NATIONAL SERVICE MANUAL

TWENTY-EIGHTH SUPPLEMENT—1935 CAR MODELS

NATIONAL AUTOMOTIVE SERVICE
SAN FRANCISCO, CALIFORNIA

1935 CAR MODELS——EQUIPMENT USED

Page	CAR	Model	Serial Nos.	Year	BATTERY Make	BATTERY Type	BATTERY Gr. Ter.	LIGHTING Make	LIGHTING Switch Model	LIGHTING Fuses	LIGHTING Circuit Breaker	CARBURETION Carburetor Make and Model	CARBURETION Fuel Pump Make and Model
1302	AUBURN	653	653-1001	1935	U.S.L.	RN-15A	Pos.	Sor.Man.	B-5640-A	20	*	Carter 307S, Strom. EX-22	AC B
1304	AUBURN	851	851-1001	1935	U.S.L.	XY-15A	Pos.	Sor.Man.	A-5640-A	20	*	Strom. EE-1	AC B-1522146
1306	AUBURN	Super 851	851-1001	1935	U.S.L.	XY-15A	Pos.	Sor.Man.	A-5640-A	20	*	Strom. EX-32	AC B-1522146
†	AUSTIN	Bantam		1935	U.S.L.	XY-9A	Neg.	B. & S.	50518	20	*	Till. M-10A	None
1308	BUICK	35-40	2,777,650	1935	Delco	13-J, JF	Neg.	Delco-R.	478-S,T	30	*	Strom. EE-1	AC R-1521794
1310	BUICK	35-50	2,777,650	1935	Delco	13-J, JF	Neg.	Delco-R.	487-F,G,W	*	D.R.411-A	Marvel ED1S-10-1577	AC I-1521804
1312	BUICK	35-60	2,777,650	1935	Delco	15-G, GF	Neg.	Delco-R.	487-F,G,W	*	D.R.411-A	Marvel ED2S-10-1579	AC I-1521805
1312	BUICK	35-90	2,777,650	1935	Delco	17-D, DF	Neg.	Delco-R.	487-F,G,W	*	D.R.411-A	Marvel ED3-10-1581	AC I-1521805
1314	CADILLAC	V-8 10, 20, 30	3,105,101	1935	Delco	17-D, DF	Pos.	Delco-R.	487-G,H,J,K	*	D.R.411-A	Detroit X-8244	AC D-856062
1316	CADILLAC	V-12 40	4,101,701	1935	Delco	21-C, CF	Pos.	Delco-R.	487-H,K	*	D.R.411-A	Detroit 51	AC D-856263
1318	CADILLAC	V-16 60	5,100,101	1935	Delco	25-A, AF	Pos.	Delco-R.	487-H,K	*	D.R.411-A	Detroit 51	AC D-856263
1320	CHEVROLET	Std. EC	EC-1001	1935	Delco	13-AC, P	Neg.	Delco-R.	478-H	15	*	Carter 284-S	AC W-1521812*
1322	CHEVROLET	Mstr.EA,ED.EA, ED-1001		'35	Delco	15-X, Y	Neg.	Delco-R.	479-Y,R	15	*	Carter 284-S	AC W-1521798*
1324	CHRYSLER	Six C-6	6,800,001	1935	Willard	WH-2-15	Pos.	Douglas	5374	20	*	Carter (B&B) E6F1, E6F2	AC P-1521788
1326	CHRYSLER	Airstrm.CZ	6,701,501	1935	Willard	WH-2-15	Pos.	Douglas	5374	20	*	Strom. EX-32, EXV-3	AC D-1521803
1328	CHRYSLER	Airflow C-1	6,601,201	1935	Willard	WH-4-17	Pos.	Douglas	5394	20	*	Strom. EX-32	AC D-1521790
1330	CHRYSLER	Imper. C-2	7,012,301	1935	Willard	WH-4-17	Pos.	Douglas	5394	20	*	Strom. EE-22	AC D-1521790
1330	CHRYSLER	Cust. Imp. C-3	7,528,551	1935	Willard	WH-4-17	Pos.	Douglas	5394	20	*	Strom. EE-22	AC D-1521790
1332	CHRYSLER	Cust. Imp. CW*		1935	Willard	RH-21	Pos.	Culver-Stearns		20	*	Strom. EE-3	AC I-1521549
1334	DE SOTO	Airstrm.SF	6,023,501	1935	Willard	WH-2-15	Pos.	Douglas	5374	20	*	Carter (B&B) E6F1, E6F2	AC P-1521788
1336	DE SOTO	Airflow SG	5,082,501	1935	Willard	WH-2-15	Pos.	Douglas	5394	20	*	Carter (B&B) E6F1, E6F2	AC P-1521788
1338	DODGE	DU	3,756,501	1935	Willard	WT-1-15	Pos.	Douglas	5394	20	*	Strom. EX-22	AC B-1521789
1340	DUESENBERG	J, SJ		1935	Exide	21-ER	Neg.	Delco-R.	486-D	*	D.R.5759	Strom. EE-3, UU3	SW & Autopul.
1342	FORD	V-8		1935	Ford	40-10655-C	Pos.	Ford(RBM)	11654-B	20	*	Strom. EE-1	AC R-1521764
1344	GRAHAM	Std. 6-74	1,700,001	1935	Willard	WS-1-13	Pos.	Delco-R.	479-P	20	*	Strom. EX-22, EXV-2	AC P-1521392
1346	GRAHAM	Spec.6-73	1,635,001	1935	Willard	WS-1-13	Pos.	Delco-R.	479-P	20	*	Strom. EX-23	AC P-1521674
1348	GRAHAM	Std. 8-72	1,810,001	1935	Willard	WS-2-15	Pos.	Delco-R.	479-P	20	*	Strom. EE-14	AC P-1521674
1350	GRAHAM	Super 8-75	1,035,001	1935	Willard	WS-2-15	Pos.	Delco-R.	479-P	20	*	Strom. EX-32	AC P-1521674
1352	HUDSON	6 GH	53-101	1935	National	ST-3-17X	Pos.	Sor.Man.	5770-A	20	*	Carter 309-S	AC R-1521540
1354	HUDSON	SHT,HU,HHU	54,55,56-101	'35	Exide	XTL-19-17F	Pos.	Sor.Man.	5770-A	20	*	Carter 310-S	AC R-1521540
§	HUPMOBILE	517-W		1935	Willard	WMB-17	Pos.	Clum	9526	20	*	Strom. EX-32	SW 706-E
1356	HUPMOBILE	518-D	D-5001	1935	Willard	WS-2-15	Pos.	Cole (Hersee)		20	*	Carter 316-S	AC T-1521811
§	HUPMOBILE	521-J	J-14001	1935	Willard	WST-2-17	Pos.	Clum	9526	20	*	Strom. EX-32	AC T-1521811
1358	HUPMOBILE	521-O	O-5001	1935	Willard	WH-2-15	Pos.	Clum	9526	20	*	Carter 317-S	AC T-1521811
§	HUPMOBILE	527-T	T-6001	1935	Willard	WH-2-15	Pos.	Clum	9526	20	*	Strom. EE-22	AC T-1521811

§—Refer to Hupmobile Series 417-W, 421-J, 427-T.
†—Refer to previous page for same model.

1935 CAR MODELS——EQUIPMENT USED

	IGNITION				STARTER		GENERATOR					
Make	Coil Model	Dist. Model	Switch Make	Switch Model	Make	Model	Armature Number	Model	Armature Number	Year	Model	CAR	Page
Auto-Lite	CE-4401	IGB-4317	Oakes	Hershey	Auto-Lite	MAB-4062	MAB-2057	GAR-4205	GAR-2214	Early '35	3510	LA FAYETTE	1360
Auto-Lite	IG-4626	IGB-4317	Electrolock		Auto-Lt.	MAB-4068, 76	MAB-2057*	GAR4601-3*	GAR-2214	1935-36	3610	LA FAYETTE	1360
Delco-Remy	539-B	662-P	Delco-Remy	431-G	Delco-Remy	727-N	823881	961-C	1836971	Early '35	50	LA SALLE	1362
Delco-Remy	539-C	662-P	Delco-Remy	431-L	Delco-Remy	727-N	823881	961-D	1857866	Late '35	35-50	LA SALLE	1364
Auto-Lite	CE-4001-L	IGM-4003	Oakes	Hershey	Auto-Lite	MAO-4003-B	MAO-2006	GBC-4103	GBC-2035	1935	V-12	LINCOLN	1366
Auto-Lite	CE-4402	IGE-4012	Oakes	Hershey	Auto-Lite	MAB-4053	MAB-2057	GAR-4601-3	GAR-2214	1935	3520	NASH	1368
Auto-Lite	IG-4626	IGB-4328	Electrolock		Auto-Lite	MAB-4068	MAB-2057	GAR-4618-2	GAR-2155	1935-36	3540, 3640	NASH	1370
Auto-Lite	CE-4402	IGK-4101	Oakes	Hershey	Auto-Lite	MAB-4054	MAB-2047	GAR-4601-3	GAR-2214	1935	3580	NASH	1372
Delco-Remy	536-E	622-Y	Delco-Remy	431-R	Delco-Remy	734-K	823881	935-X	1854856	1935	F-35	OLDSMOBILE	1374
Delco-Remy	536-E	662-R	Delco-Remy	431-R	Delco-Remy	725-Y	823881	935-X	1854856	1935	L-35	OLDSMOBILE	1376
Auto-Lite	CE-4607	IGH-4026,A	Electrolock		Auto-Lite	MAX-4006	MAW-2006	GAR-4611-5	GAR-2116	1935	120	PACKARD	1378
Delco-Remy	539-K	662-W	Delco-Remy	430-L	Owen-Dyneto	DI-1272	13292	CO-1240	23704	1935	1200, 1, 2	PACKARD	1380
Delco-Remy	539-K	662-W	Delco-Remy	430-L	Owen-Dyneto	DN-1270	13409	CO-1240	23704	1935	1203, 4, 5	PACKARD	1380
Auto-Lite	CE-4022, 23	IGO-4002-A	Delco-Remy	430-M	Owen-Dyneto	DN-1273	13409	CO-1271	23709	1935	1207, 8	PACKARD	1382
Delco-Remy	537-E	662-J	Oakes	Hershey	Owen-Dyneto	DI-1237	16437	CO-1236	23691	Early '35	845	PIERCE ARROW	1384
Delco-Remy	537-E(2)	4105	Oakes	Hershey	Owen-Dyneto	DY-1242	16439	CO-1236	23691	Early '35	1245, 55	PIERCE ARROW	1385
Delco-Remy	537-E	662-J	Oakes	Hershey	Delco-Remy	497	1843420	929-A	1856943	Late '35	845	PIERCE ARROW	1386
Delco-Remy	537-E(2)	4105	Oakes	Hershey	Delco-Remy	497	1843420	929-A	1856943	Late '35	1245, 55	PIERCE ARROW	1388
Auto-Lite	IG-4610	IGS-4003	Electrolock		Auto-Lite	MAW-4002,4	MAW-2030	GBM-4603-1	GBM-2006F	1935	PJ, PJ(E)	PLYMOUTH	1390
Auto-Lite	IG-4610	IGS-4003	Electrolock		Auto-Lite	MAW-4002,4	MAW-2030	GAR-4608	GAR-2116F	1935	Deluxe PJ	PLYMOUTH	1392
Delco-Remy	539-L	647-A	Delco-Remy	431-L	Delco-Remy	727-T,S	823881	935-W	1854856	1935	701A, B	PONTIAC	1394
Delco-Remy	539-L	663-B	Delco-Remy	431-L	Delco-Remy	727-S	823881	935-W	1854856	1935	605	PONTIAC	1396
Delco-Remy	536-G	645-K	Delco-Remy	431-W	Delco-Remy	738-K	1847432	937-Z	1838448	1935	6-A	REO	1398
Delco-Remy	538-B	644-M	Delco-Remy	429-Z	Delco-Remy	736-G	818002	955-R	817807	1935	7-S	REO	1400
Auto-Lite	IG-4607	IGB-4393	Electrolock		Auto-Lite	MAN-4005, 2	MAD-2083	GBM4604,4A2	GBM-2006B	1935	Dict.	STUDEBAKER	1402
Delco-Remy	538-A	662-M	Delco-Remy	430-A	Delco-Remy	736-H	1838663	935-Y	1856072	1935	Comm.	STUDEBAKER	1404
Delco-Remy	538-H	662-M	Delco-Remy	430-A	Delco-Remy	736-H	1838663	935-Y	1856072	1935	Pres.	STUDEBAKER	1404
Delco-Remy	531-C(2)	4028	Oakes	Hershey	Delco-Remy	727-C	822187	391	37826	1935	SV-16	STUTZ	†
Delco-Remy	531-C	660-W	Oakes	Hershey	Delco-Remy	727-C	822187	391	37826	1935	DV-32	STUTZ	†
Auto-Lite	IG-4616	IGB-4301-A,B	Electrolock		Auto-Lite	MAB-4060	MAB-2114	GBK-4601-2	GBK-2055	1935	Std. G	TERRAPLANE	1406
Auto-Lite	IG-4616	IGB-4301-A,B	Electrolock		Auto-Lite	MAB-4069	MAB-2114	GBK-4602-1	GBK-2055	1935	Deluxe GU	TERRAPLANE	1408
Auto-Lite	IG-4406	IGB-4078	Electrolock		Auto-Lite	MZ-4033	MZ-2089	GAM-4504	GAM-2055	1935	77	WILLYS	1410

TABLE OF IGNITION AND VALVE TIMING

1935 MODELS

Car and Model	Year	Special Cyl. Heads, Fuel or Distributors	Adaptor	IGNITION TIMING Rod	Breaker Gap	Spark Plug Gap	Piston Position	Spark Control	Valve	TAPPET CLEARANCE Timing	Running Intake	Running Exhaust	VALVE TIMING Piston Position
AUBURN 6-53	(1935)	Before #653-3034	114	42	.020"	.025"	.0042" BTDC.	FA.	IO.	.012"	.008"H	.008"H	.0113" BTDC.
AUBURN 6-53	(1935)	After #653-3034	114	42	.020"	.025"	.0042" BTDC.	FA.	IO.	.012"	.008"H	.008"H	.0253" BTDC.
AUBURN 8-51	(1935)	First 5169 Engines	105	5	.015"	.025"	.0042" BTDC.	FA.	IO.	.012"	.008"H	.008"H	.0113" BTDC.
AUBURN 8-51	(1935)	After 5169 Engines	105	5	.015"	.025"	.0042" BTDC.	FA.	IO.	.012"	.008"H	.008"H	.0253" BTDC.
AUBURN Superch. 851	(1935)	All Engines	105	5	.018"	.025"	.0042" BTDC.	FA.	IO.	.012"	.008"H	.008"H	.0253" BTDC.
BUICK 35-40	(1935)	Std. Fuel	113	31	.015"	.023"	.0014" BTDC.	FA.	Exh.	.008"	.008"	.008"	Valve .163"*
BUICK 35-40	(1935)	Ethyl Fuel	113	31	.015"	.023"	.0238" BTDC.	FA.	Exh.	.008"	.008"	.008"	Valve .163"*
BUICK 50	(1935)		113	38	.015"	.023"	.0198" BTDC.	Adv.	Exh.	.008"	.008"	.008"	Valve .180"*
BUICK 60	(1935)		113	31	.015"	.023"	.0523" BTDC.	Adv.	Exh.	.008"	.008"	.008"	Valve .180"*
BUICK 90	(1935)		113	31	.015"	.023"	.0466" BTDC.	Adv.	Exh.	.008"	.008"	.008"	Valve .180"*
CADILLAC V-8 10,20,30	(1935)		104	42	.015"	.026"	.0075" BTDC.	FA.	IO.	.006"	.006"C	.010"C	.0168" BTDC.
CADILLAC V-12 40	(1935)		113	33	.021"	.026"	.0058" BTDC.	FA.	IO.	None	None	None	.0000" TDC.
CADILLAC V-16 60	(1935)		113	33	.016"	.026"	.0058" BTDC.	FA.	IO.	None	None	None	.0000" TDC.
CHEVROLET Std., Mstr.	(1935)	First 100,000 Cars	113*	33	.018"	.032"	.0385" BTDC.	FA.	IO.	.006"	.006"H	.013"H	.0061" BTDC.
CHEVROLET Std., Mstr.	(1935)	After 100,000 Cars	113*	33	.018"	.032"	.0097" BTDC.	FA.	IO.	.006"	.006"H	.013"H	.0061" BTDC.
CHEVROLET Fleet Mod.	(1935)		113*	33	.018"	.040"	.0000" TDC.	FA.	IO.	.010"	.010"H	.016"H	.0061" BTDC.
CHRYSLER C-6	(1935)	6.0-1 C.I. Head	114	42	.020"	.025"	.0000" TDC.	FA.	IO.	.010"	.006"H	.008"H	.0000" TDC.
CHRYSLER C-6	(1935)	6.5-1 Al. Head	114	42	.020"	.025"	.0108" ATDC.	FA.	IO.	.010"	.006"H	.008"H	.0000" TDC.
CHRYSLER CZ	(1935)	6.2-1 C.I. Head	114	42	.018"	.025"	.0000" TDC.	FA.	IO.	.011"	.006"H	.008"H	.0015" BTDC.
CHRYSLER CZ	(1935)	7.0-1 Al. Std. Fuel	114	42	.018"	.025"	.0000" TDC.	FA.	IO.	.011"	.006"H	.008"H	.0015" BTDC.
CHRYSLER CZ	(1935)	7.0-1 Al. Ethyl Fuel	114	42	.018"	.025"	.0062" BTDC.	FA.	IO.	.011"	.006"H	.008"H	.0015" BTDC.
CHRYSLER C-1	(1935)	6.2-1 C.I. Head	114	42	.018"	.025"	.0000" TDC.	FA.	IO.	.011"	.006"H	.008"H	.0019" BTDC.
CHRYSLER C-1	(1935)	6.5-1 Al. Std. Fuel	114	42	.018"	.025"	.0118" ATDC.	FA.	IO.	.011"	.006"H	.008"H	.0019" BTDC.
CHRYSLER C-1	(1935)	6.5-1 Al. Ethyl Fuel	114	42	.018"	.025"	.0015" BTDC.	FA.	IO.	.011"	.006"H	.008"H	.0019" BTDC.
CHRYSLER C-2, C-3	(1935)	6.5-1 Std. Al. Head	114	42	.018"	.025"	.0118" ATDC.	FA.	IO.	.011"	.006"H	.008"H	.0019" BTDC.
CHRYSLER C-2, C-3	(1935)	7.45-1 Spec. Al. Head	114	42	.018"	.025"	.0381" ATDC.	FA.	IO.	.011"	.006"H	.008"H	.0019" BTDC.
CHRYSLER CW*	(1935)	6.5-1 Std. Al. Head	114	42	.018"	.025"	.0019" ATDC.	FA.	IO.	.008"	.006"H	.008"H	.0019" BTDC.
DE SOTO SF	(1935)	6.0-1 C.I. Head	114	12	.020"	.025"	.0000" TDC.	FA.	IO.	.010"	.006"H	.008"H	.0000" TDC.
DE SOTO SF	(1935)	6.5-1 Al. Head	114	12	.020"	.025"	.0108" ATDC.	FA.	IO.	.010"	.006"H	.008"H	.0000" TDC.
DE SOTO SG	(1935)	6.5-1 Std. Al. Head	114	12	.020"	.025"	.0108" ATDC.	FA.	IO.	.010"	.006"H	.008"H	.0000" TDC.
DE SOTO SG	(1935)	7.0-1 Spec. Al. Head	114	12	.020"	.025"	.0211" ATDC.	FA.	IO.	.010"	.006"H	.008"H	.0000" TDC.
DODGE DU	(1935)	6.5-1 C.I. Head	114	42	.020"	.025"	.0068" ATDC.	FA.	IO.	.011"	.006"H	.008"H	.0153" ATDC.
DUESENBERG J	(1935)	Intake Camshaft	104	8	.020"	.025"	.0645" BTDC.	Adv.	IO.	.025"	.025"C	.025"C	.0161" BTDC.
DUESENBERG J	(1935)	Exhaust Camshaft	104	8	.020"	.025"	.0645" BTDC.	Adv.	EC.	.025"	.025"C	.025"C	.0868" ATDC.
FORD V-8	(1935)	All Engines	104	40	.013"	.025"	.0058" BTDC.	FA.	IO.	.013"	Not Adj.	Not Adj.	.0327" BTDC.
GRAHAM Six 74	(1935)	5.8-1 C.I. Head	102	2	.018"	.025"	.0111" BTDC.	FA.	IO.	.012"	.010"H	.010"H	.0016" BTDC.
GRAHAM Six 74	(1935)	6.87-1 Al. Head	102	2	.018"	.025"	.0016" BTDC.	FA.	IO.	.012"	.010"H	.010"H	.0016" BTDC.
GRAHAM Spec. 6-73	(1935)	All	102	2	.018"	.025"	.0037" BTDC.	FA.	IO.	.012"	.010"H	.010"H	.0000" TDC.
GRAHAM 8-72	(1935)	All	102	40	.018"	.025"	.0034" BTDC.	FA.	IO.	.012"	.010"H	.010"H	.0000" TDC.
GRAHAM Superch. 8-75	(1935)	Load.Cont.8-10°early	104	40	.018"	.025"	.0034" BTDC.	FA.	IO.	.012"	.010"H	.010"H	.0000" TDC.

*—Use with 152 Adaptor.

*—Amount valve open at LDC.

Rod and Adaptor data intended for use with Weidenhoff Motor Gauge and furnished through courtesy of Joseph Weidenhoff, Inc., Chicago, Illinois.

TABLE OF IGNITION AND VALVE TIMING

1935 MODELS

Car and Model	Year	Special Cyl. Heads, Fuel or Distributors	Adaptor	IGNITION TIMING Rod	Breaker Gap	Spark Plug Gap	Piston Position	Spark Control	TAPPET CLEARANCE Valve	Timing	VALVE TIMING Running Intake	Running Exhaust	Piston Position
HUDSON GH 6	(1935)	Before Eng. #73,790	114	44	.020"	.022"	.0101" BTDC.	FA.	IO.	.010"	.006"H	.008"H	.0562" BTDC.
HUDSON GH 6	(1935)	After Eng. #73,791	114	44	.020"	.022"	.0000" TDC.	FA.	IO.	.010"	.006"H	.008"H	.0562" BTDC.
HUDSON H,HU,HHU 8	(1935)	Before Eng. #65,246	114	44	.020"	.022"	.0089" BTDC.	FA.	IO.	.010"	.006"H	.008"H	.0494" BTDC.
HUDSON H,HU,HHU 8	(1935)	After Eng. #65,247	114	44	.020"	.022"	.0000" TDC.	FA.	IO.	.010"	.006"H	.008"H	.0494" BTDC.
HUPMOBILE 517-W	(1935)		104	5	.018"	.028"	.0174" BTDC.	FA.	EC.	.021"	.010"H	.013"H	.0034" ATDC.
HUPMOBILE 518-D	(1935)		104	2	.018"	.028"	.0194" BTDC.	FA.	EC.	.021"	.010"H	.013"H	.0038" ATDC.
HUPMOBILE 521-J	(1935)		104	2	.018"	.028"	.0194" BTDC.	FA.	EC.	.021"	.010"H	.013"H	.0038" ATDC.
HUPMOBILE 521-O	(1935)		104	2	.015"	.028"	.0221" BTDC.	FA.	EC.	.017"	.006"H	.013"H	.004" ATDC.
HUPMOBILE 527-T	(1935)		104	2	.015"	.028"	.0221" BTDC.	FA.	EC.	.026"	.018"H	.018"H	.0113" ATDC.
LA FAYETTE 3510	(1935)		104	40	.020"	.025"	Before TDC.	FA.			.015"	.015"	——	——
LA FALETTE 3610	(1935)		104	40	.020"	.025"	Before TDC.	FA.			.015"	.015"	——	——
LA SALLE 50	(Early '35)		104	40	.020"	.026"	.0255" BTDC.	FA.	IO.	.015"	.006"	.008"	.0144" ATDC.
LA SALLE 35-50	(Late '35)		104	40	.020"	.026"	.0264" BTDC.	FA.	IO.	.015"	.006"	.009"	.0144" ATDC.
LINCOLN 12	(1935)	All Models	104	40	.020"	.022"	.0200" BTDC.	FA.	IO.	.004"	.004"C	.006"C	.1768" BTDC.
NASH 3520	(1935)		113*	37	.020"	.025"†	Before TDC.	FA.			.015"H	.015"H	——	——
NASH 35, 3640	(1935)	First Cars	——	—	.020"	.025"†	Before TDC.	FA.			.015"	.015"	——	——
NASH 35, 3640	(1935)	With 'Caution' Plate	——	—	.020"	.025"†	.0000" TDC.	FA.			.015"	.015"	——	——
NASH 3580	(1935)		113*	37	.015"	.025"†	Before TDC.	FA.			.015"H	.015"H	——	——
OLDSMOBILE F-35	(1935)		104	40	.022"	.025"	.0015" BTDC.	FA.	IO.	.010"	.008"H	.010"H	.0163" BTDC.
OLDSMOBILE L-35	(1935)		104	2	.022"	.025"	.0036" BTDC.	FA.	IO.	.010"	.008"H	.010"H	.0000" TDC.
PACKARD 120	(1935)	All Engines	114	5	.020"	.028"	.0093" BTDC.	FA.	EC.	.006"	.007"H	.009"H	.006" ATDC.
PACKARD 1200, 1,2	(1935)	6.5-1 H.C. Engine	114	5	.020"	.025"	.0168" BTDC.	FA.	IO.	.004"	.004"H	.006"H	.4070" BTDC.
PACKARD 1200, 1,2	(1935)	6.0-1 L.C. Engine	114	5	.020"	.025"	.0467" BTDC.	FA.	IO.	.004"	.004"H	.006"H	.4070" BTDC.
PACKARD 1203, 4, 5	(1935)	All Engines	114	5	.020"	.025"	.0168" BTDC.	FA.	IO.	.004"	.004"H	.006"H	.4070" BTDC.
PACKARD 1207, 8	(1935)	All Engines	114	2	.020"	.025"	.0256" BTDC.	FA.	IO.	None	None	None	.0000" TDC.
PIERCE ARROW 845	(1935)		114	29	.018"	.025"	.0123" BTDC.	Adv.	IO.	.010"	None	None	.0123" ATDC.
PIERCE ARROW 1245,55	(1935)	All Engines	114	42	.018"	.025"	.0091" BTDC.	Adv.	IO.	.004"	None	None	.1303" BTDC.
PLYMOUTH Std. PJ	(1935)		114	42	.020"	.025"	.0000" TDC.	FA.	IO.	.011"	.006"H	.008"H	.0153" ATDC.
PLYMOUTH Deluxe PJ	(1935)		114	42	.020"	.025"	.0000" TDC.	FA.	IO.	.011"	.006"H	.008"H	.0153" ATDC.
PONTIAC 701A, B	(1935)		114	42	.020"	.025"*	.0133" BTDC.	FA.	IO.	.0125"	.010"H	.010"H	.0092" BTDC.
PONTIAC 605	(1935)		114	42	.018"	.025"*	.0117" BTDC.	FA.	IO.	.0125"	.010"H	.010"H	.0082" BTDC.
REO Fly. Cld. 6-A	(1935)		104	2	.020"	.025"	.0388" BTDC.	FA.	IO.	.012"	.007"H	.008"H	.0000" TDC.
REO Royale 7-S	(1935)		104	2	.020"	.025"	.032" BTDC.	FA.	IO.	.012"	.007"H	.008"H	.0000" TDC.
STUDEBKR. Dict. 1A,2A	(1935)	All Engines	104	2	.020"	.025"	.0000" TDC.	Ret.	IO.	.010"	.004"H	.006"H	.0098" BTDC.
STUDEBKR. Comm. 1B	(1935)	All Engines	104	2	.020"	.025"	.0000" TDC.	Ret.	IO.	.010"	.004"H	.006"H	.0915" BTDC.
STUDEBKR. Pres. 1C	(1935)	All Engines	104	2	.020"	.025"	.0000" TDC.	Ret.	IO.	.010"	.004"H	.006"H	.0915" BTDC.
STUTZ SV-16	(1935)		113	31	.017"	.025"	.0951" BTDC.	Adv.	EC.	.028"	.028"C	.028"C	.0208" ATDC.
STUTZ DV-32	(1935)	Intake Camshaft	104	8	.020"	.022"	.1677" BTDC.	Adv.	IO.	.046"	.046"C	.046"C	.0107" BTDC.
STUTZ DV-32	(1935)	Exhaust Camshaft	104	8	.020"	.022"	.1677" BTDC.	Adv.	EC.	.046"	.046"C	.046"C	.0425" ATDC.
TERRAPLANE G, GU	(1935)	Before Eng. #128,076	114	43	.020"	.022"	.0101" BTDC.	FA.	IO.	.010"	006"H	.008"H	.0562" BTDC.
TERRAPLANE G, GU	(1935)	After Eng. #128,077	114	43	.020"	.022"	.0000" TDC.	FA.	IO.	.010"	006"H	.008"H	.0562" BTDC.
WILLYS 77	(1935)		104	2	.018"	.025"	.0066" BTDC.	FA.	IO.	.010"	.004"H	.006"H	.0000" TDC.

NOTE:—See Car Pg. for final ignition setting on Hudson and Terraplane cars.
Maximum Advance Setting is .0245" (Hudson), .0279" (Terraplane) before TDC.
*—Use with 152 Adaptor and X-4615 collar.

*—Set at .022" on cars with radio.
†—Set at .030" on cars with radio.

1935 CAR MODELS
CAR PAGES

Cam Angle data for Auto-Lite distributors compiled in co-operation with Joseph Weidenhoff, Incorporated, Chicago, Illinois.

Cam Angles for Delco-Remy distributors are correct with breaker gap set midway between limits and breaker arm fibre bumper worn in (1000 miles).

SERIAL NUMBER:—First number, 653-1001. On right hand side of cowl under hood. Letter following serial number designates body type.

ENGINE NUMBER:—On front left hand upper half of crankcase.

ENGINE:—Lycoming, Model WF. Six cylinder, 'L' head type.
Bore—3 1/16". **Stroke**—4¾".
Piston Displacement—209.94 cubic inches.
Rated Horsepower—22.51.
Developed Horsepower—85 at 3500 R.P.M.
Compression Ratio—6.2-1 Std. aluminum head.

Pistons:—Bohn, aluminum alloy, split skirt, Invar strut type. Piston length, 3¾".
Weight—16 ozs. stripped, 21.92 ozs. with rings and pin.
Removal—Pistons and rods removed from below.
Clearance—Top .00975-.00825". Skirt .0015".
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 must be between 5-10 lbs.
Installing Pistons—Slot should be toward left or camshaft side of engine.

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	Side Clearance
Comp. All	⅛"	.008-.013"	.0015-.003"
Oil Cont. (3)	⅛"	.008-.013"	.001-.0025"
Oil Cont. (4)	3/16"	.008-.013"	.001-.0025"

Piston Pin:—Diameter .8750-.8748". Length 2.520-2.500". Pin is locked in the rod. No bushing used in piston.

Pin Fit in Piston—Tight push fit at 70°F. (selective).

Connecting Rod:—Weight 2.34 lbs. Length 9½".
Crankpin Journal Diameter—2⅛".
Lower Bearing Type—Spun babbitt lined. No shims.
Clearance—.001-.0025" (total), .004-.009" (total sideplay).

Adjustment—Adjust by filing bearing caps when wear exceeds .004". No shims used.
Installing Rods—Rods are numbered and must be installed in same numbered cylinders. Lower bearings are offset. Install rods with narrow half of bearing toward nearest main bearing. Oil jet holes in upper half of lower bearing must be toward camshaft side of engine on all rods.

Crankshaft:—5 bearings. Integral counterweights.
Journal Diameters—2⅜" all bearings.
Bearing Type—Bronze-backed, babbitt-lined.
Clearance—.001-.00162".
Adjustment—Take up bearings when wear exceeds .003". Check adjustment by assembling .002" feeler ½" wide between bearing and shaft. Crankshaft should turn by hand with feeler in place and bearing caps tight.
End Thrust—Taken by center main bearing. End-play .005" minimum, .010" maximum.

Camshaft:—Five bearing. Non-adjustable chain drive. Camshaft design changed after 3034 engines (see Valve Timing below).
Bearing Type—Bronze and cast-iron.
Clearance—.0025-.0035".
Timing Chain—Whitney. Width 1¼". Pitch ½". Length 24½" or 49 links.
Camshaft Setting—Sprockets are marked. Mesh chain with sprockets turned so there are 12 links on lower side of chain betwen marks. This is equal to 13 teeth inclusive of teeth meshed opposite marks. With sprockets in this position, pistons 1 and 6 will be on top dead center with dead center mark on flywheel at indicator on housing. This setting correct for all engines. Change in valve timing (see below) is due to new camshaft design.

Valves:—	Head Dia.	Stem Dia.	Length
Intake	1 9/16"	.3424-.3425"	5¼"
Exhaust	1 13/32"	.3420-.3425"	5¼"

	Seat Angle	Lift	Stem Clearance
Intake	30°	5/16"	.0045-.008"
Exhaust	45°	5/16"	.0045-.008"

Tappet Clearance—.008-.010" all valves—running clearance with engine hot. Clearance for timing .012".

Valve Springs—	Spring Pressure	Length
Valve Closed	42-47 lbs.	2 3/16"
Valve Open	88-94 lbs.	1⅞"

Valve Timing—See Camshaft Setting (above).

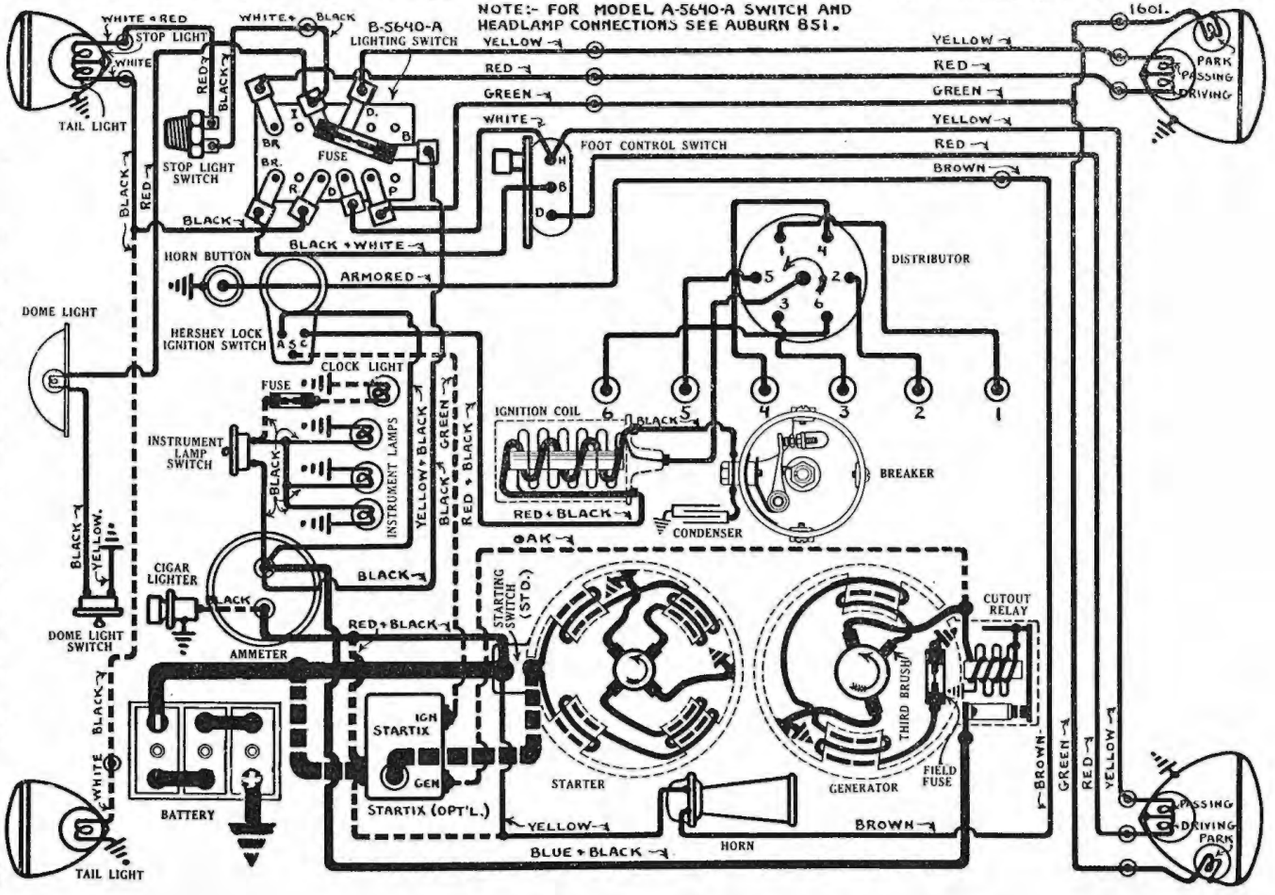
Cars before Serial 653-3034
Intake Valves—Open 5° BTDC. Close 40° ALDC.
Exhaust Valves—Open 50° BLDC. Close 10° ATDC.

Cars after Serial 653-3034
Intake Valves—Open 7½° BTDC. Close 37½° ALDC.
Exhaust Valves—Open 50° BLDC. Close 5° ATDC.

To Check Valve Timing—Set tappet clearance #1 intake valve at .012". This valve should open with piston #1 slightly before top dead center when flywheel mark '1/6' (dead center mark) is approximately 1.53 teeth (first 3034 cars), or 2.29 teeth (after 3034 cars) before the indicator on the flywheel housing. Reset tappet clearance at .008-.010" with engine hot.

Lubrication:—Pressure. Gear type oil pump located in crankcase.
Normal Oil Pressure—15 lbs. idling, 40 lbs. maximum engine R.P.M. with warm oil.
Oil Pressure Relief Valve—Located in bracket bolted on left hand side of crankcase. Operates at 30 lbs. Adjustable by changing spacer washers between plug and relief valve spring (plug at lower end of bracket).
Capacity and Oil—6 qts. Use SAE. #30 (summer, first 3000 miles with new engine), #40 (summer, after 3000 miles), #20 (winter).

CARBURETION:—See Carburetion Section for complete data on Carburetor, Fuel Pump, and Gasoline Gauge.
Carburetor:—Carter Model 307-S (before Serial No. 653-3036), Stromberg Model EX-22 (after Serial No. 653-3037), 1¼", downdraft type.
Fuel Pump:—Stewart-Warner, Type 708-A (first series), A.C., Type B-1521814 (second series).
Gasoline Gauge:—K-S Telegauge, hydrostatic type.



CLUTCH:—Long Model 9AB-CS. 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 at lower end of clutch pedal, change position of pedal (bolt hole is slotted).
Clutch Facings—Moulded type, 2 required, 5¾" I.D., 9" O.D., .137" thick. Clutch facings are Raybestos #250.

STEERING:—Front Suspension. Conventional 'I' beam section front axle with Reverse-Elliott ends and semi-elliptic springs. Axle is Columbia Type 10000A-1.
Kingpin Inclination—7½° crosswise.
Caster—3½-4°. Adjust by using wedge shims between spring and spring pad on axle.
Camber—1½°.
Toe In—⅛-3/16". Adjust in usual manner by changing length of tie rod.

IGNITION:—Coil Model IG-4065. Mounted on right side of engine block.
Ignition Current—2.5 amperes idling, 4.5-5.5 amperes at 6.0 volts with engine stopped.
Ignition Switch:—Oakes-Hershey co-incidental ignition switch and steering post lock. Switch used on cars with Startix has two 'on' position. Lower or 'STX' position of lever is normal running position with Startix operative. Upper or 'IGN' position should be used to check ignition or whenever automatic cranking is not desired.
Distributor Model IGB-4318. Single breaker, 6 lobe cam, full automatic advance type.
Breaker Gap—.020-.024" (first 1000 miles with new points), .018-.020" (after first 1000 miles).
Breaker Arm Spring Tension—16-22 ozs.
Cam Angles—Closed 40°. Open 20° (distributor).

Automatic Advance

Distributor		Engine	
Degrees	R.P.M.	Degrees	RP.M.
Start	300	0	600
2	540	4	1080
4	780	8	1560
6	1020	12	2040
8	1260	16	2520
10	1500	20	3000

Removal:—Mounted on cylinder head. To remove, take out hold-down screw in advance arm, lift distributor out.

IGNITION TIMING:— Flywheel Degs. Piston Position
All engines ..... 3° BTDC ..... .0042" BTDC.
Timing:—With #1 piston on compression, turn engine over until piston is 3° before top dead center, stop when flywheel mark '/' lines up with indicator in inspection hole in flywheel housing. This mark is 3° or approximately 1 tooth before top dead center mark '1/6'. Then 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, Type J-6. 14 MM. Metric.
Spark Plug Gaps—Set at .025".

BATTERY:—U.S.L., Type RN-15-A, 6 volt, 15 plate, 90 A.H. capacity (20 hour rate).
Starting Capacity—115 amperes for 20 minutes.
Grounded Terminal—Positive (+) terminal.
Location—Under right front seat.

STARTER:—Model MAJ-4032 (Std.). MAJ-4033 (with Startix Optl.). Armature No. MAJ-2006.
Starter Drive—Outboard Bendix, Type R11FX-10.
Cranking Performance—155 R.P.M. (engine), 1705 R.P.M. (armature), 170 amperes.
Rotation—Counter-clockwise at commutator end.
Brush Spring Tension—44-56 ozs. (new brushes).

Torque		R.P.M.	Volts	Amperes
0 ft. lbs.		4100	5.5	57
.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:—(MAJ-4032) Type SW-3737-S. Mounted on starter field frame and operated by flexible cable control from instrument panel. (MAJ-4033) Startix automatic starting switch controlled by ignition switch. See Equipment Section for complete data.
Removal:—Flange mounted on right front face of flywheel housing. To remove, take out 3 flange mounting cap screws.

GENERATOR: — Model GAR-4603-3. Armature No. GAR-2077. Air-cooled. Third brush control type.
Charging Rate Adjustment—Take off commutator cover band. Shift third brush by hand by prying on brush mounting plate, counter-clockwise to increase, or clockwise to decrease charging rate. Brush held in position by friction.
Maximum Charging Rate—20 amperes (cold), 16.3 (hot), 8 volts, 2050-2250 R.P.M., 25 M.P.H.

Performance Data

Cold			Hot		
Amperes	Volts	R.P.M.	Amperes	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 ozs. (new brushes).
Motoring—4.65-5.15 amperes at 6.0 volts.
Field Current—3.70-4.10 amperes at 6.0 volts.
Field Fuse—5 ampere capacity.
Removal:—Pivot mounted at right front of engine. Fan belt drive. To remove, take out two pivot bolts, one clamp bolt.
Belt Adjustment—Adjusted in usual manner by swinging generator away from engine. Tension should be just sufficient to drive generator and pump without slipping.

CUTOUT RELAY:—Model CB-4021. Mounted on generator field frame.
Cuts In—6.75-7.5 volts, 800 R.P.M.
Cuts Out—.5-2.5 amperes discharge.
Relay Contact Gap—.025-.035".
Air Gap—.010-.030" contacts closed.

LIGHTING:—Soreng-Manegold Switch, Model B-5640-A (4 pos.), A-5640-A (3 pos). Delco-Remy Foot Control Switch, Model 465-W. Two distinct lighting systems used as follows: **Controlled Beam (A-5640-A Switch).** Upper and lower beams controlled by foot switch. **Assymetrical Passing Beam (B-5640-A Switch).** Upper and lower beams controlled by lighting switch. Foot control switch provides assymetrical passing beam composed of lower beam (right hand headlamp) and upper beam (left hand headlamp). Headlamp beams are crossed with left hand headlamp illuminating right hand side of road.

Bulb Specifications

Position	Candlepower	Mazda No.
Headlights (B-5640-A switch)	32-21	2320-C
Headlights (A-5640-A switch)	32-32	1000
Parking, Instrument, Clock	3	63
Stop and Tail	21-2	1158
Tail (right—optl.)	3	63
Dome	6	81

FUSES:—Lighting—20 ampere on back of switch
Clock Light—10 ampere on clock case.
Generator Field Fuse—5 ampere under cover on generator field frame.

SERIAL NUMBER:—First number, 851-1001. On right hand side of cowl under hood. Letter following serial number designates body type.

ENGINE NUMBER:—On front left hand upper half of crankcase.

ENGINE:—Lycoming Model GG. Eight cylinder, In Line, 'L' head type.
Bore—3 1/16". **Stroke**—4¾".
Piston Displacement—279.92 cubic inches.
Rated Horsepower—30.0.
Developed Horsepower—115 at 3600 R.P.M.
Compression Ratio—6.2-1 Std. aluminum head.

Pistons:—Bohn, aluminum alloy, split skirt, Invar strut type. Piston length 3¾".
Weight—16 ozs. stripped, 21.92 ozs. with rings and pin.
Removal—Rods and pistons removed from below.
Clearance—Top .00975-.00825". Skirt .0015".
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 must be between 5-10 pounds.
Installing Pistons—Slot should be toward left or camshaft side of engine.

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	Side Clearance
Comp. All	⅛"	.008-.013"	.0015-.003"
Oil Cont. (3)	⅛"	.008-.013"	.001-.0025"
Oil Cont. (4)	3/16"	.008-.013"	.001-.0025"

Piston Pin:—Diameter .8750-.8748". Length 2.520-2.500". Pin is locked in the rod. No bushing used in piston.
Pin Fit in Piston—Tight push fit at 70°F (selective).

Connecting Rod:—Weight 2.34 lbs. Length 9½".
Crankpin Journal Diameter—2⅛".
Lower Bearing Type—Spun babbitt-lined. No shims.
Clearance—.001-.0025" (total). .004-.009" (total sideplay).
Adjustment—Adjust by filing bearing caps when wear exceeds .004". No shims used.
Installing Rods—Rods are numbered and must be installed in same numbered cylinders. Lower bearings are offset. Install rods with narrow half of bearing toward nearest main bearing. Oil jet holes in upper half of lower bearing must be toward camshaft side of engine on all rods.

Crankshaft: — Five bearings. No counterweights (Lanchester type vibration dampener).
Journal Diameters—2⅜" all bearings.
Bearing Type—Bronze-backed, babbitt-lined.
Clearance—.0010-.00162".
Adjustment—Take up bearings by filing caps when wear exceeds .003". Check adjustment by assembling .002" feeler ½" wide between bearing and shaft. Crankshaft should turn by hand with feeler in place and bearing caps tight.
End Thrust—Taken by center main bearing. End-play .005" minimum, .010" maximum.

Camshaft:—Six bearing. Non-adjustable chain drive. Camshaft design changed after 5169 engines (see Valve Timing below).
Bearing Type—Bronze and cast-iron.
Clearance—.0025-.0035".
Timing Chain—Whitney. Width 1". Pitch ½". Length 24½" or 49 pitches.

Camshaft Setting—Sprockets are marked. Mesh chain with sprockets turned so there are exactly 12 links on lower side of chain between marks. This is equal to 13 teeth inclusive of teeth meshed opposite marks. With sprockets in this position, pistons #1 and 8 will be on top dead center with dead center mark on flywheel at indicator on housing. This setting correct for all engines. Change in valve timing (see below) is due to new camshaft design.

Valves:—	Head Diameter	Stem Diameter	Length
Intake	1 9/16"	.3420-.3425"	5¼"
Exhaust	1 13/32"	.3420-.3425"	5¼"

	Seat Angle	Lift	Stem Clearance
Intake	30°	5/16"	.0045-.008"
Exhaust	45°	5/16"	.0045-.008"

Tappet Clearance—.008-.010" all valves—running clearance with engine hot. Clearance for timing .012".

Valve Springs—	Spring Pressure	Length
Valve Closed	42-47 lbs.	2 3/16"
Valve Open	88-94 lbs.	1⅞"

Valve Timing—See Camshaft Setting above.

Cars before Engine No. 5169

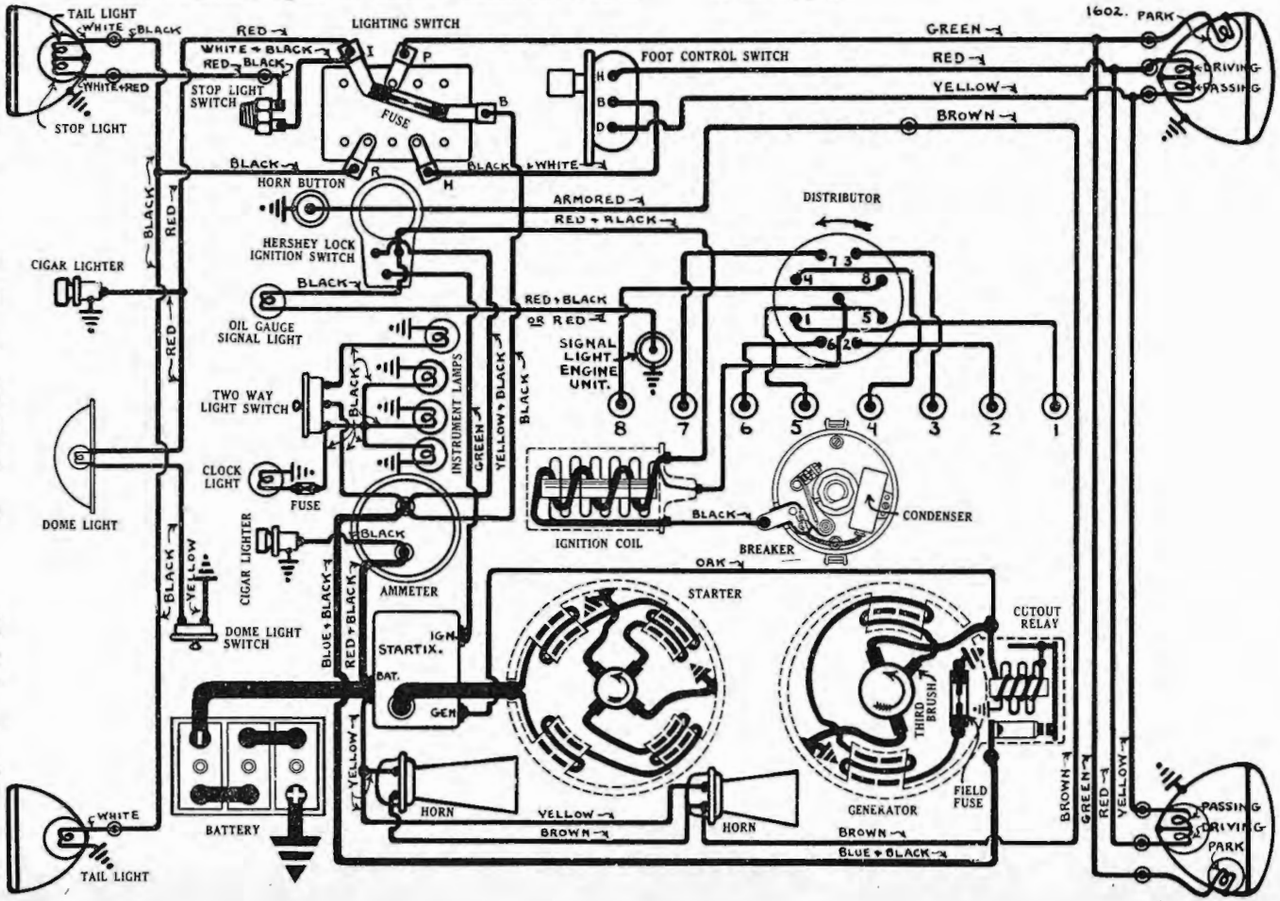
Intake Valves—Open 5° BTDC. Close 40° ALDC.
Exhaust Valves—Open 50° BLDC. Close 10° ATDC.

Cars after Engine No. 5169

Intake Valves—Open 7½° BTDC. Close 37½° ALDC.
Exhaust Valves—Open 50° BLDC. Close 5° ATDC.
To Check Valve Timing—Set tappet clearance #1 intake valve at .012". This valve should open with piston #1 slightly before top dead center when flywheel mark '⅛' (dead center mark) is approximately 1.53 teeth (first cars) or 2.29 teeth (later cars) before the indicator on the flywheel housing. Reset tappet clearance at .008-.010" with engine hot.

Lubrication:—Pressure. Gear type oil pump located in crankcase.
Normal Oil Pressure—15 lbs. idling, 40 lbs. at maximum engine R.P.M. with warm oil.
Oil Pressure Relief Valve—Located in bracket bolted on left hand side of crankcase. Operates at 30 lbs. Adjustable by changing spacing washer between plug and relief valve spring (plug at lower end of bracket).
Capacity and Oil—8 qts. Use SAE. #30 (summer—first 3000 miles with new engine), #40 (summer—after 3000 miles), #20 (winter).

CARBURETION:—See Carburetion Section for complete data on Carburetor, Fuel Pump, and Gasoline Gauge.
Carburetor:—Stromberg, Model EE-1. 1" dual, down-draft type.



Fuel Pump:—Stewart-Warner, Type 706-D (first cars), A.C., Type B-1522146 (later cars). Diaphragm type.
Gasoline Gauge:—K-S Telegauge, hydrostatic type.

CLUTCH:—Long, Model 9AB-6C1. Single plate, dry disc type. No adjustment for wear required.
Clutch Pedal Adjustment—Free movement of clutch pedal must be 1". To adjust, loosen transverse bolt at lower end of clutch pedal, change position of pedal (bolt hole is slotted).
Clutch Facings—Moulded type, 2 required. 5½" I.D., 9¾" O.D., .137" thick. Clutch facings are Raybestos #250.

STEERING:—Front Suspension—Conventional 'I' beam section front axle with Reverse-Elliott ends and semi-elliptic springs. Axle is Columbia Type 1700A-5.
Kingpin Inclination—7½° crosswise.
Caster—2° maximum without load, 3° loaded. Use wedge shims inserted between spring and spring pad on axle to correct caster.
Camber—1½°.
Toe In—⅛-3/16". Adjust in usual manner by changing length of tie rod.

IGNITION:—Coil Model CE-4001. On right side of engine block.
Ignition Current—3 amperes idling, 4½-5½ amperes at 6 volts stopped.
Ignition Switch—Oakes Hershey type co-incidental ignition switch and steering post lock. Switch has two 'on' positions. Lower or 'STX' position of lever is normal running position with Startix operative. Upper or 'IGN' position should be used to check ignition or whenever automatic cranking is not desired.

Distributor Model IGP-4002. Single breaker, 8 lobe cam, full automatic advance type.
Breaker Gap—.013-.017" (.015-.019" first 1000 miles with new contacts).
Breaker Arm Spring Tension—18 ozs., minimum, 20 ozs. maximum.
Cam Angles—Closed 29°. Open 16° distributor.

Automatic Advance

Distributor		Engine	
Degrees	R.P.M.	Degrees	R.P.M.
Start	300	0	600
2	540	4	1020
4	780	8	1560
6	1020	12	2040
8	1260	16	2520
10	1500	20	3000

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

IGNITION TIMING:— Flywheel Degs. Piston Position
All engines ..... 3° BTDC. ..... .0042" BTDC.
Timing—With #1 piston on compression, turn engine over until piston is 3° before top dead center, stop when flywheel mark '/' lines up with indicator in inspection hole in flywheel housing. This mark is 3° or approximately 1 tooth before top dead center mark '⅛'. Then 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:—1-6-2-5-8-3-7-4 (see diagram).
Spark Plugs:—Champion, Type J-6. 14 MM. Metric.
Spark Plug Gaps—Set at .025".

BATTERY:—U.S.L., Type XY-15A. 6 volt, 15 plate, 105 A.H. capacity (20 hour rate).
Starting Capacity—119 amperes for 20 minutes.
Grounded Terminal—Positive (+) terminal.
Location—Under right front seat.

STARTER:—Model MAB-4063. Armature No. MAB-2006.
Starter Drive—Outboard Bendix Type R11FX-10.
Rotation—Counter-clockwise at commutator end.
Brush Spring Tension—44-56 ounces with new brushes.
Cranking Performance—140 R.P.M. (engine), 1540 R.P.M. (armature), 160 amperes.

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:—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 GAR-4603-3. Armature No. GAR-2077. Air-cooled. Third brush control type.
Charging Rate Adjustment—Take off commutator cover band. Shift third brush by hand by prying on brush mounting plate, counter-clockwise to increase, or clockwise to decrease charging rate. Brush held in position by friction.
Maximum Charging Rate—20 amperes (cold), 16.3 (hot), 8 volts, 2050-2250 R.P.M., 25 M.P.H.

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	1115	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 with new brushes.
Motoring Current—4.65-5.15 amperes at 6.0 volts.
Field Current—3.70-4.10 amperes at 6.0 volts.
Field Fuse—7½ amperes under cover on top of generator field frame.

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

Belt Adjustment:—Belt adjusted in usual manner by swinging generator away from engine. Tension should be just sufficient to drive generator without slipping.

CUTOUT RELAY:—Model CB-4021. Mounted on generator.
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 A-5640-A. Delco-Remy Foot Control Switch, Model 465-W. Foot switch on toeboard controls headlamp upper and lower beams. Headlamp bulbs are pre-focused type.

Bulb Specifications

Position	Candlepower	Mazda No.
Headlamps	32-21	2320-C
Parking, Inst., Clock	3	63
Tail (right side)	3	63
Stop and Tail (left)	21-2	1158
Dome	6	81

FUSES:—Lighting—20 ampere on back of switch.
Clock Light—10 ampere on clock case.
Generator Field—7½ ampere on generator.

SERIAL NUMBER:—First number, 851-1001. On right hand side of cowl under hood. Letter following serial number designates body type.

ENGINE NUMBER:—On front left hand upper half of crankcase.

ENGINE:—**Lycoming, Model GH.** Eight cylinder, In Line, 'L' head type. Engine is supercharged by centrifugal type supercharger mounted on left side of crankcase and driven by separate chain.
Bore—3 1/16". **Stroke**—4¾".
Piston Displacement—279.92 cubic inches.
Rated Horsepower—30.0.
Developed Horsepower—150 at 4000 R.P.M.
Compression Ratio—6.5-1. Std. aluminum head.

Pistons before Eng. No. 4759:—Bohn, aluminum alloy, Invar Strut, split skirt type. Piston length, 3¾".
Weight—16 ozs. stripped, 21.92 ozs. with rings and pin.
Removal—Pistons and rods removed from below.
Clearance—Top .00975-.00825". Skirt .0015".
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 between 5-10 pounds.
Installing Pistons—Slot should be toward left or camshaft side of engine.

Pistons after Eng. No. 4759:—Ray Day, Ray Day metal type. Piston length 3¾".
Weight—14.40 ozs. stripped, 19.84 ozs. with rings and pin.
Removal—Pistons and rods removed from below.
Clearance—Top .01125-.01325". Skirt .002-.0025".

Piston Rings:—**Bohn Pistons**—Two compression, two oil control rings per piston, all above pin. **Ray Day Pistons**—Two compression, one oil control ring per piston, all above pin. Rings used on Bohn pistons are all Sealed Power Corp. Rings used with Ray Day pistons are Perfect Cricle #70 (compression), #85 (oil control).

Ring	Width	End Gap	Side Cl'rance
Comp. (#1, 2)	⅛"	.008-.013"	.0015-.003"
Oil Cont. (#3 Bohn)	⅛"	.008-.013"	.001-.0025"
Oil Cont. (#4 Bohn)	3/16"	.008-.013"	.001-.0025"
Oil Cont. (Ray Day)	3/16"	.007-.015"	.001-.0025"

Piston Pin:—Diameter .8750-.8748". Length 2.520-2.500". Pin is locked in the rod. No bushing used in piston.
Pin Fit in Piston—Tight push fit at 70°F (selective).

Connecting Rod:—Weight 2.34 lbs. Length 9½".
Crankpin Journal Diameter—2⅛".
Lower Bearing Type—Spun babbitt-lined. No shims.
Clearance—.0010-.0025" total. Sideplay .004-.009" total.
Adjustment—Adjust by filing bearing caps when wear exceeds .004". No shims used.
Installing Rods—Rods are numbered and must be installed in same numbered cylinders. Lower bearings are offset. Install rods with narrow half of bearing toward nearest main bearing. Oil jet holes in upper half of lower bearing must be toward camshaft side of engine on all rods.

Crankshaft:—Five bearing. Shaft is counterweighted and a Lanchester type vibration dampener used.
Journal Diameters—2⅜" all bearings.
Bearing Type—Bronze-backed, babbitt-lined.
Clearance—.0010-.00162".
Adjustment—Take up bearings by filing bearing caps when wear exceeds .003". Check adjustment by assembling .002" feeler ½" wide between bearing and shaft. Crankshaft should turn by hand with feeler in place and bearing caps tight.
End Thrust—Taken by center bearing. Endplay .005" minimum, .010" maximum.

Camshaft:—Six bearing. Non-adjustable chain drive.
Bearing Type—Steel-backed, babbitt-lined.
Timing Chain—Whitney. Width 1¼". Pitch ½". Length 24½" or 49 links.
Camshaft Setting—Sprockets are marked. Mesh chain with sprockets turned so that there are 12 links between marks on sprockets. This is equal to 13 teeth inclusive of teeth meshed opposite marks. With sprockets in this position, pistons #1 and 8 will be on top dead center with dead center mark on flywheel lined upwith indicator on housing.

Valves:—	Head Diameter	Stem Diameter	Length
Intake	1 9/16"	.3420-.3425"	5¼"
Exhaust	1 13/32"	.3420-.3425"	5¼"

	Seat Angle	Lift	Stem Clearance
Intake	30°	5/16"	.0045-.008"
Exhaust	45°	5/16"	.0045-.008"

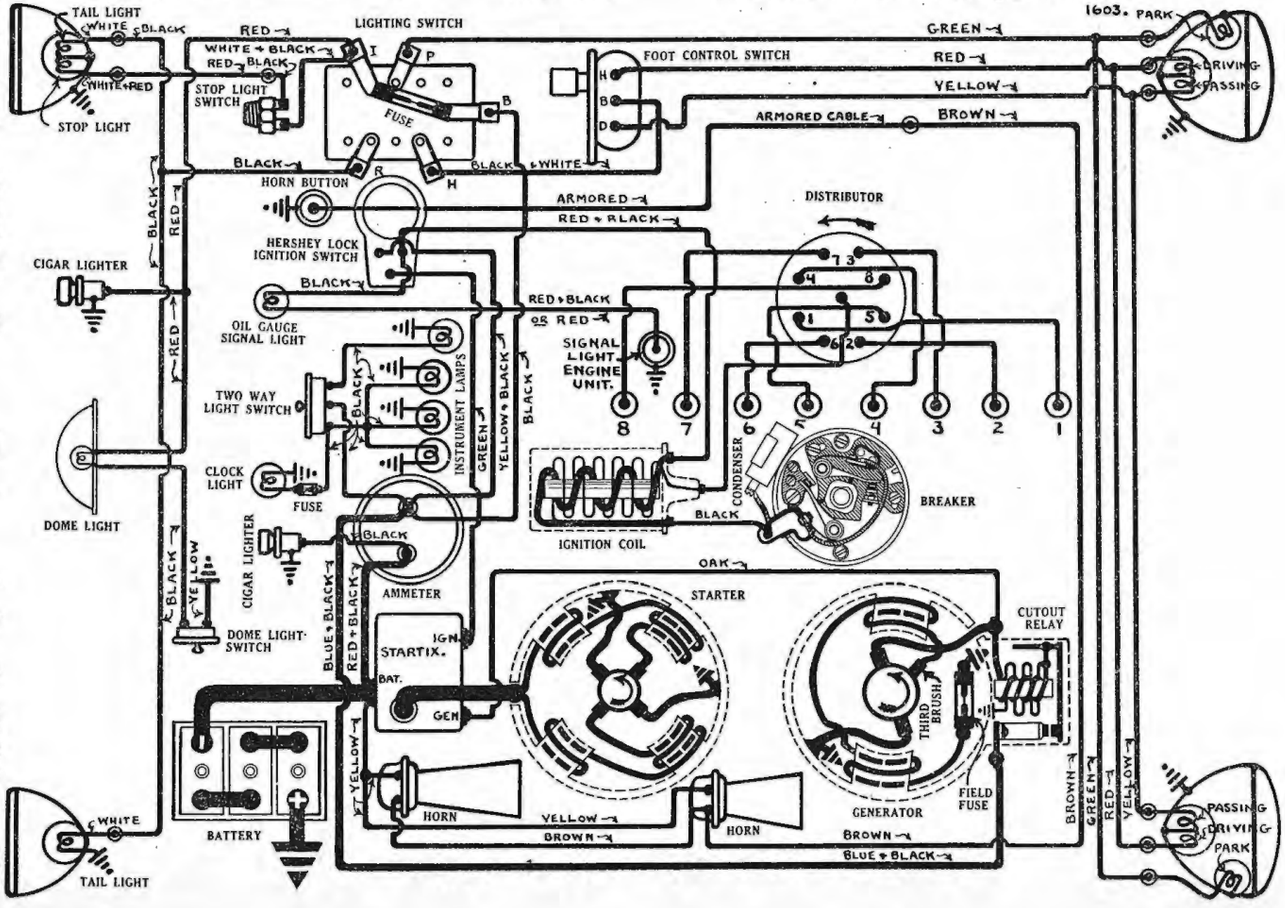
Tappet Clearance—.008-.010"—all valves with engine hot. Clearance for timing .012".

Valve Springs:—	Spring Pressure	Length
Valve Closed	42-47 lbs.	2 3/16"
Valve Open	88-94 lbs.	1 27/32"

Valve Timing—See Camshaft Setting above.
Intake Valves—Open 7½° BTDC. Close 37½° ALDC.
Exhaust Valves—Open 50° BTDC. Close 5° ATDC.
To Check Valve Timing—Set tappet clearance #1 intake valve at .012". This valve should open with piston slightly before top dead center when a point on the flywheel approximately 2.29 teeth before the dead center mark '⅛' lines up with the indicator on the flywheel housing. Reset tappet clearance at .008-.010" with engine hot.

Lubrication:—Pressure. Gear type oil pump located in the crankcase.
Normal Oil Pressure—15 lbs. idling, 40 lbs. at maximum engine R.P.M. with warm oil.
Oil Pressure Relief Valve—Located in bracket bolted on left hand side of crankcase. Operates at 30 lbs. Adjustable by changing spacing washer between plug and relief valve spring (plug at lower end of bracket).

Capacity and Oil—8 qts. Use SAE. #30 (summer—first 3000 miles with new engine), #40 (summer—after 3000 miles), #20 (winter).



CARBURETION:—See Carburetion Section for complete data on Carburetor, Fuel Pump, and Gasoline Gauge.
Carburetor:—Stromberg, Model EX-32, 1½" plain tube, downdraft type mounted on Supercharger.
Fuel Pump: — Stewart-Warner Type 706-D (first cars), A.C., Type B-1522146 (later cars). Diaphragm type.
Gasoline Gauge:—K-S Telegauge, hydrostatic type.

CLUTCH:—Long Model 9AB-6C1. Single plate, dry disc type. No adjustment for wear required.
Clutch Pedal Adjustment—Free movement of clutch pedal should be 1". To adjust, loosen transverse bolt at lower end of clutch pedal, change position of pedal (bolt hole is slotted).
Clutch Facings—Moulded type, 2 required, 5½" I.D., 9¾" O.D., .137" thick. Facings are Raybestos #250.

STEERING:—Front Suspension—Conventional 'I' beam section front axle with Reverse-Elliott ends and semi-elliptic springs. Axle is Columbia Type 1700A-5.
Kingpin Inclination—7½° crosswise.
Caster—2° maximum without load, 3° loaded. Use wedge shims inserted between spring and spring pad on axle to correct caster angle.
Camber—1½°.
Toe In—⅛-3/16". Adjust in usual manner by changing length of tie rod.

IGNITION:—Coil Model CE-4001. On right side of engine block.
Ignition Current—3 amperes idling, 4½-5½ amperes at 6.0 volts stopped.
Ignition Switch—Oakes Hershey type co-incidental ignition switch and steering post lock. Switch has two 'on' positions. Lower or 'STX' position of lever is normal running position with Startix operative. Upper or 'IGN' position should be used to check ignition or whenever automatic cranking is not desired.

Distributor Model IGH-4027. 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 Timing).
Breaker Gap—.018-.020".
Breaker Arm Spring Tension—16-20 ounces.
Cam Angles—Closed 34.5°. Open 10.5° distributor. Both sets together when properly synchronized.

Automatic Advance

Distributor		Engine	
Degrees	R.P.M.	Degrees	R.P.M.
Start	400	0	800
1	700	2	1400
2	990	4	1980
3	1280	6	2560
4	1560	8	3120
5.5	2000	11	4000

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

IGNITION TIMING:— Flywheel Degs. Piston Position
All engines ..... 3-4° BTDC. ..... .0042" BTDC.
Timing (Stationary Contacts)—With #1 piston on compression, turn engine over until piston is 3-4° before top dead center, stop when flywheel mark '/' lines up with indicator in inspection hole in right front face of flywheel housing. This mark is approximately 1½ teeth before the top dead center mark '⅛'. Then 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 opposite #1 segment in distributor cap.
Synchronization (Movable Contacts)—Manufacturer recommends use of a Winn Synchrometer to synchronize contacts. No flywheel marks are provided and some type of equipment must be used for this purpose. Change position of movable sub-plate carrying second set of contacts by loosening two lockscrews and shifting plate until movable contacts open exactly 45° after stationary set. Distributor firing intervals are regular 45-45-45 distributor degrees.
Auto-Lite Synchronizing Tool ST-206—See Equipment Section for complete directions on synchronizing distributor with this tool (old Part No. IGH-1). Used in connection with 45-degree marks on rotor fantail.
NOTE—Manufacturer recommends use of a Neon Timing Light in setting ignition. See Equipment Section for complete directions.
Firing Order:—1-6-2-5-8-3-7-4 (see diagram).
Spark Plugs:—Champion Type J-9B. 14 MM. Metric.
Spark Plug Gaps—Set at .025".

BATTERY:—U.S.L., Type XY-15A. 6 volt, 15 plate, 105 A.H. capacity (20 hour rate).
Starting Capacity—119 amperes for 20 minutes.
Grounded Terminal—Positive (+) terminal.
Location—Under right front seat.

STARTER:—Model MAB-4063. Armature No. MAB-2006.
Starter Drive—Outboard Bendix Type R11FX-10.
Rotation—Counter-clockwise at commutator end.
Brush Spring Tension—44-56 ounces with new brushes.
Cranking Performance—140 R.P.M. (engine), 1540 R.P.M. (armature), 160 amperes.

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:—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 GAR-4603-3. Armature No. GAR-2077. Air-cooled. Third brush control type.
Charging Rate Adjustment—Take off commutator cover band. Shift third brush by hand by prying on brush mounting plate, counter-clockwise to increase, or clockwise to decrease charging rate. Brush held in position by friction.
Maximum Charging Rate—20 amperes (cold), 16.3 (hot), 8 volts, 2050-2250 R.P.M., 25 M.P.H.

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	1115	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 with new brushes.
Motoring Current—4.65-5.15 amperes at 6.0 volts.
Field Current—3.70-4.10 amperes at 6.0 volts.
Field Fuse—7½ amperes under cover on top of generator field frame.

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

Belt Adjustment:—Belt adjusted in usual manner by swinging generator away from engine. Tension should be just sufficient to drive generator without slipping.

CUTOUT RELAY:—Model CB-4021. Mounted on generator.
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 A-5640-A. Delco-Remy Foot Control Switch, Model 465-W. Foot switch on toeboard controls headlamp upper and lower beams. Headlamp bulbs are pre-focused type.

Bulb Specifications

Position	Candlepower	Mazda No.
Headlamps	32-21	2320-C
Parking, Inst., Clock	3	63
Tail (right side)	3	63
Stop and Tail (left)	21-2	1158
Dome	6	81

FUSES:—Lighting—20 ampere on back of switch.
Clock Light—10 ampere on clock case.
Generator Field—7½ ampere on generator.

SERIAL NUMBER:—First number, 2,777,650. On right front side of frame front cross member.

ENGINE NUMBER:—Stamped on right side of crankcase above oil filler.

ENGINE:—**Own Model 40.** Eight cylinder, In line, 'I' or overhead valve type.

Bore—3 3/32". **Stroke**—3⅞".

Piston Displacement—233 cubic inches.

Rated Horsepower—30.63.

Developed Horsepower—93 at 3200 R.P.M.

Compression Ratio—5.45-1. No optional ratios.

Compression Pressure—121 lbs. at 1000 R.P.M. or 100 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 .001", .005", .010", .015", .020", .030" oversize.

Weight—26.0 ozs (stripped), 32.8 ozs. (with rings, pin, and pin bushings).

Removal—Pushrods must be removed before head can be taken off. Pistons and rods removed from above.

Clearance—.0075" top. .00175" bottom.

Fitting New Pistons—Use feeler stock ½" wide. Piston should pass through cylinder of own weight with .0015" feeler and should hold own weight with .00225" feeler.

Installing Pistons—Pin hole in piston offset 3/64". Install pistons with offset toward camshaft side

Piston Rings:—Four rings per piston, two compression rings, one oil control ring above piston pin, one oil control ring below pin. Both oil ring grooves drilled radially with ten ⅛" drain holes.

Ring	Width	End Gap	Wall Thickness	Side Clearance
Comp. (top)	⅛"	.010-.015"	.140"	.0015-.003"
Comp. (lower)	⅛"	.010-.015"	140"	.001-.0025"
Oil Cont. (all)	5/32"	.010-.018"	.135"	.001-.0025"

Piston Pin:—Diameter 13/16". Length 2 11/16". Pin is clamped in rod. Pin bosses in piston are bronze-bushed.

Clearance in Piston Bushings—.0003-.0005" radial.

Connecting Rod:—Weight 27.0 ozs. Length 7¼"

Lower Bearing Diameter—2".

Lower Bearing—Spun-babbittt lined type.

Clearance—.001-.002". Sideplay .005-.008".

Adjustment—Shims. Do not file bearing caps.

Installing Rods—Assemble rods with marks on rods and caps together and pointing toward rear of engine.

Crankshaft:—Five bearing type. Integral counterweights.

Journal Diameters—#1 2 5/16"; #2 3⅜"; #3 2 7/16"; #4 2½"; #5 2 9/16".

Bearing Type—Steel-backed, babbitt-lined. Bearings are dowelled in crankcase and cap and are assembled with .000-.002" projection above cap and crankcase to insure contact. New bearings should be line-reamed after installing.

Clearance—.001-.002". 1/32" clearance at each end

Adjustment—Shims provided. Do not file caps.

End Thrust—Taken by #3 (center) bearing. Endplay .004-.007".

Camshaft:—Five bearings. Non-adjustable chain drive.

Journal Diameters—#1 2 1/32"; #2 2"; #3 1 31/32"; #4 1 15/16"; #5 1 21/32".

Bearing Type—Steel-backed, babbitt-lined.

Clearance—(#1) .0005-.0025"; (all others) .0005-.0035"; Endplay .002-.006" (all bearings).

Timing Chain—Link Belt, Width 1", Pitch .500", Length 25" or 49 links.

Camshaft Setting—Both sprockets marked at space between teeth. Two teeth on chain also marked. Mesh chain so that marked tooth is opposite marked space on each sprocket.

Valves:—

	Head dia.	Stem Dia.	Seat Angle
Intake	1 17/32"	.3715-.3725"	45°
Exhaust	1 11 /32"	.3711-.3719"	45°

	Valve Lift	Stem Clearance
Intake	.314-.319"	.0015-.0035"
Exhaust	.314-.319"	.0021-.0039"

NOTE—Exhaust valve stems are copper-plated.

Tappet Clearance—.008" all valves—engine hot.

Valve Springs—Double springs used on all valves.

	Total Spring Pressure	Length
Valve Closed	55-65 lbs.	1 15/16"
Valve Open	151-164 lbs.	1 19/32"

Valve Timing—See camshaft setting above.

Intake Valves—Open 4½° BTDC. Close 54° ALDC.

Exhaust Valves—Open 57½° BLDC. Close 21° ATDC

NOTE—Above figures represent 'timing points'

To Check Valve Timing—Set up micrometer gauge over #2 or #7 exhaust valve so as to measure valve opening (gauge rod should rest on valve spring cap). Valve should be .163" open when dead center mark for pistons #1 and 8 is visible in flywheel inspection hole.

Lubrication:—Pressure type. Gear type oil pump located in crankcase.

Normal Oil Pressure—35 lbs.

Oil Pressure Relief Valve—Operates at 35 lbs. No adjustment.

Capacity and Oil—7 qts. (dry), 6 qts. (refill). Use SAE. #30 (100 to 30°F.), #20-W (30 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:—Stromberg, Model EE-1, 1" dual, downdraft type.

Automatic Choke—Delco-Remy Carburetor Control, Type 498-D, 498-E, 498-F.

Fuel Pump:—A.C., Type R-1521794 diaphragm type.

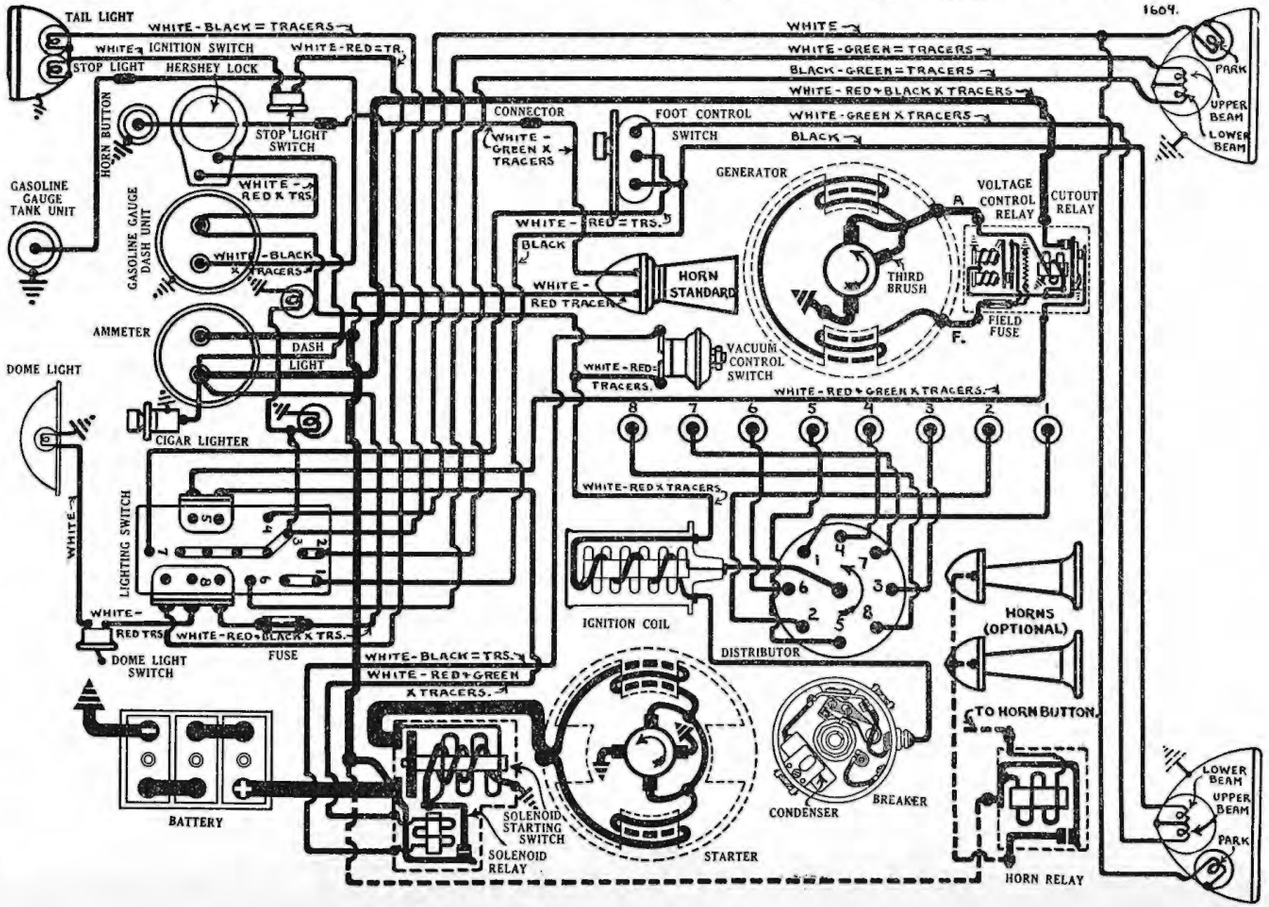
Gasoline Gauge:—A.C., electric type.

CLUTCH:—**Own Make.** Single plate, dry disc type. No adjustment required for wear.

Clutch Pedal Adjustment—Free movement or lash of clutch pedal should be 1". To adjust, turn nut on clutch release yoke.

Clutch Facings—Molded asbestos. 2 required, 6⅛" I.D., 9⅜" O.D., .130-.136" thick.

NOTE—Driven disc is segmented and care must be taken not to distort disc in removing and installing facings. Driven disc assembly should be balanced to with in ¼" ounce (static) with new facings by grinding outer edge of disc. Release lever heights must be equal within .005".



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

Caster—2¾-3¼° with car weight on wheels. See note below for preliminary checks. Toe-in must be adjusted first. To adjust caster, loosen nuts on upper adjuster bolt and adjuster shaft (on inner side of steering knuckle support, back off locknuts on adjustment screws at top of steering knuckle support (these screws bear against caster adjustment bolt). Turn rear adjusting screw out (counter-clockwise) and front screw in (clockwise) an equal amount to increase caster angle, or turn rear adjusting screw in (clockwise) and front screw out (counter-clockwise) to decerease caster angle. Adjustment range is 6°. Both screws must be tight against adjuster bolt. Tighten adjusting screw locknuts, adjuster bolt nut, and adjuster shaft nut. One turn of adjusting screws changes caster angle 1°.

Camber—¼° with car weight on wheels. See note below. No adjustment provided.

Toe In—⅛-3/16″. Roll car ahead one complete revolution before checking toe-in. Adjust by changing length of each tie rod equally. With wheels in straight-ahead position, intermediate steering arm must be midway between rear lower support arm bolts. Correct by equalizing length or tie rods, check toe-in, and steering wheel position. Turning tie rods ⅛ turn changes toe-in 5/64″.

NOTE:—All front wheel checks should be made with frame height corrected (by adding load or or raising frame) to following figures:

Distance from bumper seat on frame front cross member to top of lower support arm, 4 9/16″

Distance from frame to top of spring clip at rear—4 dr. Sedan and 2 dr. Sedan, 6⅞″ with spare at rear or 7¼″ with fender wells. Coupes, 6¼″ with spare tire at rear or 6⅝″ with fender wells.

IGNITION:—Coil Model 528-H. Mounted on right side of engine block.

Ignition Current—2½ amperes idling, 4½ stopped.

Ignition Switch—Oakes Hershey type co-incidental ignition switch and steering post lock.

Distributor Model 663-E. Single breaker, 8 lobe cam, full automatic advance type with auxiliary vacuum spark control and Octane Selector.

Breaker Gap—Set at .015″. Limits .0125-.0175″.

Breaker Arm Spring Tension—19-23 ounces.

Cam Angles—Closed 34°. Open 14° distributor.

Automatic Advance

Distributor Degrees	R.P.M.	Engine Degrees	R.P.M.
Start	250	3.5	500
7	400	14	800
15	1300	30	2600

Octane Selector—Adjustable at distributor only. Pointer must be at midpoint on scale after setting ignition timing. Selector can be adjusted for fuel being used by loosening two distributor hold-down screws and rotating distributor and pointer toward 'High' end of scale until very light knock is evident when engine is accelerated from 10 M.P.H. with wide open throttle.

Vacuum Spark Control Model 680-R. Vacuum unit provides additional advance for all speeds above idling except when engine is accelerated or is pulling heavily when return spring within unit will retard spark.

Vacuum Spark Advance

Engine Degrees	Vacuum
Start	5-7″ of HG
10-13°	10-13″ of HG.

Removal:—Distributor mounted on right side of crankcase. To remove, take out two hold-down screws. In installing distributor, see that cork oil seal is in place.

IGNITION TIMING:— Flywheel Degs. Piston Position

Standard Fuel	2° BTDC	.0014″ BTDC.
Ethyl Fuel	8° BTDC	.0238″ BTDC.

NOTE—All engines timed for standard fuel at factory. See note below for Ethyl fuel setting (no flywheel marks provided).

Timing (Using Timing Light)—Connect timing light between distributor terminal and ground. Turn on ignition. Crank engine over until #3 exhaust valve begins to open, stop when 'ADV' mark on flywheel lines up with reference line on housing inspection hole in right front face of flywheel housing. Loosen two hold-down screws, rotate distributor until timing lamp lights, indicating that contacts are opening, tighten hold-down screws, see that rotor is opposite #1 segment in cap (see diagram). See that pointer of Octane Selector is opposite center line on scale.

Timing (Using Synchroscope)—Engines can be timed with a Synchroscope or Neon light. Ignition mark on flywheel is filled in with white paint. Idle engine at 400 R.P.M. See Equipment Section for instructions.

Ethyl Fuel Setting—With ignition properly set for standard fuel (2° BTDC.), loosen distributor hold-down screws, rotate distributor clockwise 3 divisions on scale, tighten hold-down screws. This will provide correct 8° BTDC. setting for Ethyl fuel.

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

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

Spark Plug Gaps—.020-.025″.

BATTERY:—Delco, Type 13-JW, 13-JF (export). 6 volt, 13 plate, 98 A.H. capacity (20 hour rate).

Starting Capacity—117 amperes for 20 minutes.

Grounded Terminal—Negative (—) terminal.

Location—Under right front seat.

STARTER:—Model 734-Z. Armature No. 823881.

Starter Drive—Solenoid operated pinion shift and overrunning clutch.

Rotation—Counter-clockwise at commutator end.

Brush Spring Tension—24-28 ounces.

Cranking Performance—135 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:—Solenoid Switch Type 1512. Vacuum Switch Type 1594. Starting switch and pinion shift solenoid mounted on starter. Controlled through relay in solenoid case by vacuum switch operated by accelerator pedal. See Equipment Section for complete data.

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

GENERATOR:—Model 936-C. Armature No. 1854856. Third brush control in conjunction with Voltage Control Relay (two-step charging control).

Charging Rate Adjustment—Use test meters to check generator output. Connect jumper wire from 'F' terminal on generator to ground on generator frame. Loosen lockscrew 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—18 amperes (cold), 14 amperes (hot), 8.5 volts, 2400 R.P.M., 30 M.P.H.

Performance Data

	Amperes	Volts	R.P.M.
Cold	17-20	8.2-8.5	2400
Hot	13-15	7.7-8.0	3000

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 in 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 bolts and clamp bolt, pull generator away from engine by means of spring scale hooked to clamp bolt until tension is 20 lbs., tighten mounting bolts.

SPECIAL GENERATORS:—Model 931-Z (City Police), 935-L (State Police). Available as special equipment. See Equipment Section for complete data.

CONTROL UNIT:—Model 5589. Mounted on generator. Consists of Cutout Relay and Voltage Control Relay in a single case. Cutout Relay has special ground contacts for starter solenoid circuit control. See Equipment Section for complete data on these units.

Cutout Relay

Cuts In—6.4-6.8 volts, 7.25-7.75 M.P.H.

Cuts Out—0-3.0 ampere discharge current.

Relay Contact Gap—.018-.025″.

Air Gap—.018-.022″ with 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:—Switch Model 478-S, 478-T (RHD). Control Switch Model 465-R. Foot control switch operative only with lighting switch in #4 position (Country Driving) providing assymetrical passing beam. Headlamp bulbs are pre-focused type.

Bulb Specifications

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

FUSES:—Lighting—30 ampere in connector in lighting switch feed line from ammeter.

HORNS:—Klaxon Model K-26-L, Type 1609 Std. Model K-33-B, Type 1851 (low note), 1852 (high note) (Optional). Optional horns are matched tone, twin horns controlled by horn relay.

Horn Relay:—Model 266-T. Current draw .8 amps.

Contact Gap—.015-.025″.

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

SERIAL NUMBER:—First number, 2,777,650. On right frame side rail in front of shock absorber.

ENGINE NUMBER:—Stamped on right upper crankcase wall above oil filler.

ENGINE:—Own Model 50. Eight cylinder, In line, 'I' or overhead valve type.
Bore—2 31/32". **Stroke**—4¼"
Piston Displacement—235.3 cubic inches.
Rated Horsepower—28.2.
Developed Horsepower—88 at 32 R.P.M.
Compression Ratio—5.25-1. No optional ratios.
Compression Pressuse—114 lbs. at 1000 R.P.M. or 97 lbs. at cranking speed (135 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 .001", .005", .010", .015", .020", .030" oversize. Length, 3½".
Weight—25.0 ozs. (stripped), 31.2 ozs. (with rings, pin, and bushings).
Removal—At bottom of engine. Remove pistons #3 to 8 on side opposite camshaft without removing counterweights by setting counterweights ahead of piston and rotating shaft as pistons are removed Take off balancer by removing castellated nuts and washers on retaining bolts and slipping off balancer halves as shaft is rotated before removing #1 and 2 pistons.
Clearance—.0077" top, .0017" bottom.
Fitting New Pistons—Use feeler stock ½" wide. Piston should pass through cylinder of its own weight with .00125" feeler and hold its own weight with .002" feeler.
Installing Pistons—Pin hole in piston offset 3/64". Install pistons with offset toward camshaft side.

Piston Rings:—Four rings per piston, two compression rings, one oil control ring above pin, one oil control ring below pin. Both oil ring grooves drilled radially with ten ⅛" oil drain holes.

Ring	Width	End Gap	Wall Thickness	Side Clearance
Comp. Top	⅛"	.010-.015"	.130"	.0015-.003"
Comp.Lower	⅛"	.010-.015"	.130"	.001-.0025"
Oil Cont. All	5/32"	.010-.018"	.130"	.001-.0025"

Piston Pin:—Diameter ¾". Length 2 17/32". Pin is clamped in rod. Pin holes in piston bronze-bushed.
Clearance in Piston Bushings—.0003-.0005" radial.

Connecting Rod:—Weight 32 ozs. Length, 9".
Lower Bearing Diameter—2⅛".
Lower Bearing—Spun-babbitt lined type.
Clearance—.001-.002": Sideplay, .005-.008".
Adjustment—Shims. Do not file bearing caps.
Installing Rods—Connecting rod lower bearings offset. Assemble rods with marks on caps pointing toward nearest main bearing.

Crankshaft:—Five bearing type. Bolted-on counterweights.
Journal Diameters—#1, 2 5/16"; #2 2⅜"; #3 2 7/16"; #4 2½"; #5 2 9/16".
Bearing Type—Steel-backed, babbitt-lined type. Bearings are dowelled in crankcase and cap and are assembled with .000-.002" projection above cap and crankcase to insure contact. New bearings should be line-reamed after installing.
Clearance—.001-.002". 1/32" clearance at each end (except #3).
Adjustment—Shims provided. Do not file caps.
End Thrust—Taken by #3 (center bearing. Endplay, .004-.007".

Camshaft:—Five bearing. Helical gear drive.
Journal Diameters—#1 2 9/32"; #2 2 7/32"; #3 1 59/64"; #4 1⅞"; #5 1 21/32".
Bearing Type—Steel-backed, babbitt-lined type.
Clearance—(#1) .0005-.0025"; (all others) .0005-.0035"; endplay (all bearings) .002-.006".
Timing Gears—Crankshaft and generator gears Steel. Camshaft gear Textolite.
Gear Backlash—.0005-.0015" for new gears.
Adjustment—Install '+1S' replacement camshaft gear (with teeth .001" thicker on pitch circle) when backlash exceeds .0015". If lash is still excessive, install complete set new gears.
Camshaft Setting—Gears are marked. Mesh marked tooth opposite marked space between teeth.

Valves:—

	Head Dia.	Stem Dia.	Seat Angle
Intake	1 15/32"	.3407-.3417"	45°
Exhaust	1 11/32"	.3403-.3411"	45°

	Valve Lift	Stem Clearance
Intake	.340"	.0007-.0015"
Exhaust	.340"	.0010-.0019"

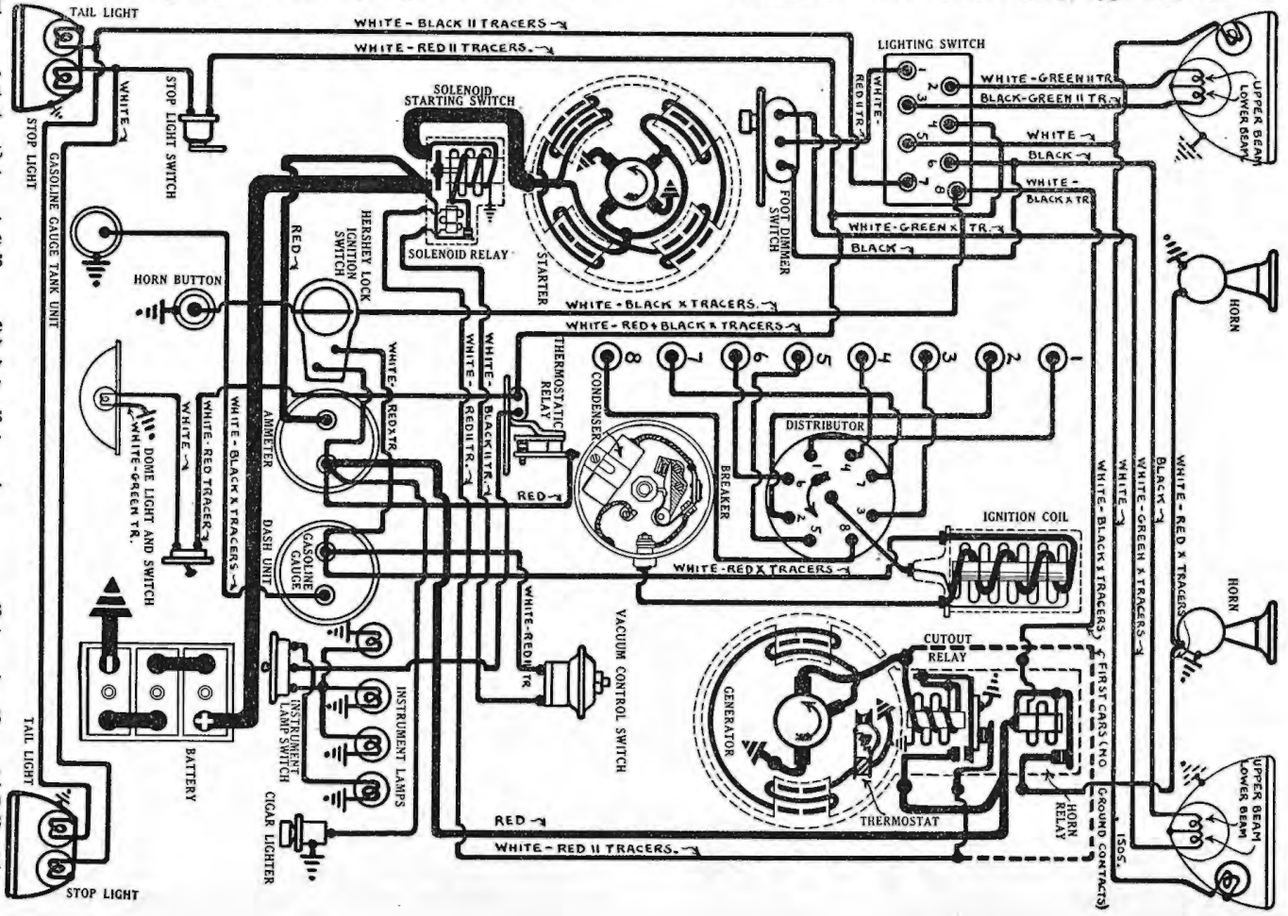
NOTE—Exhaust valve stems are copper-plated.
Tappet Clearance (Lash)—.008" hot (all valves).
Valve Springs—Double springs on all valves.

	Total Spring Pressure	Length
Valve Closed	45-55 lbs.	1 15/16"
Valve Open	132-145 lbs.	1 19/32"

Valve Timing—See Camshaft Setting above.
Intake Valves open 4½° BTDC. Close 54° ALDC.
Exhaust Valves open 58° BLDC. Close 30° ATDC.
NOTE:—Above figures represent 'timing' points
To Check Valve Timing—Set up micrometer gauge over #2 or #7 exhaust valve so as to measure valve movement (gauge rod should rest on valve spring cap). Set tappet clearance at .008". Valve should be .180" open when dead center mark for pistons #1 and 8 is visible in inspection hole.

Lubrication:—Pressure type. Gear type pump located in crankcase.
Oil Pressure—35 lbs.
Oil Pressure Relief Valve—Not adjustable. Operates at 35 lbs.
Capacity and Oil—9 quarts (dry), 7 quarts (refill). Use SAE. #40 (100°F. and above), #30 (100°-30°F.), #20 (30°-0°F.), #10 (0° to —15°F.).

CARBURETION:—(Fuel System). See Carburetion Section for complete data on Carburetor, Automatic Choke, Fuel Pump, and Gasoline Gauge.
Carburetor:—Marvel, Model ED-1-S, 1¼" dual updraft type.
Automatic Choke—Delco-Remy, type No. 498-C.



Fuel Pump:—A.C., Type 'I' combination fuel and vacuum pump.

Gasoline Gauge:—A.C. electric type.

CLUTCH:—Own Make. Single plate, dry disc type. No adjustment required for wear.

Clutch Pedal Adjustment—Free movement or lash of clutch pedal should be 1". Adjust by turning nut on forward end of clutch release rod. Clearance between pedal and under side of toeboard should be ⅛". Adjust by turning stopscrew at rear of clutch pedal shaft.

Clutch Facings—Woven type, 2 required. 6¼" I.D., 9½" O.D., .130-.135" thick.

NOTE:—When replacing linings, driven plate assembly should be balanced within ¼ oz. (static) by grinding outer edge of disc. Release lever height must be equal within .005". Use J-285B gauge plate in setting up levers.

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

Kingpin Inclination—4°53' crosswise.

Caster—1¾-2¼° with car weight on wheels. See note below for preliminary checks. Toe In must be correct. To adjust caster, loosen nuts holding upper and lower knuckle support yokes to outer ends of control arms, loosen clampbolt on top of knuckle support, turn upper support bolt clockwise (facing forward—head of bolt to rear) to increase caster angle, or counter-clockwise to decrease caster angle. Tighten clamp bolt, tighten upper and lower yoke retaining nuts. Turning support bolt three complete turns will change caster angle 1°. Caster of both front wheels must be equal within ⅛°.

Camber—¼° with car weight on wheels. See note below. To adjust, insert special washers between upper knuckle support yoke and upper control arm to increase camber, or between lower knuckle support yoke and lower control arm to decrease camber. A 1/16" washer will change camber 1/3°.

Toe In—5/32-7/32". Roll car ahead one complete revolution of wheels before checking toe in. Adjust by changing length of each tie rod equally. With wheels in straight-ahead position, intermediate steering arm must be midway between rear lower support arm bolts. Correct by equalizing length of the tie rods, recheck toe-in, and steering wheel position. Turning tie rod ⅛ turn changes toe-in 1/16".

NOTE—All front wheel checks should be made with frame height correct (distance from top of jack pad to lower face of frame cross member must be equal within 1/64" on both sides of car.

IGNITION:—Coil Model 528-H. Ignition current 2½ amperes (idling), 4½ amperes (stopped).

Ignition Switch:—Oakes 'Hershey' type co-incidental steering post and ignition switch lock.

Distributor Model 663-C. Single breaker, 8-lobe cam type. No synchronization required. Fitted with vacuum spark advance and Octane Selector.

Breaker Gap—Set. at .015". Limits .0125-.0175".

Breaker Arm Spring Tension—19-23 ounces.

Cam Angles (Distributor Degrees) — Closed 31°. Open 14°.

Automatic Advance

Distributor Degrees	R.P.M.	Engine Degrees	R.P.M.
Start	250	3.5	500
7	400	14	800
10.5	800	21	1600

Octane Selector—Consists of manual retard (12° engine maximum) located on instrument panel to adjust spark for various fuel characteristics. Lever should be placed at 'High' end of scale with fuel of 76-78 Octane rating and should be moved toward 'Low' end of scale only enough to eliminate excessive knock when fuel of lower rating is used. Lever must be placed at 'High' when ignition setting is being checked or adjusted.

Vacuum Spark Advance—Model 680-H—Vacuum unit provides additional spark advance for all speeds above idling except when engine is accelerated or is pulling heavily (return spring in unit will retard spark under these conditions).

Advance (Engine Degrees)	Engine R.P.M.	Vacuum (Ins. of Mercury)
Start	700	5-7"
10-12	900	10-13"

Mounting:—On generator at right of engine. Distributor held in place by hold-down screw in advance arm.

IGNITION TIMING:— Flywheel Degrees Piston Travel
All engines .....7° BTDC..... .0198" BTDC.
This setting is correct with Octane Selector turned to 'High' end of scale.

Timing (using Timing Light)—Connect timing light between ignition terminal on distributor and ground. Turn Octane Selector to 'High' position and see that distributor is advanced (rear end of slot in advance plate should be against stop screw). Turn on ignition, turn engine over until #3 exhaust valve begins to open, stop when 'ADV/7°' mark on flywheel lines up with reference mark on housing (inspection hole on top face right rear motor support), loosen advance arm clamp bolt, rotate distributor until indicator bulb just lights, tighten clamp bolt, see that rotor is opposite No. 1 terminal in cap, check spark plug connections (see diagram).

Timing (using Synchroscope or Neon Light)—See Equipment Section for complete directions. Idle engine at speed not greater than 400 R.P.M.

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

Spark Plugs:—A.C., Type H-9. 18 MM. Metric type.
Spark Plug Gap—.020-.025".

BATTERY:—Delco, Type 13-J, 13-JF (Export), 6 volt, 13 plate, 98 A.H. capacity (20 hour rate).
Starting Capacity—117 amperes for 20 minutes.
Grounded Terminal—Negative (—) terminal.
Location—Under right front seat.

STARTER:—Model No. 727-G. Armature No. 823881.
Rotation—Counter-clockwise (commutator end).
Brush Spring Tension—24-28 ounces each.
Cranking—400 amperes—4.0 volts—575 R.P.M.

Performance Data

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

Starting Switch:—Solenoid No. 1513. Vacuum Switch No. 1587. Starter pinion shift operated by solenoid on starter field frame. Controlled by vacuum switch operated by foot accelerator pedal or hand throttle. See Equipment Section for complete data.

Mounting—Flange mounted on right front face of flywheel housing.

GENERATOR:—Model 956-H. Armature No. 1845920. Third brush control type with thermostat. Thermostat contacts open at 200°F. cutting resistance in field circuit and reducing output approximately 40%. Thermostat is not adjustable.

Charging Rate Adjustment—Slotted adjustment lever located on commutator end plate directly below distributor cup. Loosen clamp screw on lever one turn, move lever down (clockwise) to increase, or up (counter-clockwise) to decrease, charging rate, tighten clamp screw.

Standard Setting—20 amperes (cold), 8.5 volts, 21.5-26 M.P.H.

Performance Data

	Amperes	Volts	R.P.M.
Cold	19-22	8.3-8.7	2000
Hot	11-14	7.5-7.9	2200-2600

Rotation—Counter-clockwise (commutator end).
Shunt Field Current—2.1-2.5 amperes at 6.0 volts.
Brush Spring Tension—23-27 ounces each.
Mounting—Flange mounted on right rear face of timing gear case.

SPECIAL GENERATORS:—Models 929-B, 956-L. These generators are special equipment. See Equipment Section for complete data.

CUTOUT RELAY:—Model 264-K. Mounted on generator field frame. Relay has extra ground contacts above armature for starter solenoid relay control (see diagram). Horn relay located in cutout relay case.

Cuts in	Cut-out Relay	Cuts out
6.7-7.5 volts (7-7.5 M.P.H.).		0-2 amperes discharge.

Contact Gap—.015-.025".
Air Gap:—.012-.017" (contacts closed).

Horn Relay

Current to close contacts—.25 amps. at 2 volts min.
Contact Gap—.015-.025".
Air Gap—.012-.017" (contacts closed).

LIGHTING: — Switch Model 487-F. Export Models 487-G (L.H.D.), 486-W (R.H.D.). Foot Control Switch No. 465-R. Foot Control Switch operative only with lighting switch lever in extreme right (country driving) position, providing asymmetrical passing beam (lower beam from right hand lamp which lights left hand side of road). Headlight bulbs are new 'pre-focused' type.

Bulb Sizes

Position	Candlepower	Mazda No.
Headlights	32-32	2330-L
Stop (Backing)	15	87
Dome	6	81
Dash, Tail, Parking	3	63

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 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.

HORNS:—Klaxon, Model K-33-C. Matched set, blended tone. Current draw 12 amperes at 6.0 volts each. Horns operated by horn relay (see Relay paragraph above).

SERIAL NUMBER:—First number, 2,777,650. On right frame side rail in front of front shock absorber.

ENGINE NUMBER:—Stamped on right side of upper crankcase wall above oil filler.

ENGINE:—Own. Models 60 and 90. Eight cylinder, In line, 'I' or overhead valve type.
Bore & Stroke—3 3/32 x 4⅝" (60), 3 5/16 x 5" (90).
Displacement—278.1 (60), 344.8 (90) cubic inches
Rated Horsepower—30.63 (60), 35.12 (90).
Developed Horsepower—100 (60), 116 (90) at 3200 R.P.M.
Compression Ratio—5.25-1 (60), 4.95-1 (90).
Compression Pressure—114 lbs. (60), 103 lbs. (90) at 1000 R.P.M. or 114 lbs. (60), 95 lbs. (90) at cranking speed (120 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 .001", .005", .010", .015", .020", .030" oversize. Piston length, 3 13/16" (60), 3 29/32" (90).
Weight—26.7 ozs. (60), 30.4 ozs. (90) stripped or 33.6 ozs. (60), 38.4 ozs. (90) with rings, pin and bushings.
Removal—At bottom of engine. Remove pistons #3 to 8 on side opposite camshaft without removing counterweights by placing adjacent counterweights ahead of pistion and revolving shaft as piston is withdrawn. Take off balancer by removing castellated nuts and washers and slipping off balancer halves as shaft is rotated before taking out pistons #1 and 2.
Clearance—Top .0075" (60), .0097" (90), Bottom .00175" (60), .002" (90).
Fitting New Pistons—Use feeler stock ½" wide. Piston should pass through cylinder of own weight with .0015" feeler and hold own weight with .00225" feeler.
Installing Pistons—Pin hole in piston offset 3/64" (60), 3/32" (90). Install pistons with offset toward camshaft side.

Piston Rings:—Four rings per piston, two compression rings, one oil control ring above pin, one oil ring below pin. Both oil ring grooves drilled radially with ten ⅛" oil drain holes.

Ring	Width	End Gap	Wall Thickness	Side Clearance
Comp. Top	⅛"	.010-.015"	.140"	.0015-.003"
Comp. Lower	⅛"	.010-.015"	.140"	.001-.0025"
Oil Cont. (60)	5/32"	.010-.018"	.135"	.001-.0025"
Oil Cont. (90)	5/32"	.010-.018"	.145"	.001-.0025"

Piston Pin:—Diameter 13/16" (60), ⅞" (90). Length 2 11/16" (60), 2 27/32" (90). Pin is clamped in rod. Pin holes in piston are bronze-bushed.
Clearance In Piston Bushing—.0003-.0005" radial.

Connecting Rod:—Weight 39.65 ozs. (60), 49.5 ozs. (90). Length 9¾" (60), 11" (90).
Lower Bearing Diameter—2 3/16" (60), 2⅜" (90).
Lower Bearing Type—Spun-babbitt lined type.
Clearance—.001-.002". Sideplay .005-.008".
Adjustment—Shims. Do not file bearing caps.
Installing Rods—Lower bearings are offset. Assemble rods with marks on rods and caps toward nearest main bearing.

Crankshaft:—Five bearings. Bolted-on counterweights.
Journal Diameters—(60) #1 2 5/16", #2 2⅜", #3 2 7/16", #4 2½", #5 2 9/16". (90) #1 2 9/16", #2 2⅝", #3 2 11/16", #4 2¾", #5 2 13/16".
Bearing Type—Steel-backed, babbitt-lined type.
Clearance—.001-.002". 1/32" clearance at each end (except #3).
Adjustment—Shims. Do not file bearing caps.
End Thrust—Taken by #3 (center) bearing. Endplay .004-.007".

Camshaft:—Six bearings. Helical gear drive.
Bearing Type—Steel-backed, babbitt-lined type.
Clearance—(#1) .0005-.0025"; (all others) .0005-.0035"; (endplay—all bearings) .002-.006".
Timing Gears—Crankshaft and generator gears Steel. Camshaft gear Textolite.
Gear Backlash—.0005-.0015" for new gears.
Adjustment—Install '+1S' replacement camshaft gear (with teeth .001" thicker on pitch circle when backlash exceed .0015". If lash is still excessive, install complete set of new gears.
Camshaft Setting—Gears are marked. Mesh marked tooth opposite marked space between teeth.

Valves:— Engine	Head Diameter	Stem Diameter
60—Intake	1 9/16" (overall)	.3715-.3725"
60—Exhaust	1 7/16" "	.3711-.3719"
90—Intake	1 25/32" "	.3715-.3725"
90—Exhaust	1 19/32" "	.3711-.3719"

	Seat Angle	Lift	Stem Clearance
Intake-all	45°	.340"	.0007-.0015"
Exhaust-all	45°	.340"	.0010-.0019"

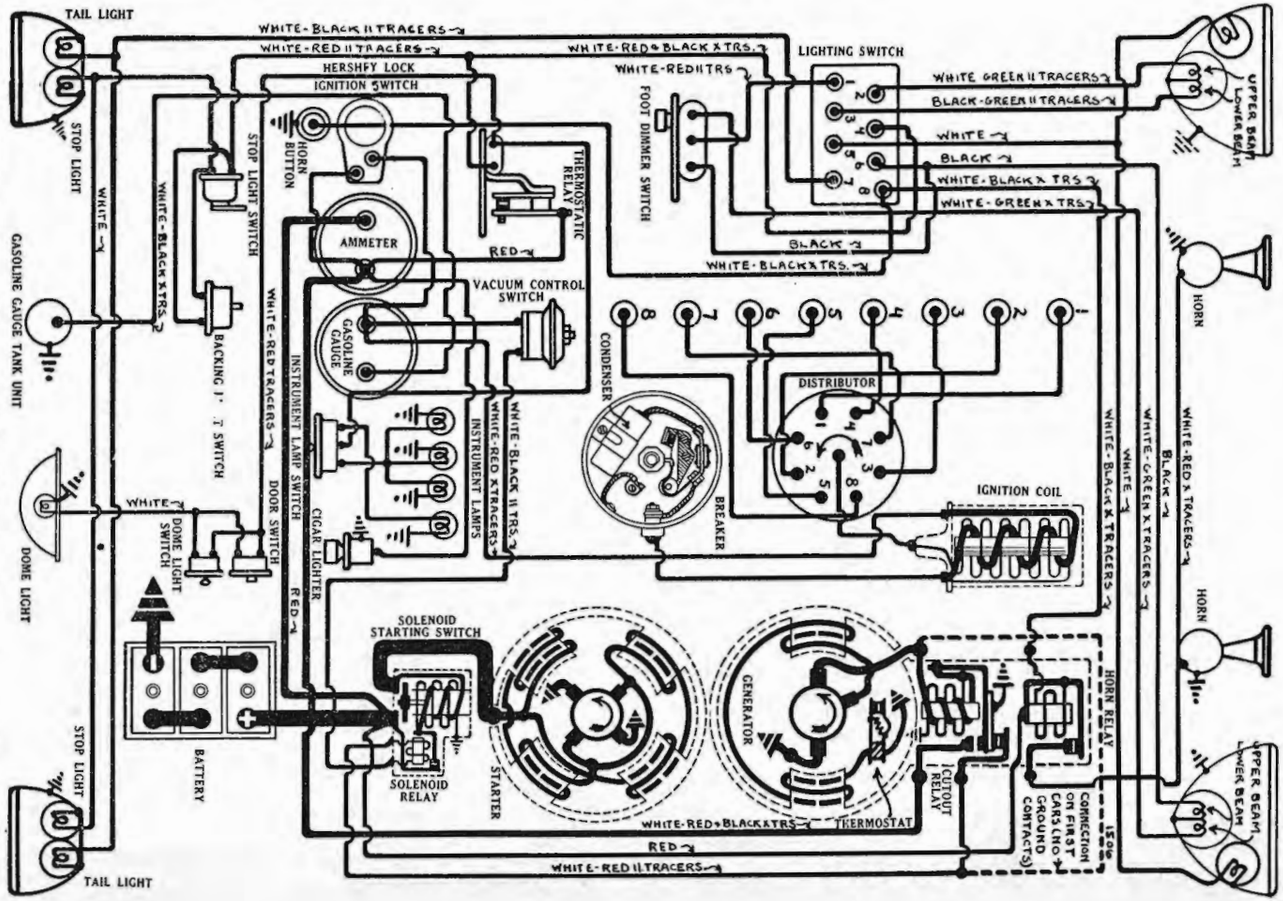
NOTE:—Exhaust valve stems are copper-plated.
Tappet Clearance (Lash)—.008" hot (all valves).
Valve Springs—Double springs used.

Inner Spring—	Pressure	Length
Valve Closed	20-25 lbs.	1 21/32"
Valve open	55-61 lbs.	1 5/16"
Outer Spring—	**Pressure**	**Length**
Valve Closed	35-40 lbs.	1 15/16"
Valve Open	96-103 lbs.	1 19/32"

Valve Timing—See Camshaft Setting above.
Intake Valves open 4½° BTDC. Close 54° ALDC.
Exhaust Valves open 58° BTDC. Close 30° ALDC.

NOTE:—Above figures represent 'timing' points when valve is .004" off seat with .008" lash.
To Check Valve Timing—Set up micrometer gauge over #2 or #7 exhaust valve so as to measure valve movement (gauge rod should rest on valve spring cap). Set tappet clearance at .008". Valve should be .180" open when dead center mark for pistons #1 and #8 is visible in inspection hole.

Lubrication:—Pressure type. Gear type pump mounted in crankcase.
Oil Pressure—35 pounds.



Oil Pressure Relief Valve—Not adjustable.
Capacity—Dry, 11½ quarts (60), 12½ quarts (90). Refill, 8 quarts (60), 9 quarts (90).
Recommended Oil—Use SAE. #40 (100°F. and above), #30 (100°-30°F.), #20 (30°-0°F.), #10 (0° to —15°F.).

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

Carburetor:—**(60)** Marvel, Model ED-2-S, 1 5/16".
(90) Marvel, Model ED-3, 1 7/16" dual updraft
Automatic Choke—Delco-Remy, Type No. 498-C.

Fuel Pump:—A.C., Type 'F' fuel and vacuum pump.
Gasoline Gauge:—A.C., electric type.

CLUTCH:—**Own Make.** (60) Single plate, dry disc type. All specifications and data same as for Series 50 except facing outside diamter 9⅞". (90) Double plate, dry disc type. See data below. No adjustment required for wear.
Pedal Adjustment—Free movement or lash of clutch pedal should be 1". Adjust by turning nut on forward end of clutch release rod. Clearance between pedal and toeboard should be ⅛". Adjust by turning stopscrew at rear of pedal shaft.
Clutch Facings—Woven type, 4 required, 6½" I.D., 9" O.D., .135-.140" thick.
NOTE:—Center driving plate is bolted to flywheel and acts as a clutch pilot. Driven discs are clamped betwen center driving plate and front and rear driving plates when clutch is engaged.
Clutch Assembly—With clutch disassembled, check length of four center plate driving pins from face of center plate to end of pins on lever side. If lengths are not equal within .0005" replace plate. With one clutch driven plate tight against centerplate, check total clearance between center plate and other driven plate. Clearance must be equal within .005" from one side to the other. Correct by installing brass or steel shims between driven disc and clutch hub on low side, passing hub bolt through hole in shim and locking bolt by peening nut on flat side of bolt. Total clearance between discs and center plate should be .020-.045". Clearance between release levers and driving pins should be .001". With this clearance, release bearing run-out should be less than .005" with bearing resting solidly on all levers. Correct by grinding bottom of release lever clip slightly on levers which are low.

STEERING:—**Front Suspension**—Independent, linked parallelogram type with coil springs. See Series 50 for complete data and Caster, Camber, and Toe In adjustments.
Kingpin Inclination—4°53' crosswise.
Caster—1-1¼° with car weight on wheels.
Camber—¼° with car weight on wheels.
Toe In—5/32-7/32".

IGNITION:—**Coil Model 528-H.** Ignition current 2½ amperes (idling), 4½ amperes (stopped).
Ignition Switch:—Oakes 'Hershey' type co-incidental steering post and ignition switch lock.
Distributor Model 663-A. Single breaker 8-lobe cam type. No synchronization required. Fitted with Vacuum Spark Advance and Octane Selector.
Breaker Gap—Set at .015". Limits, .0125-.0175".
Breaker Arm Spring Tension—19-23 ounces.
Cam Angles (Distributor Degrees) — Closed 31°. Open 14°.

Automatic Advance

Distributor Degrees	R.P.M.	Engine Degrees	R.P.M.
Start	250	3.5	500
7	400	14	800
15	1300	30	2600

Octane Selector—Consists of manual retard (12° engine maximum) with operating lever located on instrument board. Used to adjust spark for various fuel characteristics. Lever should be placed at 'High' end of scale for fuel of 76-78 Octane rating and should be moved toward 'Low' end of scale only enough to eliminate excessive knocking when fuel of lower rating is used. Lever must be placed in 'High' position when ignition is being checked or set.
Vacuum Spark Advance—Model 680-H. Vacuum unit on distributor provides additional spark advance for all speeds above idling except when engine is accelerated or is pulling heavily (return spring will retard spark under these conditions.

Advance (Engine Degrees)	Engine R.P.M.	Vacuum Ins. of Mercury)
Start	700	5-7"
10-12°	900	10-13"

IGNITION TIMING:—

	Flywheel Degs.	Piston Travel
Model 60	11° BTDC	.0523" BTDC.
Model 90	10° BTDC	.0466" BTDC.

Octane Selector turned to 'High' end of scale.
Timing (using Timing Light)—Connect timing light between distributor terminal and ground. Turn Octane Selector lever to 'High' end of scale and see that distributor is advanced (rear end of slot in advance plate should be against stop screw). Turn on ignition, turn engine over until #3 exhaust valve begins to open, stop when 'ADV/11°' (60) or 'ADV/10°' (90) mark on flywheel lines up with reference mark on housing (inspection hole located on top face of right rear motor support), loosen advance arm clamp bolt, rotate distributor until indicator bulb just lights, tighten clamp bolt, see that rotor is directly opposite #1 terminal in cap, check spark plug connections (see diagram).
Timing (using Synchroscope or Neon Light)—See Equipment Section for complete directions.
Firing Order:—1-6-2-5-8-3-7-4 (see diagram).
Spark Plugs:—A.C., Type H-9. 18 MM. Metric type.
Spark Plug Gap—.020-.025".
Radio Suppressors—Use special elbow type United Motors #1207820 (with adaptor #1208094 for center terminal of distributor).

BATTERY:—**(60) Delco, Type 15-G, GF (Export),** 6 volt, 15 plate, 114 A.H. capacity (20 hour rate).
Starting Capacity—137 amperes for 20 minutes.
(90) Delco, Type 17-D, DF (Export), 6 volt, 17 plate, 130 A.H. capacity (20 hour rate).
Starting Capacity—156 amperes for 20 minutes.
Grounded Terminal—Negative (—) terminal.
Location—Under right front seat.

STARTER:—**Model 727-F. Armature No. 820158.**
Rotation—Counter-clockwise (commutator end).
Brush Spring Tension—24-28 ounces each.
Cranking—380 amperes—4.2 volts—625 R.P.M.

Performance Data

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

Starting Switch:—Solenoid No. 1512. Vacuum Switch No. 1587. Starter pinion shift operated by solenoid on starter field frame. Controlled by vacuum switch operated by foot accelerator pedal or hand throttle (see Equipment Section for complete data).

GENERATOR:—**Model 956-H. Armature No. 1845920.** Third brush control type with thermostat. Thermostat contacts open at 200°F. cutting resistance in field circuit and reducing output approximately 40%. Thermostat is not adjustable.
Charging Rate Adjustment—Slotted adjustment lever located on commutator end plate directly below distributor cup. Loosen clamp screw on lever one turn, move lever down (clockwise) to increase, or up (counter-clockwise) to decrease, charging rate, tighten clamp screw.
Standard Setting—20 amperes (cold), 8.5 volts, 22.5-27.5 M.P.H. (60), 24.5-30 M.P.H. (90).

Performance Data

	Amperes	Volts	R.P.M.
Cold	19-22	8.3-8.7	2000
Hot	11-14	7.5-7.9	2200-2600

Rotation—Counter-clockwise (commutator end).
Shunt Field Current—2.1-2.5 amperes at 6.0 volts.
Brush Spring Tension—23-27 ounces.
Mounting—Flange mounted on right rear face of timing gear case.

SPECIAL GENERATORS:—**Model 929-B, 956-L.** These generators are special equipment. See Equipment Section for complete data.

CUTOUT RELAY:—**Model 264-K.** Mounted on generator field frame. Relay has extra ground contacts mounted above armature for starter solenoid relay control. Horn relay is in cutout relay case.

Cutout Relay

Cuts In—6.75-7.5 volts, 7.5-8 M.P.H. (60), 8-8.5 M.P.H. (90).
Cuts Out—0-2 ampere discharge.
Contact Gap:—.015-.025".
Air Gap:—.012-.017" (contacts closed).

Horn Relay

Current to close contacts—.25 amperes.
Contact Gap—.015-.025".
Air Gap—.012-.017" (contacts closed).

LIGHTING:—**Switch Model 487-F. Export Models 487-G (L.H.D.), 486-W (R.H.D.). Foot Control Switch No. 465-R.** Foot Control Switch operative only with lighting switch lever in extreme right (country driving) position, providing asymmetrical passing beam (lower beam from right hand lamp which lights left hand side of road). Headlight bulbs are new 'pre-focused' type.

Bulb Sizes

Position	Candlepower	Mazda No.
Headlights	32-32	2330-L
Stop (Backing)	15	87
Dome	6	81
Dash, Tail, Parking	3	63

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 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.

HORNS:—**Klaxon, Model K-33-C.** Matched set, blended tone. Horns operated by horn relay (see Relay paragraph above).

SERIAL NUMBER:—Same as engine number.

ENGINE NUMBER:—First number, 3,105,001. Stamped on right hand side of crankcase below water inlet.

ENGINE:—Model 355-D. Eight cylinder, 90 degree 'Vee', 'L' head type.
Bore—3⅜". **Stroke**—4 15/16".
Piston Displacement—353 cubic inches.
Rated Horsepower—36.45.
Developed Horsepower—130 at 3400 R.P.M.
Compression Ratio—6.25-1 (Std.), 5.75-1 (Optional).
Compression Pressure—148 lbs. at 1000 R.P.M. or 160 lbs. at 2800 R.P.M. (standard head).

NOTE—Cylinder heads are stamped with compression ratio at point directly above the front spark plug.

Pistons:—Lynite Lo-Ex, aluminum alloy, 'T' slot, cam ground type with Anodized finish (special hard oxide deposited on bearing surface). Piston diameter across pin bosses is .0065" less than at right angles to bosses. Pistons cannot be ground. Refinish cylinders to take replacement pistons furnished .005", .015", .030" oversize. Piston length, 3 21/32".
Weight—15.008 ozs. (stripped), 20.880 ozs. (with rings, pin, and locking screw).
Removal—Piston and rods removed from below.
Clearance—Top .019". Bottom .0023".
Fitting New Pistons—Check piston with micrometer gauge at point just below and to left of 'T' slot junction midway between pin holes with piston at 70°. Check cylinder bore with micrometer, finish bore to size giving correct clearance. Feeler gauges ⅜-½" wide can be used in side opposite slot. Piston should fall of own weight with .002" feeler and lock on .0025" feeler.
Installing Pistons—Install pistons with slot to left as viewed from driver's seat.

Piston Rings:—Three compression rings, one oil control ring per piston. Oil ring groove drilled with oil drain holes. Install compression rings in #2 and 3 grooves with notch or step toward bottom.

Ring	Width	End Gap	Wall Thickness
Comp. (all)	.0930-.0935"	.007-.012"	.145"
Oil Cont.	.1860-.1865"	.007-.015"	.145"

Piston Pin:—Diameter .8742-.8744". Length 3 1/32". Pin is locked in piston by locking screw in one boss. Heat piston in boiling water to remove or install pins.
Pin Fit in Piston—Locking screw end .0004" press fit or hand push fit with piston at 200-210°F. Free end .0000" clearance or hand push fit with piston at 70°F.
Pin Clearance in Rod Bushing—.0002-.0008".

Connecting Rod:—Weight 34.496 ozs. Length 10½".
Lower Bearing—Spun babbitt type. No shims.
Clearance—.0015". Sideplay .003-.006".
Adjustment—None. Do not file bearing caps. Replace rods.
Installing Rods—Numbers on rods and caps must correspond and must be toward bottom of engine.

Crankshaft:—Three bearing type with four counterweights.
Journal Diameters—2⅜" (all bearings).
Bearing Type—Bronze-backed, babbitt-lined type.
Clearance—.0015".
Adjustment—None. Do not file caps. Replace bearings.
End Thrust—Taken by #3 (rear) main bearing. Endplay .001-.005".

Camshaft:—Non-adjustable chain drive.
Timing Chain—Morse #766. Width 1¾". Pitch .500". Length, 27" or 54 links.
Camshaft Setting—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	Length
Intake	1.660-1.666"	⅜"	6 17/32"
Exhaust	1.634-1.640"	⅜"	6½"

	Seat Angle	Lift	Stem Clearance
Intake	30°	23/64"	.0015-.0035"
Exhaust	45°	23/64"	.0025-.0045"

Tappet Clearance—.006" Int., .010" Exh., engine cold.
Valve Springs—Double springs used on all valves.

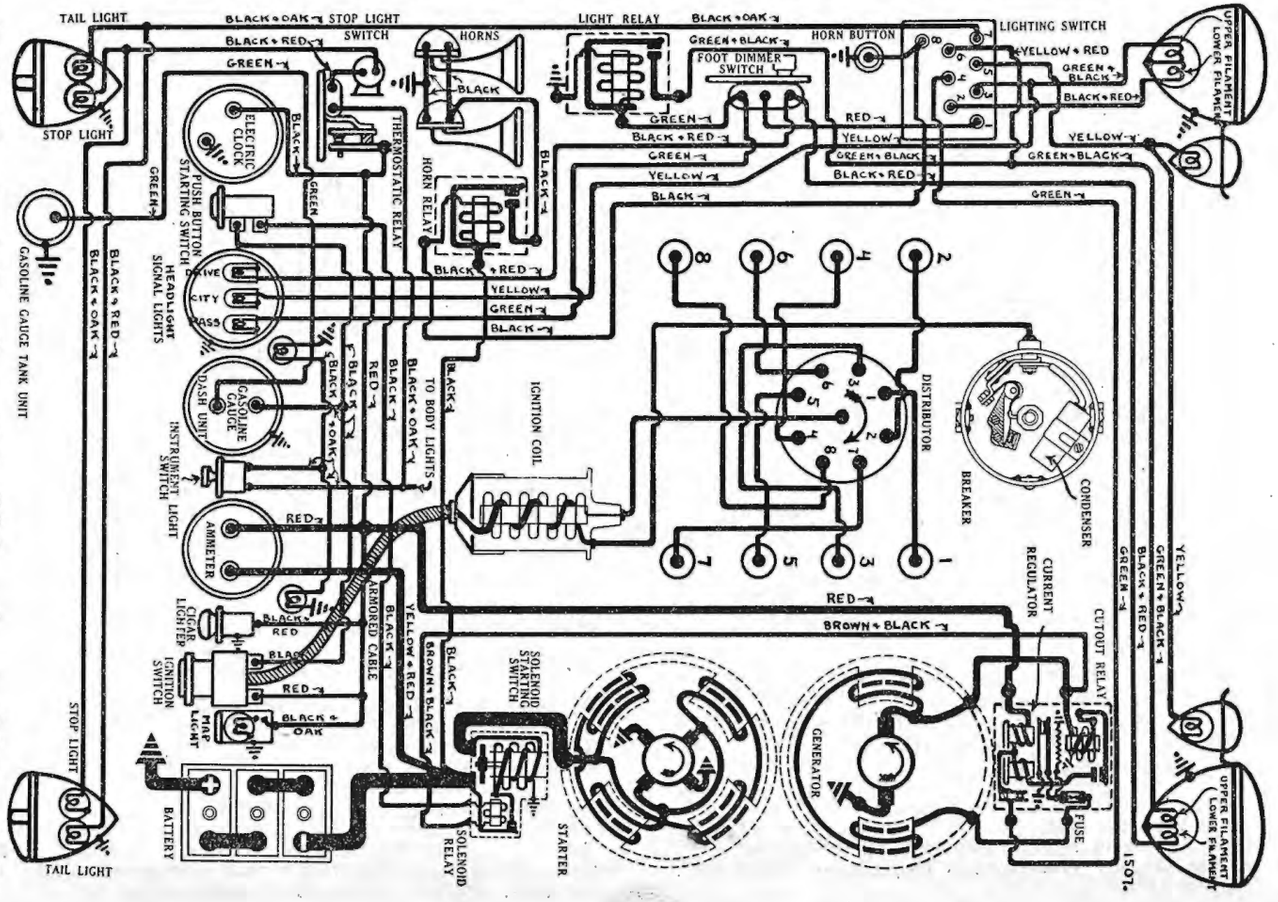
	Spring Pressure	Inner Spg. Length	Outer Spg. Length
Valve Closed	70 lbs.	1.751"	1.922"
Valve Open	185 lbs.	1.407"	1.578"

Valve Timing—See Camshaft Setting above.
Intake Valves—Open 6° BTDC. Close 42° ALDC.
Exhaust Valves—Open 38° BLDC. Close 2° ATDC.
To Check Valve Timing—No flywheel marks. Intake opening point for #1 cylinder is approximately 1.883 teeth before flywheel mark 'C 1/4'.

Lubrication:—Pressure type. Gear type oil pump located in crankcase.
Oil Pressure—30 lbs. at idling speed.
Pressure Relief Valve—Operates at 11 lbs. or 10 M.P.H. Not adjustable.
Capacity and Oil—8 quarts. Summer, SAE. #30 (moderate driving) or SAE. #40-50 (high speed driving). Winter, SAE. #20-W (temperatures down to 0°F.), SAE. #10-W (temperatures down to —15°F.) for moderate driving.

CARBURETION:—(Fuel System). See Carburetion Section for complete data on Carburetor, Automatic Choke, Fuel Pump, and Gasoline Gauge.
Carburetor:—Detroit Lubricator, Type X-8244 2" updraft type (see Carburetor Section).
Choke Control—Detroit semi-automatic type.
Fuel Pump:—A.C., Type D mechanical pump.
Gasoline Gauge:—A.C. Electric type.

CLUTCH:—Own make. Double plate, dry disc type.
Clutch Pedal Adjustment—Lash or free movement of clutch pedal should be 1½". Clearance between clutch pedal and under side of toeboard should be ¼" with clutch pedal released (pedal stop screw adjustment).
Clutch Facings—Woven type, 4 required, 6½" I.D., 9½" O.D., .120-.130" thick (see Note).



NOTE—Driven discs and facings should be selected so that difference in thickness of the two disc assemblies is not more than .005". Total clearance between clutch facings and center driving plate should be approximately .030".

STEERING:—Front Suspension—Independent, linked parallelogram type with helical springs.
Caster—1½° with car weight on wheels. Adjusted by turning threaded pin linking upper suspension arms (shock absorber arms) to steering knuckle support. To adjust, loosen pin locks, loosen lower suspension arm yoke, turn pin as follows:
Right wheel (head of pin to rear)—Turn pin clockwise to increase caster angle, or counter-clockwise to decrease caster angle.
Left wheel (head of pin to front)—Turn pin counter-clockwise to increase caster angle, or clockwise to decrease caster angle.
One full turn of the pin will change caster ½°. Lock pins in place after making adjustment. Caster must be exactly equal on both wheels.
Camber—¾-1½° with car weight on wheels and top surface of lower spring support 5 3/16" below lower face of frame. No adjustment recommended. Crosswise inclination of kingpin, 4°.
Toe In—⅛-3/16". To adjust, increase or decrease length of each tie rod equally. Turn tie rods in same direction that wheels revolve to increase toe-in, and in opposite direction to decrease toe-in.

IGNITION:—Coil Type 539-D. Lock coil type mounted on back of instrument board.
Ignition Current. 2.2 amperes (idling), 4.4 amperes (engine stopped).
Ignition Switch. Assembled as part of coil.

Distributor:—Type 661-V. Single breaker, 8 lobe cam type. No synchronization is required. Regular 45° firing intervals (90° 'V' type engine).
Breaker Gap—Set at .015". Limits .0125-.0175".
Breaker Arm Spring Tension—17-21 ounces.
Manual Advance. 20° (engine) adjustment at distributor only.
Cam Angles—Closed 31°. Open 14° (distributor).

Automatic Advance

Distributor		Engine	
Degrees	R.P.M.	Degrees	R.P.M.
Start	500	1.5	1000
12	1200	24	2400

Mounting—Two cap screw flange mounting at front of engine (between banks).

IGNITION TIMING:— Flywheel Degs. Piston Position
All engines ..... 4° BTDC ..... .0075" BTDC.
To Set: Loosen hold-down screw in pointer arm on distributor, center pointer on quadrant scale, tighten hold-down screw. Take off flywheel inspection cover (top—right hand side). Turn engine over with No. 1 piston (right hand block) on compression, stop when 'IG/A-1' mark on flywheel before TDC. mark 'C¼' lines up with indicator on housing, loosen advance arm clamp bolt, rotate distributor until contacts begin to open, tighten clamp bolt. See diagram for spark plug cable connections.

Synchronization—Not required.

Firing Order:—1-2-7-8-4-5-6-3. See diagram.
Spark Plugs:—A.C., Type G-6. 18 MM. Metric type.
Spark Plug Gaps—.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 hand front seat or right front fender (when mounted under fender, battery is accessible by lifting engine hood).
Dimensions—Width, 7". Length, 11¾". Height, 9⅜".

STARTER:—Model 728-U, 728-V (RHD.). Armature No. 818134. Four pole mechanical shift (solenoid) type through reduction gears and overrunning clutch.
Rotation — Counter-clockwise (armature shaft) commutator end and also drive end (drive gear).
Brush Spring Tension—24-28 ounces.

Performance Data

Torque	R.P.M.	Volts	Amperes
0 lb. ft.	2500	5.0	70
28 "	Lock	3.0	600

Starting Switch:—Solenoid switch, Type 1514, 1521, 1519 (R.H.D.). Pushbutton switch 1379. Solenoid (starting switch and gear shift) mounted on starter field frame, controlled by pushbutton switch, operative only with ignition 'on'. See Equipment Section 'Starter Controls'.

Starter Mounting:—Three screw flange mounting at right of transmission (on rear face of flywheel housing). Shift solenoid mounted on starter.

GENERATOR:—Model 933-B. Armature No. 1854458. Current regulated, two-brush shunt wound type. Lamp load capacity, 11 amperes.
Adjustment—See Control Unit paragraph and 'Generator Regulation' in Equipment Section. Generator is two-brush type—no third brush is used. Lamp load must not exceed 11 amperes.
Charging Rate—Constant rate at all speeds above 1200 R.P.M. or 20 M.P.H.

Performance Data

	Amperes Lamps Off	Amperes Lamps On	Volts	R.P.M.
Cold	13-16	20.5	7.7-8.1	1200
Hot	9-11	15.5	7.3-7.55	1200

Rotation—Counter-clockwise at commutator end.
Shunt Field Current—1.6-1.9 amperes at 6 volts.
Brush Spring Tension—22-26 ounces.
Field Fuse—6 ampere capacity (in control unit).

Generator Mounting:—Three bolt flange mounting on right side. Drop mud pan and remove generator from underneath car. Do not disturb pivot cap screw on front of chain case (used only for chain adjustment).
Chain Adjustment. Loosen generator mounting bolts and pivot screw, loosen second pivot screw on front of chain case, pull generator away from engine until tight, slack off ⅛", tighten mounting bolts and pivot screws.

CONTROL UNIT:—Delco-Remy Type 5541. Consists of cut-out relay, current regulator unit, field fuse, field resistance, thermostat relay. See Equipment Section 'Generator Regulation' for complete data.
Adjustment—Increase current regulator armature spring tension to increase generator output, decrease spring tension to decrease output.
Setting—13-16 amperes (cold—lamps off), 19-22 amperes (cold—lamps on). Above 'lamps on' figure correct with 11 ampere lamp load. Cold figures correct with generator at 70°F.

Cut-out Relay
Cuts in—6.75-7.25 volts, 650-750 R.P.M.
Cuts out—3 ampere discharge (max. at 6.3 volts).
Relay Contact Gap—.015-.025".
Air Gap—.012-.017" (contacts closed).

Current Regulator
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 until fibre bumper just touches stop).
.006-.008" between fibre bumper and stop (armature up).

LIGHTING:—Series 10, 20—Switch Model 487-J, 487-G (RHD.). Series 30—Switch Model 487-H,487-K (Export). Foot Control Switch Model 465-Z. Foot Control switch used to control assymetric passing beam (obtained by depressing beam from left hand headlight only). Operative with light switch in 'Country' or driving position. Headlights are aimed straight forward.
Headlight Indicators—Illuminated dial on instrument board indicates position of light switch lever as follows:
Pass—Assymetric passing beam (see above).
City—Lower beam—upper filaments.
Drive—Upper beam—lower filaments.
Headlight Type—New prefocused type bulb with flange base. Not interchangeable with other type bulbs. No focusing operation required. Headlights are aimed straight forward (with lenses removed). Lenses are marked 'Right' and 'Left' and are not interchangeable.

Bulb Specifications

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

HEADLIGHT THERMOSTAT RELAY: — Thermostatic arm type current limit relay (no winding) in Control Unit case. Protects headlamp circuits. Contacts open with lamp load of 20 amperes at temperature of 210°F.

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 25 ampere current load but will open in one minute with load of 38 amperes at temperature of 70-80°F.

HORNS:—Klaxon, Model K-33B, Type 1855 (low note), Type 1856 (high note). Matched set, blended tone, vibrator type. Horns operated by horn relay. Horn current, 24-28 amperes.

Horn Relay Model 266-T:—Horn relay requires .25 amperes at 2.0 volts (min.) to close contacts. Current draw, .8 amps.
Contact Gap—.015-.025".
Air Gap—.012-.017" (contacts closed).

FUSES:—Generator field—6 ampere capacity (in control unit).

SERIAL NUMBER:—Same as engine number.

ENGINE NUMBER:—First number, 4,101,701. On right hand side of chain case in front of generator.

ENGINE:—Model 370-D. Twelve cylinder, 45° Vee, 'I' or overhead valve type. Cylinder blocks for each bank cast enbloc and separate from crankcase.
Bore—3⅛". Stroke—4".
Piston Displacement—368 cubic inches.
Rated Horsepower—46.9.
Developed Horsepower—150 at 3600 R.P.M.
Compression Ratio—6.0-1 (std.), 5.65-1 (optional).
Compression Pressure—145 lbs. at 1000 R.P.M. or 160 lbs. at 3200 R.P.M. (standard head).
NOTE—Cylinder heads are stamped with compression ratio on end of head. Compression ratios may be altered by changing head gasket.

Pistons:—Lynite Lo-Ex, aluminum alloy, 'T' slot, cam ground type with Anodized finish (special hard oxide deposited on bearing surface). Piston diameter across pin bosses is .0065" less than at right angles to bosses. Pistons cannot be ground. Refinish cylinders to take replacement pistons furnished .005", .015", .030" oversize. Piston length, 3 15/16".
Weight—11.172 ozs. (stripped), 16.976 ozs. (with rings, pin, and locking screw).
Removal—Pistons and rods removed from below.
Clearance—Top .019". Bottom .0020".
Fitting New Pistons—Check piston with micrometer gauge at point just below and to the left of 'T' slot junction midway between pin holes with piston at 70°. Check cylinder bore with micrometer, finish to size giving correct clearance. Feeler gauges ⅜-½" wide can be used on side opposite slot. Piston should fall of own weight with .0015" feeler and lock on .002" feeler.
Installing Pistons—Install pistons with slot to left as viewed from driver's seat.

Piston Rings:—Three compression rings, one oil control ring per piston, all above pin. Oil ring groove drilled with oil drain holes. Install compression rings in #2 and 3 grooves with notch or step toward bottom.

Ring	Width	End Gap	Wall Thickness
Comp. (all)	.0930-.0935"	.007-.012"	.135"
Oil Cont.	.1545-.1550"	.007-.015"	.135"

Piston Pin:—Diameter .8742-.8744". Length 2.810-2.815". Pin is locked in piston by locking screw in one boss. Heat piston in boiling water to remove or install pin.
Pin Fit in Piston—Locking screw end .0004" press fit or hand push fit with piston at 200-210°F. Free end .0000" clearance or hand push fit at 70°F.
Installing Pins—Heat pistons in boiling water. Lubricate pins before inserting in pin bosses.
Pin Clearance in Rod Bushing—.0002-.0008".

Connecting Rods:—Weight 31.856 ozs. Length 9¼".
Lower Bearing—Spun babbitt type. No shims.
Clearance—.0015". Sideplay .004-.007".
Adjustment—None. Do not file caps. Replace rods.
Installing Rods—Numbers on rods and caps must correspond and must be toward bottom of engine.

Crankshaft:—Four bearing type with integral counterweights.
Journal Diameters—2⅝" (all bearings).
Bearing Type—Steel-backed, babbitt-lined type.
Clearance—.001".
Adjustment—None. Do not file caps. Replace bearings.
End Thrust—Taken by #3 main bearing. Endplay .001-.005".

Camshaft:—Duplex chain drive with automatic take-up.
Timing Chain—Morse #766 Duplex. Width 1½". Pitch .375". Length 41¼" or 110 links. See Equipment Section for complete data on Morse Automatic Idler Sprocket.
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	Length
Intake	1.509-1.515"	11/32"	6 9/64"
Exhaust	1.384-1.390"	11/32"	6 9/64"

	Seat Angle	Lift	Stem-to-Guide Clearance
All Valves	45°	11/32"	.001-.0025"

Tappet Clearance—None in service (automatic take-up).
Valve Springs—Double springs used on all valves.

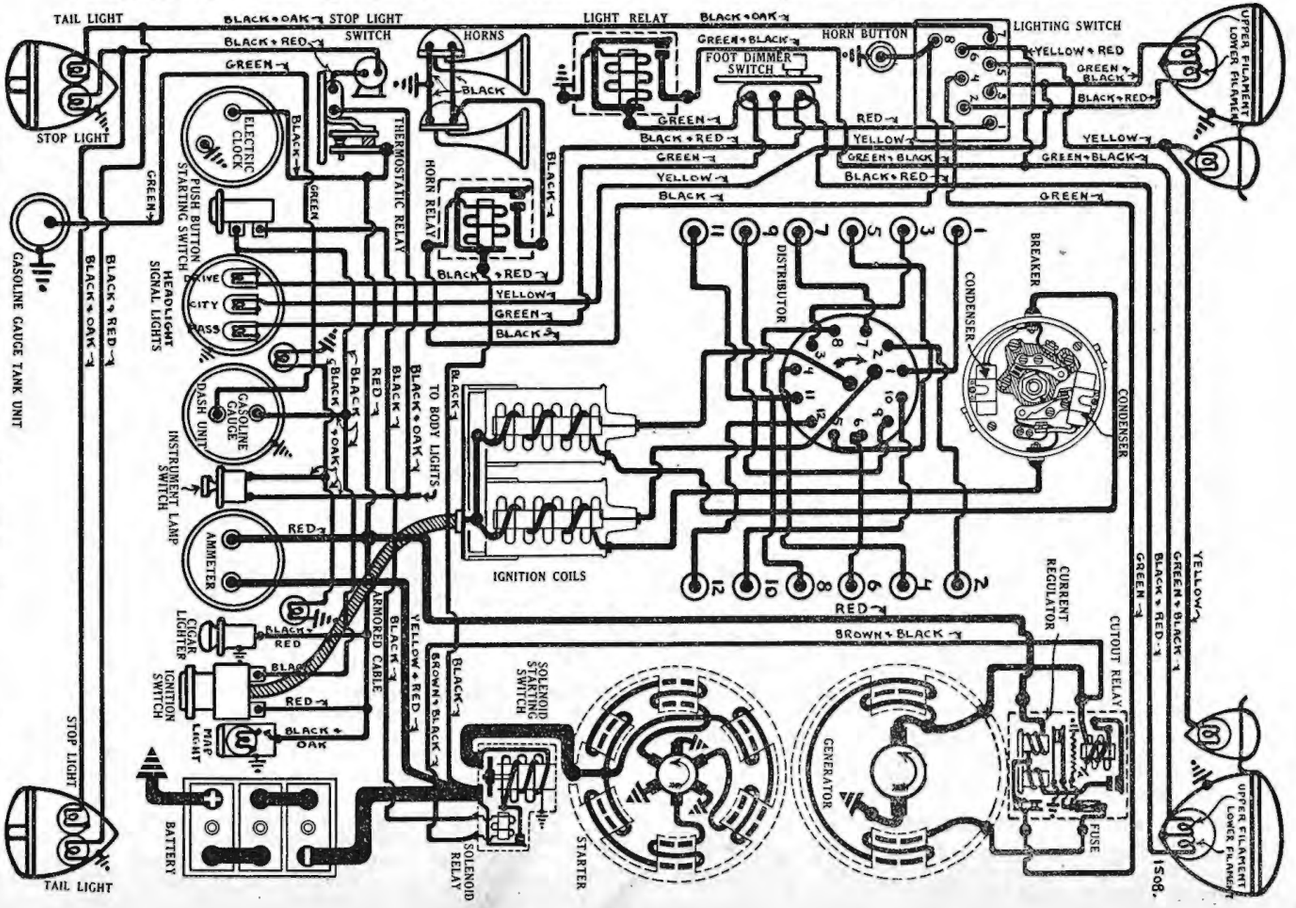
	Spring Pressure	Inner Spg. Length	Outer Spg. Length
Valve Closed	69½ lbs.	1.751"	1.922"
Valve Open	167 lbs.	1.407"	1.578"

Valve Timing—See Camshaft Setting above.
Intake Valves Open—At TDC. Close—44° ALDC.
Exhaust Valves Open—39° BLDC. Close 5° ATDC.
To Check Valve Timing—No. 1 intake valve should open with piston on top dead center when flywheel mark 'C/1-11' lines up with indicator.
NOTE:—Automatic valve tappet take-up should not require attention in service but must be reset to initial clearance of .030" when replacing or grinding valves. See Equipment Section for data.

Lubrication—Pressure type. Gear type oil pump mounted in crankcase on rear main bearing cap.
Normal Oil Pressure—30 lbs. at 60 M.P.H.
Oil Pressure Relief Valve—Operates at 14 lbs. Not adjustable. Located under plug on front face of chain case cover.
Capacity and Oil—9 qts. Use SAE. #40 or 50 (summer), #20 (winter).

CARBURETION:— (Fuel System). See Carburetion Section for complete data on Carburetor, Automatic Choke, Fuel Pump, and Gasoline Gauge.
Carburetor:—Detroit, Model 51, 1½" expanding vane or air valve, updraft type. One carburetor used for each cylinder bank with interconnected throttles. Carburetor throttles must be synchronized.
Automatic Choke—Detroit semi-automatic type.
Fuel Pump:—A.C., Type D.
Gasoline Gauge:—A.C., Electric type.

CLUTCH:—Own make. Double plate, dry disc type.
Clutch Pedal Adjustment—Lash or free movement of clutch pedal should be 1½". Clearance between clutch pedal and under side of toeboard should be



¼" with clutch pedal released (pedal stop screw adjustment).

Clutch Facings—Woven asbestos compound, 4 required, 5⅞", I.D., 10" O.D., .120-.130" thick (see note).

NOTE—Driven discs and facings should be selected so that difference in thickness of the two disc assemblies is not more than .005". Total clearance between clutch facings and center driving plate should be approximately .030".

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

Caster—1½° with car weight on wheels. Adjusted by turning threaded pin linking upper suspension arms (shock absorber arms) to steering knuckle support. To adjust, loosen pin locks, loosen lower suspension arm yoke, turn pin as follows:

Right wheel (head of pin to rear)—Turn pin clockwise to increase caster angle or counter-clockwise to decrease caster angle.

Left wheel (head of pin to front)—Turn pin counter-clockwise to increase caster angle or clockwise to decrease caster angle.

One full turn of the pin will change caster ½°. Lock pins in place after making adjustment. Caster must be exactly equal on both wheels.

Camber—¾-1½° with car weight on wheels and top surface of lower spring support 5 3/16" below lower face of frame. No adjustment recommended. Crosswise inclination of kingpin, 4°.

Toe In—⅛-3/16". 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 553-E. Two coil unit assembled with ignition switch.

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

Distributor Model 667-C. Double breaker, 6 lobe cam, full automatic advance type. Contacts open alternately at 37½° and 22½° intervals, corresponding to 75° and 45° firing intervals of engine (unequal firing intervals caused by 45° included angle between cylinder banks). Contacts must be synchronized (see Timing).

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

Breaker Arm Spring Tension—17-21 ounces.

Cam Angles (Distributor Degrees)—Closed 39°. Open 21°. Each set operates independently.

Manual Advance—28° (engine), adjustment at distributor.

Automatic Advance

Distributor		Engine	
Degrees	R.P.M.	Degrees	R.P.M.
Start	300	2	600
12	800	24	1600
16	1100	32	2200
19	1400	38	2800

IGNITION TIMING:— Flywheel Degs. Piston Position
All engines ..... 4° BTDC. ..... .0058" BTDC.

Timing (Stationary Contacts)—Loosen hold-down screw in advance arm, center distributor pointer on quadrant scale by rotating distributor, tighten hold-down screw, take off cover plate over inspection plate in flywheel housing. With #1 piston on compression, crank engine by jacking up one rear wheel, placing car in gear and turning wheel, stop with piston 4° before top dead center when flywheel mark 'IG/A' lines up with indicator on housing (the IG/A mark does not have any identifying symbol and care must be taken to use the right mark, which is 4° before flywheel mark 'C/1-11'). Loosen advance arm clamp bolt, rotate distributor housing until stationary contacts (mounted directly on breaker plate) are beginning to open, tighten lock bolt, check rotor position and spark plug connections (see diagram). Then synchronize movable contacts.

Synchronization (Movable Contacts)—first method:—Turn engine over 75° or slightly less than ¼ revolution to firing position of piston #4, stop when flywheel mark 'IG/A', which is 4° before top dead center mark 'C/4-10' lines up with indicator on housing, loosen lock screws on movable sub-plate (carrying second set of contacts), turn eccentric adjusting screw until contacts begin to open, tighten locking screws.

Synchronization—second method:—Use synchronizing tool, Cadillac Part No. 109224. This tool developed for use on V-12 distributor with unequal firing intervals. Install tool, adjust so that stationary contacts begin to open when pointer is on farthest indicating point on quadrant 'RH', turn engine over or rotate distributor shaft until pointer is directly opposite '12 L.H.' mark on quadrant, loosen lock screws on movable sub-plate, turn eccentric adjusting screw until contacts begin to open, tighten locking screws.

Firing Order:—1-4-9-8-5-2-11-10-3-6-7-12 (see diagram). Spark plug cables not connected in this order.

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

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

BATTERY:—Delco, Type 21-C, 21-CF (Export), 6 volt, 21 plate, 164 A.H. capacity (20 hour rate).

Starting Capacity—195 amperes for 20 minutes.

Grounded Terminal—Positive (+) terminal.

Location—In compartment under right front fender, accessible by lifting engine hood.

STARTER:—Model 580. Armature No. 1837058. Six pole type with reduction gears and overrunning clutch. Starter drive is solenoid operated pinion shift type.

Rotation—Counter-clockwise (armature shaft) at commutator end.

Brush Spring Tension—36-40 ounces each.

Performance Data

Torque	R.P.M.	Volts	Amperes
0 ft. lbs.	2200	5.7	70
35 "	Lock	3.0	600

Starting Switch:—Solenoid Switch Model 1515. Push-button Switch Model 1379. Starter pinion shift operated by solenoid switch. Solenoid circuit controlled by solenoid relay and pushbutton switch on instrument panel. See Equipment Section.

Mounting:—Flange mounted on rear face of flywheel housing at right of transmission. To remove, take out 3 flange mounting cap screws.

GENERATOR:—Model 933-C. Armature No. 1854458. Current regulated, two-brush shunt wound type. Lamp load capacity limited to 11 amperes.

Adjustment—See Control Unit paragraph and Equipment Section for complete data. Generator is two-brush type—no third brush used.

Charging Rate—Constant 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	1200
Hot	9-11	15.5	7.3-7.55	1200

Rotation—Counter-clockwise at commutator end.

Shunt Field Current—1.6-1.9 amperes at 6.0 volts.

Brush Spring Tension—22-26 ounces each.

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

Mounting:—Flange mounted on rear face of timing chain case at right of engine. To remove, disconnect water pump drive coupling, take out flange mounting screws. Chain adjustment automatic, requires no attention during life of chain.

CONTROL UNIT:—Model 5541. Consists of Cut-out Relay, Current Regulator unit, field fuse, field resistance, thermostat relay in case on generator field frame. See Equipment Section for complete data on this unit.

Cut-out Relay

Cuts in—6.75-7.25 volts.

Cuts out—2.5 ampere discharge (max)., 6.3 volts.

Relay Contact Gap—.015-.025".

Air Gap—.012-.017" (contacts closed).

Current Regulator

Adjustment—Operate generator at 2500 R.P.M., adjust current regulator armature spring tension to secure output below (increase spring tension to increase generator output, decrease spring tension to decrease output).

Setting—13-16 amperes (cold—lamps off), 19-22 amperes (cold—11 ampere lamp load).

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 until fibre bumper just touches stop).
.006-.008" between fibre bumper and stop (armature up).

LIGHTING: — Switch Model 487-H, 487-K (RHD.).

Foot Control Switch Model 465-Z. Foot control switch used to control assymetric passing beam (obtained by depressing beam from left hand headlight only). Operative with light switch in 'Country' or Driving position.

Headlight Indicator—Illuminated dial on instrument board indicates position of lighting switch lever as follows:

Pass—Assymetric passing beam (see above).
City—Lower beam—upper filaments.
Drive—Upper beam—lower filaments.

Bulb Specifications

Lamps	Candlepower	Mazda No.
Headlights	32-32	2330-L
Rear Signal (Stop)	15	87
Tail, Map, Parking, Instrument	3	63
Dome, Quarter, Deck, Tonneau	6	81
Indicator Lights	---	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.

HEADLIGHT THERMOSTAT RELAY:—Thermostatic arm type current limit relay (no winding) in control unit. Protects headlamp circuits. Contacts open with lamp load of 20 amperes at temperature of 210°F.

HORNS:—Klaxon, Model K-33B, Type 1855 (low note), Type 1856 (high note), matched set, blended tone, vibrator type. Horns operated by horn relay.

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

Contact Gap—.015-.025".

Air Gap—.012-.017" (contacts closed).

FUSES:—Generator field—6 ampere capacity.

SERIAL NUMBER:—Same as engine number.

ENGINE NUMBER:—First number, 5,100,001. On right hand side of crankcase in front of generator.

ENGINE:—Model 452-D. Sixteen cylinder, 45° Vee, 'I' or overhead valve type. Cylinder blocks for each bank cast Enbloc and seperate from crankcase.
Bore—2". **Stroke**—4".
Piston Displacement—452 cubic inches.
Rated Horsepower—57.5.
Developed Horsepower—185 at 3800 R.P.M.
Compression Ratio—6.0-1 (Std.), 5.65-1 (optional).
Compression Pressure—154 lbs. at 1000 R.P.M. or 172 lbs. at 3200 R.P.M. (standard head).
NOTE—Cylinder heads are stamped with compression ratio on end of head. Compression ratio may be altered by changing head gasket.

Pistons:—Lynite Lo-Ex, aluminum alloy, 'T' slot, Cam ground type with Anodized finish (special hard oxide deposited on bearing surface). Piston diameter across pin bosses is .0065" less than at right angles to bosses. Pistons cannot be ground. Refinish cylinders to take replacement pistons furnished .005", .015", .030", oversize. Piston length 3 5/16".
Weight—12.040 ozs. (stripped), 17.232 ozs. (with rings, pin, and locking screw).
Removal—Pistons and rods removed from bottom.
Clearance—Top .018". Bottom .0018".
Fitting New Pistons—Check piston with micrometer gauge at point just below and to left of 'T' slot junction midway between pin holes with piston at 70°. Check cylinder bore with micrometer, finish to size giving correct clearance. Feeler gauges 3/8-1/2" wide can be used in side opposite slot. Piston should fall of own weight with .0015" feeler and lock on .002" feeler.
Installing Pistons—Install pistons with slot to left as viewed from driver's seat.

Piston Rings:—Three compression rings, one oil control ring per piston, all above pin. Oil ring groove drilled with oil drain holes. Install compression rings in #2 and 3 grooves with notch or step toward bottom.

Ring	Width	End Gap	Wall Thickness
Comp. (all)	.0930-.0935"	.007-.012"	.130"
Oil Cont.	.1545-.1550"	.007-.015"	.135"

Piston Pin:—Diameter .8742-.8744". Length 2.810-2.815". Pin is locked in piston by locking screw in one boss. Heat piston in boiling water to remove or install pin.
Pin Fit in Piston—Locking screw end .0004" press fit or hand push fit with piston at 200-210°F. Free end .0000" clearance or hand push fit at 70°F.
Pin Clearance in Rod Bushing—.0002-.0008".

Connecting Rods:—Weight 31.856 ozs. Length 9 1/4".
Lower Bearing—Spun babbitt type. No shims.
Clearance—.0015". Sideplay .004-.007".
Adjustment—None. Do not file caps. Replace rods.
Installing Rods—Numbers on rods and caps must correspond and must be toward bottom of engine.

Crankshaft:—Five bearing type with integral counterweights.
Journal Diameters—2 5/8" (all bearings).
Bearing Type—Steel-backed, babbitt-lined type.
Clearance—.002-.004".
Adjustment—None. Do not file caps. Replace bearings.
End Thrust—Taken by #3 main bearing. End-play .001-.005".

Camshaft:—Duplex chain drive with automatic take-up.
Timing Chain—Morse #766 Duplex. Width 1 1/2". Pitch .375". Length 41 1/4" or 110 links. See equipment section for complete data on Morse automatic idler sprocket.
Camshaft Setting—Sprockets are marked. Mesh chain with sprockets turned so that 'O' marks are adjacent and in line with a straightedge across the shaft centers.

Valves:—	Head Diam.	Stem Diam.	Length
Intake	1.509-1.515"	11/32"	6 9/64"
Exhaust	1.384-1.390"	11/32"	6 9/64"

	Seat Angle	Lift	Stem Clearance
All Valves	45°	11/32"	.001-0025"

Tappet Clearance—None in service (automatic take-up).
Valve Springs—Double springs used on all valves.

	Inner Spring Length	Outer Spring Length
Spring Pressure		
Valve Closed 64 lbs.	1.751"	1.875"
Valve Open 141 lbs.	1.407"	1.531"

Valve Timing—See Camshaft Setting above.
Intake Valves Open—At TDC. Close—40° ALDC.
Exhaust Valves Open—39° BLDC. Close— 5° ATDC.

NOTE:—Automatic valve tappet take-up should not require attention in service but must be reset to initial clearance of .030" when replacing or grinding valves. See Equipment Section for complete data.
To Check Valve Timing—No. 1 intake valve should open with piston on top dead center when flywheel mark 'C 1/15' lines up with indicator.

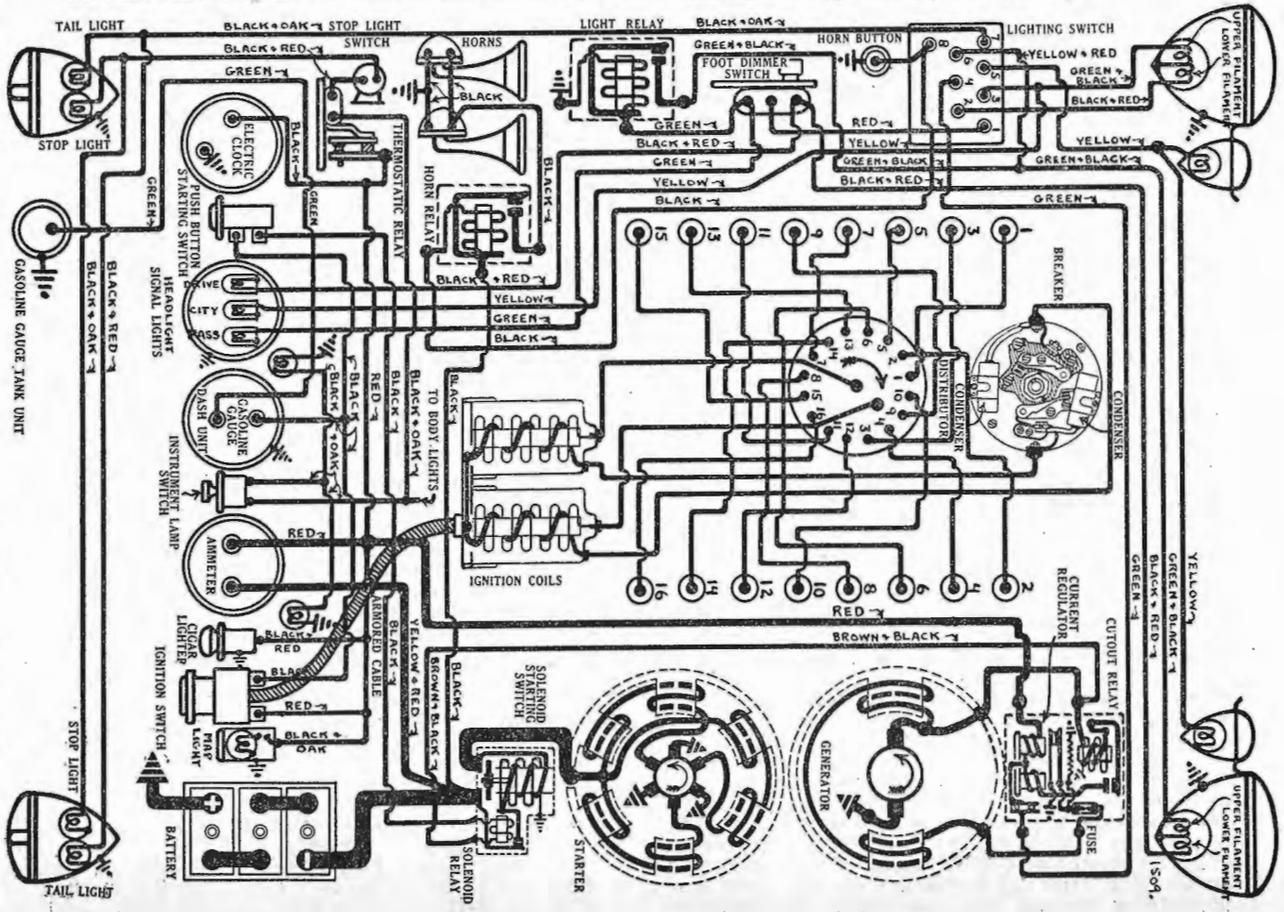
Lubrication—Pressure type. Gear type oil pump located in crankcase on rear main bearing cap.
Normal Oil Pressure—30 lbs. at 60 M.P.H.
Oil Pressure Relief Valve—Operates at 14 lbs. Not adjustable. Located under plug on front face of chain case cover.
Capacity and Oil—10 qts. Use SAE. #40 or 50 (summer), #20 (winter).

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

Carburetor:—Detroit, Model 51, 1 1/2" expanding vane or air valve, updraft type. One carburetor used for each cylinder bank with interconnected throttles. Carburetor throttles must be synchronized.
Automatic Choke—Detroit semi-automatic type.

Fuel Pump:—A.C., Type D.

Gasoline Gauge:—A.C., Electric type.



CLUTCH:—Own make. Double plate, dry disc type.
Clutch Pedal Adjustment—Lash or free movement of clutch pedal should be 1½". Clearance between clutch pedal and underside of toeboard should be ¼" with clutch pedal released (pedal stopscrew adjustment).
Clutch Facings—Woven Abestos Compound, 4 required. 5⅞" I.D., 10" O.D., .120-.130" thick. See note.
NOTE—Driven discs and facings should be selected so that difference in thickness of the two disc assemblies is not more .005". Total clearance between clutch facings and center driving plate should be approximately .030".

STEERING:—Front Suspension—Independent, linked parallelogram type with helical springs.
Caster—1½° with car weight on wheels. Adjusted by turning threaded pin linking upper suspension arms (shock absorber arms) to steering knuckle support. To adjust, loosen pin locks, loosen lower suspension arm yoke, turn pin as follows:
Right wheel (head of pin to rear)—Turn pin clockwise to increase caster angle or counter-clockwise to decrease caster angle.
Left wheel (head of pin to front)—Turn pin counter-clockwise to increase caster angle or clockwise to decrease caster angle.
One full turn of the pin will change caster ½°. Lock pins in place after making adjustment. Caster must be exactly equal on both wheels.
Camber—¾-1½° with car weight on wheels and top surface of lower spring support 5 3/16" below lower face of frame. No adjustment recommended. Crosswise inclination of kingpin, 4°.
Camber—1° with car weight on wheels. No adjustment provided. Crosswise inclination of kingpin, 4°.
Toe In—⅛-3/16". To adjust, increase or decrease length of each tie rod equally. Turn tie rods in same direction that whels revolve to increase toe-in or in opposite direction to decrease toe-in.

IGNITION:—Coil Model 553-E. Two coil unit assembled with ignition switch.
Ignition Switch—Model 431-EA. Connected to coil unit by armored cable.
Distributor Model 4118. Double breaker, 8 lobe cam, full automatic advance type. Contacts open alternately at regular 22½° intervals, corresponding to 45° firing interval of engine. Contacts must be synchronized (see Timing).
Breaker Gap—Set at .016". Limits .014-.018".
Breaker Arm Spring Tension—17-21 ounces.
Cam Angles (Distributor Degrees) — Closed 31°. Open 14°. Each set operates independently and controls one coil.
Manual Advance—28° (engine), adjustment at distributor only.

Automatic Advance

Distributor Degrees	Distributor R.P.M.	Engine Degrees	Engine R.P.M.
Start	200	2.5	400
8.25	600	16.5	1200
17	1100	34	2200

IGNITION TIMING:— Flywheel Degs. Piston Position
All engines ..... 4° BTDC. ..... .0058" BTDC.
Timing (Stationary Contacts)—Loosen hold-down screw in advance arm, center distributor pointer on quadrant scale by rotating distributor, tighten hold-down screw, take off cover plate over inspection hole in flywheel housing. With #1 piston on compression, crank engine by jacking up one rear wheel, placing car in gear and turning wheel, stop with piston 4° before top dead center when flywheel mark 'IG/A' (which is 4° before top dead center mark 'C/1-15') lines up with indicator on housing, loosen taper lock screw in center of breaker cam, carefully locate cam so that stationary contacts (mounted directly on breaker plate) are beginning to open, tighten locking screw, check rotor position and spark plug cable connections (see diagram). Then synchronize movable contacts as directed below.
Synchronization (Movable Contacts)—first method:—Turn engine over 45° or ⅛ revolution to firing position of piston #8, stop when 'IG/A' mark lines up with indicator, loosen lock screw on movable sub-plate (carrying second set of contacts), turn eccentric adjusting screw until contacts begin to open, tighten locking screws.
Synchronization—Second Method—Use synchronizing tool, Cadillac Part No. 109224. Install tool and adjust so that stationary or first set of contacts begin to open with pointer opposite farthest indicating point on quadrant 'R.H.', turn engine over until pointer is directly opposite next or '16 L.H.' graduation on quadrant. Loosen lock screws on movable sub-plate (carrying second set of contacts), turn eccentric adjusting screw until contacts open, tighten lockscrew.
Firing Order: — 1-8-9-14-3-6-11-2-15-10-7-4-13-12-5-16 (see diagram). Spark plug cables not connected in this order.
Spark Plugs:—A.C., Type G-6. 18 MM. Metric type.
Spark Plug Gaps—.026". Limits, .025-.027".

BATTERY:—Delco, Type 25-A, 25-AF (Export), 6 volt, 25 plate, 196 A.H. capacity (20 hour rate).
Starting Capacity—234 amperes for 20 minutes.
Grounded Terminal—Positive (+) terminal).
Location—In compartment under right front fender. Accessible by lifting engine hood.

STARTER:—Model 580. Armature No. 1837058. Six pole type with reduction gears and overrunning clutch. Starter drive is solenoid operated pinion shift type.
Rotation—Counter-clockwise (armature shaft) at commutator end.
Brush Spring Tension—36-40 ounces each.

Performance Data

Torque	R.P.M.	Volts	Amperes
0 ft. lbs.	2200	5.7	70
35 "	Lock	3.0	600

Starting Switch:—Solenoid Switch Model 1515. Push-button Switch Model 1379. Starter pinion shift operated by solenoid switch. Solenoid circuit controlled by solenoid relay and pushbutton switch on instrument panel (see Equipment Section).
Mounting:—Flange mounted on rear face of flywheel housing at right of transmission. To remove, take out 3 flange mounting cap screws.

GENERATOR:—Model 933-C. Armature No. 1854458. Current regulated, two-brush shunt wound type. Lamp load capacity limited to 11 amperes.
Adjustment—See Control Unit paragraph and Equipment Section for complete data. Generator is two-brush type—no third brush used.
Charging Rate—Constant 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	1200
Hot	9-11	15.5	7.3-7.55	1200

Rotation—Counter-clockwise at commutator end.
Shunt Field Current—1.6-1.9 amperes at 6.0 volts.
Brush Spring Tension—22-26 ounces each.
Field Fuse—6 ampere capacity (in control unit).
Mounting:—Flange mounted on rear face of timing chain case at right of engine. To remove, disconnect water pump drive coupling, take out flange mounting screws. Chain adjustment automatic, requires no attention during life of chain.

CONTROL UNIT:—Model 5541. Consists of Cut-out Relay, Current Regulator unit, field fuse, field resistance, thermostat relay in case on generator field frame. See Equipment Section for complete data on this unit.

Cut-out Relay

Cuts in—6.75-7.25 volts.
Cuts out—2.5 ampere discharge (max.) at 6.3 volts.
Relay Contact Gap—.015-.025".
Air Gap—.012-.017" (contacts closed).

Current Regulator

Adjustment—Operate generator at 2500 R.P.M., adjust current regulator armature spring tension to secure output below (increase spring tension to increase generator output, decrease spring tension to decrease output).
Setting—13-16 amperes (cold—lamps off), 19-22 amperes (cold—lamps on). Lamps on figure correct with 11 ampere lamp load.
Regulator Contact Gap—.015-.025".
Air Gap—.055-.060" between armature and center of core (armature down until fibre bumper just touches stop).
.006-.008" between fibre bumper and stop (armature up).

LIGHTING: — Switch Model 487-H, 487-K (RHD.). Foot Control Switch Model 465-Z. Foot control switch used to control assymetric passing beam (obtained by depressing beam from left hand headlight only). Operative with light switch in 'Country' or Driving position.
Headlight Indicator—Illuminated dial on instrument board indicates position of lighting switch lever as follows:
Pass—Assymetric passing beam (see above).
City—Lower beam—upper filaments.
Drive—Upper beam—lower filaments.

Bulb Specifications

Lamps	Candlepower	Mazda No.
Headlights	32-32	2330-L
Rear Signal (Stop)	15	87
Tail, Map, Parking, Instrument	3	63
Dome, Quarter, Deck, Tonneau	6	81
Indicator Lights	—	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 of found to be defective.
HEADLIGHT THERMOSTAT RELAY: — Thermostatic arm type current limit relay (no winding) in Control Unit case. Protects headlamp circuits. Contacts open with lamp load of 20 amperes at temperature of 210°F.
HORNS:—Klaxon, Model K-33B, Type 1855 (low note), Type 1856 (high note). Matched set, blended tone, vibrator type. Horns operated by horn relay. Horn current, 24-28 amperes.
Horn Relay Model 266-T:—Horn relay requires .25 amperes at 2.0 volts (min.) to close contacts. Current draw, .8 amps.
Contact Gap—.015-.025".
Air Gap—.012-.017" (contacts closed).
FUSES:—Generator field—6 amperes capacity.

FLEET MODEL NOTE:—A special engine is available for fleet use where maximum economy is desired. Engines are standard except for cylinder head (identified by letter 'F' cast above #1 exhaust port), carburetor with economy throttle stop, and vacuum spark control. Rear axle ratio with this engine is 3.82-1 (42-11 ring gear and pinion). All specifications are the same except:

Spark Plug Gap—Set at .040".
Intake Tappet Clearance—.010" Hot.
Exhaust Tappet Clearance—.016" Hot.
Ignition Setting—At TDC.
Carburetor—Carter Model 321-S downdraft type.

These models may be identified by special name plate on instrument panel and plate on valve pushrod cover listing these specifications.

SERIAL NUMBER:—First number, 1001. On plate on right front sill (passenger cars), or on front of dash (trucks). Prefix (IEC, IEB, etc.), indicates model and assembly plant.

ENGINE NUMBER:—First number 4,708,995 with prefix as follows: M—Passenger cars (EC), K—Commercial (EB), T—Trucks (Q). Stamped on boss on right side of cylinder block in back of fuel pump.

ENGINE:—Own Master Model. Six cylinder, 'T' or overhead valve type. Cylinders cast enbloc.
Bore—3 5/16". **Stroke**—4".
Piston Displacement—206.8 cubic inches.
Rated Horsepower—26.3 A.M.A.
Developed Horsepower—74 at 3200 R.P.M. (passenger cars), 68.5 at 3200 R.P.M. (trucks).
Compression Ratio—5.45-1. No optional ratios.
Compression Pressure—Should be 75 lbs. or better.

Pistons:—Cast-iron, tin-plated, cam ground type with greater clearance across pin bosses. Pistons are tin-plated to thickness of .0005-.001" after finishing and cannot be ground. Refinish cylinders to take standard replacement pistons furnished .003", .010", .020", .030", .040" oversize (hone cylinders for .003" oversize or ream and hone for larger pistons). Piston length 3 11/16".
Weight—28.8 ozs. stripped, 38.24 ozs. with rings, pin and bushings. Held to ⅛ oz. max. variation
Removal—Pistons and rods removed from above.
Clearance—.0145" top, .0015-.003" skirt.
Fitting New Pistons—Use feeler gauge between piston and cylinder at right angles to pin bosses to check clearance. Piston should pass through bore on .002" feeler and lock on .003" feeler.

Piston Rings:—Two compression, one oil control ring per piston, all above pin. Lower ring groove drilled radially with oil drain holes. Rings furnished .005", .010", .015", .020", .030", .040" oversize.

Ring	Width	End Gap	Side Clearance
Comp. All	⅛"	.005-.015"	.0015-.003"
Oil Cont.	3/16"	.013-.021"	.0015-.0025"

Piston Pin: — Diameter .990-.9895". Length 2 29/32". Pin is locked in rod. Pin bosses in piston are bronze bushed. New pistons furnished with bushings installed and pins fitted. Pins furnished for service standard and .003", .005", .010" oversize.
Pin Fit in Piston Bushing—Light thumb push fit.

Connecting Rod:—Weight 31.68 ozs. Length 7½".
Crankpin Journal Diameter—2.1245-2.1250".
Lower Bearing Type—Spun babbitt. Solid shims.
Clearance—.0005-.002". Sideplay .004-.011".
Adjustment—Shims. Remove shims from each side equally to secure 'snap fit' (rod should snap from one side to the other with a light tap of 8 oz. ball pein hammer). Bearing is loose if rod can be moved by hand.
Installing Rods—Install rods in same numbered cylinders as indicated by numbers stamped on rod and cap with these numbers together and toward camshaft side of engine. Oil hole in cap should be away from camshaft. Assemble oil dippers on rod caps with mouth of dipper toward camshaft.

Crankshaft: — Three bearings. Integral counterweights.
Journal Diameters—#1, 2.058-2.059"; #2, 2.120-2.121"; #3, 2.183-2.184".
Bearing Type—Removable steel-backed, babbitt-lined.
Clearance—.001-.003".
Adjustment—Shims. Remove shims until there is a heavy drag on the crankshaft, then replace one .002" shim. If necessary to use unequal number, place extra shim on camshaft side.
End Thrust—Taken by center main bearing. Endplay .004-.007". Flanges on center main bearing should be turned down to provide this clearance.

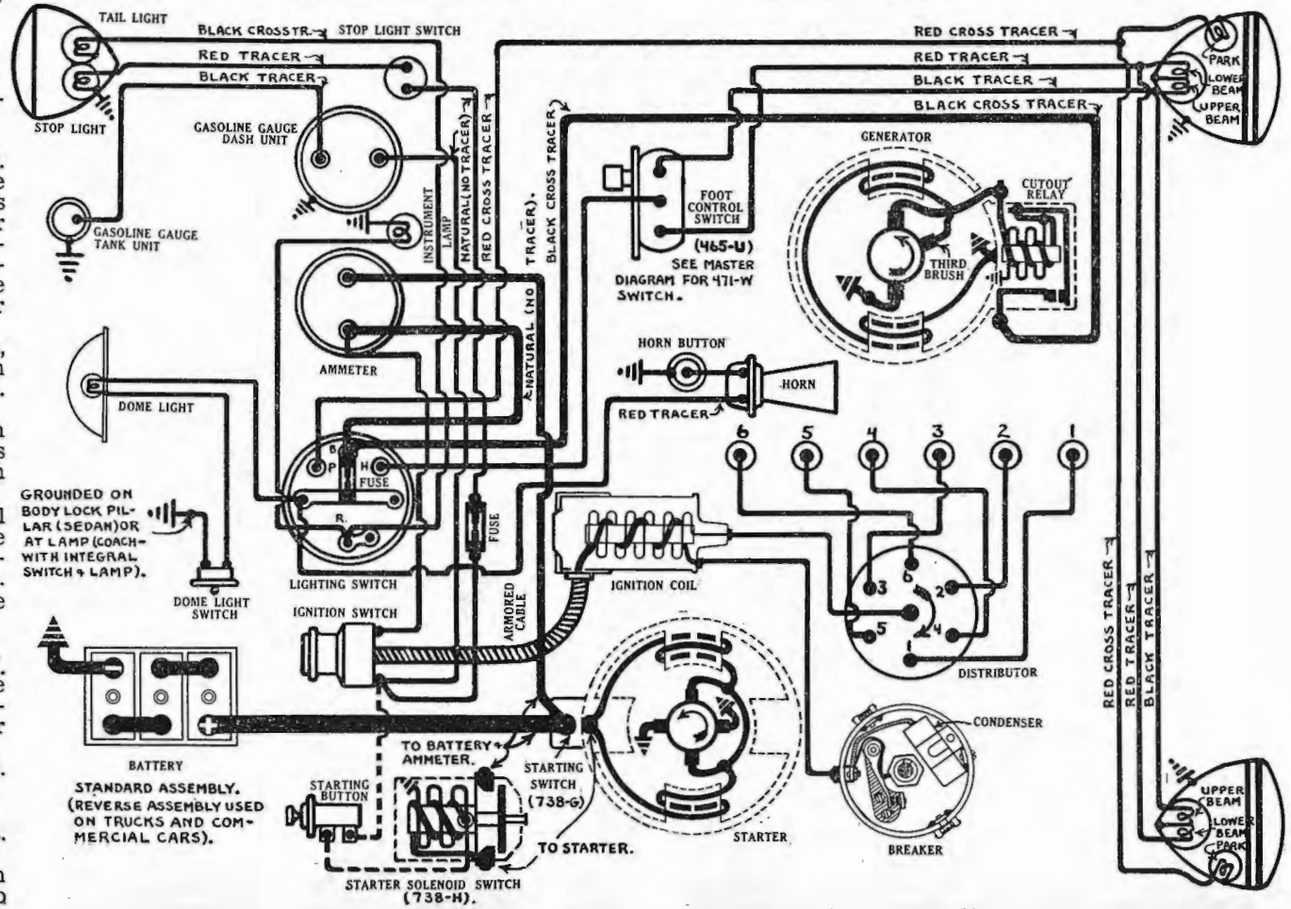
Camshaft:—Three bearing. Gear driven.
Bearing Type—#2 and 3 are steel-backed, babbitt-lined. These bearings are pressed in crankcase and staked to prevent movement.
Clearance—.002-.004". Check at center bearing.
End Thrust—Taken by thrust plate in back of camshaft gear. Endplay should be Free to .003".
Camshaft Gears—Crankshaft gear steel. Camshaft gear Bakelite-Fabric composition. Backlash between gears should be .002-.005".
Camshaft Setting:—Mesh marked tooth on crankshaft gear opposite marked space between teeth on camshaft gear. Marked tooth on crankshaft gear is third tooth counter-clockwise from space in line with keyway. Marked space on camshaft gear is thirteenth space clockwise from space opposite keyway (12 teeth between these points).

Valves:—

	Head Diameter	Stem Diameter	Length
Intake	1 45/64"	11/32"	5.986"
Exhaust	1 15/32"	11/32"	4.810"

	Seat Angle	Lift	Stem Clearance
Intake	30°	.316"	.001-.003"
Exhaust	30°	.309"	.002-.004"

NOTE—On a few of the first cars valve head diameter was 1 41/64" (Int.), 1 15/32" (Exh.), and seat angle was 45° (all).
Installing New Guides—Use special tool to press out old guides and install new guides. Assemble collars on guides with open face up (intake), down toward cylinder head (exhaust) before in-



stalling. Finish ream new guides to inside diameter .343" (all). Check stem size with 'No-Go' gauges (stem sizes above merely nominal).

Tappet Clearance—.006" minimum (.006-.008") Int., .013" minimum (.013-.015") Exh. with engine hot.

Valve Springs—Springs have variable spaced coils. Install springs with close-coil end toward cylinder head (down).

	Spring Pressure	Length
Valve Closed	45 lbs.	1 7/8"
Valve Open	98 lbs.	1 9/16"

Valve Timing—See Camshaft Setting above.
Intake Valves—Open 4° BTDC. Close 34° ALDC.
Exhaust Valves—Open 47° BLDC. Close 4° ATDC.

To Check Valve Timing—No flywheel mark provided for valve timing check. With intake tappet clearance set at .006" (engine hot), #1 intake valve should open with piston 4° before top dead center when a point on the flywheel approximately 1½ teeth before the dead center point lines up with the indicator in the inspection hole.

Lubrication:—Pressure and positive splash system (positive pressure to crankshaft and camshaft bearings, timing gears, and through oil distributor at left of engine to valve rocker arm bushings and connecting rod dipper troughs). Connecting rod bearings, piston pins and cylinder walls lubricated by splash from troughs at low speeds and by jet from oil nozzles striking rod dippers directly at high speeds. Vane type oil pump located in crankcase.

Normal Oil Pressure—12 lbs. at 50 M.P.H.

Oil Pressure Relief Valve—Conventional pressure relief or by-pass valve not used. Oil distributor on left side of crankcase proportions oil between high pressure points (crankshaft, camshaft bearings, timing gears) and low pressure points (oil troughs and rocker arm shafts). Excess oil is returned from rocker arm shafts to crankcase through overflow pipe. Distributor valve operates at 6½ lbs.

Checking Connecting Rod Oiling System—Use special gauge to check height of dippers assembled on connecting rod bearing cap and height of oil troughs (one gauge) when assembling rods. Use Target Gauge to check jet from oil nozzles in troughs (use water under pressure—jet should strike hole in target—use special tool to bend nozzle to correct position). Check nozzles after this adjustment with height gauge to make certain that rods will clear.

Capacity and Oil—5 qts. Use SAE. #20 (summer above 75°F), or #30 for high speed driving, #20-W (75° to 32°), #10-W (winter 32° to —15°F).

CARBURETION:—See Carburetion Section for data.

Carburetor:—Carter, Model 284-S, 1¼" downdraft type.

Fuel Pump:—A.C., Series W, Type 1521798, superseded by Type 1521812. Diaphragm type pump.

Gasoline Gauge:—A.C., Electric type.

CLUTCH:—Own make. Single plate, dry disc type. No adjustment required for wear.

Clutch Pedal Adjustment—Clearance between pedal and toeboard should be ½". To adjust, loosen two nuts on bracket at right of pedal (EB, EC) or on pedal stop bracket below pedal (Q), adjust pedal stop, tighten nuts. Free movement of clutch pedal should be 1". To adjust, loosen locknut and turn adjusting nut on clutch fork connecting link (EB, EC), or loosen locknut on pedal shaft stop below pedal, loosen locknut on adjusting setscrew, turn setscrew.

Clutch Facings—(EB, EC) molded woven asbestos composition, 2 required, 6¼" I.D., 9" O.D., ⅛" thick. (Q) molded asbestos composition, 2 required, 6¼" I.D., 10" O.D., ⅛" thick.

NOTE—Propeller shaft must be disconnected at universal and transmission removed to remove clutch.

STEERING:—Front Suspension—Conventional 'I' beam section front axle with Reverse-Elliott ends and semi-elliptic springs.

Kingpin Inclination—7°10' plus or minus 1°.

Caster—1¾° plus or minus ½° (EB, EC), 2¾° (Q). Adjust by installing wedge shims between spring and spring pad on axle.

Camber—1° plus or minus ½°. Axle may be bent cold to correct camber.

Toe In—5/64-⅛". Adjust in usual manner by loosening clamps and turning tie rod.

IGNITION:—Coil Model 536-D. Mounted on side of engine above distributor.

Ignition Current—2.5 amperes idling, 4.8 stopped.

Ignition Switch—Model 431-P (switch and cable).

Distributor Model 645-G. Single breaker, 6 lobe cam, full automatic advance type with auxiliary vacuum spark control and Octane Selector.

Breaker Gap—Set at .018". Limits .018-.024".

Breaker Arm Spring Tension—17-21 ounces.

Cam Angles—Closed 36°. Open 24° distributor.

Automatic Advance

Distributor		Engine	
Degrees	R.P.M.	Degrees	R.P.M.
Start	300	1.5	600
16	1500	32	3000

Vacuum Spark Control Model 680-L—Provides additional advance except when engine is suddenly accelerated (when spark is retarded by return spring in unit) or at high speed with wide open throttle (when vacuum port in carburetor is cut off by carburetor throttle valve shaft).

Vacuum Spark Advance

Engine Degrees	Vacuum
Start	5" of HG minimum
16-18°	9-11" of HG

Octane Selector—Adjustment at distributor providing maximum of 10° advance or retard from center '0' position. Should be adjusted to provide maximum advance without spark knock for particular fuel being used.

IGNITION TIMING:—

Flywheel Degs.	Piston Position
First 100,000 cars 10° BTDC.	.0385" BTDC.
After 100,000 cars 5° BTDC.	.0097" BTDC.

Timing (using Neon Timing Light)—This method recommended by manufacturer. Mount timing light so that it is directed on flywheel through timing inspection hole in right front face of flywheel housing. Clip one lead to #1 spark plug, ground other lead to engine. Set Octane Selector at '0'. Run engine at idling speed, loosen advance arm clamp bolt, rotate distributor until steel ball on flywheel appears to be directly in line with pointer on housing, tighten clamp bolt.

Timing (without Neon Light)—With #1 piston on compression, turn engine over until steel ball set in flywheel lines up with pointer in inspection hole in right front face of flywheel housing (piston will be 10° BTDC. on first cars, or 5° BTDC. on later cars). Adjust as above.

Octane Selector Setting—Adjust as above.

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

Spark Plugs:—A.C., Type K-11. 14 MM. Metric.

Spark Plug Gaps—Set at .032". Limits .032-.035".

BATTERY:—(EC) Delco, Type 13-AC or 13-P. 6 volt, 13 plate, 86 A.H. capacity (20 hour rate).

Starting Capacity—102 amperes for 20 minutes.

Grounded Terminal—Negative (—) terminal.

Location—On right side under front floor boards.

(Q Truck) Delco, Type 15-P. 6 volt, 15 plate, 94 A.H. capacity (20 hour rate).

STARTER:—Model 738-G, 738-H (R.H.D.). Armature No. 1847432.

Starter Drive—Barrel type Bendix drive.

Rotation—Counter-clockwise at commutator end.

Brush Spring Tension—24-28 ounces each.

Cranking Performance—65 R.P.M. 175 amperes.

Performance Data

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

Starting Switch:—(738-G). Mounted on starter and operated by starting pedal. (738-H) Type 1378 solenoid type mounted on starter and controlled by switch on instrument panel.

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

GENERATOR:—Model 943-J. Armature No. 817221. Third brush control type.

Charging Rate Adjustment—Loosen small round lockscrew 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—16-18 amperes, 1700 R.P.M., 23 M.P.H.

Performance Data

	Amperes	Volts	R.P.M.
Cold	16-18	8.0-8.3	1700
Hot	11-13	7.5-7.8	1800

Rotation—Counter-clockwise at commutator end.

Brush Spring Tension—14-18 ounces each.

Field Current—3.5-4.5 amperes at 6.0 volts.

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

Belt Adjustment:—Belt tension adjusted in usual manner by swinging generator away from engine.

CUTOUT RELAY:—Model 265-G. Mounted on generator. See Equipment Section for complete article.

Cuts In—6.75-7.5 volts, 720 R.P.M., 8 M.P.H.

Cuts Out—0-2.5 ampere discharge current.

Relay Contact Gap—.015-.025".

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

LIGHTING:—Light Switch Model 478-H. Foot Control Switch Model 465-U, 471-W. Foot operated control switch on toeboard controls upper and lower beams.

Bulb Specifications

Position	Candlepower	Mazda No.
Headlamps	21-21	1110
Park, Inst., Tail, Stop	3	63
Dome	6	81

FUSES:—Lighting—15 ampere on back of switch.

Stop Light—15 ampere, cartridge type, in lead on back of instrument panel.

HORNS:—Klaxon, Model K-31, Type 1359 (EC), Model K-26-L, Type 1601 (EB, Q). Vibrator type.

SERIAL NUMBER:—First number, 1001. Prefix 1EA, 1ED, etc., indicates model and assembly plant. On plate on right front sill (passenger cars), or on front of dash (trucks).

ENGINE NUMBER:—First number, 4,708,995. Stamped on boss on right side of cylinder block in back of fuel pump.

ENGINE: — Own Master Model. Six cylinder, 'T' or overhead valve type. Cylinders cast enbloc.
Bore—3 5/16". **Stroke**—4".
Piston Displacement—206.8 cubic inches.
Rated Horsepower—26.3 A.M.A.
Developed Horsepower—80 at 3200 R.P.M.
Compression Ratio—5.6-1. No optional ratios.
Compression Pressure—75 lbs. or better.

Pistons:—Cast-iron, tin-plated, cam ground type with greater clearance across pin bosses. Pistons are tin-plated to thickness of .0005-.001" after finishing and cannot be ground. Refinish cylinders to take standard replacement pistons furnished .003", .010", .020", .030", .040" oversize (hone cylinders for .003" oversize or ream and hone for larger pistons). Piston length 3 11/16".
Weight—28.8 ozs. stripped, 38.24 ozs. with rings, pin and bushings. Held to ⅛ oz. max. variation.
Removal—Pistons and rods removed from above.
Clearance—.0145" top, .0015-.003" skirt.
Fitting New Pistons—Use feeler gauge between piston and cylinder at right angles to pin bosses to check clearance. Piston should pass through bore on .002" feeler and lock on .003" feeler.

Piston Rings:—Two compression, one oil control ring per piston, all above pin. Lower ring groove drilled radially with oil drain holes. Rings furnished .005", .010", .015", .020", .030", .040" oversize.

Ring	Width	End Gap	Side Clearance
Comp. All	⅛"	.005-.015"	.0015-.003"
Oil Cont.	3/16"	.013-.021"	.0015-.0025"

Piston Pin: — Diameter .990-.9895". Length 2 29/32". Pin is locked in rod. Pin bosses in piston are bronze bushed. New pistons furnished with bushings installed and pins fitted. Pins furnished for service standard and .003", .005", .010" oversize.
Pin Fit in Piston Bushing—Light thumb push fit.

Connecting Rod:—Weight 31.68 ozs. Length 7½".
Crankpin Journal Diameter—2.1245-2.1250".
Lower Bearing Type—Spun babbitt. Solid shims.
Clearance—.0005-.002". Sideplay .004-.011".
Adjustment—Shims. Remove shims from each side equally to secure 'snap fit' (rod should snap from one side to the other with a light tap of 8 oz. ball pein hammer). Bearing is loose if rod can be moved by hand.
Installing Rods—See Standard Model EC for instructions.

Crankshaft:—3 bearings. Integral counterweights.
Journal Diameters — #1, 2.058-2.059"; #2, 2.120-2.121"; #3, 2.183-2.184".
Bearing Type — Removable steel-backed, babbitt-lined.
Clearance—.001-.003".
Adjustment—Shims. Remove shims until there is a heavy drag on the crankshaft, then replace one .002" shim. If necessary to use unequal number, place extra shims on camshaft side.
End Thrust—Taken by center bearing. Endplay .004-.007". Flanges on center main bearing should be turned down to provide this clearance.

Camshaft:—Three bearing. Gear driven.
Bearing Type—#2 and 3 are steel-backed, babbitt-lined. These bearings are pressed in crankcase and staked to prevent movement.
Clearance—.002-.004". Check at center bearing.
End Thrust—Taken by thrust plate in back of camshaft gear. Endplay should be Free to .003".
Camshaft Gears—Crankshaft gear steel. Camshaft gear Bakelite-Fabric composition. Backlash between gears should be .002-.005".
Camshaft Setting—Mesh marked tooth on crankshaft gear opposite marked space between teeth on camshaft gear. See Standard Model EC for location of marks on gears.

Valves:—	Head Diameter	Stem Diameter	Length
Intake	1 45/64"	11/32"	5.986"
Exhaust	1 15/32"	11/32"	4.810"

	Seat Angle	Lift	Stem Clearance
Intake	30°	.316"	.001-.003"
Exhaust	30°	.309"	.002-.004"

Installing New Guides—See Standard Model EC for complete instructions.
Tappet Clearance—.006" min. (.006-.008") Intake, .013" minimum (.013-.015") Exh. with engine hot.
Valve Springs—Springs have variable spaced coils. Install springs with close-coil end toward cylinder head (down).

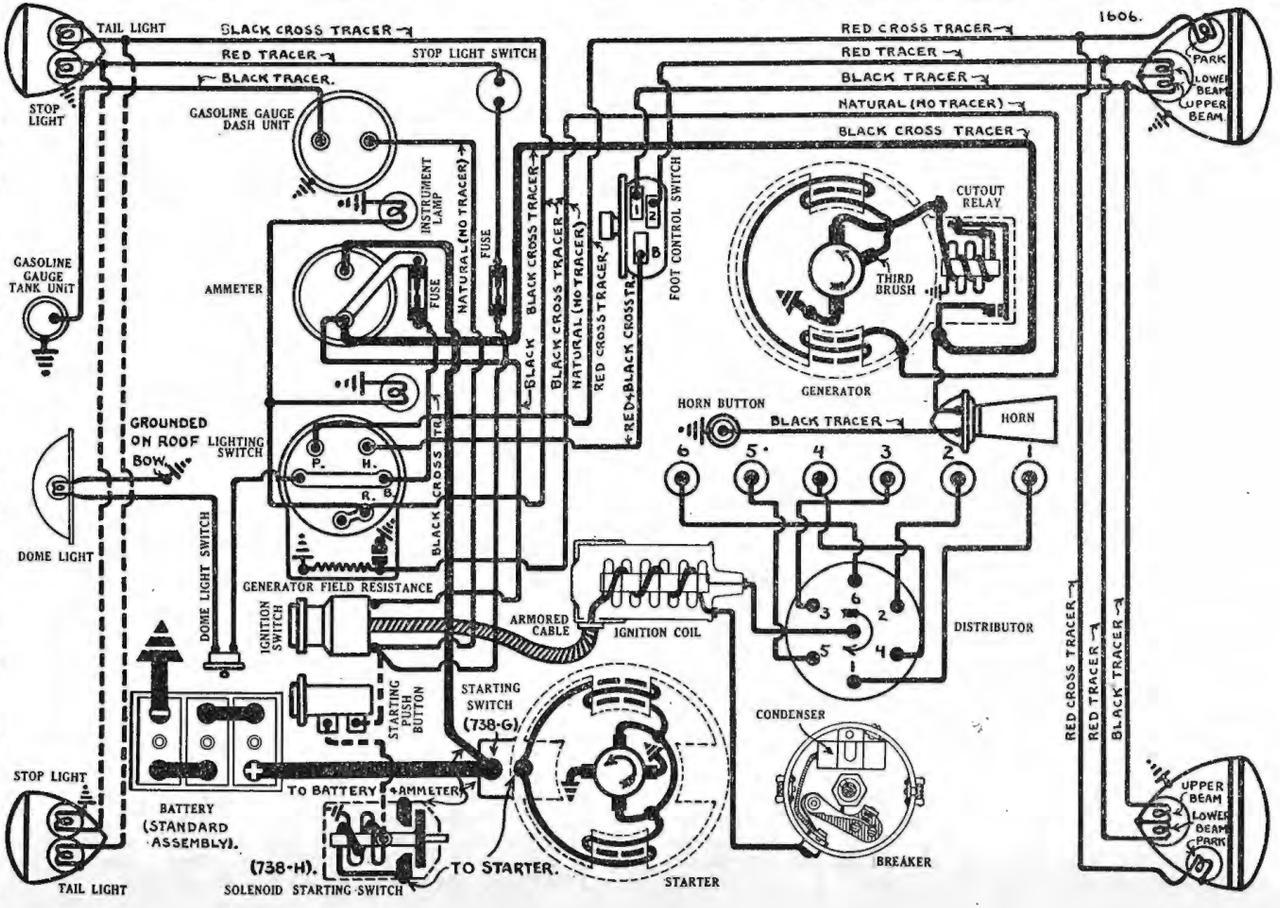
	Spring Pressure	Length
Valve Closed	45 lbs.	1⅞"
Valve Open	98 lbs.	1 9/16"

Valve Timing—See Camshaft Setting above.
Intake Valves—Open 4° BTDC. Close 34° ALDC.
Exhaust Valves—Open 47° BLDC. Close 4° ATDC.
To Check Valve Timing—No flywheel mark provided for valve timing check. With intake tappet clearance set at .006" (engine hot), #1 intake valve should open with piston 4° before top dead center when a point on the flywheel approximately 1½ teeth before the dead center point lines up with the indicator in the inspection hole.

Lubrication—Pressure and positive splash system. See Standard Model EC for complete description of oiling system and Oil Distributor Valve, and for connecting rod dipper and oil nozzle setting.
Normal Oil Pressure—12 lbs. at 50 M.P.H.
Capacity and Oil—5 qts. Use SAE. #20 (summer above 75°F), or #30 for high speed driving, #20-W (75° to 32°), #10-W (winter 32° to —15°F).

CARBURETION:—See Carburetion Section for data.
Carburetor:—Carter, Model 284-S, 1¼" downdraft.
Fuel Pump:—A.C., Series W, Type 1521798, superseded by Type 1521812. Diaphragm type pump.
Gasoline Gauge:—A.C., Electric type.

CLUTCH:—Own make. Single plate, dry disc type. No adjustment required for wear.
Clutch Pedal Adjustment — Clearance between pedal and toeboard should be ½". To adjust,



loosen two nuts on bracket at right of pedal, adjust pedal stop, tighten nuts. Free movement of clutch pedal should be 1". To adjust, loosen locknut and turn adjusting nut on clutch fork connecting link.

Clutch Facings—Molded woven asbestos composition, 2 required, 6¼" I.D., 9" O.D., ⅛" thick.

NOTE—Propeller shaft must be disconnected at universal and transmission removed to remove clutch.

STEERING:—ED Front Suspension—Conventional 'I' beam section axle with Reverse Elliott ends and semi-elliptic springs. All data and service directions as given for Standard Model EC apply except that caster angle should be 3° for Model ED.

EA Front Suspension—Independent 'knee-action' type with entire suspension unit (coil spring housing, built-in shock absorber unit, wheel support arm, and radius rod) pivoted on kingpin and turning with wheel.

NOTE—Caster, camber and kingpin angle must be checked with car weight on wheel spindles. Manufacturer recommends special checking gauge by which these points can be checked from the frame with car weight supported on horses placed under spindles at inner bearing cone. Check height of suspension unit before making other tests as follows:

Suspension Unit Height—Distance from bottom of kingpin support to bottom of brake flange plate should be 5⅝" (5-wheel cars), 4⅜" (6-wheel cars). To adjust, remove capscrew in center of adjusting plug, lift out adjusting plug lock, coat adjusting plug with permatex, screw plug in or out to secure correct height. Plug must not be more than ⅛" above or below surface of housing cover. Replace lock and capscrew.

Kingpin Inclination—7¾°. Correct by bending kingpin support.

Camber—¼°. No adjustment provided. If spindle is bent, replace suspension unit. If kingpin bearings are worn, they should be replaced (special oversize rollers can be installed by reaming out kingpin support yoke ends).

Kingpin Caster—0°. Correct by bending kingpin support. Caster effect is secured by trailing wheel center behind center of kingpin.

Toe In—1/16-3/32" measured at hub height. Correct as usual by chenging length of tie rod.

Lubrication—Entire suspension unit must be kept filled with special Shock Insulation Fluid to level of filler plug on front of unit.

NOTE—Suspension unit is serviced as a unit and is removed by taking out kingpin. Kingpin is locked in place by tapered lock bolt in conventional manner. Special hydraulic knock-out tool (filled with grease) should be used to remove welch plugs used above and below kingpin after dust caps and lock rings have been removed. Kingpin is carried at top and bottom on 32 loose rollers. 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 up), before pushing kingpin into place. Check clearance between thrust bearing and upper support yoke and install shim if end-play exceeds .006".

IGNITION:—Coil Model 536-D. Mounted on side of engine above distributor.

Ignition Current—2.5 amperes idling, 4.8 stopped.

Ignition Switch—Model 431-P (switch and cable).

Distributor Model 645-G. Single breaker, 6 lobe cam, full automatic advance type with auxiliary vacuum spark control and Octane Selector.

Breaker Gap—Set at .018". Limits .018-.024".

Breaker Arm Spring Tension—17-21 ounces.

Cam Angles—Closed 36°. Open 24° distributor.

Automatic Advance

Distributor		Engine	
Degrees	R.P.M.	Degrees	R.P.M.
Start	300	1.5	600
16	1500	32	3000

Vacuum Spark Control Model 680-V—Provides additional spark advance except when engine is suddenly accelerated (when spark is retarded by return spring in unit) or at high speeds with wide open throttle (when vacuum port in carburetor is cut off by carburetor throttle valve shaft).

Vacuum Advance

Engine Degrees	Vacuum
Start	5" of HG. Minimum
11-13°	9-11" of HG.

Octane Selector:—Adjustment at distributor providing maximum of 10° advance or retard from center '0' position. Should be adjusted to provide maximum advance without spark knock for particular fuel being used.

Removal:—Distributor mounted on right side of engine. To remove, loosen clamp bolt in advance plate.

IGNITION TIMING:—

Flywheel Degs.	Piston Position
First 100,000 cars.....10° BTDC.	.0385" BTDC.
After 100,000 cars..... 5° BTDC.	.0097" BTDC.

Timing (using Neon Timing Light)—This method recommended by manufacturer. Mount timing light so that it is directed on flywheel through timing inspection hole in right front face of flywheel housing. Clip one lead to #1 spark plug and ground other lead to engine. Set Octane Selector at '0'. Run engine at idling speed, loosen advance arm clamp bolt, rotate distributor until steel ball on flywheel appears to be directly in line with pointer on housing, tighten clamp bolt.

Timing (without Neon Light)—With #1 piston on compression, turn engine over until steel ball set in flywheel lines up with pointer in inspection hole in right front face of flywheel housing (piston will be 10° BTDC. on first cars, or 5° BTDC. on later cars). Set Octane Selector at '0', loosen distributor clamp bolt, rotate distributor until contacts begin to open, tighten clamp bolt.

Octane Selector Setting—Advance Octane Selector as much as possible without spark knock after setting ignition.

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

Spark Plugs:—A.C., Type K-11. 14 MM. Metric.

Spark Plug Gaps—Set at .032". Limits .032-.035".

BATTERY:—Delco, Type 15-Y or 15-X. 6 volt, 15 plate, 94 A.H. capacity (20 hour rate).

Starting Capacity—115 amperes for 20 minutes.

Grounded Terminal—Negative (—) terminal.

Location—On right side under front floor boards.

STARTER:—Model 738-G, 738-H (R.H.D.). Armature No. 1847432.

Starter Drive—Barrel type Bendix drive.

Rotation—Counter-clockwise at commutator end.

Brush Spring Tension—24-28 ounces.

Cranking Performance—65 R.P.M., 175 amperes.

Performance Data

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

Starting Switch:—(738-G). Starterator operated by accelerator pedal with Type 1575 vacuum unit control. See Equipment Section. (738-H). Type 1378 solenoid mounted on starter and controlled by switch on instrument panel.

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

GENERATOR:—Model 935-V. Armature No. 1854856. Third brush regulation, lighting switch control. Field resistance on switch is shorted out with lamps turned on, increasing generator output. Special switch position between 'Off' and 'Park' provides this high charging rate with lamps off. See 'Lamp Control Generators' in Equip. Section.

Charging Rate Adjustment—Manufacturer recommends that position of third brush not be changed as brush is set for maximum safe output at factory. To check charging rate, ground field terminal on generator to frame, use test ammeter to check output, shift third brush by hand counter-clockwise to increase or clockwise to decrease charging rate, remove field ground.

Maximum Charging Rate—20 amperes (cold), 15 amperes (hot), 2400 R.P.M. 26-27 M.P.H.

Performance Data

	Amperes	Volts	R.P.M.
Cold	18-21	8.2-8.5	2400
Hot	12-15	7.6-8.0	2900

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 Resistance—Std. 1 ohm. Optional ¾ ohm and 1½ ohm. Should be changed only for unusual operating conditions, excessive night driving, etc.

SPECIAL GENERATORS:—Model 936-A (Canada), 935-U (Government), 931-R (City Delivery, Taxicab), 933-H (City Police), 936-J (State Police), 933-J (School Bus) also used. See Equipment Section for complete data.

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

Belt Adjustment:—Belt tension adjusted in usual manner by swinging generator away from engine. Belt should have small amount of slack.

CUTOUT RELAY:—Model 265-G. Mounted on generator. See Equipment Section for complete article.

Cuts In—6.75-7.5 volts, 720 R.P.M., 8 M.P.H.

Cuts Out—0-2.5 ampere discharge current.

Relay Contact Gap—.015-.025".

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

LIGHTING:—Light Switch Model 479-Y, 479-R (Canada). Foot Control Switch Model 471-W. Foot operated control switch on toeboard controls upper and lower beams.

Bulb Specifications

Position	Candlepower	Mazda No.
Headlamps	32-21	2320-C
Park, Inst., Tail, Stop	3	63
Dome	6	81

FUSES:—Lighting—15 amperes above ammeter.

Stop Light—15 amperes in lead behind instrument board.

HORNS:—Klaxon, Model K-26-L, Type 1601. Vibrator type.

SERIAL NUMBER:—First number, 6,800,001 (Detroit), 9,703,366 (Windsor, Canada). On right front door hinge pillar post.

ENGINE NUMBER:—Stamped on boss on left side of cylinder block between #1 and 2 cylinders. Letter 'A' following number indicates that cylinder bore is .020" larger than standard. Letter 'B' indicates that main and connecting rod bearings are .010" smaller than standard. Letters 'AB' indicate that bore and bearing sizes are as above.

ENGINE:—Six cylinder, 'L' head type. Floating power.
Bore—3⅜". **Stroke**—4½".
Piston Displacement—241.5 cubic inches.
Rated Horsepower—27.34 A.M.A.
Developed Horsepower—93 at 3400 R.P.M.
Compression Ratio—6.0-1 Std. cast-iron head, 6.5-1 Optl. aluminum head.
Compression Pressure—120-130 lbs. 6.0-1 head), 125-135 lbs. (6.5-1 Al. head) 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 3⅞.
Removal—Pistons and rods removed from above.
Weight—Held to 7 grams or ¼ oz. variation.
Clearance—Top .024". Skirt .002".
Fitting New Pistons—Use micrometer gauges to check cylinder bore and piston diameter.
Installing Pistons—Slot at left (away from valve).

Piston Rings:—Two compression, one undercut oil wiper ring (#3), one oil control ring 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 Clearance
Comp. All	⅛"	.007-.015"	.003"
Oil Cont. All	5/32"	.007-.015"	.003"

Piston Pin:—Diameter 55/64". Length 2⅞". Pin floats in piston and rod. Held by retaining rings. Piston should be heated in boiling water to remove or install pins. Pins furnished .003", .005", .008" oversize.
Pin Fit in Piston—Tight thumb push fit with piston heated to 120°F.
Pin Fit in Rod Bushing—Light thumb push fit with piston at room temperature (70°F).

Connecting Rod:—Weight—maximum variation held to 7 grams or ¼ oz. Length 8¾".
Crankpin Journal Diameter—2⅛".
Lower Bearing—Removable steel-backed, babbitt-lined type. No shims.
Clearance—.001-.00275". Sideplay .003-.009".
Adjustment—None (no shims). Replace bearings. Do not file rods or caps. Install new bearings with small boss registering with groove (both halves). Furnished .010" undersize and standard.
Installing Rods—Lower bearings are offset. Install rods with widest half of bearing toward rear of engine (#1, 3, 5), or toward front of engine (#2, 4, 6). Oil hole in upper half of bearing must be toward valve side on all rods.

Crankshaft:—4 bearing. Integral counterweights.
Journal Diameters—2½" all bearings.
Bearing Type—Removable steel-backed, babbitt-lined type. No shims.
Clearance—.001-.002".
Adjustment—None (no shims). Replace bearings. Do not file caps. Bearings furnished .010" undersize and standard size for service.
End Thrust—Taken by rear bearing. Endplay .003-.007".

Camshaft:—4 bearing. Non-adjustable chain drive.
Bearing Type—Removable steel-backed, babbitt-lined type (except #4, machined in crankcase).
Clearance—.0015-.0025". Endplay .003-.005".
End Thrust—Taken by thrust plate at rear of 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.

Valves:—	Head Diam.	Stem Diam.	Length
Intake	1 17/32"	.340-.341"	5 5/16"
Exhaust	1 15/32"	.340-.341"	5 5/16"

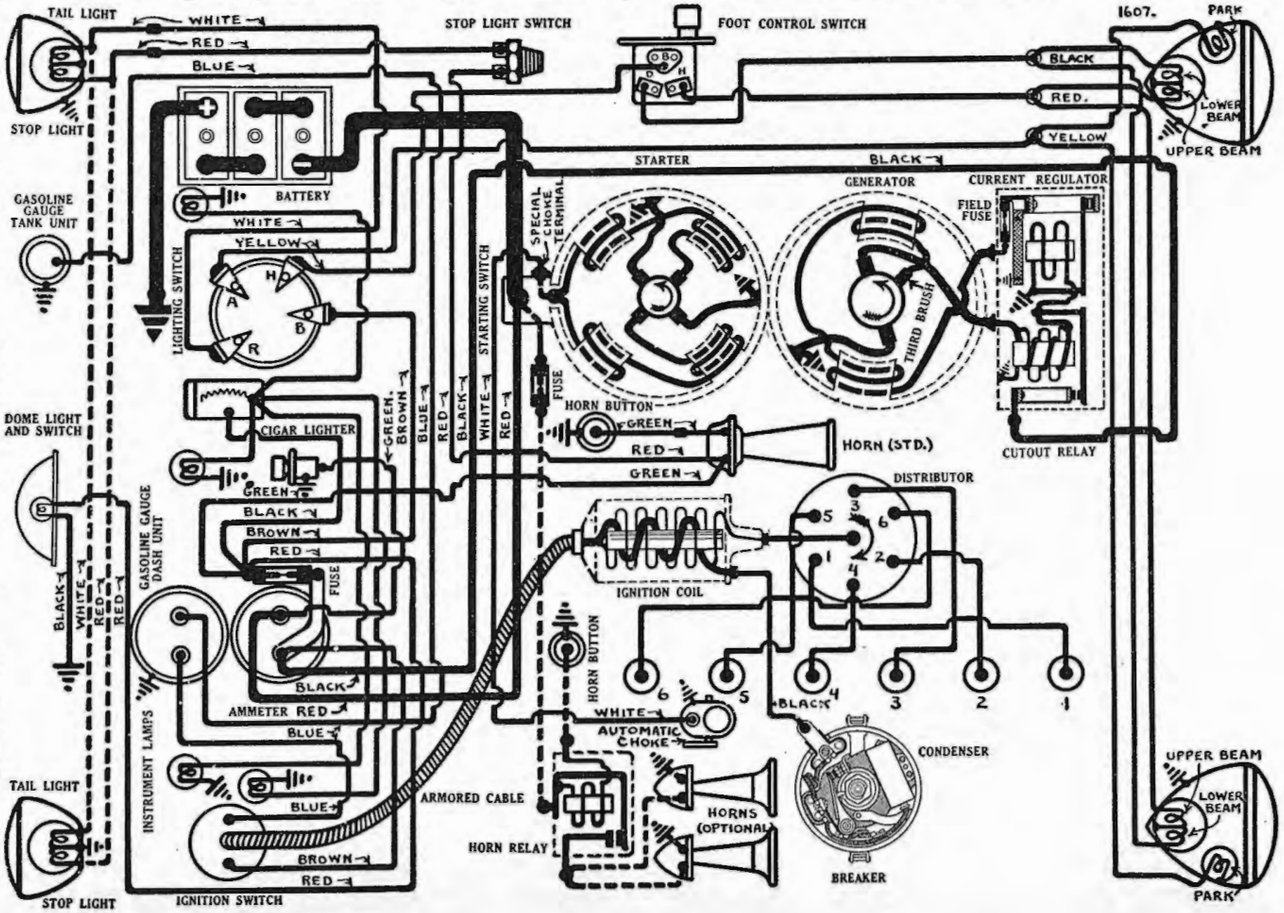
	Seat Angle	Lift	Stem Clearance
Intake	45°	11/32"	.001-.003"
Exhaust	45°	11/32"	.003-.005"

Installing New Guides—Use special tool to remove and install guides. Intake guides installed with taper end up, exhaust guides with taper end down. Top of guide must be 13/16" 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. Valves accesible by removing right front wheel and housing cover.
Valve Springs—Variable pitch type. Install springs with closer spaced coils at top. Do not compress springs to length of less than 1 11/16".

	Spring Pressure	Spring Length
Valve Closed	46-50 lbs.	2 1/32"
Valve Open	104-110 lbs.	1 22/32"

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 and exhaust valves at .010". Intake valve should open at top dead center when 'O' mark on impulse neutralizer at front of engine lines up with pointer on chain case. Reset tappet clearance at .006" with engine hot.

Lubrication:—Pressure. Gear type oil pump located at right of crankcase.
Normal Oil Pressure—40-50 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 spring



unpainted. Heavy spring (to increase pressure) painted green. Lighter spring (to decrease pressure) painted red.

Capacity & Oil—6 qts. Use SAE. #30 (summer—or #40 for high speed driving or above 100°F), #20-W (winter 32° to 0°F), #10-W (0° to —15F°).

CARBURETION:—See Carburetion Section for data.

Carburetor:—Carter (Ball & Ball), Model E6F1, E6F2, 1½" downdraft type.

Automatic Choke—Sisson.

Fuel Pump:—A.C., Type P-1521788 diaphragm type.

Gasoline Gauge:—Motometer electric type.

CLUTCH:—Borg and Beck Model 10A6. Single plate, dry disc type. No adjustment required for wear.

Clutch Pedal Adjustment—Clutch pedal should just clear under side of toeboard with clutch engaged. To adjust, turn stopscrew located just above clutch pedal shaft. Free movement of pedal should be 1 1/16". To adjust, loosen locknut and turn adjusting nut (clevis) on clutch fork adjusting rod.

Clutch Facings—Woven asbestos, 2 required, 6⅛" I.D., 9⅞" O.D., .133" thick.

NOTE—To remove clutch first remove clutch fork and pivot by taking out pivot capscrew. 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—Independent, linked parallelogram type with coil springs. All specifications and service adjustments same as for Model CZ (following) except kingpin inclination 10° plus or minus ½° (including camber angle), or 8¾-10¼° from vertical (without camber angle).

IGNITION:—Coil IG-4618 (Coupe), IG-4617 (Sedan).

Ignition Switch—Electrolock connected to coil by armored cable.

Distributor Model IGS-4001, A. 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—IGS-4001

Distributor Degrees	R.P.M.	Engine Degrees	R.P.M.
Start	350	0	700
3	400	6	800
6	710	12	1420
9	1020	18	2040
12	1350	24	2700

Automatic Advance—IGS-4001-A

Start	350	0	350
3	400	6	800
6	780	12	1560
9	1160	18	2320
12	1530	24	3060

NOTE—Distributor changed to IGS-4001-A after 20,000. IGS-4001 distributors should be changed over by using new weight springs. Part #IG-884 and setting distributor to advance curve given for IGS-4001-A whenever advance mechanism requires attention. Type number on nameplate should be changed to IGS-4001-A.

Vacuum Spark Control—Provides additional advance for intermediate speed range above idling. Spark is retarded by return spring within unit when engine is accelerated or is operated with wide-open throttle.

Vacuum Spark Advance

Distributor Degrees	Vacuum
½°	4-5" of HG.
9° max.	12" of HG.

IGNITION TIMING:—

	Flywheel Degs.	Piston Posi.
6.0-1 Head Engines	At TDC.	.0000" TDC.
6.5-1 Head Engines	5° ATDC.	.0108" ATDC.

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 reaches top dead center, stop when center '0' mark or 5° line to left of center '0' mark on impulse neutralizer 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 '0' mark), tighten hold-down screw. Loosen advance clamp bolt, rotate distributor until lamp goes out, tighten clamp bolt.

Timing (Using Synchroscope)—Engine can be timed using a Synchroscope by directing light on impulse neutralizer. See Equipment Section.

Timing (Using Motor Gauge)—Engine can be timed with a motor gauge by installing gauge in timing hole located directly over #6 piston.

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

Spark Plugs:—A.C., Type K-9 (Std. cast-iron head), KL-9 (aluminum head). Not interchangeable.

Spark Plug Gaps—Set at .025".

BATTERY:—Willard Type WH-2-15, RH-2-15 (Export), 6 volt, 15 plate, 119 A.H. cap. (20 hr. rate).

Starting Capacity—140 amperes for 20 minutes.

Grounded Terminal—Positive (+) terminal.

Location—On left side under driver's seat.

STARTER:—Model MAX-4002, MAX-4005 (RHD), 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.	5300 Min.	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

NOTE—See Equipment Section for instructions on installing Field Equalizer on these starters.

Starting Switch:—(MAX-4002) Type SW-2813. See Equipment Section for pedal adjustment and for Type SS-4101 solenoid switch (MAX-4005).

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

GENERATOR:—Model GAR-4608-5. Armature No. GAR-2116-F. Air-cooled. Third brush control in conjunction with Current Regulator (two-rate charging control). See Equipment Section.

Charging Rate Adjustment—Use test meters to check generator output. Connect jumper wire between fuse cup on regulator unit to ground on generator frame. Shift third brush by hand in counter-clockwise direction to increase, or clockwise to decrease charging rate until output is 21 amperes at 8.6 volts with generator at room temperature. Third brush held in position by friction. Remove jumper wire.

Commutator Bar Method—Shift third brush 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. Do not exceed.

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 amp. more 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 field frame. Consists of Cutout Relay and Current Regulator in a single case. See Equipment Section for complete data.

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 headlamp 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—Lighting switch button and shaft are integral. To remove switch, pull out button to end 'on' position, insert thin bladed tool in hole in switch housing behind instrument panel, press tightly toward center of shaft to disengage operating bar from groove in shaft, pull out button and shaft, remove switch.

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

Twin Horns—30 ampere in horn lead near starter.

Generator Field—5 ampere in regulator.

HORNS:—Klaxon Model K-26-L (Std). Model K-33-C Type 1899 (low note), 1900 (high note) Optional. Optional twin horns operated by horn relay.

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

Relay Contact Gap—.015.-025".

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

SERIAL NUMBER:—First number, 6,701,501 (Detroit), 9,755,421 (Windsor, Canada). On right front door hinge pillar post.

ENGINE NUMBER:—First Number, CZ-1001. Stamped on boss on left side of cylinder block between #1 and 2 cylinders. See Model C6 for explanation of letter following engine number.

ENGINE:—Own. Eight cylinder, In line, 'L' head type. Floating power engine mounting.
Bore—3¼". Stroke—4⅛".
Piston Displacement—273.8 cubic inches.
Rated Horsepower—33.80 A.M.A.
Developed Horsepower—105 at 3400 R.P.M.
Compression Ratio—6.2-1 Std. cast-iron head, 7.0-1 special aluminum head.
Compression Pressure—125-135 lbs. (6.2-1 cast-iron head), 130-140 lbs. (7.0-1 al. head) at 1000 R.P.M.

Pistons:—Aluminum alloy, 'T' slot, cam ground type. See Model C6 for standard oversizes and semi-finished pistons.
Removal—Pistons and rods removed from above.
Weight—Held to 7 grams or ¼ oz. variation.
Clearance—Top .024". Skirt .002".
Fitting New Pistons—Use micrometer gauges to check cylinder bore and piston diameters.
Installing Pistons—Slot should be at left or away from valve side of engine.

Piston Rings:—Two compression, one undercut oil wiper ring (#3), one oil control ring per piston, all above pin. Oil ring grooves are drilled radially with oil drain holes. Rings furnished in same oversizes as pistons (except .023").

Ring	Width	End Gap	Side Clearance
Comp. All	⅛"	.007-.015"	.003"
Oil Cont. All	5/32"	.007-.015"	.003"

Piston Pin:—Diameter 55/64". Length 2¾". Pin floats in piston and rod. Held by retaining rings. Piston should be heated in boiling water to remove or install pins. Pins furnished .003", .005", .008" oversize for service.
Pin Fit in Piston—Tight thumb push fit with piston heated to 120°F.
Pin Fit in Rod Bushing—Light thumb push fit with both parts at room temperature (70°F.).

Connecting Rod:—Weight held to 7 grams or ¼ oz. maximum variation. Length 9 3/16".
Crankpin Journal Diameter—2 3/16".
Lower Bearing Type—Removable steel-backed, babbitt-lined type. No shims.
Clearance—.001-.00275". Sideplay, .003-.009".
Adjustment—None (no shims). Replace bearings. Do not file bearing caps. Install new bearings with small boss registering with groove in rod and cap. Bearings furnished for service .010" undersize and standard.
Installing Rods—Lower bearings are offset. Install rods with widest half of bearing toward rear (#1, 3, 5, 7) or toward front (#2, 4, 6, 8). Oil hole in upper half of bearing must be toward valve side of engine on all rods.

Crankshaft:—Five bearing. Integral counterweights.
Journal Diameters—2 45/64" all bearings.
Bearing Type—Interchangeable steel-backed, babbitt-lined type. No shims.
Clearance—.001-.002".
Adjustment—None (no shims). Replace bearings. Do not file bearing caps. Bearings furnished for service .010" undersize and standard.
End Thrust—Taken by rear bearing. Endplay, .002-.005"

Camshaft:—Six bearing. Non-adjustable chain drive.
Bearing Type—Removable steel-backed babbitt-lined type (except #6 which is machined in crankcase).
Clearance—.0015-.0025". Endplay, .003-.005".
End Thrust—Taken by thrust plate between sprocket hub and front main bearing.
Timing Chain—Morse. Width 1¼". 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.

Valves:—

	Head Diameter	Stem Diameter	Length
Intake	1 15/32"	.340-.341"	5⅜"
Exhaust	1 13/32"	.340-.341"	5⅜"

	Seat Angle	Lift	Stem Clearance
Intake	45°	11/32"	.001-.003"
Exhaust	45°	11/32"	.003-.005"

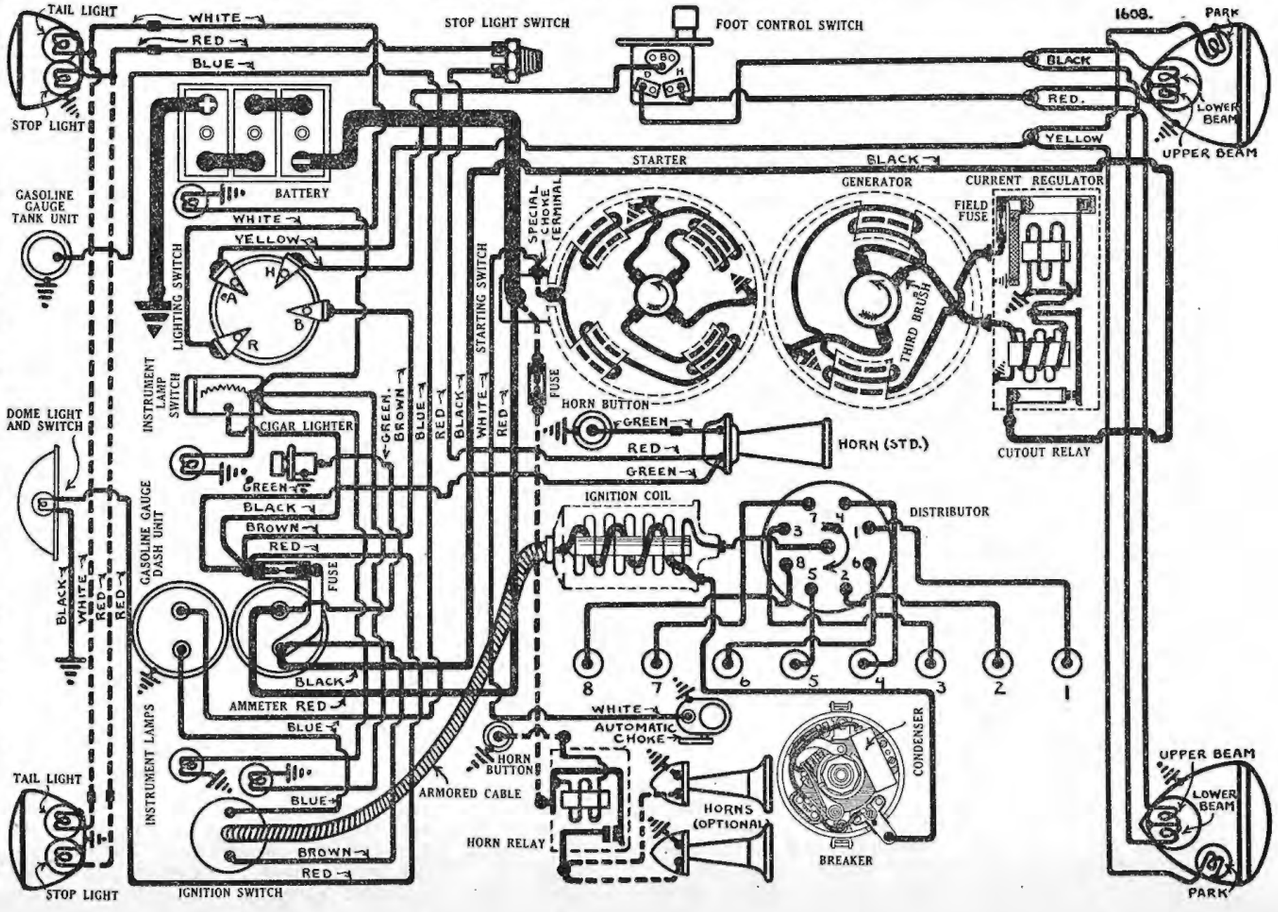
Installing New Guides—See Model C6 for complete instructions.
Tappet Clearance—.006" intake, .008" exhaust. running clearance with engine hot. Set exhaust clearance at .010" for sustained high speed driving. Valves accessible by removing right front wheel and wheel housing cover under fender.
Valve Springs—Variable pitch type. Install springs with closer spaced coils at top. Do not compress springs to length of less than 1 11/16".

	Spring Pressure	Length
Valve Closed	46-50 lbs.	2 1/32"
Valve Open	104-110 lbs.	1 22/32"

Valve Timing—See Camshaft Setting above.
Intake Valves—Open 2° BTDC. Close 44° ALDC.
Exhaust Valves—Open 46° BLDC. Close 4° ATDC.
To Check Valve Timing—Set tappet clearance #1 valves at .011" intake, .012" exhaust. Intake valve should open with piston 2° BTDC when 2° line on impulse neutralizer at front of engine lines up with pointer on chain case cover. Reset tappet clearance at .006" (engine hot).

Lubrication:—Pressure. Gear type oil pump located on right hand side of crankcase.
Normal Oil Pressure—40-50 lbs. at driving speeds.
Oil Pressure Relief Valve—Located under cap on left hand side of crankcase. Operates at 40-45 lbs. See Model C-1 (following) for adjustments.
Capacity & Oil—6 qts. Use SAE. #30 (summer—#40 for sustained high speed driving or temperatures above 100°F), #20-W (winter 32° to 0°F), #10-W (winter 0° to —15°F.).

CARBURETION:—See Carburetion Section for complete data.
Carburetor:—Stromberg, Model EX-32, EXV-3, 1½" downdraft type.



Automatic Choke—Sisson.

Fuel Pump:—AC Type D-1521803 diaphragm type.

Gasoline Gauge:—Motometer electric type.

CLUTCH:—Borg and Beck Model 10A6. Single plate, dry disc type. All specifications and adjustments same as for Model C6 (preceding).

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

Kingpin Inclination—4°30′ (4¼-5¾° depending upon camber angle) alone, or 5°30′ plus or minus ½° including camber angle.

Caster—1½° (½°-2½°). Measure with car weight on springs but not on wheels (jack up car with jack placed under lower control arm or spring seat). To adjust, loosen upper and lower control arm yoke nuts, remove lubricant fitting at front end of upper control arm yoke pin, loosen clamp bolts on upper yoke and upper end of knuckle support, insert special wrench in lubricant fitting hole, turn upper control arm yoke pin so as to move upper end of knuckle toward rear of car to increase caster angle, or toward front of car to decrease caster angle. Tighten yoke nuts and clamp bolts, replace lubricant fitting.

Camber—½° (¼-1°). Camber affected by caster adjustment and must be checked when caster angle is changed. Before changing camber, see that king pin pivot angle is correct and that loaded heights of front springs are equal (see paragraph below). To adjust camber, jack up car with jack placed under lower control arm or spring seat, so that weight of car is on springs but not on wheel, disconnect tie rod at wheel end. Remove upper control arm yoke nut, pull yoke out of control arm, add spacers between yoke and control arm to increase camber, or remove spacers to decrease camber (place spacers removed in this manner on inner face of control arm under yoke nut).

Toe In—1/16-⅛″ measured at hub height on center of tread. Adjust by changing length of each tie rod equally. Measure tie rods to be certain that lengths between ends are equal.

Spring Heights—Distance from center line of lower control arm yoke pin to top of frame cross member (flat section) should be 7¼ to 7⅜″ with car weight on wheels but no load in car. Heights must be equal on both sides within ⅛″.

IGNITION:—Coil CE-4603 (Coupe), CE-4604 (Sedan).

Ignition Switch—Electrolock connected to coil by armored cable.

Distributor Model IGT-4001. Single breaker, 8 lobe cam, full automatic advance type with auxiliary vacuum spark control.

Breaker Gap—Set at .018″.

Breaker Arm Spring Tension—18-20 ounces.

Cam Angles—Closed 31°. Open 14° (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
5	650	10	1300
8	1025	16	2050
11	1400	22	2800
13	1650	26	3300

Vacuum Spark Control—Provides additional advance for intermediate speed range above idling except when engine is accelerated or operated with wide-open throttle.

Vacuum Spark Advance

Distributor Degrees	Vacuum
½°	4-5″ of HG.
7° Max.	12″ of HG.

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

IGNITION TIMING:—

	Flywheel Degs.	Piston Posi.
All 6.2-1 head Engs.	At TDC.	.0000″ TDC.
7.0-1 Engs. Std. Fuel	At TDC.	.0000″ TDC.
7.0-1 Engs. Ethyl Fuel	4° BTDC.	.0062″ BTDC.

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 reaches top dead center, stop when center 'O' mark on impulse neutralizer at front of engine (all engines—Std. fuel) or 4° line to right of center '0' mark (7.0-1 Al. head engines—Ethyl fuel) lines up with pointer on chain case cover. Loosen hold-down screw in advance arm, center pointer on scale opposite 'O' mark, tighten hold-down screw. Then loosen advance arm clamp bolt, rotate distributor until timing lamp goes out, tighten clamp bolt.

Timing (Using Synchroscope)—Engine can be timed with synchroscope or neon timing light.

Timing (Using Motor Gauge)—Engine can be timed with a motor gauge by installing gauge in timing hole located directly over #8 piston.

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

Spark Plugs:—A.C., Type K-9 (cast-iron head), KL-9 (aluminum head). 14 MM. Metric. Not interchangeable.

Spark Plug Gaps—Set at .025″.

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 drivers seat.

STARTER:—Model MAX-4002 (Coupe), MAX-4004 (Sedan), MAX-4005 (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.	5300 Min.	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

NOTE—See Equipment Section for instructions on installing Field Equalizer on these starters.

Starting Switch:—Type SW-2813 (MAX-4002, MAX-4004). See Equip. Section for pedal adjustment and Type SS-4101 solenoid switch (MAX-4005).

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

GENERATOR:—Model GAR-4608-A-5. 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—Use test meters to check generator output. Connect jumper wire between fuse cup on regulator unit and 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. Third brush held in position by friction. Remove jumper wire.

Commutator Bar Method—Shift third brush 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.

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:—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 mounting 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 field frame. Consists of Cutout Relay and Current Regulator in a single case. See Equipment Section for complete data.

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 headlamp 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, Tail	3	63
Stop, Dome	15	87

NOTE—Lighting switch button and shaft are integral. See note on Model C-6 for instructions on removing switch.

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

Twin Horns—30 ampere in horn relay lead.

Generator Field—5 ampere in regulator.

HORNS:—Klaxon Model K-26-L, Type 1610 Std. Model K-33-C, Type 1899 (low note), 1900 (high note) Optional. See Model C6 for horn relay data (used with optional twin horns).

SERIAL NUMBER:—First number, 6,601,201 (Detroit), 9,821,126 (Windsor, Canada). On right front door hinge pillar post.

ENGINE NUMBER:—First number, C1-1001. Stamped on boss on left side of cylinder block between #1 and 2 cylinders. See Model C6 for explanation of letter following engine number.

ENGINE:—Own. Eight cylinder, In line, 'L' head type. Floating power engine mounting.
Bore—3¼". **Stroke**—4⅞".
Piston Displacement—323.5 cubic inches.
Rated Horsepower—33.80 A.M.A.
Developed Horsepower—115 at 3400 R.P.M.
Compression Ratio—6.2-1 Std. cast-iron head, 6.5-1 special aluminum head.
Compression Pressure—120-130 lbs. (6.2-1 cast-iron head), 145-155 lbs. (6.5-1 aluminum head) at 1000 R.P.M.

Pistons:—Aluminum alloy, 'T' slot, cam ground type. See Model C-6 for standard oversizes and semi-finished pistons.
Removal—Pistons and rods removed from above.
Weight—Held to 7 grams or ¼ oz. variation.
Clearance—Top .024". Skirt .002".
Fitting New Pistons—Use micrometer gauges to check cylinder bore and piston diameters.
Installing Pistons—Slot should be at left or away from valve side of engine.

Piston Rings:—Two compression, one undercut oil wiper ring (#3), one oil control ring per piston, all above pin. Oil ring grooves are drilled radially with oil drain holes. Rings furnished in same oversizes as pistons (except .023").

Ring	Width	End Gap	Side Clearance
Comp. All	⅛"	.007-.015"	.003"
Oil Cont. All	5/32"	.007-.015"	.003"

Piston Pin:—Diameter 55/64". Length 2¾". Pin floats in piston and rod. Held by retaining rings. Piston should be heated in boiling water to remove or install pins. Pins furnished .003", .005", .008" oversize for service.
Pin Fit in Piston—Tight thumb push fit with piston heated to 120°F.
Pin Fit in Rod Bushing—Light thumb push fit with both parts at room temperature (70°F).

Connecting Rod:—Weight held to 7 grams or ¼ oz. maximum variation. Length 9".
Crankpin Journal Diameter—2 3/16".
Lower Bearing Type—Removable steel-backed, babbitt-lined type. No shims.
Clearance—.001-.00275". Sideplay .003-.009".
Adjustment—None (no shims). Replace bearings. Do not file bearing caps. Install new bearings with small boss registering with groove in rod and cap. Bearings furnished for service .010" undersize and standard.
Installing Rods—Lower bearings are offset. Install rods with widest half of bearing toward rear (#1, 3, 5, 7) or toward front (#2, 4, 6, 8). Oil hole in upper half of bearing must be toward valve side of engine on all rods.

Crankshaft:—Five bearing. Integral counterweights.
Journal Diameters—2 45/64" all bearings.
Bearing Type—Interchangeable steel-backed, babbitt-lined type. No shims.
Clearance—.001-.002".
Adjustment—None (no shims). Replace bearings. Do not file bearing caps. Bearings furnished for service .010" undersize and standard.
End Thrust—Taken by rear bearing. Endplay .002-.005".

Camshaft:—Six bearing. Non-adjustable chain drive.
Bearing Type—Removable steel-backed, babbitt-lined type (except #6 which is machined in crankcase).
Clearance—.0015-.0025". Endplay .003-.005".
End Thrust—Taken by thrust plate between sprocket hub and front main bearing.
Timing Chain—Morse. Width 1¼". 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.

Valves:—	Head Diam.	Stem Diam.	Length
Intake	1 15/32"	.340-.341"	5 9/16"
Exhaust	1 13/32"	.340-.341"	5 9/16"

	Seat Angle	Lift	Stem Clearance
Intake	45°	11/32"	.001-.003"
Exhaust	45°	11/32"	.003-.005"

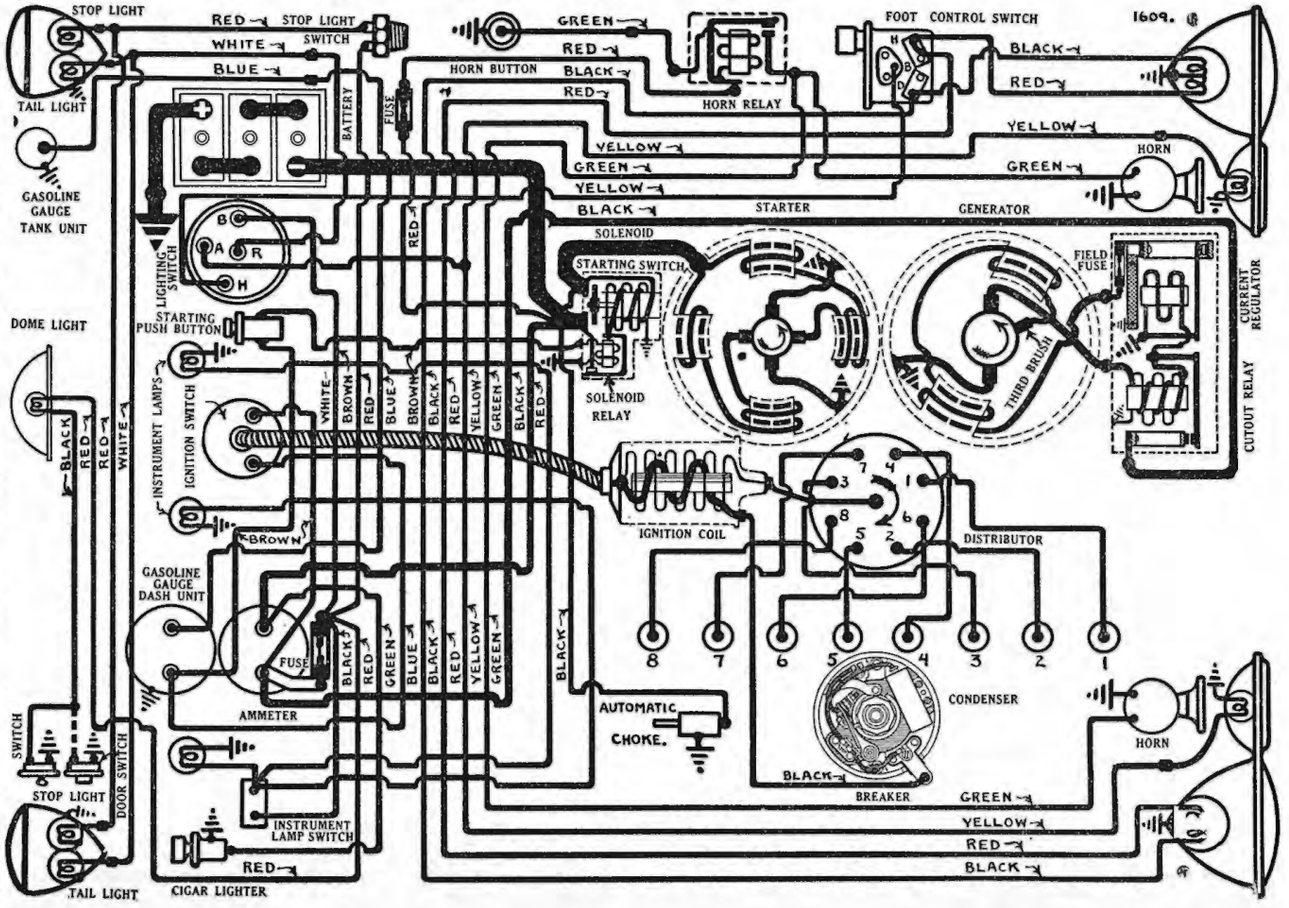
Installing New Guides—See Model C-6 for instructions.
Tappet Clearance—.006" Int., .008" Exh. running clearance with engine hot. Set exhaust clearance at .010" for sustained high speed driving. Valves accessible by removing right front wheel and housing cover under fender.
Valve Springs—Variable pitch type. Install springs with closer spaced coils at top. Do not compress springs to length of less than 1 11/16".

	Spring Pressure	Length
Valve Closed	46-50 lbs.	2 1/32"
Valve Open	104-110 lbs.	1 22/32"

Valve Timing—See Camshaft Setting above.
Intake Valves—Open 2° BTDC. Close 44° ALDC.
Exhaust Valves—Open 46° BLDC. Close 4° ATDC.
To Check Valve Timing—Set tappet clearance #1 valves at .011" Int., .012" Exh. Intake valve should open with piston 2° BTDC when 2° line on impulse neutralizer at front of engine lines up with pointer on chain case cover. Reset tappet clearance at .006" Int., .008" Exh. (engine hot).

Lubrication:—Pressure. Gear type oil pump located on right hand side of crankcase.
Normal Oil Pressure—40-50 lbs. at driving speeds.
Oil Pressure Relief Valve—Located under cap on left hand side of crankcase. Operates at 40-45 lbs. Adjustable. To adjust, remove cap, withdraw locking wire, turn slotted plug clockwise to increase pressure, or counter-clockwise to decrease pressure, replace locking wire and cap.
Capacity & Oil—Use SAE. #30 (summer—#40 for sustained high speed driving or temperatures above 100°F), #20-W (winter 32° to 0°F), #10-W winter 0° to -15°F).

CARBURETION:—See Carburetion Section for complete data.



Carburetor:—Stromberg, Model EX-32, 1½" down-draft type.
Automatic Choke—Sisson.
Fuel Pump:—AC. Type D-1521790 diaphragm type.
Gasoline Gauge—Motometer electric type.

CLUTCH:—Borg and Beck Model 11A6. Single plate, dry disc type. No adjustment required for wear.
Clutch Pedal Adjustment—Clutch pedal should just clear underside of toeboard with clutch engaged. To adjust, turn pedal stopscrew located above clutch pedal shaft. Free movement of clutch pedal must be 1 1/16". To adjust, turn clutch shaft collar adjusting screw at right hand end of clutch pedal shaft.
Clutch Facings—Woven asbestos, 2 required, 6⅛" I.D., 11" O.D., .133" thick.
NOTE—Mark flywheel and clutch cover 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 tubular section front axle with Reverse-Elliott ends and semi-elliptic springs.
Kingpin Inclination—4° crosswise.
Caster—2° plus or minus 1°. Adjust by inserting wedge shims between spring and axle pad on axle. Shims or angle plates furnished ½, 1, 2°.
Camber—½° plus or minus ¼°. No adjustment provided. Manufacturer recommends that no attempt be made to correct camber by bending tubular axle centers. Replace axle.
Toe In—1/16"-⅛" measured at hub height on center of tire tread. Adjust in usual manner by changing length of tie rod.

IGNITION:—Coil Model CE-4605, A. Mounted on hood ledge.
Ignition Switch—Electrolock connected to coil by armored cable.
Distributor Model IGT-4001-B. Single breaker, 8 lobe cam, full automatic advance type with auxiliary vacuum spark control.
Breaker Gap—Set at .018".
Breaker Arm Spring Tension—18-20 ounces.
Cam Angles—Closed 31°. Open 14° (distributor).
Manual Advance—20° (engine). Adjustment only.

Automatic Advance — IGT-4001-B

Distributor Degrees	R.P.M.	Engine Degrees	R.P.M.
Start	350	0	700
3	400	6	800
6	660	12	1320
9	925	18	1850
12	1200	24	2400

Vacuum Spark Control—Provides additional advance for intermediate speed range above idling except when engine is accelerated or operated with wide-open throttle.

Vacuum Spark Advance

Distributor Degrees	Vacuum
½°	4-5" of HG.
7° Max.	12" of H.G.

Removal:—Distributor mounted on left side of crankcase. Accessible by removing left front wheel and housing cover under fender. To remove, take out hold-down screw in advance arm.

IGNITION TIMING:—

	Flywheel Degs.	Piston Posi.
6.2-1 Cast-iron head	At TDC.	.0000" TDC.
6.5-1 al. head—Std. fuel	5° ATDC.	.0118" ATDC.
6.5-1 al. hd.—Ethyl fuel	2° BTDC.	.0015" BTDC.

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 reaches top dead center, 2° before, or 5° after top dead center, stop when '0' center mark, 2° line to right, or 5° line to left of '0' mark on impulse neutralizer at front of engine lines up with pointer on chain case. Loosen hold-down screw in advance arm, center pointer on scale opposite '0' mark, tighten hold-down screw. Then loosen advance arm clamp bolt, rotate distributor until timing lamp goes out, indicating that contacts are opening, tighten clamp bolt.
Timing (Using Synchroscope)—Engine can be timed with a synchroscope or neon light.
Timing (Using Motor Gauge)—Engine can be timed with a motor gauge by installing gauge in timing hole over #1 piston.
Firing Order:—1-6-2-5-8-3-7-4. See diagram.
Spark Plugs:—A.C., Type K-9 (cast-iron head), KL-9 (al. head). 14 MM. Metric. Not interchangeable.
Spark Plug Gaps—Set at .025".

BATTERY:—Willard, Type WH-4-17, RH-4-17 (Export), 6 volt, 17 plate, 136 A.H. cap. (20 hr. rate).
Starting Capacity—160 amperes for 20 minutes.
Grounded Terminal—Positive (+) terminal.
Location—On left side under drivers seat.

STARTER:—Model MAX-4003. Armature MAW-2030.
Starter Drive—Magnetic 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.	5300 Min.	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

NOTE—See Equipment Section for instructions on installing Field Equalizer on these starters.
Starting Switch:—Type SS-4101. Mounted on starter. Solenoid operated pinion shift and switch controlled through relay in solenoid case by pushbutton on instrument panel. See Equipment Section for complete data.
Removal:—Starter flange mounted on left front face of flywheel housing. Accessible by removing left front wheel and housing cover under fender. To remove, take out two flange mounting screws.

GENERATOR:—Model GAR-4608-B-5. 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—Use test meters to check generator output. Connect jumper wire between fuse cup on regulator unit and 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. Third brush held in position by friction. Remove jumper wire.
Commutator Bar Method—Shift third brush 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.
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 water pump belt drive. Accessible by removing left front wheel and housing cover under fender. To remove, take out two pivot bolts and one clamp bolt.
Belt Adjustment:—Loosen mounting 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 5394. Clum Foot Control Switch Model 9590. 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, Ig.Sw.Lamp	1½	55
Instrument	3	63
Stop and Tail	21-2	1158
Dome (C-1)	15	87

NOTE—Lighting switch button and shaft are integral. See Note on Model C-6 for instructions on removing switch.

FUSES:—Lighting—20 ampere on back of ammeter.
Horns—30 ampere in horn relay lead near starter.
Generator Field—5 ampere in regulator.

HORNS:—Klaxon Model K-33-D Type 1955 (low note), 1956 (high note). Matched tone, twin horns. Vibrator type. Operated by horn relay.
Horn Relay:—Model 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.
Contact Gap—.015-.025".

SERIAL NUMBER:—On right front door hinge pillar post. First number each model as follows:

	Detroit	Windsor,Canada
Model C-2	7,012,301	9,850,401
Model C-3	7,528,551	none

ENGINE NUMBER:—First number, C2-1001, C3-1001. Stamped on boss on left side of cylinder block between #1 and 2 cylinders. See Model C-6 for explanation of letter following engine number.

ENGINE:—Own. Eight cylinder, In line, 'L' head type. Floating power engine mounting.

Bore—3¼". **Stroke—4⅞".**

Piston Displacement—323.5 cubic inches.

Rated Horsepower—33.80 A.M.A.

Developed Horsepower—130 at 3400 R.P.M. Std. 6.5-1 head, 138 at 3400 R.P.M. Optl. 7.45-1 head.

Compression Ratio—6.5-1 Std., 7.45-1 Optl.

Compression Pressure—145-155 lbs. (6.5-1 head), 160-170 lbs. (7.45-1 head) at 1000 R.P.M.

NOTE—Both the 6.5 and 7.45 heads are aluminum. Aluminum heads must be tightened cold.

Pistons:—Aluminum alloy, 'T' slot, Cam ground type. See Model C-6 for standard oversizes and semi-finished pistons.

Removal—Pistons and rods removed from above.

Weight—Held to 7 grams or ¼ oz. variation.

Clearance—Top .024". Skirt .002".

Fitting New Pistons—Use micrometer gauges to check cylinder bore and piston diameter.

Installing Pistons—Slot should be at left or away from valve side of engine.

Piston Rings:—Two compression, one undercut oil wiper ring (#3), one oil control ring per piston, all above pin. Oil ring grooves are drilled radially with oil drain holes. Rings furnished in same oversizes as pistons (except .023").

Ring	Width	End Gap	Side Clearance
Comp. All	⅛"	.007-.015"	.003"
Oil Cont. All	5/32"	.007-.015"	.003"

Piston Pin:—Diameter 55/64". Length 2¾". Pin floats in piston and rod. Held by retaining rings. Piston should be heated in boiling water to remove or install pins. Pins furnished .003", .005", .008" oversize for service.

Pin Fit in Piston—Tight thumb push fit with piston heated to 120°F.

Pin Fit in Rod Bushing—Light thumb push fit with both parts at room temperature (70°F).

Connecting Rod:—Weight held to 7 grams or ¼ oz. maximum variation. Length 9".

Upper Bearing—Bronze bushing.

Crankpin Journal Diameter—2 3/16".

Lower Bearing Type—Removable steel-backed, babbitt-lined type. No shims.

Clearance—.001-.00275". Side play .003-.009".

Adjustment—None (no shims). Replace bearings. Do not file bearing caps. Install new bearings with small boss registering with groove in rod and cap. Bearings furnished for service .010" undersize and standard.

Installing Rods—Lower bearings are offset. Install rods with widest half of bearing toward rear (#1, 3, 5, 7) or toward front (#2, 4, 6, 8). Oil hole in upper half of bearing must be toward valve side of engine on all rods.

Crankshaft:—Five bearings. Integral counterweights.

Journal Diameters—2 45/64" all bearings.

Bearing Type—Interchangeable steel-backed, babbitt-lined type. No shims.

Clearance—.001-.002".

Adjustment—None (no shims). Replace bearings. Do not file bearing caps. Bearings furnished for service .010" undersize and standard.

End Thrust—Taken by rear bearing. Endplay .002-.005".

Camshaft:—Six bearing. Non-adjustable chain drive.

Bearing Type—Removable steel-backed, babbitt-lined type (except #6 which is machined in crankcase).

Clearance—.0015-.0025". Endplay .003-.005".

End Thrust—Taken by thrust plate between sprocket hub and front main bearing.

Timing Chain—Morse. Width 1¼". 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.

Valves:—

	Head Diam.	Stem Diam.	Length
Intake	1 15/32"	.340-.341"	5 9/16"
Exhaust	1 13/32"	.340-.431"	5 9/16"

	Seat Angle	Lift	Stem Clearance
Intake	45°	11/32"	.001-.003"
Exhaust	45°	11/32"	.003-.005"

Installing New Guides—Use special tool to remove and install guides. Intake guides installed with taper end up, exhaust guides with taper end down. Top of guide must be 13/16" 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. running clearance with engine hot. Set exhaust clearance at .010" for sustained high speed driving. Valves accessible by removing right front wheel and wheel housing cover under 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 11/16".

	Spring Pressure	Length
Valve Closed	46-50 lbs.	2 1/32"
Valve Open	104-110 lbs.	1 22/32"

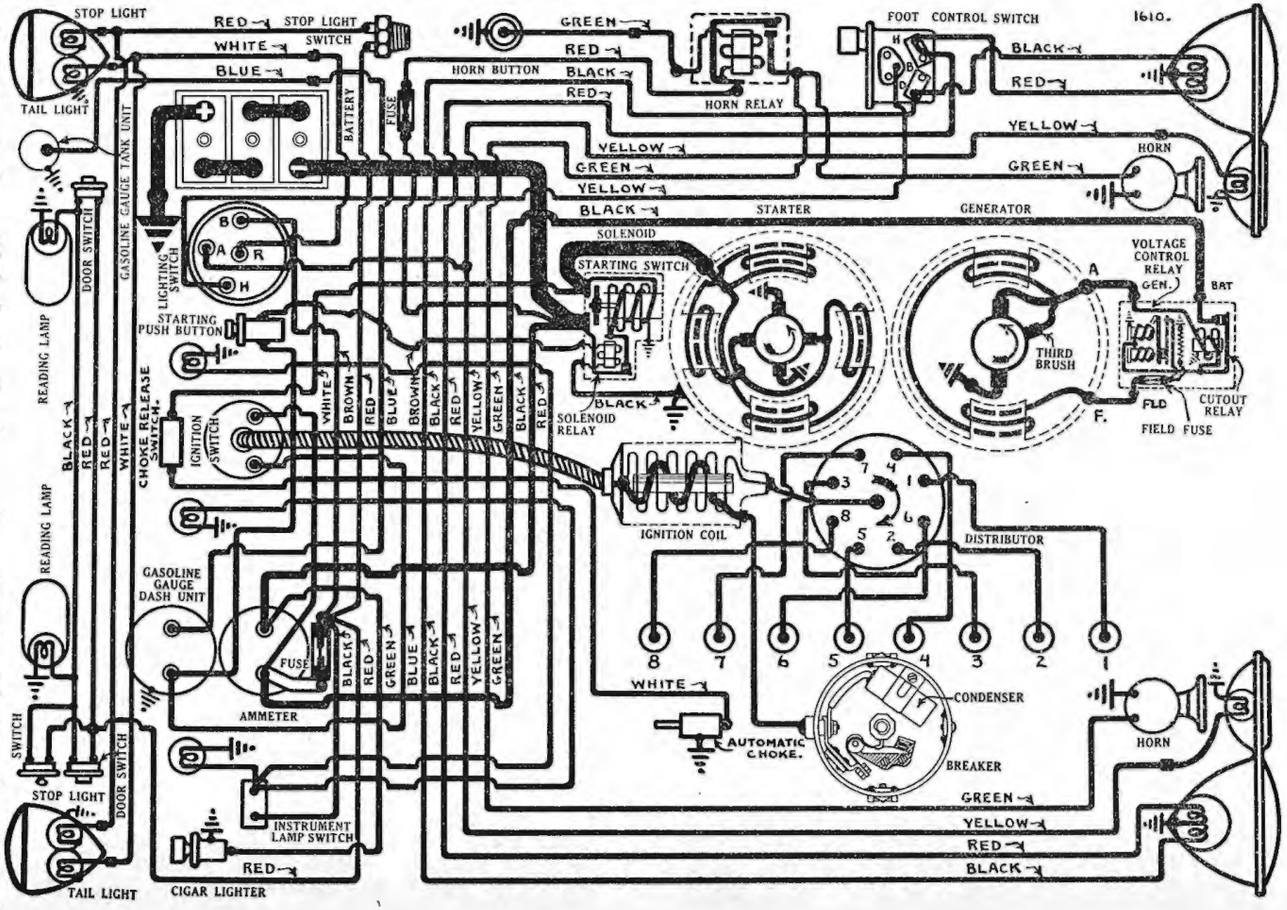
Valve Timing—See Camshaft Setting above.

Intake Valves—Open 2° BTDC. Close 44° ALDC.
Exhaust Valves—Open 46° BLDC. Close 4°ATDC.

To Check Valve Timing—Set tappet clearance #1 valves at .011" Int., .012" Exh. Intake valve should open with piston 2° BTDC when 2° line on impulse neutralizer at front of engine lines up with pointer on chain case cover. Reset tappet clearance at .006" Int., .008" Exh. with engine hot.

Lubrication:—Pressure. Gear type oil pump located on right hand side of crankcase.

Normal Oil Pressure—40-50 lbs. at driving speeds.



Oil Pressure Relief Valve—Located under cap on left hand side of crankcase. Operates at 40-45 lbs. Adjustable. To adjust, remove cap, withdraw locking wire, turn slotted plug clockwise to increase pressure, or counter-clockwise to decrease pressure, replace locking wire and cap.
Capacity & Oil—6 qts. Use SAE. #30 (summer—#40 for sustained high speed driving or temperatures above 100°F), #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, Fuel Pump, and Gasoline Gauge.
Carburetor:—Stromberg, Model EE-22, 1¼" dual downdraft type.
Automatic Choke—Sisson.
Fuel Pump:—AC. Type D-1521790 diaphragm type.
Gasoline Gauge:—Motometer electric type.

CLUTCH:—Borg and Beck Model 11A6. Single plate, dry disc type. No adjustment required for wear.
Clutch Pedal Adjustment—Clutch pedal should just clear underside of toeboard with clutch engaged. To adjust, turn pedal stopscrew located above clutch pedal shaft. Free movement of clutch pedal must be 1 1/16". To adjust, turn clutch shaft collar adjusting screw at right hand end of clutch pedal shaft.
Clutch Facings—Woven asbestos, 2 required, 6⅛" I.D., 11" O.D., .133" thick.

NOTE—Mark flywheel and clutch cover before diassembling clutch and replace in same position. Install driven plate 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—Coventional tubular section front axle with Reverse-Elliott ends and semi-elliptic springs.
Kingpin Inclination—4° crosswise.
Caster—2° plus or minus 1°. Adjust by inserting wedge shims between spring and axle pad on axle. Shims or angle plates furnished, ½, 1, 2°.
Camber—½° plus or minus ¼°. No adjustment provided. Manufacturer recommends that no attempt be made to correct camber by bending tubular axle centers. Replace axle.
Toe In—1/16"-⅛" measured at hub height on center of tire tread. Adjust in usual manner by changing length of tie rod.

IGNITION:—Coil Model 540-F. Mounted on dash.
Ignition Switch—Part of coil assembly (connected to coil by armored cable).
Distributor Model 665-B, 665-C (with Tachometer drive). Single breaker, 8 lobe cam, full automatic advance type.
Breaker Gap—Set at .018". Limits .017-.022".
Breaker Arm Spring Tension—19-23 ounces.
Cam Angles—Closed 31°. Open 14° (distributor).
Manual Advance—22° (engine—adjustment only).

Automatic Advance

Distributor		Engine	
Degrees	R.P.M.	Degrees	R.P.M.
Start	250	4	500
7	400	14	800
15	1600	30	3200

Removal:—Distributor mounted on left side of crankcase. To remove, take out hold-down screw in advance arm, lift out. Distributor accessible by taking off cover plate under left front fender.

IGNITION TIMING:—

	Flywheel Degs.	Piston Pos.
6.5-1 head engine	5° ATDC.	.0118" ATDC.
7.45-1 head engine	9° ATDC.	.0381" ATDC.

Timing (Using Test Lamp)—Connect test lamp between distributor terminal and 'live' terminal on generator control unit. With #1 piston on compression, turn engine over until piston is 5° or 9° past top dead center, stop when line marked '5' or '9' (left hand facing front of engine) on impulse neutralizer at front of engine is directly in line with pointer on chain case cover. Loosen advance arm hold-down screw, center pointer on scale (opposite '0' mark), tighten hold-down screw, loosen advance arm clamp bolt, rotate distributor until test lamp goes out indicating that contacts are just opening, tighten clamp bolt, check spark plug connections.
Timing (Using Synchroscope)—Engine can be timed using a Synchroscope by directing light flash on impulse neutralizer at front of engine.
Timing (Using Motor Gauge)—See ignition table above for settings if Motor Gauge used to set ignition timing.
Firing Order:—1-6-2-5-8-3-7-4. See diagram.
Spark Plugs:—AC. Type KL-9. 14 MM. Metric. These are special plugs with 7/16" thread length.
Spark Plug Gaps—Set at .025".

BATTERY:—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—Under left hand front seat.

STARTER: — Model 727-J, L. Armature No. 823881. Solenoid operated pinion shift type. Starter drives 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 Type 1516. Switch and pinion shift operated by solenoid on starter field frame and controlled by pushbutton switch on instrument panel through solenoid relay in solenoid case. See Equipment Section for data.
Removal:—Starter flange mounted on left hand side of crankcase. To remove, take off cover plate under left front fender, take out flange mounting capscrews, pull starter out.

GENERATOR:—Model 935-G. Armature No. 1854856. Third brush control type with external voltage regulation (Voltage Control Relay) providing two-step charging rate to battery. See Equipment Section for complete data on Voltage Control Relay.
Charging Rate Adjustment (Using meters)—Connect test ammeter in charging circuit at 'Bat' terminal on control unit, connect voltmeter between this terminal and ground on generator frame. Short out Voltage Control Relay by connecting short jumper wire from 'F' terminal to ground on generator frame. Loosen lockscrew on commutator end plate, shift third brush by hand, counter-clockwise to increase or clockwise to decrease, until charging rate is 21 amperes at 8.6 volts. Tighten locking screw and remove jumper wire.
Charging Rate Adjustment (Commutator Bar Method)—With generator mounted so that commutator is visible, shift third brush until there are exactly 1⅞ 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.

Performance Data

	Amperes	Volts	R.P.M.
Cold	18-21	8.2-8.5	2400
Hot	12-15	7.6-8.0	2900

Rotation—Counter-clockwise at commutator end.
Brush Spring Tension—22-26 ozs. (main), 16-20 ozs. (third brush).
Shunt Field Current—2.3-2.6 amperes at 6.0 volts.
Field Fuse—6 ampere capacity in control unit.
Removal:—Pivot mounted at left front of engine with water pump belt drive. To remove, take off cover plate under left front fender, take out two pivot bolts and one clamp bolt, lift generator out.
Belt Adjustment—Loosen generator pivot bolts and clamp bolt, pull generator out or away from engine until tension as measured on spring scale is 45-50 lbs., tighten clamp bolt.

CONTROL UNIT:—Model 5544. Mounted on generator field frame. Consists of Cutout Relay and Voltage Control Relay in single case. See Equipment Section for complete data on each unit.

Cutout Relay

Cuts in—6.4-6.8 volts.
Cuts out—3 ampere discharge maximum.
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:—Douglas Switch Type 5394. Clum Foot Control Switch Type 9590—Foot control switch used to control driving and passing beams (upper and lower symmetrical beams). Headlight bulbs are pre-focused type.

Bulb Specifications

Position	Candlepower	Mazda No.
Headlights	32-21	2320-C.
Parking, Switch light	1.5	55
Instrument	3	63.
Stop & Tail	21-2	1158
Reading, Cab (C-3)	15	87.

NOTE—Lighting switch button and shaft are integral. See Note on Model C-6 for removal.

FUSES:—Lighting—20 ampere on back of ammeter.
Horn—30 ampere in fused connector in horn relay lead near starter.
Generator Field—6 ampere in control unit.

HORNS:—Klaxon, Model K-33-D, Type 1955 (low note), 1956 (high note). Matched tone, twin horns. Vibrator type. 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".
Armature Spring Tension—6-8 ounces.

SERIAL NUMBER:—On right front door hinge pillar post.

ENGINE NUMBER:—Stamped on boss on left hand side of cylinder block between #1 and 2 cylinders.

ENGINE:—Own. Eight cylinder, In Line, 'L' head type. Floating Power engine mounting.
Bore—3½". **Stroke**—5".
Piston Displacement—384.8 cubic inches.
Rated Horsepower—39.20.
Developed Horsepower—150 at 3200 R.P.M.
Compression Ratio—6.5-1. No optional ratios.
Compression Pressure—135-140 lbs. at 1000 R.P.M.
NOTE—Cylinder head is aluminum. Washers are used under head nuts. Tighten head cold.

Pistons:—Nelson Bohnalite, aluminum alloy, Invar Strut, split skirt type. Piston length 4⅛".
Weight—Pistons of same size held to 2 gr. (1/10 oz.) maximum variation. Used interchangeably.
Removal—Pistons and rods removed from above.
Clearance—.002" at top of skirt.
Fitting New Pistons—Use .002" feeler stock ½" wide to check clearance. Cylinders should be reconditioned when taper or out-of-round exceeds .0015". Reconditioned cylinders must not be tapered or out-of-round more than .0005".
Installing Pistons—Slot should be toward right or camshaft side of engine.

Piston Rings:—Four compression, one oil control ring per piston, all above pin. Compression rings are 'Tungtite' tongue and groove type. Oil control ring is slotted.

Ring	Width	End Gap
Comp. All	5/32"	.007-.015"
Oil Cont. (#5)	3/16"	.007-.015"

Piston Pin:—Diameter 55/64". Length 3". Pin floats in piston and rod. Held by retaining ring at each end. Heat piston in boiling water to remove or install pins. Pin hole in rod is bronze bushed.
Pin Fit in Piston—Tight thumb push fit with piston heated to 160°F.
Pin Fit in Rod Bushing—Light thumb push fit at room temperature (70°F).

Connecting Rod:—Length 10". Weight held to 2 gr. (1/10 oz.) maximum variation.
Crankpin Journal Diameter—2 3/16".
Lower Bearing—Removable steel-backed, babbitt-lined type. No shims.
Clearance—.001-.00275". Sideplay .003-.009".
Adjustment—None (no shims). Replace bearings. Do not file rods or caps. Install new bearings with small boss registering with groove in rod and cap.
Installing Rods—Oil hole in upper half of lower bearing should be toward camshaft side on all rods.

Crankshaft:—Nine bearing. Integral counterweights.
Journal Diameters—2¾" all bearings.
Bearing Type—Interchangeable steel-backed, babbitt-lined. No shims.
Clearance—.001-.002".
Adjustment—None (no shims). Replace bearings. Do not file caps.
End Thrust—Taken by rear bearing. Endplay 0015-.0045".

Camshaft:—Six bearings. Non-adjustable chain drive.
Bearing Type—#1 bronze-backed, babbitt-lined. All others steel-backed, babbitt-lined.
End Thrust—Taken by thrust plate assembled behind camshaft sprocket hub.
Timing Chain—Morse. Width 1½". Pitch .500". 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 23/32"	.340-.341"	6 9/16"
Exhaust	1 21/32"	.340-.341"	6 9/16"

	Seat Angle	Lift	Stem Clearance
Intake	45°	11/32"	.001-.003"
Exhaust	45°	11/32"	.002-.004"

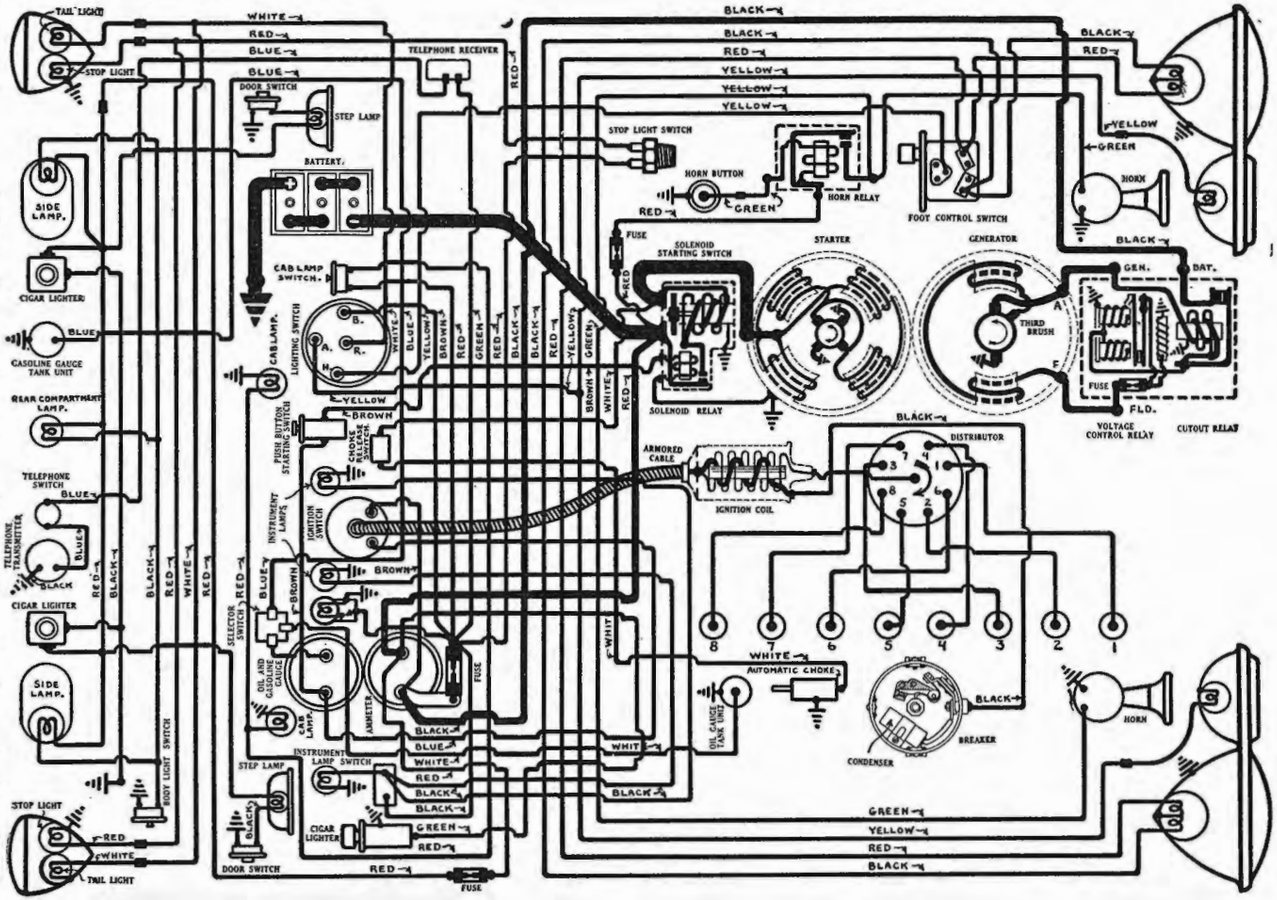
Installing New Guides—Top of guides must be ⅞" below top of block. Finish ream new guides after installing to inside diameter of .342-.343" (intake), .344-.345" (exhaust).
Tappet Clearance—.006" Int., .008" Exh. with engine warm. Set exhaust clearance at .010" for sustained high speed driving. Valves accessible by removing right front wheel and cover plate under fender.
Valve Springs—Do not compress springs to overall length of less than 2⅛".

	Spring Pressure	Length
Valve Closed	50-55 lbs.	2¾"
Valve Open	80-85 lbs.	2 13/32"

Valve Timing—See Camshaft Setting above.

Intake Valves Open—2° BTDC. Close—44° ALDC.
Exhaust Valves Open—46° BLDC. Close 4° ATDC.
To Check Valve Timing—Use regular timing gauge installed over #1 piston. Set tappet clearance #1 intake valve at .008". This valve should open with piston 2° or .002" before top dead center. Reset tappet clearance at .006" with engine warm.

Lubrication:—Pressure type. Gear type oil pump located in crankcase.
Normal Oil Pressure—30-60 lbs. at normal driving speeds.
Oil Pressure Relief Valve—Located under plug on left hand side of crankcase. Adjustable type. To adjust, remove cap, withdraw locking wire, turn slotted plug clockwise to increase, or counterclockwise to decrease oil pressure, replace locking wire and cap.
Capacity and Oil—8 qts. (refill). Use SAE #30 (summer—normal conditions), #40 (summer—high speed driving or temperatures above 100°F.), #20-W (winter—down to 0°F.), #10-W (winter—0° to —15°F.).



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

Carburetor: — Stromberg, Model EE-3. Dual, 1½" plain tube, downdraft type.
Automatic Choke—Sisson.

Fuel Pump:—A.C., Type I. Combination fuel and vacuum pump.

Gasoline Gauge:—Motometer, electric type. Combination fuel and oil gauge. Oil level reading obtained by pressing button on instrument panel.

CLUTCH:—Single plate, dry disc type. No adjustment for wear required.
Clutch Pedal Adjustment—Clutch pedal should just clear under side of toeboard. Adjust by loosening locknut and turning stopscrew at rear of pedal above shaft. Free movement of pedal should be 1 5/32". Adjust by loosening locknut and turning clutch release fork lever setscrew.
Clutch Facings—Woven rubber or asbestos composition, 2 required, 6⅛" I.D., 11" O.D., .133" thick.
NOTE—Transmission should be removed before removing clutch. Mark clutch cover and flywheel and reassemble in same position.

STEERING:—Front Suspension—Conventional tubular section front axle with Reverse-Elliott ends and semi-elliptic springs.
Kingpin Inclination—10° crosswise.
Caster—1°. Adjust by inserting angle shims between spring and spring pad on axle.
Camber—½° (¼-¾°). No adjustment. Manufacturer recommends that no attempt be made to bend axle.
Toe In—1/16-⅛" measured at hub height on center of tread. Adjust in usual manner by loosening clamp bolts and turning tie rod.

IGNITION:—Coil Model 540-L. Mounted on hood ledge on right side.
Ignition Switch:—Part of coil assembly (connected to coil by armored cable).

Distributor Model 661-Z. Single breaker, 8 lobe cam, full automatic type. No synchronization required. Manual advance consists of adjustment at distributor.
Breaker Gap—Set gap at .018". Limits, .017-.022".
Breaker Arm Spring Tension—19-23 ounces.
Manual Advance—20° (engine—adjustment only).
Cam Angles (Distributor Degrees) — Closed 31°. Open 14°.

Automatic Advance

Distributor		Engine	
Degrees	R.P.M.	Degrees	R.P.M.
Start	250	4	500
7	400	14	800
16	1800	32	3600

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

IGNITION TIMING:— Flywheel Degs. Piston Position
Aluminum Hed. engines 2° ATDC. .002" ATDC.
Timing (Using Timing Light): — Connect timing light between distributor terminal and live terminal on generator relay. Turn engine over with #1 piston on compression, stop with piston 2° after top dead center when 2° mark on impulse neutralizer at front of engine lines up with pointer on chain case, loosen advance arm clamp bolt, rotate distributor until timing lamp goes out (contacts just opening), tighten clamp bolt, see that rotor is opposite #1 segment in distributor cap, check spark plug cable connections (see diagram).
Timing (Using Gauge):—All engines can be timed using a motor gauge installed in timing plug hole over #1 piston. Ignition setting is .002" ATDC.

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

Spark Plugs:—A.C., Type KL-9. 14 MM. Metric type. These plugs have special longer (7/16") thread length.
Spark Plug Gaps—.025".

BATTERY:—Willard, Type RH-21, 6 volt, 21 plate, 170 A.H. capacity (20 hour rate).
Starting Capacity—200 amperes for 20 minutes.
Grounded Terminal—Positive (+) terminal.
Location—On left hand side under driver's seat.

STARTER:—Model 728-W. Armature No. 818134.
Starter Drive—Through reduction gears and overrunning clutch to solenoid operated pinion.
Rotation — Clockwise (armature) at commutator end.
Brush Spring Tension—24-28 ounces.

Performance Data

Torque	R.P.M.	Volts	Ampères
0 ft. lbs.	2500	5.0	70
28 "	Lock	3.0	600

Starting Switch:—Solenoid Switch, Type 1518. Push-button Switch type. Starting switch and pinion shift operated by solenoid on starter field frame. Solenoid circuit operated by solenoid relay and controlled by pushbutton on instrument panel. Operative only with ignition on. See Equipment Section for complete data.

Removal:—Starter sleeve mounted on left front face of flywheel housing. Accessible by removing left front wheel and cover plate under fender. To remove, take out sleeve mounting pilot screws.

GENERATOR:—Model 967-P. Armature No. 1836971. Third brush control type with external voltage regulation (voltage control relay combined with cut-out relay in case on generator field frame). Use test meters or commutator bar method to set third brush.
Charging Rate Adjustment (using Meters):—Use test ammeter and voltmeter to check generator output. Connect jumper wire from 'F' generator terminal to ground (this is important as voltage control relay must be shorted out while adjustment is being made). With generator at room temperature, remove cover band, loosen lock screw on commutator end plate, shift third brush by hand counter-clockwise to increase, or clockwise to decrease charging rate until output is 19 amperes at 8.6 volts, tighten lock screw, remove jumper wire. See Equipment Section for complete data on Voltage Control Relay.
Commutator Bar Method: —Remove generator from car, mount so that commutator can be seen, loosen lock screw on end plate, shift third brush so there are exactly 2¼ commutator bars exposed between third brush and nearest main brush, tighten locking screw. This setting provides maximum safe output and must not be exceeded.

Performance Data

	Amperes	Volts	R.P.M.
Cold	20-23	8.5-8.8	2000
Hot	16-19	8.0-8.4	2200

Rotation—Counter-clockwise at commutator end.
Field Current—2.1-2.5 amperes at 6.0 volts.
Brush Spring Tension—22-26 ozs. (main), 16-20 ozs. (third brush).
Field Fuse—6 ampere capacity (in regulator case).

Removal:—Generator pivot mounted at left front of engine. Driven by water pump belt. Accessible by removing left front wheel and cover plate under fender. To remove, take out two pivot bolts and one clamp bolt.
Belt Adjustment—Loosen pivot bolts and clamp bolt, swing generator out or away from engine, tighten clamp bolt before slacking off on generator, tighten pivot bolts.

RELAY-REGULATOR (CONTROL UNIT):—Model 5550. Consists of Cut-out Relay and Voltage Control Relay in case on generator field frame. See Equipment Section for complete data on Voltage Control Relay.

Cut-out Relay

Cuts In—6.4-6.8 volts.
Cuts out—3 ampere discharge (maximum).
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:—Douglas Switch, Model 5394. Clum Foot Control Switch. Foot operated switch used to control headlamp upper and lower beams.

Bulb Specifications

Lamp	Candlepower	Mazda No.
Headlights	32-21	2320-C
Stop and Tail	21-2	1158
All others	3	63

FUSES:—Lighting—20 ampere capacity, one mounted on back of ammeter, one mounted in cartridge behind instrument board.
Horn—30 ampere in horn relay lead near starter.
Generator Field—6 ampere capacity in regulator case.

HORNS:—Klaxon, Model K-33-D, Type 1955 (low note), 1956 (high note). Matched tone, twin horns. Vibrator type. Operated by horn relay.

Horn Relay:—Model 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.
Armature Spring Tension—6-8 ounces.

SERIAL NUMBER:—First number, 6,023,501 (Detroit), 9,664,001 (Windsor, Canada). On right front door hinge pillar post.

ENGINE NUMBER:—Stamped on boss on left side of cylinder block between #1 and 2 cylinders. Letter 'A' following number indicates that bore is .020" larger than standard. Letter 'B' indicates that main and connecting rod bearings are .010" smaller than standard. Letters 'AB' indicates that bore and bearing sizes are as above.

ENGINE:—Own. Six cylinder, 'L' head type. Floating power engine mounting.
Bore—3⅜". Stroke, 4½".
Piston Displacement—241.5 cubic inches.
Rated Horsepower—27.34 A.M.A.
Developed Horsepower—91 at 3400 R.P.M.
Compression Ratio—6.0-1 Std. cast-iron head, 6.5-1 special aluminum head.
Compression Pressure—120-130 lbs. (6.0-1 head), 125-135 lbs. (6.5-1 head) at 1000 R.P.M.

Pistons:—Aluminum alloy, 'T' slot, Cam ground type. See Model SG for standard oversizes and semi-finished pistons.
Removal—Pistons and rods removed from above.
Weight—Held to 7 grams or ¼ oz. variation.
Clearance—Top .025", Skirt .002".
Fitting New Pistons—Use micrometer gauges to check cylinder bore and piston diameter.
Installing Pistons—Slot at left (away from valves).

Piston Rings:—Two compression, one undercut oil wiper ring (#3), one oil control ring 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 Clearance
Comp. All	⅛"	.007-.015"	.003"
Oil Cont. All	5/32"	.007-.015"	.003"

Piston Pin:—Diameter 55/64". Length 2⅞". Pin floats in piston and rod. Held by retaining rings. Piston should be heated in boiling water to remove or install pins. Furnished .003", .005", .008" oversize.
Pin Fit in Piston—Tight thumb push fit with piston heated to 120°F.
Pin Fit in Rod Bushing—Light thumb push fit with piston at room temperature (70°F.).

Connecting Rod:—Weight—maximum variation held to 7 grams or ¼ oz. Length, 8¾".
Crankpin Journal Diameter—2⅛".
Lower Bearing—Removable steel-backed, babbitt-lined type. No shims.
Clearance—.001-.00275". Sideplay .003-.009".
Adjustment—None (no shims). 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.
Installing Rods—Lower bearings are offset. Install rods with widest half of bearing toward rear of engine (#1, 3, 5), or toward front of engine (#2, 4, 6). Oil hole in upper half of bearing must be toward valve side on all rods.

Crankshaft:—Four bearing. Integral counterweights.
Journal Diameters—2½" all bearings.
Bearing Type—Removable steel-backed, babbitt-lined type. No shims.
Adjustment—None (no shims). Replace bearings. Do not file caps. Bearings furnished .010" undersize and standard size for service.
End Thrust — Taken by rear bearing. Endplay .003-.007".

Camshaft:—4 bearing. Non-adjustable chain drive.
Bearing Type—Removable steel-backed, babbitt-lined type (except #4 machined in crankcase).
Clearance—.0015-.0025". Endplay .003-.005".
End Thrust—Taken by thrust plate at rear of 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.

Valves:—

	Head Diameter	Stem Diameter	Length
Intake	1 17/32"	.340-.341"	5 5/16"
Exhaust	1 15/32"	.340-.341"	5 5/16"

	Seat Angle	Lift	Stem Clearance
Intake	45°	11/32"	.001-.003"
Exhaust	45°	11/32"	.003-.005"

Installing New Guides—See Model SG for data.
Tappet Clearance—.006 Int., .008" Exh. with engine hot. Set exhaust clearance at .010" for sustained high speed driving. Valves accessible by removing right front wheel and housing cover under 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 11/16".

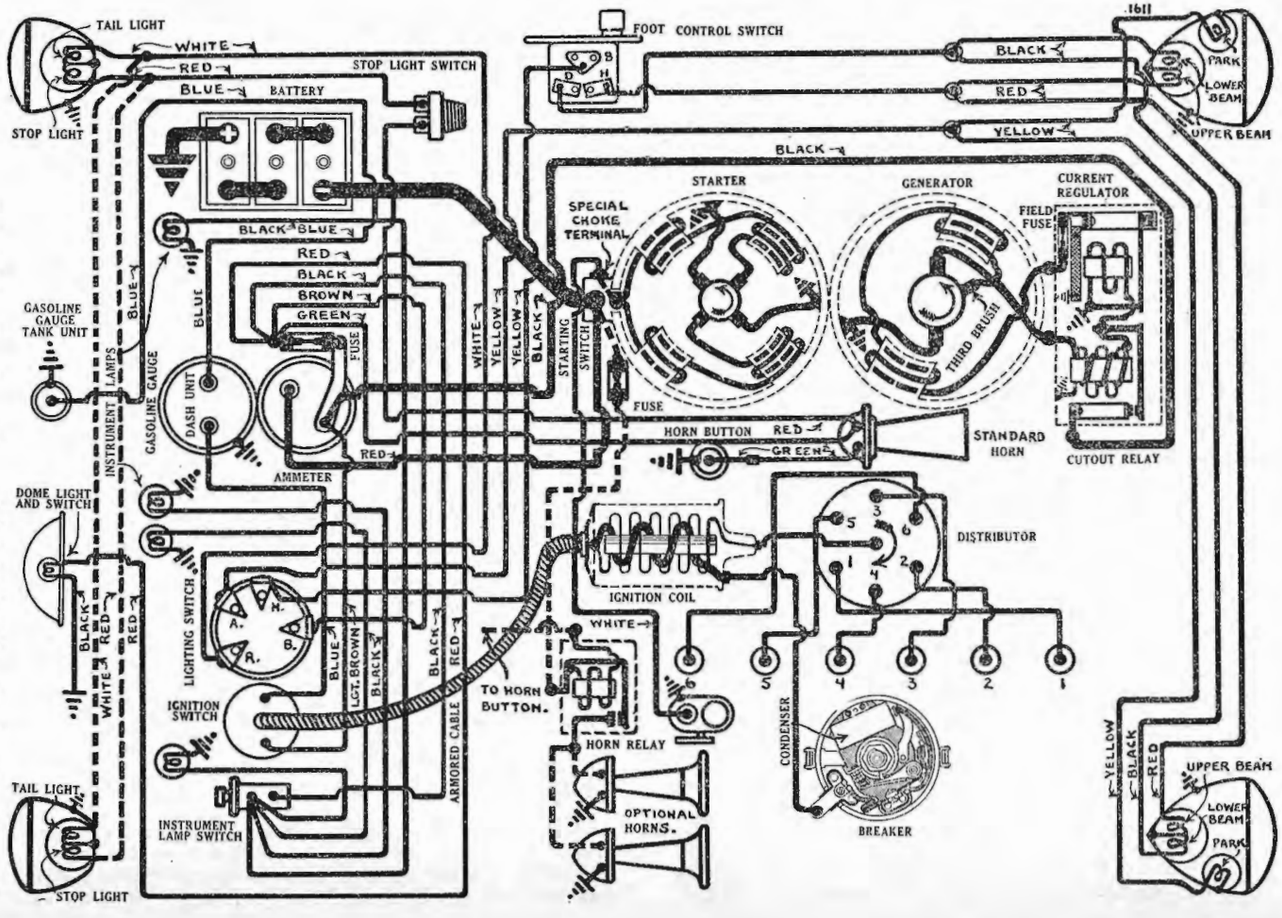
	Spring Pressure	Spring Length
Valve Closed	46-50 lbs.	2 1/32"
Valve Open	104-110 lbs.	1 22/32"

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 and exhaust valves at .010". Intake valve should open at top dead center when '0' mark on impulse neutralizer at front of engine lines up with pointer on chain case. Reset tappet clearance at .006" Int., .008" Exh., with engine hot.

Lubrication:—Pressure. Gear type oil pump located at right of crankcase.
Normal Oil Pressure—40-45 lbs. at driving speeds.
Oil Pressure Relief Valve—Under plug on left hand side of crankcase. Operates at 40-45 lbs. See Model SG for adjustment.
Capacity & Oil—6 qts. See Model SG for recommended oil.

CARBURETION:—See Carburetion Section for data.
Carburetor:—Carter Ball & Ball), Model E6F1, E6F2, 1½" downdraft type.
Automatic Choke—Sisson.
Fuel Pump:—A.C., Type P-1521788 diaphragm type.
Gasoline Gauge:—Motometer, electric type.

CLUTCH:—Borg & Beck, Model 10A6. Single plate, dry disc type. All specifications and adjustments same as for Model SG (following).



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

King Pin Angle—10° plus or minus ½° (including camber angle) or 8¾-10¼° from vertical (without camber angle).

Caster—1½° (½—2½°) with car weight on springs but not on wheels). To adjust, jack up car with jack placed under lower control arm or spring seat so that weight of car is not on wheels. Loosen upper and lower control arm yoke nuts, remove lubricant fitting at front end of upper control arm yoke pin, loosen clamp bolts on upper yoke and upper end of knuckle support, insert special caster adjusting wrench in lubricant fitting hole in front end of upper yoke, turn upper control arm yoke pin so as to move upper end of knuckle support toward rear to increase caster angle, or toward front to decrease caster angle. Tighten clamp bolts and yoke nuts.

Camber—½° (¼—1°). Camber affected by caster adjustment and must be checked when caster angle is changed. Before changing camber, see that king pin pivot angle is correct and that loaded heights of front springs are equal (see paragraph below). To adjust camber, jack up car with jack placed under lower control arm so that weight of car is on spring but not on wheel, disconnect tie rod at wheel end, remove upper control arm yoke nut, pull yoke out of control arm, add spacers between yoke and control arm to increase camber, or remove spacers to decrease camber (place spacers removed in this manner on inner face of control arm under yoke nut).

Toe In—1/16-⅛″ measured at hub height on center of tire tread. Adjust by changing length of each tie rod equally. Measure tie rods to be certain that lengths are equal after adjusting).

Spring Heights—Distance from center line of lower control arm yoke pin to top of frame cross member (flat section) should be 7¼″ to 7⅜″ with car weight on wheels but no load in car). Heights on each side of car must be equal within ⅛″.

IGNITION:—Coil Model IG-4615. Mounted on dash.

Ignition Switch—Electrolock connected to coil by armored cable.

Distributor Model IGS-4001, A. 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—IGS-4001

Distributor Degrees	R.P.M.	Engine Degrees	R.P.M.
Start	350	0	700
3	400	6	800
6	710	12	1420
9	1020	18	2040
12	1350	24	2700

Automatic Advance—IGS-4001-A

Start	350	0	700
3	400	6	800
6	780	12	1560
9	1160	18	2320
12	1530	24	3060

NOTE—Distributor changed to IGS-4001-A after 20,000. IGS-4001 distributors should be changed over by using new advance weight springs, Part #IG-884 and setting distributor to advance curve given for IGS-4001-A whenever advance mechanism requires attention.

Vacuum Spark Control—Provides additional advance for intermediate speed range above idling. Spark is retarded by return spring in unit when engine is accelerated or is operated with wide-open throttle.

Vacuum Spark Advance

Distributor Degrees	Vacuum
½°	4-5″ of HG.
9° Max.	12″ of HG.

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

IGNITION TIMING:— Flywheel Degs. Piston Position
6.0-1 cast-iron head.....At TDC. ..... .0000″ TDC.
6.5-1 Al. head .....5° ATDC. ..... .0108″ ATDC.

Timing (using Timing Light)—Connect timing light between distributor terminal and battery terminal of generator control unit. With #1 piston on compression, turn engine over until piston reaches top dead center, stop when '0' mark on impulse neutralizer or 5° line to left of center '0' mark at front of engine lines up with pointer on chain case cover. Loosen hold-down screw in advance arm, center pointer on scale (opposite center '0' mark), tighten hold-down screw. Loosen advance arm clamp bolt, rotate distributor until timing lamp goes out, tighten clamp bolt.

Timing (using Synchroscope)—Engines can be timed with a Synchroscope by directing light on impulse neutralizer at front of engine.

Timing (using Motor Gauge)—Engines can be timed with a motor gauge installed in timing hole over #6 piston (see table above).

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

Spark Plugs:—A.C., Type K-9 (cast-iron head), KL-9 (aluminum head). 14 MM. Metric. Not interchangeable.

Spark Plug Gaps—Set at .025″.

BATTERY:—Willard, Type WH-2-15, RH-2-15 (Export), 6 volt, 15 plate, 119 A.H. capacity, 20-hr. rate.

Starting Capacity—140 amperes for 20 minutes.

Grounded Terminal—Positive (+) terminal.

Location—On left side under driver's seat.

STARTER:—Model MAX-4002, MAX-4005 (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.	5300 Min.	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

NOTE—See Equipment Section for instructions on installing Field Equalizer on these starters.

Starting Switch: — (MAX-4002), Type SW-2813. See Equipment Section for pedal adjustment and for Type SS-4101 solenoid switch (MAX-4005).

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

GENERATOR: — Model GAR-4608-5. Armature No. GAR-2116-F. Air-cooled. Third brush control in conjunction with Current Regulator (two-rate charging control). See Equipment Section.

Charging Rate Adjustment (using Meters)—Use test meters to check generator output. Connect 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 until output is 21 amperes at 8.6 volts with generator at room temperature (70°F.). Brush is held in position by friction. Remove jumper wire.

Commutator Bar Method—Shift third brush 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. Do not exceed.

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. (min. 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 amp. more 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:—See Model SG for adjustment.

RELAY-REGULATOR:—Model TC-4301-A. Mounted on generator field frame. Consists of Cutout Relay and Current Regulator. See Equipment Section.

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 headlamp beams. Headlamp bulbs are pre-focused type.

Bulb Specifications

Position	Candlepower	Mazda No.
Headlamps	32-21	2320-C
Parking, Ig. Sw. Lamp	1½	55
Inst., Speedometer	3	63
Stop and Tail	21-3	1158
Dome	15	87

NOTE—Lighting switch button and shaft are integral. See Chrysler Model C-6 for switch removal.

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

Twin Horns—30 ampere in horn relay lead.

Generator Field—5 ampere in regulator.

HORNS:—Klaxon Model K-16, Type 2002 (Std.). Model K-33-C, Type 1899 (low note), 1900 (high note) Optional. Optional horns operated by horn relay.

Horn Relay:—Model 266-TK. Horn 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:—First number, 5,082,501 (Detroit), 9,603,436 (Windsor, Canda). On right front door hinge pillar post.

ENGINE NUMBER:—Stamped on left side of cylinder block between #1 and 2 cylinders. See Model SF for explanation of letter following engine number.

ENGINE:—Own. 6 cylinder, 'L' head. Floating power.
Bore—3⅜". **Stroke—4½".**
Piston Displacement—241.5 cubic inches.
Rated Horsepower—27.34 A.M.A.
Developed Horsepower—100 at 3400 R.P.M. Std. 6.5-1 head, or 105 at 3400 R.P.M. Optil. 7.0-1 head.
Compression Ratio—6.5-1 Std. aluminum head, 7.0-1 Special aluminum head.
Compression Pressure—125-135 lbs. (6.5-1 head), 130-140 lbs. (7.0-1 head) 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 is 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 3⅞".
Removal—Pistons and rods removed from above.
Weight—Held to 7 grams or ¼ oz. variation.
Clearance—Top .025". Skirt .002".
Fitting New Pistons—Use micrometer gauges to check cylinder bore and piston diameter.
Installing Pistons—Slot at left (away from valves).

Piston Rings:—Two compression, one undercut oil wiper, ring (#3), one oil control ring 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 Clearance
Comp. All	⅛"	.007-.015"	.003"
Oil Cont. All	5/32"	.007-.015"	.003"

Piston Pin:—Diameter 55/64". Length 2⅞". Pin floats in piston and rod. Held by retaining rings. Piston should be heated in boiling water to remove or install pins. Pins furnished .003", .005", .008" oversize.
Pin Fit in Piston—Tight thumb push fit with piston heated to 120°F.
Pin Fit in Rod Bushing—Light thumb push fit with piston at room temperature (70°F).

Connecting Rod:—Weight, maximum variation held to 7 grams or ¼ oz. Length 8¾".
Crankpin Journal Diameter—2⅛".
Lower Bearing—Removable steel-backed, babbitt-lined type. No shims.
Clearance—.001-.00275". Sideplay .003-.009".
Adjustment—None (no shims). Replace bearings. Do not file rods or caps. Install new bearings with small boss registering with groove (both halves). Furnished .010" undersize and standard.
Installing Rods:—Lower bearings are offset. Install rods with widest half of bearing toward rear of engine (#1, 3, 5), or toward front of engine (#2, 4, 6). Oil hole in upper half of bearing must be toward valve side on all rods.

Crankshaft:—Four bearing. Integral counterwgts.
Journal Diameter—2½" all bearings.
Bearing Type—Removable steel-backed, babbitt-lined type. No shims.
Clearance—.001-.002".
Adjustment—None (no shims). Replace bearings. Do not file caps. Bearings furnished .010" undersize and standard size for service.
End Thrust—Taken by rear bearing. Endplay .003-.007".

Camshaft:—4 bearing. Non-adjustable chain drive.
Bearing Type—Removable steel-backed, babbitt-lined type (except #4, machined in crankcase).
Clearance—.0015-.0025" radial, .003-.005" endplay.
End Thrust—Taken by thrust plate at rear of 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.

Valves:—

	Head Diameter	Stem Diameter	Length
Intake	1 17/32"	.340-.341"	5 5/16"
Exhaust	1 15/32"	.340-.341"	5 5/16"

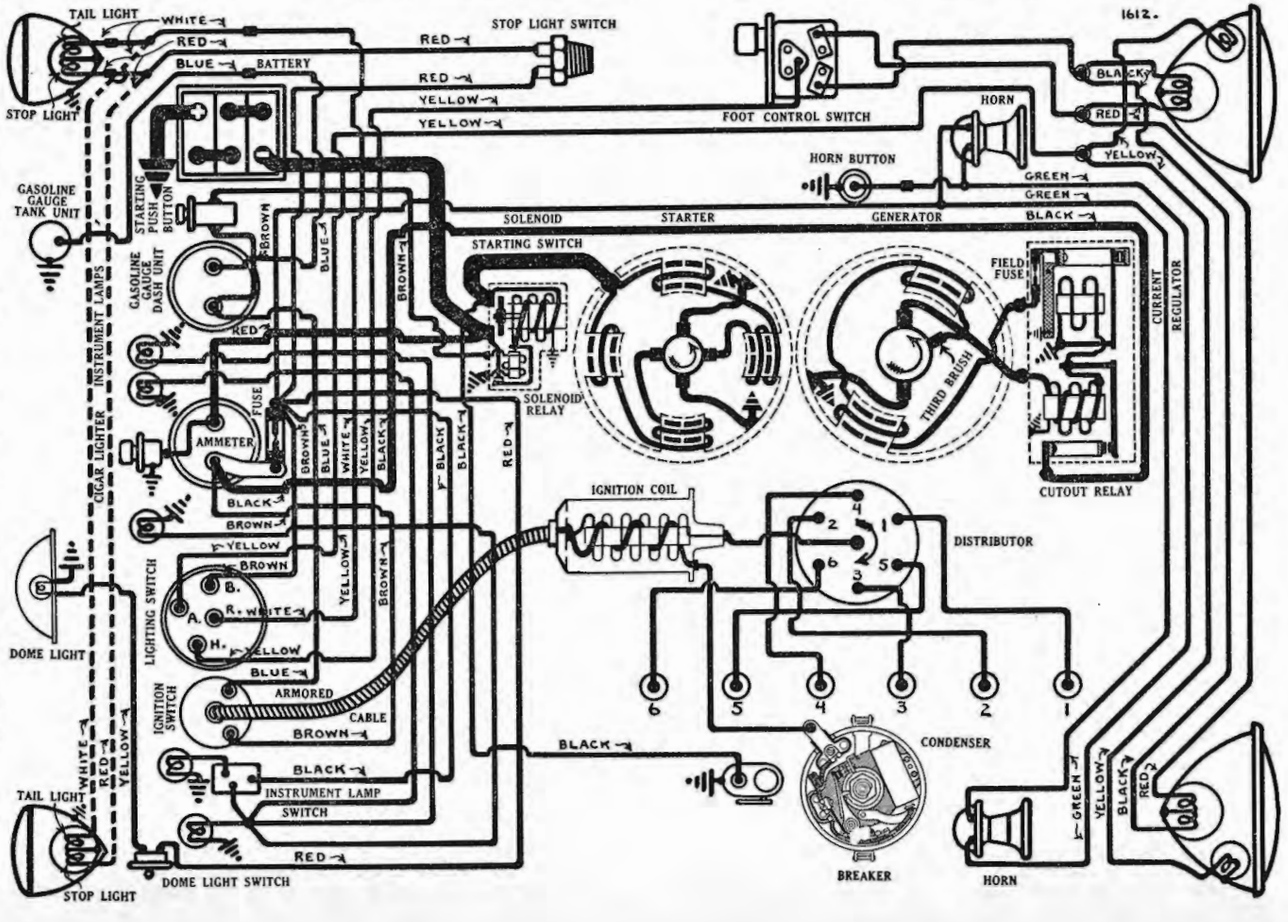
	Seat Angle	Lift	Stem Clearance
Intake	45°	11/32"	.001-.003"
Exhaust	45°	11/32"	.003-.005"

Installing New Guides—Use special tool to remove and install guides. Intake guides installed with taper end up, exhaust guides with taper end down. Top of guide must be 13/16" 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. Tappet adjustment accessible by removing right front wheel and cover plate under front 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 11/16".

	Spring Pressure	Spring Length
Valve Closed	46-50 lbs.	2 1/32"
Valve Open	104-110 lbs.	1 22/32"

Valve Timing:—See Camshaft Seting 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 and exhaust valves at .010". Intake valve should open at top dead center when 'O' mark on impulse neutralizer at front of engine lines up with pointer on chain case. Reset tappet clearance at .006" Int., .008" Exh. (engine hot).

Lubrication:—Pressure. Gear type oil pump located at right of crankcase.
Normal Oil Pressure—40-45 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 spring unpainted. Heavy spring (to increase pressure)



painted green. Lighter spring (to decrease pressure) painted red.

Capacity & Oil—6 qts. Use SAE. #30 (summer—#40 for high speed driving or temperatures above 100°F), #20-W (winter 32° to 0°F), #10-W (winter 0° to —15°F).

CARBURETION:—See Carburetion Section for data.

Carburetor:—Carter (Ball & Ball), Model E6F1, E6F2, 1½" downdraft type.

Automatic Choke—Sisson.

Fuel Pump:—A.C., Type P-1521788 diaphragm type.

Gasoline Gauge:—Motometer electric type.

CLUTCH:—Borg and Beck Model 10A6. Single plate, dry disc type. No adjustment required for wear.

Clutch Pedal Adjustment—Clutch pedal should just clear underside of toeboard with clutch engaged. To adjust, turn stopscrew located just above clutch pedal shaft. Free movement of pedal should be 1 1/16". To adjust, loosen locknut and turn adjusting nut (clevis) on clutch fork adjusting rod.

Clutch Facings—Woven asbestos, 2 required, 6⅛" I.D., 9⅞" O.D., .133" thick.

NOTE—To remove clutch first remove clutch fork and pivot by taking out pivot capscrew. Mark clutch cover and flywheel before disassembling and install 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 with in .005".

STEERING:—Front Suspension—Conventional tubular section front axle with Reverse-Elliott ends and semi-elliptic springs.

Kingpin Inclination—4° crosswise.

Caster—2° plus or minus 1°. Adjust by wedge shims inserted betwen springs and spring pad on axle. Shims or angle plates furnished ½, 1, 2°.

Camber—½° plus or minus ¼°. No adjustment provided. Manufacturer recommends that no attempt be made to correct camber by bending tubular axle centers.

Toe In—1/16-⅛" measured at hub height. Adjust as usual by changing length of tie rod.

IGNITION:—Coil Model IG-4614, IG-4614-A.

Ignition Switch—Electrolock connected to coil by an armored cable.

Distributor Model IGS-4001, A. 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—IGS-4001

Distributor Degrees	R.P.M.	Engine Degrees	R.P.M.
Start	350	0	700
3	400	6	800
6	710	12	1420
9	1020	18	2040
12	1350	24	2700

Automatic Advance—IGS-4001-A

Start	350	0	700
3	400	6	800
6	780	12	1560
9	1160	18	2320
12	1530	24	3060

NOTE—Distributor changed to IGS-4001A after 20,000. IGS-4001 distributors should be changed over by using new advance weight springs Part #IG-884 and setting distributor to advance curve given for IGS-4001-A whenever advance mechanism requires attention.

Vacuum Spark Control—Provides additional advance for intermediate speed range above idling. Spark is retarded by return spring in unit when engine is accelerated or is operated with wide-open throttle.

Vacuum Spark Advance

Distributor Degrees	Vacuum
½°	4-5" of HG.
9° max.	12" of HG.

Removal:—Distributor mounted on left side of crankcase. Accessible by removing left front wheel and cover plate under fender. To remove, disconnect vacuum line, take out hold-down screw

IGNITION TIMING:— Flywheel Degs. Piston Position
6.5-1 head engines .....5° ATDC. ..... .0108" ATDC.
7.0-1 head engines .....7° ATDC. ..... .0211" ATDC.

Timing (Using Timing Light)—Connect timing light between distributor terminal and battery terminal on generator regulator. With #1 piston on compression, turn engine over until piston is 5° or 7° past top dead center, stop when line marked '5' or '7' at left of center '0' mark on impulse neutralizer at front of engine lines up pointer on chain case cover. Loosen hold-down screw in advance arm, center pointer on scale (opposite '0' 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.

Timing (Using Motor Gauge)—Engines can be timed with a motor gauge installed in timing hole over #1 piston. See table above for setting.

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

Spark Plugs:—A.C. Type KL-9. 14 MM. Metric. These plugs have a longer (7/16") thread length.

Spark Plug Gaps—Set at .025".

BATTERY:—Willard, Type WH-2-15, RH-2-15 (Export), 6 volt, 15 plate, 119 A.H. cap. (20 hr. rate).

Starting Capacity—140 amperes for 20 minutes.

Grounded Terminal—Positive (+) terminal.

Location—On left side under driver's seat.

STARTER:—Model MAX-4003. Armature MAW-2030.

Starter Drive—Magnetic 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.	5300 Min.	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

NOTE—See Equipment Section for instructions on installing Field Equalizer on these starters.

Starting Switch:—SS-4101. Solenoid type pinion shift and starting switch (See Equipment Section).

Removal:—Starter flange mounted on left front face of flywheel housing. Accessible by removing left front wheel and cover plate under fender. To remove starter, take out two flange capscrews.

GENERATOR: — Model GAR-4608-5. Armature No. GAR-2116-F. Air-cooled. Third brush control in conjunction with Current Regulator (two-rate charging control). See Equipment Section.

Charging Rate Adjustment (using Test Meters)—Use test meters to check generator output. Connect 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 until output is 21 amperes at 8.6 volts with generator at room temperature (70°F.). Brush is held in position by friction. Remove jumper wire.

Commutator Bar Method—Shift third brush 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 and must not be exceeded.

Performance Data

Cold—Regulator Contacts Closed			Hot—Regulator Contacts Closed		
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 ounces 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 amp. more, 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 water pump belt drive (fan mounted on crankshaft). Accessible by removing left front wheel and cover plate. To remove, take out two pivot bolts and one clamp bolt.

Belt Adjustment:—Loosen pivot and clamp bolts, pull generator 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. See Equipment Section.

Cutout Relay

Cuts In—6.75-7.5 volts.

Cuts Out—.5-2.5 amperes 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.

Contact Close—1.1-1.3 volts below opening point.

Contact Gap—.005" minimum.

Air Gap—.045" with contacts closed.

LIGHTING:—Douglas Switch, Model 5394. Clum Foot Control Switch Model 9590. Foot control switch is 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
Inst., Speedometer	1½	55
Aux., Direct Inst.	3	63
Reading	15	87

NOTE—Lighting switch button and shaft are integral. See note on Chrysler Model C-6 for directions on removing switch.

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

Optional Horns—30 ampere in horn relay lead. See Model SF for wiring of horns and relay.

Generator Field—5 ampere in regulator.

HORNS:—Std. Klaxon Model K-26-S, Type 1549 (low note), 1550 (high note). Matched tone, twin horns.

SERIAL NUMBER:—First number, 3,756,501 (Detroit), 9,403,286 (Canada). On right front door hinge pillar post.

ENGINE NUMBER:—Stamped on boss on left side of cylinder block between #1 and 2 cylinders. Letter 'A' following engine number indicates bore is .020" oversize. Letter 'B' indicates that main and connecting rod bearings are .010" undersize. 'AB' indicates cylinder bore and bearing sizes as above.

ENGINE:—Own. Six cylinder, 'L' head type. Floating power engine mounting.
Bore—3¼". **Stroke**—4⅜".
Piston Displacement—217.8 cubic inches.
Rated Horsepower—25.35.
Developed Horsepower—85 at 3600 R.P.M.
Compression Ratio—6.5-1 Std. alloy iron head.
Compression Pressure—135-145 lbs. at 1000 R.P.M.

Pistons:—Aluminum alloy, steel strut, slotted skirt type. Semi-finished pistons (head and ring grooves completely finished, skirt semi-finished) furnished for service in two sizes (1) standard to .023" oversize, (2) .025" to .050" oversize. Pistons should be slotted and then finished to size (.001" smaller diameter at bottom of skirt than at top). If piston finishing equipment not available, use finished replacement pistons furnished .003", .005", .010", .015", .020", .023", .025", .030", .040", .050", .060" oversize and recondition cylinders to standard oversize. Piston length 3 11/16".
Weight—Maximum allowable variation ¼ oz.
Removal—Pistons and rods removed from above.
Clearance—Top .022". Bottom .0015-.002".
Fitting New Pistons—Use .002" feeler stock ½" wide to check clearance. Pull required to withdraw feeler from between piston and cylinder wall on side opposite slot should be 7-14 lbs.
Installing Pistons—Slot should be at left or away from valves.

Piston Rings:—Two 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.

Ring	Width	End Gap	Side Clearance
Comp. All	⅛"	.007-.015"	.003"
Oil Cont. All	5/32"	.007-.015"	.003"

Piston Pin:—Diameter 55/64". Pin floats in piston and rod. Held by retaining rings. Piston can be heated in boiling water to remove or install pins. Pins furnished .003", .005", .008" oversize.
Pin Fit in Piston—Tight thumb push fit with piston at 180°F.
Pin Fit in Rod Bushing—Tight thumb push fit with piston at room temperature (70°F.).

Connecting Rod:—Weight maximum variation allowable 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 bearing 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 on all bearings.

Crankshaft:—Four bearings. Integral counterweights.
Journal Diameters—2½" all bearings.
Bearing Type—Removable steel-backed, babbitt-lined type. No shims.
Clearance—.001-.002".
Adjustment—None. Replace bearings. Do not file bearing caps. Bearings furnished .010" undersize and standard size.
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 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 engine.

Valves:—

	Head Diameter	Stem Diameter	Length
All Valves	1 15/32"	.3405"	4 27/32"

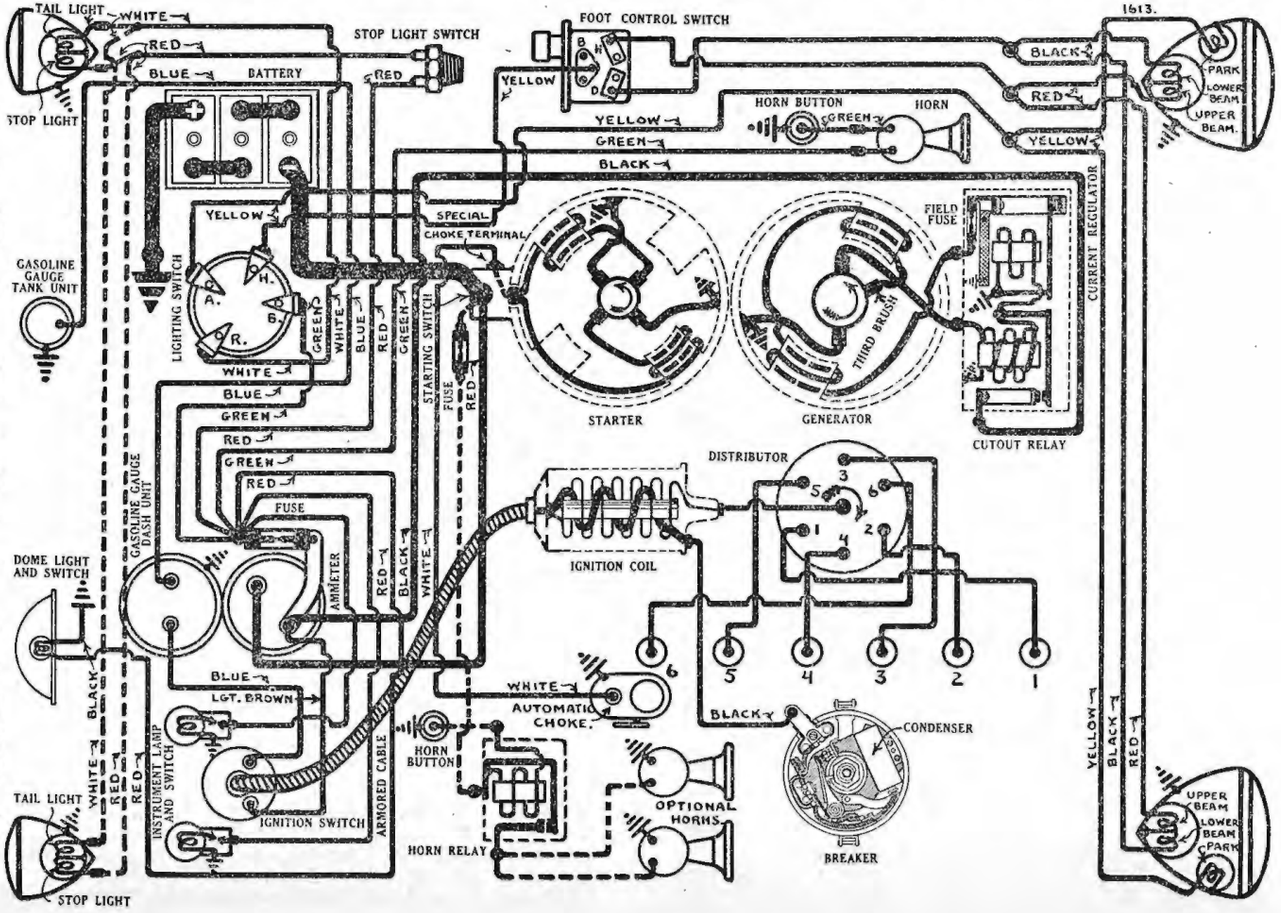
	Seat Angle	Lift	Stem-to-Guide Clearance
Intake	45°	5/16"	.001-.003"
Exhaust	45°	5/16"	.003-.005"

Installing New Guides—Use special tool to remove and install guides. Intake guides installed with taper end up, exhaust guides with taper end down. Top of guides must be ⅞" below top of block. Finish ream new guides to inside diameter of .342-.343" (Int.), .344-.345" (Exh.) after installing.
Tappet Clearance—.006" Int., .008" Exh. engine hot. Set exhaust clearance at .010" for sustained high speed driving. Adjustment accessible by removing cover plate under right front wheel.
Valve Springs—Variable pitch type. Install springs with closer spaced coils at top. Do not compress spring to over-all length of less than 1 7/16".

	Spring Pressures	Length
Valves Closed	34-38 lbs.	1¾"
Valves 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—Set tappet clearance #6 valves at .011" Int., .012" Exh. Install regular timing gauge in timing plug hole over #6 piston. Intake valve should open with piston .015" past top dead center. Reset tappet clearance at .006" Int., .008" Exh. 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 un-



painted. Heavy springs (to increase pressure) are painted green. Lighter spring (to decrease pressure) painted red.

Capacity & Oil—5 qts. Use SAE. #30 (summer—or #40 for sustained high speed or temperatures above 100°F), #20-W (winter 32° to 0°F), #10-W (winter 0° to —15°F).

CARBURETION:—See Carburetion Section for data.

Carburetor:—Stromberg, Model EX-22, 1¼" down-draft type with Fast idle.

Automatic Choke—Sisson.

Fuel Pump:—A.C., Type B-1521789 diaphragm type.

Gasoline Gauge:—Motometer, Electric type.

CLUTCH:—Borg & Beck, Model 10A6. 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 at rear. Free movement of pedal must be 1 1/16". Adjust by loosening lock nut 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 required, 6⅛" I.D., 9⅞" 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—8°30' crosswise.

Caster—2° (1½-2½°). Adjust by inserting wedge plates between springs and axle pads. Wedges furnished 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" (0-⅛"). Adjust in usual manner by loosening tie rod end clamps and turning tie rod.

IGNITION:—Coil Model IG-4609 (Coupe), IG-4613 Sedan.

Ignition Switch—Electrolock connected to coil by armored cable.

Distributor Model IGS-4002. 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—IGS-4002

Distributor Degrees	R.P.M.	Engine Degrees	R.P.M.
Start	350	0	700
3	400	6	800
6	780	12	1560
9	1160	18	2320
12	1530	24	3060

Vacuum Spark Control—Mounted on side of distributor cup, advances spark by rotating breaker plate through link coupling (breaker plate grounded through pig-tail connection). Provides additional advance for intermediate speeds above idling. Spark is retarded by return spring in unit when engine is accelerated or is operated with wide-open throttle.

Vacuum Spark Advance—IGS-4002

Distributor Degrees	Vacuum
½°	4-5" of HG.
9° Max.	12" of HG.

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

IGNITION TIMING:—	Flywheel Degs.	Piston Posi.
DU Engines	4° ATDC.	.007" ATDC.

Timing (Using Timing Light)—Connect timing light between distributor terminal and battery terminal on generator regulator. With #1 piston on compression, turn engine over until piston is 4° past top dead center, stop when fourth graduation at left of center 'O' mark on fan pulley at front of engine lines up with pointer on chain case cover. Loosen advance arm hold-down screw, center pointer on scale (line up with 'O' mark), tighten hold-down screw, loosen advance arm clamp bolt, rotate distributor until timing lamp goes out, tighten clamp bolt.

Timing (Using Motor Gauge)—Engines can be timed with a motor gauge installed in timing hole over #6 piston. See table above for setting.

Timing (Using Synchroscope)—Engines can be timed with a Synchroscope by directing light on fan pulley at front of engine.

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 WT-1-15. 6 volt, 15 plate, 90 A.H. capacity (20 hour rate).

Starting Capacity—117 amperes for 20 minutes.

Grounded Terminal—Positive (+) terminal.

Location—On left side under driver's seat.

STARTER:—Model MAW-4003, MAW-4004 (Export). Armature No. MAW-2030.

Starter Drive—Postive 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-2813 (MAW-4003), 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-4608-5. Armature No. GAR-2116-F. Air-cooled. Third brush control in conjunction with Current Regulator (two-rate charging control). See Equipment Section.

Charging Rate Adjustment (Using Meters)—Use test meters to check generator output. Connect jumper wire from fuse cup on side of regulator case to ground on generator frame. Shift third brush by hand counter-clockwise to increase, or clockwise to decrease charging rate until maximum output is 21 amperes at 8.6 volts with generator at room temperature (70°F.). Remove jumper wire.

Commutator Bar Method—Shift third brush 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:—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 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.

Contact Close—1.1-1.3 volts below opening point.

Contact Gap—.005" minimum.

Air Gap—.045" with contacts closed.

LIGHTING:—Douglas Switch Model 5394. 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, Instrument	1½	55
Stop and Tail	21-3	1158
Dome	15	87

NOTE—Lighting switch button and shaft are integral. See preceding article on Chrysler C6 for instructions on removing switch.

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

Twin Horns—30 ampere in horn lead near starter.

Generator Field—5 ampere in regulator.

HORNS:—Auto-Lite Model HA-4002 Std. Klaxon Model K-33-C, Type 1903 (low note), 1904 (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 volts minimum to close contacts. Current draw .8 amperes.

Relay Contact Gap—.015-.025"

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

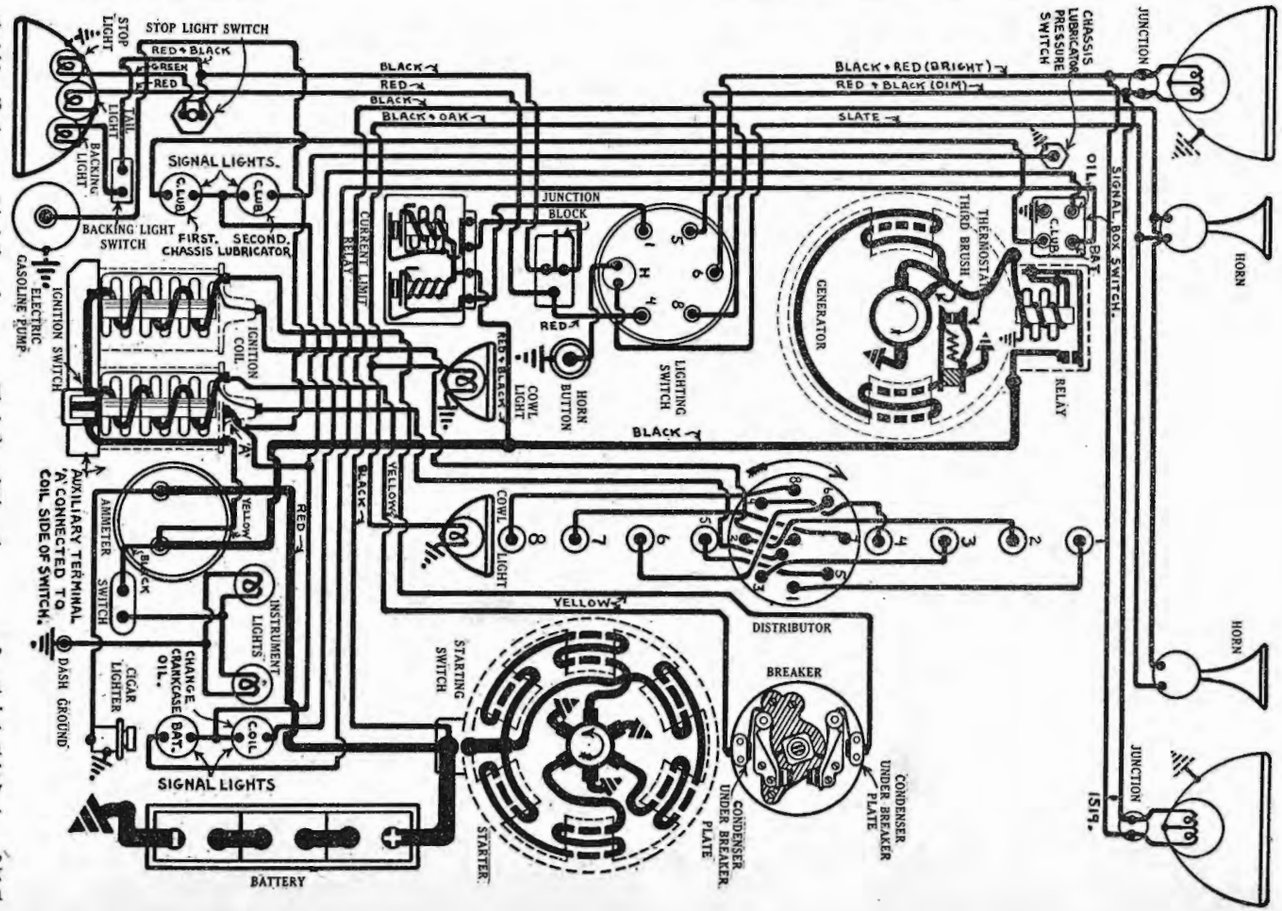
SERIAL NUMBER:—On plate on left side of dash.
ENGINE NUMBER:—Stamped on left rear engine support.
ENGINE:—Eight cylinder, In line, Overhead valve type. Two intake and two exhaust valves per cylinder operated by two camshafts on cylinder head (exh. camshaft right, int. camshaft left).
Bore—3¾". **Stroke**—4¾".
Piston Displacement—420 cubic inches.
Rated Horsepower—45.
Developed Horsepower—(J) 265 at 4200 R.P.M.
Compression Ratio—5.2-1 Std. cast-iron head.
Pistons:—Ray-Day, aluminum alloy, split, full skirt type. Skirt is separated from head by horizontal slot. Piston length 4⅜".
Weight—20 ounces.
Removal—Pistons and rods removed from below. Rotate crankshaft while withdrawing pistons.
Clearance—Top .022". Lands .018". Bottom .0035".
Piston Rings:—Four rings per piston, three compression, one oil control, all above pin. Lower ring groove drilled radially with oil drain holes.

Ring	Width	End Gap	Wall Thickness
Comp. All	⅛"	.014-.016"	.140-.150"
Oil Cont.	3/16"	.014-.016"	.140-.150"

Piston Pin:—Diameter 1 1/16". Length 3 17/64". Pin floats in piston and rod. Held by two locking rings at each end. Pin hole in connecting rod is bushed and diamond-bored to size.
Pin Fit in Piston—Slight driving fit at room temperature (pin holes reamed to 1.06225-1.06175").
Pin Fit in Rod Bushing—Free push fit (bushing diamond-bored to inside dimaeter of 1.0625").
Connecting Rod:—Weight 18 ozs. (without cap bolts or bushing). Length 9 13/16". Rod is a Duralumin forging used with a steel bearing cap.
Lower Bearing—Poured 'Mogul alloy' lined type.
Clearance—.0015-.002".
Adjustment—None (no shims). Bearings should not require adjustment during life of engine. Caps can be reduced with fine emery cloth on a surface plate if necessary.
Crankshaft:—Five bearings. Integral counterweights. Special mercury-cartridge type damper.
Journal Diameters—2¾" all bearings.
Bearing Type—'Mogul alloy' lined type.
Clearance—.0015".
Adjustment—None (no shims). Bearings should not require adjustment during life of engine. Caps can be reduced with fine emery cloth on a surface plate if necessary.
End Thrust—Taken by front main bearing. Thrust washer assembled between bearing and crankshaft sprocket. Endplay .0015-.003".
Camshaft:—Two camshafts on cylinder head. Each camshaft supported by five bearings.
Journal Diameters—1¼" all bearings.
Bearing Type—'Mogul alloy' lined type.
Clearance—.0015".
End Thrust—Taken by front bearing. Endplay, .0015-.003".
Timing Chains—Link Belt. **Upper Chain**—Width 1 11/16", Pitch ⅜", Length 51¾". **Lower Chain**—Width 2", Pitch ⅜", Length 47¼". Both camshafts are driven in tandem by upper chain from transfer sprocket on front of engine. Transfer sprocket driven in tandem with two accessory sprockets by lower chain from crankshaft. Automatic idler take-ups used on both chains.
Camshaft Setting—To change or set valve timing, turn engine over (by prying on flywheel ring gear with pry-bar inserted through inspection plate hole in housing) until #8 piston is slightly before top dead center entering power stroke (distributor rotor will be opposite #8 segment in distributor cap), stop when flywheel mark '/INT. OPENS' lines up with reference line on housing. This mark is exactly ⅝" before top dead center mark '1&8/CL'. Take off upper chain case cover, release idler sprocket by taking off cotter pin and plain washer, pry forward on sprocket bushing and spring until spring is nearly released, use tool #J-7016 to release spring tension, withdraw bushing lift chain off sprocket, remove sprocket, block chain up at lower end to prevent it dropping off transfer sprocket. Then set each camshaft as follows:
Intake Camshaft. Take out 6 capscrews, remove intake camshaft sprocket, set tappet clearance #1 intake valve at .025" (see note on tappet clearance), turn intake camshaft in direction of rotation until intake valve begins to open (use straddle clamp to twist valve tappet, valve opens when clearance is taken up and cam grips valve tappet), mesh sprocket in chain, keep driving side of chain taut, slip chain on sprocket one tooth at a time until sprocket can be mounted on camshaft without disturbing position of shaft or transfer sprocket, insert capscrews. Check ignition timing.
Exhaust Camshaft. With #8 piston slightly past top dead center entering power stroke and flywheel mark '/EXH.CLOSES', which is 1¼" past top dead center mark '1&8/CL', at reference line on housing, take off 6 cap screws, remove exhaust camshaft sprocket, set tappet clearance #1 exhaust valve at .025", turn exhaust camshaft in direction of rotation (clockwise) until #1 exhaust valve begins to close (use straddle clamp to twist valve tappet, valve closes when tappet is just released by cam so that tappet can be turned easily), mesh sprocket in chain, keep driving side of chain taut, slip chain on sprocket one tooth at a time until sprocket can be mounted on camshaft without disturbing position of camshaft or transfer sprocket, insert cap screws.
Idler Sprocket Assembly:—Mesh idler sprocket in chain, insert bushing and spring, use special tool to wind up spring 12 notches or two complete turns, assemble washer and cotter pin. Turn engine over with starter to allow chain to assume normal running position, then release spring tension, change setting to 9 notches or 1½ turns. See Equipment Section for complete data on Link Belt automatic idler sprockets.

Valves:—

	Head Diam.	Stem Diam.	Stem Lgth
Intake	1½"	11/32"	5.002"
Exhaust	1 7/16"	11/32"	4.992"



Seat Angle—30° (all valves). **Lift**, .360".
Stem-to-Guide Clearance—.002".
Valve Springs—Double springs used on all valves.

Inner Springs—	Pressure	Length
Valve Closed	26 lbs.	1 15/16"
Valve Open	36-40 lbs.	1 19/32"

Outer Springs—	Pressure	Length
Valve Closed	35-40 lbs.	2¼"
Valve Open	65-70 lbs.	1 29/32"

Tappet Clearance—.025" (cold) all valves.

NOTE:—To change or set tappet clearance, use feeler gauge and check actual tappet clearance of each valve (clearance between heel of cam and tappet). Remove camshafts, tappets, tappet adjusting nuts. Use shims of various thickness to change length of adjusting nut so that clearance when assembled will be .025" (measure length of adjusting nut with 1" micrometer, add or remove shims as necessary, recheck adjusting nut with micrometer). Reassemble camshafts, check Valve Timing and Ignition Timing.

Valve Timing

Intake Valves open 6° BTDC. Close 40° ALDC.
Exhaust Valves open 40° BLDC. Close 14° ATDC.

To Check Valve Timing:—Check tappet clearance #1 intake and exhaust valves (set at .025" cold). #1 intake valve should open with #8 piston slightly before top dead center entering power Stroke when flywheel mark '/INT.OPENS' lines up with reference line on housing. This mark is exactly ⅝" before top dead center mark '1&8/CL'. #1 exhaust valve should close with #8 piston slightly past top dead center when flywheel mark '/EXH.CLOSES' lines up with reference line. This mark is 1¼" past top dead center mark '1&8/CL'.

Lubrication:—Pressure type. Gear type oil pump located in oil pan.
Oil Pressure—2-10 lbs. (low idling speeds) increasing approximately 1 lb. per M.P.H. Maximum pressure, 80-100 lbs (high speed operation).
Oil Pressure Relief Valve—Built into oil pump. Controlled by adjustment nut located on lower left hand side of crankcase directly in front of oil float gauge indicator. Turn adjustment nut clockwise to increase, or counter-clockwise to decrease pressure.
Capacity—12 qts.

CARBURETION:—See Carburetion Section for data.
Carburetor:—Stromberg, Model EE-3 Dual downdraft type (Model J), UU-3 dual updraft type Model SJ Supercharged).
Fuel Pump:—Mechanical bellows type pump (on left side of crankcase) and Stewart-Warner, Type 398-C electric type booster pump (Model J), or Autopulse Triplex Unit (SJ Supercharged).
Gasoline Gauge:—K-S Telegauge, hydrostatic type.

CLUTCH:—Special Long. Double plate, dry disc type. No adjustment required for wear.
Clutch Pedal Adjustment—Free movement of clutch pedal must be 1-1½".
Clutch Facings—Special moulded composition, 4 required, 6½" I.D., 11" O.D., .137" thick.

NOTE:—Manufacturer recommends that cover plate assembly and driven member assembly be returned to factory for reconditioning. Driven member assembly consists of center driving plate and the two driven discs.

Clutch Assembly—The three center driving plate adjusting screws (round-headed screws) must be backed off until the ends are flush with the pressure plate before the cover plate is bolted on the flywheel. Adjust these screws by turning in until they bottom and then backing each screw off exactly 4 notches.

STEERING:—Front Suspension—Conventional 'I' beam section front axle with Reverse-Elliott ends and semi-elliptic springs.
Caster—1-3°. **Camber**—1°.
Toe In—⅛-¼". Adjust in usual manner by loosening tie rod end clamps and rotating tie rod.
KingPin Bearing Adjustment—Kingpins are carried on a double-row ball bearing at the top and a ball thrust bearing at the bottom. Adjustment for end-thrust (up-and-down movement) is provided at lower bearing. To adjust, remove locking bar in adjusting nut below kingpin, back off adjusting nut, remove shims until there is no perceptible up- and-down movement of steering knuckle with adjusting nut tightened, or there is is a slight drag on steering knuckle when revolved around kingpin. Replace locking bar.

IGNITION:—Coil Model 553-A (2 coil unit). Consists of two coils on bracket with ignition switch.
Distributor Model 4094. Double breaker, 4 lobe cam, semi-automatic advance type. Contacts open alternately at regular 45° intervals corresponding to 90° firing interval of engine. Contacts must be synchronized (see Timing).
Breaker Gap—Set gap at .020". Limits, .018-.024".
Breaker Arm Spring Tension—17-21 ounces.
Cam Angles—Closed 49°. Open 41° (distributor). Each set operates independently.
Manual Advance—20° (engine—maximum).

Automatic Advance

Distributor Degrees	Distributor R.P.M.	Engine Degrees	Engine R.P.M.
Start	380	2	760
2½	500	5	1000
5	660	10	1320
10	1020	20	2040
15	1320	30	2640
20	1550	40	3100

IGNITION TIMING:— Flywheel Degs. Piston Position
All engines.....1½" or 12° BTDC. ..... .0645" BTDC.
With manual control fully advanced.
Timing (Stationary Contacts):—Synchronize contacts before setting timing if synchronizing tool is used. With #8 piston on compression, turn engine over by prying on flywheel ring gear with prybar, stop when flywheel mark 'Spark Adv./' which is 1½" before top dead center mark '1 &8/CL') lines up with reference line on housing, loosen taper lock screw in center of breaker cam, carefully locate cam so that stationary contacts (mounted directly on breaker plate) are beginning to open, tighten lock screw, see that rotor is in position to fire #8 spark plug.
Synchronization—Using Gauge:—Use special synchronizing tool (dummy cam), Duesenberg #6965. Loosen taper lock screw, remove regular firing cam, install synchronizing tool on distributor shaft, turn tool until stationary contact breaker arm rubbing block drops into slot in tool and rests against shoulder, loosen lock screws on movable sub-plate (carrying second set of contacts), turn eccentric adjusting screw until second breaker arm rubbing block is against shoulder of second slot, tighten locking screws, remove tool, replace regular firing cam, check timing.
Synchronization—On Engine:—Turn engine over 90° from firing position of piston #8 to firing position for piston #3 (1½" on flywheel before top dead center position). Loosen lock screws on movable sub-plate, turn eccentric adjusting screw until second set of contacts (mounted on plate) open, tighten lockscrews, check contact gap.
Firing Order:—1-6-2-5-8-3-7-4 (see diagram). Spark plug cables not connected in this order.
Spark Plugs:—Champion, Type C-7 or #18 (Model J), Type R-1 (SJ-Supercharged) 18 MM. Metric.
Spark Plug Gaps—Set at .025". Limits, .022-.028".

BATTERY:—Exide, Type XR-21-ER, 6 volt, 21 plate, 164 A.H. capacity (20 hr. rate).
Starting Capacity—123 amperes for 20 minutes.
Grounded Terminal—Negative (—) terminal.
Location—On right hand side under dust shield.

STARTER:—Model 429. Armature No. 37895.
Starter Drive—Bendix Type R11X-10.
Rotation—Counter-clockwise at commutator end.
Brush Spring Tension—36-40 ounces each.

Performance Data

Torque	R.P.M.	Volts	Amperes
0 ft. lbs.	3000	5.0	70
19 "	Lock	3.0	500

Mounting:—Flange mounted on right hand front face of flywheel housing. To remove, take out flange mounting bolts.

GENERATOR:—Model 428. Armature No. 827753.
Third brush regulation, thermostat control. Thermostat contacts open at 165°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 counterclockwise to increase, or clockwise to decrease charging rate, tighten locking screw.
Maximum Charging Rate:—12 amperes (hot), 7.6 volts, 1450 R.P.M.

Performance Data

	Amperes	Volts	R.P.M.
Cold	19-21	8.3-8.7	1200
Hot	11-13	7.5-7.8	1450

Rotation—Counter-clockwise at commutator end.
Shunt Field Current—3.2-4.1 amperes at 6.0 volts.
Brush Spring Tension—20-28 ounces each.
Mounting:—Cradle mounted on left hand side of engine. To remove, disconnect drive coupling, loosen mounting clamp band.

CUT-OUT RELAY:—Model 265-B. On generator.
Cuts in—7.0-7.5 volts, 500 R.P.M. (generator).
Cuts out—0-2.5 amperes discharge.
Relay Contact Gap—.015-.025".
Air Gap—.012-.017" (contacts closed).

LIGHTING:—Switch Model 486-D. Mounted at lower end of steering column.

Bulb Specifications

Lamp	Candlepower	Mazda No.
Headlights (Std.)	21-21	1110
Stop and Backing	21	1129
Tail, Cowl, Instr., Step	3	63
Dome and Corner	3	64
Signal Lights	1.5	2B-G6-10

CURRENT LIMIT RELAY:—Model 5759. Consists of vibrating and lock-out circuit breaker.

Vibrating Unit

Starts to operate with current load of 35-40 amperes, limiting load to 5-20 amperes.
Contact Gap—.012-.030".
Air Gap—.015-.030" (contacts closed).
Spring Tension—5 ozs. minimum at brass button.

Lock-out Unit

Contacts open with current load of 25-30 amperes, limiting current to less than 1 ampere.

SERIAL NUMBER:—Same as engine number.

ENGINE NUMBER:—Stamped on top of clutch housing and on left frame side member in front of dash bracket.

ENGINE:—**Own Model 48.** Eight cylinder, 90 degree 'Vee', 'L' head type. Both cylinder banks and crankcase cast integrally.
Bore—3.062". **Stroke**—3.75".
Piston Displacement—221 cubic inches.
Rated Horsepower—30.
Developed Horsepower—90 at 3800 R.P.M.
Compression Ratio—6.3-1 (Std. aluminum head).
Compression Pressure—138 lbs. at 1600 R.P.M. or 105 lbs. at cranking speed.
NOTE—The 131" WB. and 157" WB. trucks are equipped with a 5.32-1 ratio cast-iron head and compression pressure is 109 lbs. at 2500 R.P.M.

Pistons:—Aluminum alloy, open split skirt, cam ground type. Skirt is tapered from top to bottom (.001-.002" greater diameter at bottom of skirt measured at right angles to bosses). Recondition cylinders to take replacement pistons furnished .0025", .005", .015", .030", .045", .060" oversize. Piston length 2.97".
Weight—287-291 grams (stripped), 389.5-396 grams (with rings and pin).
Removal—Pistons and rods removed from above.
Clearance—Skirt .002" min., .003" max.
Fitting New Pistons—Do not use feeler gauges to check clearance. Use micrometer gauge to check piston diameter at a point just below horizontal slot and at left of vertical slot at right angles to pin bosses. Measure cylinder bore crosswise of engine 2" up from bottom of cylinder bore. Difference between these readings will be clearance and must be within .002" min., and .003" max. Piston should be measured before pin is installed.
Installing Pistons—Slot should be toward left viewed from driver's seat.

Piston Rings:—Two 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. All	.0915-.092"	.009-.015"	.140"
Oil Cont.	.1545-.155"	.005-.009"	.140"

Piston Pin:—Diameter .7501-.7504". Length 2.77". Pin floats in piston and rod and is held by retainer ring in rod which engages groove in pin. Heat piston to 200°F. (dip in boiling water for one minute) to remove or install pins.
Pin Fit in Piston—Slight drag with piston at 200°F.
Clearance in Rod—.0002". With this clearance rod should rock on piston of its own weight, but piston should not rock on rod. This test should be made before retainer ring is installed.
Installing Pins—Use a taper pilot inserted ahead of pin to expand retainer ring.
Connecting Rod—Wt. 469-473 grams. Lgth. 7".
Lower Bearing Type—Separate copper-lead type bearing sleeves assembled on crankpin.
Bearing Size—2" I.D., 2.218" O.DD., 1.937" long on crankpin.
Clearance—.003". Sideplay .010-.022".
Adjustment—None. Replace bearings.
NOTE—Use tool, #V-131, to check bearing fit with rod caps tightened. Tool grasps bearing flanges and allows bearings to be rotated to test fit. Bearings should rotate freely. If bearings cannot be turned or turn hard, check for bent rods, distorted bearings, or burrs. This tool now has serrations on the jaws to engage the smaller diameter flanges of the copper-lead type bearings. First type tool without serrations can be adapted by filing notches 1/16" wide on face of jaws.

Crankshaft:—Three bearing, 90° type. Integral counterweights.
Journal Diameters—2" all bearings.
Bearing Type—Babbitt bearing surface integral with crankcase and bearing cap.
Clearance—.001-.003".
Adjustment—None (no shims). Do not file bearing caps.
End Thrust—Taken by rear bearing. Endplay .002-.006".

Camshaft:—Three bearings. Gear driven.
Bearing Diameters—1.812" all bearings.
Timing Gears—Crankshaft gear steel. Camshaft gear Bakelized fabric. Gears have been changed from 10 pitch to 8 pitch. Camshaft gear 44 teeth (new), 56 teeth (old). Crankshaft gear 22 teeth (new), 28 teeth (old).
Gear Backlash—.004" maximum.
Camshaft Setting—Gears are marked. Mesh marked tooth on crankshaft gear with space between teeth on camshaft gear marked by straight line.

Valves:—

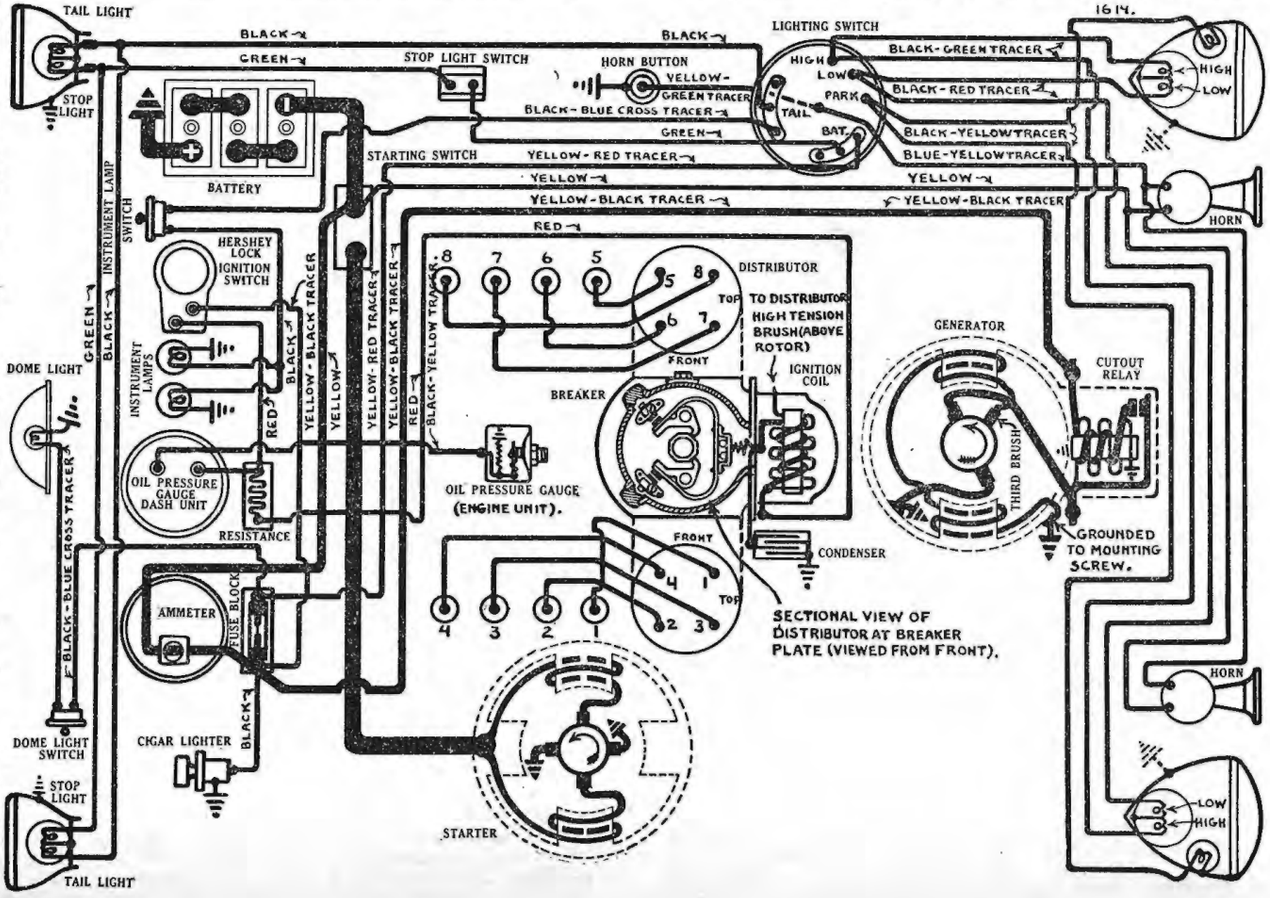
	Head Diameter	Stem Diameter	Length
All valves	1.537"	.3105-.3115"	4.750-4.751"

	Seat Angle	Lift	Stem Clearance
All Valves	45°	.295"	.0015-.0035"

Tappet Clearance—.0125-.0135" all valves. No adjustment. Use special two-step feeler as Go-No Go gauge. First step (.0125") should pass between valve stem and lifter with lifter on heel of cam. Second step (.0135") should be 'no go'. Replace valves if clearance is excessive or grind off end of valve stem if clearance is insufficient.
Valve Springs—See note on Valve Assembly below.

	Spring Pressure	Length
Valve Closed	39-44 lbs.	2.68"
Valve Open	62-65 lbs.	2.38"

NOTE—Split type valve guide bushings retained by a 'C' washer type retainer on lower end are used. To remove valves, use V-78 bar type valve lifter, insert tongue of lifter between valve spring coils and engage flanged lower end of valve guide bushing, pull bushing down and remove valve guide bushing retainer, then pull valve assembly out from above. Use special fixture #V-130 to disassemble valve units. Insert valve assembly in fixture, compress spring with lever engaging valve head, remove valve spring retainers. With this fixture the valve head acts as a stop to prevent excessive compression of the valve spring.
Valve Timing—See Camshaft Setting above.
Intake Valves—Open 9½° BTDC. Close 54½° ALDC.
Exh. Valves—Open 57½° BLDC. Close 6½° ATDC.



Valve Timing Check—No flywheel marks or other means of checking timing provided. If dead center point for piston #1 is established on flywheel, #1 intake opening will be approximately 2.96 teeth before this point.

Lubrication:—Pressure. Gear type oil pump located in crankcase. Driven by gears from camshaft.
Normal Oil Pressure—30 lbs. at 55 M.P.H.
Oil Pressure Relief Valve—Operates at 30 lbs. Located under plug directly above camshaft front bearing. Not adjustable.
Oil Pressure Gauge—Electrical type. See complete article in Equipment Section.
Capacity and Oil—5 qts. Use SAE. #40 (summer 32° to 100°F), #50 (summer above 90°F), #30 (20° to 65°F), #20 or 20-W (winter 50° to 30°F), #10-W (30° to —15°F).

CARBURETION:—See Carburetion Section for data.
Carburetor:—Stromberg, Model EE-1, 1" dual, down-downdraft type.
Fuel Pump:—A.C., Type R-1521764 diaphragm type.
Gasoline Gauge:—K-S Telegauge, hydrostatic type.

CLUTCH:—Long Model 9CF, 11CF (Trucks). Semi-centrifugal single plate, dry disc type. Release levers have weights at outer ends which increase clutch pressure from 310 lbs (engine stopped) to 1980 lbs. (at 4000 R.P.M.) by centrifugal force. Pedal pressure has been reduced to 25 lbs. at idling speed. No adjustment required for wear.
Clutch Pedal Adjustment—Free movement of clutch pedal must be 1½-2". This clearance is greater than that used with previous design and must be maintained to provide clearance for release bearing when release levers move back under centrifugal action. To adjust, remove clevis pin on clutch lever adjusting rod (at upper end of clutch release lever), turn clevis on forward end of adjusting rod.
Clutch Facings—Molded asbestos, 2 required, 5.76" I.D., 9.0" O.D., .140" thick.
NOTE—Clutch cover plate is bolted directly to flat surface of flywheel by six special pilot cap screws. Driven plate has six springs in vibration damper instead of 12 springs on old design.

STEERING:—Front Suspension—Front axle 'I' beam section with Reverse-Elliott ends and transverse-cantilever spring.
Kingpin Inclination—7° crosswise.
Caster—7° loaded. Caster on 131" WB. and 157" WB. trucks should be 3°30'. No adjustment.
Camber—2°. No adjustment provided.
Toe In—.06". Adjust in usual manner by changing length of tie rod.

IGNITION:—Coil Part No. 40-12000-B. Mounted on top of ignition unit at front of engine. Resistor unit mounted in back of instrument panel.
Ignition Current—2.8 amperes idling, 4 stopped.
Ignition Switch—Oakes Hershey type co-incidental ignition switch and steering post lock.
Distributor Part No. 40-12127-B. Double breaker, 8 lobe cam, full automatic advance type with vacuum brake control. One set of contacts (right hand) are used for timing. Second set of contacts (left hand) are used to load coil (these contacts close first and open first but spark does not occur until timing contacts open). Contacts are rigidly mounted on breaker plate and no synchronization is required. See Equipment Section for complete data on Mallory Distributors.
Breaker Gap—.012-.014" (both sets). Stationary contact studs are accessible through hole in side of housing after taking out rubber plugs.
Breaker Arm Spring Tension—22-27 ounces.
Cam Angles—Closed 34°. Open 11° distributor. Both sets with correct lead for loading contacts.
Automatic Advance—Vacuum Brake Inoperative

Distributor Degrees	R.P.M.	Engine Degrees	R.P.M.
Start	200	0	400
2	325	4	650
3	425	6	850
5	850	10	1700
8	1475	16	2950

Vacuum Brake—Consists of an adjustable spring-loaded plunger in vacuum cylinder on side of distributor housing. Braking action of plunger on edge of advance weight plate governed by manifold vacuum. See Ignition Timing for setting.
NOTE—Distributor shaft and governor weight assemblies with above advance characteristics identified by mark '34' or '40-B' stamped on rear end of shaft beside coupling tongue and on outside rim of advance weight (this mark may be seen by removing vacuum brake piston).
Removal:—Complete ignition unit mounted on timing gear case cover at front of engine. To remove, disconnect vacuum line, take out three flange capscrews.
NOTE—On first cars in 1935, the single bolt hole on the right hand end of the mounting flange was drilled smaller than formerly. The smaller hole would not fit the locating pin of the regular timing fixture and has since been returned to its former size. The small hole on these distributors can be drilled out to .323" to take the timing fixture locating plug and new type mounting bolts, Part No. 48-12148 used. All distributors now fitted with these new type bolts with a .312-.316" locating shoulder under the head.

IGNITION TIMING:— Flywheel Degs. Piston Position
All engines ..... 4° BTDC. ..... .0058" BTDC.
Timing—No flywheel marks. Ignition designed to be set with piston #1 on top dead center. With #1 piston (front cylinder—right hand bank) on top dead center of compression stroke, loosen timing adjusting screw on left hand side of ignition unit, place screw in retard position at lower end of slot, then move screw upward in slot until contacts begin to open. Note position of screw with reference to timing graduations on edge of slot at this point, then move upward one additional graduation, tighten screw. This will give correct setting of 4° before top dead center.
NOTE—Top dead center position of piston #1 can be determined by inserting gauge rod in cylinder, or by measuring distance to top of pistons in cylinders #2 and #3 should be equal.
Vacuum Brake Setting—Vacuum brake can be adjusted for fuel characteristics or operating conditions by loosening locknut and backing off adjusting screw until engine pings under load and then turning screw in just enough to eliminate this ping. Tighten locknut.
Firing Order:—1-5-4-8-6-3-7-2 with cylinders numbered from front to rear as follows: Right hand bank—1, 2, 3, 4. Left bank—5, 6, 7, 8 (see diagram).
Spark Plugs:—Champion, Type 7. 18 MM. Metric.
Spark Plug Gaps—Set at .025".

BATTERY:—Ford, Part No. 40-10655-C. 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 side under front floor board.

STARTER:—Part No. 18-11002. Armature No. 18-11005.
Starter Drive—Inboard Bendix, Type L11FX-10.
Rotation—Counter-clockwise at commutator end.
Brush Spring Tension—2 lbs. each.
Cranking Performance—100 R.P.M., 225 amperes, 4.75 volts.

Performance Data

Torque	R.P.M.	Volts	Amperes
4 ft. lbs.	1070	4.6	200
8 "	660	4.3	340
12 "	300	3.65	465
14 "	Lock	3.5	500

Starting Switch:—R.B.M., Type A-11450-C. Ford Part No. 18-11450. Operated by pedal on toeboard.
Removal:—Starter mounted on right front face of flywheel housing. To remove, take out two bolts on endplate.

GENERATOR:—Part No. 40-10000-B. Armature No. 40-10005. Air-cooled. Third brush control type.
Charging Rate Adjustment—Take off commutator 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—15 amperes, 25 M.P.H. (4" generator pulley) or 30 M.P.H. (new 4 5/16" pulley).

Performance Data

Amperes	Volts	R.P.M.	M.P.H.
0	6.1	660	8.8
4	6.25	795	10.6
8	6.5	960	12.8
12	6.7	1150	15.2
16	6.95	1500	20.0
18	7.1	1800	25.0

Rotation—Counter-clockwise at commutator end.
Field Current—4.5 amperes at 6.0 volts.
Brush Spring Tension—18-20 ounces.
Removal:—On bracket between cylinder banks at front of engine with fan mounted on end of generator shaft. Driven in tandem with two water pumps by Vee belt. To remove, take off nut on bracket mounting stud.
Belt Adjustment:—Loosen nut on bracket flange mounting bolt, move generator up until total sideplay on belt at point midway between water pump and crankshaft pulleys is ¾-1", tighten nut.

SPECIAL GENERATORS:—See Equipment Section for data on Regulator (Two-Rate Relay) when used.

CUTOUT RELAY:—Part No. B-10505. Mounted on generator. Generator field lead is grounded to cutout mounting screws.
Cuts In—7 volts, 10 M.P.H.
Cuts Out—3 ampere discharge current.
Relay Contact Gap—.015-.020".
Air Gap—.010-.015" with contacts closed.

LIGHTING:—R.B.M. Switch, Type B-11657 (body and contact assembly), B-11673 (plate), B-11655-B (cover). Ford Part No. B-11654B. Lighting switch mounted at lower end of steering column and operated by handle on steering wheel.

Bulb Specifications

Position	Candlepower	Mazda No.
Headlamps	32-32	2330-C
Stop and Tail	21-2	1158
All others	3	63

FUSES:—20 ampere capacity on fuse block. 25 amperes (cars with radio).
HORNS:—Vibrator type. Horn current 6-8 amperes.

SERIAL NUMBER: — First number, 1,700,001. On plate on floor within body back of right front seat.

ENGINE NUMBER: — First number, 1,705,001. On plate on left hand side of crankcase and on chassis serial number plate.

ENGINE:—Own. Model 74. Six cylinder, 'L' head type.
Bore—3". **Stroke**—4".
Piston Displacement—169.6 cubic inches.
Rated Horsepower—21.6 A.M.A.
Developed Horsepower—60 at 3500 R.P.M.
Compression Ratio—5.8-1 Std. cast-iron head, 6.87-1 optl. aluminum head.
Compression Pressure—95-100 lbs. (5.8-1 head), 115 lbs. (6.87-1 head) at 50 R.P.M.

Pistons:—Bohn Bohnalite, aluminum alloy, Invar strut, split skirt type. Length—3 41/64".
Weight—14 ounces. Held to 2 gram variation.
Removal—Pistons and rods removed from below.
Clearance—Skirt .002" see Fitting Pistons.
Fitting New Pistons—Use .002" feeler stock ½" wide inserted between piston and cylinder wall on side opposite slot. Pull required to withdraw feeler should be within 10-17 lbs.
Installing Pistons—Slot should be toward left or away from valves.

Piston Rings:—Two compression, one oil control ring per piston, all above pin. Lower ring groove drilled radially with eight 9/64" oil drain holes.

Ring	Width	End Gap
Comp. all	⅛"	.005-.010"
Oil Cont.	3/16"	.005-.010"

Piston Pin:—Diameter 13/16". Length 2 9/16". Pin is locked in the connecting rod.
Pin Clearance in Piston—.0001" or push fit.

Connecting Rod:—Length 7" (center-to-center).
Crankpin Journal Diameter—1 15/16".
Lower Bearing Type—Interchangeable, steel-backed, cadmium-nickel lined type, no shims.
Clearance—.001-.0025". Sideplay .005-.008".
Adjustment—None (no shims). Replace bearings.
Installing Rods—Oil hole in upper side of rod lower bearing must be toward right or camshaft side of engine on all rods.

Crankshaft:—Four bearings. Integral counterweights.
Journal Diameters—2¼" all bearings.
Bearing Type — Interchangeable, steel-backed, cadmium nickel-lined type.
Clearance—.001-.0027".
Adjustment—None (no shims). Replace bearings.
End Thrust—Taken by front bearing. Endplay .004-.006".

Camshaft:—Four bearing. Non-adjustable chain drive.
Bearing Type—#1 and 4 steel-backed, babbitt-lined type. #2 and 3 are cast-iron.
Clearance—#1 and 4—.0015-.002". #2 and 3—.002-.003".
End Thrust—Taken by spring-loaded plunger in camshaft sprocket and thrust plate on chain case cover.
Timing Chain—Link Belt. Width 1". Pitch ½". Length 23" or 46 links.
Camshaft Setting—Sprockets are marked. Mesh chain so that there are nine links or ten teeth (inclusive) between marks on sprockets.

Valves:— Head Diameter. Stem Diameter. Length.

Intake	1 33/64"	.3125"	5 3/16"
Exhaust	1 13/64"	.3125"	5 3/16"

	Seat Angle	Lift	Stem Clearance
Intake	30°	9/32"	.001-.0026"
Exhaust	30°	9/32"	.002-.0036"

Tappet Clearance—.010" all valves — engine hot.

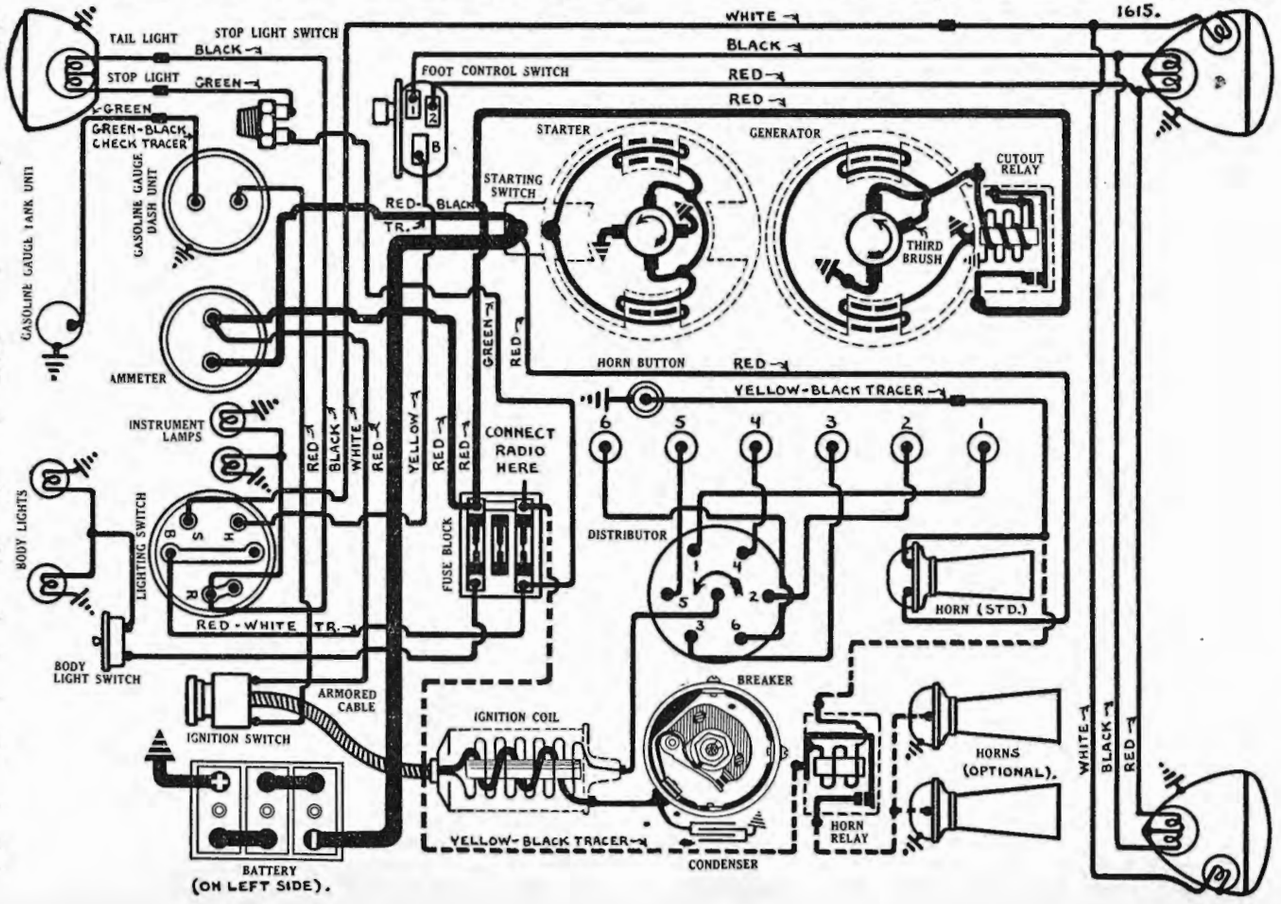
Valve Springs	Spring Pressure	Length
Valve Closed	32.2-34.2 lbs.	1 21/32".
Valve Open	71-75 lbs.	1 3/8".

Valve Timing—See Camshaft Setting above.
Intake Valves—Open 2° BTDC. Close 42° ALDC.
Exhaust Valves—Open 42° BLDC. Close 8° ATDC.
To Check Valve Timing—Set tappet clearance #1 exhaust valve at .012". This valve should close with piston #1 .025" past top dead center when flywheel mark 'EC-1' lines up with indicator in right front face of flywheel housing. Reset tappet clearance at .010" with engine hot.

Lubrication:—Pressure. Gear type oil pump located in crankcase.
Normal Oil Pressure—50 lbs. at 30 M.P.H.
Oil Pressure Relief Valve—Operates at 40-45 lbs. Located within crankcase. Adjustable by adding or removing shims or washers in plug above spring.
Capacity & Oil—5 qts. Use SAE. #50 (summer above 70°F), #40 (summer 40° to 70°F), #30 (winter 20° to 40°F), #20-W (winter 0° to 20°F).

CARBURETION:—See Carburetion Section for complete data on Carburetor, Fuel Pump and Gasoline Gauge.
Carburetor:—Stromberg, Model EX-22 or EXV-2, 1¼" downdraft type.
Fuel Pump:—AC. Type P-1521392 diaphragm type.
Gasoline Gauge: AC. electric type.

CLUTCH:—Illinois. Single plate, dry disc type. Cutch consists of pressure plate assembly bolted directly to flywheel by six capscrews in release lever mounting brackets. Adjusting shims located between bracket and face of flywheel (see clutch pedal adjustment for details of shims).
Clutch Pedal Adjustment—Free movement of clutch pedal must be 1-1¼". To adjust, take out cotter pin at either end of clutch pedal connecting link, turn turnbuckle to secure correct lash, replace cotter pin, tighten turnbuckle locknut. When limit of adjustment is reached, loosen two capscrews in each clutch mounting bracket slightly, pull out shim under bracket (shim holes are slotted — not necessary to take out capscrews completely), tighten bracket screws. This will provide new range of adjust-



ment on connecting link. Shims can be discarded. New shims of correct thickness are supplied with new driven plate.

Clutch Facings—Manufacturer recommends that no attempt be made to reline driven plate in the field as it is important that driven plate thickness under pressure be maintained accurately. Driven plate with new facings are furnished with new shims of correct thickness. These shims should be installed under bracket mounting screws.

Clutch Facings—Moulded type, 2 required, 5⅛" I.D., 7⅞" O.D., ⅛" thick.

NOTE:—Release levers are pivoted on eccentric pins which are correctly positioned and peened in place when clutch is assembled. Levers and pins should not be disturbed.

STEERING:—Front Suspension — Conventional 'I' beam section front axle with Reverse-Elliott ends and outboard-mounted semi-elliptic springs.

Kingpin Inclination—7½° crosswise.

Caster—2½°. Use wedge shims inserted between spring and spring pad on axle to correct caster.

Camber—1°.

Toe In—⅛". Adjust in usual manner by changing length of tie rod.

IGNITION:—Coil Model 536-J. Mounted on the dash.

Ignition Current—2 amperes idling, 4 stopped.

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

Distributor Model 622-Z (Cast-iron head), 623-A (Al. Head). Single breaker, 6 lobe cam, full automatic advance type with Auxiliary vacuum spark control.

Breaker Gap—Set at .018". Limits .018-.024".

Breaker Arm Spring Tension—17-21 ounces.

Cam Angles—Closed 36°. Open 24° distributor.

Automatic Advance—622-Z.

Distributor Degrees	R.P.M.	Engine Degrees	R.P.M.
Start	400	2	800
3	600	6	1200
7	1300	14	2600

Automatic Advance—623-A.

Start	400	2	800
9	1400	18	2800

Vacuum Spark Control Model 680-N—Provides additional advance for intermediate speeds above idling except when engine is suddenly accelerated or is operated with wide open throttle when spark will be retarded by return spring in unit.

Vacuum Spark Advance.

Engine Degrees	Vacuum
Start	7" of HG Minimum.
10-12°	9-13" of HG.

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

IGNITION TIMING:—

	Flywheel Degs.	Piston Pos.
Cast-iron Heads	5 1/3° BTDC	.0111" BTDC.
Aluminum Heads	2° BTDC	.0016" BTDC.

Timing (All engines)—With #1 piston on compression, turn engine over until piston is 5 1/3° or ½" (engines with cast-iron heads), 2° or 3/16" engines with Aluminum heads) before top dead center, stop when flywheel mark '/SA-1' lines up with indicator on housing, 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 Type C-7. 18 MM. Metric.

Spark Plug Gaps—Set at .025". Limits .023-.027".

BATTERY:—Willard, Type WS-1-13, R-1-13 (Export), 6 volt, 13 plate, 86 A.H. capacity (20 hour rate).

Starting Capacity—105 amperes for 20 minutes.

Grounded Terminal—Positive (+) terminal.

Location—Under left front seat.

Cars with Radio—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.

STARTER:—Model 738-J. Armature No. 823881.

Starter Drive—Manual pinion shift with overrunning clutch.

Rotation—Counter-clockwise at commutator end.

Brush Spring Tension—24-28 ounces each.

Cranking Performance—60 R.P.M., 175 amperes.

Performance Data

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

Starting Switch:—Mounted on starter field frame. Operated by pinion shift lever (starting pedal).

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

GENERATOR:—Model 937-Y. Armature No. 1859794. Air-cooled. Third brush control type.

Charging Rate Adjustment—Loosen lockscrew 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), 15 amperes (hot), 8.3 volts, 2000 R.P.M., 22-23 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 ozs., all brushes.

Field Current—3.5-4.5 amperes at 6.0 volts.

Removal:—Generator cradle mounted at left front of engine with fan belt drive. To remove, slack off drive belt, disconnect water pump coupling, loosen mounting clamp band.

Belt Adjustment:—Belt adjustment provided at fan bracket. With correct adjustment sideplay of belt should be 1" midway between pulleys.

SPECIAL GENERATOR:—Model 936-L. Used on cars with radio. See Equipment Section for complete data.

CUTOUT RELAY:—Model 265-B. Mounted on generator. See Equipment Section for complete data.

Cuts in—6.75-7.5 volts.

Cuts out—0-2.5 ampere discharge current.

Relay Contact Gap—.015-.025".

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

LIGHTING:—Switch Model 479-P. Foot Control Switch Model 465-V. Foot switch 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	1½	55.
Instrument	1	51.
Stop and Tail	21-2	1158.
Body lights	3	63.

FUSES: — Lighting — Two 20 ampere fuses on fuse block on dash. One extra fuse mounted on fuse block.

Generator Field—6 ampere capacity in regulator case (radio generator only).

HORNS:—Klaxon Model K-16 Type 2001 Std. Model K-26-G Type 1794 (high note) Type 1795 (low note) or Model K-33-C Type 2036 (high note) Type 2035 (low note) optional equipment. Optional horns are matched tone, twin horns operated by horn relay.

Horn Relay:—Model 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.

Armature Spring Tension—6-8 ounces.

SERIAL NUMBER:—First number, 1,635,001. On plate on floor inside right rear door (sedans), or under right seat (coupes).

ENGINE NUMBER:—First number, 1,640,001. On plate on right hand side of crankcase and on chassis serial number plate.

ENGINE:—Own, Model 73. Six cylinder, 'L' head type.
Bore—3¼". **Stroke—4½".**
Piston Displacement—224 cubic inches.
Rated Horsepower—25.35 A.M.A.
Developed Horsepower—85 at 3400 R.P.M.
Compression Ratio—6.5-1. Std. aluminum head.
Compression Pressure—105 lbs. at cranking speed (60 R.P.M.).

Pistons:—Bohn Bohnalite, aluminum alloy, Invar strut, split skirt type. Length, 3 23/32".
Weight—17 ozs. Held to 2 gram variation.
Removal—Pistons and rods removed from below.
Clearance—Top .020". Skirt .002". See Fitting Pistons.
Fitting New Pistons—Use .002" feeler stock ½" wide inserted between piston and cylinder wall on side opposite slot. Pull required to withdraw feeler should be between 10-16 lbs.
Installing Pistons—Slot should be toward left or camshaft side of engine.

Piston Rings:—Two compression, one oil control ring per piston, all above pin. Lower ring groove drilled radially with eight 9/64" oil drain holes.

Ring	Width	End Gap	Wall Thickness
Comp. All	⅛"	.007-.015"	.145"
Oil Cont.	3/16"	.010-.015"	.145"

Piston Pin:—Diameter 13/16". Length 2 13/16". Pin is locked in the connecting rod.
Pin Clearance in Piston—.0001" or push fit.

Connecting Rod:—Weight 34¼ ozs. Length 9¼".
Crankpin Journal Diameter—2¼".
Lower Bearing Type—Spun babbitt-lined type.
Clearance—.002". Sideplay .005".
Adjustment—Laminated shims provided. Do not file rods or bearing caps.
Installing Rods—Oil hole in upper side of rod lower bearing must be toward right or away from camshaft on all rods.

Crankshaft:—Seven bearing. Crankshaft is machined and crank throws bored out to reduce rotating weight (no counterweights).
Journal Diameters—2 47/64" all bearings.
Bearing Type—Interchangeable, steel-backed, babbitt-lined, except #1—bronze-backed, babbitt-lined type.
Clearance—.002".
Adjustment—None (no shims). Replace bearings.
End Thrust—Taken by front bearing. Endplay .004-.006".

Camshaft:—Four bearing. Non-adjustable chain drive.
Bearing Type—Babbitt-lined.
Clearance—.001-.0025" on diameters.
End Thrust—Taken by spring-loaded plunger in camshaft sprocket and thrust plate on chain case cover.
Timing Chain—Link Belt. Width 1". Pitch .500". Length 26" or 52 links.
Camshaft Setting—Sprockets are marked. Mesh chain so that there are exactly 10 links or 11 teeth (inclusive) between marks on sprockets.

Valves:—

	Head Diameter	Stem Diameter	Length
Intake	1 9/16"	.341"	5½"
Exhaust	1 15/16"	.341"	5½"

	Seat Angle	Lift	Stem Clearance
Intake	30°	.3125"	.001"
Exhaust	45°	.3175"	.001"

Tappet Clearance—.010" all valves, engine hot.

Valve Springs	Spring Pressure	Length
Valve Closed	50-55 lbs.	2 3/16"
Valve Open	94-99 lbs.	1⅞"

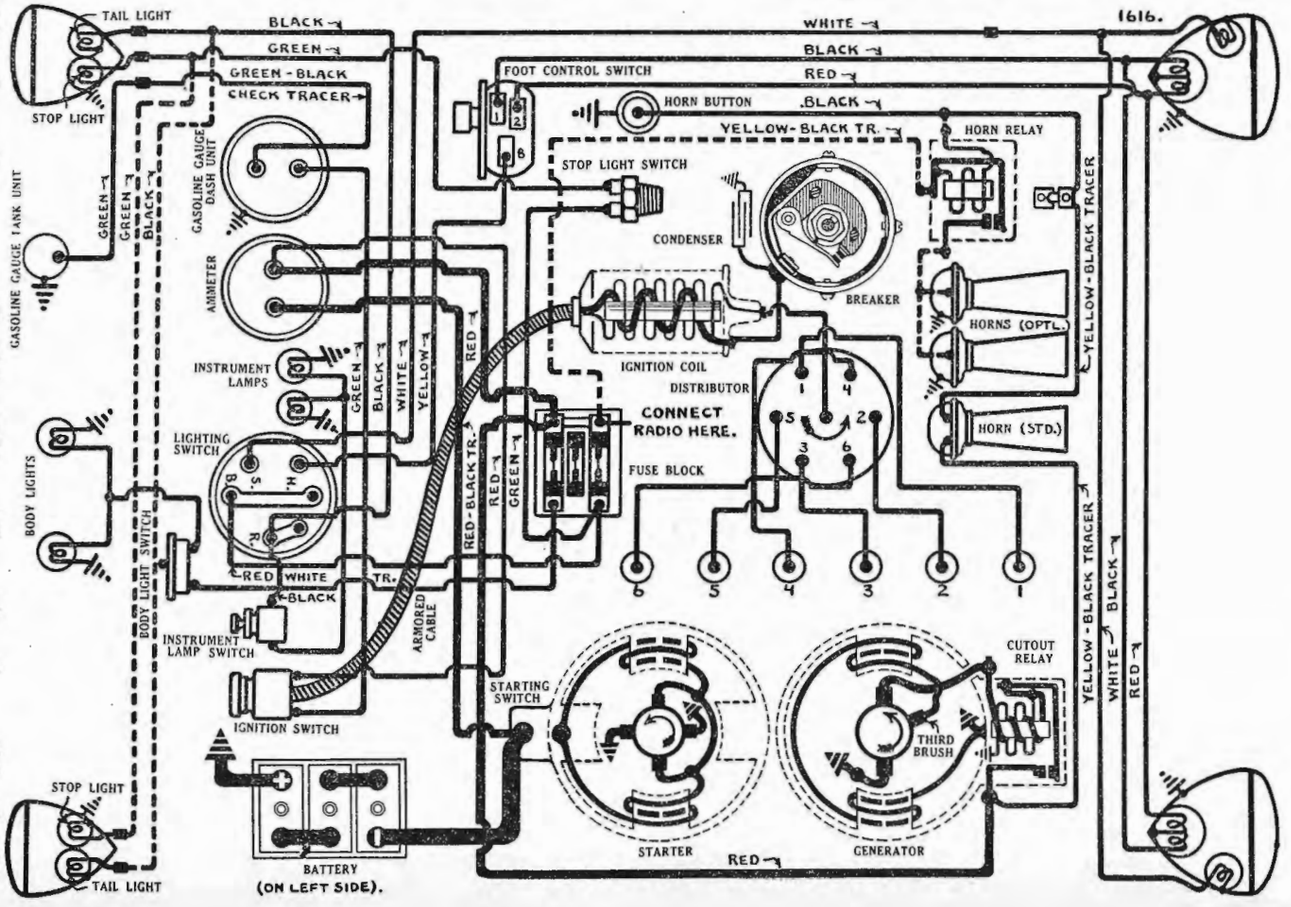
Valve Timing—See Camshaft Setting above.
Intake Valves—Open at TDC. Close 40° ALDC.
Exhaust Valves—Open 40° BLDC. Close 10° ATDC.
To Check Valve Timing—Set tappet clearance #1 exhaust valve at .012". This valve should close with piston #1 .0422" past top dead center when flywheel mark 'EC-1' lines up with indicator in inspection hole in right front face of flywheel housing. Reset tappet clearance at .010" with engine hot.

Lubrication:—Pressure. Gear type oil pump located in crankcase.
Normal Oil Pressure—50 lbs. at 30 M.P.H.
Oil Presure Relief Valve—Operates at 40-45 lbs. Located under plug on right side of crankcase. Adjustable by adding or removing shims or washers in plug above spring.
Capacity and Oil—6 qts. Use SAE. #50 (summer above 70°F.), #40 (40° to 70°F.), #30 (winter 20° to 40°F.), #20-W (winter 0° to 20°F.).

CARBURETION:—See Carburetion Section for complete data on Carburetor, Fuel Pump, and Gasoline Gauge.
Carburetor:—Stromberg, Model EX-23, 1¼" downdraft type.
Automatic Choke—Stromberg.
Fuel Pump:—A.C., Type P-1521674 diaphragm type.
Gasoline Gauge:—A.C., electric type.

CLUTCH:—Long Model 9AB-M. Single plate, dry disc type. No adjustment for wear required.
Clutch Pedal Adjustment—Free movement of clutch pedal should be 1¼". Adjust whenever free movement has decreased to ½". To adjust, turn set screw at lower end of clutch pedal (unscrew to increase free movement).
Clutch Facings—Moulded type, 2 required, 5¾" I.D., 9" O.D., 9/64" thick.

STEERING:—Front Suspension—Conventional 'I' beam section front axle with Reverse-Elliott ends and



outboard-mounted semi-elliptic springs.
Kingpin Inclination—7° crosswise.
Caster—2°. Use wedge shims inserted between spring and spring pad on axle to correct caster.
Camber—1°.
Toe In—⅛". Adjust in usual manner by changing length of tie rod.

IGNITION:—Coil Model 536-J. Mounted on the dash.
Ignition Current—1.8 amps. (idling), 3 (stopped).
Ignition Switch—Model 431-U. Connected to coil by armored cable.

Distributor Model 632-Z. Single breaker, 6 lobe cam, full automatic advance type. Manual advance consists of adjustment at distributor.
Breaker Gap—Set at .018". Limits .018-.024".
Breaker Arm Spring Tension—17-21 ounces.
Cam Angles—Closed 36°. Open 24° distributor.
Manual Advance—30° (engine) adjustment at distributor only.

Automatic Advance

Distributor		Engine	
Degrees	R.P.M.	Degrees	R.P.M.
Start	500	2	1000
10½	1950	21	3900

Removal—Mounted on left hand side of cylinder head. Driven by offset tongue-and-slot coupling. Take out hold-down screw in advance arm, lift out.

IGNITION TIMING:— Flywheel Degs. Piston Position
All engines ..... 3° BTDC. ..... .0037" BTDC.
Timing—With #1 piston on compression, turn engine over until piston is 3° or 5/16" on flywheel before top dead center, stop when flywheel mark '/SA-1' lines up with pointer in inspection hole in right front face of flywheel housing, loosen advance arm clamp bolt, rotate distributor until contacts begin to open, tighten clamp bolt, check spark plug connections (rotor must be opposite #1 segment in cap).

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

Spark Plugs:—Champion, Type C-7. 18 MM. Metric.
Spark Plug Gaps—Set at .025". Limits .023-.027".

BATTERY:—Willard, Type WS-1-13, R-1-13 (Export). 6 volt, 13 plate, 86 A.H. capacity (20 hour rate).
Starting Capacity—105 amperes for 20 minutes.
Grounded Terminal—Positive (+) terminal.
Location—In cradle under left front seat.
Cars with Radio—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.

STARTER:—Model 738-D. Armature No. 823881. Model 738-E (R.H.D.). Manual pinion shift operated by starting switch pedal. Drives through overrunning clutch.
Rotation—Counter-clockwise at commutator end.
Brush Spring Tension—24-28 ozs. each.
Cranking Performance—60 R.P.M., 180-190 amps.

Performance Data

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

Removal:—Flange mounted on right hand front face of flywheel housing. Take out flange mounting screws.

GENERATOR:—Model 936-D. Armature No. 1854856. Air-cooled. Third brush control type.
Charging Rate Adjustment—Loosen lockscrew 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—20 amperes (cold), 15 amperes (hot), 8.5 volts, 2400 R.P.M., 23-24 M.P.H.

Performance Data

	Amperes	Volts	R.P.M.
Cold	17-20	8.2-8.5	2400
Hot	13-15	7.7-8.0	3000

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.
Removal:—Generator pivot mounted at right front of engine with fan belt drive. To remove, take out two pivot bolts and one clamp bolt.
Belt Adjustment:—Loosen mounting bolts, pull generator away from engine until belt sideplay midway between pulleys is 1", tighten mounting bolts.

SPECIAL GENERATORS:—Model 936-E (cars with radio), Model 931-V (Police Service). See Equipment Section for complete data.

CUTOUT RELAY:—Model 265-H. Mounted on generator. See Equipment Section for complete data on this unit.
Cuts In—6.75-7.5 volts, 11 M.P.H.
Cuts Out—0-2.5 ampere discharge current.
Relay Contact Gap—.015-.025".
Air Gap—.012-.017".

LIGHTING:—Switch Model 479-P. Foot Control Switch Model 465-V. Foot control switch is 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	1½	55
Instrument	1	51
Tail, Body Lights	3	63
Stop	15	87

FUSES:—Lighting. Two 20 ampere fuses on fuse block on dash. One spare fuse mounted on fuse block.
Generator Field—6 ampere capacity in regulator case (radio generators only).

HORNS:—Klaxon Model K-16, Type 2001 or K-26-L, Type 1608 Standard. Model K-33-C, Type 1909 (low note), Type 1910 (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 volts minimum to close contacts. Current draw .8 amperes.
Contact Gap—.015-.025".
Air Gap—.012-.017" with contacts closed.
Armature Spring Tension—6-8 ounces.

SERIAL NUMBER:—First number, 1,810,001. On plate on floor inside right rear door (sedans), or under right seat (coupes).

ENGINE NUMBER:—First number, 1,815,001. On plate on right side of crankcase and on chassis serial number plate.

ENGINE:—Own Model 72. Eight cylinder, In Line, 'L' head type.
Bore—3⅛". Stroke—4".
Piston Displacement—245.4 cubic inches.
Rated Horsepower——31.25 A.M.A.
Developed Horsepower—95 at 3400 R.P.M.
Compression Ratio—6.7-1. Std. aluminum head.
Compression Pressure—115 lbs. at cranking speed (60 R.P.M.).

Pistons:—Bohn, Bohnalite, aluminum alloy, Invar strut, split skirt type. Length 3 19/32".
Weight—16 ounces. Held to 2 gram variation.
Removal—Pistons and rods removed from below.
Clearance—Top .025". Skirt .002" (see Fitting Pistons).
Fitting New Pistons—Use .002" feeler stock ½" wide to check clearance. Pull required to withdraw feeler from between piston and cylinder wall on side opposite slot must be between 10-16 lbs.
Installing Pistons—Slot should be toward left or on camshaft side of engine.

Piston Rings:—Two compression, one oil control ring per piston, all above pin. Lower ring groove drilled radially with eight 9/64" oil drain holes.

Ring	Width	End Gap	Wall Thickness
Comp. All	⅛"	.010-.015"	.140"
Oil Cont.	3/16"	.007-.015"	.140"

Piston Pin:—Diameter 13/16". Length 2⅝". Pin is locked in the connecting rod.
Pin Clearance in Piston—.0001" or push fit.

Connecting Rod:—Weight 30¾ ozs. Length 8⅝".
Crankpin Journal Diameter—2⅛".
Lower Bearing Type—Spun babbitt-lined type.
Clearance—.002". Sideplay .005".
Adjustment—Laminated shims provided. Do not file rods or caps.
Installing Rods—Oil hole in upper side of rod lower bearing must be toward right or away from camshaft on all rods.

Crankshaft:—Five bearing. Lanchester vibration dampener.
Journal Diameter—2⅜" all bearings.
Bearing Type—Interchangeable bronze-backed, babbitt-lined type. No shims.
Clearance—.002".
Adjustment—None (no shims). Replace bearings.
End Thrust—Taken by front bearing. Endplay .006".

Camshaft:—Six bearing. Adjustable chain drive.
Bearing Type—Babbitt-lined type.
Clearance—.0015-.002".
End Thrust—Taken by spring-loaded plunger in camshaft gear and thrust plate on chain case cover.
Timing Chain—Link Belt. Width 1¼". Pitch ½". Length 33½" or 67 links.
Chain Adjustment—Chain adjusted by shifting accessory sprocket (water pump bracket). To adjust, loosen two flange mouting screws, back off adjustment set screw lock nut, turn up adjustment set screw until chain hums with engine running, back off screw until chain runs noiselessly, tighten lock nut and mounting screws.
Camshaft Setting—Sprockets are marked. Mesh chain so there are exactly ten links between marks on sprockets or eleven teeth inclusive of teeth meshed opposite marks.

Valves:—

	Head Diameter	Stem Diameter	Length
Intake	1⅜"	.341"	4⅞"
Exhaust	1¼"	.341"	4⅞"

	Seat Angle	Lift	Stem Clearance
Intake	45°	.3145"	.001"
Exhaust	45°	.3195"	.001"

Tappet Clearance—.010" all valves—engine hot.

Valve Springs—	Spring Pressure	Length
Valve Closed	50 lbs.	2 3/16"
Valve Open	106 lbs.	1⅞"

Valve Timing—See Camshaft Setting above.
Intake Valves—Open at TDC. Close 40° ALDC.
Exhaust Valves—Open 40° BLDC. Close 10° ATDC.
To Check Valve Timing—Set tappet clearance #1 exhaust valve at .012". This valve should close with piston #1 .037" past top dead center when flywheel mark 'EC-1' lines up with pointer in inspection hole in right hand front face of flywheel housing. Reset tappet clearance at .010" with engine hot.

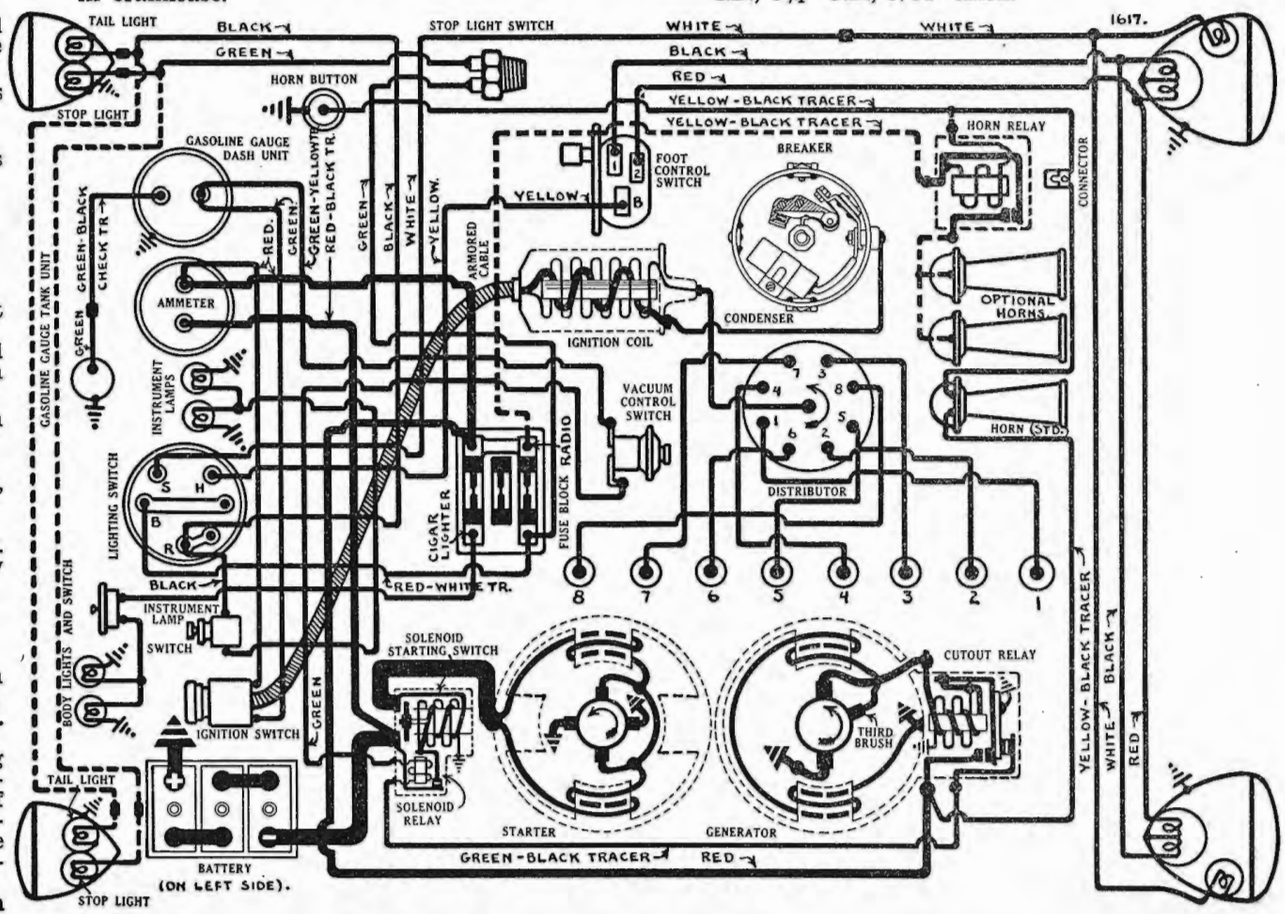
Lubrication:—Pressure. Gear type oil pump located in crankcase.
Normal Oil Pressure—50 lbs. at 30 M.P.H.
Oil Pressure Relief Valve—Operates at 40-50 lbs. Located under plug on side of crankcase. Adjustable by adding or removing shims or washers in plug above spring.
Capacity and Oil—7 qts. Use SAE. #50 (summer above 70°F.), #40 (summer 40° to 70°F.), #30 (winter 20° to 40°F.), #20-W (winter 0° to 20°F.).

CARBURETION:—See Carburetion Section for complete data on Carburetor, Automatic Choke, Fuel Pump, and Gasoline Gauge.
Carburetor:—Stromberg, Model EE-14, 1" dual, downdraft type.
Automatic Choke—Stromberg.

Fuel Pump:—A.C., Type 1521674 diaphragm type.

Gasoline Gauge:—A.C., electric type.

CLUTCH:—Long Model 9AB-M. Single plate, dry disc type. No adjustment required for wear.
Clutch Pedal Adjustment—Free movement of clutch pedal should be 1¼". Adjust whenever free movement has decreased to ½". To adjust, turn set screw at lower end of clutch pedal (unscrew to increase free movement).
Clutch Facings—Moulded type, 2 required, 5½" I.D., 9¾" O.D., 9/64" thick.



STEERING:—Front suspension—Conventional 'I' beam section front axle with Reverse-Elliott ends and outboard-mounted semi-elliptic springs.
Kingpin Inclination—7° crosswise.
Caster—2°. Use wedge shims inserted between spring and spring pad on axle to correct caster.
Camber—1°.
Toe In—⅛". Adjust in usual manner by changing length of tie rod.

IGNITION:—**Coil Model 536-J.** Mounted on dash.
Ignition Current—1.8 amperes idling, 3 stopped.
Ignition Switch:—**Model 431-U.** Connected to coil by armored cable.

Distributor Model 661-X. Single breaker, 8 lobe cam, full automatic advance type with auxiliary vacuum spark control.
Breaker Gap—Set at .018".
Breaker Arm Spring Tension—19-23 ounces.
Cam Angles—Closed 31°. Open 14° distributor.

Automatic Advance

Distributor		Engine	
Degrees	R.P.M.	Degrees	R.P.M.
Start	500	2	1000
8½	2050	17	4100

Vacuum Spark Control Model 680-N:—Provides additional spark advance for intermediate engine speeds except when car is suddenly accelerated or operated with wide open throttle when spark will be retarded by return spring in unit. Vacuum unit not effective at idling or closed throttle position since vacuum connection on carburetor is above throttle valve.

Vacuum Spark Advance

Degrees (Engine)	Vacuum (Ins. of Hg.)
Start	7" minimum
10-12	9-13"

NOTE—⅛" movement of vacuum unit plunger is equal to approximately 3° advance.

IGNITION TIMING:— Flywheel Degs. Piston Position
All engines 3° BTDC .0034" BTDC.
Timing—With #1 piston on compression, turn engine over until piston is 3° or 5/16" on flywheel before top dead center, stop when flywheel mark '/SA-1' lines up with indicator in inspection hole in right front face of flywheel housing, loosen advance arm clamp bolt, rotate distributor until contacts begin to open, tighten clamp bolt, check spark plug connections (rotor must be opposite #1 segment in cap).

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

Spark Plugs:—Champion, Type C-7. 18 MM. Metric.
Spark Plug Gaps—Set at .025".

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—In cradle under left front seat.
Cars with Radio—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.

STARTER:—**Model 734-U, 738-A (R.H.D.). Armature No. 823881.** Solenoid operated pinion shift and starting switch type. Solenoid controlled by accelerator pedal. Starter drives through overrunning clutch.
Rotation—Counter-clockwise at commutator end.
Brush Spring Tension—24-28 ounces each.
Cranking Performance—60 R.P.M., 190-200 amps.

Performance Data

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

Starting Switch:—Solenoid Type 1517 (734-U), 1512 (738-A). Vacuum Switch Type 1600. See Equipment Section for complete data. Solenoid is controlled by vacuum switch (operated by accelerator pedal), and is combination starting switch and pinion shift.

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

GENERATOR:—**Model 936-F. Armature No. 1854856.** Air-cooled. Third brush control type.
Charging Rate Adjustment—Loosen lockscrew 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—20 amperes (cold), 15 amperes (hot), 8.5 volts, 2400 R.P.M., 23-24 M.P.H.

Performance Data

	Amperes	Volts	R.P.M.
Cold	17-20	8.2-8.5	2400
Hot	13-15	7.7-8.0	3000

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.

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

Belt Adjustment:—Loosen mounting bolts, pull generator away from engine until belt sideplay midway between pulleys is 1", tighten mounting bolts.

SPECIAL GENERATORS:—**Model 936-G.** Used on cars with radio. See Equipment Section for complete data.

CUTOUT RELAY:—**Model 265-S.** Mounted on generator. Has special ground contacts for starter solenoid control. See Equipment Section for complete data on this unit.
Cuts In—6.75-7.5 volts.
Cuts Out—0-2.5 ampere discharge current.
Relay Contact Gap—.015-.025".
Air Gap—.012-.017".

LIGHTING:—**Switch Model 479-P. Foot Control Switch Model 465-V.** Foot control switch 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	1½	55
Instrument	1	51
Tail, Body Lights	3	63
Stop	15	87

FUSES:—**Lighting**—Two 20 ampere fuses on fuse block on dash. One extra fuse mounted on fuse block.
Generator Field—6 ampere capacity in regulator case (radio generator only).

HORNS:—Klaxon Model K-26-L, Type 1608 Standard. Model K-33-C Type 1909 (low note), Type 1910 (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 volts minimum to close contacts. Current draw .8 amperes.
Contact Gap—.015-.025".
Air Gap—.012-.017" with contacts closed.
Armature Spring Tension—6-8 ounces.

SERIAL NUMBER:—First number, 1,035,001. On plate on floor inside right rear door (sedans) or under right seat (coupes).

ENGINE NUMBER:—First number, 1,040,001. On plate on right hand side of crankcase and on chassis serial number plate.

ENGINE:—Own Model 75. Eight cylinder, In line, 'L' head type. Engine is supercharged. Centrifugal type supercharger located between carburetor and manifold (downdraft carburetor is mounted on top of supercharger housing). No special directions required for servicing this engine.
Bore—3¼". **Stroke**—4".
Piston Displacement—265.4 cubic inches.
Rated Horsepower—33.8 A.M.A.
Developed Horsepower—140 at 4000 R.P.M.
Compression Ratio—6.7-1 Std. aluminum head.
Compression Pressure—120 lbs. at cranking speed (60 R.P.M.).

Pistons:—Bohn Bohnalite, aluminum alloy, Invar strut, split skirt type. Length 3 23/32".
Weight—17 ounces. Held to 2 gram variation.
Removal—Pistons and rods removed from below.
Clearance—Skirt .002". See Fitting Pistons.
Fitting New Pistons—Use .002" feeler stock ½" wide to check clearance. Pull required to withdraw feeler from between piston and cylinder wall on side opposite slot must be between 10-16 lbs.
Installing Pistons—Slot should be toward left or camshaft side of engine.

Piston Rings:—Two compression, one oil control ring per piston, all above pin. Lower ring groove drilled radially with eight 9/64" oil drain holes.

Ring	Width	End Gap	Wall Thickness
Comp. All	⅛"	.010-.015"	.145"
Oil Cont.	3/16"	.007-.015"	.145"

Piston Pin:—Diameter 13/16". Length 2 13/16". Pin is locked in the connecting rod.
Pin Clearance in Piston—.0001" or push fit.

Connecting Rod:—Weight 30¾ ozs. Length 8⅝".
Crankpin Journal Diameter—2⅛".
Lower Bearing Type—Spun-babbitt lined type.
Clearance—.002". Sideplay .005".
Adjustment—Laminated shims provided. Do not file rods or caps.
Installing Rods—Oil hole in upper side of rod lower bearing must be toward right or away from camshaft on all rods.

Crankshaft:—Five bearing. Lanchester vibration dampener.
Journal Diameter—2⅜" all bearings.
Bearing Type—Interchangeable bronze-backed, babbitt-lined type. No shims.
Clearance—.002".
Adjustment—None (no shims). Replace bearings.
End Thrust—Taken by front bearing. Endplay .006".

Camshaft:—Six bearing. Adjustable chain drive.
Bearing Type—Babbitt-lined type.
Clearance—.015-.002".
End Thrust—Taken by spring-loaded plunger in camshaft gear and thrust plate on chain case cover.
Timing Chain—Link belt. Width 1½". Pitch ½". Length 34" or 68 links.
Chain Adjustment—Chain adjusted by shifting accessory sprocket (water pump bracket). To adjust, loosen two flange mounting screws, back off adjutsment setscrew locknut, turn up adjustment setscrew until chain hums with engine running, back off screw until chain runs noiselessly, tighten locknut and mounting screws.
Camshaft Setting—Sprockets are marked. Mesh chain so there are exactly ten links between marks on sprockets ar eleven teeth inclusive of teeth meshed opposite marks.

Valves:—	Head Diam.	Stem Diam.	Length
Intake	1½"	.341"	4⅞"
Exhaust	1⅜"	.341"	4⅞"

	Seat Angle	Lift	Stem Clearance
Intake	45°	.3145"	.001"
Exhaust	45°	.3195"	.001"

Tappet Clearance—.010" all valves—engine hot.

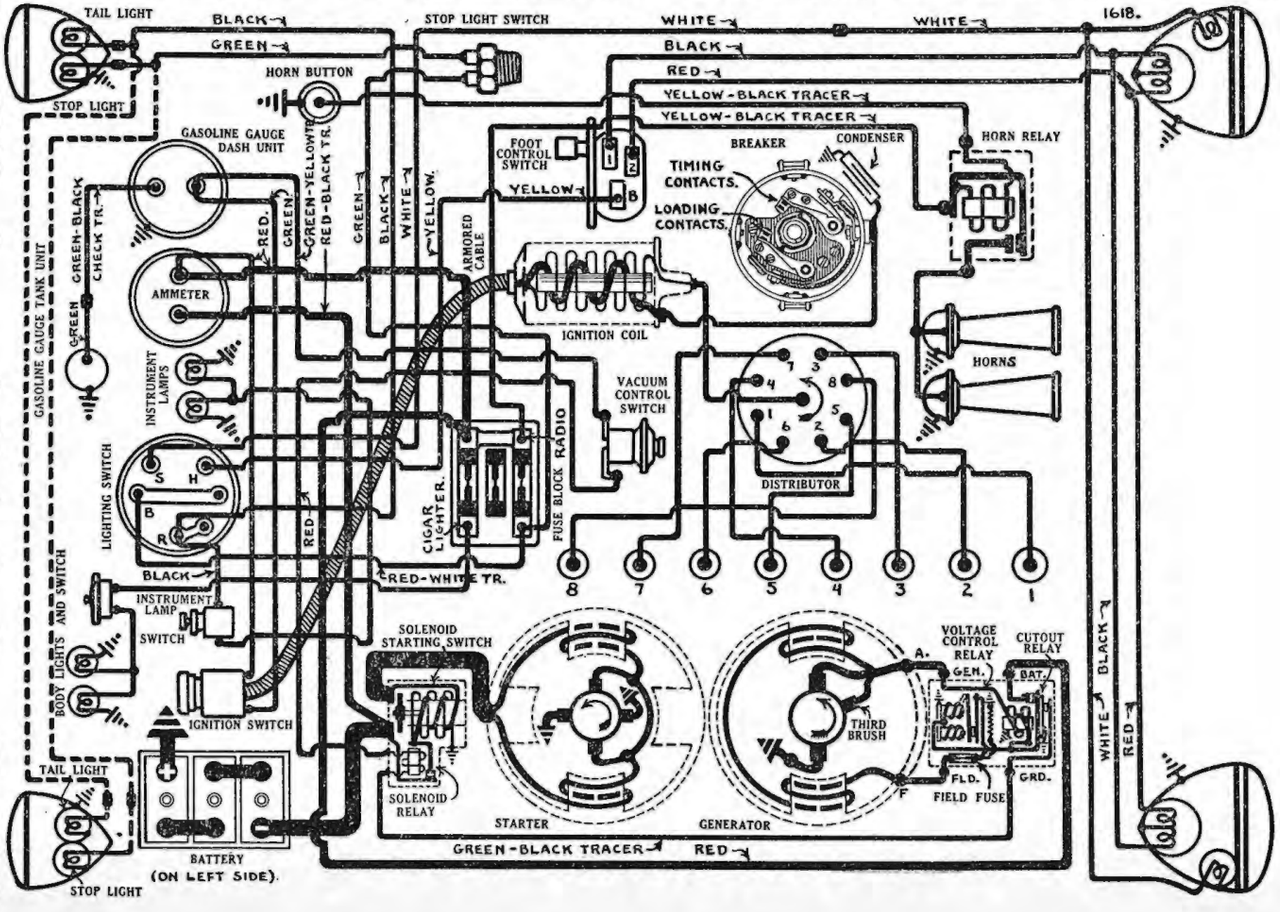
Valve Springs—	Spring Pressure	Length
Valve Closed	50 lbs.	2 3/16"
Valve Open	106 lbs.	1⅞"

Valve Timing—See Camshaft Setting above. Intake Valves—Open at TDC. Close 40° ALDC. Exhaust Valves—Open 40° BLDC. Close 10° ATDC.
To Check Valve Timing—Set tappet clearance #1 exhaust valve at .012". This valve should close with piston #1 .037" past top dead center when flywheel mark 'EC-1' lines up with pointer in inspection hole in right hand front face of flywheel housing. Reset tappet clearance at .010" with engine hot.

Lubrication:—Pressure. Gear type oil pump located in crankcase.
Normal Oil Pressure—50 lbs. at 30 M.P.H.
Oil Pressure Relief Valve—Operates at 40-45 lbs. Located under plug on side of crankcase. Adjustable by adding or removing shims or washers in plug above spring.
Capacity & Oil—7 qts. Use SAE. #50 (summer above 70°F). #40 (summer 40° to 70°F), #30 (winter 20° to 40°F), #20-W (winter 0° to 20°F).

CARBURETION:—See Carburetion Section for complete data on Carburetor, Automatic Choke, Fuel Pump, and Gasoline Gauge.
Carburetor:—Stromberg, Model EX-32, 1¼" downdraft type.
Automatic Choke—Stromberg.
Fuel Pump:—AC. Type 1521674 diaphragm type.
Gasoline Gauge:—A.C., Electric type.

CLUTCH:—Long Model 9AB-M. Single plate, dry disc type. No adjustment required for wear.
Clutch Pedal Adjustment—Free movement of clutch pedal should be 1¼". Adjust whenever free movement has decreased to ½". To adjust,



turn setscrew at lower end of clutch pedal (unscrew to increase free movement).
Clutch Facings—Moulded type, 2 required, 5½" I.D., 9¾" O.D., 9/64" thick.

STEERING:—Front Suspension—Conventional 'I' beam section front axle with Reverse-Elliott ends and outboard-mounted semi-elliptic springs.
Kingpin Inclination—7° crosswise.
Caster—2°. Use wedge shims inserted between spring and spring pad on axle to correct caster.
Camber—1°.
Toe In—⅛". Adjust in usual manner by changing length of tie rod.

IGNITION:—Coil Model 539-M. Mounted on dash.
Ignition Current—1.8 amperes idling, 3 stopped.
Ignition Switch—Model 431-U (switch and cable). Connected to coil by armored cable.
Distributor Model 661-Y. Double breaker, 8 lobe cam, full automatic advance type with auxiliary vacuum spark control. Stationary contacts are used for timing. Movable contacts are used to load coil (open and close 10° before timing contacts). Contacts must be synchronized—see Timing.
Breaker Gap—Set at .018".
Breaker Arm Spring Tension—19-23 ounces.
Cam Angles—Closed 37°. Open 8° distributor. With movable contacts properly set to load coil. See Synchronization directions.

Automatic Advance

Distributor		Engine	
Degrees	R.P.M.	Degrees	R.P.M.
Start	200	1.5	400
5.25	1000	10.5	2000
7.75	2000	15.5	4000

Vacuum Spark Control Model 680-P—Provides additional spark advance for intermediate engine speeds except when engine is suddenly accelerated or is operated with wide open throttle when spark is retarded by return spring in unit. Not effective at idling speeds since vacuum connection on carburetor is above throttle valve.

Vacuum Spark Advance

Engine Degrees	Vacuum
Start	10" of HG. Minimum
10-12°	16" of HG. Maximum

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
Stat'ry (timing) contacts 3° BTDC. ..... .0034" BTDC.
Movable (loading) contacts 11-13° BTDC.
Timing (Stationary Contacts)—With #1 piston on compression, turn engine over until piston is 3° before top dead center, stop when flywheel mark '/SA-1' lines up with pointer in right front face of flywheel housing, 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 movable contacts as directed below.
Synchronization (Movable Contacts)—These contacts are set to open and close 8-10° before timing contacts. Use Delco-Remy Synchronizing tool, Part #1838182 (not designed for this distributor but may be used). Place tool in position on top of breaker cam, rotate distributor until stationary (timing) contacts just open, note point on center scale directly opposite fixed point on distributor cup, then rotate distributor 35° so that point on end scale 8-10° less than original reading on center scale lines up with same point on distributor cup, loosen lockscrews on sub-plate carrying movable contacts, turn eccentric adjusting screw until contacts open, tighten lockscrews.

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

Spark Plugs:—Champion, Type C-7. 18 MM. Metric.
Spark Plug Gaps—Set at .025". Limits .023-.027".

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 driver's seat.
Cars with Radio—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.

STARTER:—Model 734-U, 738-A (RHD). Armature No. 823881.
Starter Drive—Solenoid operated pinion shift. Starter drives through overrunning clutch.
Rotation—Counter-clockwise at commutator end.
Brush Spring Tension—24-28 ounces.
Cranking Performance—60 R.P.M., 190-200 amps.

Performance Data

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

Starting Switch:—Solenoid Type 1517 (734-U), 1512 (738-A). Vacuum Switch Type 1600. See Equipment Section for complete data. Solenoid is combination starting switch and pinion shift and is controlled through relay in solenoid case by vacuum switch operated by accelerator pedal.

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

GENERATOR:—Model 936-G . Armature No. 1854856. Third brush control in conjunction with Voltage Control Relay (two-step charging rate). See Equipment Section for complete data on Voltage Control Relay.
Charging Rate Adjustment—Use test meters to check generator output. Short out regulator by connecting jumper wire between 'F' terminal on generator and ground on generator frame. Loosen lockscrew 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—23 amperes (cold), 20 amperes (hot), 8.8 volts, 2800 R.P.M., 24-25 M.P.H.

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 in regulator case.

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

Belt Adjustment—Loosen mounting bolts, pull generator away from engine until belt sideplay midway between pulleys is 1", tighten mounting bolts.

CONTROL UNIT:—Model 5590. Mounted on generator. Consists of Cutout Relay and Voltage Control Relay in a single case. See Equipment Section for complete data on these units.

Cutout Relay

Cuts In—6.4-6.8 volts.
Cuts Out—0-3.0 ampere discharge current.
Relay Contact Gap—.018-.025".
Air Gap—.018-.022" with 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:—Switch Model 479-P. Foot Control Switch Model 465-V. Foot switch 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	1½	55
Instrument	1	51
Tail, Body Lights	3	63
Stop	15	87

FUSES:—Lighting—Two 20 ampere on fuse block on dash. One extra fuse mounted on fuse block.
Generator Field—6 ampere in regulator case.

HORNS:—Klaxon Model K-33-C, Type 1909 (low note), 1910 (high note). Matched tone, twin horns operated by horn relay.
Horn Relay:—Model 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.
Armature Spring Tension—6-8 ounces.

SERIAL NUMBER:—First number, 53-101. On plate on engine side of dash. All model numbers will carry prefix '53'.

ENGINE NUMBER:—First number, 70,000. 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—93 at 3800 R.P.M. (Std. 6.25-1 head), 100 at 3800 R.P.M. (7.0-1 head).
Compression Ratio—6.25-1 (Std. cast-iron head), 7.0-1 (optl. composite aluminum-iron head).
Compression Pressure—116 lbs. at 219 R.P.M. (6.25-1 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".
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 cylinders #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 Diameter	Stem Diameter	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.
Exh. 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 the dead center mark 'UDC.1-6' lines up with the pointer on the housing. No flywheel mark provided.

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—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:—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 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