram).

Spark Plugs:—AC. Type K-10 or Champion Type J-5-C. 14 MM. Metric type.

Spark Plug Gaps—.025". Limits .022-.025".

BATTERY:—Willard, Type WH-5-19. 6 volt, 19 plate, 153 A.H. capacity (20 hour rate).

Starting Capacity—180 amperes for 20 minutes.

Grounded Terminal — Positive (+) terminal grounded to transmission top bolt.

Location—Left hand side under front floor.

STARTER:—Model 497. Armature No. 1843420.

Starter Drive—Outboard Bendix Type R11SXT-10.

Rotation—Counter-clockwise at commutator end.

Brush Spring Tension—36-40 ounces each.

Cranking Performance—100-105 R.P.M.

Performance Data

Torque	R.P.M.	Volts	Amperes
0 ft. lbs.	3000	5.0	70
19 "	Lock	3.0	500

Starting Switch:—Startix automatic starting system controlled by ignition switch. See Equipment Section for complete data.

Removal:—Starter flange mounted on left front face of flywheel housing. To remove, take out three flange mounting capscrews.

GENERATOR:—Model 929-A. Armature No. 1856943. Air-cooled. Third brush control type with external voltage regulation (two-step charging rate). Voltage Control Relay combined with Cutout Relay in case on generator field frame. See Equipment Section for complete data on Voltage Control Relay.

Charging Rate Adjustment—Use test ammeter and voltmeter to check generator output. Connect jumper wire between 'F' terminal on generator and ground on generator frame. This is important as voltage regulator must be shorted out when adjustment is being made. Loosen lockscrew on commutator end plate, shift third brush by hand counter-clockwise to increase,, or clockwise to decrease charging rate. Tighten locking screw and remove jumper wire.

Maximum Charging Rate—23-26 amperes, 2200 R.P.M., 20-25 M.P.H.

Performance Data

	Amperes	Volts	R.P.M.
Cold	23-26	8.8-9.1	2200
Hot	17-20	8.1-8.5	2400

Rotation—Counter-clockwise at commutator end.

Brush Spring Tension—22-26 ozs. (main), 16-20 ozs. (third brush).

Shunt Field Current—1.8-2.3 amperes at 6.0 volts.

Field Fuse—6 ampere capacity in regulator case.

Removal:—Cradle mounted at left front of engine with fan belt drive (double Vee belt). To remove, slack off belt, disconnect water pump drive coupling, loosen mounting clamp band.

Belt Adjustment:—To adjust, loosen clamp bolt on fan bracket, turn eccentric shaft spindle until 10 lb. pull on belt midway between pulleys causes 1" deflection, tighten clamp bolt. Additional range of adjustment secured by taking bracket off engine and moving bracket up until mounting bolts engage lower holes.

CONTROL UNIT:—Model 5540. Consists of Cutout Relay and Voltage Control Relay in case on generator field frame. See special article in Equipment Section for complete data on these units.

Cutout Relay

Cuts In—6.4-6.8 volts, 8-10 M.P.H.

Cuts Out—0-3 ampere discharge current.

Relay Contact Gap—.015-.025".

Air Gap—.012-.017" (contacts closed).

Voltage Control Relay

Contacts Open—8.35-8.65 volts at 70°F.

Contacts Close—7.3-7.7 volts at 70°F.

Contact Gap—.008-.013".

Contact Spring Tension—.7-.9 ounces.

Air Gap—.028-.040" between armature and core (armature down against lower stop), .028-.040" armature travel (between armature and lower stop).

LIGHTING:—R.B.M. Switch Model 1451 (body), 1450 (plate), 1452 (cover). Lighting switch provides 'Country Passing' assymetrical beam (upper beam left hand headlamp, lower beam right hand headlamp).

Bulb Specifications

Position	Candlepower	Mazda No.
Headlights	32-32	1000.
Auxiliary headlights	6	81.
Tail	6	81.
Stop and Backing	21	1129.
Dome	15	87.
Instrument, Lock	3	63.

FUSES:—Electric Clock—5 ampere on back of clock.

Generator Field—6 ampere in regulator case.

CURRENT LIMIT RELAY:—Model 410-F. Vibrating type. Starts to operate with current load of 30-35 amperes, limiting load to 5-18 amperes.

Contact Gap—.012-.030".

Air Gap—.015-.030" (contacts closed).

Spring Tension—5 ozs. min. measured at brass button.

HORNS:—Klaxon Model K-26-G. Type 1775 (low note). 1776 (high note). Vibrator type, blended tone, twin horns operated by horn relay.

Horn Relay:—Model 266-TK. Relay requires .25 amperes to close contacts. Current draw .8 amperes.

Contact Gap—.015-.025".

Air Gap—.012-.017" (contacts closed).

NOTE—Series PJ(E) do not have separate serial numbers. This series may be distinguished by letter 'E' inserted in engine number, thus: PJ-E-1001. This letter 'E' should not be confused with letters 'A', 'B', etc., following engine number.

SERIAL NUMBER:—First number—(Detroit) 1,039,101, (Los Angeles) 3,151,501, (Canada) 9,396,076. On right front door hinge pillar post.

ENGINE NUMBER:—First number PJ-1001 or PJ-E-1001 (see note above). Stamped on left side of cylinder block between #1 and 2 cylinders. Letter 'A' following engine number indicates that bore is .020" larger than standard. Letter 'B' indicates main and connecting rod bearings .010" smaller than standard. Letters 'AB' indicate bore and bearings as above and also that outside diameters of connecting rod bearings are .005" larger than standard. Letter 'C' indicates that connecting rod outside diameters are .005" larger than standard.

ENGINE:—Own. Six cylinder, 'L' head type. Floating Power engine mounting.
Bore—3⅛". **Stroke**—4⅜".
Piston Displacement—201.31 cubic inches.
Rated Horsepower—23.44.
Developed Horsepower—82 at 3600 R.P.M. (Series PJ), 65 at 3000 R.P.M. (Series PJE).
Compression Ratio—6.7-1. No optional ratios.
Compression Pressure—140-150 lbs. at 1000 R.P.M.

Pistons:—Aluminum alloy, "T" slot, Cam ground type. Semi-finished pistons (head and ring grooves completely finished, skirt semi-finished) furnished for service where 'Cam' grinding equipment is available in two sizes: (1) standard to .023" oversize, (2) .025 to .050" oversize. If cam grinding equipment not available, use finished replacement pistons furnished .003", .005", .010", .015", .020", .023", .025", .030", .040", .050", .060" oversize and finish cylinder bores to provide correct clearance. Piston length — 3 11/16".
Weight—Maximum allowable variation ¼ oz.
Removal—Pistons and rods removed from above.
Clearance—.0015" at bottom.
Fitting New Pistons—Use micrometer to check piston diameter and cylinder bore. Measurement on piston made at bottom of skirt at right angles to piston pin (pin must be removed).
Installing Pistons—Slot should be at left or away from valves.

Piston Rngs:—Two undercut compression rings, two oil control rings per piston, all above pin, lower ring grooves drilled radially with oil drain holes. Rings furnished in same oversizes as pistons (except .023").

Ring	Width	End Gap	Side Clear.
Comp. (all)	⅛"	.007-.015"	.002"
Oil Cont. (all)	5/32"	.007-.015"	.002"

Piston Pin:—Diameter 55/64". Length 2⅝". Pin floats in piston and rod. Held by retaining rings. Piston can be heated in boiling water to remove or install pin. Pins furnished .003", .005, .008" oversize.
Pin Fit in Piston—Tight thumb push fit with piston at 120°F.
Pin Fit in Rod Bushing—Tight thumb push fit with piston at room temperature (70°F).

Connecting Rod:—Weight Maximum variation held to ¼ oz. Length 7 15/16".
Lower Bearing—Removable steel-backed, babbitt-lined type. No shims.
Clearance—.001-.00275". Sideplay .003-.009".
Adjustment—None. Replace bearings. Do not file rods or caps. Install new bearings with small boss registering with groove (both halves). Bearings furnished .010" undersize and standard size.
Installing Rods—Lower bearings are offset. Install rods with widest half of bearings toward rear of engine (#1, 3, 5) or toward front (#2, 4, 6). Oil hole in upper half of bearing must be toward camshaft side of engine on all rods.

Crankshaft:—4 bearing. Integral counterweights.
Journal Diameters—2¼" (all bearings).
Bearing Type—Removable steel-backed, babbitt-lined type.
Clearance—.001-.002".
Adjustment—None. Replace bearings. Do not file bearing caps. Bearings furnished .010" undersize and standard size for service.
End Thrust—Taken by #4 (rear) bearing. Endplay .003-.007".

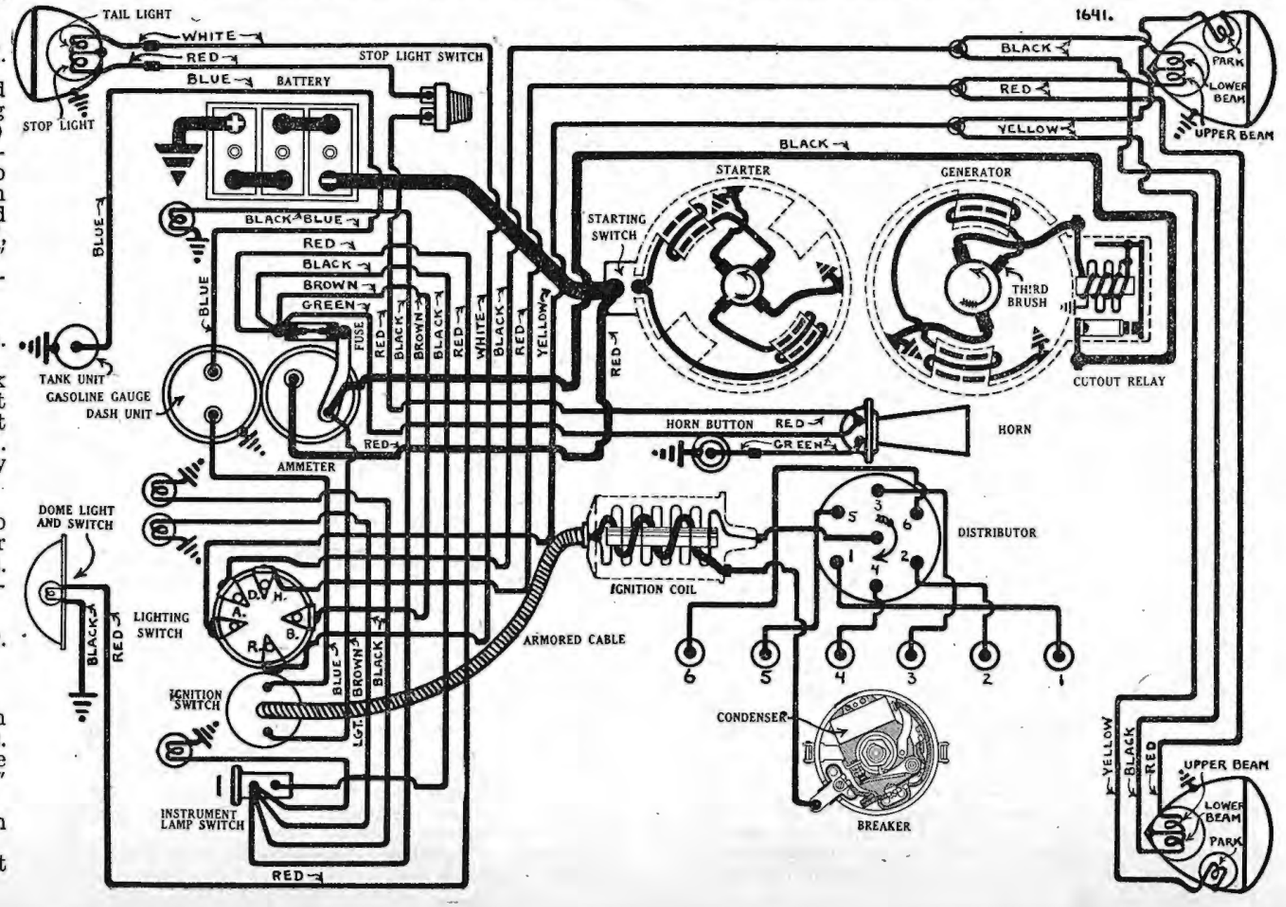
Camshaft:—Four bearings. Non-adjustable chain drive.
Bearing Type—Removable steel-backed, babbitt-lined type, except #4, which is machined in crankcase.
Clearance—.0015-.0025". Endplay .003-.005".
End Thrust—Taken by thrust plate at rear of the sprocket hub.
Timing Chain—Morse. Width 1". Pitch .500". Length 24" or 48 links.
Camshaft Setting—Sprockets are marked. Mesh chain with sprockets turned so that marks are adjacent and in line with a straightedge across the shaft centers. Install chain endless with camshaft sprocket off.

Valves:—

	Head Diameter	Steam Diam.	Length
All Valves	1 15/32"	3405"	4 27/32"

	Seat Angle	Lift	Stem-to-Guide-Clr.
Intake	45°	5/16"	.001-.003"
Exhaust	45°	5/16"	.003-.005"

Installing New Guides—Use special tool to remove and install guides. Intake guides installed with tapered end up, exhaust guides with taper end down. Top of guide must be ⅞" below top of block. Finish ream new guides to inside diameter of .342-.343" (intake), .344-345" (exhaust) after installing.
Tappet Clearance—.006" Int., .008" Exh. with engine hot. Set exhaust clearance at .010" for sustained high speed driving. Adjustment acces-



sible by removing housing cover under right front fender.

Valve Springs—Variable pitch type. Install springs with closer spaced coils at top. Do not compress spring to length of less than 1 7/16".

	Spring Pressure	Length
Valve Closed	34-38 lbs.	1¾"
Valve Open	77-83 lbs.	1 7/16"

Valve Timing—See Camshaft Setting (above).
Intake Valves—Open 6° ATDC. Close 46° ALDC.
Exhaust Valves—Open 42° BLDC. Close 8° ATDC.
To Check Valve Timing—Install regular timing gauge in timing plug hole over #6 piston, set tappet clearance #6 valves at .011" (intake), .012" (exhaust). Intake valve should open with piston .015" past top dead center, and exhaust valve close with piston .027" past top dead center. Reset tappet clearance at .006" (intake), .008" (exhaust) with engine hot.

Lubrication:—Pressure. Gear type oil pump located on right hand side of crankcase.
Normal Oil Pressure—30-60 lbs. at driving speeds.
Oil Pressure Relief Valve—Under plug on left hand side of crankcase. Operates at 40-45 lbs. Adjustable by changing spring. Standard springs unpainted. Heavy spring (to increase pressure) painted green. Lighter spring (to reduce pressure) painted red.
Capacity & Oil—5 qts. Use SAE. #30 (summer or #40 for sustained high speed or above 100°F), #20-W(winter 32° to 0°F), #10-W(0° to —15°F).

CARBURETION:—See Carburetion Section for data.
Carburetor:—Carter (Ball & Ball), Model C6D1, C6D2, 1¼, downdraft type, with Fast Idle (series PJ). Model B6D1, 1" downdraft type (series PJE).
Automatic Choke—Sisson (optional).
Fuel Pump:—A.C., Type B-1521789 diaphragm type.
Gasoline Gauge:—Motometer electric type.

CLUTCH:—Borg & Beck. Single plate, dry disc type. No adjustment required for wear.
Clutch Pedal Adjustment—Clutch pedal should just clear underside of toeboard. Adjust by turning stopscrew located just above clutch pedal shaft. Free movement of clutch pedal must be 1 1/16". Adjust by loosening locknut and turning release fork rod adjusting nut (at clutch release fork).
Clutch Facings—Moulded Asbestos (flywheel side), Woven Asbestos (pressure plate side), one of each type required, 5⅝" I.D., 9¼" O.D., .133" thick.
NOTE—Mark clutch cover and flywheel before disassembling and reassemble in same position. Install driven plate assembly with mark 'Flywheel Side' toward flywheel (hub is offset). Use special gauge plate and adaptor to set up release levers when reassembling clutch. Release lever heights must be equal within .005".

STEERING:—Front Suspension—Conventional tubular front axle with Reverse-Elliott ends and semi-elliptic springs.
Kingpin Inclination—8½° crosswise.
Caster—2° (1½—2½°). Adjust by inserting wedge plates between springs and axle pads. Wedges available in ½, 1, 2° angles.
Camber—½° (¼—¾°). No adjustment provided. Axle may be bent cold not more than ½° to correct camber. Replace axle if out more than ½°.
Toe In—1/16". Adjust in usual manner by loosening tie rod end clamps and rotating tie rod.

IGNITION:—Coil Model IG-4610. Mounted on dash.
Ignition Switch—Electrolock connected to coil by armored cable.
Distributor Model IGS-4003. Single breaker, 6 lobe cam, full automatic advance type with auxiliary vacuum spark control.
Breaker Gap—Set at .020". Limits .018-.020".
Cam Angles—Closed 36°. Open 24° (distributor).
Breaker Arm Spring Tension—16-20 ounces.
Manual Advance—20° (engine) adjustment only.

Automatic Advance

Distributor Degrees	R.P.M.	Engine Degrees	R.P.M.
Start	350	0	700
3	400	6	800
6	860	12	1720
9	1320	18	2640
11	1600	22	3200

Vacuum Spark Control—Provides additional advance for intermediate speeds above idling. Spark is retarded by return spring in unit when engine is accelerated or operated with wide-open throttle.

Vacuum Spark Advance

Distributor Degrees	Vacuum
½°	4-5" of HG.
11° Max.	14" of HG.

Removal:—Distributor mounted on left side of engine. To remove disconnect vacuum line, take out hold-down screw in advance arm.

IGNITION TIMING:—

	Flywheel Degs.	Piston Posi.
All engines	At TDC	.0000" TDC.

Timing (Using Timing Light)—Connect timing light between distributor terminal and battery terminal on generator control unit. With #1 piston on compression turn engine over until piston is on top dead center, stop when 'O' center line on fan pulley at front of engine lines up with pointer on chain case cover. Loosen hold-down screw in advance arm, center pointer on scale (lined up with 'O' mark), tighten hold-down screw. Loosen advance arm clamp bolt, rotate distributor until lamp goes out, tighten clamp bolt.
Timing (Using Synchroscope)—Engines can be timed with a Synchroscope by directing light on fan pulley. See Equipment Section for directions.
Timing (Using Motor Gauge)—Engines can be timed with a motor gauge installed in timing hole over #6 piston.
Firing Order:—1-5-3-6-2-4. See diagram.
Spark Plugs:—AC. Type K-9. 14 MM. Metric.
Spark Plug Gaps—Set at .025".

BATTERY:—Willard, Type WS-1-13. 6 volt, 13 plate, 86 A.H. capacity (20 hour rate).
Starting Capacity—105 amperes for 20 minutes.
Grounded Terminal—Positive (+) terminal.
Location—On left side under drivers seat.

STARTER:—MAW-4002, MAW-4004 (Export). Armature No. MAW-2030.
Starter Drive—Positive shift outboard pinion.
Rotation—Counter-clockwise at commutator end.
Brush Spring Tension—31-42 ozs. (new brushes).

Performance Data

Torque	R.P.M.	Volts	Amperes
0 ft. lbs.	4900 Min.	5.5	65
2.75 "	1480	5.0	200
5.45 "	820	4.5	300
8.50 "	400	4.0	400
11.55 "	110	3.5	500
12.0 "	Lock	3.0	505
18.0 "	Lock	4.0	670

NOTE—See Equipment Section for method of correcting burnt commutators on these starters whenever this trouble is encountered.

Starting Switch:—SW-2677-A (MAW-4002). Mounted on starter field frame and operated by pinion shift (starting pedal). See Equipment Section for adjustment of pedal and Type SS-4101 solenoid switch (MAW-4004).

Removal:—Starter flange mounted on left front face of flywheel housing. To remove, take out two flange mounting capscrews.

GENERATOR:—Model GBM-4603-1. Armature No. GBM-2006-F. Air-cooled. Third brush control.
Charging Rate Adjustment (Using Meters)—Use test meters to check generator output. Shift third brush by hand counter-clockwise to increase, or clockwise to decrease charging rate until output is 17-19 amperes at 8.25 volts, with generator at room temperature (70°F). Third brush held in position by friction.
Commutator Bar Method—Shift third brush until there are exactly 4 commutator bars exposed between edge of third brush and nearest main brush.
Maximum Charging Rate—Above settings provide maximum safe output for generator and must not be exceeded.

Cold — **Performance Data** — Hot

Amps.	Volts	R.P.M.	Amps.	Volts	R.P.M.
0	6.4	800	0	6.4	850
4	6.8	950	4	6.9	1050
8	7.25	1125	8	7.4	1250
12	7.7	1375	12	7.9	1680
16	8.1	1800	15.2	8.3	2500
18	8.3	2400			

Rotation—Counter-clockwise at commutator end.
Brush Spring Tension—24 ozs. minimum (old brushes), 36 ozs. maximum (new brushes).
Field Current—3.80-4.20 amperes at 6.0 volts.
Motoring Current—5.32-5.88 amperes at 6.0 volts.

Removal:—Generator pivot mounted at left front of engine with fan belt drive. To remove, take out two pivot bolts and one clamp bolt.
Belt Adjustment:—Loosen pivot and clamp bolts, pull generator out or away from engine until tension as measured on spring scale is 45-50 lbs.

CUTOUT RELAY:—Model CB-4014. Mounted on generator. See Equipment Section for data.
Cuts In—6.75-7.5 volts.
Cuts Out—.5-2.5 amperes discharge current.
Relay Contact Gap—.025-.035".
Air Gap—.010-.030" with contacts closed.

LIGHTING:—Douglas Switch Model 5409. Headlamp bulbs are pre-focused type.

Bulb Specifications

Position	Candlepower	Mazda No.
Headlamps	32-21	2320-C
Parking, Ig.Sw.Lamp	1½	55
Instrument	3	63
Stop and Tail	21-3	1158
Dome	15	87

NOTE—Lighting switch button and shaft are integral. See article on Chrysler Model C-6 for instructions on removing switch.

FUSES:—Lighting—20 ampere on back of ammeter.

HORNS:—Auto-Lite Model HA-4001. Vibrator type. See article and diagram on PJ Deluxe model for data on twin horns when these units are used.

SERIAL NUMBERS: — First number, 2,397,601 (Detroit), 3,019,401 (Los Angeles), 9,326,551 (Windsor, Canada). On right front door hinge pillar post.

ENGINE NUMBER:—First number, PJ-1001. Stamped on boss on left side of crankcase between #1 and 2 cylinders. See Model PJ for explanation of letter following engine number.

ENGINE:—Six cylinder, 'L' head type. Floating power engine mounting.
Bore—3⅛". Stroke—4⅜".
Piston Displacement—201.31 cubic inches.
Rated Horsepower—23.44.
Developed Horsepower—82 at 3600 R.P.M.
Compression Ratio—6.7-1. No optional ratios.
Compression Pressure—140-150 lbs. at 1000 R.P.M.

Pistons:—Aluminum alloy, 'T' slot, cam ground type. Semi-finished pistons (head and ring grooves completely finished, skirt semi-finished) furnished for service where 'Cam' grinding equipment is available in two sizes: (1) standard to .023" oversize, (2) .025" to .050" oversize. If cam grinding equipment not available, use finished replacement pistons furnished .003", .005", .010", .015", .020", .023", .025", .030", .040", .050", .060" oversize and finish cylinder bores to provide correct clearance. Piston length—3 11/16".
Weight—Maximum allowable variation ¼ oz.
Removal—Pistons and rods removed from above.
Clearance—.0015" at bottom.
Fitting New Pistons—Use micrometer to check piston diameter and cylinder bore. Measurement on piston made at bottom of skirt at right angles to piston pin (pin must be removed).
Installing Pistons—Slot should be at left or away from valves.

Piston Rings:—Two undercut compression rings, two oil control rings per piston, all above pin. Lower ring grooves drilled radially with oil drain holes. Rings furnished in same oversize as pistons (except .023").

Ring	Width	End Gap	Side Clearance
Comp. (all)	⅛"	.007-.015"	.002"
Oil Cont. (all)	5/32"	.007-.015"	.002"

Piston Pin:—Diameter 55/64". Length 2⅝". Pin floats in piston and rod. Held by retaining rings. Piston can be heated in boiling water to remove or install pin. Pins furnished .003", .005", .008" oversize.
Pin Fit in Piston—Tight thumb push fit with piston at 120°F.
Pin Fit in Rod Bushing—Tight thumb push fit with piston at room temperature (70°F.).

Connecting Rod—Weight—maximum variation held to ¼ oz. Length 7 15/16".
Lower Bearing—Removable steel-backed, babbitt-lined type. No shims.
Clearance—.001-.00275". Sideplay .003-.009".
Adjustment—None. Replace bearings. Do not file rods or caps. Install new bearings with small boss registering with groove (both halves). Bearings furnished .010" undersize and standard size.
Installing Rods—Lower bearings are offset. Install rods with widest half of bearing toward rear of engine (#1, 3, 5) or toward front (#2, 4, 6). Oil hole in upper half of bearing must be toward camshaft side of engine on all rods.

Crankshaft:—4 bearing. Integral counterweights.
Journal Diameters—2¼" (all bearings).
Bearing Type—Removable steel-backed, babbitt-lined type.
Clearance—.001-.002".
Adjustment—None. Replace bearings. Do not file bearing caps. Bearings furnished .010" undersize and standard size for service.
End Thrust—Taken by #4 (rear) bearing. Endplay .003-.007".

Camshaft:—Four bearings. Non-adjustable chain drive.
Bearing Type—Removable steel-backed, babbitt-lined type, except #4, which is machined in crankcase.
Clearance—.0015-.0025". Endplay .003-.005".
End Thrust—Taken by thrust plate at rear of the sprocket hub.
Timing Chain—Morse. Width 1". Pitch .500". Length 24" or 48 links.
Camshaft Setting—Sprockets are marked. Mesh chain with sprockets turned so that marks are adjacent and in line with a straightedge across the shaft centers. Install chain endless.

Valves:—

	Head Diameter	Stem Diameter	Length
All Valves	1 15/32"	.3405"	4 27/32"

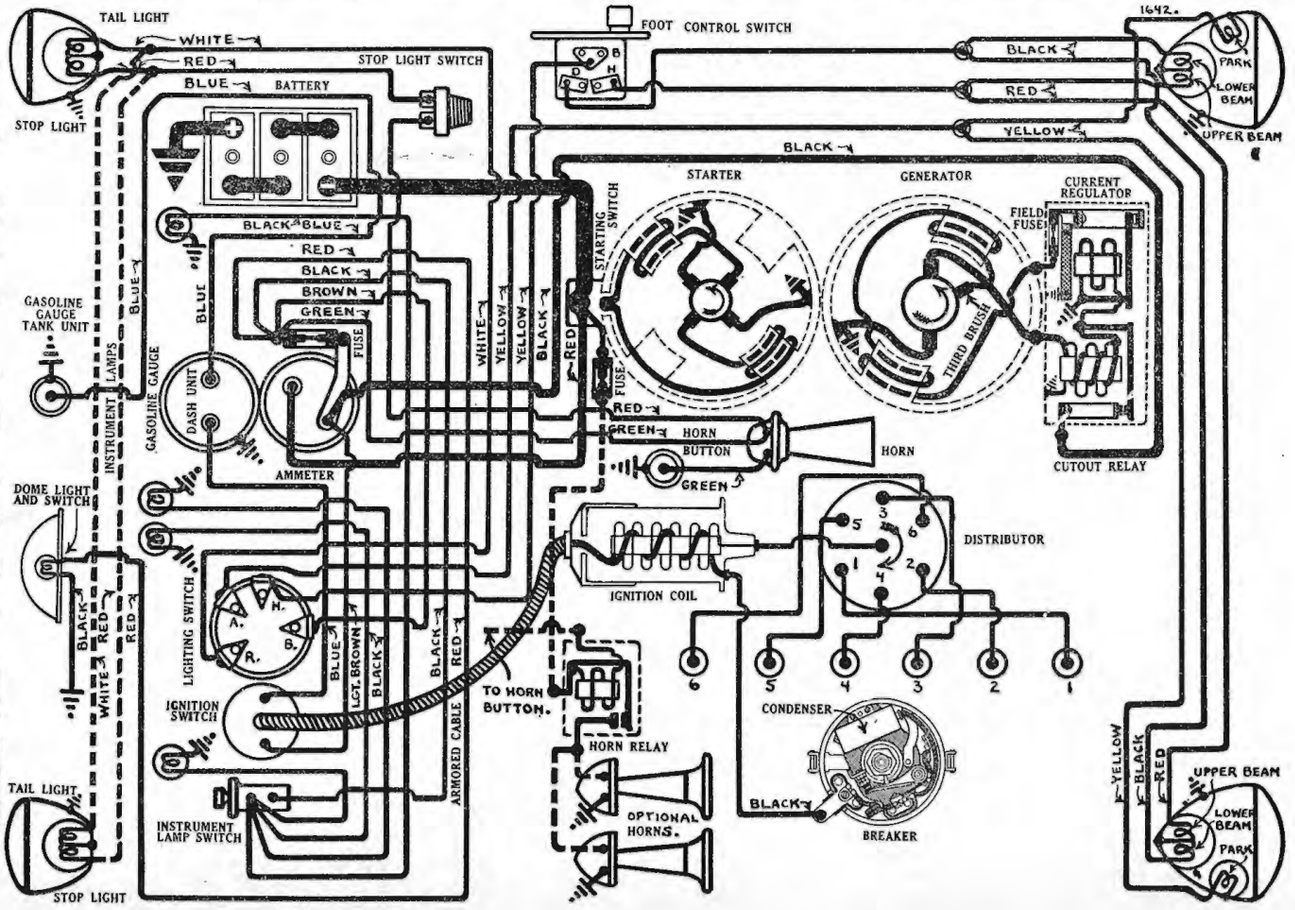
	Seat Angle	Lift	Stem-to-Guide Clearance
Intake	45°	5/16"	.001-.003"
Exhaust	45°	5/16"	.003-.005"

Installing New Guides—See Model PJ for data.
Tappet Clearance—.006" Int., .008" Exh. with engine hot. Set exhaust clearance at .010" for sustained high speed driving. Adjustment accessible by removing housing cover under right fender.
Valve Springs—Variable pitch type. Install springs with closer spaced coils at top. Do not compress springs to over-all length of less than 1 7/16"

	Spring Pressure	Length
Valve Closed	34-38 lbs.	1¾"
Valve Open	77-83 lbs.	1 7/16"

Valve Timing—See Camshaft Setting (above). Intake Valves—Open 6° ATDC. Close 46° ALDC. Exhaust Valves—Open 42° BLDC. Close 8° ATDC.
To Check Valve Timing—Install regular timing gauge in timing plug hole over #6 piston, set tappet clearance #6 valves at .011" (intake), .012" (exhaust). Intake valve should open with piston .015" past top dead center, and exhaust valve close with piston .027" past top dead center. Reset tappet clearance at .006" (intake), .008" (exhaust) with engine hot.

Lubrication:—Pressure. Gear type oil pump located on right hand side of crankcase.
Normal Oil Pressure—30-60 lbs. at driving speeds.
Oil Pressure Relief Valve—Under plug on left hand side of crankcase. Operates at 40-45 lbs. See Model PJ for adjustment.
Capacity & Oil—5 qts. Use SAE. #30 (summer or



#40 for sustained high speed or above 100°F), #20-W (winter 32° to 0°F), #10-W (0° to —15°F).

CARBURETION:—See Carburetion Section for data.
Carburetor:—Carter (Ball & Ball), Model C6D1, C6D2, 1¼", downdraft type, with Fast Idle.
Automatic Choke—Sisson (optional).
Fuel Pump:—A.C., Type B-1521789 diaphragm type.
Gasoline Gauge:—Motometer electric type.

CLUTCH:—Borg & Beck. Single plate, dry disc type. No adjustment required for wear.
Clutch Pedal Adjustment—Clutch pedal should just clear under side of toeboard. Adjust by turning stop screw located just above clutch pedal shaft. Free movement of clutch pedal must be 1 1/16". Adjust by loosening lock nut and turning release fork rod adjusting nut (at release fork).
Clutch Facings—Moulded asbestos (flywheel side), woven asbestos (pressure plate side), one of each type required, 5⅝" I.D., 9¼" O.D., .133" thick.
NOTE—Mark clutch cover and flywheel before disassembling and reassemble in same position. Install driven plate assembly with mark 'Flywheel Side' toward flywheel (hub is offset). Use special gauge plate and adaptor to set up release levers when reassembling clutch. Release lever heights must be equal within .005".

STEERING:—Front Suspension—Conventional tubular front axle with Reverse-Elliott ends and semi-elliptic springs.
Kingpin Inclination—8½° crosswise.
Caster—2° (1½-2½°). Adjust by inserting wedge plates between springs and axle pads. Wedges available in ½, 1, 2° angles.
Camber—½° (¼-¾°). No adjustment provided. Axle may be bent cold not more than ½° to correct camber. Replace tubular axle if camber is out more than ½°.
Toe In—1/16". Adjust in usual manner by loosening tie rod end clamps and rotating tie rod.

IGNITION:—Coil Model IG-4610. Mounted on dash.
Ignition Switch—Electrolock connected to coil by armored cable.
Distributor Model IGS-4003. Single breaker, 6 lobe cam, full automatic advance type with auxiliary vacuum spark control.
Breaker Gap—Set at .020". Limits .018-.020".
Breaker Arm Spring Tension—16-20 ounces.
Cam Angles—Closed 36°. Open 24° (distributor).
Manual Advance—20° (engine) adjustment only.

Automatic Advance

Distributor Degrees	R.P.M.	Engine Degrees	R.P.M.
Start	350	0	700
3	400	6	800
6	860	12	1720
9	1320	18	2640
11	1600	22	3200

Vacuum Spark Control—Mounted on side of distributor, advances spark by rotating breaker plate through link coupling (breaker plate grounded by pig-tail connection). Provides additional advance for intermediate speeds above idling. Spark is retarded by return spring in unit when engine is accelerated or operated with wide-open throttle.

Vacuum Spark Advance

Distributor Degrees	Vacuum
½°	4-5" of HG.
11° Max.	14" of HG.

Removal:—Distributor mounted on left side of engine. To remove, disconnect vacuum line, take out hold-down screw in advance arm.

IGNITION TIMING:—

	Flywheel Degs.	Piston Posi.
All engines	At TDC.	.0000" TDC.

Timing (Using Timing Light—Connect timing light between distributor terminal and battery terminal on generator control unit. With #1 piston on compression turn engine over until piston is on top dead center, stop when 'O' center line on fan pulley at front of engine lines up with pointer on chain case cover. Loosen hold-down screw in advance arm, center poiner on scale (lined up with 'O' mark), tighten hold-down screw. Loosen advance arm clamp bolt, rotate distributor until lamp goes out, tighten clamp bolt.
Timing (Using Synchroscope)—Engines can be timed with a Synchroscope by directing light on fan pulley. See Equipment Section for directions.
Timing (Using Motor Gauge)—Engines can be timed with a motor gauge installed in timing hole over #6 piston.
Firing Order:—1-5-3-6-2-4. See diagram.
Spark Plugs:—AC. Type K-9. 14 MM. Metric.
Spark Plug Gaps—Set at .025".

BATTERY:—Willard, Type WS-1-13, 6 volt, 13 plate, 86 A.H. capacity (20 hour rate).
Starting Capacity—105 amperes for 20 minutes.
Grounded Terminal—Positive (+) terminal.
Location—On left side under dirver's seat.

STARTER:—MAW-4002, MAW-4004 (Export). Armature No. MAW-2030.
Starter Drive—Positive shift outboard pinion.
Rotation—Counter-clockwise at commutator end.
Brush Spring Tension—31-42 ozs. with new brushes.

Performance Data

Torque	R.P.M.	Volts	Amperes
0 ft. lbs.	4900 Min.	5.5	65
2.75 "	1480	5.0	200
5.45 "	820	4.5	300
8.50 "	400	4.0	400
11.55 "	110	3.5	500
12.0 "	Lock	3.0	505
18.0 "	Lock	4.0	670

NOTE—See Equipment Section for method of correcting burnt commutators on these starters whenever this trouble is encountered.
Starting Switch:—SW-2677-A (MAW-4002). Mounted on starter field frame and operated by pinion shift (starting pedal). See Equipment Section for adjustment of pedal and Type SS-4101 solenoid switch (MAW-4004).
Removal:—Starter flange mounted on left front face of flywheel housing. To remove, take out two flange mounting capscrews.

GENERATOR:—Model GAR-4608. Armature No. GAR-2116-F. Air-cooled. Third brush control in conjunction with Current Regulator (two-rate charging control). See Equipment Section for complete data on Regulator.
Charging Rate Adjustment (Using Meters)—Use test meters to check generator output. Connect jumper wire from fuse cup on regulator case to ground on generator frame. Shift third brush by hand counter-clockwise to increase, or clockwise to decrease charging rate until output is 21 amperes at 8.6 volts with generator at room temperature (70°F). Brush held in position by friction. Remove jumper wire.
Commutator Bar Method—Shift third brush by hand until there are exactly 4 commutator bars exposed between the edge of the third brush and the nearest main brush.
Maximum Charging Rate—Above settings provide maximum safe output for generator and must not be exceeded.

Performance Data

Cold—Regulator Contacts Closed—Hot					
Amps.	Volts	R.P.M.	Amps.	Volts	R.P.M.
0	6.4	800	0	6.4	825
4	6.8	950	4	6.8	1000
8	7.25	1100	8	7.25	1200
12	7.7	1275	12	7.7	1440
16	8.1	1525	16	8.1	1825
21	8.6	2400	18.5	8.35	2500

Rotation—Counter-clockwise at commutator end.
Brush Spring Tension—24 ozs. minimum (old brushes), 36 ozs. maximum (new brushes).
Field Current—3.51-3.89 amperes at 6.0 volts.
Motoring Current—5.03-5.57 amperes at 6.0 volts (½ ampere additional if relay and regulator in circuit).
Field Fuse—5 ampere in knurled cup on side of regulator case.
Removal:—Generator pivot mounted at left front of engine with fan belt drive. To remove, take out two pivot bolts and one clamp bolt.
Belt Adjustment:—Loosen pivot and clamp bolts, pull generator out or away from engine until tension as measured on spring scale is 45-50 lbs.

RELAY-REGULATOR:—Model TC-4301-A. Mounted on generator. Consists of Cutout Relay and Current Regulator in a single case. See Equipment Section for complete data on these units.

Cutout Relay

Cuts In—6.75-7.5 volts.
Cuts Out—.5-2.5 ampere discharge current.
Relay Contact Gap—.015-.045".
Air Gap—.010-.030" with contacts closed.

Current Regulator

Contacts Open—8.45-8.95 volts at 70°F.
Contacts Close—1.1-1.3 volts below opening point.
Contact Gap—.005" minimum.
Air Gap—.045" with contacts closed.

LIGHTING:—Douglas Switch Model 5374. Clum Foot Control Switch Model 9579. Foot control switch is used to control upper and lower beams. Headlamp bulbs are pre-focused type.

Bulb Specifications

Position	Candlepower	Mazda No.
Headlamps	32-21	2320-C
Parking, Ig. Sw. Lamp	1½	55
Instrument	3	63
Stop and Tail	21-3	1158
Dome	15	87

NOTE—Switch button and shaft are integral. See note on Chrysler Model C-6 for removal.

FUSES:—Lighting—20 ampere on back of ammeter.
Twin Horns—20 ampere in horn lead near starter.
Generator Field—5 ampere in regulator.

HORNS:—Auto-Lite Model HA-4001 Std. Klaxon Model K-33-D, Type 1959 (low note), 1960 (high note) Optional. Optional horns are matched tone, twin horns operated by horn relay.
Horn Relay:—Model 266-TK. Relay requires .25 amperes at 2.0 volts (min.) to close contacts. Current draw .8 amperes.
Relay Contact Gap—.015-.025"
Air Gap—.012-.017" with contacts closed.

SERIAL NUMBER:—First number (701-A) 6AA-1001, (701-B) 6AB-1001. On left hand frame side rail under front fender.

ENGINE NUMBER:—First number 6-10001. On boss on left hand top corner of cylinder block.

ENGINE:—Six cylinder, 'L' head type.
Bore—3⅜". **Stroke**—3⅞".
Piston Displacement—208 cubic inches.
Rated Horsepower—27.4 (SAE.).
Developed Horsepower—80 at 3600 R.P.M.
Compression Ratio—6.2-1. No optional ratios.
Compression Pressure—148-150 lbs. at 1000 R.P.M.

Pistons:—Electro-plated cast-iron. Pistons are tin-plated to thickness of .00075-.00125" after finishing and cannot be ground. Standard pistons furnished in following sizes: 3.720", 3.730", 3.740". Oversize pistons furnished 005", 010", 015", 020", 030" oversize and are held to same weight as standard (can be used in one cylinder without destroying balance).
Piston Length—3 25/32".
Weight—Held to 1/16 oz. variation. Not necessary to select pistons for service.
Removal—Pistons and rods removed at top.
Clearance—Top .022". Bottom .0015".
Fitting New Pistons—Use .002" feeler stock ½" wide inserted between piston and cylinder wall to check clearance. Pull required to withdraw feeler should be 10-20 lbs. Piston must not be out-of round or tapered more than .0005".

Piston Rings:—Four rings per piston, 3 compression rings above pin, one oil control ring below pin. Oil ring groove drilled radially with ten ⅛" oil drain holes.

Ring	Width	End Gap	Side Clearance
Comp. (all)	⅛"	.007-.017"	.001-.0025"
Oil Cont.	3/16"	.007-.017"	.001-.0025"

Piston Pin:—Diameter 15/16". Length 3 25/32". Pin is locked in piston (opposite end slotted to allow free movement of boss on pin).
Pin Fit in Piston—Press fit (see below).
Pin Fit in Rod Bushing—.0003-.0005" clearance. See Connecting Rod upper bearing.
Fitting Pins—Use special tool HM-412 to install pins (tool checks pressure required to press pin into place). Coat bosses with graphite grease, insert slotted end of pin in lockpin boss. Pressure should be 200-350 lbs.

Connecting Rod:—Weight held to 1/16 oz. maximum variation. Length, 7 11/16".
Upper Bearing—Split bushed type 15/16" diameter. Two bushings used with 3/32" gap at center forming oil groove. Use special tool to install bushings (shoulder on tool prevents closing up gap). Drilled oil passage in rod must open into this groove. New bushings should be burnished and then reamed to size giving correct clearance.
Lower Bearing—Interchangeable steel-backed, cadmium-silver alloy lined type. Bearings furnished .0005" undersize for service.
Clearance—.0005-.0015". Sideplay .005-.010".
Adjustment—None (no shims). Replace bearings. Do not file bearing caps. Clearance must be kept below .0015".
Installing Rods—Connecting rods not offset. Install rods in same cylinders from which removed.

Crankshaft:—Four bearing type with integral counterweights.
Journal Diameters—#1 2¼", #2 2 9/32", #3 2 5/16", #4 2⅜".
Bearing Type—Interchangeable steel-backed, cadmium-silver lined type. Upper and lower bearing halves interchangeable.
Clearance—.001-.003".
Adjustment—None (no shims). Replace bearings. Do not file bearing caps. Bearing upper halves can be removed without removing crankshaft by using special tool. Tool consists of a flat headed plug which is inserted in oil hole in crankshaft and turns out bearing as crankshaft is rotated. Install new bearings in same manner, inserting plain edge of bearing on indented side of upper bearing support. Tool furnished with bearings.

Camshaft:—Four bearing type. Non-adjustable chain drive.
Bearing Type—Steel-backed, babbitt-lined type.
Clearance—.0015-.0025". Endplay .002-.005".
Timing Chain—Morse Side-Guide type. Width 1". Pitch ⅜". Length 56 links.
Camshaft Setting—Sprockets are marked. Mesh chain with sprockets turned so that '0' marks are adjacent and in line with a straightedge across the shaft centers.

Valves:—

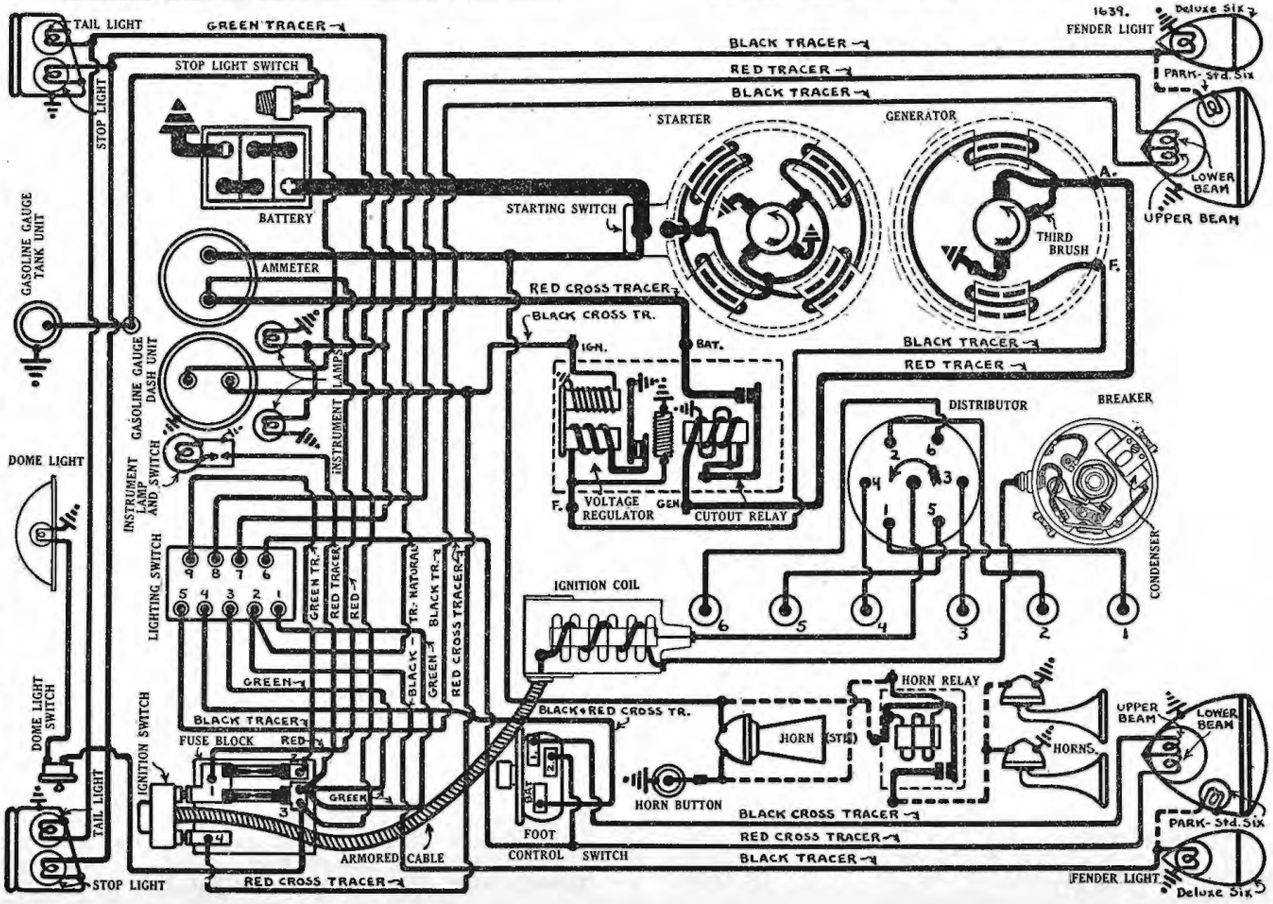
	Head Diameter	Stem Diameter	Seat Angle
Intake	1 17/32"	.310"	30°
Exhaust	1 15/32"	.310"	45°

Valve Lift—19/64" (all valves).
Stem-to-Guide Clearance—Free fit to .0006" clearance (for new guides).
Tappet Clearance—.009-.011" all valves, engine hot. Use .009" and .011" feelers as 'go' and 'no go' gauges. Hood sill must be removed to adjust clearance of valves in front cluster.
Valve Springs—Install springs with one closed coil at bottom two closed coils at top. Valve spring dampener installed on top of each spring. Use new dampener whenever dampener is removed.

	Spring Pressure	Spring Length
Valve Closed	52 lbs.	1 29/32"
Valve Open	82 lbs.	1 39/64"

Valve Timing—See Camshaft Setting (above). Intake Valves—Open 5° BTDC. Close 39° ALDC. Exhaust Valves—Open 45° BLDC. Close 5° ATDC. These figures correct with .0125" tappet clearance.
To Check Valve Timing—Set tappet clearance #1 intake valve at .0125". This valve should open with piston 5° before top dead center and first straight line of ignition mark '/IGN.1&6/' slightly past indicator. Reset tappet clearance at .010".

Lubrication:—Pressure. Gear type oil pump on right hand side of crankcase. Dip pump gears in oil before installing (pump does not require priming).
Normal Oil Pressure—5 to 40 lbs.



Oil Pressure Relief Valve—Built in pump cover. Not adjustable. Relief valve ball clearance should be .0145-.0165".

Oil Pump Clearances—Shaft bearing .0005-.002". Idle gear bearing .0005-.002". Driving gear backlash .003-.004". Backlash between pump gears .006-.008". Pump gear end clearance .002-.006".

Capacity and Oil—6 qts. Use SAE. #10-W for first 500 miles in new cars. After 500 miles use SAE. #30 (above 95°F.), #20 (32° to 95°F.), #10-W (0° to 32°F.).

CARBURETION:—See Carburetion Section for complete data on Carburetor, Fuel Pump, and Gasoline Gauge.

Carburetor:—Carter, Model 306-S, 314-S, 1¼" downdraft type.

Fuel Pump:—A.C., Type R-1521783 diaphragm type.

Gasoline Gauge:—A.C., Electric type.

CLUTCH:—Own make, single plate, dry disc type. No release lever adjustment necessary for wear.

Clutch Pedal Adjustment—Clearance between clutch pedal and pedal felt retainer board (on under side of toeboard) should be ⅝". Adjust by loosening lock nut and turning pedal stop screw. Lash or free movement of clutch pedal should be 1". Adjust by changing length of clutch pedal link (adjusting screw on outer end of link).

Clutch Facings—Moulded type, 2 required. 6¼" I.D., 9⅞" O.D., ⅛" thick.

NOTE—Cap screws used to hold clutch cover on flywheel are sufficiently long to relieve clutch spring tension. To disassemble clutch, back off cap screws equally, one turn at a time. Clutch springs should force cover free of flywheel flange. If cover sticks, strike sharply on radius outside spring cups before screws are completely removed.

STEERING:—Front Suspension—Independent type used on De Luxe Models. All data same as for Eight Cylinder Model 605 (see next page).

Standard Six Model 701-B—Conventional "I" beam section front axle with Reverse-Elliott ends and semi-elliptic springs.

Kingpin Inclination—7°10' (crosswise).

Camber—1½° plus 0° minus 1° (car empty). Bending of axle to correct camber not recommended.

Caster—1¼° plus or minus ¼° (car empty). Adjust by using wedge shims between spring and axle pad.

Toe In—0-⅛" (measured 9" above floor). Adjust in usual manner by changing length of tie rod.

IGNITION:—Coil Model 539-L. On engine side of dash.

Ignition Current—3.5 amperes at 6.2 volts.

Ignition Switch—Model 431-L (switch and cable). Connected to coil by armored cable.

Distributor Model 647-A. Single breaker, 6 lobe cam, full automatic advance type with auxiliary 'Vacuumatic' spark advance and Gaselector.

Breaker Gap—Set at .020". Limits .018-.024".

Breaker Arm Spring Tension—17-21 ounces.

Cam Angles—Closed 36°. Open 24° (distributor).

Manual Adjustment—20° (engine). See Gaselector.

Automatic Advance

Distributor Degrees	R.P.M.	Engine Degrees	R.P.M.
Start	275	2	550
5.5	800	11	1600
11	1900	22	3800

Vacuumatic Spark Advance—Vacuum unit on distributor provides additional advance except when engine is accelerated or is pulling heavily when spark is retarded by return spring in unit. Vacuum unit linked directly to breaker plate.

Advance (Engine°)	Vacuum (Ins. of HG)
Start	9-11"
15	16-18"

Gaselector—Consists of manual adjustment at distributor, with graduated scale and pointer (locked by thumbnut) providing 10° advance and retard from center '0' position. Should be used to compensate for special fuels or driving conditions.

Removal:—Distributor on left hand side of crankcase. Disconnect vacuum connection, take out hold-down screws in advance arm, lift out.

IGNITION TIMING:— Flywheel Degs. Piston Position

All engines ..... 6° BTDC. ..... .0133" BTDC.

NOTE—The two straight lines of the ignition mark '/IGN.1&6/' indicate the allowable timing range, lower mark 6° BTDC., upper mark 2°BTDC. Set ignition at lower mark or 6° BTDC.

Timing (using Timing Light)—Connect timing light between distributor terminal and ground, turn on ignition, remove cover plate over inspection hole in left front face of flywheel housing, loosen thumbnut on Gaselector, center pointer on scale (opposite '0' mark). With #1 piston on compression, turn engine over until first line of ignition mark on flywheel '/IGN.1&6/' lines up with pointer, loosen advance arm clamp bolt, rotate distributor until timing lamp lights (contacts just opening, tighten clamp bolt.

Timing (using Synchroscope)—See Equipment Section for complete instructions. Ignition mark on flywheel (6° line) should be filled in with white paint or chalk so as to be distinguishable. Idle engine at 6 M.P.H.

Firing Order:—1-5-3-6-2-4 (see diagram).

Spark Plugs:—A.C., Type K-7. 14 MM. Metric type.

Spark Plug Gaps—.025" (.022" cars with radio).

BATTERY:—Delco, Type 15-T, 15-TF (Export), 6 volt, 15 plate, 94 A.H. capacity (20 hour rate).

Starting Capacity—115 amperes for 20 minutes.

Grounded Terminal—Negative (—) terminal.

Location—Left hand side under front floor boards.

STARTER:—Model 727-T, 727-S (RHD). Armature No. 823881. Manual pinion shift with overrunning clutch operated by foot pedal (727-T) or by solenoid switch with accelerator pedal control (727-S).

Rotation—Counter-clockwise at commutator end.

Brush Spring Tension—24-28 ounces each.

Performance Data

Torque	R.P.M.	Volts	Amperes
0 ft. lbs.	5500	5.0	65
15 "	Lock	3.0	600

Starting Switch:—(727-S for RHD). Solenoid Switch Type 1516. Vacuum Switch Type 1588. See wiring diagram and data on Eight Cylinder Model 605.

Removal:—Starter on left front of flywheel housing. Take out flange cap screws.

GENERATOR:—Model 935-W. Armature No. 1854856. Ventilated. Fixed third brush with external voltage regulation. Vibrating type voltage regulator combined with Cutout Relay in case on dash. See Equipment Section for complete data on Voltage Regulator.

Charging Rate Adjustment—Third brush is fixed and cannot be adjusted. Voltage regulator is sealed and seals must be broken (voiding warranty) before adjustment can be made to regulator or cutout relay. See data below.

Performance Data

	Amperes	Volts	R.P.M.
Cold	22-26	8.7-9.1	3300
Hot	17-20	8.2-8.5	3500

Above figures correct with ammeter connected in charging line at 'Bat' terminal of Relay-Regulator with 'F' terminal grounded. Do not operate generator on open circuit.

Rotation—Counter-clockwise at commutator end.

Field Current—2.3-2.6 amperes at 6.0 volts.

Brush Spring Tension—22-26 ozs. (main), 16-20 ozs. (third brush).

Removal:—Pivot mounted at left front of engine with fan belt drive. Take out two pivot bolts and one clamp bolt.

Belt Adjustment—Loosen pivot bolts and clamp bolt, move generator out or away from engine to take up stretch or slack in belt.

RELAY REGULATOR:—Model 5588, 5557 (RHD). Consists of Cutout Relay and vibrating Voltage Regulator in case on dash. See Equipment Section for complete data on these units. Cutout Relay has special ground contacts (5557 only).

Cutout Relay

Cuts In—6.5-7.25 volts.

Cuts Out—3 amperes max. discharge at 6.3 volts.

Relay Contact Gap—.018-.025".

Air Gap—.018-.022" with contacts closed.

Voltage Regulator

Adjustment—Operate generator at 2800-3000 R.P.M. charging battery at not less than 8 amperes. Adjust regulator so that voltage is 7.7-8.0 volts at 70°F. and 7.45-7.55 volts at 150°F. Regulator is over-compensated for temperature and adjustments must be made at these temperatures. Do not operate generator on open-circuit.

Regulator Contact Gap—.015-.025".

Contact Spring Tension—2.7-3.5 ounces.

Air Gap—.060-.070" between armature and core (armature down so that fibre bumper just touches stop. .008-.013" (between fibre bumper and stop with armature up).

LIGHTING:—Delco-Remy Switch, Model 479-Z (701B), 479-S (701A). Foot Control Switch Model 465-V. Control switch on toeboard provides assymetrical passing beam (lower beam right hand headlamp, upper beam left hand headlamp). Headlamp beams are crossed. Headlamp bulbs are pre-focused type.

Bulb Specifications

Position	Candlepower	Mazda No.
Headlights	32-21	2320-C
Fender, Instrmnt., Tail	3	63
Stop	15	87
Dome	6	81

Parking lamps (instead of fender lamps) used on Model 701B Standard Six.

FUSES:—Fuse Block Model 1050-X. On back of instrument panel. Two 20 ampere capacity fuses, one spare fuse. Left hand fuse protects left hand headlamp circuit. Right hand fuse protects all other lighting circuits.

HORNS:—Klaxon, Model K-26-L (standard), K-33-B twin horns (optional). Vibrator type. Horn relay used with Model K-33-B.

Horn Relay:—Model 266-T. Relay requires .25 amperes at 2 volts minimum to close contacts. Current draw .8 amperes.

Contact Gap—.015-.025".

Air Gap—.012-.017".

Armature Spring Tension—6-8 ounces.

SERIAL NUMBER:—First number, 8AA-1001. On left hand frame side rail under front fender.

ENGINE NUMBER:—First number, 8-1001. On boss on left hand top corner of cylinder block.

ENGINE:—Eight cylinder In line, 'L' head type.
Bore—3 3/16". **Stroke**—3½".
Piston Displacement—223.4 cubic inches.
Rated Horsepower—32.6 (SAE).
Developed Horsepower—84 at 3600 R.P.M.
Compression Ratio—6.2-1. No optional ratios.
Compression Pressure—137-139 lbs. at 1000 R.P.M.

Pistons:—Electro-plated cast-iron. Pistons are tin-plated to thickness of .00075-.00125" after finishing and cannot be ground. Standard pistons furnished in following sizes: 3.1845", 3.1855", 3.1865". Oversize pistons furnished .005", .010", .015", .020", .030" oversize and are held to same weight as standard (can be used in one cylinder without destroying balance. Piston length 3⅞".
Weight—Held to 1/16 oz. variation. Not necessary to select pistons for service.
Removal—Pistons and rods removed at top.
Clearance—Top .022". Bottom .0015". See below.
Fitting New Pistons—Use .002" feeler stock ½" wide inserted between piston and cylinder wall to check clearance. Pull required to withdraw feeler should be 10-20 lbs.

Piston Rings:—Four rings per piston, 3 compression rings above pin, one oil control ring below pin. Oil ring groove drilled radially with ten ⅛" oil drain holes.

Ring	Width	End Gap	Side Clearance
Comp. (all)	⅛"	.007-.017"	.001-.0025"
Oil Cont.	3/16"	.007-.017"	.001-.0025"

Piston Pin:—Diameter 15/16". Length 2⅞". Pin is locked in piston (opposite end slotted to allow free movement of boss on pin).
Pin Fit in Piston—Press fit (see below).
Pin Fit in Rod Bushing—.0003-.0005" clearance.
Fitting Pins—Use special tool HM-412. See Pontiac Six for instructions.

Connecting Rod:—Weight held to 1/16 oz. maximum variation. Length, 7 11/16".
Upper Bearing—Split bushed type 15/16" diameter. See Pontiac Six for instructions.
Lower Bearing—Interchangeable steel-backed, cadmium-silver alloy lined type. Bearings furnished .0005" undersize for service.
Clearance—.0005-.0015". Sideplay .005-.010".
Adjustment—None (no shims). Replace bearings. Do not file bearing caps. Clearance must be kept below .0015".
Installing Rods—Connecting rod lower bearings are offset. Install rods with narrow half of bearing toward nearest main bearing (widest half of bearing toward front on #2, 4, 6, 8 or toward rear on #1, 3, 5, 7).

Crankshaft:—Five bearing type with integral counterweights.
Journal Diameters—#1 2¼", #2 2 9/32", #3 2 5/16", #4 2 11/32", #5 2⅜".
Bearing Type—Interchangeable steel-backed, babbitt-lined type. Upper and lower bearing halves are interchangeable.
Clearance—.001-.003".
Adjustment—None (no shims). Replace bearings. Do not file bearing caps. See Pontiac Six for directions on bearing removal.
End Thrust—Taken by #3 (center) bearing. End-play .003-.008".

Camshaft:—Five bearing type. Non-adjustable chain drive.
Bearing Type—Steel-backed, babbitt-lined type.
Clearance—.0015-.025". Endplay .002-.005".
Timing Chain—Morse Side-Guide type. Width 27/32". Pitch ⅜". Length 56 links.
Camshaft Setting—Sprockets are marked. Mesh chain with sprockets turned so that '0' marks are adjacent and in line with a straightedge across the shaft centers.

Valves:—

	Head Diameter	Stem Diameter	Seat Angle
Intake	1 13/32"	.310"	30°
Exhaust	1 11/32"	.310"	45°

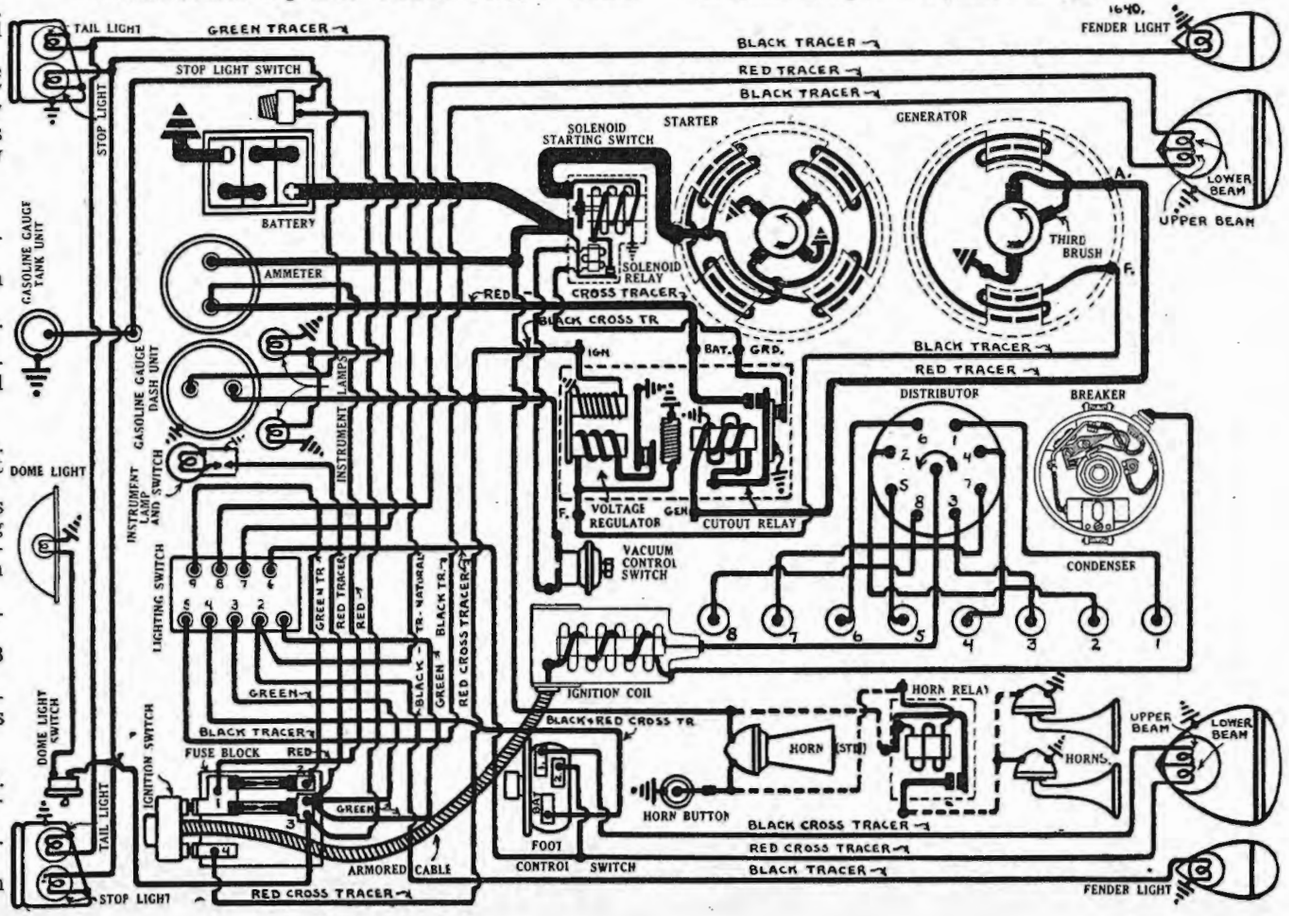
Valve Lift—19/64" (all valves).
Stem-to-Guide Clearance—Free fit to .0006" clearance (for new guides).
Tappet Clearance—.009-.011" all valves, engine hot. Use .009" and .011" feelers as 'go' and 'no go' gauges. Hood sill must be removed to adjust clearance of valves in front cluster.
Valve Springs—Install springs with one closed coil at bottom two closed coils at top. Valve spring dampener installed on top of each spring. Use new dampener whenever dampener is removed

	Spring Pressure	Spring Length
Valve Closed	52 lbs.	1 29/32"
Valve Open	82 lbs.	1 39/64"

Valve Timing—See Camshaft Setting (above).
Intake Valves—Open 5° BTDC. Close 39° ALDC.
Exhaust Valves—Open 45° BLDC. Close 5° ATDC.
These figures correct with .0125" tappet clearance.
To Check Valve Timing—Set #1 intake valve tappet clearance at .0125". This valve should open with piston 5° before top dead center with first straight line of ignition mark on flywheel '1 IGN. 1&8/' slightly past indicator. Reset tappet clearance at .010".

Lubrication:—Pressure. Gear type oil pump on right hand side of crankcase. Dip pump gears in oil before installing (pump does not require priming).
Normal Oil Pressure—5 to 40 lbs.
Oil Pressure Relief Valve—Built in pump cover. Not adjustable. Relief valve ball clearance should be .0145-.0165".
Oil Pump Clearances—Shaft bearing .0005-.002". Idle gear bearing .0005-.002". Driving gear backlash .003-.004". Backlash between pump gears .006-.008". Pump gear end clearance .002-.006".
Capacity and Oil—7 qts. Use SAE. #10-W for first 500 miles in new cars. After 500 miles use SAE. #30 (above 95°F.), #20 (32° to 95°F.), #10-W (0° to 32°F.).

CARBURETION:—See Carburetion Section for data.
Carburetor:—Carter, Model 298-S, 315-S, 1¼" down-draft type.
Automatic Choke—Carter Climatic Control.
Fuel Pump:—A.C., Type R-1521783 diaphragm type.
Gasoline Gauge:—A.C., Electric type.



CLUTCH:—Own make, single plate, dry disc type. No release lever adjustment necessary for wear.

Clutch Pedal Adjustment—Clearance between clutch pedal and pedal felt retainer board (on under side of toeboard) should be 5/8". Adjust by loosening lock nut and turning pedal stop screw. Lash or free movement of clutch pedal should be 1". Adjust by changing length of clutch pedal link (adjusting screw on outer end of link).

Clutch Facings—Moulded type, 2 required. 6¼" I.D., 9⅞" O.D., ⅛" thick.

NOTE—Cap screws used to hold clutch cover on flywheel are sufficiently long to relieve clutch spring tension. To disassemble clutch, back off cap screws equally, one turn at a time. Clutch springs should force cover free of flywheel flange. If cover sticks, strike sharply on radius outside spring cups before screws completely removed.

STEERING:—Front Suspension—Independent type. Entire suspension unit (coil spring housing with built-in shock absorber unit, wheel support arm and radius rod) pivoted on kingpin and turns with front wheel.

King Pin Inclination—7° (with load on wheels).

Camber—1-2° (with load on wheels). No adjustment provided. Replace front frame cross tube and check suspension unit housing and wheel support arm. Do not bend cross tube hot or cold.

Caster (King Pin Tilt)—0°. Adjust by shims at frame cross tube brackets. Frame must be absolutely level when checking caster. Use jacks to set frame height (vertical distance from floor) as follows: 15 11/16" to bottom of frame cross tube at center, 19" to lower face of rear spring horns.

Tread—57⅜" (with load on wheels).

Toe In—0-1/16". Adjust by changing length of tie rod.

Lubrication—Entire suspension unit must be kept filled with special Shock Insulating Fluid to level of filler plug on front of unit (capacity 2½ qts.).

NOTE—Suspension unit is removed by taking out kingpin (kingpin locked in place by tapered lock bolt in usual manner). Kingpin is carried at top and bottom on 32 loose rollers retained by convex plug and snap rings. Use special loading tool to insert rollers after kingpin has been installed. Insert kingpin at bottom with longest end (from slot) upward, tap ball thrust bearing in place between top of steering knuckle and upper support boss (with dust shield at top) before pushing kingpin up into place. Check steering knuckle endplay (between thrust bearing and upper support boss) and insert shim if more than .006". Install roller retainer plugs with convex face in.

Leveling Frame—Car is leveled by turning adjusting plugs in housing covers of suspension units. To adjust, remove cap screw in center of adjusting plug, lift out adjusting plug lock, use special wrench to turn adjusting plug until distance from lower face of cross tube yoke to bottom of brake drum is 5⅛" with car weight on wheels. Adjusting plug must not be turned in more than 2 turns from flush position with housing cover. Replace lock and cap screw.

IGNITION:—Coil Model 539-L. On engine side of dash.

Ignition Current—3.5 amperes at 6.2 volts.

Ignition Switch—Model 431-L (switch and cable).

Distributor Model 663-B. Single breaker, 8 lobe cam, full automatic advance type with auxiliary 'Vacuumatic' spark advance and Gaselector.

Breaker Gap—Set at .018". Limits .015-.020".

Breaker Arm Spring Tension—19-23 ounces.

Cam Angles—Closed 31°. Open 14° (distributor).

Manual Adjustment—20° (engine). See Gaselector.

Automatic Advance

Distributor Degrees	R.P.M.	Engine Degrees	R.P.M.
Start	300	3	600
5	600	10	1200
11	1700	22	3400

Vacuumatic Spark Control—Vacuum unit on distributor provides additional advance except when engine is accelerated or is pulling heavily (low vacuum) when spark is retarded by return spring.

Advance (Engine °)	Vacuum (Ins. of Hg.)
Start	4-6"
20	16-21"

Gaselector—Consists of manual adjustment at distributor, with graduated scale and pointer (locked by thumbnut), providing 10° advance and retard from center '0' position. Should be used to compensate for special fuels or driving conditions.

Removal:—Distributor on left hand side of crankcase. Disconnect vacuum connection, take out hold-down screws in advance arm, lift out.

IGNITION TIMING:— Flywheel Degs. Piston Position
All engines ..... 6° BTDC. ..... .0117" BTDC.

NOTE—The two straight lines of the ignition mark '/IGN.1&8/' indicate the allowable timing range, lower mark 6° BTDC., upper mark 2° BTDC. Set ignition at lower mark or 6° BTDC.

Timing (using Timing Light)—Connect timing light between distributor terminal and ground, turn on ignition, remove cover plate over inspection hole in left front face of flywheel housing, loosen thumbnut on Gaselector, center pointer on scale (opposite '0' mark). With #1 piston on compression, turn engine over until first line of ignition mark on flywheel '/IGN.1&8/' lines up with pointer, loosen advance arm clamp bolt, rotate distributor until lamp lights, tighten clamp bolt.

Timing (using Synchroscope)—See Equipment Section for complete instructions. Ignition mark on flywheel (6° line) should be filled in with chalk Idle engine at 6 M.P.H.

Firing Order:—1-6-2-5-8-3-7-4 (see diagram).

Spark Plugs:—A.C., Type K-7. 14 MM. Metric type.

Spark Plug Gaps—.025" (.022" cars with radio).

BATTERY:—Delco, Type 17-K, 17-KF (Export), 6 volt, 17 plate, 107 A.H. capacity (20 hour rate).

Starting Capacity—131 amperes for 20 minutes.

Grounded Terminal—Negative (—) terminal.

Location—Left hand side under front floor boards.

STARTER:—727-S. Armature No. 823881. Manual pinion shift type (solenoid operated).

Rotation—Counter-clockwise at commutator end.

Brush Spring Tension—24-28 ounces each.

Performance Data

Torque	R.P.M.	Volts	Amperes
0 ft. lbs.	5500	5.0	65
15 "	Lock	3.0	600

Starting Switch:—Solenoid switch Type 1516. Vacuum Switch Type 1588. Solenoid switch mounted on starter field frame is combination starting switch and pinion shift and is controlled by vacuum switch operated by accelerator pedal. Generator cutout relay has extra ground contacts for solenoid relay control. See Equipment Section.

Removal:—Starter on left front of flywheel housing. Take out flange cap screws.

GENERATOR:—Model 935-W. Armature No. 1854856. Ventilated. Fixed third brush with external voltage regulation. Vibrating type voltage regulator combined with Cutout Relay in case on dash. See Equipment Section for complete data.

Charging Rate Adjustment—Third brush is fixed and cannot be adjusted. Voltage regulator is sealed and seals must be broken (voiding warranty) before adjustment can be made to regulator or cutout relay. See data below on Relay Regulator.

Performance Data

	Amperes	Volts	R.P.M.
Cold	22-26	8.7-9.1	3300
Hot	17-20	8.2-8.5	3500

Above figures correct with ammeter connected in charging line at 'Bat' terminal of Relay-Regulator with 'F' terminal grounded.

Rotation—Counter-clockwise at commutator end.

Field Current—2.3-2.6 amperes at 6.0 volts.

Brush Spring Tension—22-26 ozs. (main), 16-20 ozs. (third brush).

Removal:—Pivot mounted at left front of engine with fan belt drive. Take out two pivot bolts and one clamp bolt.

Belt Adjustment:—Loosen pivot bolts and clamp bolt, move generator out or away from engine to take up stretch or slack in belt.

RELAY REGULATOR:—Model 5557. Consists of Cutout Relay and vibrating Voltage Regulator in case on dash. See Equipment Section for complete data on these units. Cutout Relay has special ground contacts.

Cutout Relay

Cuts In—6.5-7.25 volts.

Cuts Out—3 amperes max. discharge at 6.3 volts.

Relay Contact Gap—.018-.025".

Air Gap—.018-.022" with contacts closed.

Voltage Regulator

Adjustment—Operate generator at 2800-3000 R.P.M. charging battery at not less than 8 amperes. Adjust regulator so that voltage is 7.7-8.0 volts at 70°F. and 7.45-7.55 volts at 150°F. Regulator is over-compensated for temperature and adjustments must be made at these temperatures. Do not operate generator on open-circuit.

Regulator Contact Gap—.015-.025".

Contact Spring Tension—2.7-3.5 ounces.

Air Gap—.060-.070" between armature and core (armature down so that fibre bumper just touches stop. .008-.013" (between fibre bumper and stop with armature up).

LIGHTING:—Delco-Remy Switch, Model 479-Z. Foot Control Switch Model 465-Z. Control switch on toeboard provides assymetrical passing beam (lower beam right hand headlmp, upper beam left hand headlamp). Headlamp beams are crossed. Headlamp bulbs are pre-focused type.

Bulb Specifications

Position	Candlepower	Mazda No.
Headlights	32-21	2320-C
Fender, Instrmnt., Tail	3	63
Stop	15	87
Dome	6	81

FUSES:—Fuse Block Model 1050-X. On back of instrument panel. Two 20 ampere capacity fuses, one spare fuse. Left hand fuse protects left hand headlamp circuit. Right hand fuse protects all other lighting circuits.

HORNS:—Klaxon, Model K-26-L (standard), K-33-B twin horns (optional). Vibrator type. Horn relay used with Model K-33-B.

Horn Relay:—Model 266-T. Relay requires .25 amperes at 2.0 volts (minimum) to close contacts. Current draw .8 amperes.

Contact Gap—.015-.025".

Air Gap—.012-.017".

SERIAL NUMBER:—First number, 100. On front end of left frame side rail under fender.

ENGINE NUMBER:—Stamped on upper left hand corner of cylinder block.

ENGINE:—Own Model 6-A. Six cylinder, 'L' head type.
Bore—3⅜". **Stroke**—4¼".
Piston Displacement—228 cubic inches.
Rated Horsepower—27.3.
Developed Horsepower—85 at 3400 R.P.M.
Compression Ratio—7-1. Std. aluminum head.
Compression Pressure—115 lbs. at 1000 R.P.M. or 90 lbs. at cranking speed.

Pistons:—Own aluminum alloy, 'T' slot, cam ground type. Refinish cylinders to take standard replacement pistons furnished .005", .010", .020", .030", .040", .050", .060" oversize as well as semi-finished. Exact size of piston is stamped on top. Piston length 4".
Weight—.81 lbs. stripped, 1.29 lbs. with rings and pin.
Removal—Pistons removed from above, rods from below. To remove assemblies, take off rod bearing caps, install brass guards on rod bolts (necessary to avoid marring crankpin surface), push piston up in cylinder until pin is exposed, remove retaining rings, push pin out, remove piston from above, remove rod from below. Use new retaining rings when installing pistons.
Clearance—.027-.033" top, .0024-.0032" bottom.
Fitting New Pistons—Use standard oversize piston (size stamped on top), refinish cylinder bore to size giving correct clearance. Feeler gauges can be used to check clearance.
Installing Pistons—Slot should be at left. Pistons stamped with arrow and word 'Front.' Arrow must point toward front of engine on all pistons.

Piston Rings:—Two compression rings, two oil control rings per piston. Lower ring groove drilled radially with oil drain holes.

Ring	Width	End Gap	Wall Thickness
Comp. All	⅛"	.007-.012"	.145"
Oil Cont. (3)	5/32"	.009-.014"	.145"
Oil Cont. (4)	3/16"	.009-.014"	.145"

Piston Pin:—Diameter .9834" plus or minus .0001". Length 2.903-2.898". Pin floats in piston and rod. Held by retaining rings at each end. See Removal of pistons above.
Clearance in Rod—.000-.0003".
Clearance in Piston—.0000-.0003" with piston and pin at normal temperature (70°F.).

Connecting Rod:—Weight 44 ozs. Length 10.500".
Crankpin Journal Diameter—2.1875"
Lower Bearing Type—Removable steel-backed, babbitt-lined type. Solid shims are used.
Clearance—.0015-.0025". Sideplay .008".
Adjustment—Shims. Bearings also replaceable.

Crankshaft:—Seven bearings. Integral counterweights.
Journal Diameters—2.625" all bearings.
Bearing Type—Precision type, removable steel-backed, babbitt-lined. Solid shims.
Clearance—.002-.0025".
Adjustment—Shims. Bearings also replaceable.
End Thrust—Taken by center bearing. Endplay .005".

Camshaft:—Four bearings. Non-adjustable chain drive.
Bearing Type—Steel-backed, babbitt-lined.
Clearance—.0015".
Timing Chain—Morse, Type DO-7654. Width 1". Pitch .500". Length 24" or 48 links.
Camshaft Setting:—Sprokets are marked. Mesh chain with sprockets turned so that marks are adjacent and in line with a straightedge across the shaft centers. Install chain with camshaft sproket off engine. Insert dowel-type capscrew with ground shoulder first (in hole with reamed top) to center camshaft sprocket. Capscrew holes are offset so that sprocket cannot be assembled incorrectly.

Valves:—	Head Diameter	Stem Diameter	Length
All Valves	1 13/16"	11/32"	6 1/32"

	Seat Angle	Lift	Stem Clearance
All Valves	45°	5/16"	.017-.021"

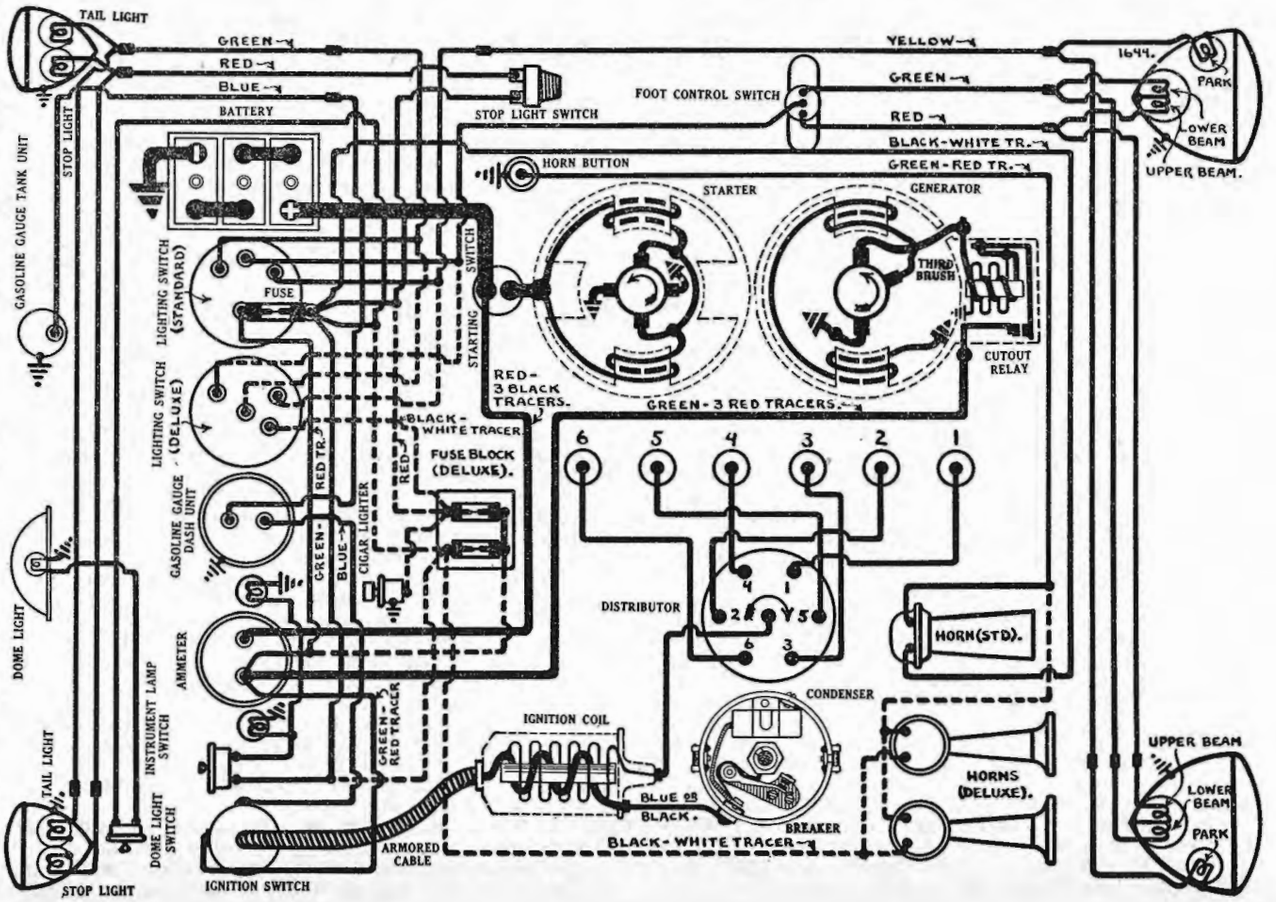
Tappet Clearance—.007" Int. .008" Exh. engine hot.

Valve Springs—	Spring Pressure	Length
Valve Closed	50-54 lbs.	2⅜"
Valve Open	140 lbs. + or - 5 lbs.	2 1/16"

Valve Timing—See Camshaft Setting above.
Intake Valves—Open At TDC. Close 50° ALDC.
Exhaust Valves—Open 48° BLDC. Close 2° ATDC.
To Check Valve Timing—Set tappet clearance #1 intake valve at .012". This valve should open with piston #1 on top dead center when flywheel mark 'UDC.#1' lines up with indicator in inspection hole in flywheel housing at right of engine. Reset tappet clearance at .007" with engine warm.

Lubrication:—Pressure. Gear type oil pump located in oil pan.
Normal Oil Pressure—30 lbs. at 1200 R.P.M. when hot.
Oil Pressure Relief Valve—Operates at 33 lbs. when engine is hot. Located under nut on left hand side of crankcase. Adjustable by turning nut. Turn nut in or clockwise to increase, and out or counter-clockwise to decrease pressure.
Capacity & Oil—6 qts. Use SAE. #30 (summer), 20W (winter).

CARBURETION:—See Carburetion Section for complete data on Carburetor, Fuel Pump, and Gasoline Gauge.
Carburetor:—Carter (Ball & Ball) 303-S (Serial No. 100 to 251), 304-S (252 to 2038), 320-S (2039 up), 1½" downdraft type.
Fuel Pump:—A.C., Type P-1521772 diaphragm type.
Gasoline Gauge:—K-S electric type.



CLUTCH:—Borg & Beck Type 10A6. Single plate, dry disc type. No adjustment required for wear.
Clutch Pedal Adjustment—Free movement of clutch pedal must be 1". To adjust, loosen transverse bolt which clamps pedal to shaft, move pedal forward to provide 1" free movement, tighten bolt.
Clutch Facings—Molded Asbestos, 2 required, 6⅛" I.D., 9⅞" O.D., .133 plus or minus .003" thick.

NOTE—Punch mark cover plate, flywheel, and pressure plate before disassembling clutch and assemble in same position. Use gauge plate to set up release levers after disassembling clutch. Lever heights must be equal within .005".

STEERING:—Front Suspension—Conventional 'I' beam section front axle with Reverse-Elliott ends and semi-elliptic springs.
Kingpin Inclination—8° crosswise.
Caster—1½°. Use wedge shims inserted between spring and spring seat to correct caster.
Camber—1½°. Axle may be bent cold for minor corrections.
Toe In—0-1/16". Adjust in usual manner by loosening clamp bolts and turning tie rod.

IGNITION:—Coil Model 536-G. Mounted on the dash.
Ignition Current—2 amperes idling, 5 stopped.
Ignition Switch:—Model 431-W (switch and cable). Connected to coil by armored cable.

Distributor Model 645-K (644-M on first cars). Single breaker, 6 lobe cam, full automatic advance type. Manual advance consists of adjustment at distributor.
Breaker Gap—Set at .020". Limits .018-.024".
Breaker Arm Spring Tension—17-21 ozs.
Cam Angles—Closed 36°. Open 24° (distributor).
Manual Advance—25° (engine—adjustment only).

Automatic Advance

Distributor		Engine	
Degrees	R.P.M.	Degrees	R.P.M.
Start	300	2	600
4.5	800	9	1600
7	1600	14	3200

Removal:—Distributor mounted on right hand side of cylinder head. To remove, take out hold-down screw in advance arm.

IGNITION TIMING:— Flywheel Degs. Piston Posi.
All engines .....10° or ¾" BTDC..... .0388" BTDC
Timing—With #1 piston on compression, turn engine over until piston is 10° before top dead center, stop when prick-punch mark on flywheel lines up with pointer in inspection hole in right front face of flywheel housing. The punch mark is ¾" before top dead center mark 'UDC.#1'. Loosen advance arm clamp bolt, rotate distributor until contacts begin to open, tighten clamp bolt, see that rotor is opposite #1 segment in distributor cap.
Timing (Using Motor Gauge)—All engines can be timed with a motor gauge installed in #1 spark plug port. See table above for setting.

Firing Order:—1-5-3-6-2-4. See diagram.

Spark Plugs:—Champion Type C-7A. 18 MM. Metric.
Spark Plug Gaps—Set at .025".

BATTERY:—Willard, Type WH-1-13. 6 volt, 13 plate, 102 A.H. capacity (20 hour rate).
Starting Capacity—120 amperes for 20 minutes.
Grounded Terminal—Negative (—) terminal.
Location—On left side under driver's seat.

STARTER:—Model 738-K. Armature No. 1847432.
Starter Drive—Barrel Type Bendix. Type A-1718.
Rotation—Counter-clockwise at commutator end.
Brush Spring Tension—24-28 ounces each.
Cranking Performance—150 R.P.M.

Performance Data

Torque	R.P.M.	Volts	Amperes
0 ft. lbs.	5000	5.0	65
12 "	Lock	3.63	475

Starting Switch:—Model 405-C. Operated by depressing clutch pedal.

Removal:—Starter flange mounted on left front face of flywheel housing. To remove, take out flange mounting capscrews.

GENERATOR:—Model 937-Z. Armature No. 1838448. Third brush control type.
Charging Rate Adjustment—Loosen locking screw on commutator end plate, shift third brush by hand counter-clockwise to increase, or clockwise to decrease charging rate, tighten locking screw.
Maximum Charging Rate—18 amperes, 8.3 volts, 2000 R.P.M., 24.5 M.P.H.

Performance Data

	Amperes	Volts	R.P.M.
Cold	15-18	7.9-8.3	2000
Hot	13-15	7.7-8.0	2400

Rotation—Counter-clockwise at commutator end.
Brush Spring Tension—23-27 ounces each.
Field Current—3.5-4.5 amperes at 6.0 volts.

Removal:—Generator pivot mounted at left front of engine with fan belt drive. To remove, take out two pivot mounting bolts and one clamp bolt.

Belt Adjustment:—Belt tension adjusted in usual manner by loosening pivot bolts and clamp bolt and swinging generator out or away from engine.

SPECIAL GENERATORS:—Model 936-M. Used on cars with radio. See Equipment Section for complete data.

CUTOUT RELAY:—Model 265-H. Mounted on generator field frame. See article in Equipment Section.
Cuts In—6.75-7.5 volts, 7 M.P.H.
Cuts Out—0-2.5 ampere discharge current.
Relay Contact Gap—.015-.025".
Air Gap—.012-.017" (contacts closed).

LIGHTING:—Douglas Switch Model 5399 (Std.), 5400 Deluxe). R.B.M. Foot Control Switch Model 1050. Foot control switch on toeboard used to control upper and lower headlamp beams. Headlamp bulbs are pre-focused type.

Bulb Specifications

Position	Candlepower	Mazda No.
Headlamps	32-21	2320-C
Parking	1.5	55
Tail, Instrument, Dome	3	63
Stop	15	87

FUSES:—Lighting—One 20 ampere capacity on back of switch (std.) or two 20 ampere on fuse block under cowl back of instrument board (Deluxe).

HORNS:—Sparton. Vibrator Type. Single horn (std.), or twin horns (Deluxe). Horn current 8 amperes (single horn), 17 amperes (twin horns).

SERIAL NUMBER—First number, 100. On top of left frame side member near steering gear.

ENGINE NUMBER:—Stamped on upper left hand corner of cylinder block.

ENGINE:—Own Model S-3. Six cylinder, 'L' head type.
Bore—3⅜". **Stroke**—5".
Piston Displacement—268 cubic inches.
Rated Horsepower—27.3.
Developed Horsepower—85 at 3200 R.P.M.
Compression Ratio—5.4-1 Std. cast-iron head.
Compression Pressure—95 lbs. at 1000 R.P.M. or 78-82 lbs. at cranking speed.

Pistons:—Lynite, Lo-EX aluminum alloy, 'T' slot, cam ground type. Refinish cylinders to take standard replacement pistons furnished .005", .010", .020", .030", .040", .050", .060" oversize as well as semi-finished. Exact size of piston is stamped on head. Piston length 4".
Weight—.81 lbs. stripped, 1.29 lbs. with rings and pin.
Removal—Pistons removed from above, rods from below. To remove assemblies, take off rod bearing caps, install brass guards on rod bolts (necessary to avoid marring crankpin surface), push piston up until pin is exposed, remove retaining rings and push out pin, remove piston from above, remove rod from below. Use new retaining rings when installing pistons.
Clearance—.030" top. .0006-.0014" bottom.
Fitting New Pistons—Use standard oversize piston (size stamped on head), refinish cylinder bore to size giving correct clearance. Do not use feeler gauges to check clearance.
Installing Pistons—Slot should be at left. Piston stamped with arrow and word 'Front.' Arrow should point toward front of engine on all pistons.

Piston Pins:—Diameter .9834". Length 2.903". Pin floats in piston and rod. Held by retaining rings. See Removal of Piston above.
Clearance in Rod—.0003".
Clearance in Piston—.0000-.0003" with piston and pin at normal temperature (70°F.).

Piston Rings:—Two compression rings, two oil control rings per piston. Lower ring groove drilled radially with oil drain holes.

Ring	Width	End Gap	Wall Thickness
Comp All	3/32"	.007-.015"	.145"
Oil Cont. (3)	5/32"	.007-.015"	.145"
Oil Cont. (4)	3/16"	.007-.015"	.145"

Connecting Rod:—Weight 2.47 lbs. Length 10½".
Crankpin Journal Diameter—2 3/16".
Lower Bearing Type—Spun-babbitt lined integral with rod and bearing cap. No shims.
Clearance—.0015-.0025". Sideplay .003-.007".
Adjustment—None (no shims). Replace rods. Do not file bearing caps.

Crankshaft:—Seven bearings. Integral counterweights.
Journal Diameters—2.625" all bearings.
Bearing Type—Precision type steel-backed, babbitt-lined. No shims.
Clearance—.002".
Adjustment—None (no shims). Replace removable bearings. Bearings are precision type and need not be line-reamed after installing. All bearings should be replaced as a set. When installing bearings see that lip on bearing is engaged in slot in crankcase and bearing cap (necessary to prevent bearing from rotating).
End Thrust—Taken by rear bearing. Endplay .003-.007".

Camshaft:—Four bearings. Non-adjustable chain drive.
Bearing Type—Steel-backed, babbitt-lined.
Clearance—.0015-.002".
End Thrust—Taken by spring-loaded plunger or thrust plug in camshaft sprocket and thrust plate on chain case cover.
Timing Chain—Morse 766 Bushed Joint type. Width 1½". Pitch .500". Length 24" or 48 links.
Camshaft Setting—Sprockets are marked. Mesh chain with sprockets turned so that marks are adjacent and in line with a straightedge across the shaft centers. Install chain with camshaft sprocket off engine. Insert dowel-type capscrew with ground shoulder first (in reamed-top hole) to center camshaft sprocket. Sprocket capscrews are offset so that sprocket cannot be installed incorrectly.

Valves:	Head Diameter	Stem Diameter	Length
All Valves	1 13/16"	.3437"	5¾"

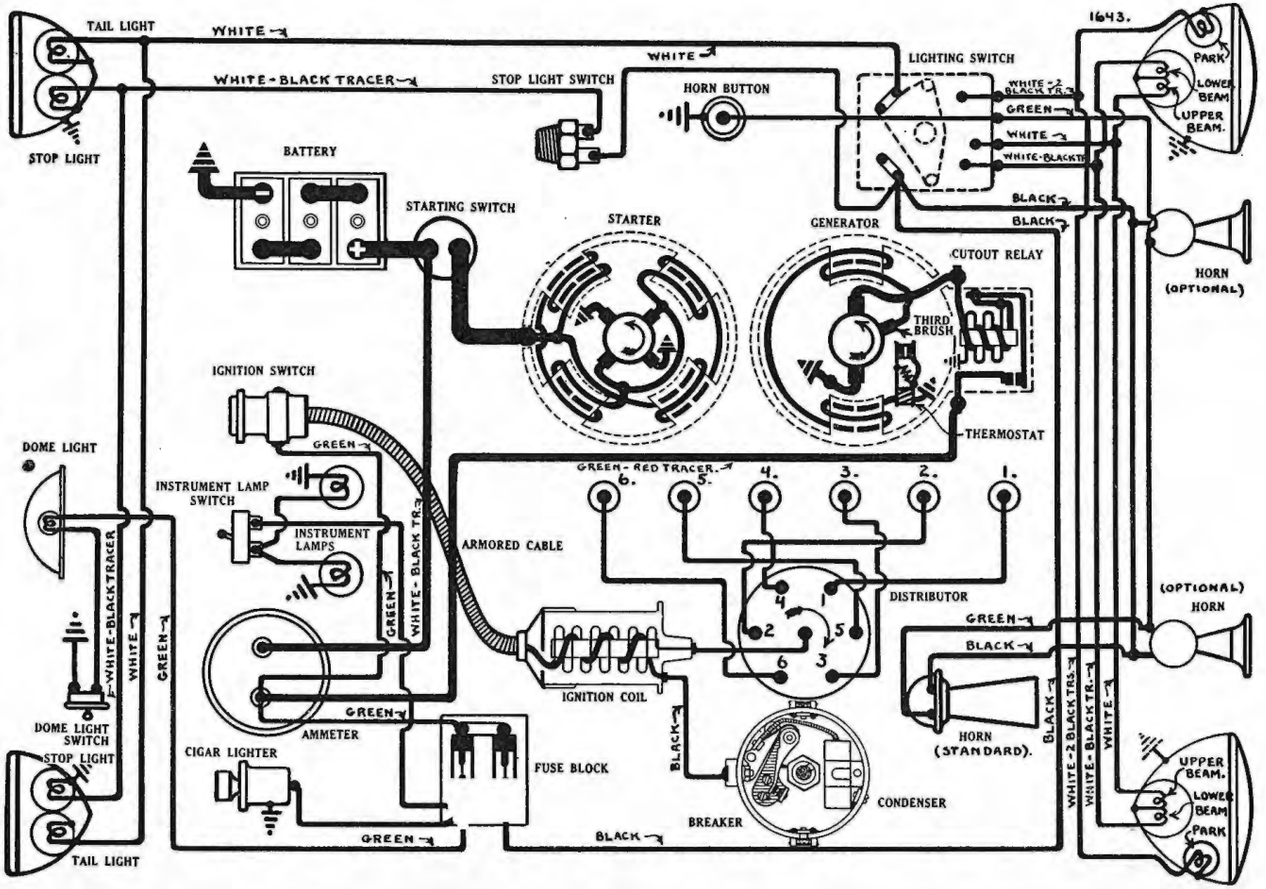
	Seat Angle	Lift	Stem Clearance
All Valves	45°	5/16"	.002-.004"

Tappet Clearance—.007" (intake), .008" (exhaust) engine warm.

Valve Springs—	Spring Pressure	Spring Lgth.
Valves Closed	58-62 lbs.	2⅜"
Valves Open	90 lbs.	2 1/16"

Valve Timing—See Camshaft Setting above.
Intake Valves open—at TDC. Close—50° ALDC.
Exhaust Valves open—48° BLDC. Close— 2° ATDC.
To Check Valve Timing:—Set tappet clearance #1 intake valve at .012". This valve should open with piston on top dead center when flywheel mark 'UDC.#1' lines up with indicator in inspection hole in flywheel housing (right hand side of engine). Reset tappet clearance at .007" with engine warm.

Lubrication:—Pressure type. Gear type oil pump located in oil pan.
Normal Oil Pressure—30 lbs. at 35 M.P.H.
Oil Pressure Relief Valve—Operates at 30-35 lbs. Located under nut on left hand side of crankcase. Adjustable by turning nut. Turn nut in (clockwise) to increase, or out (counter-clockwise) to decrease oil pressure.
Capacity and Oil—6 qts. Use SAE. #30 (summer), #20 (winter).



CARBURETION: — (Fuel System). See Carburetion Section for complete data on Carburetor, Automatic Choke, Fuel Pump, and Gasoline Gauge.

Carburetor:—Stromberg, Model EX-32, 1½" plain tube, downdraft type.
Automatic Choke—Stromberg (standard on De Luxe models only).

Fuel Pump:—A.C., Type P-1521772 diaphragm type.

Gasoline Gauge:—K-S Telegauge, hydrostatic type.

CLUTCH:—**Own.** Single plate, dry disc type. No adjustment required for wear.
Clutch Pedal Adjustment—Free movement of clutch pedal must be 1". Adjustment is made by means of transverse bolt at bottom of clutch pedal.
Clutch Facings—Woven type, one required, 6⅛" I.D., 9¾" O.D., 5/16" thick.

STEERING:—**Front Suspension**—Conventional 'I' beam section front axle with Reverse-Elliott ends and semi-elliptic springs.
Kingpin Inclination—8° crosswise.
Caster—4°. Use wedge shims installed between spring and spring seat on axle to correct caster.
Camber—1½°. Axle may be bent cold for minor corrections of camber.
Toe In—0-⅛". Adjust in usual manner by loosening clamp bolts and turning tie rod.

IGNITION:—**Coil Model 538-B.** Coil assembled as unit with ignition switch.
Ignition Current—1½-2 amperes (idling), 5 amperes (stopped).
Ignition Switch—Model 429-Z. Electrolock type switch.

Distributor Model 644-M. Single breaker, 6 lobe cam, full automatic advance type. Manual advance consists of adjustment at distributor only.
Breaker Gap—Set gap at .020". Limits, .018-.024".
Breaker Arm Spring Tension—17-21 ozs. (at tip of breaker arm).
Manual Advance—25° (engine—adjustment only).
Cam Angles (Distributor Degrees)—Closed 36°. Open 24°.

Automatic Advance

Distributor		Engine	
Degrees	R.P.M.	Degrees	R.P.M.
Start	300	2	600
9	1450	18	2900

IGNITION TIMING:—Flywheel Degs. Piston Position
All engines.....8½° or 3 teeth BTDC. .... .032" BTDC.
Timing (using Timing Light):—Connect timing light between distributor terminal and ground, turn on ignition, turn engine over with #1 piston on compression, stop when ignition mark on flywheel, which is 8½° or three teeth before top dead center mark 'UDC.#1' lines up with reference mark on flywheel housing (right hand side of engine), loosen advance arm clamp bolt, rotate distributor until timing light just lights, indicating that contacts are opening, tighten clamp bolt, see that rotor is opposite #1 segment in distributor cap, check spark plug connections (see diagram).

NOTE:—Car can be road tested and ignition timing changed slightly for best performance in accordance with special fuel characteristics or operating conditions of the car. Setting should be just under the detonating or spark knock point (in general this will be 2-3 teeth or .012-.031" piston travel before top dead center).
Timing (using Gauge):—All engines can be timed using a motor gauge installed in #1 cylinder spark plug hole. See above for settings.

Firing Order:—1-5-3-6-2-4 (see diagram).

Spark Plugs:—Champion, Type C-7. 18 MM. Metric.
Spark Plug Gaps—Set gaps at .025".

BATTERY:—**Willard, Type WH-1-13,** 6 volt, 13 plate, 102 A.H. capacity (20 hour rate).
Starting Capacity—120 amperes for 20 minutes.
Grounded Terminal—Negative (—) terminal.
Location—On left hand side under driver's seat.

STARTER:—**Model 736-G. Armature No. 818002.**
Starter Drive—Bendix Drive, Type RCD11FX-10.
Rotation—Counter-clockwise at commutator end.
Brush Spring Tension—24-28 ounces each.
Cranking Performance—120-130 R.P.M.

Performance Data

Torque	R.P.M.	Volts	Amperes
0 ft. lbs.	6000	5.0	65
15 "	Lock	3.15	570

Starting Switch:—**Delco-Remy Model 405-C.** Mounted on top of brake master cylinder and operated by clutch pedal.

Mounting:—Flange mounted on left hand front face of flywheel housing. To remove, take out 3 flange mounting cap screws.

GENERATOR:—**Model 955-R. Armature No. 817807.** Third brush regulation, thermostat control. Thermostat contacts open at 200°F., reducing generator output approximately 40%.
Charging Rate Adjustment:—Take off commutator cover band, loosen small round lock screw on commutator end plate, shift third brush by hand counter-clockwise to increase, or clockwise to decrease charging rate, tighten locking screw.
Maximum Charging Rate:—18 amperes (cold), 8.5 volts, 1550 R.P.M.

Performance Data

	Amperes	Volts	R.P.M.
Cold	19-22	8.3-8.7	1550
Hot	9-12	7.3-7.7	1800-2000

Rotation—Counter-clockwise at commutator end.
Field Current—4.0-6.1 amperes at 6.0 volts.
Brush Spring Tension—14-18 ounces each.

Mounting:—Pivot mounted at left front of engine. Fan belt drive. To remove, take out two pivot bolts, and one clamp bolt.
Belt Adjustment—Loosen clamp bolt and pivot bolts, pull generator away from engine until belt is snug, tighten clamp bolt, and pivot bolts.

CUT-OUT RELAY:—**Model 265-G.** Mounted on generator field frame. See article in Equipment Section.
Cuts in—6.75-7.5 volts, 6.5-7 M.P.H.
Cuts out—0-2.5 ampere discharge.
Relay Contact Gap—.015-.025".
Air Gap—.012-.017" (contacts closed).

LIGHTING:—**Switch Model 486-X.** Lighting switch mounted at lower end of steering column controlled by lever on steering wheel. Double filament headlight bulbs controlled by lighting switch.

Bulb Specifications

Lamp	Candlepower	Mazda No.
Headlights	32-21	1116
Stop	15	87
All others	3	63

FUSES:—**Lighting**—Two 20 ampere capacity on fuse block in back of instrument board under cowl.

HORNS:—E.A. Broadway Model Vibrator type (standard). Sparton tuned, twin horns Model CL-5 (special De Luxe equipment). Horn current, 17 amperes total at 6 volts (Model CL-5).

NOTE—Models designated as '1-A' have conventional front axle, '2-A' types have independently sprung front wheels. All other data is the same for all cars.

SERIAL NUMBER: — First number (1-A) 5,500,001, (2-A) 5,212,001. On plate on left frame side member under front fender.

ENGINE NUMBER:—Stamped on left center of cylinder block.

ENGINE:—Dictator, Six cylinder, 'L' head type.
Bore—3¼". **Stroke**—4⅛".
Piston Displacement—205 cubic inches.
Rated Horsepower—25.4.
Developed Horsepower—88 at 3600 R.P.M. (std. hd.).
Compression Ratio—6.3-1 Std., 6.9-1 Optl.
Compression Pressure—109.5-116 lbs. (Std. 6.3-1 head), 110-120 lbs. (Optl. 6.9 head) at cranking speed (150 R.P.M.).

NOTE—Special 6.9-1 head is aluminum and special copper-asbestos head gasket must be used (steel-bestos gasket used with standard cast-iron head).

Pistons: — Lynite, aluminum alloy, 'T' slot, cam ground type (.00825-.01075") smaller diameter across pin bosses, skirt is not tapered vertically). Refinish cylinders to take replacement pistons furnished .002", .004", .010", .015", .020", .030" oversize. Replacement pistons stamped on head with exact size as measured at right angles to pin bosses ¼" up from bottom of skirt. Piston length 3¾".
Weight—.94 lbs. (without rings or pin).
Removal—Pistons and rods removed from above.
Clearance—Top .016-.018". Bottom .0015".
Fitting New Pistons—Use .002" feeler stock 1" wide to check clearance. Insert piston in bore upside down with pin bosses parallel to crankshaft, and feeler between piston and cylinder wall midway between bosses on camshaft side (opposite side from piston slot). Pull required to withdraw feeler should be 7-15 lbs. Piston selected for bore should be within this range.
Installing Pistons—Slot should be on minimum pressure side (away from camshaft).

Piston Rings:—Three rings per piston, two compression, one oil control, all above pin. Oil ring groove is drilled radially with ten 5/32" oil drain holes. Compression rings are Perfect Circle '70' and should be installed with the step downward. All pistons have a heat insulating groove above the top compression ring, this groove is slightly narrower than ring grooves and no ring is fitted.

Ring	Width	End Gap	Wall Thickness
Comp. All	⅛"	.013-.021"	.145"
Oil Cont.	3/16"	.013-.021"	.135"

Piston Pin:—Diameter ⅞". Length 2⅞". Pin is locked in rod. Pin hole in piston is line-reamed and burnished.
Clearance in Piston—.0001-.0003" or light push fit. With this clearance rod will rock on piston of own weight. Pins are fitted and furnished with new pistons.

Connecting Rod:—2.09 lbs. Length 8¼".
Crankpin Journal Diameter—2.06175-2.06275".
Lower Bearing—Integral spun babbitt-lined type.
Clearance—.0005-.002". Sideplay .005-.009".
Adjustment—None. Replace rods. Do not file caps.

Crankshaft:—Four bearings. Integral counterweights.
Journal Diameters—2.2495-2.250" all bearings.
Bearing Type—Interchangeable steel-backed, babbitt-lined type.
Clearance—.0005-.0025".
Adjustment—None. Replace bearings. Do not file caps.
End Thrust—Taken by #1 (front) bearing. End-play .003-.006". Adjusted by shims.

Camshaft:—Four bearing. Helical gear drive.
Bearing Type—Split steel-backed, babbitt-lined type.
Clearance—.00075" (front), .002-.00375" (all others).
End Thrust—Taken by steel thrust washer between #1 bearing and camshaft gear.
Timing Gears—Crankshaft gear cast-iron. Camshaft gear Celeron Fabric. Camshaft gear furnished for service in three sizes: 'S' standard, 'L' low limit, 'H' high limit.
Camshaft Setting—Gears are marked. Mesh marked tooth on crankshaft gear between two marked teeth on camshaft gear. Use gear pullers and pushers to remove or install gears.

Valves:—	Head Diameter	Stem Diameter	Length
Intake	1 15/32"	11/32"	5 7/32"
Exhaust	1 9/32"	11/32"	5 7/32"

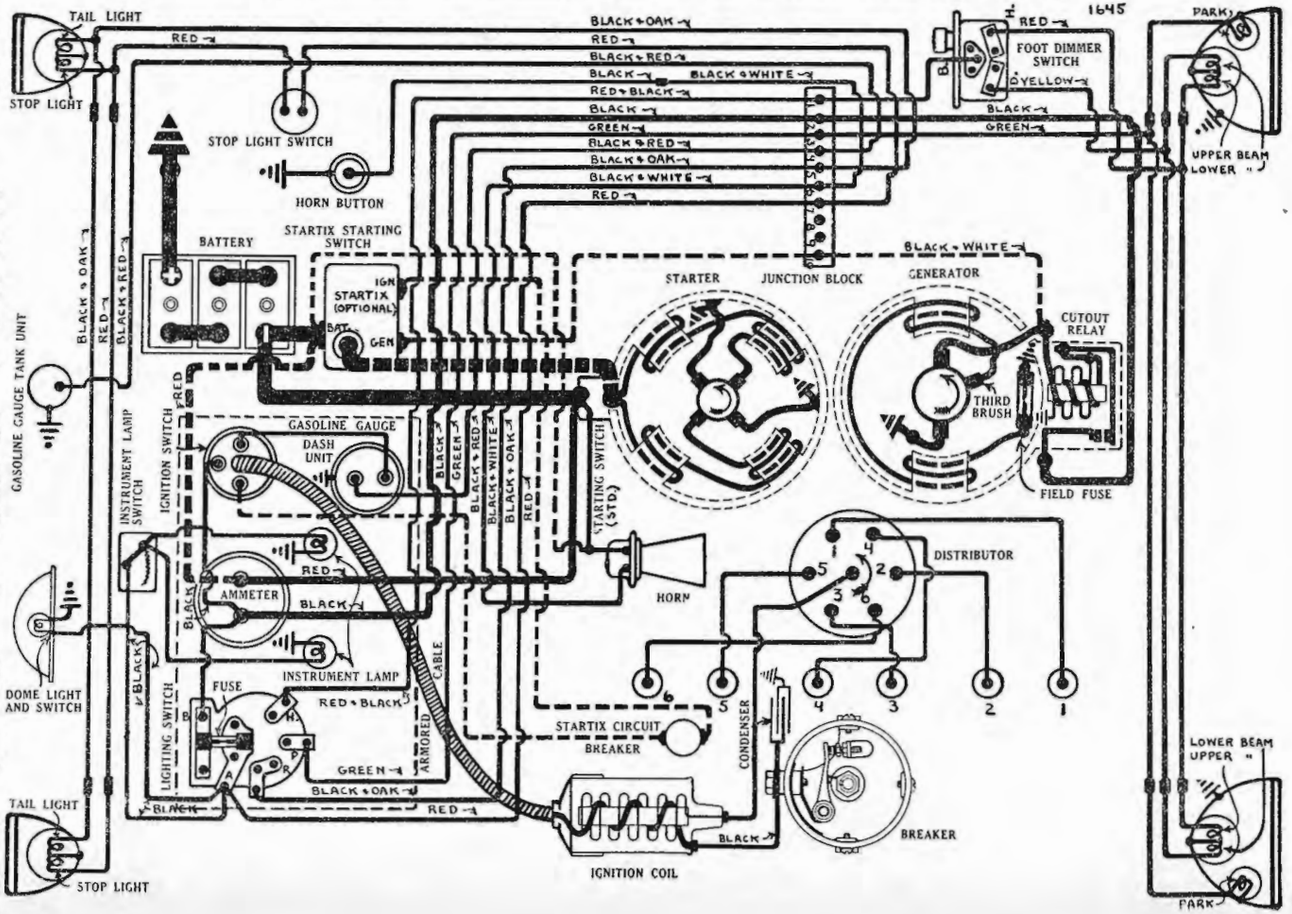
	Seat Angle	Lift	Stem-to-Guide Clearance
All Valves	45°	5/16"	.001-.003"

Tappet Clearance—.004" Int., .006" Exh. engine hot.
Valve Springs—New type. Install springs with closed coils at top. No spring damper used.

	Spring Pressure	Length
Valve Closed	63-68 lbs.	2 1/16"
Valve Open	98-108 lbs.	1¾"

Valve Timing—See Camshaft Setting above.
Intake Valves—Open 5° BTDC. Close 40° ALDC.
Exhaust Valves—Open 40° BLDC. Close 5° ATDC.
To Check Valve Timing—Set tappet clearance #1 intake valve at .010". This valve should open with piston 5° before top dead center when flywheel mark 'IN.OP.1-6' lines up with indicator (inspection hole in left front face of flywheel housing below starter). Reset tappet clearance at .004" with engine hot.

Lubrication:—Pressure. Gear type oil pump located on right side of crankcase.
Normal Oil Pressure—40 lbs. at 26.8 M.P.H.
Oil Pressure Relief Valve—Operates at 40 lbs. Located on right hand front corner of crankcase. Screw adjustment.
Capacity and Oil—5 qts. Use SAE. #30 (summer 45° to 90°F.—average driving), #40 (summer above



90°F.—high speed driving), #20 (winter 45° to 0°F.), #10 (winter below 0°F.).

CARBURETION:—See Carburetion Section for complete data on Carburetor, Automatic Choke, Fuel Pump, and Gasoline Gauge.

Carburetor:—Stromberg, Model EX-23, 1¼" downdraft type with built-in Automatic Choke and integral Fast-idle.

Fuel Pump:—A.C., Type R-1521795 diaphragm type.

Gasoline Gauge:—A.C., Electric type.

CLUTCH:—Borg & Beck Model 9A6. Single plate, dry disc type. No adjustment required for wear.

Clutch Pedal Adjustment—Free movement of clutch pedal must be 1" minimum. Adjust by turning clutch release adjustment lever set screw (on left hand side of clutch housing). On cars with free-wheeling check setting of free-wheeling unit positive lock control rod after adjusting clutch pedal.

Free-wheeling Control Rod—To adjust, remove clevis pin holding control rod on clutch release shaft lever, turn control rod clevis until clevis pin can just be inserted with free-wheeling unit positive lock pin lever in the extreme rear position and both springs (thrusting against lock pin lever swivel) compressed equally. Gear shift lever must be in neutral and free-wheeling control in free-wheeling position.

Clutch Facings—Moulded type, 2 required, 5¾" I.D., 9" O.D., ⅛" thick.

Installing New Facings—Driven plate is segmented (alternate segments convex and concave) with horseshoe tongue in each segment. Each facing is riveted separately to convex side of plate segments. Old rivets should be drilled out to avoid damage to tongues. Insert new rivets with head on plate side (if split) or on facing side (if rolled).

NOTE—In reassembling clutch, release levers must be set to equal height within .005". Use special clutch finger setting disc HMJ-285.

STEERING:—Front Suspension—(2-A) Independent with transverse spring. All specifications and service for this type suspension same as for Commander and President Models (see next page).

(1-A) Conventional 'I' beam section axle with Reverse-Elliott ends and semi-elliptic springs. Specifications and data below.

Kingpin Inclination—9½° crosswise.

Caster—1-1½°. Adjust by inserting wedge shims between spring and spring pad on axle. Spring pad should incline 1½° down toward rear.

Camber—1-1½°. No adjustment. Axle may be bent cold to correct camber.

Toe In—1/16-⅛". Adjust in usual manner by changing length of tie rod.

IGNITION:—Coil Model IG-4607. Mounted under cowl.

Ignition Current—½-1½ amperes idling, 4-5 amperes stopped.

Ignition Switch—Connected to coil by armored cable. On models with Startix, switch has two 'on' positions. On position with key turned to right is regular running position with Startix operative. Key should be turned to left to check ignition timing or whenever automatic cranking is not desired.

Distributor Model IGB-4393. Single breaker, 6 lobe cam, full automatic advance type with auxiliary vacuum spark control.

Breaker Gap—Set at .020". Limits .018-.020".

Breaker Arm Spring Tension—16-20 ounces.

Cam Angles—Closed 40.5°. Open 19.5° distributor.

Automatic Advance

Distributor Degrees	R.P.M.	Engine Degrees	R.P.M.
Start	400	0	800
2	500	4	1000
4	600	8	1200
6	700	12	1400
8	1000	16	2000
10.5	1400	21	2800

Vacuum Spark Control Model VC-4001:—Provides additional advance except when engine is suddenly accelerated, or is operated with wide open throttle when spark will be retarded by return spring in unit. Maximum vacuum advance, 6° (engine).

Removal:—Distributor mounted on left side of crankcase. To remove, loosen clamp bolt in advance arm (not necessary to disconnect vacuum line).

IGNITION TIMING:—

	Flwheel Degs.	Piston Position
All engines	At TDC.	.0000" TDC.

Timing—Use left hand 'on' position of ignition switch if ignition turned on to check timing. Crank engine by placing transmission gears in 'high', jack up one rear wheel, turn wheel by hand, stop with piston #1 on top dead center entering power stroke when flywheel mark 'UDC.1-6' lines up with indicator in inspection hole in left front face of flywheel housing under starter. Loosen advance arm clamp bolt, rotate distributor until contacts begin to open, tighten clamp bolt, see that rotor is opposite #1 segment in distributor cap.

Firing Order:—1-5-3-6-2-4 (see diagram).

Spark Plugs:—Champion No. 8. 18 MM. Metric.

Spark Plug Gaps—Set at .025". Limits .0225-.0275".

BATTERY:—Willard, Type WH-1-13, RH-1-13 (Export). 6 volt, 13 plate, 102 A.H. capacity (20 hour rate).

Starting Capacity—120 amperes for 20 minutes.

Grounded Terminal—Positive (+) terminal.

Location—On left side under front floor boards.

STARTER:—Model MAN-4005, MAN-4002 (with Startix). Armature No. MAD-2083.

Starter Drive—Outboard Bendix Type RCD10FXD-9.

Rotation—Counter-clockwise at commutator end.

Brush Spring Tension—44-56 ozs. (new brushes).

Cranking Performance—90 R.P.M., 240 amperes.

Performance Data

Torque	R.P.M.	Volts	Amperes
0 ft. lbs.	4000	5.5	65
.4 "	2400	5.5	100
3.0 "	1280	5.0	200
6.1 "	790	4.5	300
9.4 "	470	4.0	400
12.5 "	190	3.5	500
15.0 "	Lock	3.0	580
23.0 "	Lock	4.0	820

Starting Switch:—(MAN-4005), Type SW-3737S. Mounted on starter and operated through flexible cable by button on instrument panel. Pull required to close switch should be 2.3 lbs. minimum at end of switch lever.

(MAN-4002). Startix automatic starting with Startix circuit breaker. Controlled by ignition switch. See Equipment Section for complete data.

Removal:—Starter flange mounted on left front face of flywheel housing. To remove, take out two flange capscrews.

GENERATOR:—Model GBM-4604 (first), GBM-4604-A-2 (later cars). Armature No. GBM-2006B. Air cooled Third brush control type. See Special Generator Section for generators equipped with Current Regulator.

Charging Rate Adjustment—Take off commutator cover band, shift third brush by hand counter-clockwise to increase, or clockwise to decrease charging rate. Third brush held in position by friction.

Maximum Charging Rate—20 amperes (cold), 17 amperes (hot), 8.5 volts, 2100 R.P.M., 17.9 M.P.H.

Performance Data—GBM-4604

Cold Amps.	Volts	R.P.M.	Hot Amps.	Volts	R.P.M.
0	6.4	760	0	6.4	800
4	6.8	920	4	6.9	960
8	7.25	1050	8	7.35	1150
12	7.65	1240	12	7.8	1360
16	8.1	1450	16	8.3	1750
20	8.5	2150	18	8.5	2450

Performance Data—GBM-4604-A-2

0	6.4	760	0	6.4	820
4	6.8	920	4	6.8	1000
8	7.3	1080	8	7.3	1200
12	7.75	1300	12	7.75	1500
16	8.2	1640	14.6	8.05	2300
17.2	8.3	2050			

Rotation—Counter-clockwise at commutator end.

Brush Spring Tension—24 ozs. minimum (old brushes), 36 ozs. maximum (new brushes).

Field Current—3.80-4.20 amperes at 6.0 volts.

Field Fuse—5 ampere under cover on generator field frame (GBM-4604). No fuse on GBM-4604A2.

Motoring Current—5.22-5.78 amperes at 6.0 volts.

Removal:—Pivot mounted at left front of engine with fan belt drive. To remove, take out two pivot bolts and one clamp bolt.

Belt Adjustment:—Loosen pivot bolts and clamp bolt, pull generator out or away from engine until fan can just be turned with belt held stationary.

SPECIAL GENERATORS:—Model GAR-4609-4 (first), GAR-4609-A-4 (later cars). Optional equipment on cars with radio or other accessories. Used with Relay-Regulator Model TC-4302. See Equipment Section for complete data.

CUTOUT RELAY:—Model CB-4021 (GBM-4604), CB-4014 (GBM-4604-A-2). Model CB-4021 has special terminal connected to main brush lead for Startix connection. See Equipment Section for complete data on these units.

Cuts In—6.4 volts, 6 M.P.H.

Cuts Out—1 ampere (.5-2.5) discharge current.

Relay Contact Gap—.025-.035".

Air Gap—.010-.030" with contacts closed.

LIGHTING:—Clum Switch Model 9582. Foot Control Switch Model 9584. Foot operated control switch on toeboard controls headlamp upper and lower beams. Headlamp bulbs are pre-focused type.

Bulb Specifications

Position	Candlepower	Mazda No.
Headlamps	32-32	2330
Parking	1.5	55
Instrument	3	63
Stop and Tail	21-2	1158
Dome	6	C81

FUSES:—Lighting—30 ampere on back of lighting switch.

Generator Field—5 ampere under cover on generator field frame (GBM-4604 only).

HORNS:—Sparton. Vibrator type. Horn current 6 amperes.

SERIAL NUMBER:—First number (Comm.) 8,103,001, (Pres.) 7,101,001. On plate on left frame side member under front fender.

ENGINE NUMBER:—Stamped on boss on upper left center of cylinder block.

ENGINE:—Own. Eight cylinder, In line, 'L' head type.
Bore—3 1/16". **Stroke**—4¼".
Piston Displacement—250 cubic inches.
Rated Horsepower—30.
Developed Horsepower—(Comm.) 107 at 3800 R.P.M. (Pres.) 110 at 3600-3800 R.P.M.
Compression Ratio—(Comm.) 6.0-1 (cast-iron head), (Pres.) 6.5-1 (aluminum head). The 6.5-1 aluminum head is optional on Commander models.
Compression Pressure—94-104 lbs. (6.0-1 head), 105-115 lbs. (6.5-1 head) at cranking speed (150 R.P.M.).

Pistons:—Lynite, aluminum alloy, 'T' slot, cam ground type (.00825-.01075" smaller diameter across pin bosses, piston not tapered vertically). Refinish cylinders to take replacement pistons furnished .002", .004", .010", .015", .020", .030" oversize. Replacement pistons stamped on head with exact size as measured at right angles to pin bosses ¼" from bottom of skirt. Piston length 3¾".
Weight—.84 lbs. (without rings or pin).
Removal—Pistons and rods removed from above.
Clearance—Top .015-.018". Bottom .0015".
Fitting New Pistons—Use .003" feeler stock 1" wide to check clearance. Insert piston in bore upside down with pin bosses parallel to crankshaft, and feeler between piston and cylinder wall midway between bosses on camshaft side (opposite side from slot). Pull required to withdraw feeler should be 7-13 pounds.
Installing Pistons—Slot should be on minimum pressure side (away from camshaft).

Piston Rings:—Three rings per piston, two compression, one oil control, all above pin. Oil ring groove is drilled radially with ten 5/32" oil drain holes. Compression rings are Perfect Circle '70' and should be installed with step downward. All pistons have a heat insulating groove above the top compression ring, this groove is slightly narrower than ring grooves, and no ring is fitted.

Ring	Width	End Gap	Wall Thickness
Comp. All	1/8"	.013-.018"	.135"
Oil Cont.	3/16"	.013-.018"	.125"

NOTE—Inner rings installed back of oil ring.

Piston Pin:—Diameter ⅞". Length 2⅝". Pin is locked in rod. Pin holes in piston are line-reamed and burnished.
Clearance in Piston—.0001-.0003" or light push fit. With this clearance rod will rock on piston of own weight. Fitted pins furn. with new pistons.

Connecting Rod:—Weight 2 lbs. Length 8".
Crankpin Journal Diameter—1.87425-1.87525".
Bearing Type—Removable Clevite (steel-backed, lead-bronze lined type).
Clearance—.00075-.00275". Sideplay .005-.009".
Adjustment—None. Replace bearings. Do not file caps. New bearings should be pressed in place in rod and cap (upper and lower halves interchangeable) so that tongues on bearings engage grooves in rod and cap and oil holes line up. Bearings cannot be reamed, and crankpins must be turned down to size giving correct clearance. Bearings furnished .005", .010", .020" undersize and standard.

Crankshaft:—Nine bearings. Bolted-on counterweights.
Journal Diameters—2.3435-2.3440" all bearings.
Bearing Type—Interchangeable steel-backed, babbitt-lined type.
Clearance—.001-.003".
Adjustment—None. Replace bearings. Do not file caps.
End Thrust—Taken by #1 (front) bearing. End-play .003-.006. Adjusted by shims.

Camshaft:—Six bearings. Helical gear drive.
Bearing Type—Split steel-backed, babbitt-lined.
Clearance—.00075" (front), .002-.00375" (all others).
End Thrust—Taken by steel trust washer between #1 bearing and camshaft gear.
Timing Gears—Crankshaft gear cast-iron, camshaft gear Celeron Fabric. Camshaft gears furnished for service in three sizes, 'S' standard, 'L' low limit, 'H' high limit.
Camshaft Setting—Gears are marked. Mesh marked tooth of crankshaft gear between two marked teeth on camshaft gear. Use gear pullers.

Valves:—

	Head Diameter	Stem Diameter	Length
Intake	1 13/32"	11/32"	5 7/32"
Exhaust	1 9/32"	11/32"	5 7/32"

	Seat Angle	Lift	Stem-to-Guide Clearance
All Valves	45°	11/32"	.001-.003"

Tappet Clearance—.004" Int., .006" Exh. eng. hot.
Valve Springs—Springs installed with closed coils at top. Cup type valve cages used on all springs at top.

	Spring Pressure	Length
Valve Closed	59-64 lbs.	2 3/32"
Valve Open	98-108 lbs.	1¾"

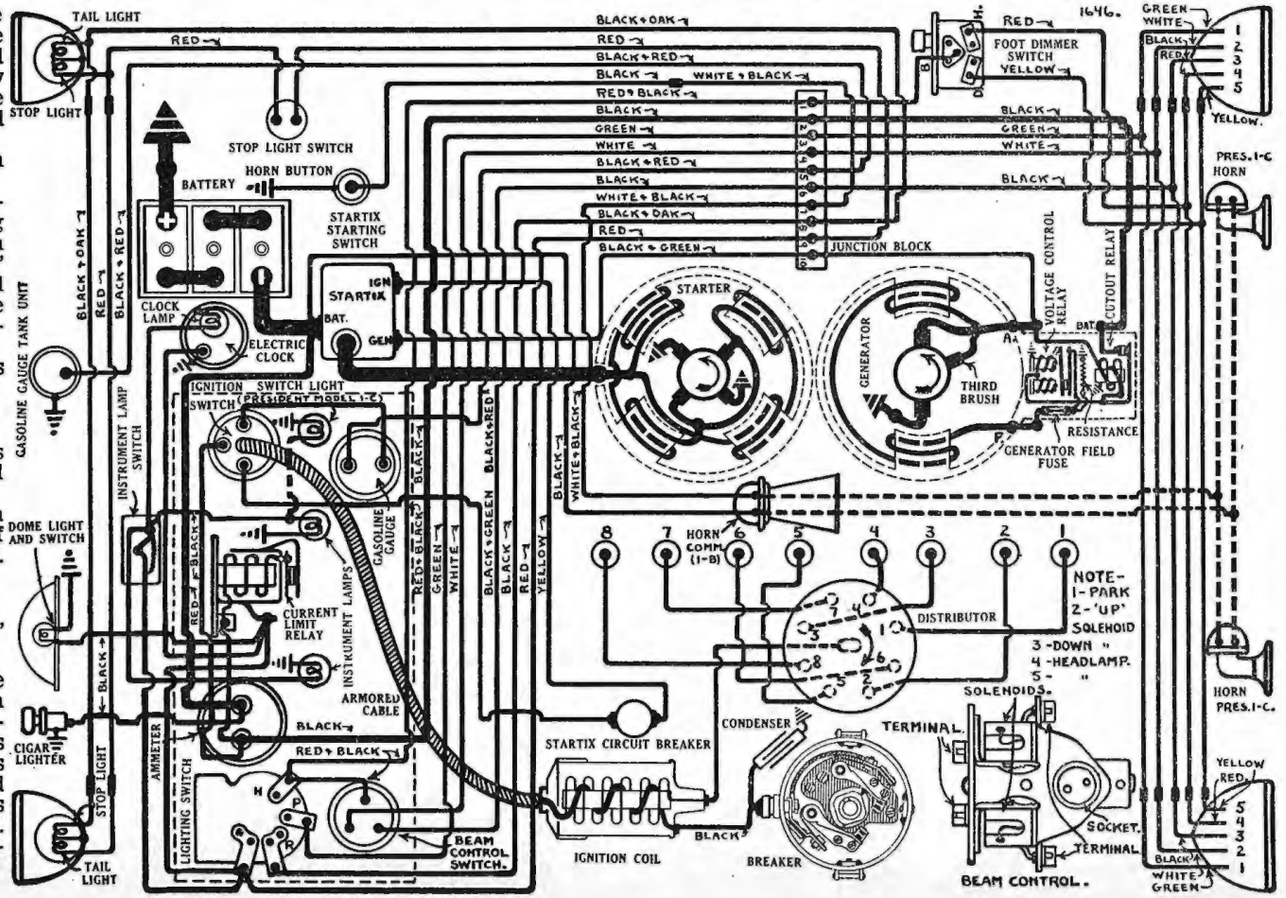
Valve Timing—See Camshaft Setting (above).
Intake Valves—Open 15° BTDC. Close 43° ALDC.
Exhaust Valves—Open 48° BTDC. Close 10° ATDC.
To Check Valve Timing—Set tappet clearance #1 intake valve at .010". This valve should open with piston 15° or .0915" before top dead center when flywheel mark 'IN.OP./1-8' lines up with indicator. Reset tappet clearance at .004" with engine hot.

Lubrication:—Pressure. Gear type oil pump located in crankcase.
Normal Oil Pressure—40 lbs. at 27.4 M.P.H.
Oil Pressure Relief Valve—Operates at 40 lbs. On left front corner of crankcase. Screw adjustment.
Capacity and Oil—8 qts. Use SAE. #30 (summer 45° to 90°F.—average driving), #40 (summer above 90°F.—high speed driving), #20 (winter 45° to 0° F.), #10 (winter below 0°F.).

CARBURETION:—See Carburetion Section for data.
Carburetor:—Stromberg, Model EE-1, 1" dual, down-draft type with lever type Fast idle.
Automatic Choke—Stromberg Type.

Fuel Pump:—A.C. (Comm.) Type T-1521796, (Pres.) Type J-1521797 fuel and vacuum pump.

Gasoline Gauge:—A.C., Electric type.



CLUTCH:—Long. Single plate, dry disc type. No adjustment required for wear.

Clutch Pedal Adjustment—Free movement of clutch pedal must be 1″ minimum. Adjust by turning clutch release adjustment lever set screw (on left hand side of clutch housing). On Commander cars check setting of free-wheeling unit positive lock control rod after adjusting pedal.

Free-wheeling Control Rod—To adjust, loosen clevis pin holding control rod on clutch release shaft lever, turn control rod clevis until clevis pin can just be inserted with free-wheeling unit positive lock pin lever in the extreme rear position and both springs (thrusting against lock pin lever swivel) compressed equally. Gear shift lever must be in neutral and free-wheeling control in free-wheeling position.

Clutch Facings—Moulded type, 2 required, 5½″ I.D., 9¾″ O.D., 9/64″ thick.

Installing New Facings—One facing riveted to main driving plate, one facing riveted to spring segments. To remove old facings, drill out 12 iron rivets holding sections together, then drill out brass facing rivets after separating sections. Spring segments should be riveted to facings so that clearance is between center portion of spring segment and facing at outer circumference (center portion of spring segments will bear against main plate when sections assembled).

NOTE—Use alignment shaft and adjusting sleeve HMJ-278, HMJ-278-2 to set up release levers in reassembling clutch, or use straightedge across top of stamped steel cover plate and set lever height at ⅞″ below. Levers must be equal within .020″.

STEERING:—Front Suspension—Independent type with transverse spring.

Kingpin Inclination—9½° crosswise.

Caster—½° (-¼ to +¾°) with car weight on wheels, tires properly inflated, and frame level (car unloaded). Caster determined by spring mounting. No adjustment possible.

Camber—1-1½° with car weight on wheels, car unloaded and on level floor, frame height normal (bounce car up and down several times), tires properly inflated. Camber adjusted by adding or removing shims located between steering knuckle support arm and steering knuckle support arm outer bearing. Shims are 1/32″ thick. One shim will change camber angle ¼°. Maximum allowable number of shims is six.

Toe In—1/16-⅛″. Adjust by changing length of longer tie rod (shorter tie rod need not be adjusted). Tie rod has right and left hand threads.

IGNITION:—Coil Model 538-A (Comm.), 538-H (Pres). On cowl connected to switch by armored cable.

Ignition Current—½-1½ amp. idling, 4.5 stopped.

Ignition Switch:—Type 430-A. Two 'on' positions. Regular running position is with key turned to right (ignition on, Startix operative). Turn key to left whenever automatic cranking not wanted.

Distributor Model 662-M. Double breaker, 4 lobe cam, full automatic advance type with auxiliary vacuum spark control. Contacts open alternately at 45° intervals corresponding to 90° firing interval of engine. Must be synchronized (see Timing).

Breaker Gap—Set at .020″. Limits .018-.024″.

Breaker Arm Spring Tension—19-23 ounces.

Cam Angles—Closed—34°. Open 11° (distributor). Both sets together when properly synchronized.

Automatic Advance

Distributor Degrees	R.P.M.	Engine Degrees	R.P.M.
Start	300	2.5	600
14.5	1800	29	3600

Vacuum Spark Control Model 680-J. Vacuum unit provides additional advance except when engine is being accelerated, pulling heavily, or operated with wide open throttle when spark will be retarded by return spring within unit.

Vacuum Unit

Advance—Engine °	Vacuum—Inches of Hg.
Start	3″ min.
5-7°	6″ max.

Removal:—Mounted on cylinder head. To remove, loosen advance arm clamp bolt, lift distributor out.

IGNITION TIMING:— Flywheel Degs. Piston Position

All engines ..... At TDC. ..... .0000″ TDC.

Timing (Stationary Contacts)—Use left hand 'on' position of ignition switch if ignition turned on to check contact opening (to avoid automatic cranking). Crank engine by placing transmission in high and rolling car forward on floor. With #1 piston on top dead center of compression stroke and flywheel mark 'UDC/1-8' lined up with indicator in inspection hole in flywheel housing, loosen advance arm clamp bolt, rotate distributor until stationary contacts open, tighten clamp bolt.

Synchronization (Movable Contacts)—Turn engine over 90° to top dead center position for piston #6 with flywheel mark 'UDC/3-6' lined up with indicator. Loosen lock screws on movable sub-plate carrying second set of contacts, turn eccentric adjusting screw until contacts open, tighten lock-screws.

Synchronization (using Tool)—Use special Delco-Remy tool, Part #1838182,. See Equipment Section for complete directions. Firing intervals should be regular 45-45-45 distributor degrees.

Firing Order:—1-6-2-5-8-3-7-4 (see diagram).

Spark Plugs:—Champion, Type #8. 18 MM. Metric.

Spark Plug Gaps—.025″. Limits .0225-.0275″.

BATTERY:—Comm., Willard, Type WH-1-13, RH-1-13 (export), 6 volt, 13 plate, 102 A.H. capacity (20 hour rate). Starting capacity 120 amperes for 20 minutes.

Pres., Willard, Type WH-4-17, RH-4-17 (export), 6 volt, 17 plate, 136 A.H. capacity (20 hour rate). Starting capacity 160 amperes for 20 minutes.

Grounded Terminal—Positive (+) terminal.

Location—Left hand side under front floor boards.

STARTER:—Model 736-H. Armature No. 1838663.

Starter Drive—Outboard Bendix Type RCD10FXD-9.

Rotation—Counter-clockwise at commutator end.

Brush Spring Tension—32-36 ounces.

Cranking Performance—90 R.P.M., 180 amperes.

Performance Data

Torque	R.P.M.	Volts	Amperes
0 ft. lbs.	6000	5.0	65
15 "	Lock	3.15	570

Starting Switch:—Startix automatic starting switch and Startix circuit breaker (anti-backfire unit). See Equipment Section for complete data.

Removal:—Flange mounted on left hand front face of flywheel housing. Take out two capscrews.

GENERATOR:—Model 935-Y. Armature No. 1856072. Air-cooled. Third brush control with external voltage control (Voltage control Relay) providing two step charging rate. See Equipment Section.

Charging Rate Adjustment—Connect test ammeter in charging line at 'Bat' terminal of control unit, short out Voltage Control Relay by connecting jumper wire between 'F' terminal and ground. Loosen lock screw on commutator end plate, shift third brush by hand counter-clockwise to increase, or clockwise to decrease charging rate, tighten locking screw, remove jumper wire.

Maximum Charging Rate—20 amperes (cold), 17 (hot), 8.5 volts, 2800 R.P.M. or 33.3 M.P.H. (Comm.), 32.3 M.P.H. (Pres.).

Performance Data

	Amperes	Volts	R.P.M.
Cold	20-23	8.5-8.8	2800
Hot	16-20	8.1-8.5	3100

Rotation—Counter-clockwise at commutator end.

Brush Spring Tension—22-26 ozs. (main), 16-20 ozs. (third brush).

Field Current—2.3-2-6 amperes at 6.0 volts.

Field Fuse—6 ampere capacity in control unit.

Removal:—Cradle mounted at left front of engine. To remove, slack off belt, disconnect water pump drive coupling, loosen mounting clamp band.

Belt Adjustment:—To take up slack in generator drive belt, loosen nut back of fan bracket, lift up fan assembly until fan can just be turned with belt held stationary, tighten bracket nut.

CONTROL UNIT:—Model 5546. Mounted on generator. Consists of Cutout Relay and Voltage Control Relay. See complete articles in Equipment Section.

Cutout Relay

Cuts In—6.4-6.8 volts, 8.3 M.P.H. (Comm.), 8.1 M.P.H. (Pres.).

Cuts Out—3 amperes maximum discharge.

Relay Contact Gap—.015-.025″.

Air Gap—.012-.017″ contacts closed.

Voltage Control Relay

Contacts Open—8.35-8.65 volts at 70°F.

Contacts Close—7.3-7.7 volts at 70°F.

Contact Gap—.008-.013″.

Contact Spring Tension—.7-.9 ounces.

Air Gap—.028-.040″ between armature and core (armature down against lower stop), .028-.040″ armature travel (between armature and lower stop).

LIGHTING:—Clum Switch, Model 9583. Foot Control Switch Model 9584. R.B.M. Beam Control Switch Model 1100. Lights are turned off and on by lighting switch. Headlight system provides six beam patterns. Three driving beams (Primary or Clear Road Beam, Secondary or Lower Beam, City or Low Beam) are controlled by Beam Control Switch on instrument panel. A passing or deflected beam for each of the driving beams is provided by operation of the Foot Control Switch.

Bulb Specifications

Position	Candlepower	Mazda No.
Headlights	32-32	1000
Parking	1.5	55
Clock & Ig. Switch (Pres.)	1.5	55
Instrument	3	63
Stop and Tail	21-2	1158
Dome	6	C-81

CURRENT LIMIT RELAY:—Model 410-L. Vibrating circuit breaker in lighting circuits. Starts to operate with load of 30-35 amperes limiting load to 5-18 amperes.

Contact Gap—.012-.030″.

Air Gap—.015-.030″ with contacts closed.

Spring Tension—5 ozs. min. at brass button.

FUSES:—Generator Field—6 ampere in Control Unit.

HORNS:—Sparton Vibrator type (Twin horns on Pres. model). Horn current 6 amperes each.

SERIAL NUMBERS:—First number — 51-101. On plate on engine side of dash. All cars have this prefix '51'.

ENGINE NUMBER:—First number 103,001. Stamped on left side of cylinder block opposite #6 cylinder.

ENGINE:—Own. Six cylinder, 'L' head type.
Bore—3". **Stroke**—5".
Piston Displacement—212.058 cubic inches.
Rated Horsepower—21.6.
Developed Horsepower—88 at 3800 R.P.M. (std. 6.0-1 head), 100 at 3800 R.P.M. (optl. 7.0-1 head).
Compression Ratio—6.0-1 (std. cast iron head), 7.0-1 (optl. composite aluminum-iron head).
Compression Pressure — 111 lbs. at 215 R.P.M. (6.0-1 head), 127 lbs. at 207 R.P.M. (7.0-1 head) with all spark plugs removed and throttle wide open.
NOTE—High-octane type fuel must be used in engines with 7.0-1 ratio composite head.

Pistons:—Own, Lo-Ex silicon-aluminum alloy, 'T' slot, cam ground type. Refinish cylinders to take finished replacement pistons furnished in following sizes: B, D, F, J—standard bore (3.000-3.004"), BO, DO, FO, JO—ten-thousandths oversize (3.010-3.014"), BB, DD, FF—twenty-thousandths oversize (3.020-3.022"). Piston length, 3 3/16".
Weight—10.88 ozs. stripped, 12.99 ozs with rings and pin.
Removal—Pistons and rods removed from above.
Clearance—Top .016". Bottom .001".
Fitting New Pistons—Use feeler gauge .0015-.002" thick to check clearance. It should be possible to withdraw feeler from between piston and cylinder wall on side opposite slot when grasped between thumb and forefinger.
Installing Pistons—Slot should be to left or away from valves.

Piston Rings:—Two compression rings, one oil control ring above pin, one oil control ring below pin. Lower ring groove drilled radially with oil drain holes.

Ring	Width	End Gap	Wall Thickness
Comp.	.093"	.006-.016"	.123".
Oil Cont.	.187"	.006-.016"	.128".

Piston Pin:—Diameter ¾". Length 2 7/16". Pin floats in piston and rod. Held by retaining rings.
Pin Fit in Piston—Snug fit with piston at 200° F.
Clearance in Rod Bushing—.0003".

Connecting Rod:—Weight 28.96 ozs. Length 8 3/16".
Upper Bearing—Bronze bushing.
Lower Bearing—Spun-babbitt lined type.
Clearance—.001". Sideplay .006-.010".
Adjustment—Shims (laminated type). Do not file rod or caps.
Crankpin Journal Diameter—1 15/16".
Installing Rods—Connecting rod lower bearings are offset. Install rods with right hand offset (widest half of bearing toward rear) in cylinders #1, 2, 4, and rods with left hand offset (widest half of bearing toward front) in #3, 5, 6.

Crankshaft:—3 bearing. Integral counterweights.
Journal Diameters—#1 2 11/32", #2 2⅜", #3 2 13/32".
Bearing Type—Removable bronze-backed, babbitt-lined.
Clearance—.001".
Adjustment—Laminated shims. Do not file caps.
End Thrust—Taken by #2 (center) bearing. Endplay .006-.012".

Camshaft:—Three bearing. Gear driven.
Timing Gears—Crankshaft gear Steel. Camshaft gear GE. Bakelite.
End Thrust—Taken by spring-loaded plunger in camshaft gear and thrust plate on gear cover.
Camshaft Setting:—Gears are marked. Mesh marked tooth on crankshaft gear between two marked teeth on camshaft gear.

Valves:—

	Head Diameter	Stem Diam.	Length
All Valves	1⅜"	5/16"	5 11/32"

	Seat Angle	Lift	Stem Clearance
Intake	45°	11/32"	.0015-.003".
Exhaust	45°	11/32"	.003-.005".

Tappet Clearance—.006" Int., .008" Exh., engine hot.
Valve Springs—Cages installed on all springs at bottom. Install with open side toward cylinder.

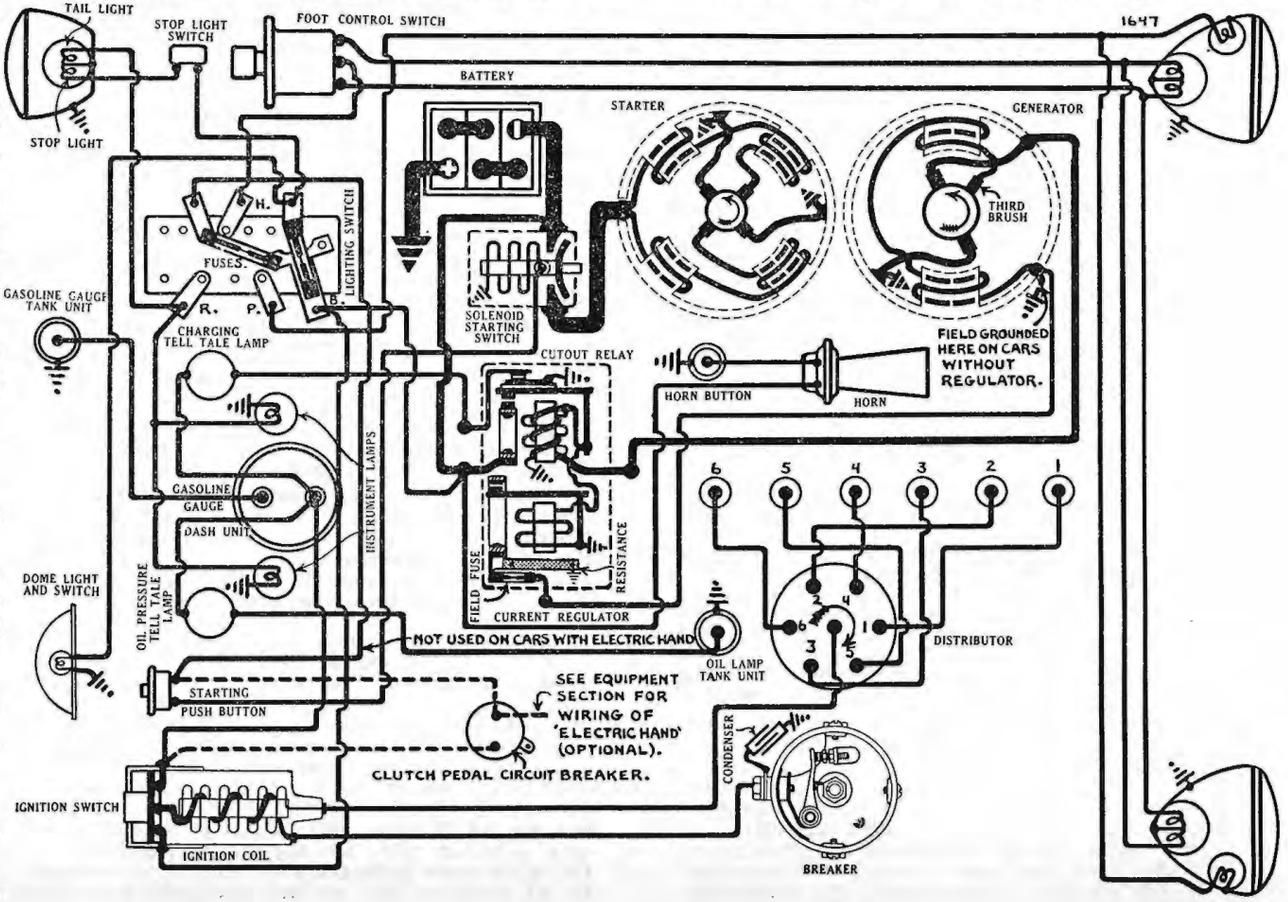
	Spring Pressure	Length
Valve Closed	44 lbs.	2"
Valve Open	102 lbs.	1 21/32"

Valve Timing—See Camshaft Setting (above).
Intake Valves—Open 10°40' BTDC. Close 60° ALDC.
Exhaust Valves—Open 50° BLDC. Close 18°44' ATDC.
To Check Valve Timing—Set tappet clearance #1 intake valve at .010". This valve should open with piston 10°40' or .0562" before top dead center when a point on the flywheel approximately 3.17 teeth before top dead center mark 'UDC. 1-6' lines up with indicator. Reset tappet clearance at .006" with engine warm and running.

Lubrication:—Duo-flow (splash) system with positive pump feed to oil troughs and timing gears. Oscillating plunger type oil pump mounted on right side of crankcase.
Normal Oil Pressure—3 lbs.
Oil Pressure Relief Valve—Operates at 3 lbs. Located on right hand side of crankcase at rear (combined with oil pressure signal light switch). See Signal Light data in Equipment Section. No adjustment.
Capacity & Oil—5 qts. (refill), 6 qts. (dry). Use SAE, #30 (above 40°F), 20-W (40° to 0°F), #10-W (0° to —15°F.).

CARBURETION:—See Carburetion Section for data.
Carburetor: — Carter Model 311-S, 1¼" downdraft type.
Fuel Pump:—AC. Type R-1521540 diaphragm type.
Gasoline Gauge:—King-Seeley electric type.

CLUTCH:—Own make. Single plate type operating in oil. No adjustment for wear required.
Clutch Pedal Adjustment—Free movement of clutch pedal must 1½". To adjust, loosen locknut on clutch pedal connecting link, remove clevis pin at lower end of link, turn clevis until free movement of pedal is 1½", replace pin and tighten locknut. See adjustment for Automatic Clutch linkage below.
Automatic Clutch Conrtol—On cars with Automatic clutch, check control linkage whenever



clutch pedal is adjusted. Depress accelerator pedal, pull back on clutch control unit cable (left side of engine), check clearance between back of slot in cable yoke and clevis pin which attaches it to operating lever. This clearance should be 7/8".

Clutch Lubrication—Oil in clutch should be drained and replaced at 5000-15000 mile intervals. To drain oil, turn flywheel until filler plug is visible in inspection hole (left hand front face of flywheel housing), remove plug, turn flywheel until star stamped on flywheel is visible in inspection hole, allow at least one minute in this position for draining, turn flywheel until filler plug hole is visible, insert 1/3 pint Hudsonite Clutch Compound, replace filler plug.

Clutch Facings—Driven plate is 5 3/8" I.D., 8 5/8" O.D., .203" thick. Facing consists of 90 cork inserts mounted on driven plate.

STEERING:—Front Suspension—Conventional 'I' beam section front axle with Elliott type ends and semi-elliptic springs (standard), or Axle-flex articulated axle (optional). Data and adjustments for both types are the same.

Kingpin Inclination—7° crosswise.

Caster—3 1/4-3 3/4°. Adjust by inserting wedge shims between springs and spring pad on axle.

Camber—1/2°. No adjustment. Axle may be bent cold to correct camber.

Toe In—1/8" measured 10" above ground. Adjust by loosening tie rod end clamp bolts and rotating tierod in direction that wheels revolve to increase, or in opposite direction to decrease toe-in. NOTE—End thrust on kingpin is taken by five ball bearings in plug above kingpin. Bearing lower race is machined directly in kingpin end.

AUTOMATIC SHIFT (ELECTRIC HAND):—Bendix electro-pneumatic type optional on these cars. See article in Equipment Section for complete description, wiring diagram, and trouble shooting.

IGNITION:—Coil Model IG-4616. Resistance unit mounted on distributor connected in primary.

Ignition Current—2.5 amperes idling, 4.5 stopped.

Ignition Switch:—Electrolock. Connected to coil by armored cable.

Distributor Model IGB-4301-A (first 25076 cars), IGB-4301-B (after Eng. No. 128077). Single breaker, 6 lobe cam, full automatic advance type.

Breaker Gap—Set at .020". Limits .018-.020".

Breaker Arm Spring Tension—16-22 ounces.

Cam Angles—Closed 40.5°. Open 19.5° (distributor).

Automatic Advance—IGB-4301-A

Distributor Degrees	R.P.M.	Engine Degrees	R.P.M.
Start	400	0	800
3	720	6	1440
6	1040	12	2080
9	1360	18	2720
12	1680	24	3360
15	2000	30	4000

Automatic Advance—IGB-4301-B

Start	300	0	600
3	400	6	800
5	615	10	1230
10	1150	20	2300
14.5	1630	29	3260

Removal:—Mounted on right side of crankcase. To remove, take out hold-down screw in advance arm.

IGNITION TIMING:—

	Flywheel Degs.	Piston Posi.
First 25076 cars	4 1/2° or 1/2" BTDC.	.0101" BTDC.
Eng. No. 128077 up	At TDC.	.0000" TDC.

Timing (Initial Setting)—With #1 piston on compression, turn engine over until piston reaches top dead center, stop when flywheel mark 'UDC. 1-6' lines up with pointer on edge of inspection hole in left front face of flywheel housing above starter (after 25076 cars or 1/2" before this point on first cars). Loosen hold-down screw in advance arm, turn distributor clockwise to limit of advance arm slot, then turn distributor slowly counter-clockwise until contacts just open, tighten hold-down screw, see that rotor is opposite #1 segment in distributor cap. Car should then be road-tested and spark advanced as much as operating conditions and fuel will allow.

Timing (Final Setting)—With engine at normal operating temperature, and running at 8 M.P.H. in high gear on level road, accelerate engine rapidly and note performance from 10-15 M.P.H. A slight spark knock should be noticed. If no knock is heard, loosen hold-down screw and advance distributor one graduation on scale (turn distributor counter-clockwise) If knock is too severe, retard distributor one graduation (clockwise). Repeat test until satisfactory setting is secured. Final setting must not be beyond maximum advance mark on flywheel (3/4" before mark 'UDC.1-6').

Firing Order:—1-5-3-6-2-4. See diagram.

Spark Plugs—Champion Type J-7-S. 14 MM. Metric.

Spark Plug Gaps—Set at .022".

BATTERY:—National, Type ST-3-17X. 6 volt 17 plate, 96 A.H. capacity (20 hour rate).

Starting Capacity—120 amperes for 20 minutes.

Grounded Terminal—Positive (+) terminal.

Location—On left hand side under front floor.

STARTER:—Model MAB-4060. Armature MAB-2114.

Starter Drive—Inboard Bendix, Type A-1588.

Rotation—Counter-clockwise at commutator end.

Brush Spring Tension—44-56 ozs. (new brushes).

Cranking Performance—150 R.P.M.

Performance Data

Torque	R.P.M.	Volts	Amperes
0 ft. lbs.	3700	5.5	60
3.4 "	1100	5.0	200
6.6 "	695	4.5	300
10.15 "	420	4.0	400
15.8 "	Lock	3.0	582
22.5 "	Lock	4.0	775

Lock torque figures correct without switch.

Starting Switch:—Type SS-4001. Solenoid type switch mounted on starter field frame controlled by pushbutton switch. See Equipment Section.

Removal:—Starter flange mounted on left front face of flywheel housing. To remove, take out flange mounting bolts.

GENERATOR:—Model GBK-4601-2. Armature No. GBK-2055. Air-cooled. Third brush control type. Current Regulator (two-rate charging control) used on some models. See Equipment Section for complete data on Regulator.

Charging Rate Adjustment—Use test meters to check generator output. On cars with Current Regulator, short out regulator by connecting jumper wire from 'F' terminal on generator to ground on generator frame. Take off commutator cover band, shift third brush by hand counter-clockwise to increase charging rate, or clockwise to decrease charging rate. Third brush held in position by friction. Remove jumper wire.

Maximum Charging Rate—17 amperes (cold) or 13 amperes (hot) cars without regulator or 22 amperes (cold), 17 amperes (hot) cars with regulator, 8.0 volts, 2200 R.P.M., 28 M.P.H.

NOTE—On generators used without the regulator, the field terminal on the generator frame is grounded by a grounding cup assembled on the terminal. This ground cup must be removed when a regulator is installed.

Performance Data—No Regulator

Cold			Hot		
Amps.	Volts	R.P.M.	Amps.	Volts	R.P.M.
0	6.4	800	0	6.4	840
4	6.8	1000	4	6.85	1050
8	7.2	1200	8	7.3	1260
12	7.6	1400	12	7.7	1560
16.5	8.0	2200	14.8	8.0	2250

Rotation—Counter-clockwise at commutator end.

Brush Spring Tension—18-22 ozs. (new brushes).

Field Current—4.08-4.52 amperes at 6.0 volts.

Field Fuse—5 ampere in knurled cup on side of regulator case (no fuse when regulator not used).

Motoring Current—4.18-4.62 amperes at 6.0 volts.

Removal:—Pivot mounted at left front of engine with fan belt drive. To remove, take out two pivot bolts and one clamp bolt.

Belt Adjustment:—Loosen pivot bolts and clamp bolt, pull generator out from engine until slack on belt midway between crankshaft and generator pulleys is 1 1/4" (measure from straightedge across pulleys), tighten mounting bolts.

CUTOUT RELAY:—Model CBA-4002. Used on cars without regulator. Mounted on dash. See Equipment Section for complete data.

Cuts In—6.4 volts, 8 M.P.H.

Cuts Out—.5-2.5 amperes discharge current.

Contact Gap—.025-.035". With upper or ground contacts closed.

Air Gap—.010-.030" with contacts closed.

RELAY-REGULATOR:—Model TC-4304-A. Used on some cars. Mounted on dash. Consists of Cutout Relay and Current Regulator in a single case. See Equipment Section for data on these units.

Cutout Relay

All data same as for Model CBA-4002 above.

Current Regulator

Contacts Open—8.45-8.95 volts at 70°F.

Contacts Close—1.1-1.3 volts below opening point.

Contact Gap—.005" minimum.

Air Gap—.045" with contacts closed.

LIGHTING:—Soreng-Manegold Switch Model F-5640-A. R.B.M. Foot Control Switch Model 1076, A. Foot switch used to control Country Driving (high) and City (low) beams with lighting switch in second or driving position. Headlamp bulbs are pre-focused type.

Bulb Specifications

Position	Candlepower	Mazda No.
Headlamps	32-21	2320-C
Parking, Instrument	3	63
Stop and Tail	21-2	1158
Dome	15	87
Signal lights	3	64 (DC)

SIGNAL LIGHTS:—Battery Charge Tell-tale and Oil Pressure Tell-tale lights mounted in instrument cluster. See Equipment Section for complete data.

HORNS:—Auto-Lite Type HA-4003, 4004 Std. Klaxon Model K-26-M Type 1716 (high note), 1717 (low note) Optional. All horns are vibrator type. Optional horns are matched tone, twin horns.

FUSES:—Lighting—Two 20 ampere on back of switch.

Generator Field—5 ampere in knurled plug on regulator case—not used without regulator.

SERIAL NUMBER:—First number, 52-101. On plate on engine side of dash. All serial numbers have this prefix '52'.

ENGINE NUMBER:—First number, 103,001. Stamped on left side of cylinder block opposite #6 cylinder.

ENGINE:—Own. Six cylinder, 'L' head type.
Bore—3". **Stroke**—5".
Piston Displacement—212.058 cubic inches.
Rated Horsepower—21.6.
Developed Horsepower—88 at 3800 R.P.M. (std. 6.0-1 head), 100 at 3800 R.P.M. (optl. 7.0-1 head).
Compression Ratio—6.0-1 (std. cast-iron head), 7.0-1 (optl. composite aluminum-iron head).
Compression Pressure—111 lbs. at 215 R.P.M. (6.0-1 head), 127 lbs. at 207 R.P.M. (7.0-1 head) with all spark plugs removed and throttle wide open.
NOTE—High-octane type fuel must be used in engines with 7.0-1 ratio composite head.

Pistons:—Own, Lo-Ex silicon-aluminum alloy, 'T' slot Cam ground type. Refinish cylinders to take finished replacement pistons furnished in following sizes: B, D, F, J—standard bore (3.000-3.004"), BO, DO, FO, JO—ten-thousandths oversize (3.010-3.014"), BB, DD, FF—twenty-thousandths oversize (3.020-3.022"). Piston length, 3 3/16".
Weight—10.88 ozs. stripped; 12.99 ozs. with rings and pin.
Removal—Pistons and rods removed from above.
Clearance—Top .016". Bottom .001".
Fitting New Pistons—Use feeler gauge .0015-.002" thick to check clearance. It should be possible to withdraw feeler from between piston and cylinder wall on side opposite slot when grasped between thumb and forefinger.
Installing Pistons—Slot should be to left or away from valves.

Piston Rings:—Two compression rings, one oil control ring above pin, one oil control ring below pin. Lower ring groove drilled radially with oil drain holes.

Ring	Width	End Gap	Wall Thickness
Comp.	.093"	.006-.016"	.123"
Oil Cont.	.187"	.006-.016"	.128"

Piston Pin:—Diameter ¾". Length 2 7/16". Pin floats in piston and rod. Held by retaining rings.
Pin Fit in Piston—Snug fit with piston at 200°F.
Clearance in Rod Bushing—.0003".

Connecting Rod:—Weight 28.96 ozs. Length 8 3/16".
Crankpin Journal Diameter—1 15/16".
Lower Bearing—Spun-babbitt lined type.
Clearance—.001". Sideplay .006-.010".
Adjustment—Shims (laminated type). Do not file rod or caps.
Installing Rods—Connecting rod lower bearings are offset. Install rods with right hand offset (widest half of bearing toward rear) in cylinders #1, 2, 4, and rods with left hand offset (widest half of bearing toward front) in #3, 5, 6.

Crankshaft:—Three bearings. Integral counterweights.
Journal Diameters—#1, 2 11/32"; #2, 2⅜"; #3, 2 13/32".
Bearing Type—Removable bronze-backed, babbitt-lined.
Clearance—.001".
Adjustment—Laminated shims. Do not file caps.
End Thrust—Taken by #2 (center) bearing. End-play .006-.012".

Camshaft:—Three bearing. Gear driven.
Timing Gears—Crankshaft gear Steel. Camshaft gear GE. Bakelite.
End Thrust—Taken by spring-loaded plunger in camshaft gear and thrust plate on gear cover.
Camshaft Setting—Gears are marked. Mesh marked tooth on crankshaft gear between two marked teeth on camshaft gear.

Valves:—	Head Diam.	Stem Diam.	Length
All Valves	1⅜"	5/16"	5 11/32"

	Seat Angle	Lift	Stem Clearance
Intake	45°	11/32"	.0015-.003"
Exhaust	45°	11/32"	.003-.005"

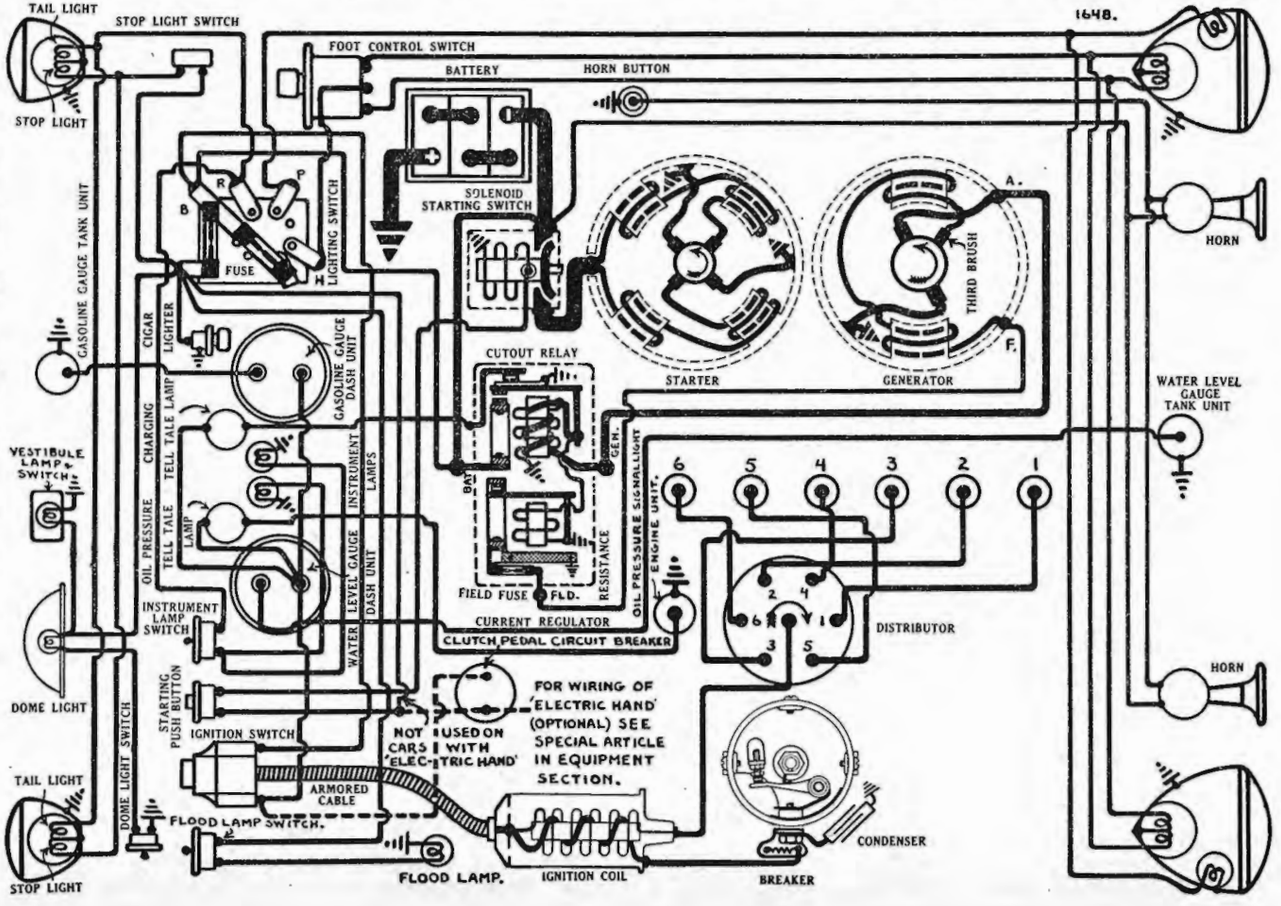
Tappet Clearance—.006" Int., .008" Exh. engine hot.
Valve Spring—Cages installed on all springs at bottom. Install with open side toward cylinder.

	Spring Pressure	Length
Valve Closed	44 lbs.	2"
Valve Open	102 lbs.	1 21/32"

Valve Timing—See Camshaft Setting (above).
Intake Valves—Open 10°40' BTDC. Close 60° ALDC.
Exhaust Valves—Open 50° BLDC. Close 18°44' ATDC
To Check Valve Timing—Set tappet clearance #1 intake valve at .010". This valve should open with piston 10°40' or .0562" before top dead center when a point on the flywheel approximately 3.17 teeth before top dead center mark 'UDC.1-6' lines up with the indicator. Reset tappet clearance at .006" with engine warm and running.
Lubrication—Duo-flow (splash) system with positive pump feed to oil troughs and timing gears. Oscillating plunger type oil pump mounted on right side of crankcase.
Normal Oil Pressure—3 lbs.
Oil Pressure Relief Valve—Operates at 3 lbs. Located on right hand side of crankcase at rear (combined with oil pressure signal light switch). See Signal Lights in Equipment Section. No adjustment required.
Capacity & Oil—5 qts. (refill), 6 qts. (dry). Use SAE. #30 (above 40°F), 20-W (40° to 0°F), #10-W (0° to —15°F).

CARBURETION:—See Carburetion Section for complete data on Carburetor, Automatic Choke, Fuel Pump, and Gasoline Gauge.
Carburetor:—Carter, Model 309-S, 1¼", downdraft type with drop-bar type Fast idle.
Automatic Choke—Carter Climatic Control integral with carburetor.
Fuel Pump:—AC. Type R-1521540 diaphragm type.
Gasoline Gauge:—King-Seeley electric type.

CLUTCH:—Own make. Single plate type operating in oil. No adjustment for wear required.
Clutch Pedal Adjustment—Free movement of clutch pedal must be 1½". To adjust, loosen locknut on clutch pedal connecting link, remove clevis pin at lower end of link, turn clevis until free movement of pedal is 1½", replace pin and



tighten locknut. See adjustment for Automatic Clutch linkage below.

Automatic Clutch Control—On cars with Automatic clutch, check control linkage whenever clutch pedal is adjusted. Depress accelerator pedal, pull back on clutch control unit cable left side of engine), check clearance between back of slot in cable yoke and clevis pin which attaches it to operating lever. This clearance should be 7/8".

Clutch Lubrication—Oil in clutch should be drained and replaced at 5000-15000 mile intervals. To drain oil, turn flywheel until filler plug is visible in inspection hole (left hand front face of flywheel housing), remove plug, turn flywheel until star stamped on flywheel is visible in inspection hole, allow at least one minute in this position for draining, turn flywheel until filler plug hole is visible, insert 1/3 pint Hudsonite Clutch Compound, replace filler plug.

Clutch Facings—Driven plate is 5 3/8" I.D., 8 5/8" O.D., .203" thick. Facing consists of 90 cork inserts mounted on driven plate.

STEERING:—Front Suspension—Conventional 'I' beam section front axle with Elliott type ends and semi-elliptic springs (standard), or Axle-flex articulated axle (optional). Data and adjustments for both types are the same.

Kingpin Inclination—7° crosswise.

Caster—3 1/4-3 3/4°. Adjust by inserting wedge shims between springs and spring pad on axle.

Camber—1/2°. No adjustment. Axle may be bent cold to correct camber.

Toe In—1/8" measured 10" above ground. Adjust by loosening tie rod end clamp bolts and rotating tie rod in direction that wheels revolve to increase toe-in, or in opposite direction to decrease toe-in.

NOTE—End thrust on kingpin is taken by five ball bearings in plug above kingpin. Bearing lower race is machined directly in kingpin end.

AUTOMATIC SHIFT (ELECTRIC HAND):—Bendix electro-pneumatic type optional on these cars. See article in Equipment Section for complete description, wiring diagram, and trouble shooting.

IGNITION:—Coil Model IG-4616. Resistance unit mounted on distributor connected in primary circuit.

Ignition Current—2.5 amperes idling, 4.5 stopped.

Ignition Switch—Electrolock. Connected to coil by armored cable.

Distributor Model IGB-4301-A (first 25076 cars), IGB-4301-B (Eng. No. 128077 up). Single breaker, 6 lobe cam, full automatic advance type.

Breaker Gap—Set at .020". Limits .018-.020".

Breaker Arm Spring Tension—16-22 ounces.

Cam Angles—Closed 40.5°. Open 19.5° (distributor).

Automatic Advance—IGB-4301-A

Distributor Degrees	R.P.M.	Engine Degrees	R.P.M.
Start	400	0	800
3	720	6	1440
6	1040	12	2080
9	1360	18	2720
12	1680	24	3360
15	2000	30	4000

Automatic Advance—IGB-4301-B

Start	300	0	600
3	400	6	800
5	615	10	1230
10	1150	20	2300
14.5	1630	29	3260

Removal:—Mounted on right side of crankcase. To remove, take out hold-down screw in advance arm, lift out.

IGNITION TIMING:—

	Flywheel Degs.	Piston Pos.
First 25076 cars	4 1/2° or 1/2" BTDC.	.0101" BTDC.
Eng. No. 128077 up	At TDC.	.0000" TDC.

Timing (Initial Setting)—With #1 piston on compression, turn engine over until piston reaches top dead center, stop when flywheel mark 'UDC. 1-6/' lines up with pointer on edge of inspection hole in left front face of flywheel housing above starter (after 25076 cars or 1/2" before this point on first cars). Loosen hold-down screw in advance arm, turn distributor clockwise to limit of advance arm slot then turn distributor slowly counter-clockwise until contacts just open, tighten hold-down screw, see that rotor is opposite #1 segment in distributor cap. Car should be road-tested and spark advanced as much as operating conditions and fuel will allow.

Timing (Final Setting)—With engine at normal operating temperature, and running at 8 M.P.H. in high gear on level road, accelerate engine rapidly and note performance from 10-15 M.P.H. A slight spark knock should be noticed. If no knock is heard, loosen hold-down screw and advance distributor one graduation on scale (turn distributor counter-clockwise). If knock is too severe, retard distributor one graduation (clockwise). Repeat test until satisfactory setting is secured. Fnal setting must not be beyond maximum advance mark on flywheel (3/4" before mark 'UDC.1-6/).

Firing Order:—1-5-3-6-2-4. See diagram.

Spark Plugs:—Champion Type J-7-S. 14 MM. Metric.

Spark Plug Gaps—Set at .022".

BATTERY:—National, Type ST-3-17X. 6 volt, 17 plate, 96 A.H. capacity (20 hour rate).

Starting Capacity—120 amperes for 20 minutes.

Grounded Terminal—Positive (+) terminal.

Location—On left hand side under front floor.

STARTER:—Model MAB-4060. Armature No. MAB-2114

Starter Drive—Inboard Bendix, Type A-1588.

Rotation—Counter-clockwise at commutator end.

Brush Spring Tension—44-56 ozs. (new brushes).

Cranking Performance—150 R.P.M.

Performance Data

Torque	R.P.M.	Volts	Amperes
0 ft. lbs.	3700	5.5	60
.6 "	1910	5.5	100
3.4 "	1100	5.0	200
6.6 "	695	4.5	300
10.15 "	420	4.0	400
15.8 "	Lock	3.0	582
22.5 "	Lock	4.0	775

Lock torque figures correct without switch.

Starting Switch:—Type SS-4001. Solenoid type switch mounted on starter field frame controlled by pushbutton switch on instrument panel. See Equipment Section.

Removal:—Starter flange mounted on left front face of flywheel housing. To remove, take out flange mounting bolts.

GENERATOR:—Model GBK-4602-1. Armature No. GBK-2055. Ventilated, third brush control type with external current regulation (two-step charging rate). See Equipment Section for complete data on Regulator.

Charging Rate Adjustment—Use test meters to check generator output. Short out current regulator by connecting jumper wire from 'F' terminal on generator to ground. Take off commutator cover band, shift third brush by hand, counter-clockwise to increase, or clockwise to decrease charging rate. Remove jumper wire.

Maximum Charging Rate—22 amperes (cold) or 18 amperes (hot), 8.0 volts, 2400 R.P.M., 28 M.P.H.

Performance Data

Cold—Regulator Inoperative			Hot		
Amperes	Volts	R.P.M.	Amperes	Volts	R.P.M.
0	6.4	800	0	6.4	840
4	6.7	980	4	6.8	1025
8	7.0	1110	8	7.15	1200
12	7.3	1300	12	7.5	1450
16	7.55	1500	16	7.85	1760
22	8.0	2200	18	8.0	2400

Rotation—Counter-clockwise at commutator end.

Brush Spring Tension—18-22 ozs. (new brushes).

Motoring—4.46-4.94 amperes at 6.0 volts.

Field Current—3.75-4.15 amperes at 6.0 volts.

Field Fuse—5 amperes in knurled cup on side of regulator case.

Removal:—Pivot mounted at left front of engine with fan belt drive. To remove, take out two pivot bolts, one clamp bolt.

Belt Adjustment—Loosen pivot bolts and clamp bolt, pull generator out from engine until slack on belt midway between crankshaft and generator pulleys is 1 1/4" (measure from straightedge across pulleys), tighten mounting bolts.

REGULATOR:—Model TC-4304-A. Consists of Cutout Relay and Current Regulator (two-rate relay) in a single case on the dash. See Equipment Section for complete article on these units. Cut-out relay has extra set of ground contacts for generator charging tell-tale signal light control.

Cutout Relay

Cuts In—6.4 volts, 750 R.P.M., 8 M.P.H.

Cuts Out—.5-2.5 ampere discharge current.

Relay Contact Gap—.015-.045" (with upper or ground contacts closed—ground contacts must be open with main contacts closed).

Air Gap—.010-.030" with contacts closed.

Current Regulator

Contact Open—8.45-8.95 volts at 70°F.

Contacts Close—1.1-1.3 volts below opening point.

Contact Gap—.005" minimum.

Air Gap—.045" with contacts closed.

LIGHTING:—Soreng-Manegold Switch Model 5770-A. R.B.M. Foot Control Switch Model 1076, A. Foot switch used to control Country Driving (high) and City (low) beams with lighting switch in driving or second position. Headlight bulbs are pre-focused type.

Bulb Specifications

Position	Candlepower	Mazda No.
Headlights	32-21	2320-C
Parking, Instrument	3	63
Signal Lights	3	64(DC)
Stop & Tail	21-2	1158
Dome	15	87

SIGNAL LIGHTS:—Battery Charge Tell-tale and Oil Pressure Tell-tale lights mounted on instrument panel. See Equipment Section for complete data.

HORNS:—Auto-Lite HA-4003, 4004 (Std), Klaxon Model K-26-M, Type 1716 (high note), 1717 (low note) matched tone, twin horns (optl.).

FUSES:—Lighting—Two 20 ampere on switch.

Generator Field—5 ampere in regulator.

SERIAL NUMBER:—First number 27,001. On left hand frame member near front spring rear shackle.

ENGINE NUMBER:—Stamped on right front upper corner of cylinder block.

ENGINE:—Own Model 77. Four cylinder, 'L' head type.
Bore—3⅛". Stroke—4⅜".
Piston Displacement—134.2 cubic inches.
Rated Horsepower—15.63.
Developed Horsepower—48 at 3200 R.P.M.
Compression Ratio—5.13-1. No optional ratios.
Compression Pressure—83 lbs. at 120 R.P.M.
NOTE—Cylinder bores are offset ⅛" from centerline of crankshaft toward valve side of engine.

Pistons:—Hard Grey Iron (cast-iron). Light weight type, relieved at pin bosses. Length, 3¾".
Weight—23-25 ozs. (without rings or pin).
Removal—Pistons and rods removed at top.
Clearance—Top .007-.008". Bottom .0025-.003".
Fitting New Pistons—Use .0025" feeler stock to check clearance. Pull required to withdraw feeler from between piston and cylinder wall must be 4 lbs. plus or minus 2 lbs.

Piston Rings:—Three compression rings, one oil control ring per piston, all above pin. Oil ring groove drilled radially with oil drain holes.

Ring	Width	End Gap	Wall Thickness
Comp. (Top)	3/32"	.010-.012"	.132"
Comp. (2,3)	3/32"	.007-.012"	.132"
Oil Cont.	3/16"	.007-.015"	.140"

Piston Pin:—Diameter .875". Length 2.713". Pin floats in piston and rod. Retained by locking rings.
Clearance in Piston—.0002-.0004". Hand press fit.
Clearance in Rod Bushing—.0004-.0006". Thumb press fit.

Connecting Rod:—Length 9 3/16" (center-to-center).
Lower Bearing Diameter—1 15/16".
Bearing Type—Spun babbitt-lined type.
Clearance—.001-.0025". Sideplay .006-.008".
Adjustment—None (no shims). Replace rods.
Installing Rods—Connecting rod lower bearings are offset. Install rods with short side of bearing toward nearest main bearing (short side forward on #1 and 3, toward rear on #2, 4). Oil hole in lower bearing upper half must be toward right (away from camshaft) on all rods.

Crankshaft:—Three main bearing type.
Journal Diameters—2 3/16" (all bearings).
Bearing Type—Interchangeable steel-backed, babbitt-lined type.
Clearance—.001-.0025".
Adjustment—None (no shims). Replace bearings. Do not file bearing caps.
End Thrust—Taken by #1 (front) main bearing. Endplay .004-.006". Adjustable by shims between crankshaft thrust washer and shaft.

Camshaft:—Four bearing. Non-adjustable chain drive.
Timing Chain—Link Belt #33403-2. Width 1¼". Pitch ½". Length 23½" or 47 links.
Camshaft Setting—Sprockets are marked. Mesh chain with sprockets turned so that marks are adjacent and in line with a straightedge across the shaft centers. Remove camshaft sprocket to install chain.

Valves:—	Head Diameter	Stem Diameter	Length
Intake	1 17/32"	.372"	5 13/64" (5¾" over all)
Exhaust	1 15/32"	.371"	5 13/64" (5¾" over all)

	Seat Angle	Lift	Stem Clearance
Intake	45°	21/64"	.002-.004"
Exhaust	45°	21/64"	.003-.005"

NOTE—Hard alloy steel inserts are used for exhaust valve seats.
Tappet Clearance—.004" Int., .006" Exh. engine hot.

Valve Springs—	Pressure	Length
Valve Closed	46½ lbs.	2¼"
Valve Open	85½ lbs.	1 15/16"

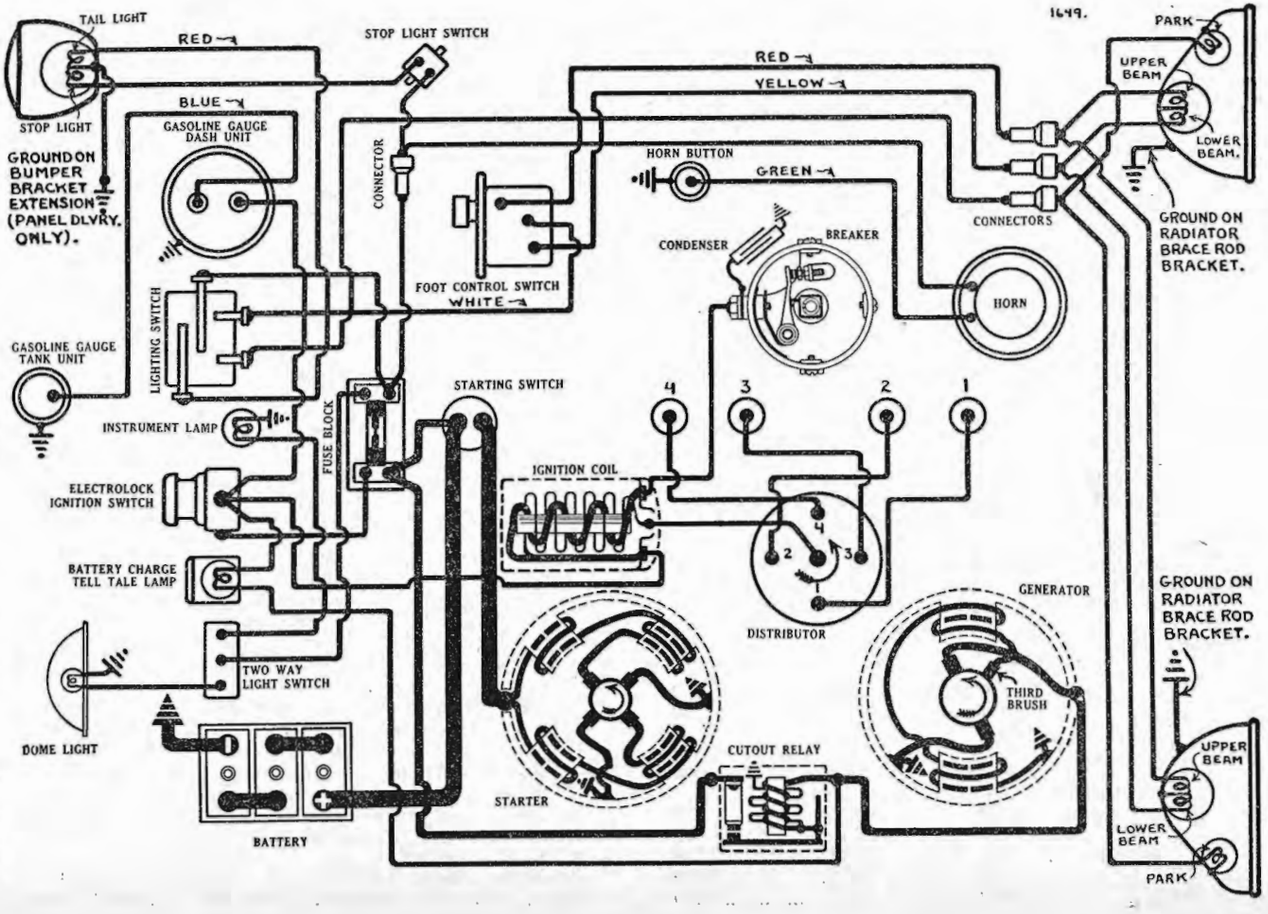
Valve Timing

Intake Valves—Open at TDC. Close 45° ALDC.
Exhaust Valves—Open 40° BLDC. Close 5° ATDC.
To Check Valve Timing—Set tappet clearance #1 intake and exhaust valves at .010". Intake valve opens with piston on top dead center when flywheel mark 'T.C.I.O.1-4' lines up with pointed end of inspection hole cover plate screw (top of flywheel housing on left hand side). Exhaust valve closes with piston 5° or .0103" down on intake stroke when flywheel mark 'E.C.' lines up with indicator. Reset tappet clearance at .004" (intake), .006" (exhaust) with engine hot.

Lubrication:—Pressure. Gear type oil pump located at left of crankcase.
Normal Oil Pressure—30 lbs. at 30 M.P.H. (warm oil).
Oil Pressure Relief Valve—Located under plug on oil pump cover. Operates at 30 lbs. Adjustable by adding or removing shims in plug above spring.
Capacity and Oil—4 qts. Use SAE. #30 (summer above 40°F.), #20-W (winter 15° to 40°F.), #10-W (winter below 15°F.).

CARBURETION:—See Carburetion Section for complete data on Carburetor, Fuel Pump, and Gasoline Gauge.
Carburetor:—Tillotson, Model D-1D. 1⅛" downdraft type.
Fuel Pump:—A.C., Type P-1521390.
Gasoline Gauge:—National, Electric Type.

CLUTCH:—Borg & Beck. Single plate, dry disc type. No adjustment of clutch required for wear.
Clutch Pedal Adjustment—Clutch pedal free movement should be ¾-1" (providing clearance of 1/16" between clutch release levers and clutch release



bearing within housing). To adjust, loosen lock nut, turn turnbuckle on end of clutch lever link cable.

Clutch Facings—Molded type, 2 required, 5⅛" I.D., 7⅞" O.D., .125" thick.

Assembling Clutch—In reassembling clutch see that all three release levers contact release bearing simultaneously and that distance from front face of release bearing to rear face of clutch back plate is 1 3/16" with clutch pedal depressed ¾" (clearance between release levers and release bearing 1/16" with clutch engaged). Install clutch driven plate with longest hub to rear.

STEERING:—Front Suspension—Conventional 'I' beam section axle with Reverse-Elliott ends and semi-elliptic springs.

Kingpin Inclination—7½° (crosswise).

Camber—2°. No adjustment.

Caster—1-2°. Adjust by shims between spring and axle pad.

Toe In—3/32". Adjust by loosening tie rod clamp bolts and rotating tie rod.

NOTE—Kingpin bushing diameter, .625". End thrust is taken by a taper roller bearing assembled between axle end and steering knuckle lower yoke. Tie rod ends are rubber bushed.

IGNITION:—Coil Model IG-4406. Mounted on right hand side of engine block.

Ignition Current—2.5 amperes at 6 volts (idling at 400 R.P.M.), 4 amperes (stopped, coil at 78°F.).

Ignition Switch — Electrolock, Type 17-A (new type—no cable). See Equipment Section.

Distributor Model IGB-4078. Single breaker, 4 lobe cam, full automatic advance type.

Breaker Gap—Set at .018". Limits, .018-.020"

Breaker Arm Spring Tension—16-22 ounces.

Cam Angle—46.5° (closed), 43.5° (open) distributor degrees.

Automatic Advance

Distributor Degrees	R.P.M.	Engine Degrees	R.P.M.
Start	300	0	600
2	510	4	1020
4	750	8	1500
6	970	12	1940
8	1190	16	2380
10	1415	20	2830
12½	1700	25	3400

IGNITION TIMING:— Flywheel Degs. Piston Position
All engines ..... 4° BTDC. ..... .0066" BTDC.

Timing—Take off cover plate over inspection hole (top surface left hand side flywheel housing). Turn engine over with #1 piston on compression, stop with piston 4° or .0066" before top dead center when flywheel mark 'IGN' lines up with pointed end of inspection plate screw, loosen advance arm clamp bolt, rotate distributor until contacts begin to open, tighten clamp bolt, see that rotor is opposite #1 segment in distributor cap, check spark plug connections (see diagram). Flywheel mark 'IGN' is 4° before top dead center mark 'T.C./I.O.1-4'.

Firing Order:—1-3-4-2 (see diagram).

Spark Plugs:—Champion, Type C-7. 18 MM. Metric type.

Spark Plug Gaps—.025".

BATTERY:—U.S.L., Type A-13-A, 6 volt, 13 plate, 78 A.H. capacity (20 hour rate).

Starting Capacity—90 amperes for 20 minutes.

Grounded Terminal—Negative (—) terminal.

Location—On 'X' member under right front seat.

STARTER:—Model MZ-4033. Armature No. MZ-2089.

Starter Drive—Special outboard Bendix.

Rotation—Counter-clockwise at commutator end.

Brush Spring Tension—44-56 ozs. (new brushes).

Performance Data

Torque	R.P.M.	Volts	Amperes
0 ft. lbs.	4900	5.5	47
.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

Starting Switch:—Model SW-4191. Foot plunger type mounted on toeboard.

Mounting:—Flange mounted on right hand front face of flywheel housing. To remove, take out two flange cap screws and one cap screw in bracket on commutator end.

GENERATOR:—Model GAM-4504. Armature No. GAM-2055. Third brush control type.

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

Maximum Charging Rate—17 amperes (cold), 8.0 volts, 1950 R.P.M.

Performance Data

Cold Amps.	Volts	R.P.M.	Hot Amps	Volts	R.P.M.
0	6.4	700	0	6.4	720
4	6.8	880	4	6.9	920
8	7.2	1075	8	7.35	1160
12	7.6	1280	12	7.8	1460
16.5	8.0	1950	13.8	8.0	2000

Rotation—Counter-clockwise at commutator end.

Brush Spring Tension—18-22 ozs. (new brushes).

Field Current—4.08-4.52 amperes at 6.0 volts.

Motoring Current—4.94-5.46 amperes at 6.0 volts.

Mounting:—Pivot mounted at right front of engine. Fan belt drive. To remove, take out two pivot bolts, one clamp bolt.

Belt Adjustment—Loosen two pivot bolts and adjustment clamp bolt, pull generator away from engine until fan can just be turned with belt held stationary, tighten clamp bolt and pivot bolts.

GENERATOR CHARGE INDICATOR:—Consists of signal light on instrument board. Signal lamp should light when ignition is turned on and will go out when generator begins to charge battery (cutout relay contacts close). If lamp does not light with ignition on and engine not running, replace bulb. Signal light bulb is standard 6-8 volt, 3 cp. S.C., Mazda 63.

RELAY:—Model CB-4008. Mounted on top of right hand frame side rail near generator.

Cuts in—7.0-7.5 volts, 700-800 R.P.M. of generator.

Cuts out—.5-2.5 amperes discharge.

Relay Contact Gap—.025-.035".

Air Gap—.010-.030" (contacts closed).

LIGHTING:—Culver-Stearns Lighting Switch, Clum Foot Control Switch. Foot operated control switch used to control headlamp upper and lower beams.

Bulb Specifications

Lamp	Candlepower	Mazda No.
Headlights	21-21	1110
Stop and Tail Light	21-2	1158
All others	3	63

FUSES:—20 ampere capacity lighting fuse mounted on engine side of dash.

HORNS:—Schwartze vibrator type disc horn.