NATIONAL SERVICE MANUAL

TWENTY-SEVENTH SUPPLEMENT—1934 CAR MODELS

NATIONAL AUTOMOTIVE SERVICE
SAN FRANCISCO, CALIFORNIA

1934 CAR MODELS——EQUIPMENT USED

Page	CAR	Model	Serial Nos.	Year	BATTERY Make	BATTERY Type	BATTERY Gr. Ter.	LIGHTING Switch Make	LIGHTING Switch Model	LIGHTING Circuit Fuses	LIGHTING Circuit Breaker	CARBURETION Carburetor Make and Model	CARBURETION Fuel Pump Make and Model
1200	AUBURN	6-52X	6-52X-1001	1934	U.S.L.	RN-15A	Pos.	Sor.Man.	B-5640-A	20	*	Carter 288-S	SW 708-A
1200	AUBURN	6-52Y	6-52Y-1001	1934	U.S.L.	RN-15A	Pos.	Sor.Man.	B-5640-A	20	*	Carter 288-S	SW 708-A
1202	AUBURN	8-50X	8-50X-1001	1934	U.S.L.	XY-15A	Pos.	Sor.Man.	B-5640-A	20	*	Strom. EX-32	SW 706-D
1204	AUBURN	8-50Y	8-50Y-1001	1934	U.S.L.	XY-15A	Pos.	Sor.Man.	A-5640-A	20	*	Strom. EE-1	SW 706-D
†	AUBURN	12-165		1934	U.S.L.	XY-17A	Pos.	Sor.Man.	5670-A	20	*	Strom. EX-2	SW 527-C
1206	AUSTIN	Bantam	375-5010	1934	U.S.L.	XY-9A	Neg.	B. & S.	50518	20	*	Till. M 10 A	None
1208	BUICK	34-40	2,735,509	1934	Delco	13-JW	Neg.	Delco-R.	478-S	30	*	Marvel BB-1	AC R-1521765
1210	BUICK	34-50	2,706,453	1934	Delco	13-JW	Neg.	Delco-R.	487-F	*	D.R.411-A	Marvel ED-1-S-10-1577	AC I-1521538
1212	BUICK	34-60	2,706,453	1934	Delco	15-GW	Neg.	Delco-R.	487-F	*	D.R.411-A	Marvel ED-2-S-10-1579	AC F-856138
1212	BUICK	34-90	2,706,453	1934	Delco	17-DW	Neg.	Delco-R.	487-F	*	D.R.411-A	Marvel ED-3-10-1581	AC F-856138
1214	CADILLAC	355-D	3,100,001	1934	Delco	17-DW	Pos.	Del.-R.	487-J,G,K,H	*	D.R.411-A	Detroit X-8244	AC D-856062
1216	CADILLAC	370-D	4,100,001	1934	Delco	21-DW	Pos.	Delco-R.	487-H,K	*	D.R.411-A	Detroit 51	AC D-856263
1218	CADILLAC	452-D	5,100,001	1934	Delco	25-AW	Pos.	Delco-R.	487-H,K	*	D.R.411-A	Detroit 51	AC D-856263
1220	CHEVROLET	DC	1001	1934	Delco	13-NW, PW	Neg.	Delco-R.	487-H	15	*	Carter 284-S	AC R-1521450
1222	CHEVROLET	DA	1001	1934	Delco	15-PW, Q	Neg.	Delco-R.	478-P	15	*	Carter 285-S	AC R-1521450
1224	CHRYSLER	CA	6,650,001	1934	Willard	WH-2-15	Pos.	Clum	9556	20	*	Carter E6C1	AC P-1521381
1224	CHRYSLER	CB	6,700,001	1934	Willard	WH-2-15	Pos.	Clum	9556	20	*	Carter E6C1	AC P-1521381
1226	CHRYSLER	CU	6,593,001	1934	Willard	WH-4-17	Pos.	Clum	9556	20	*	Strom. EE-22	AC D-1521685
1226	CHRYSLER	CV	7,010,001	1934	Willard	WH-4-17	Pos.	Clum	9556	20	*	Strom. EE-22	AC I-1521549
1228	CHRYSLER	CW	7,803,751	1934	Willard	RH-21	Pos.	Clum	9556	20	*	Strom. EE-3	AC I-1521549
1230	CONTINENTAL	41	1001	1934	U.S.L.	A-13-A	Neg.	Sor.Man.	5670-AA	20	*	Marvel AC-10-1530	AC P-1521229
†	CUNNINGHAM	V-10		1934	Willard	RH-4-15	Neg.	Delco-R.	486-D	*	D.R.5759	Strom. UUR-2	SW 403-AB
1232	DE SOTO	SE	5,068,501	1934	Willard	WS-4-17	Pos.	Clum	9556	20	*	Carter E6B1	AC P-1521381
1234	DODGE	DR	3,680,001	1934	Willard	WT-1-15	Pos.	Clum	9556	20	*	Strom. EX-22	AC B-1521211
1234	DODGE	DS	4,528,651	1934	Willard	WT-1-15	Pos.	Clum	9556	20	*	Strom. EX-22	AC B-1521211
1236	DUESENBERG	J	2125	1934	Exide	XR-21-ER	Neg.	Delco-R.	486-D	*	D.R.5759	Strom. EE-3, UU-3	SW 644-B, C
1238	FORD	V-8-112		1934	Ford	40-17	Pos.	Ford	40-3616-B	20	*	Strom. EE-1	AC R-1521459
†	FRANKLIN	17-B		1934	Willard	RH-5-19	Pos.	Delco-R.	486-V	20, 30	*	Strom. EE-2	AC D-1521119
†	FRANKLIN	18B, C		1934	Willard	WH-1-13	Pos.	Delco-R.	486-V	20	*	Strom. URO-2	AC B-855898
‡	FRANKLIN	19A, B		1934	Willard	WSB-21	Pos.	Delco-R.	486-V	20, 30	*	Strom. URO-2	AC B-855898
1240	GRAHAM	Std. 68	1,615,001	1934	Willard	WS-1-13	Pos.	Clum	9463	20	*	Strom. EX-22	AC R-1521674
1240	GRAHAM	Spec. 68	1,615,001	1934	Willard	WH-2-15	Pos.	Clum	9463	20	*	Strom. EX-22	AC R-1521674
1242	GRAHAM	Std. 67	1,805,001	1934	Willard	WS-2-15	Pos.	Clum	9463	20	*	Strom. URO-2	AC R-1521674
1242	GRAHAM	Spec. 67	1,805,001	1934	Willard	WH-2-15	Pos.	Clum	9463	20	*	Strom. EX-32	AC R-1521674
1244	GRAHAM	Cust. 69	1,025,001	1934	Willard	WH-2-15	Pos.	Clum	9463	20	*	Strom. EX-32	AC R-1521674
1246	HUDSON	LL, LT	252,000	1934	Exide	XTL-19-17-F	Pos.	Sor.Man.	5640-A	20	*	Carter 282-S	AC R-1521539*
1246	HUDSON	LTS	964,244	1934	Exide	XTL-19-17-F	Pos.	Sor.Man.	C-5640-A	20	*	Carter 299-S	AC R-1521539*

†—Refer to Car Page for preceding year.
‡—Refer to Franklin 16-B (1933).

1934 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	IG-4065	IGB-4318	Oakes	Hershey	Auto-Lite	MAJ-4032	MAJ-2006	GAR-4603-3	GAR-2077	1934	6-52X	AUBURN	1200
Auto-Lite	IG-4065	IGB-4318	Oakes	Hershey	Auto-Lite	MAJ-4033	MAJ-2006	GAR-4603-3	GAR-2077	1934	6-52Y	AUBURN	1200
Auto-Lite	CE-4001	IGP-4002-A	Oakes	Hershey	Auto-Lite	MAB-4063	MAB-2006	GAR-4603-3	GAR-2077	1934	8-50X	AUBURN	1202
Auto-Lite	CE-4001	IGP-4002-A	Oakes	Hershey	Auto-Lite	MAB-4063	MAB-2006	GAR-4603-3	GAR-2077	1934	8-50Y	AUBURN	1204
Delco-Remy	528-C	667-Z	Electrolock	15-SD	Delco-Remy	543,46	1837058	931-E, F	1844199*	1934	12-165	AUBURN	†
Auto-Lite	IG-4065	IGB-4086-A	B.&S.	50518	Auto-Lite	MAK-4001	MAK-2006	GAS-4104-B	GAS-2076	1934	Bantam	AUSTIN	1206
Delco-Remy	528-H	663-E	Oakes	Hershey	Delco-Remy	734-Z	823881	935-K	1854856	1934	40	BUICK	1208
Delco-Remy	528-H	663-C	Oakes	Hershey	Delco-Remy	727-G	823881	956-H	1845920	1934	50	BUICK	1210
Delco-Remy	528-H	663-A	Oakes	Hershey	Delco-Remy	727-F	820158	956-H	1845920	1934	60	BUICK	1212
Delco-Remy	528-H	663-A	Oakes	Hershey	Delco-Remy	727-F	820158	956-H	1845920	1934	90	BUICK	1212
Delco-Remy	539-D	661-V	Delco-Remy		Delco-Remy	728-U, V	818134	933-B	1854458	1934	355-D	CADILLAC	1214
Delco-Remy	553-E	667-C	Delco-Remy	431-E	Delco-Remy	580	1837058	933-C	1854458	1934	370-D	CADILLAC	1216
Delco-Remy	553-E	4118	Delco-Remy	431-F	Delco-Remy	580	1837058	933-C	1854458	1934	452-D	CADILLAC	1218
Delco-Remy	538-C	622-L	Delco-Remy	Elec.	Delco-Remy	714-L, 34-J	816163	943-J	817221	1934	DC	CHEVROLET	1220
Delco-Remy	538-C	644-R	Delco-Remy	Elec.	Delco-Remy	734-S, V	1847432	935-B, 67-E	1854856*	1934	DA	CHEVROLET	1222
Delco-Remy	540-J, K	644-U	Delco-Remy	Elec.	Delco-Remy	727-M	823881	935-D	1854856	1934	CA	CHRYSLER	1224
Delco-Remy	540-J, K	644-U	Delco-Remy	Elec.	Delco-Remy	727-M	823881	935-D	1854856	1934	CB	CHRYSLER	1224
Delco-Remy	540-F	661-S	Delco-Remy	Elec.	Delco-Remy	727-J	823881	935-G	1854856	1934	CU	CHRYSLER	1226
Delco-Remy	540-F	661-T	Delco-Remy	Elec.	Delco-Remy	727-J	823881	935-G	1854856	1934	CV	CHRYSLER	1226
Delco-Remy	540-L	661-Z	Delco-Remy	Elec.	Delco-Remy	728-W		967-P	1836971	1934	CW	CHRYSLER	1228
Auto-Lite	IG-4606	IGB-4202	Auto-Lite Coil Lock		Auto-Lite	MZ-4034	MZ-2053	GAM-4505	GAM-2081	1934	41	CONTINENTAL	1230
Delco-Remy	5023660	10874	Coil Lock		Delco-Remy	350	16843	285	16266	1934	V-10	CUNNINGHAM	†
Delco-Remy	540-E	644-W	Delco-Remy	Elec.	Delco-Remy	727-L	823881	935-D	1854856	1934	SE	DE SOTO	1232
Delco-Remy	540-C, D	644-U	Delco-Remy	Elec.	Delco-Remy	734-H	823881	937-P	1838448	1934	DR	DODGE	1234
Delco-Remy	540-C, D	644-W	Delco-Remy	Elec.	Delco-Remy	734-H	823881	937-P	1838448	1934	DS	DODGE	1234
Delco-Remy	553-A	4094	Delco-R.	Coil Lock	Delco-Remy	429	37895	428	827753	1934	J	DUESENBERG	1236
Ford-Mallory			Ford	Co-incidental	Ford	18-11002	18-11005	40-10000-B	40-10005	1934	V-8-112	FORD	1238
Delco-Remy	532-C	667-A	Delco-Remy	427-Z	Delco-Remy	545	37895	931-G	1844671	1934	17-B	FRANKLIN	†
Delco-Remy	533-R	644-E	Clum		Delco-Remy	723-C	818134	957-E	828292	1934	18B, C	FRANKLIN	†
Delco-Remy	533-R	644-E	Clum		Delco-Remy	723-C	818134	957-E	828292	1934	19A, B	FRANKLIN	‡
Delco-Remy	536-L	632-Z	Delco-Remy	431-H	Delco-Remy	734-U	823881	935-E	1854856	1934	68 Std.	GRAHAM	1240
Delco-Remy	536-M	632-Z	Delco-Remy	431-J	Delco-Remy	734-U	823881	935-J	1854856	1934	68 Spec.	GRAHAM	1240
Delco-Remy	536-L	661-X	Delco-Remy	431-H	Delco-Remy	734-U	823881	967-M	1844827	1934	67 Std.	GRAHAM	1242
Delco-Remy	536-M	661-Y	Delco-Remy	431-J	Delco-Remy	734-U	823881	967-N	1844827	1934	67 Spec.	GRAHAM	1242
Delco-Remy	539-F	661-Y	Delco-Remy	431-J	Delco-Remy	734-U	823881	967-L	1855966	1934	69 Cust.	GRAHAM	1244
Auto-Lite	CE-4304	IGP-4001A	Auto-Lite Coil Lock		Auto-Lite	MAB-4061	MAB-2113	GBK-4602	GBK-2055	1934	LL, LT	HUDSON	1246
Auto-Lite	CE-4304	IGP-4001A	Auto-Lite Coil Lock		Auto-Lite	MAB-4061	MAB-2113	GBK-4602	GBK-2055	1934	LTS	HUDSON	1246

1934 CAR MODELS——EQUIPMENT USED

Page	CAR	Model	Serial No.	Year	BATTERY Make	BATTERY Type	BATTERY Gr. Ter.	LIGHTING Switch Make	LIGHTING Switch Model	LIGHTING Fuses	LIGHTING Circuit Breaker	CARBURETION Carburetor Make and Model	CARBURETION Fuel Pump Make and Model
1248	HUPMOBILE	417W	W-5001	1934	Willard	WMB-17	Pos.	Clum	9526	20	*	Strom. EX-32	SW 706-E
§	HUPMOBILE	421, A		1934	Willard	WH-2-15	Pos.	Sor.Man.	B-5670A	20	*	Carter 258-S	SW 514-E
1250	HUPMOBILE	421J	J-12001	1934	Willard	WST-2-15	Pos.	Clum	9526	20	*	Strom. EX-32	AC J-1521547
§	HUPMOBILE	422		1934	Willard	WH-2-15	Pos.	Sor.Man.	B-5670A	20	*	Strom. UUR-2	SW 506-AK
§	HUPMOBILE	426		1934	Willard	WH-2-15	Pos.	Sor.Man.	B-5670A	20	*	Strom. UUR-2	SW 506-AJ
1252	HUPMOBILE	427T	T-5001	1934	Willard	WH-2-15	Pos.	Clum	9526	20	*	Strom. EE-22	AC J-1521547
1254	LA FAYETTE	110	L-1001	1934	Globe	71	Pos.	Delco-R.	478-D	20	*	Marvel 10-1603	AC R-1521454
1256	LA SALLE	350	2,100,001	1934	Delco	17-DW	Pos.	Delco-R.	487-J,G	*	D.R.411-A	Strom. EE-23	AC I-1521673
1258	LINCOLN	V-12-136	1501	1934	Exide	LX-15-21-L	Neg.	Own		*	A.L.	Strom. EE-22	AC I-1521218
1258	LINCOLN	V-12-145	3001	1934	Exide	LX-15-21-L	Neg.	Own		*	A.L.	Strom. EE-22	AC I-1521218
1260	NASH	1220	R-278,901	1934	U.S.L.	KW-13A	Pos.	Sor.Man.	5620-A	20	*	Strom. EX-32	AC R-1521454
1262	NASH	1280	B-70,801	1934	U.S.L.	KW-15A	Pos.	Sor.Man.	5620-A	20	*	Strom. EE-22	AC R-1521457
1264	NASH	1290	521,801	1934	U.S.L.	KR-17A	Pos.	Sor.Man.	5620-A	20	*	Strom. UUR-2	AC T-1521458
1266	OLDSMOBILE	F-34	51,001	1934	Delco	15-R	Neg.	Delco-R.	478-V	20	*	Strom. EX-22, 23	AC T-1521671*
1268	OLDSMOBILE	L-34	18,001	1934	Delco	17-G	Neg.	Delco-R.	478-R	*	D.R.	Strom. EE-1	AC T-1521670*
1270	PACKARD	1100, 1, 2	374,001	1934	P-O-L	619-ST	Pos.	R.B.M.		20	*	Strom. EE-22	AC F-1521220
1272	PACKARD	1103, 4, 5	752,001	1934	P-O-L	619-ST	Pos.	R.B.M.		20	*	Strom. EE-22	AC F-1521220
1274	PACKARD	1107, 8	901,601	1934	P-O-L	619-ST	Pos.	R.B.M.		20	*	Strom. EE-3	AC I-1521221
1276	PIERCE ARROW	836A	1,080,001	1934	Willard	WH-4-17	Pos.	R.B.M.		*	D.R.410-F	Strom. EE-3	SW 414-Z
1278	PIERCE ARROW	840A	2,080,001	1934	Willard	WH-4-17	Pos.	R.B.M.		*	D.R.410-F	Strom. EE-3	SW 407-BW
1280	PIERCE ARROW	1240A	3,110,001	1934	Willard	WH-5-19	Pos.	R.B.M.		*	D.R.410-F	Strom. EX-3 (Two)	SW 407-BZ
1280	PIERCE ARROW	1248A	3,560,001	1934	Willard	WH-5-19	Pos.	R.B.M.		*	D.R.410-F	Strom. EX-3 (Two)	SW 407-BZ
1282	PLYMOUTH	PF	1,859,001	1934	Willard	WS-1-13	Pos.	Clum	13786	20	*	Carter C6B1	AC B-1521211
1282	PLYMOUTH	PG		1934	Willard	WS-1-13	Pos.	Clum	13786	20	*	Carter C6B1	AC B-1521211
1284	PLYMOUTH	PE	2,188,001	1934	Willard	WS-1-13	Pos.	Clum		20	*	Carter C6B1	AC B-1521211
1286	PONTIAC	603	838,501	1934	Delco	15-KW	Neg.	Delco-R.	478-Z	20	*	Carter 283-S	AC R-1521536
1288	REO	S-4		1934	Willard	WH-1-13	Neg.	Delco-R.	486-X	20	*	Strom. EX-32	AC P-1521722
1290	STUDEBAKER	Dict. A	5,145,001	1934	Willard	WH-1-13	Pos.	Clum	9236	20	*	Strom. UR-23	AC R-1521455*
1292	STUDEBAKER	Dict. A	5,145,001	1934	Willard	WH-1-13	Pos.	Clum	9236	20	*	Strom. UR-23	AC R-1521689*
1294	STUDEBAKER	Comm. B	8,045,001	1934	Willard	WH-1-13	Pos.	Clum	9498	*	D.R.410-L	Strom. E-33	AC T-1521456
1296	STUDEBAKER	Pres. C	7,045,001	1934	Willard	WH-4-17	Pos.	Clum	9498	*	D.R.410-L	Strom. EE-22	AC J-1521203
†	STUTZ	SV-16		1934	P-O-L	A-619-ST	Neg.	Delco-R.	486-G	*	D.R.410-C	Zenith 105-DC	Oil Vac.
†	STUTZ	DV-32		1934	P-O-L	A-619-ST	Neg.	Delco-R.	486-G	*	D.R.410-C	Zenith 105-DC	SW 407-W
1298	TERRAPLANE	K, KU	373,000	1934	National	ST-3-17X	Pos.	Sor.Man.	5640-A	20	*	Carter 281-S	AC R-1521539*
1298	TERRAPLANE	KS		1934	National	ST-3-17X	Pos.	Sor.Man.	C-5640-A	20	*	Carter 295-S	AC R-1521539*
1300	WILLYS	77		1934	U.S.L.	CW-11A	Neg.			20	*	Till. D-1A	AC P-1521390

§—Refer to Hupmobile, Series 321, 322, 326.
†—Refer to Car Page for preceding year.

1934 CAR MODELS——EQUIPMENT USED

	IGNITION				STARTER		GENERATOR					
	Coil	Dist.	Switch			Armature		Armature				
Make	Model	Model	Make	Model	Make	Model	Number	Model	Number	Year	Model	CAR	Page
Auto-Lite	IG-4608	IGB-4319	Electrolock	16-B	Auto-Lite	MAB-4065	MAB-2047	GBK-4603	GBK-2055	1934	417W	HUPMOBILE	1248
Auto-Lite	IG-4604	IGC-4056	Electrolock	16-B	Auto-Lite	MAB-4050	MAB-2047	GAL-4524	GAL-2121	1934	421, A	HUPMOBILE	§
Auto-Lite	CE-4602	IGC-4058	Electrolock	16-B	Auto-Lite	MAB-4065	MAB-2047	GBK-4603	GBK-2055	1934	421J	HUPMOBILE	1250
Auto-Lite	CE-4402	IGH-4021-A	Electrolock	5-B	Auto-Lite	MAD-4118	MAD-2083	GAR-4317	GAR-2181	1934	422	HUPMOBILE	§
Auto-Lite	CE-4402	IGH-4021-A	Electrolock	5-B	Auto-Lite	MAB-4042	MAB-2046	GAG-4138	GAG-2099	1934	426	HUPMOBILE	§
Auto-Lite	CE-4602	IGP-4003	Electrolock	16-B	Auto-Lite	MAB-4066	MAB-2046	GAR-4606-3	GAR-2089	1934	427T	HUPMOBILE	1252
Auto-Lite	CE-4401	IGB-4317	Oakes	Hershey	Auto-Lite	MAB-4062	MAB-2057	GAR-4205	GAR-2214	1934	110	LA FAYETTE	1254
Delco-Remy	539-B	662-P	Delco-Remy	431-G	Delco-Remy	727-N	823881	961-C	1836971	1934	350	LA SALLE	1256
Auto-Lite	CE-4001-L	IGM-4002, A	Oakes	Hershey	Auto-Lite	MAO-4003	MAO-2006	GBC-4101	GBC-2035	1934	V-12-136	LINCOLN	1258
Auto-Lite	CE-4001-L	IGM-4002, A	Oakes	Hershey	Auto-Lite	MAO-4001, 5	"	GBC-4001,4101	GBC-2006*	1934	V-12-145	LINCOLN	1258
Auto-Lite	CE-4402	IGE-4012	Delco-Remy	425-U	Auto-Lite	MAB-4053	MAB-2057	GAR-4601-3	GAR-2214	1934	1220	NASH	1260
Auto-Lite	CE-4402	IGK-4101	Delco-Remy	425-V	Auto-Lite	MAB-4054	MAB-2047	GAR-4601-3	GAR-2214	1934	1280	NASH	1262
Auto-Lite	CE-4402	IGK-4005	Delco-Remy	425-V	Auto-Lite	MAB-4055	MAB-2073	GAR-4601-3	GAR-2214	1934	1290	NASH	1264
Delco-Remy	534-N	622-S	Delco-R.	Coil Lock	Delco-Remy	734-K	823881	935-F	1854856	1934	F-34	OLDSMOBILE	1266
Delco-Remy	534-N	662-N	Delco-R.	Coil Lock	Delco-Remy	727-H	823881	935-F, M	1853593*	1934	L-34	OLDSMOBILE	1268
Delco-Remy	5033449	5033450	Electrolock	16-S	Owen-Dy.	DI-1034, 1161	13409	CO-1177	23661	1934	Eight	PACKARD	1270
Delco-Remy	5033449	5033450	Electrolock	16-S	Owen-Dyn.	DN-1107, 62	13409	CO-1177	23661	1934	Super 8	PACKARD	1272
Auto-Lite	CE-4022	IGO-4001	Electrolock	15-S	Owen-Dyn.	DN-1107, 62	13409	CO-1166	23566	1934	Twelve	PACKARD	1274
Delco-Remy	537-E	662-J	Oakes	Hershey	Delco-Remy	497	1843420	927-V, 29-A	1856943*	1934	836A	PIERCE ARROW	1276
Delco-Remy	537-E	662-J	Oakes	Hershey	Delco-Remy	497	1843420	927-V	1839078	1934	840A	PIERCE ARROW	1278
Delco-Remy	537-E	4105	Oakes	Hershey	Delco-Remy	498	1843420	927-V	1839078	1934	1240A	PIERCE ARROW	1280
Delco-Remy	537-E	4105	Oakes	Hershey	Delco-Remy	498	1843420	927-V	1839078	1934	1248A	PIERCE ARROW	1280
Delco-Remy	540-A	622-H, U	Delco-Remy	Elec	Delco-Remy	734-H	823881	937-G	817221	1934	PF	PLYMOUTH	1282
Delco-Remy	540-A	622-H, U	Delco-Remy	Elec	Delco-Remy	734-H	823881	937-G	817221	1934	PG	PLYMOUTH	1282
Delco-Remy	540-A	644-K	Delco-Remy	Elec	Delco-Remy	734-H	823881	937-P	1838448	1934	PE	PLYMOUTH	1284
Delco-Remy	534-W	661-M	Delco-R.	Coil Lock	Delco-Remy	734-G	1847432	937-B	1854856	1934	603	PONTIAC	1286
Delco-Remy	538-B	644-M	Delco-Remy	429-Z	Delco-Remy	736-G	818002	955-R	817807	1934	S-4	REO	1288
Auto-Lite	IG-4607	IGB-4393	Auto-Lite	Coil Lock	Auto-Lite	MAN-4002	MAD-2083	GAM-4601*	GAM-2055*	1934	Dict	STUDEBAKER	1290
Delco-Remy	538-A	622-X	Delco-Remy	430-A	Delco-Remy	736-R		937-U, 35-R		1934	Dict	STUDEBAKER	1292
Delco-Remy	538-A	662-M	Delco-Remy	430-A	Delco-Remy	736-H	1838663	955-C, 53-H	820370*	1934	Comm	STUDEBAKER	1294
Delco-Remy	538-A	662-M	Delco-Remy	430-A	Delco-Remy	736-H	1838663	955-C, 53-H	820370*	1934	Pres	STUDEBAKER	1296
Delco-Remy	531-C	4028	Oakes	Hershey	Delco-Remy	727-C	822187	391	37826	1934	SV-16	STUTZ	†
Delco-Remy	531-C	660-W	Oakes	Hershey	Delco-Remy	727-C	822187	391	37826	1934	DV-32	STUTZ	†
Auto-Lite	IG-4311	IGB-4301-A	Auto-Lite	Coil Lock	Auto-Lite	MAB-4060	MAB-2114	GBK-4602	GBK-2055	1934	K, KU	TERRAPLANE	1298
Auto-Lite	IG-4311	IGB-4301-A	Auto-Lite	Coil Lock	Auto-Lite	MAB-4060	MAB-2114	GBK-4602	GBK-2055	1934	KS	TERRAPLANE	1298
Auto-Lite	IG-4406	IGB-4078	Electrolock	17-A	Auto-Lite	MZ-4033	MZ-2089	GAM-4504	GAM-2055	1934	77	WILLYS	1300

TABLE OF IGNITION AND VALVE TIMING

1934 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	Running Intake	Running Exhaust	VALVE TIMING Piston Position
AUBURN 6-52X	(1934)	6.2 Al. Head	114	42	.018"	.025"	.0042" BTDC.	FA.	IO.	.012" C.	.007"H.	.007"H.	.0113" BTDC.
AUBURN 6-52Y	(1934)	6.2 Al. Head	114	42	.018"	.025"	.0042" BTDC.	FA.	IO.	.012" C.	.007"H.	.007"H.	.0113" BTDC.
AUBURN 8-50X	(1934)	5.3 C. I. Head	105	5	.015"	.025"	.0042" BTDC.	FA.	IO.	.012" C.	.007"H.	.007"H.	.0113" BTDC.
AUBURN 8-50Y	(1934)	6.2 Al. Head	114	42	.015"	.025"	.0042" BTDC.	FA.	IO.	.012" C.	.007"H.	.007"H.	.0113" BTDC.
AUBURN 12-165	(1934)		113	19	.020"	.025"	.0477" BTDC.	Adv.	IO.	.015" C.	.008"H.	.008"H.	.0000" TDC.
AUSTIN Bantam	(1934)		104	8	.018"	.025"	.010-.012" BTDC.	FA.	IO.	.003" H.	.003"H.	.006"H.	.0000" TDC.
BUICK 40	(1934)	Std. Fuel	113	31	.015"	.023"	.0014" BTDC.	FA.	EC.	.008"	.008"	.008"	Valve .163*
BUICK 40	(1934)	Ethyl Fuel	113	31	.015"	.023"	.0238" BTDC.	FA.	EC.	.008"	.008"	.008"	Valve .163*
BUICK 50	(1934)		113	38	.015"	.023"	.0198" BTDC.	FA.	EC.	.008"	.008"	.008"	Valve .180*
BUICK 60	(1934)		113	31	.015"	.023"	.0523" BTDC.	FA.	EC.	.008"	.008"	.008"	Valve .180*
BUICK 90	(1934)		113	31	.015"	.023"	.0466" BTDC.	FA.	EC.	.008"	.008"	.008"	Valve .180*
CADILLAC 355-D	(1934)		104	42	.020"	.026"	.0075" BTDC.	FA.	IO.	.006"	.004"	.006"	.0168" BTDC.
CADILLAC 370-D	(1934)		113	33	.020"	.026"	.0058" BTDC.	FA.	IO.	None	None	None	.0000" TDC.
CADILLAC 452-D	(1934)		113	33	.016"	.026"	.0058" BTDC.	FA.	IO.	None	None	None	.0000" TDC.
CHEVROLET Std.	(1934)		113*	33	.018"	.032"	.0337" BTDC.	FA.	IO.	.010"	.006"H.	.013"H.	.0054" BTDC.
CHEVROLET Mst.	(1934)		113*	19	.018"	.032"	.0385" BTDC.	FA.	IO.	.010"	.006"H.	.013"H.	.0061" BTDC.
CHRYSLER CA, CB	(1934)	5.4 C. I. Head	114	42	.020"	.025"	.0000" TDC.	FA.	IO.	.010"	.005"H.	.007"H.	.0000" TDC.
CHRYSLER CA, CB	(1934)	6.2 Al. Head	114	42	.020"	.025"	.004" ATDC.	FA.	IO.	.010"	.005"H.	.007"H.	.0000" TDC.
CHRYSLER CU	(1934)	6.5 Al. Head	114	42	.018"	.025"	.0000" TDC.	FA.	IO.	.011"	.005"H.	.007"H.	.002" BTDC.
CHRYSLER CV	(1934)	6.5 Al. Head	114	42	.018"	.025"	.0000" TDC.	FA.	IO.	.011"	.005"H.	.007"H.	.002" BTDC.
CHRYSLER CW	(1934)	6.5 Al. Head	114	42	.018"	.025"	.002" ATDC.	FA.	IO.	.008"	.006"H.	.008"H.	.002" BTDC.
CONTINENTAL 41	(1934)		104	2	.020"	.028"	.0192" BTDC.	FA.	EC.	.010"	.007"H.	.007"H.	.0098" ATDC.
CUNNINGHAM V-10	(1934)		102	1	.020"	.031"	.059" ATDC.	Ret.	IO.	.003"	.003"C	.003"C	.0118" ATDC.
DE SOTO SE	(1934)	6.2 Al. Head	114	2	.020"	.025"	.004" ATDC.	FA.	IO.	.010"	.005"H.	.007"H.	.0000" TDC.
DODGE DR	(1934)	5.6 C. I. Head	114	42	.020"	.025"	.0017" ATDC.	FA.	IO.	.011"	.005"H.	.007"H.	.015" ATDC.
DODGE DR, DS	(1934)	6.5 Al. Head	114	42	.020"	.025"	.0067" ATDC.	FA.	IO.	.011"	.005"H.	.007"H.	.015" ATDC.
DUESENBERG J	(1934)	(Intk. Cmshft Chk)	104	8	.020"	.025"	.0645" BTDC.	Adv.	IO.	.025" C.	.025"C	.025"C.	.0161" BTDC.
DUESENBERG J	(1934)	(Ex. Cmshft Chk)	104	8	.020"	.025"	.0645" BTDC.	Adv.	EC.	.025" C.	.025"C	.025"C.	.0868" ATDC.
FORD V-8-112	(1934)		104	40	.013"	.025"	.0058" BTDC.	FA.	IO.	.013"	Not Adj.	Not Adj.	.0327" BTDC.
FRANKLIN 17B	(1934)		113*	6	.022"	.025"	.0120" BTDC.	Adv.	IO.	.031" C.	.007"H.	.007"H.	.1355" ATDC.
FRANKLIN 18, 19	(1934)		113*	6	.020"	.025"	.0163" BTDC.	Adv.	IO.	.031" C.	.007"H.	.007"H.	.3437" ATDC.
GRAHAM 68-6	(1934)	Std. & Spec. 6	102	2	.018"	.025"	.0037" BTDC.	FA.	IO.	.012"	.010"	.010"	.0000" TDC.
GRAHAM 67-8	(1934)	Standard 8	102	40	.018"	.025"	.0034" BTDC.	FA.	IO.	.012"	.010"	.010"	.0000" TDC.
GRAHAM 67-8	(1934)	Superchgd. Spec. 8	104	40	.015"	.025"	.0135" BTDC.	FA.	IO.	.012"	.010"	.010"	.0000" TDC.
GRAHAM 69-8	(1934)	Superchgd. Cust. 8	104	40	.015"	.025"	.0135" BTDC.	FA.	IO.	.012"	.010"	.010"	.0000" TDC.
HUDSON LL. LT, LTS	(1934)	All engines, see note	114	44	.020"	.022"	.0000" TDC.	FA.	IO.	.010"	.006"	.008"	.0494" BTDC.
HUPMOBILE 417W	(1934)		104	5	.017"	.028"	.0174" BTDC.	FA.	EC.	.021"	.010"	.013"	.0034" ATDC.

NOTE:—See Car Pg. for final ignition setting on Hudson and Terraplane cars.
Maximum Advance Setting is .0245" (Hudson), .0279" (Terraplane) before TDC.

*—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

1934 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	Running Intake	Running Exhaust	VALVE TIMING Piston Position
HUPMOBILE 421, A	(1934)		104	2	.018"	.028"	.0193" BTDC.	Adv.	EC.	.017"	.007"H	.013"H	.0036" ATDC.
HUPMOBILE 421J	(1934)		104	2	.017"	.028"	.0194" BTDC.	FA.	EC.	.021"	.010"	.013"	.0038" ATDC.
HUPMOBILE 422	(1934)		104	2	.020"	.028"	.0355" BTDC.	Adv.	EC.	.026"	.018"H	.018"H	.0000" TDC.
HUPMOBILE 426	(1934)		104	2	.020"	.028"	.0365" BTDC.	Adv.	EC.	.026"	.018"H	.018"H	.0113" ATDC.
HUPMOBILE 427	(1934)		104	2	.020"	.028"	.0221" BTDC.	FA.	EC.	.026"	.018"	.018"	.0113" ATDC.
LAFAYETTE	(1934)		104	40	.020"	.025"x		FA.	IO.	.012"	.012"	.012"	
LA SALLE	(1934)		104	40	.020"	.026"	.0255" BTDC.	FA.	IO.	.015" C	.006"C	.009"C	.0144" ATDC.
LINCOLN V-12-136, 145	(1934)		104	40	.020"	.022"	.020" BTDC.	Adv.	IO.	.003"	.003"C	.005"C	.1768" BTDC.
NASH 1220	(1934)		113*	37	.020"	.025"x		FA.		.015" H	.015"H	.015"H	
NASH 1280	(1934)		113*	37	.015"	.025"x		FA.		.015" H	.015"H	.015"H	
NASH 1290	(1934)		113	31	.015"	.025"x		FA.		.015" H	.015"H	.015"H	
OLDSMOBILE F-34	(1934)		I04	40	.022"	.025"	.0000" TDC.	FA.	IO.	.012"	.008"	.010"	.0000" TDC.
OLDSMOBILE L-34	(1934)		104	2	.022"	.025"	.005" BTDC.	FA.	IO.	.012"	.008"	.010"	.0000" TDC.
PACKARD 1100, 1, 2	(1934)	6.0-1 Std. Comp.	114	5	.020"	.025"	.0168" BTDC.	FA.	IO.	.004"	.004"H	.006"H	.4070" BTDC.
PACKARD 1100, 1, 2	(1934)	6.36-1 High Comp.	114	5	.020"	.025"	.0299" BTDC.	FA.	IO.	.004"	.004"H	.006"H	.4070" BTDC.
PACKARD 1103, 4, 5	(1934)	6.0-1 Std. Comp.	114	5	.020"	.025"	.0168" BTDC.	FA.	IO.	.004"	.004"H	.006"H	.4070" BTDC.
PACKARD 1103, 4, 5	(1934)	6.38-1 High Comp.	114	5	.020"	.025"	.0299" BTDC.	FA.	IO.	.004"	.004"H	.006"H	.4070" BTDC.
PACKARD 1107, 8	(1934)	6.0-1 Std. Comp.	114	2	.020"	.025"	.0237" BTDC.	FA.	IO.	None	None	None	.0299" BTDC.
PACKARD 1107, 8	(1934)	6.33-1 High Comp.	114	2	.020"	.025"	.0060" BTDC.	FA.	IO.	None	None	None	.0299" BTDC.
PIERCE ARROW 836A	(1934)		114	29	.018"	.024"	.0115" BTDC.	Adv.	IO.	.006"	.004"H	.006"H	.0115" ATDC.
PIERCE ARROW 840A	(1934)		114	29	.018"	.024"	.0122" BTDC.	Adv.	IO.	.010"	None	None	.0122" ATDC.
" " 1240A, 48A	(1934)		114	42	.018"	.024"	.0092" BTDC.	Adv.	IO.	.004"	None	None	.1303" BTDC.
PLYMOUTH PF, PG	(1934)	5.8-1 C. I. Head	114	42	.020"	.025"	.0342" BTDC.	FA.	IO.	.011"	.005"H	.007"H	.015" ATDC.
PLYMOUTH PF, PG	(1934)	6.5-1 Al. Head	114	42	.020"	.025"	.0152" BTDC.	FA.	IO.	.011"	.005"H	.007"H	.015" ATDC.
PLYMOUTH PE	(1934)	5.8-1 C. I. Head	114	42	.020"	.025"	.0038" ATDC.	FA.	IO.	.011"	.005"H	.007"H	.015" ATDC.
PLYMOUTH PE	(1934)	6.5-1 Al. Head	114	42	.020"	.025"	.0152" ATDC.	FA.	IO.	.011"	.005"H	.007"H	.015" ATDC.
PONTIAC 603	(1934)		114	42	.018"	.025"*	.0264" BTDC.	FA.	IO.	.0125"	.010"H	.010"H	.0082" BTDC.
REO S-4	(1934)		104	2	.020"	.025"	.0341" BTDC.	FA.	IO.	.012"	.007"H	.008"H	.0000" TDC.
STUDEBAKER 'A' Dict.	(1934)	All Cars	104	2	.020"	.025"	.0000" TDC.	FA.	IO.	.010"	.004"	.006"	.0876" BTDC.
" 'B' Com.	(1934)	First Cars	104	2	.020"	.025"	.0000" TDC.	FA.	IO.	.010"	.004"	.006"	.078" BTDC.
" 'B' Com.	(1934)	Aft. Ser. #8,100,001	104	2	.020"	.025"	.0000" TDC.	FA.	IO.	.010"	.004"	.006"	.0000" TDC.
" 'C' Pres.	(1934)	All cars	104	2	.020"	.025"	.0000" TDC.	FA.	IO.	.010"	.004"	.006"	.0915" BTDC.
STUTZ SV-16	(1934)		113	31	.017"	.022"	.0951" BTDC.	Adv.	EC.	.028"	.028"C	.028"C	.0208" ATDC.
STUTZ DV-32	(1934)	(Intk Cmshft. Chk)	104	8	.020"	.022"	.1677" BTDC.	Adv.	IO.	.028"	.028"C	.028"C	.0107" BTDC.
STUTZ DV-32	(1934)	(Ex Cmshft Chk)	104	8	.020"	.022"	.1677" BTDC.	Adv.	EC.	.028"	.028"C	.028"C	.0425" ATDC.
TERRAPLANE K,KU,KS	(1934)	All engines, see note	114	43	.020"	.022"	.0000" TDC.	FA.	IO.	.010"	.006"	.008"	.0562" BTDC.
WILLYS	(1934)		104	2	.018"	.025"	.0066" BTDC.	FA.	EC.	.010" C	.004"H	.006"H	.0103" ATDC.

x—Spark plug gap—.030" (cars with radio).
*—Spark plug gap—.022" (cars with radio).

1934 CAR MODELS
CAR PAGES

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

AUBURN

STANDARD MODEL 6-52-X, CUSTOM MODEL 6-52-Y (1934)
AUTO-LITE ELECTRICAL SYSTEM

SERIAL NUMBER:—First number-(6-52-X) 652X1001, (6-52-Y) 652Y1001. Located 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. First number, WF-101.

ENGINE:—Lycoming Model WF, six cylinder, 'L' head type.
Dimensions—Bore, 3 1/16". Stroke, 4¾". Displacement, 209.94 cu. ins.
Horsepower—Rated, 22.51. Developed, 85 H.P. at 3500 R.P.M.
Compression—Std. 6.2-1. No optional compression ratios.
NOTE:—Standard 6.2-1 cylinder head is aluminum.

Pistons:—Bohn, aluminum alloy, Invar Strut, split skirt type.
Weight—16 ozs. (stripped), 21.92 ozs. (with rings and pin).
Removal—Piston and rod assembly removed through bottom of engine.
Piston Length—3¾" (total), 2.3135" (top to center of pin).
Clearance—.0015" (skirt). See Fitting new Pistons.
Fitting New Pistons—Use feeler stock ½" wide to check piston clearance, .0015" feeler should be withdrawn easily but .0025" feeler should lock. If spring scale is used, use .002" feeler. Pull required to withdraw feeler should be 7-12 pounds.

NOTE:—Install pistons with slot toward left (camshaft side).

Piston Rings:—Four rings per piston, all above pin. #1 and 2, compression rings; #3 and 4, oil control rings.

Ring	Width	End Gap	Side Clearance	Wall Thickness
Comp. (#1, 2)	⅛"	.010-.018"	.0015-.003"	.135-.125"
Oil Cont. (3)	⅛"	.006-.012"	.001-.0025"	.135-.125"
Oil Cont. (4)	3/16"	.006-.012"	.001-.0025"	

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

Connecting Rod:—Weight, 2.34 lbs. Length, 9½" (center-to-center).
Big End Bearing—Spun Babbitt type. No shims.
Clearance—.001-.0025" (radial), .004-.009" (sideplay).
Adjustment—Adjust by filing bearing caps (no shims) when wear exceeds .004".

NOTE:—Connecting 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 lower bearing upper half must be toward camshaft side of engine on all rods.

Crankshaft:—Four main bearing type with integral counterweights.
Journal Sizes—2⅜" diameter (all bearings).
Bearing Type—Removable bronze-backed, babbitt lined type.
Clearance—.002-.00325" (radial).
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 second intermediate main bearing. Endplay, .003-.004". Use .003" feeler to check clearance.

Camshaft:—Five bearing type. Drive—Non adjustable chain.
Bearing Clearance—.0025-.0035" (radial).
Chain—Whitney. Width, 1". Length, 49 pitches. Pitch, ½".
Camshaft Setting—Sprockets are marked. Mesh chain with sprockets turned so there are 12 links on lower side of chain between marks. With sprockets in this position top dead center mark for pistons 1 and 6 on flywheel will be in line with indicator on housing.

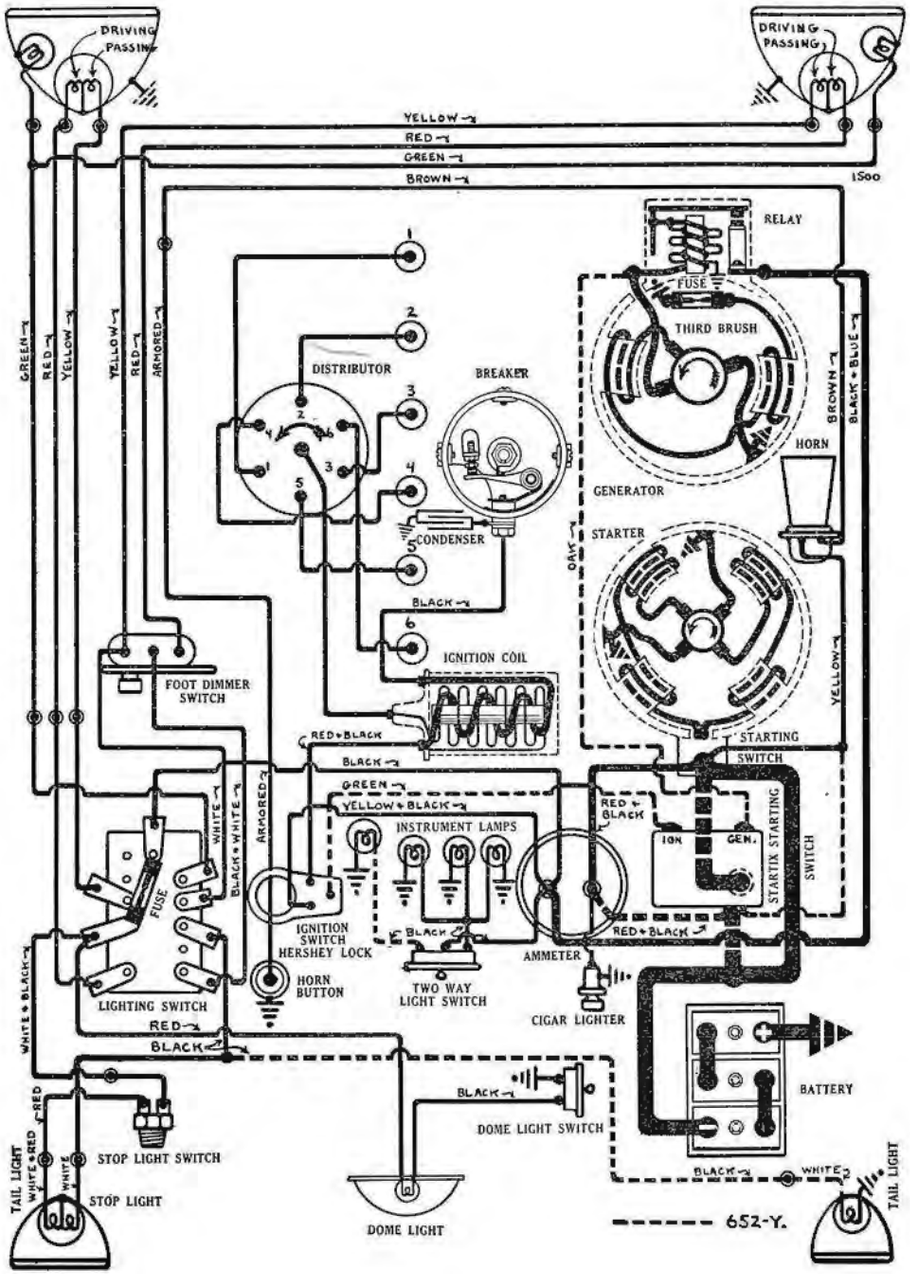
Valves:—	Head Diam.	Stem Diam.	Stem Length	Seat Angle	Lift
Intake	1 7/16"	.3410-.3425"	5¼"	30°	11/32"
Exhaust	1 13/32"	.3410-.3425"	5¼"	45°	11/32"

Tappet Clearance—.006-.008" all valves—engine hot.

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

Valve Timing

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



AUBURN

STANDARD MODEL 6-52-X, CUSTOM MODEL 6-52-Y (1934)
AUTO-LITE ELECTRICAL SYSTEM

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

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

Carburetor:—Carter, Model 288-S, 1¼" plain tube, downdraft type.

Fuel Pump:—Stewart-Warner, Type 708-A.

Gasoline Gauge:—K-S Telegauge, hydrostatic type.

IGNITION:—**Coil Model IG-4065.** Mounted on right hand side engine block.
Ignition Current—2.5 amperes (idling), 4.5-5.5 amperes (stopped).
Ignition Switch—Oakes 'Hershey' type co-incidental ignition switch and steering post lock. Switch used on 6-52Y (with Startix) has two 'on' positions. Lower position of lever 'STX' is normal running position with Startix operative. Use top position 'IGN' to check timing or whenever automatic cranking is not desired.

Distributor Model IGB-4318. Single breaker, 6 lobe cam, full automatic advance type.
Breaker Gap—.018-.020" (.020-.024" first 1000 miles with new contacts).

Breaker Arm Spring Tension—16-22 ounces.

Cam Angles (Distributor Degrees) — Closed 40°. Open 20°.

Automatic Advance

Distributor		Engine	
Degrees	R.P.M.	Degrees	R.P.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

IGNITION TIMING:— Flywheel Degs. Piston Position
All engines .....3° or 1 tooth BTDC..... .0042" BTDC.
Timing:—Crank engine with #1 piston on compression until piston is 3° or approximately 1 tooth on flywheel before top dead center, stop when flywheel mark '3—' (first 53 cars), or '/' (later cars) lines up with indicator in inspection hole in flywheel housing. These marks are 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, check spark plug cable connections (see diagram).

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

Spark Plugs:—Champion, Type J-6. 14 MM. Metric type.
Spark Plug Gaps—.025".

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

STARTER:—**Model MAJ-4032 (652X), MAJ-4033 (652Y).**
Armature No. MAJ-2006.
Starter Drive—Outboard Bendix.
Rotation—Counter-clockwise at commutator end.
Brush Spring Tension—44-56 ounces (new brushes).
Cranking Performance—155 R.P.M. (1705 R.P.M. armature), 170 amperes.

Performance Data

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

Starting Switch:—**(MAJ-4032—On 652X).** Type SW-3737-S. Mounted on starter field frame operated through flexible cable by pull button on instrument board.
MAJ-4033—On 652Y. Startix automatic starting controlled by ignition switch. See Equipment Section for complete data.

Mounting:—Flange mounted on right hand front face of flywheel housing. To remove, take out three flange mounting cap screws.

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

Performance Data
(Cold—without regulator field resistance)

Amperes	Volts	R.P.M.
0	6.4	760
4	6.75	920
8	7.05	1100
12	7.35	1300
16	7.7	1560
20	8.0	2300

Rotation—Counter-clockwise at commutator end.
Brush Spring Tension—24-36 ozs. (new brushes).
Field Current—3.70-4.10 amperes at 6.0 volts.
Field Fuse—7½ ampere on field frame.
Motoring Current—4.65-5.15 amperes at 6.0 volts.
Mounting:—Pivot mounted at right front of engine. Fan belt drive. To remove, take out two pivot bolts, one clamp bolt.
Belt Adjustment:—Loosen pivot bolts and clamp bolt, pull generator away from engine, tighten mounting bolts. Belt tension should be just enough to drive generator 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 ampere discharge.
Relay Contact Gap—.025-.035".
Air Gap—.010-.030" (contacts closed).

LIGHTING:—**Soreng-Manegold Switch, Model B-5640-A. Delco-Remy Foot Control Switch, Model 465-W.** Foot control switch provides assymetrical passing beam (lower beam right hand headlight, upper beam left hand headlight). Headlight beams are crossed with left hand headlight lighting right hand side of road.

Bulb Specifications

Lamp	Candlepower	Mazda No.
Headlights	32-21	1116
Park., Instrument, Tail (R.H.)	3	63
Stop and Tail (L.H.)	21-2	1158
Dome	6	81

FUSES:—**Lighting**—20 ampere on lighting switch.
Generator Field—7½ ampere under cover on generator.

HORNS:—Schwartze. Vibrator type.

AUBURN

STANDARD EIGHT, MODEL 850-X (1934)
AUTO-LITE ELECTRICAL SYSTEM

SERIAL NUMBER:—First number, 850X1001. On right hand side of cowl under hood. Letter following serial number designates body type.
ENGINE NUMBER:—On left hand lower half of crankcase.
ENGINE:—Lycoming, Model GF, eight cylinder, 'L' head type.
Dimensions—Bore, 3 1/16". Stroke,, 4¾". Displacement, 279.92 cu. ins.
Horsepower—Rated, 30.0. Developed, 100 H.P. at 3400 R.P.M.
Compression—Std. 5.3-1. No optional compression ratios.
Pistons:—Bohn, aluminum alloy, Invar Strut, split skirt type.
Weight—16 ozs. (stripped), 21.92 ozs. (with rings and pin).
Removal—Piston and rod assembly removed through bottom of engine.
Piston Length—3¾" (total), 2.3155" (top to center of pin).
Clearance—.0015" (skirt). See Fitting new pistons.
Fitting New Pistons—Use feeler stock ½" wide to check clearance. .0015" feeler should be withdrawn easily but .0025" feeler should lock. If spring scale is used, tension required to withdraw .002" feeler should be 7-12 pounds.
NOTE:—Install pistons with slot toward left (camshaft side).
Piston Rings:—Four rings per piston, all above pin. #1 and 2—compression rings, #3 and 4—oil control rings.

Ring	Width	End Gap	Side Clearance	Wall Thickness
Comp. (#1, 2)	⅛"	.010-.018"	.0015-.003"	.135-.125"
Oil Cont. (#3)	⅛"	.006-.012"	.001-.0025"	.135-.125"
Oil Cont. (#4)	3/16"	.006-.012"	.001-.0025"	

Piston Pin:—Diameter, .8750-.8748". Length, 2.520-2.500". Pin is locked in rod. Bushing not used in piston.
Pin Fit in Piston—Tight push fit at 70°F. (selective fit).
Connecting Rod:—Weight, 2.34 lbs. Length, 9½" (center-to-center).
Big End Bearing—Spun babbitt type. No shims.
Clearance—.001-.0025" (radial), .004-.009" (sideplay).
Adjustment—Adjust when wear exceeds .004" by filing bearing caps (no shims used).
NOTE:—Connecting 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 lower bearing upper half must be toward camshaft side of engine on all rods.
Crankshaft:—Five main bearing type.
Journal Sizes—2⅜" diameter (all bearings).
Bearing Type—Removable bronze-backed, babbitt-lined type.
Clearance—.002-.00325" (radial).
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 #3 (center) main bearing. Endplay, .003-.004". Use .003" feeler to check clearance.
Camshaft:—Six bearing type. Drive—Non-adjustable chain.
Bearing Clearance—.0025-.0035" (radial).
Chain—Width, 1". Length, 49 links. Pitch, ½".
Camshaft Setting—Sprockets are marked. Mesh chain with sprockets turned so there are 12 links on lower side of chain between marks. With sprockets in this position the top dead center mark '⅛' on flywheel will be in line with indicator on housing with pistons #1 and 8 on top dead center.

Valves:—	Head Diameter	Stem Diameter	Stem Lgth.	Seat Angle	Lift
Intake	1 7/16"	.3410-.3425"	5¼"	30°	11/32"
Exhaust	1 13/32"	.3410-.3425"	5¼"	45°	11/32"

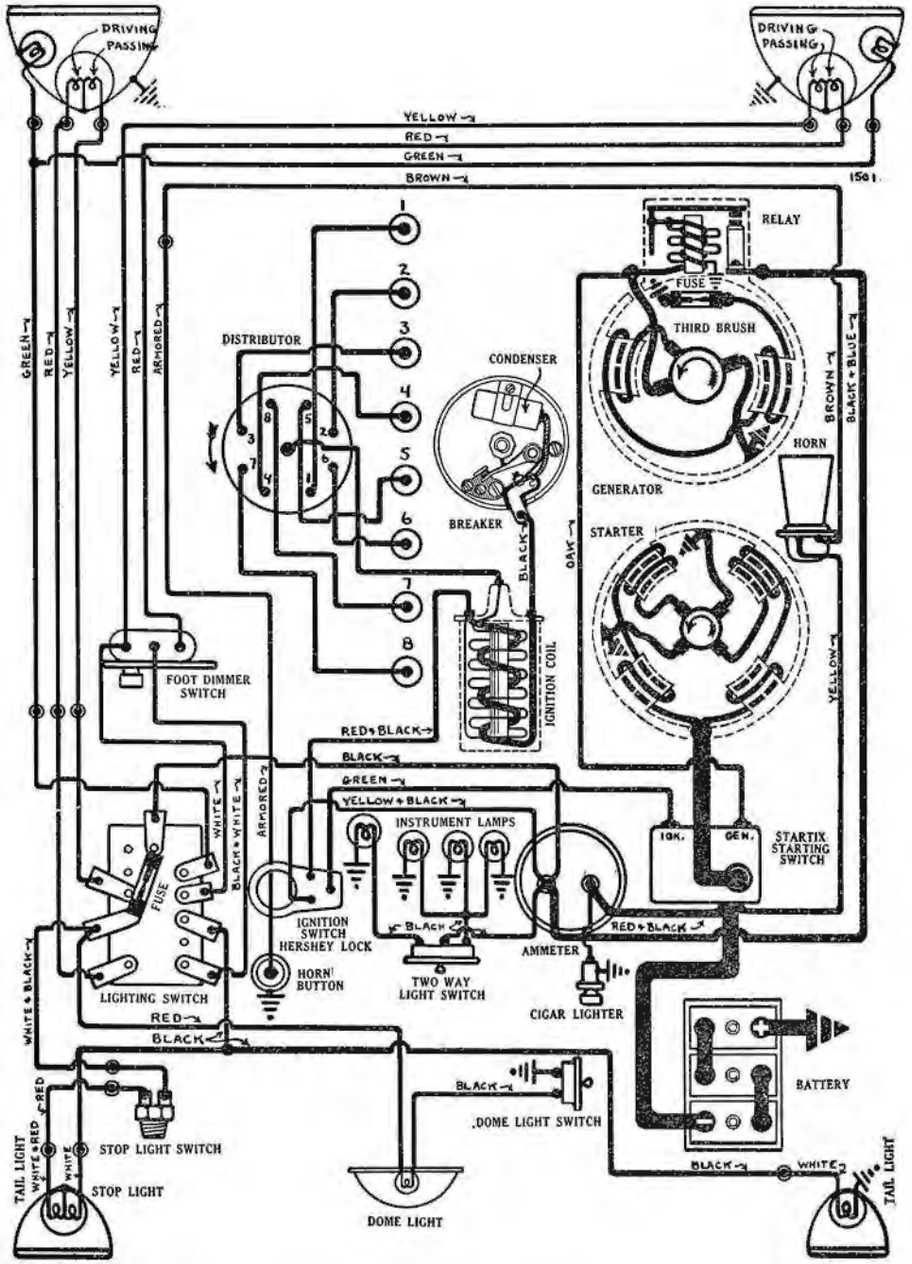
Tappet Clearance—.006-.008" (all valves—engine hot). Clearance for timing only, .012".

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

Valve Timing

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

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



AUBURN

STANDARD EIGHT, MODEL 850-X (1934)
AUTO-LITE ELECTRICAL SYSTEM

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

Carburetor: — Stromberg, Model EX-32, 1½" plain tube, downdraft type.

Fuel Pump:—Stewart-Warner, Type 706-D.

Gasoline Gauge:—K-S Telegauge, hydrostatic type.

IGNITION:—Coil Model CE-4001. On right hand side of engine block.

Ignition Current—3 amperes (idling), 4.5-5.5 amperes (stopped).

Ignition Switch—Oakes 'Hershey' type co-incidental ignition switch and steering post lock. Switch has two 'on' positions. Lower position of lever 'STX' is normal running position with Startix operative. Use top position 'IGN' to check timing or whenever automatic cranking is not desired.

Distributor Model IGP-4002-A. Single breaker, 8 lobe cam, full automatic advance type. No synchronization required.

Breaker Gap—.013-.017" (.015-.019" first 1000 miles with new contacts).

Breaker Arm Spring Tension—18 ozs. (min.), 20 ozs. (max.).

Cam Angles (Distributor Degrees) — Closed 29°. Open 16°.

Automatic Advance

Distributor Degrees	Distributor R.P.M.	Engine Degrees	Engine R.P.M.
Start	300	0	600
2	440	4	880
4	580	8	1160
6	720	12	1440
8	860	16	1720
10	1000	20	2000

IGNITION TIMING:— Flywheel Degs. Piston Position All Engines .....3° or 1 tooth BTDC. .... .0042" BTDC.

Timing:—Crank engine with #1 piston on compression until piston is 3° or approximately 1 tooth on flywheel before top dead center, stop when flywheel mark '3—' (first 470 cars) or '/' (later cars) lines up with indicator in inspection hole in flywheel housing. These marks are 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, check spark plug cable connections (see diagram).

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

Spark Plugs:—Champion, Type C-7. 18 MM. Metric type.

Spark Plug Gaps—.025".

BATTERY:—U.S.L., Type XY-15A, 6 volt, 15 plate, 104 A.H. capacity (20 hour rate).

Starting Capacity—119 amperes for 20 minutes.

Grounded Terminal—Positive (+) terminal.

Location—On right hand side under front seat.

STARTER:—Model MAB-4063. Armature No. MAB-2006. Starter drive—Outboard Bendix.

Rotation—Counter-clockwise at commutator end.

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

Cranking Performance — 140 R.P.M. (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.

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

GENERATOR:—Model GAR-4603. Armature No. GAR-2077. Third brush control type.

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

Maximum Charging Rate—20 amperes (cold), 2050-2250 R.P.M., 25 M.P.H.

Performance Data

(Cold—without regulator field resistance)

Amperes	Volts	R.P.M.
0	6.4	760
4	6.75	920
8	7.05	1100
12	7.35	1300
16	7.7	1560
20	8.0	2300

Rotation—Counter-clockwise at commutator end.

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

Field Current—3.70-4.10 amperes at 6.0 volts.

Field Fuse—7½ amperes on field frame.

Motoring Current—4.65-5.15 amperes at 6.0 volts.

Mounting:—Pivot mounted at right front of engine. Fan belt drive. To remove, take out two pivot bolts, one clamp bolt.

Belt Adjustment:—Loosen pivot bolts and clamp bolt, pull generator away from engine, tighten mounting bolts. Belt tension should be just enough to drive generator 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 ampere discharge.

Relay Contact Gap—.025-.035".

Air Gap—.010-.030" (contacts closed).

LIGHTING:—Soreng-Manegold Switch, Model B-5640-A. Delco-Remy Foot Control Switch, Model 465-W. Foot control switch provides assymetrical passing beam (lower beam right hand headlight, upper beam left hand headlight). Headlight beams are crossed with left hand headlight lighting right hand side of road.

Bulb Specifications

Lamp	Candlepower	Mazda No.
Headlights	32-32	1000
Park., Instrument, Tail (R.H.)	3	63
Stop and Tail (L.H.)	21-2	1158
Dome	6	81

FUSES:—Lighting—20 amperes on lighting switch.

Generator Field—7½ amperes under cover on generator.

HORNS:—Schwartze. Vibrator type.

AUBURN

CUSTOM EIGHT, MODEL 8-50-Y (1934)
AUTO-LITE ELECTRICAL SYSTEM

SERIAL NUMBER:—First number, 850Y1001. On right hand side of cowl under hood. Letter following serial number designates body type.

ENGINE NUMBER:—On left hand lower side of crankcase.

ENGINE:—Lycoming, Model GG, eight cylinder, 'L' head type.
Dimensions—Bore, 3 1/15". Stroke, 4¾". Displacement, 279.92 cu. ins.
Horsepower—Rated, 30.0. Developed, 115 H.P. at 3600 R.P.M.
Compression—Std. 6.2-1. No optional compression ratios.

Pistons:—Bohn, aluminum alloy, Invar Strut, Split skirt type.
Weight—16 ozs. (stripped), 21.92 ozs. (with rings and pin).
Removal—Piston and rod assembly removed through bottom of engine.
Piston Length—3¾" (total), 2.3155" (top to center of pin).
Clearance—.0015" (skirt). See Fitting New Pistons.
Fitting New Pistons—Use feeler stock ½" wide to check clearance. 0015" feeler should be withdrawn easily but .0025" feeler should lock. If spring scale is used, tension required to withdraw .002" feeler should be 7-12 pounds.
NOTE:—Install pistons with slot toward left (camshaft side).

Piston Rings:—Four rings per piston, all above pin. #1 and 2—compression rings, #3 and 4—oil control rings.

Ring	Width	End Gap	Side Clearance	Wall Thickness
Comp. (#1, 2)	⅛"	.010-.018"	.0015-.003"	.135-.125"
Oil Cont. (#3)	⅛"	.006-.012"	.001-.0025"	.135-.125"
Oil Cont. (#4)	3/16"	.006-.012"	.001-.0025"	

Piston Pin:—Diameter, .8750-.8748". Length, 2.520-2.500". Pin is locked in rod.
Pin Fit in Piston—Tight push fit at 70°F. (selective fit).

Connecting Rod:—Weight, 2.34 lbs.. Length, 9½" (center-to-center).
Big End Bearing—Spun babbitt type. No shims.
Clearance—.001-.0025" (radial), .004-.009" (sideplay).
Adjustment—Adjust when wear exceeds .004" by filing bearing caps (no shims).
NOTE:—Connecting 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 lower bearing upper half must be toward camshaft side of engine on all rods.

Crankshaft:—Five main bearing type.
Journal Sizes—2⅜" diameter (all bearings).
Bearing Type—Removable bronze-backed, babbitt-lined type.
Clearance—.002-.00325" (radial).
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 #3 (center) main bearing. Endplay, .003-.004". Use .003" feeler to check clearance.

Camshaft:—Six bearing type. Drive, Non-adjustable chain.
Bearing Clearance—.0025-.0035" (radial).
Chain—Whitney. Width, 1". Length, 49 links. Pitch, ½".
Camshaft Setting—Sprockets are marked. Mesh chain with sprockets turned so there are 12 links on lower side of chain between marks. With sprocktts in this position the top dead center mark '⅛' on flywheel will be in line with indicator on housing with pistons #1 and 8 on top dead center.

Valves:—	Head Diameter	Stem Diameter	Stem Lgth.	Seat Angle	Lift
Intake	1 7/16"	.3410-.3425"	5¼"	30°	11/32"
Exhaust	1 13/32"	.3410-.3425"	5¼"	45°	11/32"

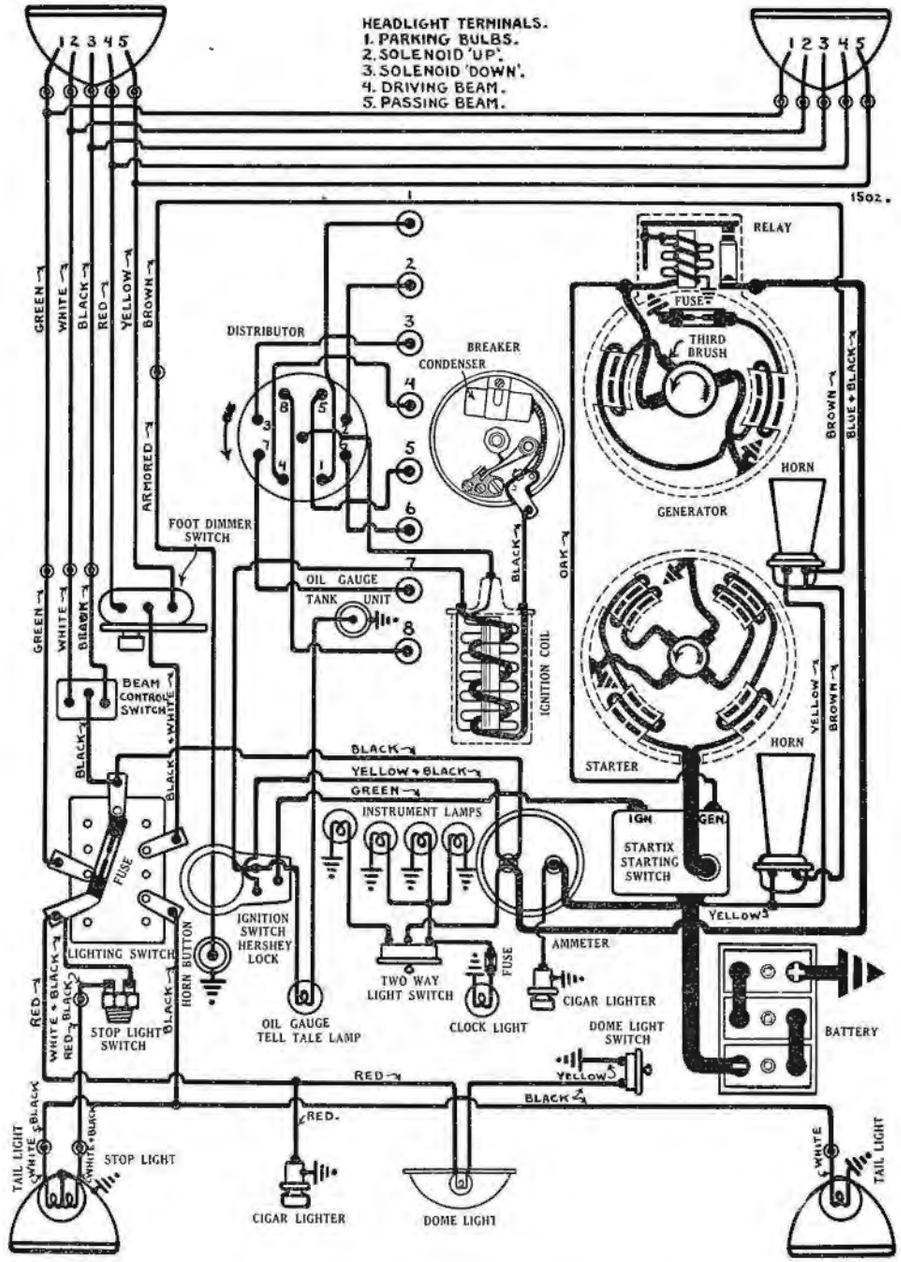
Tappet Clearance—.006-.008" (all valves—engine hot). Timing—.012".

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

Valve Timing

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

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



AUBURN

CUSTOM EIGHT, MODEL 8-50-Y (1934)
AUTO-LITE ELECTRICAL SYSTEM

CARBURETION: — (Fuel System). See Carburetion Section for complete data on Carburetor, Fuel Pump, and Gasoline Gauge.
Carburetor:—Stromberg, Model EE-1, 1" plain tube, dual, downdraft type.
Fuel Pump:—Stewart-Warner, Type 706-D.
Gasoline Gauge:—K-S Telegaughe, hydrostatic type.

IGNITION:—Coil Model CE-4001. On right hand side of engine block.
Ignition Current—3 amperes (idling), 4.5-5.5 amperes (stopped).
Ignition Switch—Oakes 'Hershey' type co-incidental ignition switch and steering post lock. Switch has two 'on' positions. Lower position of lever 'STX' is normal running position with Startix optrative. Use top position 'IGN' to check timing or whenever automatic cranking is not desired.

Distributor Model IGP-4002. Single breaker, 8 lobe cam, full automatic advance type. No synchronization required.
Breaker Gap—.013-.017" (.015-.019" first 1000 miles with new contacts).
Breaker Arm Spring Tension—18 ozs. (min.), 20 ozs. (max.).
Cam Angles (Distributor Degrees) — Closed 29°. Open 16°.

Automatic Advance

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

IGNITION TIMING:— Flywheel Degs. Piston Position All Engines .....3° or 1 tooth BTDC. .....0042" BTDC.
Timing:—Crank engine with #1 piston on compression until piston is 3° or approximately 1 tooth on flywheel before top dead center, stop when flywheel mark '3—' (first 470 cars) or '/' (later cars) lines up with indicator in inspection hole in flywheel housing. These marks are 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, check spark plug cable connections (see diagram).

Firing Order:—1-6-2-5-8-3-7-4 (see diagram).
Spark Plugs:—Champion, Type C-7. 18 MM. Metric type.
Spark Plug Gaps—.025".

BATTERY:—U.S.L., Type XY-15A, 6 volt, 15 plate, 104 A.H. capacity (20 hour rate).
Starting Capacity—119 amperes for 20 minutes.
Grounded Terminal—Positive (+) terminal.
Location—On right hand side under front seat.

STARTER:—Model MAB-4063. Armature No. MAB-2006. Starter drive—Outboard Bendix.
Rotation—Counter-clockwise at commutator end.
Brush Spring Tension—44-56 ozs. (new brushes).
Cranking Performance—140 R.P.M. (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.
Mounting:—Flange mounted on right hand front face of flywheel housing. To remove, take out flange mounting screws.

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

Performance Data
(Cold—without regulator field resistance)

Amperes	Volts	R.P.M.
0	6.4	760
4	6.75	920
8	7.05	1100
12	7.35	1300
16	7.7	1560
20	8.0	2300

Rotation—Counter-clockwise at commutator end.
Brush Spring Tension—24-36 ozs. (new brushes).
Field Current—3.70-4.10 amperes at 6.0 volts.
Field Fuse—7½ amperes on field frame.
Motoring Current—4.65-5.15 amperes at 6.0 volts.

Mounting:—Pivot mounted at right front of engine. Fan belt drive. To remove, take out two pivot bolts, one clamp bolt.
Belt Adjustment:—Loosen pivot bolts and clamp bolt, pull generator away from engine, tighten mounting bolts. Belt tension should be just enough to drive generator 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 ampere discharge.
Relay Contact Gap—.025-.035".
Air Gap—.010-.030" (contacts closed).

LIGHTING:—Soreng-Manegold Switch, Model A-5640-A. Delco-Remy Foot Control Switch Model 465-W. Beam Control Switch. Headlight bulbs are turned on and off by lighting switch. Beam control switch on instrument board provides three distinct beams (high, intermediate, low) to compensate for road and load conditions. Foot control switch deflects headlight beams to right (for all positions of beam control switch).

Bulb Specifications

Lamp	Candlepower	Mazda No.
Headlights	32-32	1000
Stop and Tail (L.H.)	21-2	1158
Tail (R.H.)	3	63
Dome	6	81
All others	3	63

FUSES:—Lighting—20 amperes on lighting switch.
Generator Field—7½ amperes under cover on generator.

HORNS:—Schwartze. Vibrator type.

AUSTIN
BANTAM MODEL (1934)
AUTO-LITE ELECTRICAL SYSTEM

SERIAL NUMBER:—First number, 375-5010.

ENGINE NUMBER:—First number, M-16500.

ENGINE:—Four cylinder, 'L' head type. Cylinders cast enbloc.
Dimension—Bore, 2.2″. Stroke, 3″. Displacement, 45.6 cu. ins.
Horsepower—Rated, 7 H.P. Developed, 13 H.P. at 3100 R.P.M.
Compression—Std. 6.0-1.

Pistons:—Lynite aluminum alloy.
Removal—Piston and rod assemblies removed through bottom of crankcase.
Clearance—.015″ (top), .004″ (skirt).

Piston Rings:—Three rings per piston, #1 and 2—compression rings, #3—oil control ring.

Ring	Width	End Gap
Comp. (#1, 2)	5/32″	.005-.010″ (new)
Oil Control (#3)	1/8″	.005-.010″ (new)

Piston Pins:—Diameter, ½″. Pin is locked in connecting rod.
Clearance in Piston—Tight thumb push fit with piston heated to temperature of boiling water.

Connecting Rod:—Length, 6″ center-to-center.
Clearance—.001-.0015″ (radial), .003″ (sideplay).

Crankshaft:—Two main bearing type. Mounted on double-row ball bearing at front and roller bearing at rear. Front bearing takes end thrust. No adjustment of these bearings should be necessary.

Camshaft:—Gear driven from crankshaft.
Camshaft Setting—Gears are marked. Mesh gears so that marked tooth on crankshaft gear is between two marked teeth on camshaft gear.

Valves:—	Head Diameter	Stem Diameter	Length	Seat Angle	Lift
Intake	1 1/32″	9/32″	3⅛″	45°	5/32″
Exhaust	1 1/32″	9/32″	3⅛″	45°	5/32″

Valve Spring Pressure—45 pounds.
Tappet Clearance—.006″ (all valves), .001″ variation allowed.

Valve Timing

Intake Valves Open—At top dead center. Close—40° after L.D.C.
Exhaust Valves Open—45° before L.D.C. Close—15° after T.D.C.

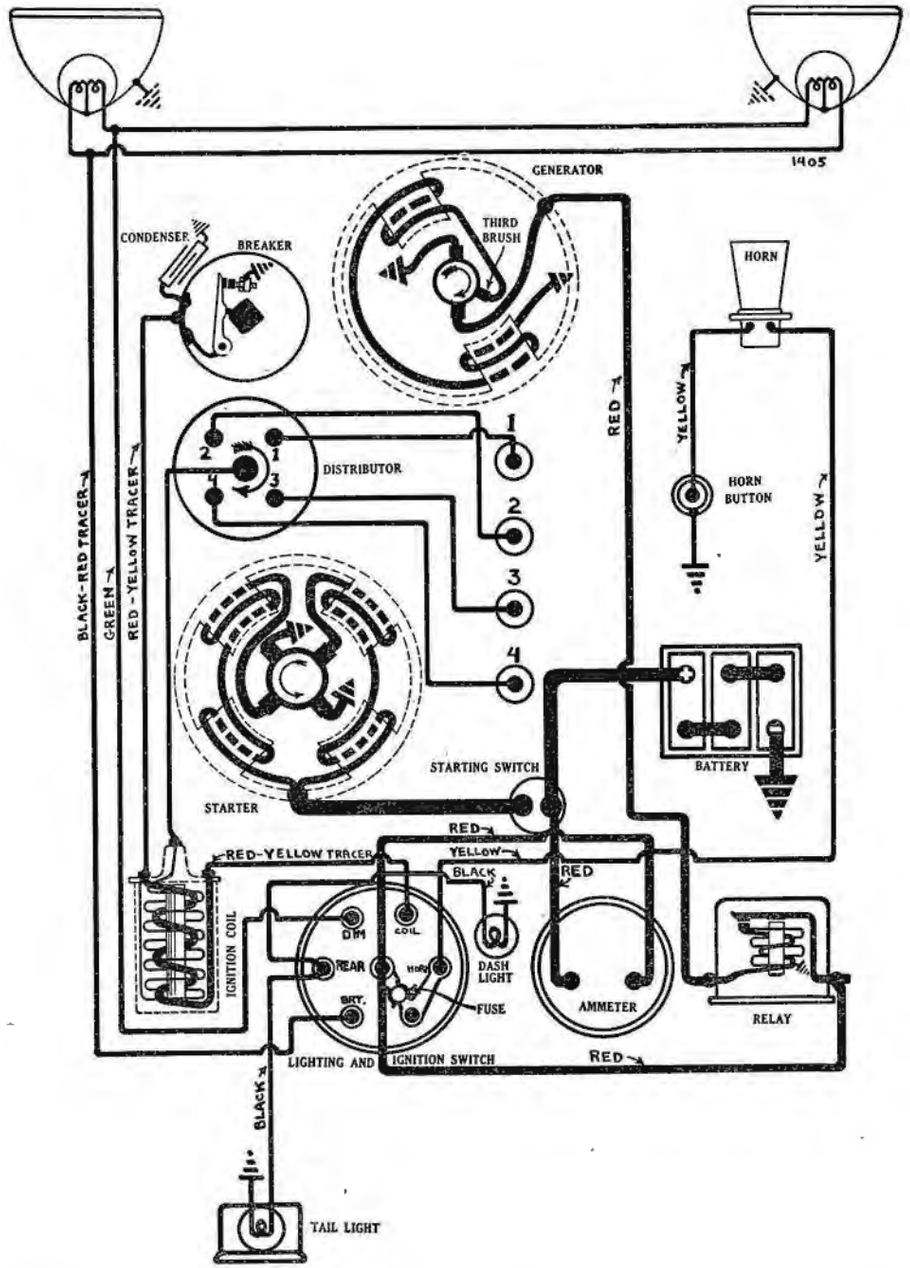
To Check Valve Timing:—Check tappet clearance of #1 intake valve (clearance should be .006″). This valve should open with #1 piston on top dead center. Use flywheel mark or regular timing gauge installed over #1 piston to determine piston position.

Lubrication:—Jet type with oil pump. Vane type oil pump mounted in crankcase at rear and driven from the camshaft. Oil fed under pressure to two oil jets on right hand side of crankcase and then sprayed in crankcase. Inspect oil jets every 3000 miles. To clean jets, take out cap screws on crankcase wall, run a wire not more than 1/16″ in diameter through jets. Be careful not to score jet walls.
Oil Capacity——5 pints.

CARBURETION:—(Fuel System). See Carburetion Section for complete data on Carburetor and Gasoline Gauge.
Carburetor:—Tillotson, Model M-10A. ⅝″ plain tube, updraft type.
Gasoline Gauge:—K-S Telegauge, hydrostatic type.

IGNITION:—**Coil Model IG-4065.** Mounted on engine side of dash.
Ignition Current——3 amperes at 6.5 volts (running), 4 amperes at 6.4 volts (stopped).
Ignition Switch—Combination ignition and lighting switch.

Distributor Model IGB-4086-A. Single breaker, 4 lobe cam, full automatic advance type.
Breaker Gap—Set gap at .018″. Limits, .018-.020″.
Breaker Arm Spring Tension—16-20 ounces.
Cam Angles (Distributor Degrees)—Closed, 46.5°. Open, 43.5°.



AUSTIN
BANTAM MODEL (1934)
AUTO-LITE ELECTRICAL SYSTEM

Automatic Advance

Distributor Degrees	R.P.M.	Engine Degrees	R.P.M.
Start	300	0	600
2	500	4	1000
4	700	8	1400
6	900	12	1800
8	1100	16	2200
11	1400	22	2800

Mounting:—Distributor now mounted in gear cover at right front of engine. To remove, loosen clamp screw in gear case cover, lift distrbutor out.

IGNITION TIMING:—

	Piston Position
All engines	.010-.012" BTDC.

To Set Ignition Timing:—Remove #1 spark plug, install regular timing gauge in spark plug port. With #1 piston on compression, turn engine over until gauge indicates piston is .010-.012" before top dead center, loosen advance arm clamp bolt, rotate distributor until contacts begin to open, tighten clamp bolt, see that rotor is directly opposite #1 segment in distributor cap, connect spark plugs as indicated on diagram.

Firing Order:—1-3-4-2. See diagram.

Spark Plugs:—Champion, Type C-7. 18 MM. Metric type.

BATTERY:—**U.S.L., Type XY-9A,** 6 volt, 9 plate, 58 A.H. capacity (20 hour rate).

Starting Capacity—68 amperes for 20 minutes.

Grounded Terminal—Negative (—) terminal.

Location—In recess in cowl under engine hood.

STARTER:—**Model MAK-4001. Armature No. MAK-2006.** Starter drive—Special outboard Bendix.

Rotation—Counter-clockwise at commutator end.

Brush Spring Tension—38-61 ozs. (new brushes).

Performance Data

Torque	R.P.M.	Volts	Amperes
.3 ft. lbs.	3240	5.5	100
1.3 "	1880	5.0	200
3.1 "	1000	4.5	300
4.8 "	220	4.0	400
5.5 "	Lock	3.5	450
7.0 "	Lock	4.0	520

Starting Switch:—Type SW-4001, mounted on toe-board.

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

GENERATOR:—**Model GAS-4104B. Armature No. GAS-2076.** Third brush control type.

Charging Rate Adjustment—Take off commutator cover band, shift third brush by hand counter-clockwise to increase, or clockwise to decrease charging rate. Third brush held in position by friction.

Maximum Charging Rate—14 amperes, 8.0 volts, 1925 R.P.M., 28-30 M.P.H.

Performance Data

Amperes	Volts	R.P.M.
2	6.6	835
6	7.1	1000
10	7.25	1260
14	8.0	1925
12	7.75	2900

Rotation—Counter-clockwise at commutator end.

Brush Spring Tension—15-20 ozs. (new brushes).

Field Current—3.80-4.20 amperes at 6.0 volts.

Motoring Current—4.46-4.94 amperes at 6.0 volts.

Mounting:—Generator cradle mounted on left hand side of engine. Fan belt drive. Generator mounting bracket integral with upper gear case cover and fan bracket. To remove, slack off drive belt tension, loosen mounting band.

CUTOUT RELAY:—**Model CB-4014.** Mounted on generator field frame.

Contacts Close—7.0-7.5 volts, 875 R.P.M., 10 M.P.H.

Contacts Open—.5-2.5 amperes discharge, 600-650 R.P.M., 6-7 M.P.H.

Contact Gap—.025-.035".

Air Gap—.010-.030" (contacts closed).

LIGHTING:—**Briggs & Stratton Switch, Model 50518.** Combination lighting and ignition switch mounted on instrument panel. Headlight beams (double filament bulbs) are controlled by lighting switch.

Bulb Specifications

Lamp	Candlepower	Mazda No.
Headlights	21-21	1110
All others	3	63

FUSES:—Lighting fuse on switch is 20 amperes.

BUICK

SERIES 40, MODELS 34-41, 46, 46S, 47, 48 (1934)
DELCO-REMY ELECTRICAL SYSTEM

SERIAL NUMBER:—First number, 2,735,509. Located on right front side of frame front cross member.

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

ENGINE:—Eight cylinder 'In line', valve-in-head type. Cylinders cast enbloc.
Dimensions:—Bore, 3 3/32". Stroke, 3⅞". Displacement, 233 cu. ins.
Horsepower:—Rated, 30.63. Developed, 93 HP. at 3200 R.P.M.
Compression:—Std., 5.45-1. Compression pressure, 121 lbs. at 1000 R.P.M. or 100 lbs. at 135 R.P.M. (cranking speed). No optional compression ratios.

Pistons:—Electro-plated cast iron. Furnished in standard oversizes of .001", .005", .010", .015", .020", .030". Pistons cannot be ground and cylinders must be reconditioned to standard oversizes.

Weight:—26.0 ounces (stripped), 32.8 ounces (complete assembly).

Removal:—Remove valve lifter guides and pushrods (must be taken off before head can be removed), take off head, remove piston assembly from top of engine after taking off lower bearing caps.

Fitting New Pistons:—Use feeler stock ½" wide. Piston should pass through cylinder of its own weight with .0015" feeler and should hold its own weight with .00225" feeler. Correct clearance, .00175".

NOTE:—Wristpin hole in piston offset, 3/64". Install pistons with offset toward camshaft side of engine.

Piston Rings:—Four rings per piston, 2 compression, 1 oil control ring above wristpin, 1 oil control ring below wristpin. Both oil control ring grooves drilled radially with ten ⅛" oil return holes.

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

Piston Pin:—Diameter, 13/16". Pin is clamped in rod and pin bosses in piston are bronze bushed. Use 5½" wrench to tighten pin clamp bolt to avoid distorting pin. Clearance in piston bushings, .0003-.0005".

Connecting Rod:—Weight, 27 ozs. Length, 7¼" (center to center).
Big End Bearing—Spun babbitt bearing. Shims provided for adjustment.
Clearance—.001-.002" (radial). .005-.008" (total side clearance).
Adjustment—Shims provided for adjustment. Do not file bearing caps.
NOTE:—Assemble rods with marks on rods and caps together and pointing toward rear of engine. Cap screws for bearing caps are ground and must not be replaced by any other type screw. Rods are new type with 45° caps.

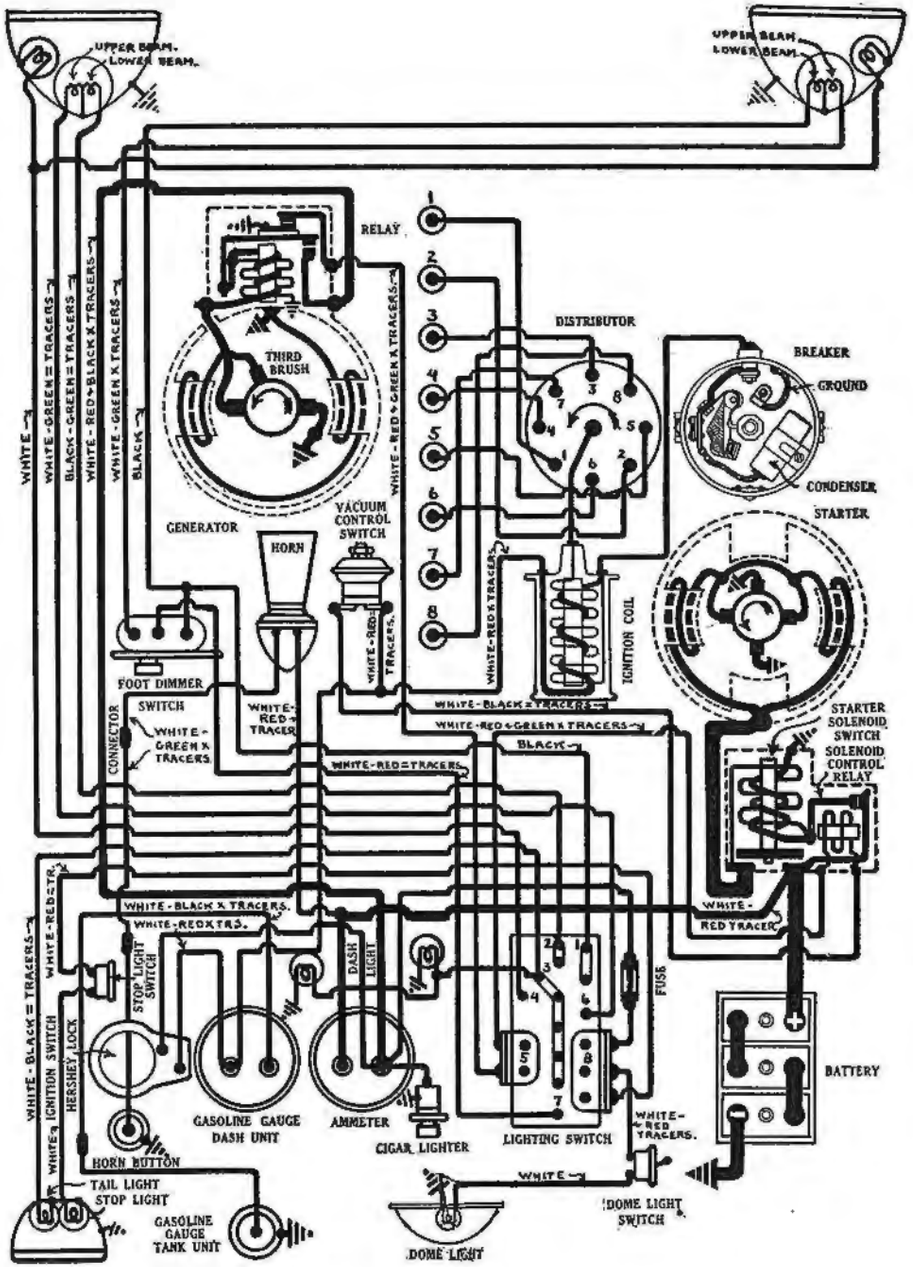
Crankshaft:—Five main bearing type with integral counterweights.
Journal Sizes—#1—2 5/16". #2—2⅜". #3—2 7/16". #4—2½". #5—2 9/16".
Bearing Type—Steel-backed babbitt lined type dowelled in crankcase and bearing cap. Bearings are assembled with .000-.002" projection above cap and crankcase to insure contact and prevent oil leakage.
Clearance:—.001-.002" (radial), 1/32" (clearance at each end, except #3).
Adjustment—Shims provided for adjustment. Do not file bearing caps.
End Thrust—Taken by #3 (center). End clearance, .004-.007" (total).

Camshaft:—Five bearing type. Camshaft drive—non-adjustable chain.
Chain—Morse. Length, 25" or 49 links. Pitch, .500.
Camshaft Setting—Space between teeth marked on each sprocket and two teeth on chain also marked. Marked tooth on chain must be meshed opposite mark on each sprocket. Sideplay on new chain should be ¼-⅜" midway between sprockets. Replace chain when sideplay is 2".

Valves:—	Head Diameter	Stem Diameter	Seat Angle	Lift
Intake	1 17/32" overall	.3715-.3725"	45°	.334"
Exhaust	1 11/32" overall	.3711-.3719"	45°	.339"

NOTE:—Exhaust valve stems are copper-plated.

Stem-to-Guide Clearance—.0015-.0035" (intake), .0021-.0039" (exhaust).
Tappet Clearance (Lash)—.008" hot (all valves).



BUICK

SERIES 40, MODELS 34-41, 46, 46S, 47, 48 (1934)
DELCO-REMY ELECTRICAL SYSTEM

Valve Springs—Double springs used on all valves.

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

Valve Timing

Intake Valves—Open 4½° BTDC. Close 40° ALDC.
Exhaust Valves—Open 57½° BLDC. Close 21° ATDC.

NOTE:—Above figures represent 'timing' points when valve is .004" off seat with .008" tappet clearance or lash.

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). Set tappet clearance at .008". Valve should be .163" open when dead center mark on flywheel for pistons #1 and #8 is visible in flywheel inspection hole.

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

Oil Pump Gear Clearances—.003-.006" (back lash), .0005-.004" (end clearance).

Oil Pressure—35 lbs.

Oil Pressure Relief Valve—Not adjustable. Operates at 35 lbs.

Capacity and Oil—7 quarts (dry), 6 quarts (refill). Use SAE #30 (100°—30°F.), #20-W (30° 0°F.). #10-W (0° to —15°F.).

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

Carburetor:—Marvel, Model BB-1, 1" dual downdraft type.

Automatic Choke—Delco-Remy, Type No. 498-D.

Fuel Pump:—A.C. Type R on right hand side of crankcase.

Gasoline Gauge:—A.C. Electric type.

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

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

Distributor:—**Model 663-E.** 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

Degrees	Distributor	R.P.M.
Start		200-240
5-7		400
9.5-11.5		900
13-15		1300
Degrees	**Engine**	**R.P.M.**
0		200-240
10-14		800
19-23		1800
26-30		2600

Octane Selector—Adjustable at distributor only. Pointer must be at midpoint on scale after setting timing. Octane Selector can be adjusted for fuel 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 Advance—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)	Vacuum (Ins. of Mercury)
Start	5-7 ins.
10-12°	10-13 ins.

Mounting—On right hand side of crankcase. To install distributor, see that cork oil seal is in place, rotate distributor until vacuum connection is at rear and parallel to engine, turn distributor shaft until rotor is opposite No. 1 segment in head, rotate oil pump drive shaft (use a screwdriver) until slot in shaft lines up with driving pin on lower end of distributor shaft, insert distributor, tighten two hold-down screws.

IGNITION TIMING:— Flywheel Degrees Piston Travel

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

All engines are timed for standard fuel at factory. No flywheel mark provided for Ethyl setting (see directions below).

Timing (Using Timing Light)—Connect timing light between distributor terminal and ground. Turn on ignition, turn 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 indicator bulb just lights, tighten hold-down screws, see that rotor is opposite #1 terminal in cap, check spark plug connections (see diagram). Line on pointer should be opposite center line on scale. Set by loosening pointer lock screw and shifting pointer.

Ethyl Fuel Setting—After setting ignition (above) for standard 2° setting, loosen distributor hold-down screws, rotate distributor clockwise three divisions on scale, tighten hold-down screws. This will provide correct 8° setting. No flywheel mark provided.

Timing (Use Synchroscope or Neon Light)—See Equipment Section for complete directions. Flywheel mark is filled with paint so as to be easily distinguished (ignition mark is less than ¼" before dead center mark and must not be confused). 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".

Radio Suppressors—Use special elbow type United Motors #1207820 (with adaptor #1208094 for center terminal of distributor).

BATTERY:—**Delco, Type 13-JW**, 6 volt, 13 plate, 98 ampere 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.**

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

Rotation—Counter-clockwise (commutator end).

Brush Spring Tension—24-28 ounces each.

Operating—375 amperes—4.1 volts—475 R.P.M.

Perormance Data

Torque	R.P.M.	Volts	Amperes
0 lb. ft.	5000	5.0	65
12 "	Lock	3.65	475

Starting Switch—Solenoid No. 1512. Vacuum Switch No. 1594. 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 935-K. Armature No. 1854856.** Third brush control type. Relay cut-out fitted with extra set of contacts for control of starter operating solenoid.

Charging Rate Adjustment:—Loosen lock screw on commutator end plate, shift third brush by hand, counter-clockwise to increase, or clockwise to decrease charging rate (viewed from commutator end), tighten lock screw.

Standard Setting—18 amperes (cold), 8.4 volts at 30 M.P.H.

Performance Data

	Amperes	Volts	R.P.M
Cold	16-19	8.0-8.4	2400
Hot	13-15	7.7-8.0	3000

Rotation—Counter-clockwise at commutator end.

Shunt Field Current—2.3-2.6 amperes at 6.0 volts.

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

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

Belt Adjustment—Loosen hinge bolts and clamp bolt, attach spring scale to clamp bolt, pull generator away from engine until scale reading is 20 lbs., tighten clamp bolt and hinge bolts.

RELAY CUT-OUT:—**Model 265-T.** Mounted on generator field frame. Relay has extra set of contacts mounted above armature for starter operating solenoid control.

Cuts In	Relay	Cuts Out
6.7-7.5 volts (10 M.P.H.).		0-2.5 amperes discharge.

Relay Contact Gap—.015-.025".

Relay Air Gap—.012-.017" (contacts closed).

Spring Tension—4.6 ozs. (to open upper contacts).

LIGHTING:—**Switch Model 478-S, 478-T (RHD.). Control Switch No. 465-R.** Foot control switch operative only with lighting switch in #4 position (country driving), providing assymetrical passing beam. Headlight bulbs are new 'pre-focused' type.

Bulb Sizes

Position	Candlepower	Mazda No.
Headlights	32-32	2330-L
" (some cars)	32-21	2330-C
Stop and Dome	6	81-L
Dash, Tail, Parking	3	63-L

FUSE:—30 ampere capacity lighting fuse in connector in lighting switch feed line from ammeter.

HORN:—Klaxon, Model K-26-L Vibrator type. Current draw, 6.5-8.5 amperes at 6.0 volts.

BUICK

SERIES 50, MODELS 34-56, 56S, 56C, 57, 58 (1934)
DELCO-REMY ELECTRICAL SYSTEM

SERIAL NUMBERS:—First number, 2,706,453. Located on right frame side rail in front of shock absorber.

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

ENGINE:—Eight cylinder 'in line' valve-in-head type. Cylinders cast en bloc.
Dimensions:—Bore, 2 21/32". Stroke, 4¼". Displacement, 235.3 cu. ins.
Horsepower:—Rated, 28.2. Developed, 88 H.P. at 3200 R.P.M.
Compression:—Std., 5.25-1. Compression pressure, 114 lbs. at 1000 R.P.M. or 97 lbs. at 135 R.P.M. (cranking speed). No optional compression ratios.
Pistons:—Electro-plated cast-iron. Furnished in standard oversizes of .001", .005", .010", .015", .020", .030". Pistons cannot be ground and cylinders must be reconditioned to standard oversize.
Weight—25.0 ozs. (stripped), 31.2 ozs. (complete assembly).
Removal—From bottom of engine. Pistons #3 to #8 can be removed on side opposite camshaft without removing counterweights by setting adjacent counterweights ahead of piston and rotating crankshaft while piston is being withdrawn. Balancer must be removed before pistons #1 and #2 can be taken out. To remove balancer, take out cotter pins, castellated nuts and washers on retaining bolts and slip off balancer halves as crankshaft is rotated. Do not remove spring banks and seats.
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. Correct clearance, .0015".
NOTE:—Piston pin hole in piston offset, 3/64". Install pistons with offset toward camshaft side of engine.

Piston Rings:—Four rings per piston, 2 compression, 1 oil control ring above piston pin, 1 oil control ring below piston pin. Both oil control ring grooves drilled radially with ten ⅛" oil return holes.

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

Piston Pins:—Diameter, ¾". Pin is clamped in rod and pin bosses in piston are bronze bushed. Use 5½" wrench to tighten pin clamp bolt to avoid distorting pin. Clearance in piston bushings, .0003-.0004".

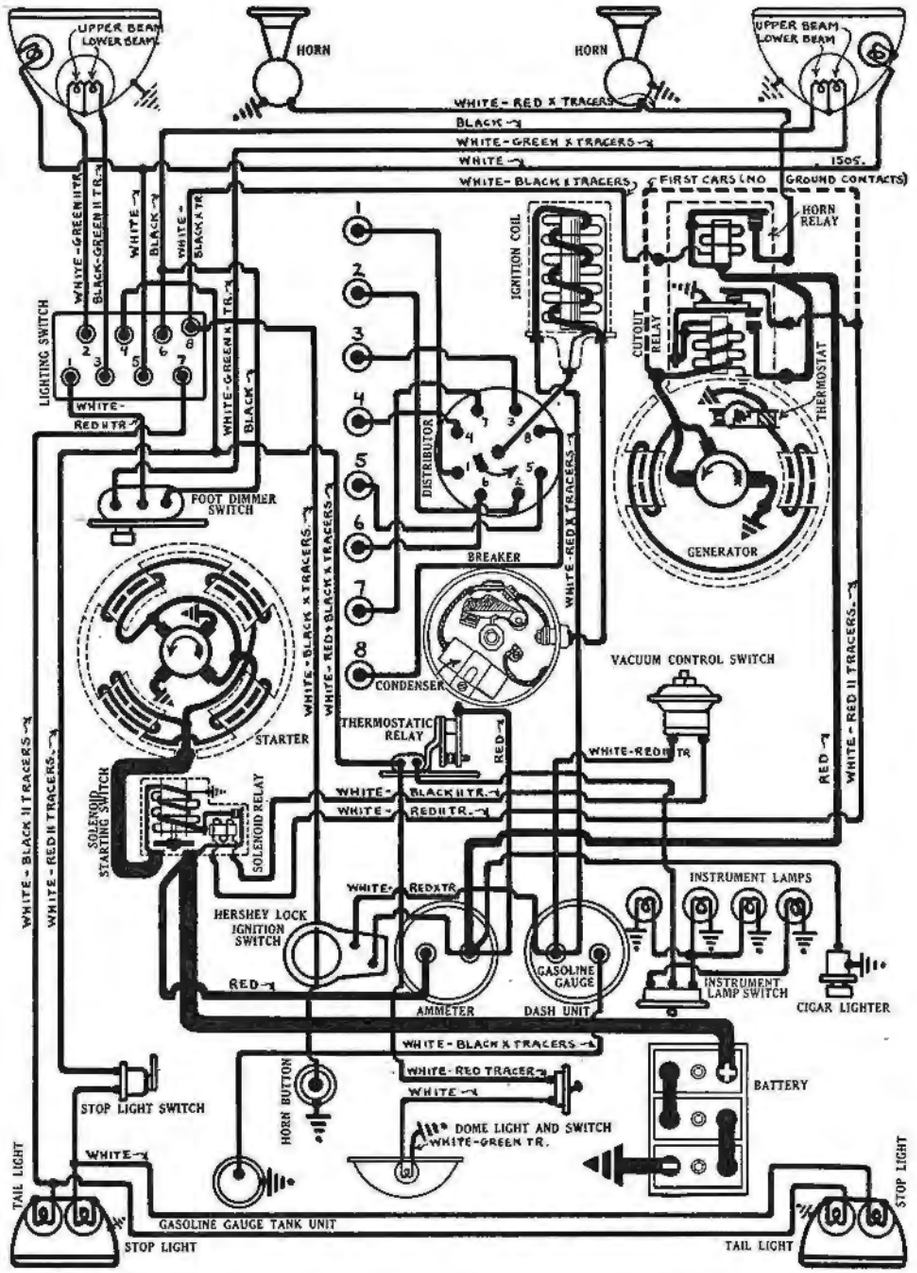
Connecting Rod:—Weight, 32 ozs. Length, 9" (center-to-center).
Big End Bearing—Spun babbitt. Shims provided for adjustment.
Clearance—.001-.002" (radial), .005-.008" (total side clearance).
Adjustment—Shims provided. Do not file bearing caps.
NOTE:—Connecting rod lower bearings are offset. Assemble rods with marks on caps pointing to nearest main bearing. Bolts for bearing caps are ground and must not be replaced by any other type bolt.

Crankshaft:—Five main bearing type with bolted-on counterweights. Balancer is mounted on crankshaft cheek between #1 and #2 crank pins.
Journal Sizes—#1-2 5/16". #2-2 ⅜". #3-2 7/16". #4-2 ½". #5-2 9/16".
Bearing Type—Steel-backed babbitt lined type dowelled in crankcase and bearing cap. Bearing shells are assembled with .000-.002" projection above cap and crankcase to insure contact and prevent oil leakage.
Clearance—.001-.002" (radial), 1/32" (clearance at each end, except #3).
Adjustment—Shims provided for adjustment. Do not file bearing caps.
End Thrust—Taken by #3 (center). End clearance, .004-.007" (total).

Camshaft:—Five bearing type. Camshaft drive, helical gears. Crankshaft and generator gears are steel. Camshaft gear is Textolite.
Adjustment—Backlash between gears should be .0005-.0015". When lash exceeds .0015" replace camshaft gear with '+1S' service gear (with teeth .001" thicker on pitch circle than standard gear). If the '+1S' gear does not correct excessive lash, install complete set of new gears.
Camshaft Setting—Gears are marked. Mesh marked tooth opposite meshed space on other gear.

Valves:—	Head Diameter	Stem Diameter	Seat Angle	Lift
Intake	1 15/32" (overall)	.3407-.3417"	45°	.340"
Exhaust	1 11/32" (overall)	.3403-.3411"	45°	.340"

NOTE:—Exhaust valve stems are copper-plated.



BUICK

SERIES 50, MODELS 34-56, 56S, 56C, 57, 58 (1934)
DELCO-REMY ELECTRICAL SYSTEM

Stem-to-Guide Clearance—.0015"-.0035" (intake), .0021-.0039" (exhaust).
Tappet Clearance (Lash)—.008" hot (all valves).
Valve Springs—Double springs used. Interchangeable with 1933.

Inner Spring—	Pressure	Length
Valve closed	10-15 lbs.	1 13/16"
Valve open	36-42 lbs.	1 15/32"
Outer Spring—	**Pressure**	**Length**
Valve closed	35-40 lbs.	1 15/16"
Valve open	96-103 lbs.	1 19/32"

Valve Timing

Intake Valves open 4½° BTDC. Close 54° ALDC.
Exhaust Valves open 58° BLDC. Close 30° ATDC.

NOTE:—Above figures represent 'timing' points when valve is .004" off seat with .008" tappet clearance or 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 flywheel inspection hole.

Lubrication:—Pressure type. Gear type pump located in crankcase.
Oil Pump Gear Clearances—.007-.010" (back lash), .0005-.004" (end clearance).
Oil Pressure—35 lbs.
Oil Pressure Relief Valve—Not adjustable. Operates at 35 lbs.

NOTE:—There is also a non-adjustable by-pass valve in the oil temperature regulator system.

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.

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

Degrees	Distributor	R.P.M.
Start		250
7		400
10.5		800
Degrees	**Engine**	**R.P.M.**
3.5		500
14		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). If rotor is not in correct position, lift distributor, disengage drive gears, turn distributor shaft, mesh gears, repeat timing.

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".
Radio Suppressors—Use special elbow type United Motors #1207820 (with adaptor #1208094 for center terminal of distributor).

BATTERY:—Delco, Type 13-JW, 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.
Operating—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, 25 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—20-26 ounces each.
Mounting—Flange mounted on right rear face of timing gear case.

SPECIAL GENERATORS:—Models 929-B, 965-L. These generators are special equipment. See Equipment Section for complete data.

CUTOUT RELAY:—Model 264-H (before Engine No. 2886405), 264-K (after Engine No. 2886405). Mounted on generator field frame. Type 264-K has special ground contacts mounted above armature for starter solenoid relay control (see illustration). Horn relay is incorporated in relay case.

Cuts in	Cut-out Relay	Cuts out
6.7-7.5 volts (8-10 M.P.H.).		0-2 amperes 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. Current draw 12 amperes at 6.0 volts each. Horns operated by horn relay (see Relay paragraph above).

BUICK

SERIES 60, MODELS 34-61, 66S, 66C, 67, 68 68C (1934)
SERIES 90, MODELS 34-90, 90L, 91, 96S, 96C, 97, 98, 98C (1934)
DELCO-REMY ELECTRICAL SYSTEM

SERIAL NUMBER:—First number, 2,706,453. Located on right frame side rail in front of front shock absorber.

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

ENGINE:—Eight cylinder in line, valve-in-head type. Cylinders cast enbloc.

Dimensions:—(60). Bore, 3 3/32". Stroke, 4⅜". Displacement, 278.1 cu. ins.
(90). Bore, 3 5/16". Stroke, 5". Displacement, 344.8 cubic inches.

Horsepower:—(60). Rated, 30.63. Developed, 100 H.P. at 3200 R.P.M.
(90). Rated, 35.12. Developed, 116 H.P. at 3200 R.P.M.

Compression:—(60). Std., 5.25-1. Compression pressure, 114 lbs. at 1000 R.P.M. or 104 lbs. at 120 R.P.M. (cranking speed).
(90). Std., 4.95-1. Compression pressure, 103 lbs. at 1000 R.P.M. or 95 lbs. at 120 R.P.M. (cranking speed). No optional compression ratios.

Pistons:—Electro-plated cast-iron. Furnished in standard oversizes of .001", .005", .010", .015", .020", .030". Pistons cannot be ground and cylinders must be reconditioned to standard oversize.
Weight—(60), 26.7 ozs. (stripped), 33.6 ozs. (complete assembly).
(90), 30.4 ozs. (stripped), 38.4 ozs. (complete assembly).
Removal—From bottom of engine. Pistons #3 to #8 can be removed on side opposite camshaft without removing counterweights by setting adjacent counterweights ahead of piston and rotating crankshaft as piston is withdrawn. Balancer must be removed before pistons #1 and #2 can be removed. To remove balancer, take out cotter pins, remove castellated nuts and washers on retaining bolts, slip off balancer halves as crankshaft is rotated. Do not remove spring banks and seats.
Fitting New Pistons—Use feeler stock ½" wide. Pistons should pass through cylinders of own weight with .0015" feeler and hold their own weight with .00225" feeler. Correct clearance, .00175" (60), .002" (90).
NOTE:—Piston pin hole in piston is offset 3/64" (60), 3/32" (90). Install pistons with offset toward camshaft side of engine.

Piston Rings:—Four rings per piston, 2 compression, 1 oil control ring above piston pin, 1 oil control ring below pin. Both oil control ring grooves drilled radially with ten ⅛" oil return holes.

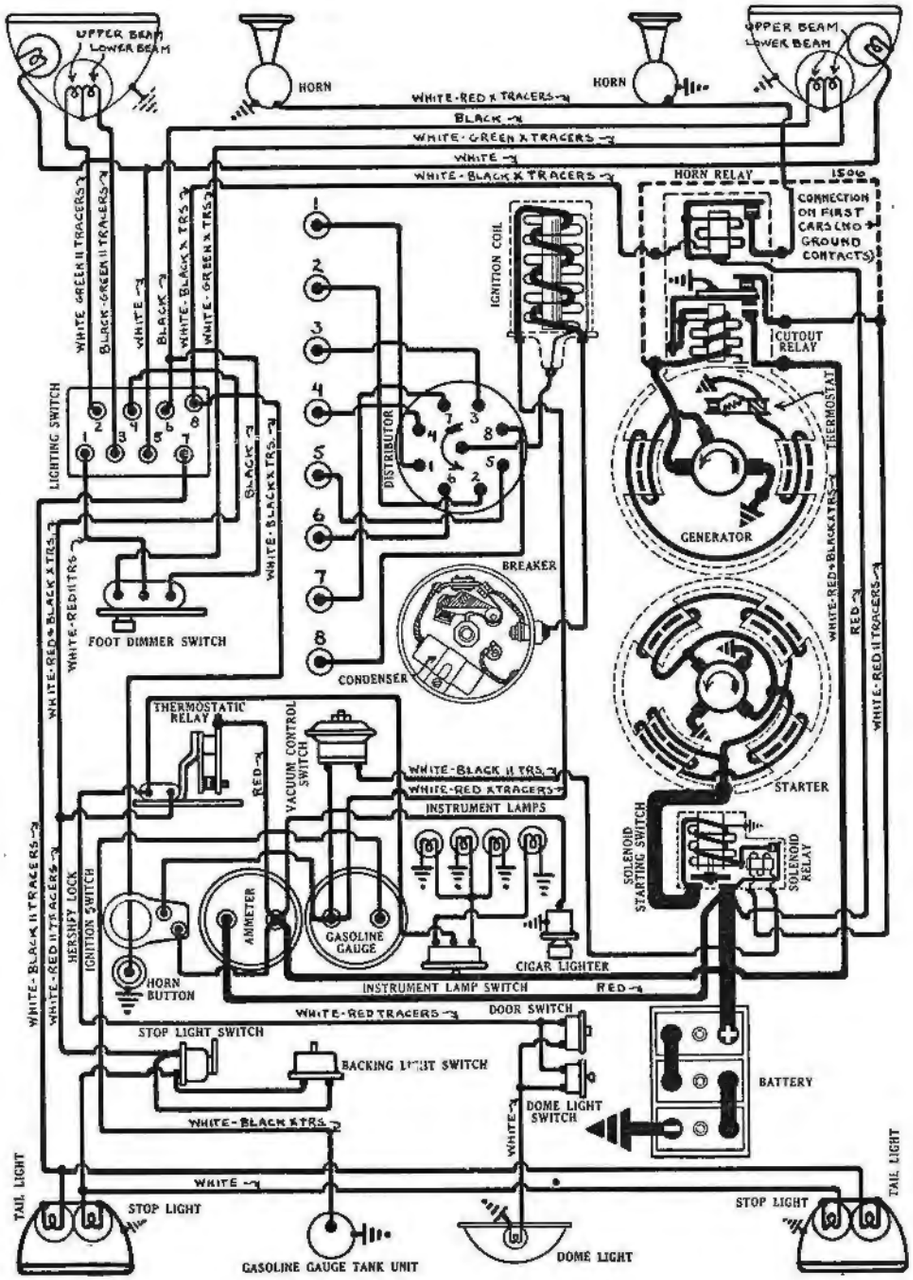
Engine	Ring	Width	Wall Thickness	End Gap	Side Clearance
60, 90	Comp. Top	⅛"	.140"	.010-.015"	.0015-.003"
60, 90	Comp. Lower	⅛"	.140"	.010-.015"	.001-.0025"
60	Oil Cont.	5/32"	.135"	.010-.018"	.001-.0025"
90	Oil Cont.	5/32"	.145"	.010-.018"	.001-.0025"

Piston Pins:—Diameter, 13/16" (60), ⅞" (90). Pin is clamped in rod and pin bosses in piston are bronze bushed. Use 5½" wrench to tighten pin clamp bolt to avoid distorting pin. Clearance in piston bushings, .003-.004".

Connecting Rod:—(60) Weight, 39.65 ozs. Length, 9¾" (center-to-center).
(90) Weight, 49.5 ozs. Length, 11" (center-to-center).
Big End Bearing—Spun babbitt. Shims provided for adjustment.
Clearance—.001-.002" (radial), .005-.008" (total side clearance).
Adjustment—Shims provided. Do not file rod or bearing caps.
NOTE:—Connecting rod lower bearings are offset. Assemble rods with marks on caps pointing to nearest main bearing. Bolts for bearing caps are ground and must not be replaced by any other type bolt.

Crankshaft:—Five main bearing type with bolted-on counterweights. Balancer is mounted on crankshaft cheek between #1 and #2 crankpins.
Journal Sizes—(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 babbit lined type dowelled in crankcase and bearing cap. Bearing shells are assembled with .000-.002" projection above cap and crankcase to insure contact and prevent oil leakage.
Clearance—.001-.002" (radial), 1/32" (clearance at each end, except #3).
Adjustment—Shims provided for adjustment. Do not file bearing caps.
End Thrust—Taken by #3 (center). End clearance, .004-.007" (total).

Camshaft:—Six bearing type. Camshaft drive, helical gears. Crankshaft and generator gears, steel. Camshaft gear, Textolite.
Adjustment—Backlash between gears should be .0005-.0015". When lash exceeds .0015" replace camshaft gear with '+1S' service gear (with teeth .001" thicker on pitch circle than standard gear). If the '+1S' gear does not correct excessive lash, install complete set of new gears.
Camshaft Setting (Valve Timing)—Gears are marked. Mesh marked tooth opposite marked space on other gear.



BUICK

SERIES 60, MODELS 34-61, 66S, 66C, 67, 68 68C (1934)
SERIES 90, MODELS 34-90, 90L, 91, 96S, 96C, 97, 98, 98C (1934)
DELCO-REMY ELECTRICAL SYSTEM

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—45° (all valves). **Lift**—.340".

NOTE:—Exhaust valve stems are copper-plated.

Stem-to-Guide Clearance—.0015-.0035" (intake), .0021-.0039" (exhaust).

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

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 Pump Gear Clearances—.007-.010" (backlash), .0005-.004" (end clearance).

Oil Pressure—35 pounds.

Oil Pressure Relief Valve—Not adjustable.

NOTE:—There is also a non-adjustable by-pass valve in the oil temperature regulator system.

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.

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	Distributor R.P.M.	Engine Degrees	Engine 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-GW, 6 volt, 15 plate, 114 A.H. capacity (20 hour rate).

Starting Capacity—137 amperes for 20 minutes.

(90) Delco, Type 17-DW, 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.

Operating—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, 25 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—20-26 ounces.

Mounting—Flange mounted on right rear face of timing gear case.

SPECIAL GENERATORS:—Models 929-B, 965-L. These generators are special equipment. See Equipment Section for complete data.

CUTOUT RELAY:—Model 264-H (before Engine No. 2886415 (60), 2886638 (90), 264-K (after Engine No. 2886415 (60), 2886438 (90). Mounted on generator field frame. Type 264-K has special ground contacts mounted above armature for starter solenoid relay control (see illustration). Horn relay is incorporated in relay case.

Cuts in	Cut-out Relay	Cuts out
6.7-7.5 volts (8-10 M.P.H.).		0-2 amperes 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).

CADILLAC

V-8 MODEL 355-D, SERIES 10, 20, 30 (1934)

DELCO-REMY SYSTEM

SERIAL NUMBER:—Same as engine number.

ENGINE NUMBER:—Stamped on right hand side of crankcase near water inlet. First number this series—3,100,001.

ENGINE:—Eight cylinder, 90° 'V', 'L' head type.
Dimensions—Bore, 3⅜". Stroke, 4 15/16". Displacement, 353 cu. ins.
Horsepower—Rated, 36.45. Developed, 130 H.P. at 3400 R.P.M. (Std. Comp.).
Compression—Std., 6.25-1. Compression pressure, 143 lbs. at 1000 R.P.M. or 157 lbs. at 2800 R.P.M. Optional compression ratio, 5.75-1.
NOTE:—Cylinder heads are stamped with actual compression ratio at a point directly above the front spark plug. These marks replace previous marking 'H.H.C.' (std. head) and 'H.C.' optional lower compression head).

Pistons:—Lynite, Lo-Ex aluminum alloy, 'T' slot, cam ground type with special 'Alumilite' finish (special hard oxide deposited on bearing surface of piston). Piston clearance across pin bosses is .0065" greater than at right angles to bosses. Pistons cannot be ground and cylinders should be reconditioned to take standard oversize pistons (.005", .015", .030").
Piston Weight (complete assembly), 20.880 ounces.
Piston Weight (without rings, pin, or locking screw), 15.008 ounces.
Clearance—Top, .019". Bottom, .0023".
Removal—Piston and rod assembly removed at bottom of engine.
Fitting New Pistons—Do not use feelers to check piston clearance. Check piston size with micrometer gauge at point just below and to the left of 'T' slot junction midway between piston holes. Piston must be at 70°F. Check cylinder bore with micrometer, finish bore to size, giving correct clearance.
NOTE:—Install pistons with slot to left as viewed from driver's seat.

Piston Rings—Three compression rings, one oil ring per piston. Oil ring groove in piston drilled radially.

Ring	Width	Gap	Wall Thickness	Groove Depth
Comp. (all)	.0930-.0935"	.007-.012"	.145"	.158" min.
Oil	.1860-.1865"	.007-.015"	.145"	.154" min.

NOTE:—Compression rings in #2 and 3 ring grooves are notched or stepped. Install these rings with notch or step downward.

Wrist Pin—Length, 3 1/32". Diameter, .8742-.8744". Pin is locked in piston by locking screw. Heat pistons in hot water to remove or install pins.
Clearance (Piston)—Locking screw end, .0004" press fit or hand push fit with piston heated to 200-210°F. Free end, .0000" clearance or hand push fit with piston at room temperature (70°F.).

Connecting Rod:—Weight, 32.848 ounces. Length, 10½". Material, #4140 steel.
Big End Bearing—Spun babbitt bearing. No shims used.
Clearance—.0015" (radial). .003-.006" (endplay).
Adjustment—None (no shims). Do not file bearing caps. Replace rods.

Crankshaft:—Three main bearing type with four counterweights.
Journal Size—2⅜" diameter (all).
Bearing Type—Separate babbitt lined-bronze backed type.
Clearance—.0015" (radial).
Adjustment—None (no shims). Do not file bearing caps. Replace bearings.
End Thrust—Taken by #3 (rear) bearing. End clearance, .001-.005".

Camshaft:—Chain driven (two-sprocket non-adjustable type).
Chain—Morse #766. Length, 54 links or 27". Pitch, .500".
Camshaft Setting—Align '0' marks on sprockets with straightedge across shaft centers. Mesh chain.

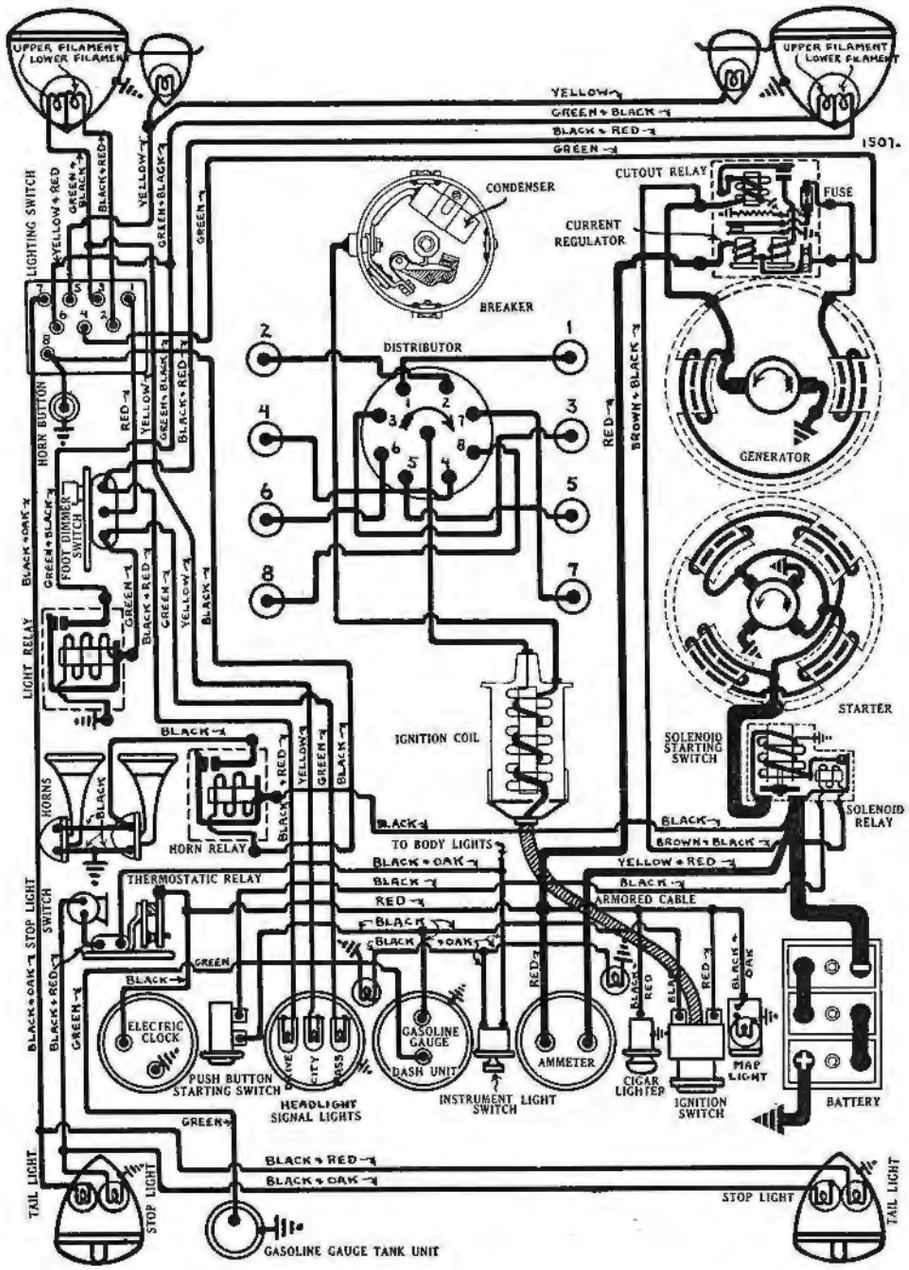
Valves:—	Head Diameter	Stem Diameter	Length	Seat Angle	Lift
Intake	1.660-1.666"	⅜"	6 17/32"	30°	23/64"
Exhaust	1.634-1.640"	⅜"	6½"	45°	23/64"

Stem-to-Guide Clearance—Intake, .0025". Exhaust, .0025".
Tappet Clearance—Intake, .006". Exhaust, .004" (operating at 35 M.P.H.).

Valve Springs—	Spring Pressure	Outer Spring Lgth.	Inner Spring Lgth.
Valve closed	70 lbs.	1.922"	1.751"
Valve open	185 lbs.	1.566"	1.395"

Valve Timing

Intake Valves Open—6° BTDC. Close—42° ALDC.
Exhaust Valves Open—38° BLDC. Close—2° ATDC.
NOTE:—Tappet clearance for timing purposes (engine cold) should be .006" (intake) and .010" (exhaust).



CADILLAC

V-8 MODEL 355-D, SERIES 10, 20, 30 (1934)
DELCO-REMY SYSTEM

Lubrication:—Pressure type. Gear type oil pump located in crankcase.
Oil Pressure—30 lbs. at 60 M.P.H.
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).
Air Cleaner. Oil-wetted type. Clean and re-oil at 2000-6000 mile intervals (cleaner unit under cap at top of silencer-cleaner unit).
Choke Control—Detroit semi-automatic type.
Fuel Pump:—A.C., Type D mechanical pump.
Gasoline Gauge:—A.C. Electric type.

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 .020″. Limits, .018-.024″.
Breaker Arm Spring Tension—17-21 ounces.
Manual Advance. 20° (engine) adjustment at distributor only.
Cam Angles (Distributor Degrees) — Closed 31°. Open 14°.

Automatic Advance

Degrees	Distributor	R.P.M.
Start		500
12		1200
Degrees	**Engine**	**R.P.M.**
1.5		1000
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-7. 18 MM. Metric type.
Spark Plug Gaps—.025-.027″.

BATTERY:—Delco, Type 17-DW, 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.
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 1519,1521 (RHD.). Pushbutton switch 1319. Solenoid (starting switch and gear shift) mounted on starter field frame. Circuit 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—14-16 amperes (cold—lamps off), 19-21 amperes (cold—lamps on). Above 'lamps on' figure correct with 11 ampere lamp load.

Cut-out Relay

Cuts in—6.75 volts.
Cuts out—2.5 ampere discharge (maximum) at 6.3 volts.
Relay Contact Gap—.015-.025″.
AirGap—.012-. 017″ (contacts closed).

Current Regulator

Regulator Contact Gap—.015-.040″.
Air Gap—.055-.075″ between armature and center of core (armature down until fibre bumper just touches core).
.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 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).

CADILLAC
V-12 MODEL 370-D (1934)
DELCO-REMY ELECTRICAL SYSTEM

SERIAL NUMBER:—Same as engine number. First number, 4,100,001.

ENGINE NUMBER:—Stamped on generator drive chain housing at right of engine and on top surface inner frame sidebar in back of radiator on right hand side.

ENGINE:—Twelve cylinder, 45° 'V', 'T' or overhead valve type. Cylinder blocks for each bank cast enbloc and separate from crankcase.
Dimensions—Bore, 3⅛". Stroke, 4". Displacement, 368 cu. ins.
Horsepower—Rated, 46.9. Developed, 150 H.P. at 3600 R.P.M.
Compression—Std., 6.0-1. Compression pressure, 160 lbs. at 3000 R.P.M. or 145 lbs. at 1000 R.P.M. Optional compression ratio, 5.65-1.
NOTE:—Cylinder heads are stamped with actual compression ratio on the end of the cylinder head. These marks replace previous markings 'H.H.C.' (standard head) and 'H.C.' (optional lower compression head). Compression ratio can be altered by changing cylinder head gaskets.

Pistons:—Lynite, Lo-Ex aluminum alloy, 'T' slot, cam ground type with special 'Alumilite' finish (special hard oxide deposited on bearing surface of piston). Piston clearance across pin bosses is .0065" greater than at right angles to bosses. Pistons cannot be ground and cylinders should be reconditioned to take standard oversize piston (.005", .015", .030").
Weight—12.048 ozs. (without rings, pin, or locking screw).
Removal—Piston and rod assembly removed through bottom of engine.
Clearance—Top, .019". Skirt, .0020" (see Fitting New Pistons).
Fitting New Pistons—Do not use feelers to check piston clearance. Check piston size with micrometer gauge at point just below and to left of 'T' slot junction at point midway between piston pin holes (piston must be at 70°F.). Use micrometer gauge to check cylinder bore and finish bore to size, giving correct clearance.
NOTE:—Install pistons with slot to left as viewed from driver's seat.

Piston Rings:—Four rings per piston, all above piston pin, #1—compression ring, #2 and 3—notched or stepped compression rings, #4—slotted oil control ring. Lower ring groove drilled radially with oil drain holes.

Ring	Width	End Gap	Wall Thickness	Groove Depth
Comp. (all)	.0930-.0935"	.007-.012"	.135"	.150" (min.)
Oil Cont.	.1545-.1550"	.007-.015"	.135"	.144" (min.)

Piston Pins:—Diameter, .8742-.8744". Length, 2.810-2.815". Pin is locked in piston by locking screw. Heat pistons in hot water to remove or install pins.
Clearance (Piston)—Locking screw end, .0004" press fit or hand push fit with piston heated to 200-210°F. Free end, .0000" clearance or hand push fit with piston at room temperature (70°F.).
NOTE:—Install pins with piston heated. Lubricate pins with oil before inserting in piston pin bosses.

Connecting Rod:—Weight, 31.806 ozs. Length, 9¼" (center-to-center).
Big End Bearing—Spun babbitt type. No shims used.
Clearance—.0015" (radial), .004-.007" (sideplay).
Adjustment—None (no shims). Do not file bearing caps. Replace rods.

Crankshaft:—Four main bearing type with integral counterweights.
Journal Sizes—2⅝" diameter (all bearings).
Bearing Type—Removable steel-backed, babbitt-lined type. No shims.
Clearance—.001" (radial).
Adjustment—None (no shims). Do not file bearing caps. Replace bearings.
End Thrust—Taken by #3 main bearing. Endplay, .001-.005".

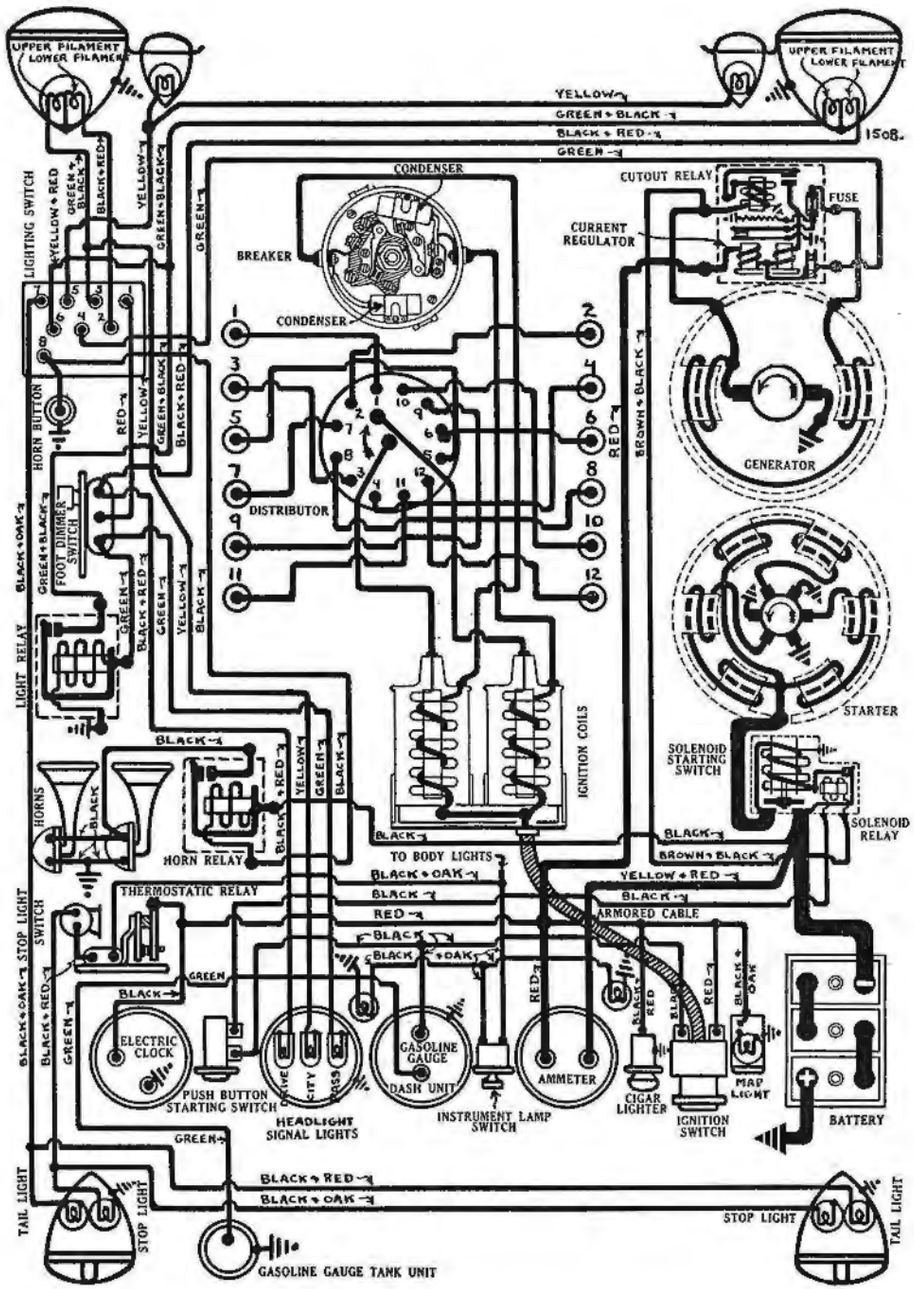
Camshaft:—Drive, Duplex chain with automatic idler sprocket take-up.
Chain—Morse #766 Duplex. Width, 1½". Length, 41¼" or 110 links.
Pitch—.375". See Equipment Section for data on Automatic idler sprocket.
Camshaft Setting—Sprockets are marked. Mesh chain with sprockets turned so that '0' marks are adjacent and in line with a straightedge across the shaft centers.

Valves:—

	Head Diameter	Stem Diameter	Length	Seat Angle	Lift
Intake	1.509-1.515"	11/32"	6 9/64"	45°	11/32"
Exhaust	1.384-1.39"	11/32"	6 9/64"	45°	11/32"

Stem-to-Guide Clearance—.0015" (intake), .0025" (exhaust).
Tappet Clearance—None in service. Automatic valve tappet take-up used.
Valve Springs—Double springs used on all valves.

	Spring Pressure	Length
Valve Closed	69½ lbs.	1.922" (outer), 1.751" (inner)
Valve Open	167 lbs.	1.578" (outer), 1.407" (inner)



CADILLAC
V-12 MODEL 370-D (1934)
DELCO-REMY ELECTRICAL SYSTEM

Valve Timing

Intake Valves Open—At TDC. Close—44° 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 data on Cadillac V-16.

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.

IGNITION:—Coil Model 553-E. Two coil unit assembled with ignition switch.
Ignition Switch—Model 431-E. 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—19-23 ounces.
Cam Angles (Distributor Degrees) — Closed 36°. Open 24°. Each set operates independently.

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 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, check rotor position and spark plug connections (see diagram). Then synchronize movable contacts as directed below.
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-16 but has special marks 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 Plugs:—A.C., Type G-7. 18 MM. Metric type.
Spark Plug Gaps—.026″. Limits, .025-.027″.

BATTERY:—Delco, Type 21-DW, 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-.040″.
Air Gap—.055-.075″ between armature and center of core (armature down until fibre bumper just touches core).
.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 to close contacts. Current draw, .8 amperes.
Contact Gap—.015-.025″.
Air Gap—.012-.017″ (contacts closed).
FUSES:—Generator field—6 ampere capacity.

CADILLAC

V-16 MODEL 452-D (1934)

DELCO-REMY ELECTRICAL SYSTEM

SERIAL NUMBER:—Same as engine number. First number this series, 5,100,001.

ENGINE NUMBER:—Stamped on generator drive chain housing at right of engine and on top surface inner frame sidebar in back of radiator on right hand side.

ENGINE:—Sixteen cylinder, 45° 'V', 'I' or overhead valve type. Cylinder blocks for each bank cast enbloc and separate from crankcase.
Dimensions—Bore, 3". Stroke, 4". Displacement, 452 cubic inches.
Horsepower—Rated, 57.7. Developed, 185 H.P. at 3800 R.P.M.
Compression—Std. 6.0-1. Compression pressure, 171 lbs. at 3200 R.P.M. or 156 lbs. at 1000 R.P.M. Optional compression ratio, 5.65-1.
NOTE:—Cylinder heads are stamped with actual compression ratio on the end of the head. These marks replace previous markings 'H.H.C.' (standard head) and 'H.C.' (optional lower compression head). Compression ratio can be altered by changing cylinder head gaskets.

Pistons:—Lynite, Lo-Ex aluminum alloy, 'T' slot, cam ground type with special 'Alumilite' finish (special hard oxide deposited on bearing surface of piston). Piston clearance across pin bosses is .0065" greater than at right angles to bosses. Pistons cannot be ground and cylinders should be reconditioned to take standard oversize piston (.005", .015", .030").
Removal—Piston and rod assembly removed from bottom of engine.
Clearance—Top, .018". Skirt, .0018" (see Fitting New Pistons).
Fitting New Pistons—Do not use feelers to check piston clearance. Check piston size with micrometer gauge at point just below and to left of 'T' slot junction at point midway between piston pin holes (piston must be at 70°F.). Use micrometer gauge to check cylinder bore and finish bore to size giving correct clearance.
NOTE:—Install pistons with slot to left as viewed from driver's seat.

Piston Rings:—Four rings per piston, all above piston pin, #1—compression ring, #2 and 3—notched or stepped compression rings, #4—slotted oil control ring. Lower ring groove drilled radially with oil drain holes.

Ring	Width	End Gap	Wall Thickness	Groove Depth
Comp. (all)	.0930"-.0935"	.007-.012"	.130"	.142" (min.)
Oil Cont.	.1545-.1550"	.007-.015"	.135"	.139" (min.)

NOTE:—Install notched compression rings with notch or step downward.

Piston Pin:—Diameter, .8742-.8744". Length, 2.810-2.815". Pin is locked in piston by locking screw. Heat pistons in hot water to remove or install pins.
Clearance (Piston)—Locking screw end, .0004" press fit or hand push fit with piston heated to 200-210°F. Free end, 0000" clearance or hand push fit with piston at room temperature (70°F.).
NOTE:—Install pins with piston heated. Lubricate pins with oil before inserting in piston pin bosses.

Connecting Rod:—Weight, 31.808 ozs. Length, 9¼" (center-to-center).
Big End Bearing—Poured babbitt type. No shims used.
Clearance—.0015" (radial), .004-.007" (sideplay).
Adjustment—None (no shims). Do not file bearing caps.- Replace rods.

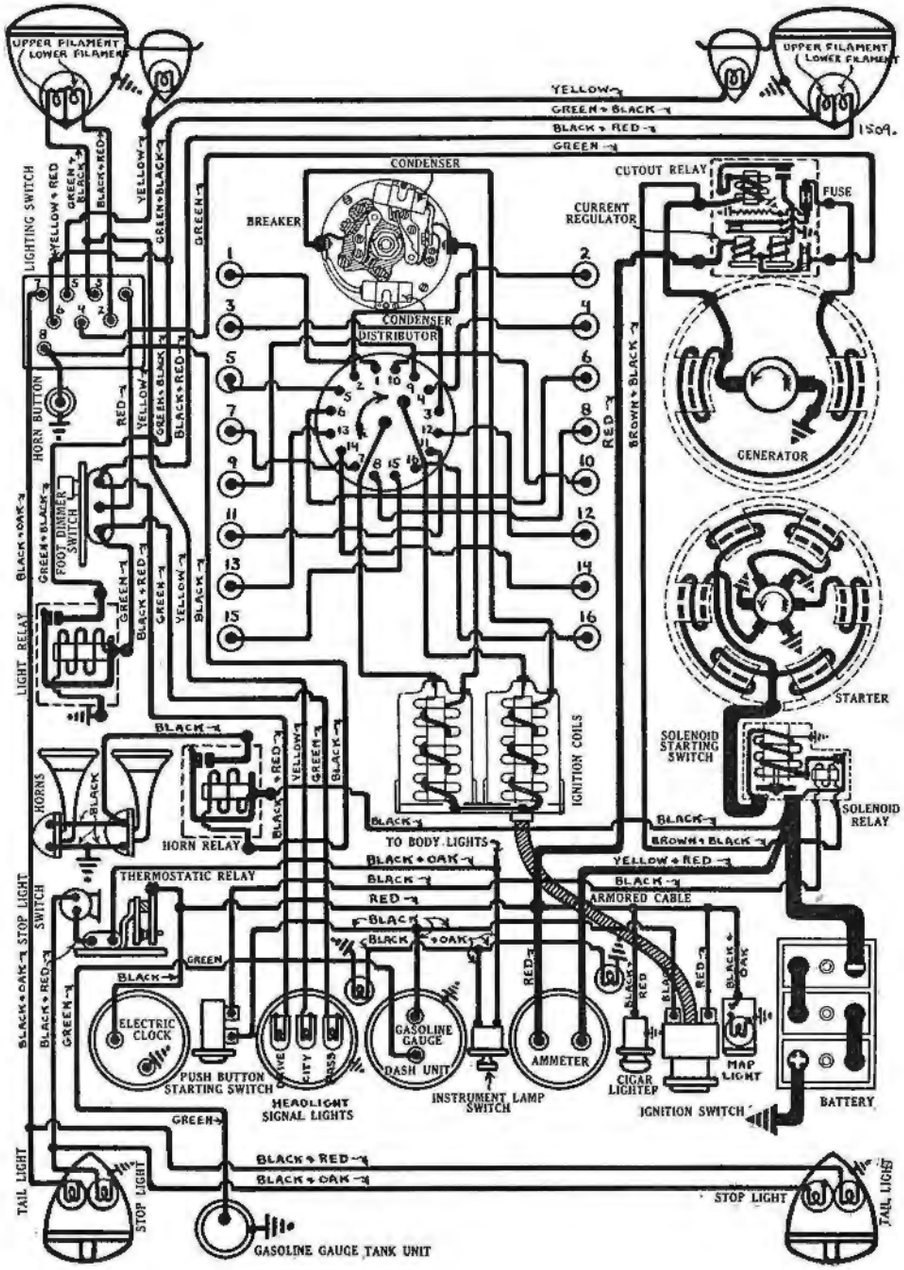
Crankshaft:—Five main bearing type with integral counterweights.
Journal Sizes—2⅝" diameter (all bearings).
Bearing Type—Removable steel-backed, babbitt-lined type. No shims.
Clearance—.002-.004" (radial).
Adjustment—None (no shims). Do not file bearing caps. Replace bearings.
End Thrust—Taken by #3 (center) main bearing. Endplay, .001-.005".

Camshaft:—Drive—Duplex chain with automatic idler sprocket take-up.
Chain—Morse #766 Duplex. Width, 1½". Length, 4¼" or 110 links.
Pitch—.375". See Equipment Section for data on 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	Seat Angle	Lift
Intake	1.509-1.515"	11/32"	6 9/64"	45°	11/32"
Exhaust	1.384-1.390"	11/32"	6 9/64"	45°	11/32"

Stem-to-Guide Clearance—.0015" (all valves).
Tappet Clearance—None in service. Automatic valve tappet take-up used.
Valve Springs—Double springs used on all valves.

	Spring Pressure	Spring Length
Valve Closed	64 lbs.	1.875" (outer), 1.751" (inner)
Valve Open	141 lbs.	1.531" (outer), 1.407" (inner)



CADILLAC
V-16 MODEL 452-D (1934)
DELCO-REMY ELECTRICAL SYSTEM

Valve Timing

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. To adjust, use special tool, Cadillac Part No. 109624, to hold plunger down at end of stroke in dashpot, idle engine and set clearance at .030". Use special combination screwdriver and wrench, Cadillac Part No. 109627-T, to make adjustment. Double springs now used in dashpot.

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, 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.

IGNITION:—Coil Model 553-E. Two coil unit assembled with ignition switch.

Ignition Switch—Model 431-F. 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—19-23 ounces.

Cam Angles (Distributor Degrees) — Closed 29°. Open 16°. Each set operates independently and controls one coil.

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 begin to open, tighten locking screws.

Firing Order: — 1-8-9-14-3-6-11-2-15-10-7-4-13-12-5-16 (see diagram).

Spark Plugs:—A.C., Type G-7. 18 MM. Metric type.

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

BATTERY:—Delco, Type 25-AW, 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-.040".

Air Gap—.055-.075" between armature and center of core (armature down until fibre bumper just touches core).
.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 to close contacts. Current draw, .8 amps.

Contact Gap—.015-.025".

Air Gap—.012-.017" (contacts closed).

FUSES:—Generator field—6 amperes capacity.

CHEVROLET
STANDARD MODEL, SERIES DC (1934)
DELCO-REMY ELECTRICAL SYSTEM

SERIAL NUMBER:—First number, 1001. Stamped on plate on right front sill.

ENGINE NUMBER:—Stamped on boss on right side of cylinder block.

ENGINE:—Six cylinder, overhead valve type.
Dimensions—Bore, 3 5/16". Stroke, 3½". Displacement, 181 cu. ins.
Horsepower—Rated, 26.3. Developed, 60 H.P. at 3000 R.P.M.
Compression—5.35-1. No optional compression ratios.

Pistons:—Cast-iron 'Cam' ground type with greatest clearance across pin bosses. Pistons furnished in standard oversizes of .003", .010", .020". Recondition cylinders to standard oversize (hone cylinders for .003" oversize or ream and hone for .010" or .020" oversize pistons). Reconditioned cylinders should not be out-of-round or tapered more than .001".
Clearance—.002-.003" (skirt)—see 'Installing New Pistons'.
Weight—Pistons of same size held to ⅛ ounce maximum weight variation.
Removal—Piston and rod assembly removed from top of engine.
Installing New Pistons—Use feeler gauge in cylinder bore at right angles to piston pin boss to gauge clearance. Piston should pass through bore with .002" feeler and should lock on .003" feeler. Finish hone cylinder bore to provide this clearance with standard oversize pistons.

Piston Rings:—Three rings per piston (all above pin), #1 and 2—compression rings, #3—oil control ring. Lower ring groove is drilled radially with oil return drain holes.

Ring	Width	End Gap	Side Clearance	Groove Depth
Comp. (#1, 2)	⅛"	.004-.014"	.0015-.0035"	.173"
Oil Cont. (#3)	3/16"	.004-.014"	.0015-.0035"	.173"

Piston Pin:—Pin is clamped in connecting rod. Pin bosses in piston are bronze bushed. Service pistons furnished with bushings in and new pins fitted.
Pin Fit in Piston—Light thumb push fit.

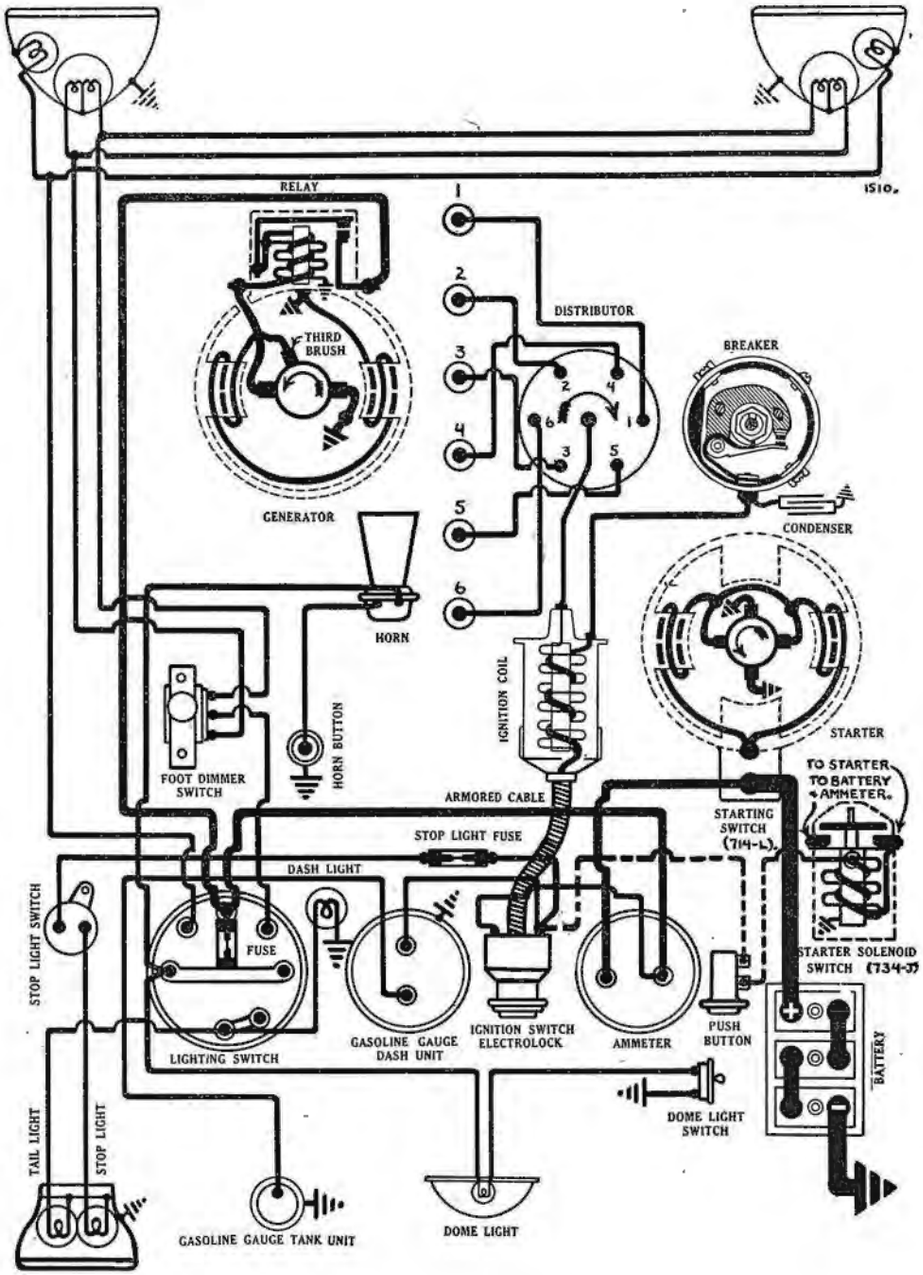
NOTE:—In assembling piston and connecting rod, center pin in piston and rod between piston bosses before tightening pin clamp screw. End clearance between upper end of connecting rod and end of piston pin bosses must be not less than .025".

Connecting Rod:—Length, 6 17/32". Weight—Rods are held to satisfactory weight variation tolerance in manufacturing.
Big End Bearing—Spun babbitt type. Shims are used.
Clearance—Snap fit (radial), .004-.011" (sideplay).
Adjusting Bearings—Remove shims, assemble bearing cap, check clearance by tapping rod from side to side with 8 oz. ball pein hammer. Bearing should move with light hammer tap but should not be movable by hand. If bearing can be moved by hand, clearance is too great. If bearing does not move under light hammer tap, clearance is too small.

NOTE:—Assemble rods with number on rod and cap together (this number indicates cylinder in which rod should be used). Install rods in engine with these numbers toward camshaft side (piston pin clamp bolt should also be toward camshaft side of engine). Assemble oil dipper on bearing cap (under bolts) with mouth of dipper toward camshaft side of engine. Check height of dipper with special gauge (for Std. models only). End of dipper should just touch cross bar of gauge with gauge rods resting on crankcase flange. Center rod on gauge should be used to test depth of oil troughs in oil pan (rest cross bar on flange, center rod should touch bottom of oil trough).

Crankshaft:—Three main bearing type with integral counterweights.
Journal Sizes—#1—2.058-2.059", #2—2.120-2.121", #3—2.123-2.124".
Bearing Type—Steel-backed, babbitt-lined type. Shims used.
Clearance—.002" (radial), .004-.007" (sideplay).
Adjustment—Remove shims until there is a heavy drag on crankshaft, then replace one .002" shim. Use an equal number of shims on each side. If necessary to use unequal number to secure correct clearance, put extra shim on camshaft side of engine.
End Thrust—Taken by #2 (center bearing). Correct end play, .004-.007". Clearance between oil deflector on rear of crankshaft and oil groove in cylinder block back of rear main bearing also controlled by center main bearing. Clearance should be .002-.032" with crankshaft in extreme rear position.

NOTE:—Crankshaft alignment should be checked when shaft is taken out of engine. Maximum allowable run-out at center bearing, .002". If more than .002", shaft should be straightened. Check crankshaft journals for out-of-round or taper. If more than .001", replace shaft.



CHEVROLET
STANDARD MODEL, SERIES DC (1934)
DELCO-REMY ELECTRICAL SYSTEM

Camshaft:—Three bearing type. Camshaft drive—helical gear. Center main bearing on camshaft is removable steel-backed, babbitt-lined type and is staked in the block and reamed to clear distributor drive shaft (drive gear located in center).
Clearance (Center Bearing)—.002-.004" (radial).
Inspection Limits—Camshaft alignment should be checked when camshaft is removed from engine. Maximum allowable run-out at center bearing is .002". If more than .002", straighten shaft. Check camshaft journals for out-of-round. If more than .001", replace camshaft.
Journal Sizes—#1—1.808-1.809". #2—1.776-1.777". #3—1.620-1.621".
End Thrust—Taken by thrust plate in back of camshaft gear. End play should be Free to .003". Adjustable by changing position of gear on camshaft (gear is press fit on shaft).
Camshaft Gears—Gears should be checked for run-out or alignment when installed. Maximum allowable run-out is .003" (crankshaft gear), .004" (camshaft gear). Replace gears if run-out is excessive and cannot be corrected (when caused by burrs on shaft or gear, etc.). Backlash between gears should be .002-.005".
Camshaft Setting—Tooth on crankshaft gear and space between teeth on camshaft gear punch-marked. Mesh marked tooth opposite marked space.

Valves:—	Head Diameter	Stem Diameter	Seat Angle	Seat Width
Intake	1 29/32"	5/16"	45°	1/16-3/32"
Exhaust	1 13/32	5/16"	45°	1/16-3/32"

Stem-to-Guide Clearance—.001-.003" (intake), .002-.004" (exhaust).
Tappet Clearance—.006" (intake), .013" (exhaust) with engine hot.

Valve Timing

Intake Valves Open—4° before T.D.C. See Camshaft Setting above.
Stem-to-Guide Clearance—.001-.003" (intake), .002-.004" (exhaust).
Tappet Clearance—.006" (intake), .013" (exhaust) with engine hot.

Lubrication:—Pressure type (positive pressure to crankshaft and camshaft bearings 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. Vane type oil pump located in crankcase.
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 and camshaft bearings), and low-pressure points (oil troughs and rocker arm shafts). An overflow tube returns excess oil from rocker shafts to crankcase.
Oil Pump Clearances—Replace pump when clearance between shaft and oil pump body exceeds .009". Assemble taper end of oil pump blades in direction of rotation.
Capacity and Oil—4½ qts. (refill). Use SAE. #30 (summer—after 2000 miles, use #20-W for first 2000 miles with new engine), #20-W (winter 32° to 0°F.), #10-W (winter 0° to —15°F.).

CARBURETION:—(Fuel System). See Carburetion Section for complete data on Carburetor, Fuel Pump, and Gasoline Gauge.
Carburetor:—Carter W-1, Model 284-S 1¼" plain tube, downdraft type.
Fuel Pump:—A.C., Type R.
Gasoline Gauge:—A.C., Electric type.

IGNITION:—Coil Model 538-C. Ignition switch assembled as part of coil (connected by armored cable).
Ignition Current—4 amperes (engine stopped), 1.9 amperes (to 40 M.P.H.).
Distributor Model 622-L. Single breaker, 6 lobe cam, full automatic advance type with auxiliary vacuum spark control and Octane Selector.
Breaker Gap—Set gap at .018". Limits, .018-.024".
Breaker Arm Spring Tension—17-21 ozs.
Cam Angles (Distributor Degrees)—Closed, 36°. Open, 24°.

Automatic Advance

Distributor Degrees	Distributor R.P.M.	Engine Degrees	Engine R.P.M.
Start	300	2	600
16	1350	32	2700

Vacuum Spark Control—Model 680-F. Vacuum control provides additional spark advance except when engine is suddenly accelerated or is pulling heavily (when spark will be retarded by return spring in unit). Vacuum is cut off by carburetor throttle valve shaft at high speed (wide open throttle) so that spark is retarded for high speed operation. Max. vacuum advance. 12° (engine).
Octane Selector—Adjustable at distributor to provide maximum of 10° advance or retard from standard setting for various fuel characteristics. Should be adjusted to provide maximum advance without spark knock.

Octane Rating of Fuel	Octane Selector Setting
40	8° Retard
52	6° Retard
58	4° Retard
64-66	0 on Scale
72	3° Advance
78	6° Advance
80	8° Advance

IGNITION TIMING:—

	Flywheel Degs.	Piston Position
All engines	10° BTDC.	.0337" BTDC.

Timing (using Neon Timing Light)—Set Octane Selector at '0'. See that vacuum spark control is in retard position. Connect Neon timing light to #1 spark plug, place Neon light so that it will illuminate flywheel inspection hole (right front face of flywheel housing). Run engine at idling speed, loosen distributor advance arm clamp bolt, rotate distributor until steel ball on flywheel appears to be directly opposite pointer on housing (Neon light will make the ball appear to stand still so that position can be checked), tighten clamp bolt.
Timing (without Neon Light)—The manufacturer states that the Neon Timing Light is an absolute necessity to properly time the engine. Setting can be checked or temporarily set in emergency by revolving crankshaft until steel ball is directly opposite pointer on housing with #1 piston slightly before top dead center on compression stroke, loosening advance arm clamp bolt, rotating distributor until contacts begin to open, tightening clamp bolt and checking spark plug connections.
Firing Order:—1-5-3-6-2-4 (see diagram).
Spark Plugs:—A.C., Type K-9. 14 MM. Metric type. **Spark Plug Gaps**—.032".

BATTERY:—Delco, Type 13-NW, 13-PW (RHD.), 6 volt, 13 plate, 90 A.H. capacity (20 hour rate).
Starting Capacity—102 amperes for 20 minutes.
Grounded Terminal—Negative (—) terminal.
Location—Under front floor boards on right side.

STARTER:—Model 714-L, 734-J (RHD). Armature No. 816163.
Rotation—Counter-clockwise at commutator end.
Brush Spring Tension—24-28 ounces each.
Cranking Performance—(Normal) 175 amperes, 2000 R.P.M. (armature speed).

Performance Data

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

Starting Switch:—714-L. Starter switch mounted on field frame, operated by foot pedal. 734-J—electrical solenoid type mounted on field frame controlled by pull switch, Delco Type 1378.
Mounting:—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 lock screw on commutator end plate, shift third brush by hand counter-clockwise to increase, or clockwise to decrease charging rate, tighten locking screw.
Standard Charging Rate—12 amperes (hot), 7.6 volts, 2200 R.P.M. or 22½ M.P.H.

Performance Data

	Amperes	Volts	R.P.M.
Cold	16-18	8.2	1700
Hot	11-13	7.55-7.85	1750-1850

Rotation—Counter-clockwise at commutator end.
Shunt Field Current—3.5-4.5 amperes at 6.0 volts.
Brush Spring Tension—14-18 ounces each.
Mounting:—Pivot mounting at left front of engine. Fan belt drive. To remove, take out two pivot bolts, one clamp bolt.
Belt Adjustment:—Loosen pivot bolts and clamp bolt, swing generator out from engine, tighten clamp bolt and pivot bolts. Belt should have small amount of slack.

RELAY CUT-OUT:—Model 265-G. On generator.
Contacts Close——7.2 volts or 7½ M.P.H.
Contacts Open—1 ampere discharge.
Relay Contact Gap—.015-.025".
Air Gap—.012-.017" (contacts closed).

LIGHTING:—Delco-Remy Switch, Model 478-H. Foot Control Switch, Model 465-Z, 465-Y (RHD.). Foot control switch on toeboard used to control upper and lower headlamp beams.

Bulb Sizes

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

FUSES:—Lighting—15 ampere capacity on switch.
Stop Light—15 ampere capacity cartridge type in stop light lead.

CHEVROLET
MASTER MODEL, SERIES DA (1934)
DELCO-REMY ELECTRICAL SYSTEM

SERIAL NUMBER:—First number, 1001. Stamped on plate on right front sill.

ENGINE NUMBER:—Stamped on boss on right side of cylinder block behind fuel pump.

ENGINE:—Six cylinder, overhead valve type.
Dimensions—Bore, 3 5/16". Stroke, 4". Displacement, 206.8 cu. ins.
Horsepower—Rated, 26.3. Developed, 80 H.P. at 3300 R.P.M.
Compression—5.45-1. No optional compression ratios.

Pistons:—Cast-iron 'Cam' ground type with greatest clearance across pin bosses. Pistons furnished in standard oversizes of .003", .010", .020". Reconditioned cylinders to standard oversize (hone for .003" oversize or ream and hone for .010" or .020" oversize). Reconditioned cylinders should not be out-of-round or tapered more than .001".
Clearance—.002-.003" (skirt)—see 'Installing New Pistons'.
Weight—Pistons of same size held to ⅛ oz. maximum weight variation in manufacturing.
Removal—Piston and rod assembly removed from top of engine.
Installing New Pistons—Use feeler gauge in bore at right angles to piston pin to check clearance. Piston should pass through bore with .002" feeler and should lock with .003" feeler. Finish hone cylinder bore to provide this clearance with standard oversize pistons.

Piston Rings—Three rings per piston (all above pin). #1 and 2—compression rings, #3—oil control ring. Lower ring groove drilled radially with oil drain holes.

Ring	Width	End Gap	Side Clearance in Groove	Groove Depth
Comp. (1 and 2)	⅛"	.004-.014"	.0015-.0035"	.173"
Oil Cont. (3)	3/16"	.004-.014"	.0015-.0035"	.173"

Piston Pin:—Pin is clamped in rod. Pin holes in piston are bronze bushed. Service pistons are furnished with bushing in place and new pins fitted.
Pin Fit in Piston—Light thumb push fit.

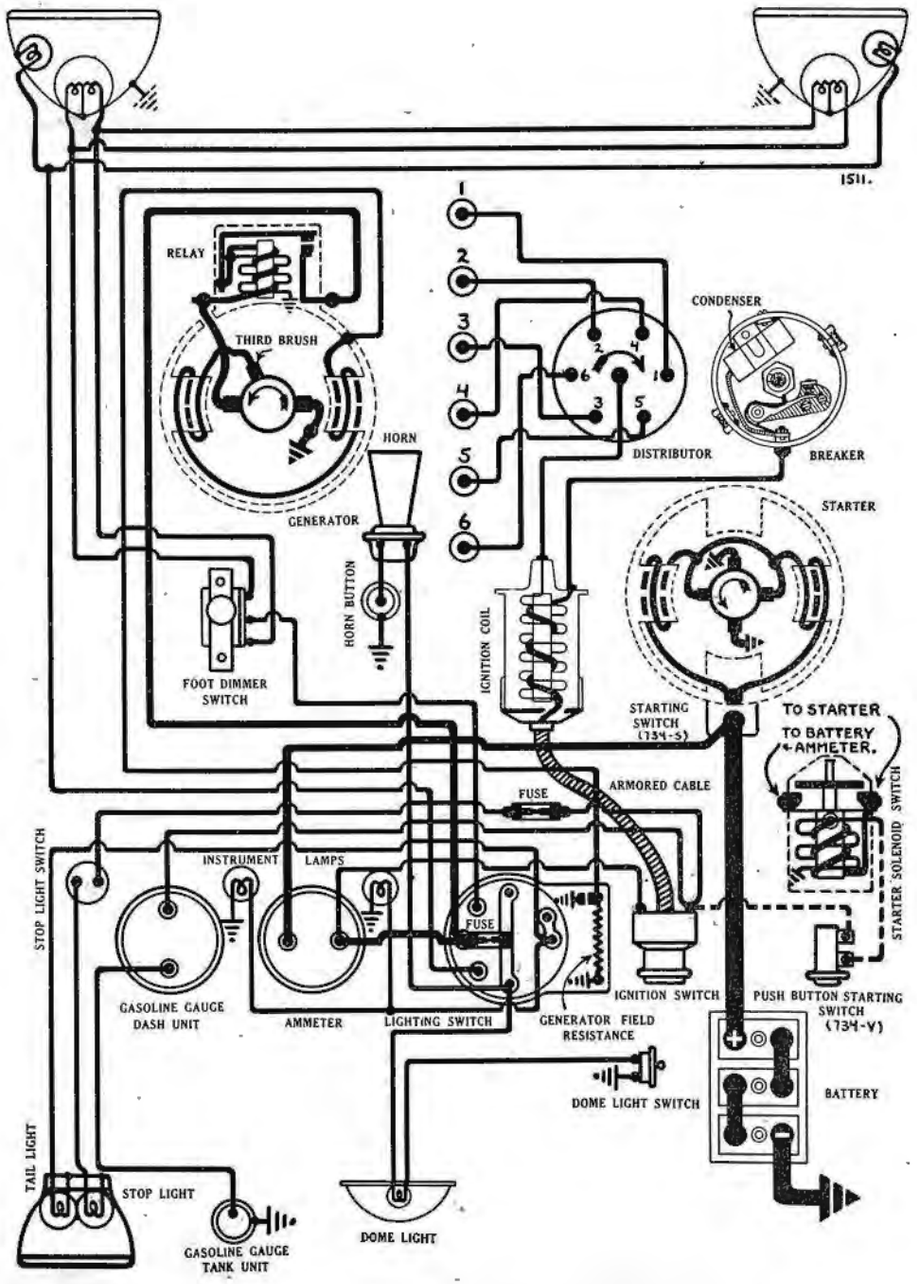
NOTE:—Center pin in piston and rod between piston bosses before tightening clamp screw. Clearanee between upper end of rod and end of piston pin bosses must not be less than .025".

Connecting Rod:—Length, 7½". Weight—Held to satisfactory weight variation tolerance in manufacturing.
Big End Bearing—Spun babbitt-lined type. Shims are used.
Clearance—Snap fit (radial), .004-.011" (endplay).
Adjusting Bearings—Bearings are adjusted and rods installed in same manner as on Standard Model (see Standard data). Use special dipper height gauge for Master Model.

Crankshaft:—Three main bearing type with integral counterweights.
Journal Sizes—#1—2.058-2.059", #2—2.120-2.121", #3—2.123-2.124".
Bearing Type—Steel-backed, babbitt-lined type. Shims are used.
Clearance—.002" (radial), .004-.007" (endplay).
Adjustment—Remove shims until there is heavy drag on crankshaft, then replace one .002" shim. Shims should be equal on each side of cap (if unequal number must be used for correct clearance, place extra shim on camshaft side).
End Thrust—Taken by #2 (center) bearing. Endplay, .004-.007". Clearance between oil deflector on rear of crankshaft and oil groove in cylinder block back of rear main bearing also controlled by center main bearing. Clearance, .002-.032" with crankshaft in extreme rear position.

NOTE:—Check crankshaft for alignment when taken out of engine. Maximum allowable run-out at center bearing, .002". If more than .002", straigten shaft. Check crankshaft journals for out-of-round and taper. If more than .001", replace shaft.

Camshaft:—Three bearing type. Camshaft drive—helical gears. Center bearing on camshaft is removable steel-backed, babbitt-lined type. Bearing is staked in the block and reamed to clear distributor drive shaft and gear (drive gear located in center of bearing).
Clearance (Center Bearing)—.002-.004" (radial).
Journal Sizes—#1—1.808-1.809", #2—1.776-1.777", #3—1.620-1.621".
End Thrust—Taken by thrust plate in back of camshaft gear. Endplay should be Free to .003". Adjustable by changing position of gear on shaft (gear is press fit, in installing gear, press on gear hub, not on the gear itself).



CHEVROLET
MASTER MODEL, SERIES DA (1934)
DELCO-REMY ELECTRICAL SYSTEM

Camshaft Gears—Check gears for alignment when installed. Maximum allowable run-out, .003" (crankshaft gear), .004" (camshaft gear). Replace gears if run-out is excessive and can not be corrected (when not due to burrs on shaft or gear, etc.). Backlash between gears, .002-.005".

Camshaft Setting—Tooth on crankshaft gear and space between teeth on camshaft gear are punch marked. Mesh gears with marks together.

NOTE:—Check camshaft for alignment when taken out of engine. Maximum allowable run-out at center bearing, .002". If more than .002", straighten shaft. Check bearing journals for out-of-round. If more than .001", replace camshaft.

	Head Diameter	Stem Diameter	Seat Angle	Seat Width
Valves:— Intake	1 41/64"	11/32"	45°	1/16-3/32"
Exhaust	1 15/32"	11/32"	45°	1/16-3/32"

Stem-to-Guide Clearance—.001-.003" (intake), .002-.004" (exhaust).

Installing New Guides—Finish ream new guides to .343" inside diameter. This will provide correct clearance (valve stem sizes above nominal, check with special 'No Go' gauges).

Tappet Clearance—.006" (intake), .013" (exhaust) engine hot and idling.

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

Valve Timing—Intake valves open 4° B.T.D.C. (see Camshaft Setting).

Lubrication:—See preceding page on Standard Model for complete description of oiling system.

Oil Pump Celarances—Replace pump when shaft and oil pump body exceeds .009". Assemble taper end of oil pump blades in direction of rotation.

Capacity and Oil—5 qts. (refill). Use SAE. #30 (summer—after 2000 miles, use #20-W for first 2000 miles with new engine), #20-W (winter 32° to 0°F.), #10-W (winter 0° to —15°F.).

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

Carburetor:—Carter W1, Model 285-S, 1¼" plain tube, downdraft type.

Fuel Pump:—A.C., Type R (right side of crankcase).

Gasoline Gauge:—A.C., Electric type.

IGNITION:—Coil Model 538-C. Ignition switch is part of coil assembly (connected by armored cable).

Ignition Current—4 amperes (engine stopped), 1.5 amperes (to 40 M.P.H.).

Distributor Model 644-R. Single breaker, 6 lobe cam, full automatic advance type with auxiliary Vacuum Spark Advance and Octane Selector.

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

Breaker Arm Spring Tension—17-21 ounces.

Cam Angles (Distributor Degrees) — Closed, 36°. Open, 24°.

Automatic Advance

Distributor Degrees	Distributor R.P.M.
Start	300
10¾	1100
18½	1550
Engine Degrees	**Engine R.P.M.**
1½	600
11½	2200
37	3100

Vacuum Spark Control:—Model 680-L. Vacuum control provides additional spark advance except when engine is suddenly accelerated or is pulling heavily (when spark is retarded by return spring in unit). Vacuum is cut off by carburetor throttle valve shaft at high speed (wide open throttle) so that spark is retarded for high speed operation. Maximum vacuum spark advance, 17° (engine).

Octane Selector:—Adjustable at distributor to provide maximum of 10° advance or retard from standard ignition setting for various fuel characteristics. Should be adjusted to provide maximum advance without spark knock (correct setting, slight 'ping' under heavy load). Set at '0' for fuel of 64-66 octane rating (Selector must be set at '0' when checking or setting timing). Each scale division is 2° (engine).

Octane Rating of Fuel	Octane Selector Setting
40	8° retard
52	6° retard
58	4° retard
64-66	0 on scale
72	3° advance
78	6° advance
80	8° advance

IGNITION TIMING:— Flywheel Degs. Piston Position

All engines ..... 10° BTDC ..... .0385" BTDC.

Timing (using Neon Timing Light):—Set Octane Selector at '0'. See that Vacuum Spark Control is in retard position. Connect Neon timing light to #1 spark plug, place Neon light so that it will illuminate flywheel inspection hole (right front face flywheel housing). Run engine at idling speed, loosen distributor advance arm clamp bolt, rotate distributor until steel ball on flywheel appears to be directly opposite pointer on housing (Neon light will make ball appear to stand still so that position can be checked), tighten clamp bolt.

Timing (without Neon Light): — Manufacturer states that Neon Timing Light is an absolute necessity to properly time the engine. Setting can be checked or set in an emergency by turning engine over until steel ball on flywheel is directly opposite pointer on housing with #1 piston slightly before top dead center entering power stroke. Then loosen advance arm clamp bolt, rotate distributor until contacts begin to open (use a timing light), tighten clamp bolt, see that rotor is opposite #1 segment in distributor cap, check spark plug cable connections (see diagram).

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

Spark Plugs:—A.C., Type K-10. 14 MM. Metric type.

Spark Plug Gaps—.032".

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

Starting Capacity—115 amperes for 20 minutes.

Grounded Terminal—Negative (—) terminal.

Location—Under front floor boards, right side.

STARTER:—Model 734-S, 734-V (RHD.). Armature No. 1847432.

Rotation—Counter-clockwise at commutator end.

Brush Spring Tension—24-28 ounces each.

Cranking Performance—(Normal) 175 amperes, 1750 R.P.M. (armature speed).

Performance Data

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

Starting Switch:—734-S—Chevrolet Starterator with Delco-Remy Type 1575 Vacuum Unit. See Equipment Section for complete data. 734-V—Electrical solenoid type mounted on starter field frame controlled by pull-type switch on instrument panel, Delco-Remy Type 1378.

Mounting:—Flange mounted on flywheel housing, right front side. To remove, take out flange mounting cap screws.

GENERATOR:—935-B (Std.). Armature No. 1854856. Third brush regulation, lighting switch control. Field resistance on lighting switch is shorted out by switch when lamps are turned on, increasing generator output. See 'Lamp Control' generators in Equipment Section.

Field Resistance—Standard, 1 ohm. Optional units, ¾ ohm and 1½ ohm. Change unit only for unusual driving conditions, such as night operation.

Charging Rate Adjustment—Ground field terminal on generator to frame. Use test ammeter to check output, shift third brush counter-clockwise to increase, or clockwise to decrease charging rate. Standard setting should be approximately 2 commutator bars (exposed) between third brush and nearest main brush. Charging rate will ordinarily not require adjustment.

Standard Charging Rate—12 amperes (hot), 7.7 volts, 2400 R.P.M. or 23 M.P.H.

Performance Data

	Amperes	Volts	R.P.M.
Cold	16-19	8.0-8.4	2400
Hot	13-15	7.7-8.0	3000

Rotation—Counter-clockwise at commutator end.

Shunt Field Current—2.3-2.6 amperes at 6.0 volts.

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

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

Belt Adjustment—Loosen mounting bolts, swing generator away from engine, tighten calmp bolt before slacking off on generator, tighten pivot bolts. Belt should have slight amount of slack.

RELAY CUT-OUT:—Model 265-H (used on 935-B, 967-E). Mounted on generator.

Cuts in—7.2 volts, 7 M.P.H.

Cuts out—1 ampere discharge. Limits, 0-2.5 amperes.

Relay Contact Gap—.015-.025".

Air Gap—.012-.017" (contacts closed).

LIGHTING:—Light Switch Model 478-P. Foot Control Switch Model 465-Z, 465-Y (RHD.). Stop Light Switch Model 474-L. Foot control switch on toeboard used to control upper and lower headlamp beams. Headlight bulbs are pre-focused type.

Bulb Sizes

Position	Candlepower	Mazda No.
Headlights	32-21	2320-C
Parking, Cowl, Instrument	3	63
Stop, Tail, Dome	3	63

FUSES:—Lighting—15 amps. (on lighting switch).

Stop Light—15 ampere capacity, cartridge type, in stop light lead.

HORNS:—Klaxon, Model K-26-L, vibrator type.

CHRYSLER

SIX CYLINDER, MODELS CA AND CB (1934)
DELCO-REMY ELECTRICAL SYSTEM

SERIAL NUMBER:—First number, (CA) 6,650,001, (CB) 6,700,001. 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:—Six cylinder, 'L' head type. Cylinders cast enbloc.
Dimensions—Bore, 3⅜". Stroke, 4½". Displacement, 241.5 cu. ins.
Horsepower—Rated, 27.34. Developed (Std. 5.4 cast-iron head), 93 H.P. at 3400 R.P.M. (optional aluminum head), 100 H.P. at 3400 R.P.M.
Compression—Std. Cast-iron head—5.4-1. Optl. H.C. Al. head—6.2-1.

NOTE:—Special cylinder head gaskets, studs, and special length spark plugs must be used on the optional aluminum (H.C.) head. Aluminum heads must always be tightened cold.

Pistons:—Aluminum alloy, 'T' slot, cam ground type. Pistons have aluminum oxide finish which provides hard wearing surface on skirt. Pistons cannot be ground because of this oxide finish, and 'cam ground' design and cylinders must be reconditioned to standard oversize. Finished pistons furnished in standard oversizes of .003", .005", .010", .015", .020", .023", .025", .030", .040", .050", .060". Reconditioned cylinders must not be out-of-round or tapered more than .0005". Finish all cylinders to same size to maintain balance.
Weight—Pistons of same size held to 1/10 oz. maximum weight variation.
Removal—Piston and rod assembly removed from top of engine.
Clearance—.025" (top), .0015" (at bottom of piston skirt).
Installing New Pistons—Install pistons with slot to left (opposite side from camshaft and valves).

Piston Rings:—Four rings per piston, #1 and #2—compression rings, #3—undercut oil wiper ring, #4—oil control ring. Lower ring grooves are drilled radially with oil drain holes.

Ring	Width	End Gap	Side Clearance in Groove
Comp. (#1 & 2)	⅛"	.007-.015"	.003" maximum
Comp. (#3-Undercut)	⅛"	.007-.015"	.003" maximum
Oil Cont. (#4)	3/16"	.007-.015"	.003" maximum

Piston Pin:—Diameter, 55/64". Length, 2⅞". Pin floats in piston and rod (retaining rings used). To install pins, heat piston in boiling water, this will allow pin to be centered easily. Pin hole in rod is bronze bushed.
Pin Fit in Piston—Tight thumb push fit with piston at 120°F.
Pin Fit in Rod Bushing—Light thumb push fit at room temperature (70°F.).

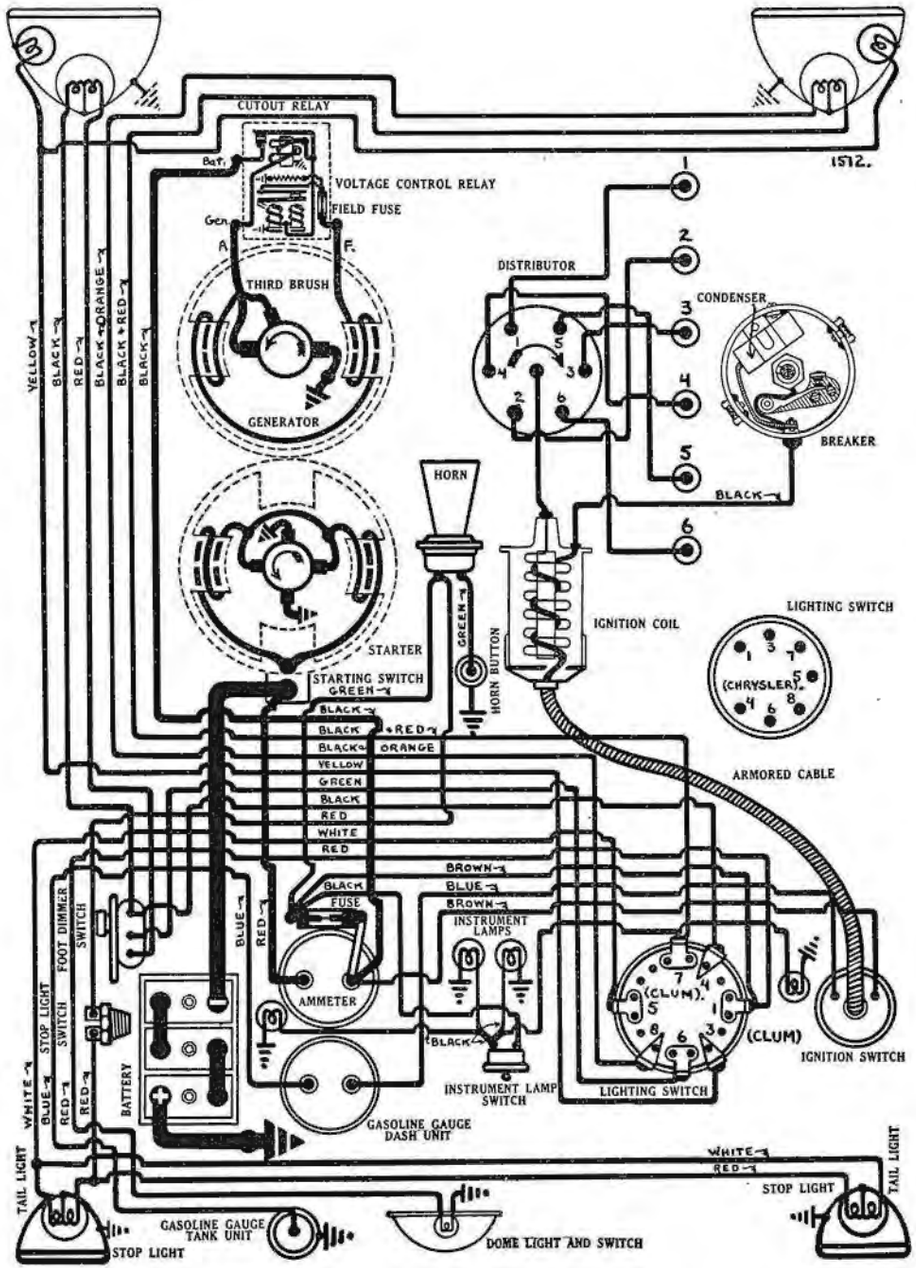
Connecting Rod:—Length, 8¾". Weight, held to 1/10 oz. maximum weight variation in manufacture.
Big End Bearing—Removable steel-backed, babbitt-lined type. No shims.
Clearance—.001-.00275" (radial), .003-.009" (sideplay).
Adjustment—No shims used. Replace bearings when clearance exceeds maximum. Do not file bearing caps. Install new bearings with small boss on bearing registering with groove in rod and bearing cap. Bearings .010" undersize available for service.

NOTE:—Connecting rod lower bearings are offset. Install rods with widest half of bearing toward rear of engine (cylinders #1, 3, 5) or toward front of engine cylinders #2, 4, 6). Oil hole in upper half of lower bearing must be toward camshaft side of engine on all rods.

Crankshaft:—Four main bearing type with integral counterweights.
Journal Sizes—2½" diameter (all bearings).
Bearing Type—Removable steel-backed, babbitt-lined type. No shims.
Clearance—.001-.002" (radial), .003-.007" (sideplay).
Adjustment—No shims used. Replace bearings. Do not file bearing caps. Bearings .010" undersize available for service.
End Thrust—Taken by #4 (rear main bearing).

NOTE:—Check crankshaft for alignment. Maximum allowable run-out at center main bearing, .001".

Camshaft:—Four bearing type. Camshaft drive, non-adjustable chain.
Bearing Type—Removable steel-backed, babbitt-lined type except #4 (rear), which is machined in crankcase. End thrust taken by front bearing.
Clearance—.0015-.0025" (radial), .003-.005" (endplay).
Chain—Width, 1". Length, 1234. Pitch, .500".
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.



CHRYSLER

SIX CYLINDER, MODELS CA AND CB (1934)
DELCO-REMY ELECTRICAL SYSTEM

Valves:—	Head Diameter	Stem Diameter	Seat Angle	Lift
Intake	1 17/32"	.340-.341"	45°	11/32"
Exhaust	1 15/32"	.340-.341"	45°	11/32"

Stem-to-Guide Clearance — .001-.003" (intake), .003-.005" (exhaust).

Installing New Guides—Top of guide must be 1 3/16" below top of block. Finish ream new guides to inside diameter of .342-.343" (intake), .344-.345" (exhaust).

Tappet Clearance—.005" (intake), .007" (exhaust) engine hot.

Valve Springs—Variable pitch type. Install springs with close coils at the top. Do not compress springs to over-all length of less than 1½".

	Spring Pressure	Spring Length
Valve Closed	45-50 lbs.	2 1/16"
Valve Open	104-110 lbs.	1 23/32"

NOTE:—Special alloy exhaust valve seat inserts are used. Inserts cannot be recut and must be reground.

Valve Timing

Intake Valves open at TDC. Close 50° ALDC.
Exhaust Valves open 48° BLDC. Close 2° ATDC.

To Check Valve Timing—Use regular timing gauge installed over #6 piston. Set tappet clearance #6 intake valve at .010". This valve should open with piston on top dead center with gauge reading zero when center '0' mark on impulse neutralizer at front of engine registers with pointer on chain case. Reset tappet clearance at .005" with engine hot.

Lubrication:—Pressure type. Gear type oil pump located on lower end of inclined accessory shaft at right of engine.

Oil Pressure—30-60 lbs. at normal driving speeds.

Oil Pressure Relief Valve—Operates at 45 lbs. Located under plug on left hand side of crankcase. Adjustable by replacing spring. Standard spring unpainted. Lighter spring (to decrease oil pressure) painted red. Heavier spring (to increase pressure) painted green.

Capacity and Oil—6 qts. Use SAE. #30 (summer), #40 (summer—temperatures in excess of 100°F. or high speed driving), #20-W (winter down to 0°F.), #10-W (0° to —15°F.).

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

Carburetor:—Carter, Model E6C1, 1½" plain tube, downdraft type.

Automatic Choke—Sisson (special equipment).

Fuel Pump:—A.C., Type P (right hand side of crankcase).

Gasoline Gauge:—Motometer, Electric type.

IGNITION:—Coil Model 540-J, K. Ignition switch is part of coil assembly.

Distributor Model 640-U. Single breaker, 6 lobe cam, full automatic advance type. Manual adjustment (at distributor), 20° (engine).

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

Breaker Arm Spring Tension—19-23 ounces (behind contacts).

Cam Angles (Distributor Degrees) — Closed 36°. Open 24°.

Automatic Advance

Degrees	Distributor	R.P.M.
Start		250
7		400
15		1400
Degrees	**Engine**	**R.P.M.**
1		500
14		800
30		2800

IGNITION TIMING:— Flywheel Degs. Piston Position
Std. (Cast-iron) head.....AT TDC. .....0000" TDC.
H.C. (Aluminum) head....3° ATDC. .....004" ATDC.

Timing (using Timing Light)—Connect timing light between distributor terminal and live terminal of generator relay. Turn engine over until #1 piston is on compression, stop with piston on top dead center when '0' center mark on impulse neutralizer at front of engine lines up with pointer on chain case (Std. Cast-iron head engines), or with piston slightly past top dead center when 3° mark on impulse neutralizer lines up with pointer (H.C. Aluminum head engines), loosen hold-down screw in advance arm, center pointer on scale, tighten hold-down screw, loosen advance arm clamp bolt, rotate distributor until timing lamp just goes out (contacts opening), tighten clamp bolt, see that rotor is opposite #1 segment in distributor cap, check spark plug connections (see diagram).

Timing (using Gauge):—All cars can be timed using a motor gauge installed in timing plug hole over #6 piston.

NOTE:—Impulse neutralizer is marked in 1° graduatons for a total of 15° on each side of the '0' or dead center point.

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

Spark Plugs:—A.C., Type S-9 (Std. Cast-iron head), Type SL-9 (Aluminum head), 14 MM. Metric type. Type SL-9 plugs have a longer (7/16") thread length.

Spark Plug Gaps—.025".

BATTERY:—Willard, Type WH-2-15, 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 hand side under driver's seat.

STARTER:—Model 727-M. Armature No. 823881. Manual pinion shift type. Starting switch mounted on starter field frame.

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:—Starting switch pedal and accelerator are interconnected so that throttle is opened ¼-1/3 when pedal is depressed to start engine (see Equipment Section).

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

GENERATOR:—Model 935-D. Armature No. 1854856. Third brush control type with external voltage regulation (regulator combined with cut-out relay in case on generator field frame.

Charging Rate Adjustment (using Meters):—Use test ammeter and voltmeter to check generator output. Connect jumper wire between 'F' generator terminal and ground (important as Voltage Regulator must be shorted out while adjustment being made). With generator at room temperature, remove commutator cover band, loosen small round lock screw on commutator end plate, shift third brush by hand, counter-clockwise to increase or clockwise to decrease charging rate until output is 21 amperes at 8.6 volts, tighten lock screw, remove jumper wire. See Equipment Section for complete data on Voltage Regulator.

Commutator Bar Method: — Remove generator from car, mount so that commutator can be seen, loosen lock screw on commutator end plate, shift third brush so that there are exactly 17/8 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.
Hot	12-15	7.6-8.0	2900
Cold	18-21	8.2-8.5	2600

Rotation—Counter-clockwise at commutator end.

Shunt Field Current—2.3-2.6 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).

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

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

RELAY REGULATOR (CONTROL UNIT):—Model 5542. Consists of cut-out relay and voltage regulator in case on generator field frame. See Equipment Section for data on Voltage Regulator.

Cut-out Relay

Cuts in—6.6-6.8 volts.

Cuts out—3 ampere discharge maximum.

Relay Contact Gap—.015-.025".

Air Gap—.012-.017" (contacts closed).

Voltage Regulator

Contacts Close—7.2 volts. **Contacts Open**—8.3 volts.

Regulator Contact Gap—.008-.013".

Air Gap—.038" between armature and core (armature down against lower stop).
.028" armature travel (between armature and lower stop).

LIGHTING:—Clum Switch, Model 9556. Delco-Remy Foot Control Switch 465-S. Foot control switch on toeboard used to control assymetric 'passing beam' (upper beam right hand headlight, lower beam left hand headlight).

Bulb Specifications

Lamp	Candlepower	Mazda No.
Headlights	32-21	A-1116
Park., Instr., Comptmt.	3	63
Stop and Tail	21-2	1158
Dome	15	87

FUSES:—Lighting—20 amps. (on back of ammeter).
Generator Field—6 ampere capacity in regulator.

HORN:—Klaxon, K-26L, Type 1610. Vibrator type.

CHRYSLER

AIRFLOW EIGHT, MODEL CU—IMPERIAL EIGHT, MODEL CV (1934)
DELCO-REMY ELECTRICAL SYSTEM

SERIAL NUMBER:—First number (CU)—6,593,001, (CV)—7,010,001. On right front door hinge pillar post.

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

ENGINE:—Model CU Eight. Eight cylinder In Line, 'L' head type.
Dimensions—Bore, 3¼". Stroke, 4½". Displacement, 298.6 cu. ins.
Horsepower—Rated, 33.80. Developed, 122 H.P. at 3400 R.P.M.
Compression—Std. Al. head—6.5-1. No optional compression ratios.

ENGINE:—Imperial Eight, Model CV. Eight cylinder In Line, 'L' head type.
Dimensions—Bore, 3¼". Stroke, 4⅞". Displacement, 323.5 cu. ins.
Horsepower—Rated, 33.80. Developed, 130 H.P. at 3400 R.P.M.
Compression—Standard aluminum head—6.5-1.
NOTE:—Cylinder head is aluminum alloy. Special gaskets, studs, and special length spark plugs (7/16" thread length) are used. Aluminum heads must always be tightened cold.

Pistons:—Aluminum alloy, 'T' slot, cam ground type. Pistons have oxide finish which provides hard wearing surface on skirt. Pistons cannot be ground because of this oxide finish and 'cam ground' design and cylinders should be reconditioned to standard oversize. Finished pistons furnished in standard oversizes of .003", .005", 010", .015", .020", .023", .025", .030", .040", .050", .060". Reconditioned cylinders must not be out-of-round or tapered more than .0005". Finish all cylinders to same size to maintain balance.
Weight—Pistons of same size held to 1/10 oz. maximum weight variation.
Removal—Piston and rod assembly removed from top of engine.
Clearance—.025" (top), .0015" (bottom of piston skirt).
Installing New Pistons—Install pistons with slot to left (opposite side from camshaft and valves).

Piston Rings:—Four rings per piston, all above piston pin. #1 and 2—compression rings, #3—undercut oil wiper ring, #4—oil control ring. Lower ring grooves drilled radially with oil drain holes.

Rings	Width	End Gap	Side Clearance in Groove
Comp. (#1 and 2)	⅛"	.007-.015"	.003" maximum
Comp. (#3 Undercut)	⅛"	.007-.015"	.003" maximum
Oil Cont. (#4)	3/16"	.007-.015"	.003" maximum

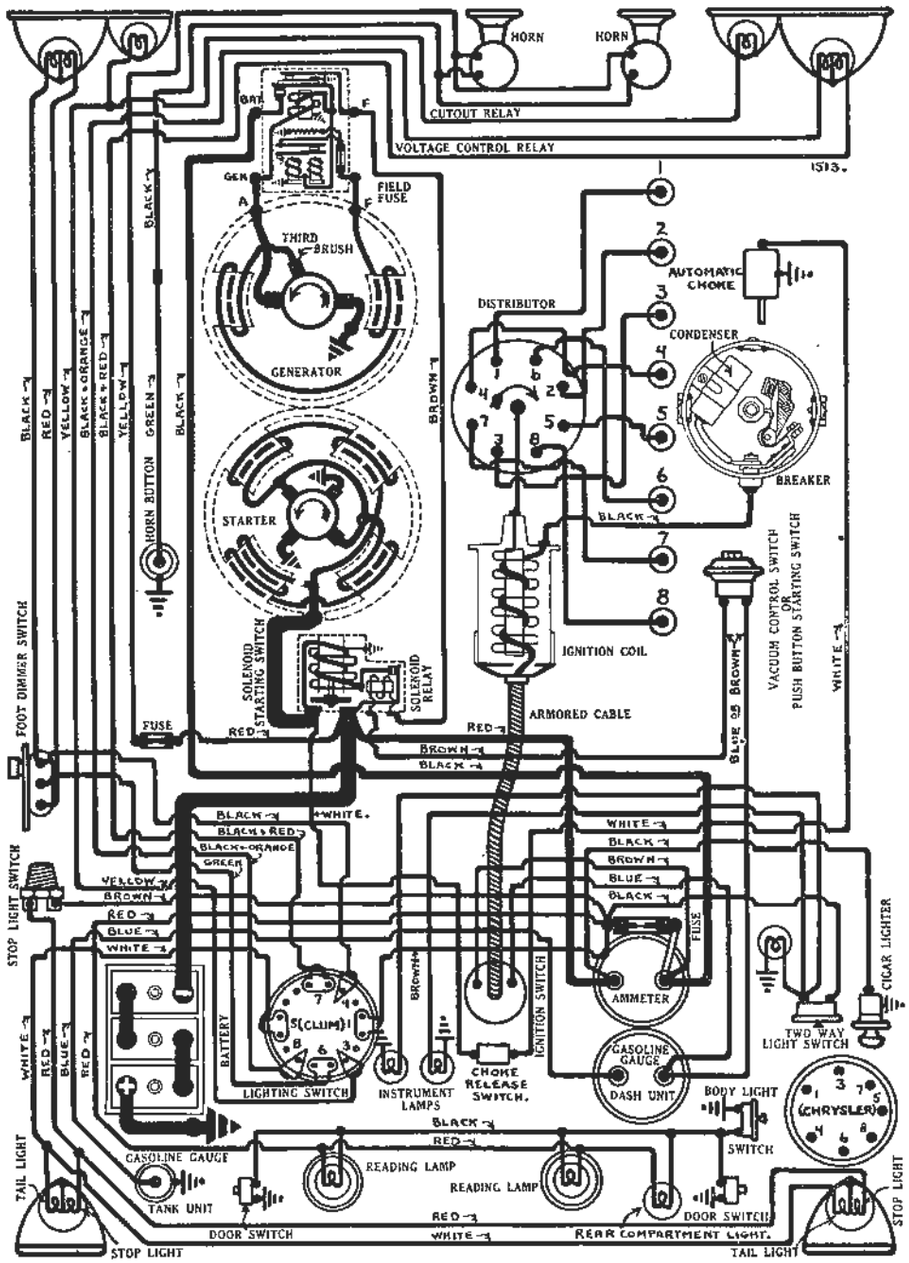
Piston Pin:—Diameter, 55/64". Length, 2¾". Piston floats in piston and rod (retaining rings used). To install or remove pins, first heat pistons in boiling water. Pin hole in connecting rod is bronze bushed.
Pin Fit in Piston—Tight thumb push fit with piston at 120°F.
Pin Fit in Rod Bushing—Light thumb push fit at room temperature (70°F.).

Connecting Rod:—Length, 9". Weight—Held to 1/10 oz. maximum weight variation in manufacture.
Big End Bearing—Removable steel-backed, babbitt-lined type. No shims.
Clearance—.001-.00275" (radial), .003-.009" (sideplay).
Adjustment—No shims used. Replace bearings when clearance exceeds maximum. Do not file bearing caps. Install new bearings with small boss on bearing registering with machined groove in rod and bearing cap. Bearings .010" undersize available for service.

NOTE:—Connecting rod lower bearings offset. Install rods with widest half of bearing toward rear of engine (#1, 3, ,5, 7) or toward front of engine #2, 4, 6, 8). Oil hole in upper half of lower bearing must be toward camshaft side of engine on all rods.

Crankshaft:—Five main bearing type with integral cunterweights.
Journal Sizes—2 45/64" diameter (all bearings).
Bearing Type—Removable steel-backed, babbitt-lined type. No shims.
Celarance—.001-.002" (radial), .002-.005" (endplay).
Adjustment—No shims used. Replace bearings. Do not file bearing caps. Bearings .010" undersize available for service.
End Thrust—Taken by #5 (rear) main bearing.

NOTE:—Check crankshaft for alignment. Maximum allowable run-out at center main bearing, .001".



CHRYSLER

AIRFLOW EIGHT, MODEL CU—IMPERIAL EIGHT, MODEL CV (1934)
DELCO-REMY ELECTRICAL SYSTEM

Camshaft:—Six bearing type. Camshaft drive—Non-adjustable chain.
Bearing Type—Removable steel-backed, babbitt-lined type except #6 (rear bearing), which is machined in crankcase. End thrust taken by #1.
Clearance—.0015-.0025″ (radial), .003″-.005″ (end-play).
Chain—Width, 1¼″. Length, 123. Pitch, .500″.
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.

	Head Diameter	Stem Diameter	Seat Angle	Lift
Valves:— Intake	1 15/32″	.340-.341″	45°	11/32″
Exhaust	1 13/32″	.340-.341″	45°	11/32″

Stem-to-Guide Clearance — .001-.003″ (intake), .003-.005″ (exhaust).
Installing New Guides—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).
Tappet Clearance—.005″ (intake), .007″ (exhaust), engine hot.
Valve Springs—Variable pitch type. Install springs with close coils at top. Do not compress springs to over-all length of less than 1½″.

	Spring Pressure	Spring Length
Valve Closed	46-50 lbs.	2 1/32″
Valve Open	104-110 lbs.	1 11/16″

NOTE:—Special alloy exhaust valve seat inserts are used. Seat inserts cannot be recut and must be reground.

Valve Timing

Intake Valves open 2° BTDC. Close 44° ALDC.
Exhaust Valves open46° BLDC. Close 4° ATDC.
To Check Valve Timing—Use regular timing gauge installed over #8 piston. Set tappet clearance #8 intake valve at .011″. This valve should open with piston .002″ before top dead center. Reset tappet clearance at .005″ with engine hot.

Lubrication:—Pressure type. Gear type oil pump located on lower end of inclined accessory shaft.
Oil Pressure—30-60 lbs. at normal driving speeds.
Oil Pressure Relief Valve—Operates at 45 lbs. Located under plug on left hand side of crankcase. To adjust, remove cap, withdraw locking wire, turn slotted plug clockwise to increase oil pressure, or counter-clockwise to decrease oil pressure, replace locking wire and cap.
Capacity and Oil—6 qts. Use SAE. #30 (summer), #40 (summer—temperatures in excess of 100°F. or high speed driving), #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-22, 1¼″ plain tube, dual, downdraft type.
Automatic Choke——Sisson.
Fuel Pump:—A.C., Type D.
Gasoline Gauge:—Motometer, Electric type.

IGNITION:—Coil Model 540-F. Ignition switch is part of coil assembly.
Distributor Model 661-S (Model CU), 661-T (Model CV). Single breaker, 8 lobe cam, full automatic advance type. No synchronization required.
Breaker Gap—Set gap at .018″. Limits, .017-.022″.
Breaker Arm Spring Tension—19-23 ozs.
Cam Angles (Distributor Degrees) — Closed 31°. Open 14°.

Model 661-S—Automatic Advance

Distributor Degrees	R.P.M.	Engine Degrees	R.P.M.
Start	250	2	500
7.6	420	15.2	840
13	1100	26	2200

Model 661-T—Automatic Advance

Start	250	4	500
7	400	14	800
13	1300	26	2600

IGNITION TIMING:— Flywheel Degs. Piston Position Aluminum Head engines....at T.D.C. .... .0000″ TDC.
Timing (using Light):—Connect timing light between distributor terminal and live terminal on generator relay. Turn engine over until #1 piston is on compression, stop when piston reaches top dead center when '0' mark on impulse neutralizer at front of engine lines up with pointer on chain case, loosen advance arm clamp bolt, rotate distributor until timing light goes out (contacts opening), tighten clamp bolt, see that rotor is opposite #1 segment in distributor cap, check spark plug connections (see diagram).
Timing (using Gauge:—All engines can be timed using a Motor Gauge installed in timing plug hole over #1 piston.
Firing Order:—1-6-2-5-8-3-7-4 (see diagram).
Spark Plugs:—A.C., Type SL-9. 14 MM. Metric.
Spark Plug Gaps—.025″.

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

STARTER:—Model 727-J. Armature No. 823881. Solenoid operated pinion shift type.
Rotation—Counter-clockwise at commutator end.
Brush Spring Tension—24-28 ounces each.

Performance Data

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

Starting Switch:—Solenoid Switch, Type 1516. Vacuum Switch Type 1592. Starting switch and pinion shift operated by solenoid on starter field frame. Solenoid circuit operated by solenoid relay and controlled by vacuum switch. Vacuum switch operated by accelerator pedal. See Equipment Section for complete data.
Mounting:—Flange mounted on left hand front face of flywheel housing. To remove, take out flange mounting cap screws.

GENERATOR:—Model 935-G. Armature No. 1854856. Third brush control type with external voltage regulation (regulator combined with cut-out relay in case on generator field frame). Third brush setting adjusted by using test meters or by 'Commutator Bar' method.
Charging Rate Adjustment (using Meters):—Use test ammeter and voltmeter to check generator output. Connect jumper wire between 'F' terminal of generator and ground (important, as Voltage Regulator must be shorted out while adjustment is being made). With generator at room temperature, remove commutator cover band, loosen small round lock screw on commutator end plate, shift third brush by hand counter-clockwise to increase, or clockwise to decrease charging rate until output is 21 amperes at 8.6 volts, tighten lock screw, remove jumper wire.
Commutator Bar Method:—Remove generator from car, mount so that commutator can be seen, loosen lock screw on commutator end plate, shift third brush so that there are exactly 1⅞ 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	18-21	8.2-8.5	2600
Hot	12-15	7.6-8.0	2900

Rotation—Counter-clockwise at commutator end.
Shunt Field Current—2.3-2.6 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).
Mounting:—Pivot mounted at left front of engine. Driven by water pump belt. To remove, take out two pivot bolts, 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 5544. Consists of Cut-out Relay and Voltage Regulator in case mounted on generator field frame. Relay has extra set of contacts for control of starter solenoid switch. See Equipment Section for complete data on Voltage Regulator.

Cut-out Relay

Cuts in—6.6-6.8 volts.
Cuts out—3 ampere discharge (maximum).
Relay Contact Gap—.015-.025″.
Air Gap—.012-.017″ (contacts closed).

Voltage Regulator

Contacts Close—7.2 volts. **Contacts Open**—8.3 volts.
Regualtor Contact Gap—.008-.013″.
Air Gap—.038″ between armature and core (armature down against lower stop.
.028″ armature travel (between armature and lower stop).

LIGHTING:—Clum Switch, Model 9556. Delco-Remy Foot Control Switch 465-S. Foot control switch on toeboard used to control assymetric 'passing beam' (upper beam right hand headlight, lower beam (left hand headlight).

Bulb Specifications

Lamp	Candlepower	Mazda No.
Headlights	32-21	2320-C
Stop and Tail	21-2	1158
Dome	15	87
All others	3	63

FUSES:—Lighting—20 amperes on back of ammeter.
Horn—20 ampere capacity cartridge type in horn lead near starter solenoid.
Generator Field—6 amperes in regulator ease.
HORNS:—Klaxon, Model K-26G, Type 1779 (low note), 1780 (high note). Matched set, blended tone, vibrator type. Horn current, 6.0-8.5 amperes at 6.0 volts (1779), 5.0-6.5 amperes at 6.0 volts (1780).

CHRYSLER

AIRFLOW CUSTOM IMPERIAL EIGHT, MODEL CW (1934)
DELCO-REMY ELECTRICAL SYSTEM

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

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

ENGINE:—Eight cylinder, In Line, 'L' head type. Cylinders cast enbloc.
Dimensions—Bore, 3½". Stroke, 5". Displacement, 384.8 cu. ins.
Horsepower—Rated, 39.20. Developed, 150 H.P. at 3200 R.P.M.
Compression—Std. 6.5-1. No optional compression ratios.
NOTE:—Standard 6.5-1 cylinder head is aluminum. Washers are used under cylinder head nuts and cylinder head must always be tightened cold.

Pistons:—Aluminum alloy, Invar strut, slotted skirt type. Piston length, 4⅛".
Weight—All pistons of same size held to 2 gram (1/10 oz.) maximum weight variation in manufacture. Unnecessary to classify pistons.
Removal—Piston and rod assembly removed through top of engine.
Clearance—.002" (at top of skirt).
Fitting New Pistons—Use .002" feeler stock ½" wide to check clearance. Recondition cylinders when taper or out-of-round is .0015" (maximum). Reconditioned cylinders must not be tapered or out-of-round more than .0005".
NOTE:—Install pistons with slot to right (camshaft side of engine).

Piston Rings:—Five rings per piston, all above pin. Compression rings installed in upper grooves are 'Tungtite' tongue-and-groove type. A slotted oil control ring is used in the lower groove.

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

Piston Pin:—Diameter, 55/64". Length, 3". Pin floats in piston and rod and is held in place by retaining rings. Heat piston in boiling water to install or remove pins. Pin hole in connecting rod is bronze-bushed.
Pin Fit in Piston—Tight thumb push fit with piston at 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 in manufacture. Not necessary to classify rods as to weight.
Big End Bearing—Removable steel-backed, babbitt-lined type. No shims.
Clearance—.001-.00275" (radial), .003-.009" (sideplay).
Adjustment—None (no shims). Replace bearings when clearance exceeds maximum. Do not file bearing caps. Install new bearings with small boss on bearing registering with machined groove in rod and cap.
NOTE:—Install connecting rods with oil hole in lower bearing upper half toward camshaft side of engine.

Crankshaft:—Nine main bearing type with eight counterweights.
Journal Sizes—2¾" diameter (all bearings).
Bearing Type—Removable steel-backed, babbitt-lined type. No shims.
Clearance—.001-.002" (radial).
Adjustment—None (no shims). Replace removable bearings. Do not file caps.
End Thrust—Taken by #9 (rear) main bearing. Endplay, .0015-.0045".
NOTE:—Check crankshaft for alignment. Maximum allowable run-out at center main bearing, .001".

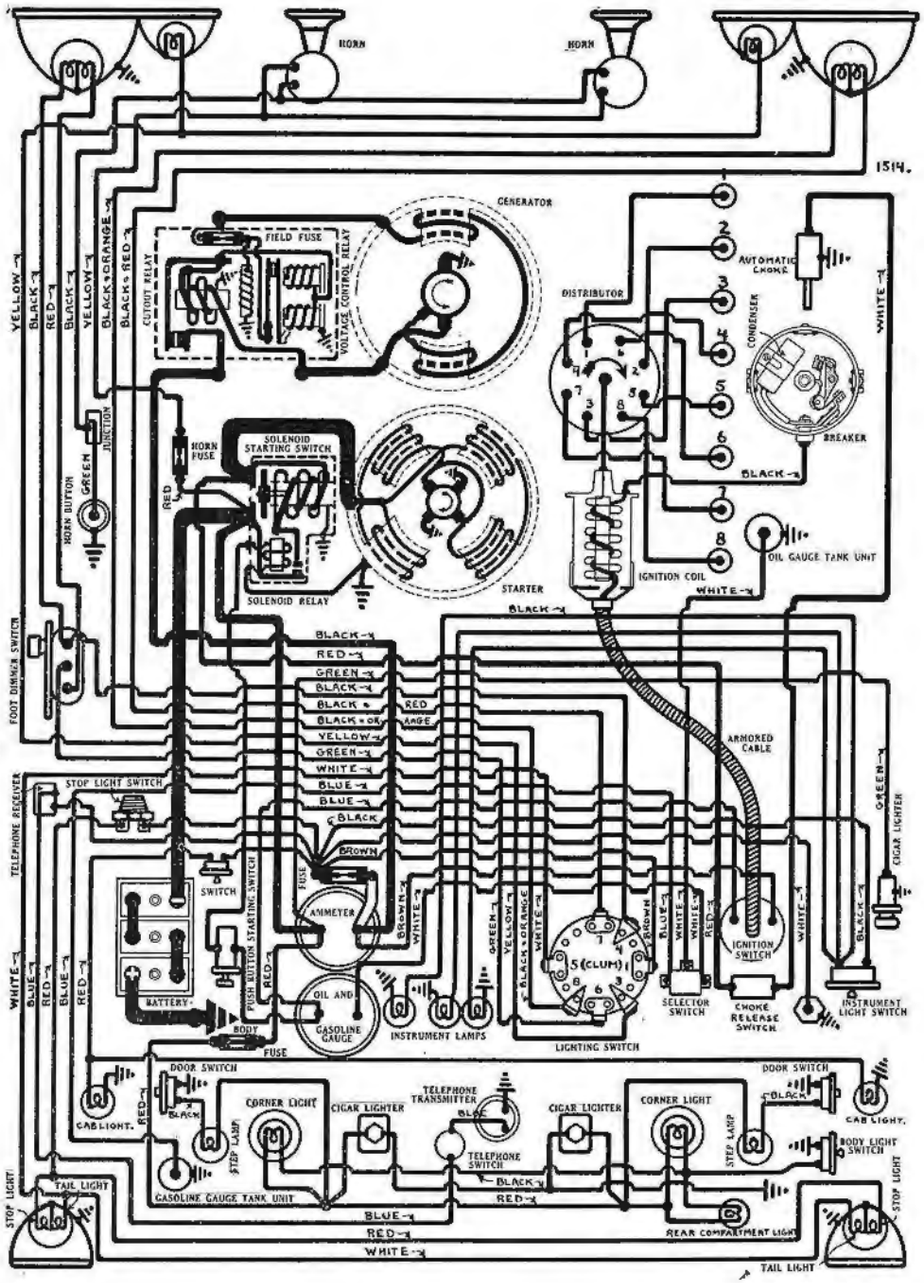
Camshaft:—Six bearing type. Camshaft drive—Non- adjustable chain.
Bearing Type—(#1) bronze-backed, babbitt-lined (all others) steel-backed. babbitt-lined type. Distributor drive gear integral with shaft at center.
Chain—Width, 1½". Pitch, .500".
Camshaft Setting—Sprockets are marked. Mesh chain with sprockets turned so marks are adjacent and in line with a straightedge across shaft centers.

Valves:—	Head Diameter	Stem Diameter	Seat Angle	Lift
Intake	1 23/32"	.340-.341"	45°	11/32"
Exhaust	1 21/32"	.340-.341"	45°	11/32"

Stem-to-Guide Clearance—.001-.003" (intake), .002-.004" (exhaust).
Installing New Guides—Top of guides must be ⅞" below top of block. Finish ream new guides to inside diameter of .342-.343" (intake), .344-.345" (exhaust).
Tappet Clearance—.006" (intake), .008" (exhaust) engine warm.

Valve Springs—	Spring Pressure	Spring Length
Valve Closed	50-55 lbs.	2¾"
Valve Open	80-85 lbs.	

NOTE:—Special alloy exhaust valve seat inserts are used. Seat inserts cannot be recut and must be ground.



CHRYSLER

AIRFLOW CUSTOM IMPERIAL EIGHT, MODEL CW (1934)
DELCO-REMY ELECTRICAL SYSTEM

Valve Timing

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 counter-clockwise 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.

IGNITION:—Coil Model 540-L. Igntion switch is part of coil assembly.

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

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" after top dead center.

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" (use wire drill or wire gauge to gauge gap).

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. Four pole type. Starter drive —through reduction gears and overrunning clutch to solenoid operated pinion gear.

Rotation — Clockwise (armature) at commutator end.

Brush Spring Tension—24-28 ounces.

Performance Data

Torque	R.P.M.	Volts	Amperes
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.

Mounting:—Sleeve mounted on left hand front face of flywheel housing. 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	22-25	8.7-9.0	1800
Hot	13-16	7.8-8.1	2000

Rotation—Counter-clockwise at commutator end.

Shunt Field Current—2.8-3.5 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).

Mounting:—Pivot mounted at left front of engine. Driven by water pump belt. To remove, take out two pivot bolts, 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—6.6-6.8 volts.

Cuts out—3 ampere discharge (maximum).

Relay Contact Gap—.015-.025".

Air Gap—.012-.017" (contacts closed).

Voltage Control Relay

Contacts Close—7.2 volts. **Contacts Open**—8.3 volts.

Contact Gap—.008-.013".

Air Gap—.038" between armature and core (armature down against lower stop).
.028" armature travel (between armature and lower stop).

LIGHTING:—Clum Switch, Model 9556. Delco-Remy Foot Control Switch, Model 465-S. Foot control switch on toeboard used to control assymetrical 'passing beam' (lower beam left hand headlight, upper beam right hand headlight), operative only with light switch in driving position. Headlights are aimed straight ahead. Headlight bulbs are prefocused type.

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—20 ampere capacity cartridge type in horn lead near starter solenoid.

Generator Field—6 ampere capacity in regulator case.

HORNS:—Klaxon, Model K-26G, Type 1783 (low note), 1784 (high note). Matched set, blended tone, vibrator type. Horn current, 6.0-8.5 amperes at 6.0 volts (Type 1783), 5.0-6.5 amperes at 6.0 volts (Type 1784).

CONTINENTAL

FOUR CYLINDER, MODEL 41 (1934)
AUTO-LITE ELECTRICAL SYSTEM

SERIAL NUMBER:—First number, 1001. On plate on lower toeboard.
ENGINE NUMBER:—On plate on left hand side of cylinder block.
ENGINE:—Continental, Model C400. Four cylinder, 'L' head type.
Dimensions—Bore, 3⅜". Stroke, 4". Displacement, 143.12 cu. ins.
Horsepower—Rated, 18.22. Developed, 38 H.P. at 2600 R.P.M.
Compression—Std. 5.05-1. No optional compression ratios.

Pistons:—Nickel-iron (cast-iron) type.
Removal—Piston and rod assembly removed through top of engine.
Clearance—Top—.014". Skirt, .003".

Piston Rings:—Three rings per piston, #1 and 2—compression rings, #3—Drainoil control ring.

Ring	Width	End Gap	Wall Thickness
Comp. (#1, 2)	⅛"	.010"	.145"
Oil Cont. (#3)	3/16"	.010-.015"	.145"

Piston Pin:—Diameter, 55/64". Pin floats in piston and rod and is held by snap rings.
Connecting Rod:—Length, 7".
Big End Bearing—Spun babbitt-lined type.
Clearance——.0015" (radial), .005" (sideplay).
Crankshaft:——Three main bearing type.
Journal Sizes—1¾" diameter (all bearings).
Bearing Type—Bronze-backed, babbitt-lined (bimetal) type.
Clearance—.0015" (radial).
End Thrust—Endplay, .006".
Camshaft:—Three bearing type. Camshaft drive—Non-adjustable chain.
Camshaft Bearing Diameters—#1—1¾", #2—1 11/16", #3—1¼".
Chain—Link belt. Width, 1". Length, 46 links. Pitch, .500".
Camshaft Setting—Sprockets are marked. Correct setting "9 links" is stamped on front end plate in chain case. Mesh chain with sprockets turned so there are exactly 9 links or ten chain pins (inclusive) between the marks on the sprockets.

Valves:—	Head Diameter	Stem Diameter	Length	Seat Angle	Lift
Intake	1 21/64"	5/16"	4 27/64"	30°	9/32"
Exhaust	1 17/64"	5/16"	4 27/64"	30°	9/32"

Tappet Clearance—.006-.008" (all valves—engine hot).
Valve Springs—73 lbs. tension (valves open).

Valve Timing

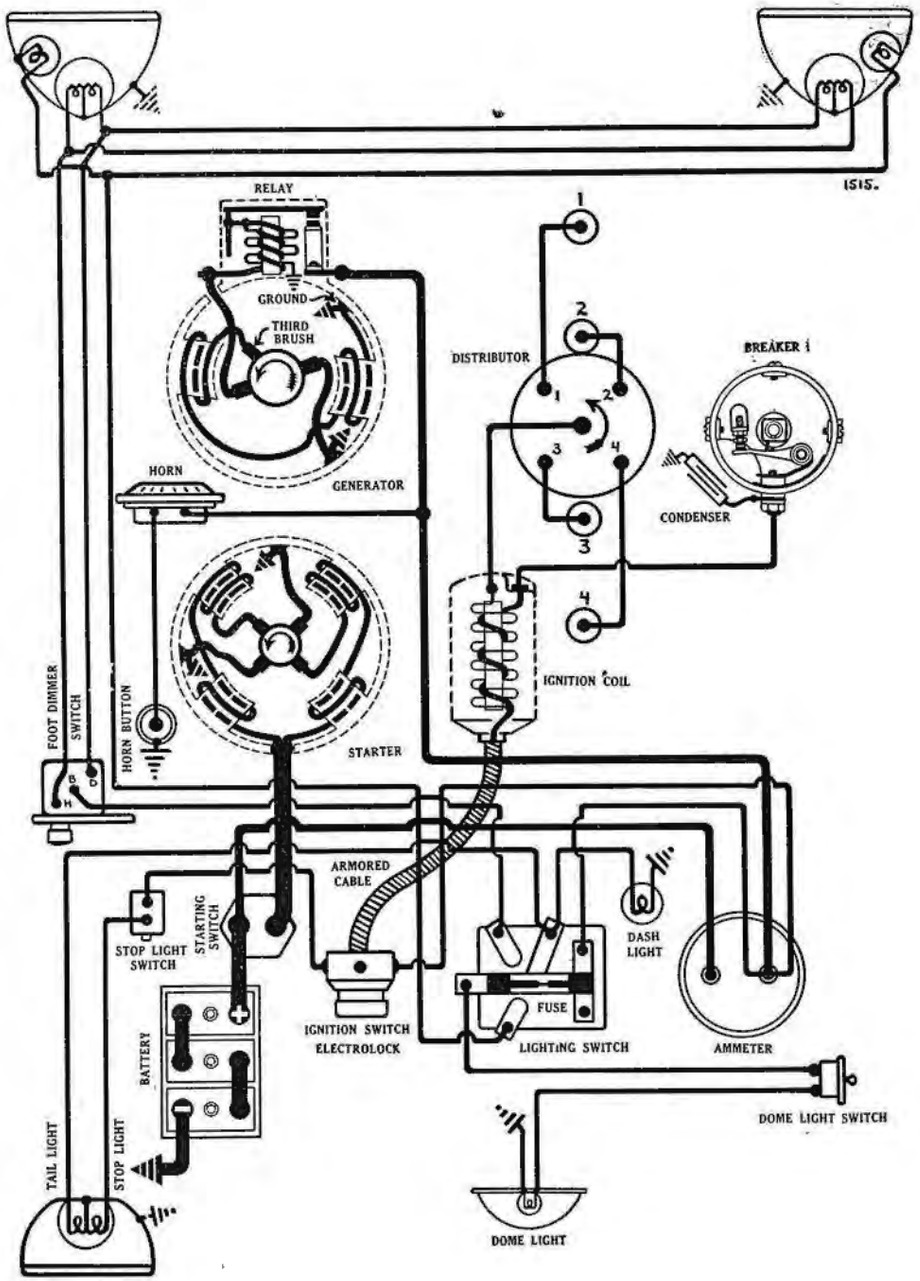
Intake Valves Open—At TDC. Close—40° ALDC.
Exhaust Valves Open—35° BLDC. Close— 5° ATDC.
To Check Valve Timing—Set tappet clearance #1 exhaust valve at .010". This valve should colse with piston 5° past top dead center when flywheel mark 'EX.CL.#1' lines up with indicator in inspection hole in left hand front face of flywheel housing. Reset tappet clearance at .006-.008" with engine hot.

Lubrication:—Pressure type. Gear type oil pump located in crankcase.
Oil Pressure—10 lbs. minimum at 500 R.P.M., 35-40 lbs. at 2500 R.P.M. with hot oil.
Capacity and Oil—4 qts. Use SAE. #30 (summer), #20 (winter).

CARBURETION:—(Fuel System). See Carburetion Section for complete data on Carburetor, Fuel Pump, and Gasoline Gauge.
Carburetor:—Marvel, Type AC 10-1530, ⅞" updraft type.
Fuel Pump:—A.C., Type P, on right hand side of crankcase.
Gasoline Gauge:—K-S Telegauge, hydrostatic type.

IGNITION:—**Coil Model IG-4606.** Coil mounted on dash, assembled as unit with ignition switch.
Ignition Current—1-3 amperes (running), 3-4.5 amperes (stopped).
Ignition Switch—Electrolock, Type 16-S. Unit with coil (connected by armored cable). See Equipment Section for complete data.

Distributor Model IGB-4202. Single breaker, 4 lobe cam, full automatic advance type.
Breaker Gap—Set at .020". Limits, .018-.020".
Breaker Arm Spring Tension—16-22 ounces.
Cam Angle—41° (closed), 49° (open) distributor degrees.



CONTINENTAL
FOUR CYLINDER, MODEL 41 (1934)
AUTO-LITE ELECTRICAL SYSTEM

Automatic Advance

Distributor Degrees	R.P.M.	Engine Degrees	R.P.M.
Start	250	0	500
3	340	6	720
5	400	10	800
8	700	16	1400
10	900	20	1800
12	1100	24	2200
13	1200	26	2400

IGNITION TIMING:— Flywheel Degs. Piston Position
All engines ..... 7° BTDC. ..... .0192" BTDC.
To Set Timing—With #1 piston on compression, turn engine over by hand until piston is 7° before top dead center, stop when flywheel mark '#1 IGN' lines up with indicator in inspection hole in left front face of flywheel housing. This mark is 7° or .610" before top dead center mark 'TDC'. 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, connect spark plugs as indicated on diagram.
Firing Order:—1-3-4-2 (see diagram).
Spark Plugs:—A.C., Type G-12. 18 MM. Metric type.
Spark Plug Gaps—Set gaps at .025-.030".

BATTERY:—U.S.L., Frontier Type A-13A, 6 volt, 13 plate, 78 A.H. capacity (20 hour rate).
Starting Capacity—90 amperes for 20 minutes.
Grounded Terminal—Negative (—) terminal.
Location—Under front floor boards on left side.

STARTER:—Model MZ-4034. Armature No. MZ-2053. Starter drive—Inboard Bendix.
Rotation—Counter-clockwise at commutator end.
Brush Spring Tension—44-56 ozs. (new brushes).
Cranking—1325 R.P.M., 200 amperes, 5 volts.

Performance Data

Torque	R.P.M.	Volts	Amperes
0 ft. lbs.	5000	5.5	60
.65 "	2500	5.5	100
2.55 "	1325	5.0	200
4.95 "	750	4.5	300
7.65 "	220	4.0	400
7.8 "	Lock	3.0	420
11.8 "	Lock	4.0	560

Starter Switch:—Model SW-4001. Foot plunger type mounted on toeboard.

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

GENERATOR:—Model GAM-4505. Armature No. GAM-2081. Third brush control type.
Charging Rate Adjustment—Take off commutator cover band, shift third brush by hand by prying on mounting stud, counter-clockwise to increase, or clockwise to decrease charging rate. Third brush held in any position by friction.
Maximum Charging Rate—17 amperes (cold), 8.0 volts, 2400 R.P.M.

Performance Data

Amperes	Volts	R.P.M.
0	6.4	700
4	6.9	880
7	7.0	1000
10	7.2	1180
14	7.8	1520
17	8.0	2375
15.2	7.9	3200

Rotation—Counter-clockwise at commutator end.
Field Current—4.08-4.52 amperes at 6.0 volts.
Motoring Current—4.94-5.46 amperes at 6.0 volts.
Brush Spring Tension—18-22 ozs. (new brushes).

Mounting:—Cradle mounted at left front of engine. Fan belt drive. Water pump driven by generator shaft extension. To remove, disconnect water pump drive coupling, slack off belt adjustment, loosen mounting clamp band.
Belt Adjustment—Loosen large nut holding fan on bracket, move fan up until belt can just be turned with fan held stationary, tighten mounting nut.

RELAY:—Model CB-4014. Mounted on generator field frame.
Cuts in—7.0-7.5 volts.
Cuts out—.5-2.5 amperes discharge.
Relay Contact Gap—.025-.035".
Air Gap—.010-.030" (contacts closed).

LIGHTING:—Soreng-Manegold Switches. Light Switch Model 5670-AA. Foot Control Switch Model C-2100-A. Light switch on instrument board. Foot control switch used to control headlight upper and lower beams.

Bulb Specifications

Lamp	Candlepower	Mazda No.
Headlights	21-21	1110
Stop and Tail Light	21-2	1158
All others	3	63

FUSES:—20 ampere capacity lighting fuse on lighting switch.

HORN:—Schwartze Model 093000. Vibrator type.

DE SOTO
AIRFLOW MODEL SE (1934)
DELCO-REMY ELECTRICAL SYSTEM

SERIAL NUMBER:—First number, 5,068,501. Located on right front door hinge pillar post.

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

ENGINE:—Six cylinder 'L' head type. Engine mounting, Floating Power.
Dimensions—Bore, 3⅜". Stroke, 4½". Displacement, 241.5 cu. ins.
Horsepower—Rated, 27.34. Developed, 100 H.P. at 3400 R.P.M. (A1. Head).
Compression—Std. Al. head—6.2-1. No optional compression ratios.
NOTE:—Special cylinder head gaskets, studs, and special length spark plugs (7/16" thread length) are used with the aluminum head. Aluminum heads must always be tightened cold.

Pistons:—Aluminum alloy 'T' slot type with aluminum oxide finish. Pistons are 'cam' ground with greatest clearance across piston pin ends. Special equipment necessary to finish pistons and cylinders should be reconditioned to standard oversize. Pistons furnished in standard oversizes of .003", .005", .010", .015", .020", .023", .025", .030", .040", .050", .060". Reconditioned cylinders must not be out-of-round or tapered more than .0005". All cylinders should be finished to same size to maintain balance.
Clearance—.025" (head), .0015" (at bottom of piston skirt).
Weight—All pistons of same size held to 2 gr. (1/10 oz.) weight variation in manufacturing.
Removal—Piston and rod assembly removed from top of engine.
Installing New Pistons—Install new pistons with slot to left (opposite side from camshaft and valves).

Piston Rings:—Four rings per piston, #1 and 2 compression rings, #3 undercut oil wiper ring, #4 special oil control ring. Lower ring grooves are drilled radially with oil drain holes.

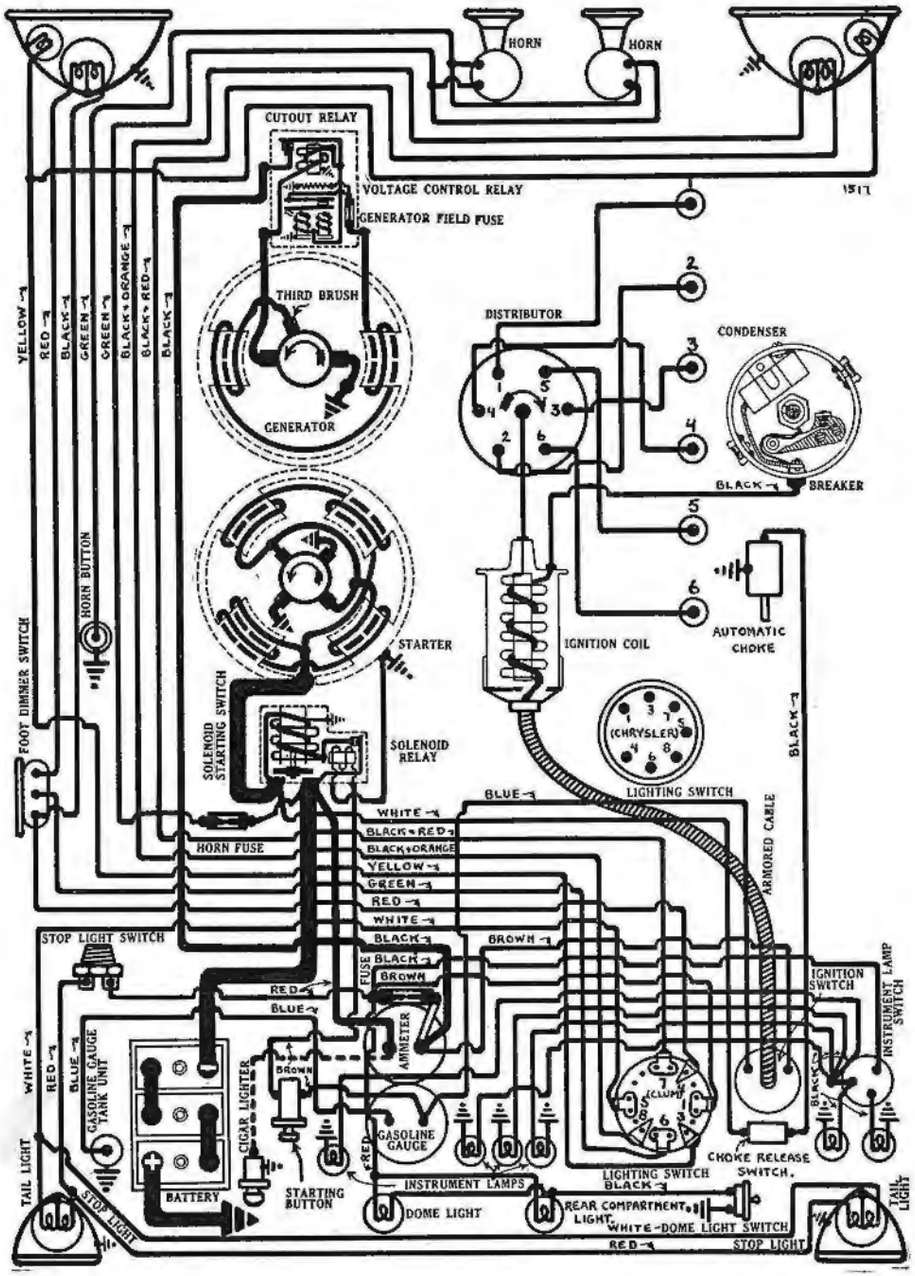
Ring	Width	End Gap	Side Clearance in Groove
Comp. (1 and 2)	⅛"	.007-.015"	.003"
Comp. (3-Undercut)	⅛"	.007-.015"	.003"
Oil Cont. (4)	3/16"	.007-.015"	.003"

Piston Pin:—Diameter, 55/64". Length, 2⅞". Pin floats in piston and rod (retaining rings used). When installing pins, piston can be heated in boiling water which will allow pin to be installed and centered easily.
Pin Fit in Piston—Tight thumb push fit with piston at 120°F.
Pin Fit in Rod—Light thumb push fit with piston at room temperature (70°F.).
NOTE:—Pin hole in upper end of connecting rod is bronze bushed.

Connecting Rod:—Length, 8¾". Weight variation, rods held to 2 gr. (1/10 oz.) variation from standard weight in manufacture.
Big End Bearing—Removable steel-backed babbitt lined type. No shims.
Clearance—.001-.0027" (radial), .003-.009" (sideplay).
Adjustment—No shims used. Replace removavle bearings when clearance exceeds maximum. Install new bearings with small boss on bearing registering with machined groove in connecting rod. Service bearings available .010" undersize.
NOTE:—Lower bearings are offset. Install rods with offset (widest half of bearing) toward rear of engine (#1, 3, 5 cylinders) or toward front of engine (#2, 4, 6 cylinders). Oil hole in upper half of bearing must be toward camshaft side of engine on all rods.

Crankshaft:—Four main bearing type with integral counterweights.
Journal Sizes—2½" diameter (all bearings).
Bearing Type—Steel-backed, babbitt-lined type. No shims.
Clearance—.001-.002" (radial), .003-.007" (endplay).
Adjustment—No shims used. Replace bearings. Do not file bearing caps.
End Thrust—Taken by rear (#4) bearing.

Camshaft:—Four bearing type. Camshaft drive, non-adjustable chain.
Bearing Type—Removable steel-backed, babbitt-lined type (except rear bearing, which is machined in crankcase).
Clearance—.0015-.0025" (radial), .003-.005" (endplay).
Chain—Width, 1". Length, 48 links. Pitch, .500".
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.



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AIRFLOW MODEL SE (1934)
DELCO-REMY ELECTRICAL SYSTEM

Valves:—

	Head Diameter	Stem Diameter
Intake	1 17/32"	.340-.341"
Exhaust	1 15/32"	.340-.341"

Seat Angle—45° (all valves). Lift, 11/32".
Stem-to-Guide Clearance — .001-.003" (intake), .003-.005" (exhaust).
Installing New Guides—When new guides are installed, ream inside diameter to .342-.343" (intake), .344-.345" (exhaust). Top of guide to top of cylinder block distance must be 1 3/16".
Tappet Clearance—.005" (intake) .007" (exhaust) with engine hot.

Valve Springs—	Pressure	Length
Valve Closed	46-50 lbs.	2 1/16"
Valve Open	104-110 lbs.	

NOTE:—Do not compress valve springs to less than 1½" length. Special alloy exhaust valve seat inserts used. Seat inserts cannot be recut and must be ground.

Valve Timing

Intake Valves open at TDC. Close, 50° ALDC.
Exhaust Valves open, 48° BTDC. Close 2° ATDC.

To Check Valve Timing—Use regular timing gauge. Set tappet clearance #6 intake valve at .010". This valve should open with piston on top dead center. Reset tappet clearance at .005" with engine hot.

Lubrication:—Pressure type. Gear type oil pump located at right of crankcase on lower end of inclined accessory shaft.
Oil Pressure—30-60 lbs. at normal driving speeds.
Oil Pressure Relief Valve—Operates at 45 lbs. Located under plug on left hand side of crankcase. Adjustable by replacing spring. Standard springs unpainted. Heavy spring (to increase oil pressure) painted green. Lighter spring (to decrease oil pressure) painted red.
Capacity and Oil—6 qts. Use SAE. #30 (summer), #20-W or 10-W (winter).

CARBURETION:—(Fuel System). See Carburetion Section for complete data on Carburetor, Fuel Pump, Gasoline Gauge, and Automatic Choke.
Carburetor:—Carter, Model E6B1, 1½" plain tube, downdraft type.
Automatic Choke—Sisson.
Fuel Pump:—A.C., Type P on right hand side of crankcase.
Gasoline Gauge:—Motometer electric type.

IGNITION:—Coil Model 540-E. Ignition switch is part of coil assembly (connected to coil by armored cable).
Distributor Model 644-W. Single breaker, 6 lobe cam, full automatic advance type.
Breaker Gap—Set gap at .020". Limits, .018-.024".
Breaker Arm Spring Tension—19-23 ozs.
Cam Angles (Distributor Degrees) — Closed 36°. Open 24°.

Automatic Advance

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

Mounting:—On left hand side of crankcase. Held in place by hold-down screw in advance arm.

IGNITION TIMING:—Flywheel Degs. Piston Position
Aluminum Head 3° ATDC. .004" ATDC.

Timing (using Timing Light)—Connect timing light between distributor terminal and live terminal of generator relay. Turn engine over until #1 piston is on compression, stop with piston slightly past top dead center when 4° mark on crankshaft impulse neutralizer at front of engine is directly under pointer on chain case, loosen hold-down screw in advance arm, center pointer on scale, tighten hold-down screw, loosen clamp bolt on advance arm, rotate distributor until timing light just goes out, tighten clamp bolt, see that rotor is opposite #1 segment in distributor cap, check spark plug connections (see diagram). The Impulse Neutralizer is marked in 1° graduations for a total of 15° on each side of the '0' or top dead center point. The ignition mark is the third graduation to the left of the center or '0' mark (facing front of engine).

Timing (using Gauge)—All cars can be timed using a Motor Gauge installed over #1 piston.
Firing Order:—1-5-3-6-2-4 (see diagram).
Spark Plugs:—A.C., Type SL-9 (aluminum heads only). 14 MM. Metric type.
Spark Plug Gap—.025".

BATTERY:—Willard, Type WS-4-17, 6 volt, 17 plate, 115 A.H. capacity (20 hour rate).
Starting Capacity—140 amperes for 20 minutes.
Grounded Terminal—Positive (+) terminal.
Location—Under left front seat.

STARTER:—Model 727-L. Armature No. 823881.
Rotation—Counter-clockwise at commutator end.
Brush Spring Tension—24-28 ounces.

Performance Data

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

Starting Switch:—Solenoid Switch No. 1516. Push-button Switch No. 1387. Starter pinion shift operated by solenoid on starter field frame. Controlled by relay (on solenoid switch case) operated by pushbutton switch on instrument panel. Operative only with ignition 'on'. See Equipment Section for complete data.
Mounting:—Flange mounted on left hand front face of flywheel housing. To remove, take out flange mounting screws.

GENERATOR:—Model 935-D. Armature No. 1854856. Third brush current control with external voltage regulation (regulator combined with relay cut-out in case on generator field frame). Third brush setting should be adjusted by using test meters or by 'Commutator Bar' method.

Charging Rate Adjustment (using Meters)—Use test ammeter and voltmeter to check generator output. Connect jumper wire from 'F' generator terminal to ground (important as voltage regulator must be shorted out while adjustment is being made). With generator at room temperature, remove commutator cover band, loosen small round lock screw on commutator end plate, shift third brush by hand, counter-clockwise to increase, or clockwise to decrease charging rate until output is 21 amperes at 8.6 volts, tighten lock screw, remove jumper wire. See Equipment Section for complete data on Voltage Regulator.

Commutator Bar Method—Remove generator from car, mount so that armature can be seen, loosen lock screw on commutator end plate, shift third brush by hand so that there are exactly 17/8 commutator bars exposed between third brush and nearest main brush. This setting provides maximum safe output 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.
Shunt Field Current—2.3-2.6 amperes at 6.0 volts.
Brush Spring Tension—22-26 ozs. (main brushes), 16-20 ozs. (third brush).
Field Fuse:—6 ampere capacity (in regulator case).
Mounting:—Pivot mounting at left front of engine. Driven by fan belt. To remove, take out two hinge bolts and one clamp bolt.
Belt Adjustment:—To adjust belt, loosen pivot bolts and clamp bolt, swing generator away from engine, tighten clamp bolt before slacking off on generator, tighten pivot bolts. Belt should be just tight enough to drive generator and water pump without slipping.

RELAY REGULATOR (CONTROL UNIT):—Model 5542. Consists of relay cut-out and voltage regulator in case on generator field frame. See Equipment Section for complete data on Voltage Regulator.

Relay Cut-out

Cuts in—6.6-6.8 volts.
Cuts out—3 ampere discharge (max).
Relay Contact Gap—.015-.025".
Air Gap—.012-.017" (contacts closed).

Voltage Regulator

Contacts Close—7.2 volts. **Contacts Open**—8.3 volts.
Regulator Contact Gap—.008-.013".
Air Gap—.038" between armature and core (armature down again lower stop).
.028 armature travel (between armature and lower stop).

LIGHTING:—Clum Switch, Model 9556. Delco Remy Foot Control Switch, Model 465-S. Foot control switch on toeboard used to provide assymmetrical 'passing' beam (upper beam right hand headlight—lower beam left hand headlight).

Bulb Specications

Lamps	Candlepower	Mazda No.
Headlights	32-21	2320-C
Parking, Instrument	3	63
Stop and Tail	21-2	1158
Dome	15	87

FUSES:—Lighting—20 ampere capacity on back of ammeter.
Horn—20 ampere capacity in fuse connector in horn lead near starter.
Generator Field—6 ampere capacity under regulator cover on generator.

HORNS:—Klaxon, Model K-26-G (matched set, blended tone) Vibrator type. Current draw, 5.0-6.5 amperes at 6.0 volts (high note), 6.0-8.5 amperes at 6.0 volts (low note).

DODGE

NEW SIX, MODEL DR, DE LUXE SIX, MODEL DS (1934)
DELCO-REMY ELECTRICAL SYSTEM

SERIAL NUMBER:—First number, (DR) 3,680,001, (DS) 4,528,651. Located 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:—Six cylinder, 'L' head type. Engine mounting, Floating Power.
Dimensions—Bore, 3¼". Stroke, 4⅜". Displacement, 217.8 cu. ins.
Horsepower—Rated, 25.35. Developed, 82 H.P. at 3600 R.P.M. (cast-iron head), 87 H.P. at 3600 R.P.M. (aluminum head).
Compression—Cast-iron head—5.6-1. High compression Al. head—6.5-1.

NOTE:—Cast-iron head standard on Model DR. Aluminum head optional on Model DR and standard on Model DS. Special cylinder head gaskets, studs and special length spark plugs (7/16" thread length) used with aluminum heads. Aluminum heads must always be tightened cold.

Pistons:—Aluminum alloy, steel strut, 'T' slot type. Finished pistons furnished in standard oversizes of .003", .005", .010", .015", .020", .023", .025", .030", .040", .050", .060" (recondition cylinders to standard oversize). Semi-finished pistons furnished in two sizes: (1) cylinders from standard to .023" oversize, (2) from .025" to .050" oversize. These pistons should be slotted and then turned to finish size (.001" smaller diameter at bottom of skirt than at top). Reconditioned cylinders should not be out-of-round or tapered more than .0005". Finish all cylinders to same size to retain balance.
Weight—Maximum allowable weight variation, ¼ oz.
Clearance—Fit pistons with .002" feeler stock ½" wide on side opposite slot. Use spring scale to check feeler tension. Scale should register 7-14 pounds tension when feeler is withdrawn. More than 14 pounds indicates piston is too tight. Less than 7 pounds indicates piston is too loose.
Removal—Piston and rod assembly removed from top of engine.
Installing Pistons—Install pistons with slot to left (opposite side from camshaft and valves).

Piston Rings:—Four rings per piston, #1—plain compression ring, #2 and #3—tongue and groove type with lower ring undercut to act as an oil wiper, #4—special oil control ring.

Ring	Width	End Gap	Side Clearance in Groove
Comp. (#1)	⅛"	.007-.012"	.003"
Comp. (#2, 3)	⅛"	.007-.015"	.003" (see note)
Oil Cont. (#4)	5/32"	.007-.015"	.003"

NOTE:—Clearance between rings in pair of tongue-and-groove rings, .003-.005".

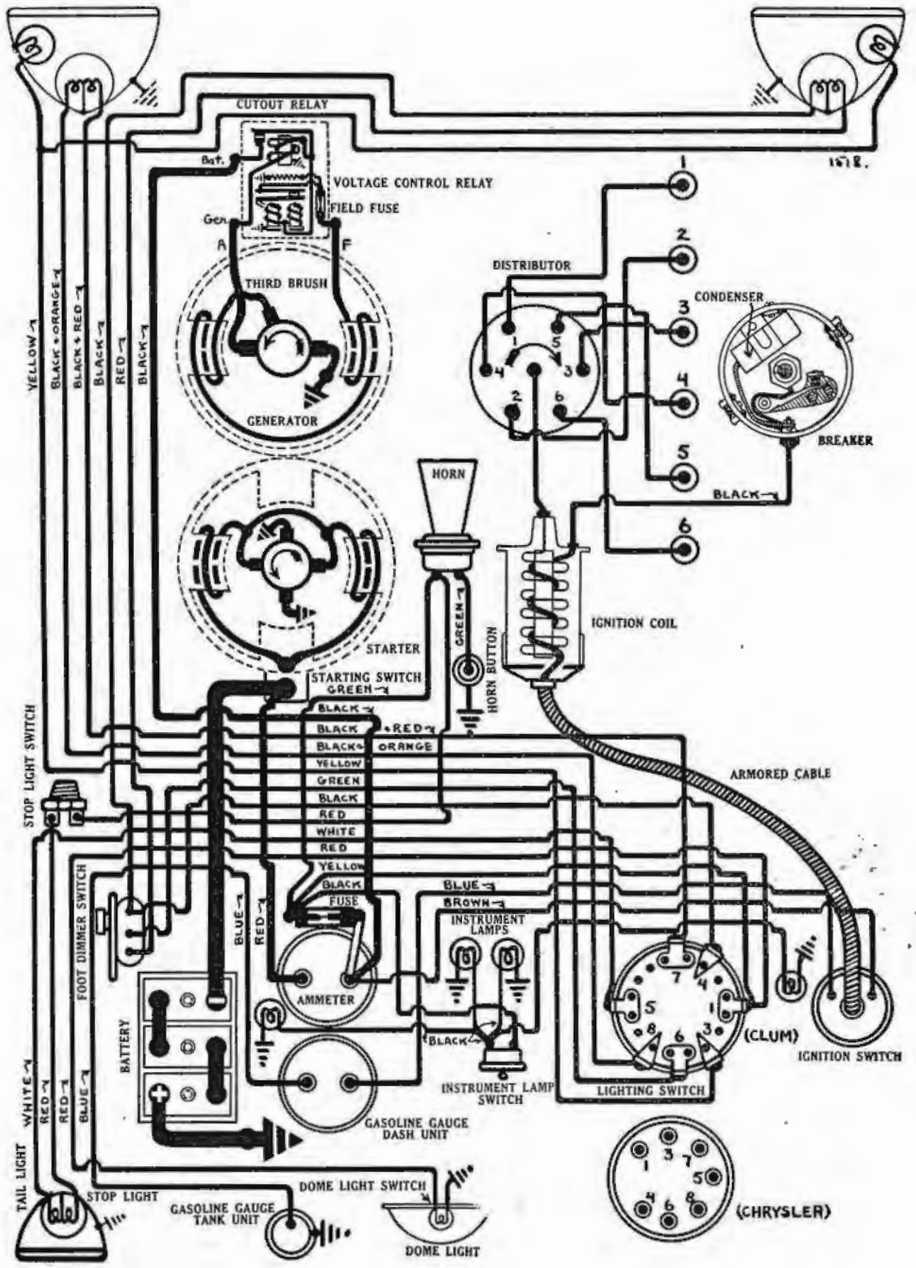
Piston Pin:—Diameter, 55/64". Pin floats in piston and rod (retaining rings used). When installing rods, piston can be heated in boiling water which will allow pin to be installed and centered easily.
Pin Fit in Piston—Tight thumb push fit with piston heated to 160°F.
Pin Fit in Rod—Light thumb push fit, piston at room temperature (70°F.).

NOTE:—Pin hole in upper end of connecting rod is bronze-bushed.

Connecting Rod:—Length, 7 15/16". Weight variation, ¼ oz. maximum.
Big End Bearing—Removable steel-backed, babbitt-lined type. No shims.
Clearance—.001-.00275" (radial), .003-.009" (sideplay).
Adjustment—No shims used. Replace removable bearings when clearance exceeds maximum. Install new bearings with small boss on bearing registering with machined groove in connecting rod. Service bearings available .010" undersize.

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

Crankshaft:—Four main bearing type with integral counterweights.
Journal Sizes—2½" diameter (all bearings).
Bearing Type—Steel-backed, babbitt-lined type. No shims.
Clearance—.001-.002" (radial), .003-.007" (endplay).
Adjustment—No shims used. Replace bearings. Do not file bearing caps.
End Thrust—Taken by #4 (rear) bearing.



DODGE

NEW SIX, MODEL DR, DE LUXE SIX, MODEL DS (1934)
DELCO-REMY ELECTRICAL SYSTEM

Camshaft:—Four bearing type. Camshaft drive—non-adjustable chain.
Bearing Type—Removable steel-backed babbitt-lined type (except rear bearing which is machined in crankcase).
Clearance—.0015-.0025" (radial), .003-.005" (endplay).
Chain—Width, 1". Length, 48 links. Pitch, .500"
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
Intake	1 15/32"	.340-.341"
Exhaust	1 15/32"	.340-.341"

Seat Angle—45° (all valves). **Lift**—5/16".
Stem-to-Guide Clearance — .001-.003" (intake), .003-.005" (exhaust).
Installing New Guides — When installing new guides, ream inside diameter to .342-.343" (intake), .344-.345" (exhaust). Top of guide to top of cylinder block distance must be 7/8".
Tappet Clearance—.005" (intake), .007" (exhaust) with engine hot.

Valve Springs	Pressure	Length
Valve Closed	34-38 lbs.	1¾"
Valve Open	77-85 lbs.	

NOTE:—Do not compress valve springs to less than 1 7/16" length. Special alloy exhaust valve seat inserts used. Seat inserts cannot be recut and must be reground.

Valve Timing

Intake Valves open 6° ATDC. Close 46° ALDC.
Exhaust Valves open 42° BLDC. Close 8° ATDC.

To Check Valve Timing:—Use regular timing gauge. Set tappet clearance #6 intake valve at .011" (cold). This valve should open with piston .015" past top dead center. Reset tappet clearance at .005" with engine hot.

Lubrication:—Pressure type. Gear type pump located at right of crankcase.
Oil Pressure—30-60 lbs. at normal driving speeds.
Oil Pressure Relief Valve—Operates at 40 lbs. Located under plug on left hand side of crankcase. Adjustable by replacing spring. Standard springs unpainted. Heavy spring (to increase oil pressure) painted green. Lighter spring (to decrease oil pressure) painted red.
Capacity and Oil—5 qts. Use SAE. #30 (summer), #20-W or 10-W (winter).

CARBURETION:—(Fuel System). See Carburetion Section for complete data on Carburetor, Fuel Pump, Gasoline Gauge, and Automatic Choke.
Carburetor:—Stromberg, Model EX-22, 1¼" plain tube downdraft type.
Automatic Choke—Sisson (special equipment).
Fuel Pump:—A.C., Type B on right hand side.
Gasoline Gauge:—Motometer, Electric type.

IGNITION:—Coil Model 540-C (sedan), 540-D (coupe), 540-A (DT-Canadian). Ignition switch is part of coil assembly (connected by armored cable).
Distributor:—Model 644-U (Cast-iron Head), 644-W (H.C. AL. Head), 644-K (DT-Canadian). Single breaker, 6-lobe cam, full automatic advance type.
Breaker Gap—Set gap at .020". Limits, .018-.024".
Breaker Arm Spring Tension—19-23 ounces.
Cam Angles (Distributor Degrees) — Closed 36°. Open 24°.

644-U Automatic Advance

Distributor Degrees	Distributor R.P.M.	Engine Degrees	Engine R.P.M.
Start	250	1	500
7	400	14	800
15	1400	30	2800

644-W Automatic Advance

Start	250	4	500
7	400	14	800
15	1600	30	3200

644-K Automatic Advance

1	250	4	500
7.5	400	15	800
16	1200	32	2400

IGNITION TIMING:— Flywheel Degs. Piston Position
DR. (Cast-iron Hd.) .....2° ATDC..... .0017" ATDC.
DR., DS. (Al. Hd.) .....4° ATDC..... .0067" ATDC.
Timing (using Timing Light):—Connect timing light between distributor terminal and live terminal of generator relay. Turn engine over until #1 piston is on compression, stop with piston slightly past top dead center when 2° mark (Cast-iron Hd.), or 4° mark (Aluminum Hd.) on crankshaft impulse neutralizer at front of engine is directly under pointer on chain case, loosen hold-down screw in advance arm, center pointer on scale, tighten hold-down screw, loosen advance arm clamp bolt, rotate distributor until timing light just goes out, tighten clamp bolt, see that rotor is directly opposite #1 segment in distributor cap, check spark plug connections (see diagram). Impulse neutralizer is marked in 1° graduations for a total of 15° on each side of the '0' or top dead center point.
Timing (using Gauge):—All cars can be timed using a Motor Gauge installed in timing plug hole over #6 piston.
Firing Order:—1-5-3-6-2-4 (see diagram).
Spark Plugs:—A.C., Type S-9 (Cast-iron Hd.), Type SL-9 (Aluminum Hd.). 14 MM. Metric type. Type SL-9 has a longer (7/16") thread length.
Spark Plug Gaps—.025".

BATTERY:—Willard, Type WT-1-15, 6 volt, 15 plate, 90 A.H. capacity (5 ampere rate).
Starting Capacity—117 amperes for 20 minutes.
Grounded Terminal—Positive (+) terminal.
Location—Under left hand front seat.

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

Performance Data

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

Starting Switch:—Manual pinion shift connected to starting switch lever. Interconnected with throttle cross shaft to provide ¼-1/3 throttle opening while cranking (see Equipment Section).
Mounting:—Flange mounted on left hand front face of flywheel housing.

GENERATOR:—Model 937-P. Armature No. 1838448. Third brush control type with external voltage regulation (regulator combined with relay cut-out in case on generator field frame.
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 regulator must be shorted out while adjustment is being made). With generator at room temperature, remove commutator cover band, loosen small round lock screw on commutator end plate, shift third brush by hand, counter-clockwise to increase, or clockwise to decrease charging rate until output is 21 amperes at 8.6 volts, tighten locking screw, remove jumper wire from voltage regulator. See Equipment Section for complete data on Voltage Regulator.
Commutator Bar Method:—Remove generator from car, mount so that armature can be seen, loosen lock screw on commutator end plate, shift third brush so there are exactly 2½ 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	19-22	8.3-8.7	2400
Hot	12-15	7.6-8.0	2600

Rotation—Counter-clockwise at commutator end.
Shunt Field Current—3.5-4.5 amperes at 6.0 volts.
Brush Spring Tension—22-26 ozs. (main brushes), 16-20 ozs. (third brush).
Field Fuse—6 ampere capacity (in regulator case).

Mounting:—Pivot mounting at left front of engine. Drive by fan belt. To remove, take out two pivot bolts, one clamp bolt.
Belt Adjustment:—Loosen pivot bolts and clamp bolt, use spring scale to pull generator horizontally away from engine until belt tension (scale reading) is 45-50 lbs., tighten clamp bolt and pivot bolts before slacking off scale tension.

RELAY REGULATOR (CONTROL UNIT):—Model 5540. Control unit consists of relay cut-out and voltage regulator in case on generator field frame. See Equipment Section for complete data on Voltage Regulator.

Relay Cut-out

Cuts in—6.6-6.8 volts. **Cuts out**—3 amps. disch., max.
Relay Contact Gap—.015-.025".
Air Gap—.012-.017" (contacts closed).

Voltage Regulator

Contacts Close—7.2 volts. **Contacts Open**—8.3 volts.
Regulator Contact Gap—.008-.013".
Air Gap—.038" between armature and core (armature down against lower stop).
.028" armature travel (between armature and lower stop).

LIGHTING:—Clum Switch, Model 9556. Delco-Remy Foot Control Switch Model 465-Z. Foot control switch used to provide assymmetrical 'passing' beam (beam from right hand head lamp tilted).

Bulb Specifications

Lamps	Candlepower	Mazda No.
Headlights	32-21	2320-C
Parking, Instrument	3	63
Stop and Tail	21-2	1158
Dome	15	87

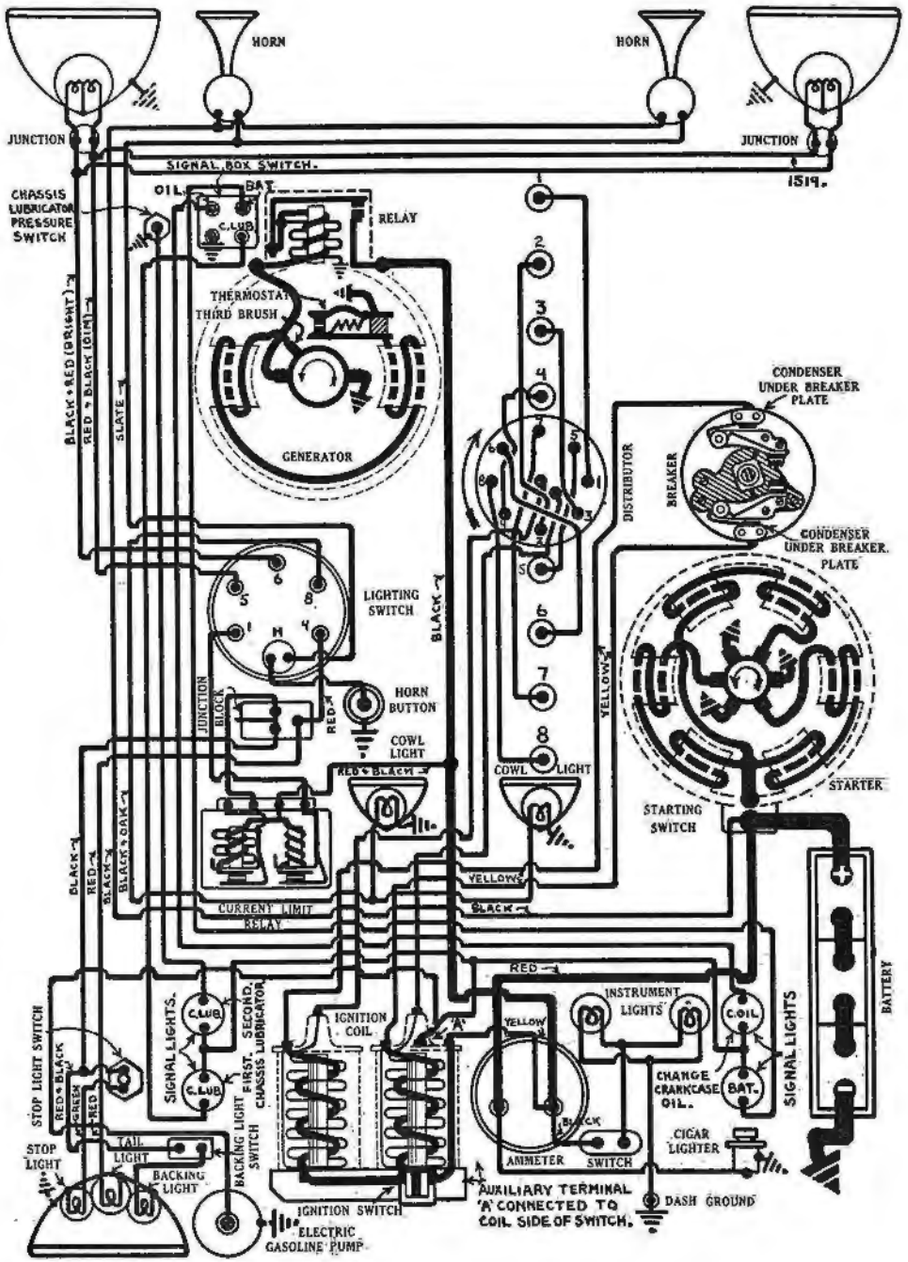
FUSES:—Lighting—20 amperes on back of ammeter.
Generator Field—6 amperes in regulator case.
HORNS:—Klaxon, Model K-31 or Model K-26M (Matched Set). Vibrator type.

DUESENBERG
MODEL J (1934)
DELCO-REMY ELECTRICAL SYSTEM

SERIAL NUMBER:—First number, 2125. Located on left hand front side of dash.
ENGINE NUMBER:—Stamped on left rear engine support. First number, J-099.
ENGINE:—Eight cylinder, 'In Line', valve-in-head type (two intake and two exhaust valves per cylinder driven by camshafts on cylinder head).
Dimensions—Bore, 3¾". Stroke, 4¾". Displacement, 420 cu. ins.
Horsepower—Rated, 45. Developed, 265 H.P. at 4200 R.P.M.
Compression—Std. Cast-iron head—5.20-1.
Pistons:—Ray-Day aluminum alloy split full skirt type. Skirt is separated from head by horizontal slot.
Weight—20 ounces. **Length**—4⅜".
Clearance—Top, .022". Second, third, fourth lands, 018". Bottom, .0035".
Removal—Piston and rods removed from bottom of engine (rotate crankshaft while withdrawing pistons).
Piston Rings:—Four rings per piston—#1, #2, #3, compression rings, #4, oil control ring. Lower ring groove drilled radially with oil drain holes.

Ring	Width	End Gap	Wall Thickness	Groove Depth (piston)
Comp. (all)	⅛"	.014-.016"	.140-.150"	.161"
Oil Cont.	3/16"	.014-.016"	.140-.150"	.166"

Wrist Pin:—Diameter, 1 1/16". Length, 3 17/64". Pin floats in piston and rod locking rings used at each end). Pin hole in upper end of connecting rod is Diamond bored.
Pin Fit in Piston—Slight driving fit (hole size, 1.06225-1.06175") at room temperature.
Pin Fit in Rod—Free push fit (bushing Diamond bored to 1.0625").
Connecting Rod:—Duralumin forging with steel bearing cap.
Weight—18 ozs. (without cap, bolts or bushing). Length, 9 13/16".
Big End Bearing—Poured 'Mogul Alloy' type. No shims.
Clearance—.0015-.002" (radial).
Adjustment—No shims used. Bearings should not require adjustment. Caps can be reduced with fine emery cloth on a surface plate if necessary.
Crankshaft:—Five main bearing type with integral counterweights and special mercury cartridge type damper.
Journal Sizes—2¾" diameter (all bearings).
Bearing Type—Separate 'Mogul Alloy' lined type. No shims.
Clearance—.0015" (radial), .0015" (endplay).
Adjustment—No shims used. Bearings should not require adjustment. Bearing caps can be reduced with fine emery on a surface plate if necessary.
End Thrust—Taken by #1 bearing. Endplay, .0015-.003".
Camshaft:—Five bearing type. Two camshafts (intake at left, exhaust at right) mounted on cylinder head, driven in tandem by chain from transfer sprocket on front of engine. Transfer sprocket driven by chain from crankshaft. Automatic idler sprocket take-ups used on each chain.
Bearing Type—'Mogul Alloy' lined type.
Clearance—.0015" (radial), .002-.003" (endplay) taken by #1 bearing.
Chain—(Upper)—Link Belt. Width, 1 11/16". Length, 51¾". Pitch, ⅜".
(Lower)—Link Belt. Width, 2". Length, 47¼". Pitch, ⅜".
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 'No. 1 and 8 Top' is exactly ⅜" before reference line on housing. 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 special tool #J-7016 to release spring tension, allow spring to unwind, withdraw bushing, lift chain off sprocket, remove sprocket, block chain up at lower end to prevent it dropping off transfer sprocket.
Intake Camshaft:—Take off 6 capscrews, remove intake camshaft sprocket, set tappet clearance #1 intake valve at .025" (see note under Valves), turn intake camshaft in direction of rotation (clockwise facing front of engine) until #1 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 camshaft or transfer sprocket, insert cap screws. Reset ignition timing.



DUESENBERG
MODEL J (1934)
DELCO-REMY ELECTRICAL SYSTEM

Exhaust Camshaft:—With #8 piston slightly past top dead center entering power stroke and flywheel mark 'No. 1 and 8 Top' 1¼" past 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—.001".
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 with flywheel mark 'No. 1 and 8 Top' exactly ⅜" before the reference line on the housing. #1 exhaust valve should close with #8 piston slightly past top dead center with flywheel mark 'No. 1 and 8 Top' 1¼" past line on housing.

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

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.

Gasoline Gauge:—K-S Telegauge, hydrostatic type.

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.
Manual Advance—20° (engine—maximum).

Automatic Advance

Distributor Degrees	Distributor R.P.M.	Engine Degrees	Engine R.P.M.
Start	400	2	800
18½	1400	37	2800
21	2000	42	4000

IGNITION TIMING:— Flywheel Degs. Piston Position
All engines.....1½" or 12° BTDC. ..... .0645" BTDC.

Timing (Stationary Contacts):—Synchronize contacts before setting timing if synchronizing tool is used (timing disturbed by synchronizing operation). 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) begin to open, tighten lock screws, check contact gap.

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

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.
Six pole type. Starter drive—Bendix.
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—20-24 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-.025" (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.

FORD

MODEL V-8-112 (1934)

SERIAL NUMBER:—Same as Engine Number. Stamped on top of clutch housing and on left frame side member in front of dash bracket.

ENGINE NUMBER:—See Serial Number.

ENGINE:—Eight cylinder, 90 degree V, 'L' head type.
Dimensions—Bore, 3 1/16". Stroke, 3¾". Displacement, 221 cu. ins.
Horsepower—Rated, 30. Developed, 90 H.P. at 3800 R.P.M.
Compression—6.3-1. Compression pressure, 138 lbs. at 1600 R.P.M. or 125 lbs. at cranking speed.

Pistons:—Aluminum, split skirt, cam ground type. Piston diameter is slightly less across piston pin bosses. Skirt also tapered from top to bottom (approximately .001" greater diameter at bottom of skirt). Recondition cylinders to standard oversize. Pistons furnished in standard oversizes of .0025", .005", .015", .030", .045".
Weight—287-291 grams (stripped), 389.5-396.9 grams (with rings and pin).
Removal—Piston and rod assembly removed from top of engine.
Clearance—Skirt, 002" minimum, .003" maximum (see Fitting New Pistons).
Fitting New Pistons—Use micrometer gauge to check pistons size and cylinder bore. Measurement on piston should be be made at top of skirt (directly below slot and to left of piston skirt split). Measurement of cylinder bore should be made at right angles to crankshaft at point 2" above bottom of cylinder bore. Piston selected for cylinder should show correct clearance (difference between two measurements). Pistons cannot be ground and cylinders should be reconditioned to take standard replacement piston. New pistons should be measured before installing pin. Do not use feeler gauges.
NOTE:—Install pistons with slot to left (facing front of engine).

Piston Rings:—Three rings per piston, #1 and 2—compression rings, #3—oil control ring. All rings above piston pin. Lower ring groove drilled radially with oil drain holes.

Ring	Width	End Gap	Wall Thickness	Groove Depth in Piston
Comp. (all)	.0915-.092"	.009-.015"	.140"	.154-.159"
Oil Cont.	.1545-.155"	.005-.009"	.140"	.154-.159"

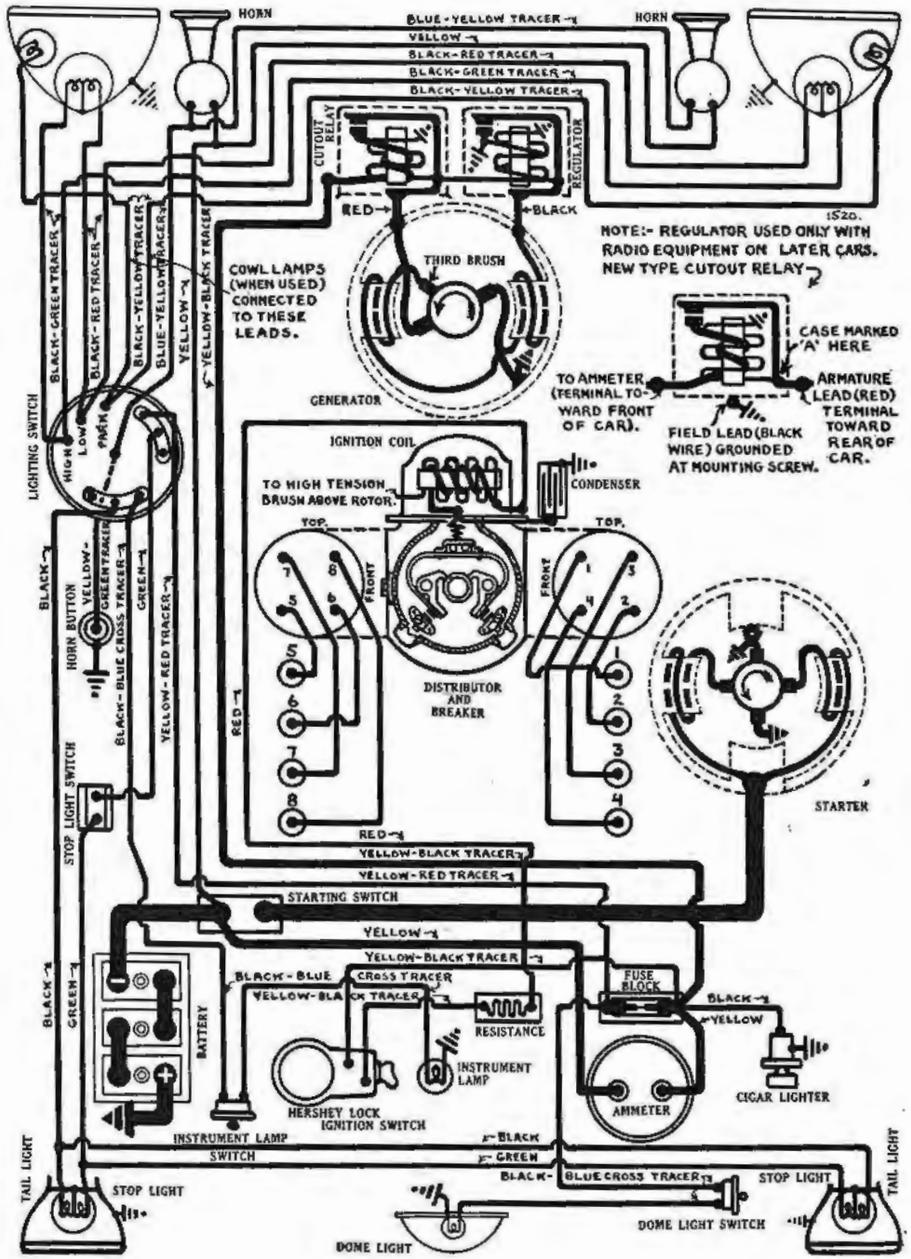
Piston Pin:—Diameter, .7501-.7504". Length, 2.77". Pin floats in piston and rod and is held by retainer ring in rod (engages slot in center of pin). Piston should be heated to 200°F. (dip in boiling water for one minute) to remove or install pins.
Pin Fit in Piston—Slight drag with piston heated to 200°F.
Pin Fit in Rod—.0002". Pin hole in rod is diamond-bored to provide this clearance. With correct clearance, rod should rock on pin of its own weight but piston should not rock (check retainer ring to make sure that retainer does not affect test by binding—make test before retainer is installed).
NOTE:—Use a taper pilot inserted ahead of piston pin to expand retainer ring when pins are installed.

Connecting Rod:—Weight, 469-473 grams. Length, 7" (center-to-center).
Big End Bearing—Separate babbitted bearing sleeves assembled on crankpin. Bearing diameter, 2" (inside), 2.218" (outside). Length, 1.937" (on crankpin).
Clearance—.003" (radial), .010-.022" (sideplay). No shims used.
Adjustment—None (no shims used). Replace bearings.
NOTE:—A new tool, Part #V-131, has been developed to test bearings with connecting rod caps tightened. Tool is used to grasp bearing flanges and test fit by rotating bearings. Bearings should rotate freely. If bearings cannot be turned, or turns hard, check for bent connecting rods, distorted or burred bearings.

Crankshaft:—Three bearing, 90° type with integral counterweights.
Journal Sizes—2" diameter (all bearings).
Bearing Type—Babbitt bearing surface integral with cap and case.
Clearance—.001-.003" (radial).
Adjustment—None (no shims used).
End Thrust—Taken by #3 (rear) main bearing. Endplay, .002-.006".

Camshaft:—Three bearing type. Camshaft drive—Gears.
Camshaft Bearings—1.812" diameter (all bearings).
Gears—Crankshaft gear, steel. Camshaft gear, Bakelized Fabric.
Camshaft Setting—Gears are marked. Mesh marked tooth on crankshaft gear opposite space between gears marked by straight line on camshaft gear.
NOTE:—Backlash between gears should not exceed .004".

Valves:—	Head Diameter	Stem Diameter	Length	Seat Angle	Lift
All valves	1.537"	.3105"-.3115"	4.750-.4.751"	45°	.295"



FORD

MODEL V-8-112 (1934)

Stem-to-Guide Clearance—.0015-.0035" all valves.

NOTE:—New split-type valve guide bushings, Part #40-9510, formed with a flange on the lower end are now used. To remove valves, use new Type V-78, bar type valve lifter, insert tongue of valve lifter between valve spring coils so as to engage flange on valve guide bushing, pull bushings down sufficiently to withdraw valve guide bushing retainer, remove valve, guides, and spring as a unit through top of engine. A new fixture, Type V-130, is used to disassemble valve units. Tool holds valve in position while spring is compressed to permit withdrawal of valve spring retainers. Valve head acts as stop to prevent excessive compression of springs.

Tappet Clearance—.0125-.0135" (all valves—not adjustable). Special two-step feeler available as Go-No Go gauge. First step (.0125") should pass between valve stem end 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 Timing

Intake Valves open 9°30' BTDC. Close 54°30' ALDC.
Exhaust Valves " 57°30' BLDC. Close 6°30' ATDC.

Lubrication:—Pressure type. Gear type oil pump located in crankcase and driven by gears at rear of camshaft (under cover back of rear bearing).

Normal Oil Pressure—30 lbs. at 55 M.P.H.

Oil Pressure Relief Valve—Operates at 30 lbs. Located under plug directly above camshaft ft. bearing.

Capacity and Oil—5 qts. Use SAE. #40 (summer 32° to 90°—use #50 for temperatures above 90°F.), #20 (winter 32° to 0°), #10 (winter below 0°F.).

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

Carburetor:—Stromberg, Model EE-1, 1" dual, plain tube, downdraft type.

Fuel Pump:—A.C., Type R.

Gasoline Gauge:—K-S Telegauge, hydrostatic type.

IGNITION:—Mallory Special Coil. Part of ignition unit at front of engine. A resistor unit mounted on back of instrument board is connected in the coil primary circuit.

Ignition Current—2.8 amperes (idling), 4 amperes (stopped).

Ignition Switch — Co-incidental ignition switch and steering post lock.

Distributor Ford Type 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) used to load coil (these contacts close first and open first but spark does not occur until timing contacts open). See Equipment Section for complete data on Mallory distributors.

Breaker Gap—.012-.014" (both sets). Stationary contact studs accessible by taking out rubber plugs on side of housing. Studs held by locking screws in stationary contact bracket.

Breaker Arm Spring Tension—22-27 ozs.

Cam Angles (Distributor Degrees) — Closed 34°. Open 11°. Both sets with correct lead for coil loading contacts.

Automatic Advance—High 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

NOTE:—Distributor shaft and Governor Weight assemblies with above advance characteristics used only on engines with dual carburetor. They may identified by figure '34' or '40-B' stamped on rear end of shaft (beside coupling tongue) and on outside rim of advance weight (remove vacuum brake piston, sight down brake cylinder).

Mounting:—Complete ignition unit mounted on front of engine. To remove, disconnect vacuum connection, take out 3 flange mounting cap screws.

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

NOTE:—Ignition coil must not be removed from ignition unit when setting contact gap or timing distributor. The Ford Motor Company recommend that this practice be discontinued.

Timing:—No flywheel marks. Ignition designed to be set with piston on top dead center. With piston #1 (front cylinder, right hand block) 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 slowly until contacts begin to open, note position of screw with reference to timing graduations on edge of slot, move screw up one additional graduation, tighten screw. This will give correct setting of 4° before top dead center. Determine top dead center position of piston by inserting gauge rod in cylinder #1 or measure distance from top of block to top of pistons #2 and 3 (with head off). This distance should be the same.

Vacuum Brake Setting:—Vacuum brake can be set for individual fuel characteristics or operating conditions by loosening lock nut and backing off vacuum brake adjusting screw until engine 'pings' under load and then turning screw in just enough to remove 'ping'. Tighten lock nut after making adjustment.

Firing Order:—1-5-4-8-6-3-7-2. Cylinders numbered as shown on diagram.

Spark Plugs:—Champion, Type C-7. 18 MM. Metric.

Spark Plug Gaps—.025".

BATTERY:—Ford, Type 40-17, Part No. 40-10655-B, 6 volt, 17 plate, 96 A.H. capacity (20 hour rate).

Starting Capacity—120 amperes for 20 minutes.

Grounded Terminal—Positive (+) terminal.

Battery Size—Width, 7¼". Length, 10 9/16". Height, 7⅛".

Location—Under front floor board, left hand side.

STARTER:—No. 18-11002. Armature No. 18-11005.

Starter Drive—Inboard Bendix.

Rotation—Counter-clockwise at commutator end.

Brush Spring Tension—2 pounds each.

Cranking Performance—225 amperes at 3 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		

Mounting:—On front of flywheel housing, right hand side. To remove, take out two bolts on starter end plate.

GENERATOR:—Part No. 40-10000-B. Armature No. 18-10005 or 40-10005. Air cooled type. Third brush control with voltage regulator or two-stage charging rate (some cars). See Equipment Section.

Charging Rate Adjustment:—Take off commutator cover band, shift third brush by prying on brush mounting stud counter-clockwise to increase, or clockwise to decrease charging rate. Brush held in position by friction. Be sure regulator contacts are closed when checking output.

Maximum Charging Rate—Maximum rated capacity of generator is 18 amperes (cold) at 1500 R.P.M. or 20 M.P.H. when voltage regulator is used, or 12 amperes without voltage regulator.

Generator Performance (Hot)

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	1875	25.0

Rotation—Counter-clockwise at commutator end.

Field Current—5 amperes maximum.

Brush Spring Tension—16 ounces.

Mounting:—On bracket between cylinder banks at front of engine. Fan mounted on end of generator shaft. Driven in tandem with two water pumps by Vee belt. To remove, take off nut on bracket flange 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 pulley is ¾-1", tighten nut.

RELAY REGULATOR:—Part No. 40-10505, A. (Std. on first cars with 40-10000-B generators, used only when radio installed on later cars). Consists of cutout relay and Voltage Regulator or Two-Rate Relay. See Equipment Section for complete data.

Cut-out Relay

Cuts in—7 volts or 10 M.P.H.

Cuts out—3 ampere discharge current.

Relay Contact Gap—.015-.020".

Air Gap—.010-.015" (contacts closed).

CUTOUT RELAY:—Part No. B-10505. (Used on late cars with 40-10000-B generator when radio not installed). This cutout relay is similar to previous units except that location of terminals has been changed (see illustration).

LIGHTING:—Essex Switch, Ford Part No. 40-3616-B. Lighting switch mounted at lower end of steering column, controlled by lever on steering wheel.

Bulb Specifications

Lamp	Candlepower	Mazda No.
Headlights	32-32	1000
Parking, Cowl, Instrument, Dome	3	63
Stop and Tail	21-2	1158

FUSES:—Lighting—20 ampere capacity on fuse block. 25 ampere capacity (cars with radio).

GRAHAM

STANDARD AND SPECIAL SIX, MODEL 68 (1934)
DELCO-REMY ELECTRICAL SYSTEM

SERIAL NUMBER:—First number, 1,615,001. On plate under floor mat near right rear door or under front seat cushion.

ENGINE NUMBER:—First number, 1,620,001. On plate on side of engine block.

ENGINE:—Six cylinder, 'L' head type. Cylinders cast enbloc.
Dimensions—Bore, 3¼". Stroke, 4½". Displacement, 224 cu. ins.
Horsepower—Rated, 25.35. Developed, 85 H.P. at 3400 R.P.M.
Compression—6.5-1. Compression pressure, 110 lbs. at cranking speed.
NOTE:—Cylinder head is aluminum.

Pistons:—Nelson Bohnalite, Invar strut, split skirt type.
Weight—17 ozs. (stripped). Length, 3 23/32".
Removal—Piston and rod assembly removed through bottom of engine.
Clearance—.0015" (skirt).

Piston Rings:—Three rings per piston, #1 and 2—compression rings, #3—oil control ring.

Ring	Width	End Gap	Wall Thickness
Comp. (#1, 2)	⅛"	.008-.012"	.145"
Oil Cont. (#3)	3/16"	.008-.012"	.145"

Piston Pin:—Diameter, 13/16". Length, 2 13/16". Pins are clamped in rod.
Pin Fit in Piston—Push fit.

Connecting Rod:—Length, 9¼".
Big End Bearing—Babbitt-lined type. Shims used.
Clearance—.002" (radial), .005" (sideplay).
Adjustment—Shims provided for adjustment.

Crankshaft:—Seven main bearing type.
Journal Sizes—2½" diameter (all bearings).
Bearing Type—Removable steel-backed, babbitt-lined type.
Clearance—.002" (radial).
Adjustment—None (no shims).
End Thrust—Taken by #1 (front) main bearing. Endplay, .006".

Camshaft:—Four bearing type. Camshaft drive—Non-adjustable chain.
Chain—Link Belt. Width, 1¼". Length, 52 links. Pitch, ½".
Camshaft Setting—Sprockets are marked. Mesh chain so there are exactly ten links or eleven teeth (inclusive) between marks on sprockets.

Valves:—	Head Diameter	Stem Diameter	Length	Seat Angle	Lift
Intake	1.567-1.557"	.341-.3405"	5.515-5.485"	30°	.318"
Exhaust	1.255-1.245"	.341-.3405"	4.906-4.876"	45°	.327"

Tappet Clearance—.010" (all valves—engine hot).
Valve Springs—1⅞" with load of 94-96 pounds.

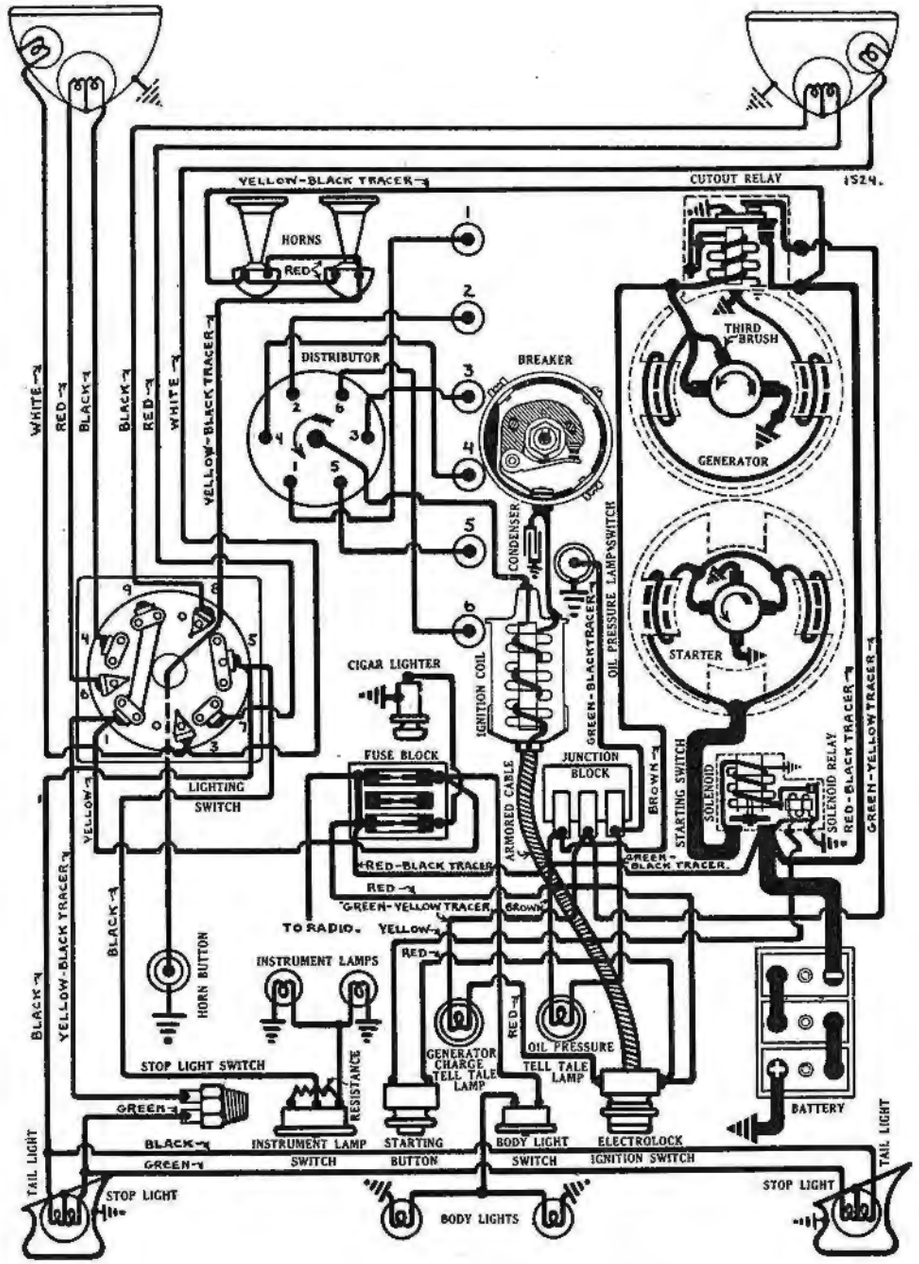
Valve Timing

Intake Valves Open—At TDC.	Close—40° ALDC.
Exhaust Valves Open—40° BLDC.	Close—10° ATDC.

To Check Valve Timing—Set tappet clearance #6 exhaust valve at .012". This valve should close with piston 10° after top dead center when flywheel mark 'EC-1' lines up with pointer on housing in inspection hole right front face of flywheel housing. Reset tappet clearance at .010".

Lubrication:—Pressure type. Gear type oil pump located in crankcase.
Normal Oil Pressure—50 lbs. at 30 M.P.H.
Oil Pressure Relief Valve—Operates at 50 lbs. Located under plug on side of crankcase (oil pressure signal switch built in regulator case). Adjustable by adding or removing shims or washers above relief valve spring in plug.
Oil Pressure Signal—See section on Signal Lights.
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:—(Fuel System). See Carburetion Section for complete data on Carburetor, Fuel Pump, and Gasoline Gauge.
Carburetor:—Stromberg, Model EX-22, 1¼" plain tube, downdraft type.
Fuel Pump:—A.C., Type R.
Gasoline Gauge:—K-S Telegauge, hydrostatic type.



GRAHAM

STANDARD AND SPECIAL SIX, MODEL 68 (1934)
DELCO-REMY ELECTRICAL SYSTEM

IGNITION:—Coil Model 536-L (Std.), 536-M,K (Deluxe). **Ignition Current**—2 amperes (running), 4 amperes (stopped).
Ignition Switch—Unit with coil (connected 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 gap at .018". Limits, .018-.024".
Breaker Arm Spring Tension—17-21 ounces.
Manual Advance—30° (engine—adjustment only).
Cam Angles (Distributor Degrees)—Closed 36°. Open 24°.

Automatic Advance

Distributor		Engine	
Degrees	R.P.M.	Degrees	R.P.M.
Start	500	2	1000
10½	1950	21	3900

IGNITION TIMING:— Flywheel Degs. Piston Position
All engines ..... 3° BTDC ..... .0037" BTDC.
Timing:—With #1 piston on compression, crank engine over until piston is 3° or 5/16" before top dead center, stop when flywheel mark '/SA-1' lines up with pointer on housing (inspection hole in right front face of flywheel 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, check spark plug cable connections (see diagram).
Firing Order:—1-5-3-6-2-4. See diagram.
Spark Plugs:—Champion #4, ⅞ SAE. Std. type.
Spark Plug Gaps—.025". Limits, .023-.027".

BATTERY:—(Standard). Willard, Type WS-1-13. 6 volt, 13 plate, 86 A.H. capacity (20 hour rate).
Starting Capacity—105 amperes for 20 minutes.
Special—cars with radio). Willard, Type WH-2-15. 6 volt, 15 plate, 119 A.H. capacity (20 hour rate).
Starting Capacity—140 amperes for 20 minutes.
Grounded Terminal—Positive (+) terminal.
Location—Under right hand front seat.

STARTER:—Model 734-U, 738-D. Armature No. 823881. Model 738-A, 738-E (R.H.D.). Solenoid type starting switch used only with 734-U (Solenoid Switch Type 1517) and 738-A (Solenoid Switch Type 1512).
Rotation—Counter-clockwise at commutator end.
Brush Spring Tension—24-28 ounces.

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 1517. Push-button Switch Type 1388 (std.), 1386 (special). Starting switch and pinion shift operated by solenoid on starter field frame. Solenoid operated through relay and controlled by pushbutton switch on instrument panel. See Equipment Section for complete data.
Mounting:—Flange mounted on right hand front face of flywheel housing. To remove, take out flange mounting capscrews.

GENERATOR:—Model 935-E. Armature No. 1854856. Third brush control type.
Charging Rate Adjustment—Take off commutator cover band, loosen lockscrew on commutator end plate, shift third brush by hand counter-clockwise to increase, or clockwise to decrease charging rate, tighten lockscrew.

Performance Data

	Amperes	Volts	R.P.M.
Cold	16-19	8.0-8.4	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.

SPECIAL GENERATORS:—Model 935-J. Used on cars equipped with radio. See Equipment Section for complete data.
Mounting:—Pivot mounted at right front of engine. Fan belt drive. To remove, take out two pivot bolts, one clamp bolt.
Belt Adjustment—Loosen pivot bolts and clamp bolt, swing generator away from engine until side-play on belt midway between fan and crankshaft pulleys is 1", tighten clamp bolt before slacking off on generator, tighten pivot bolts.

CUTOUT RELAY:—Model 265-S (935-E Generator). Relay has an extra set of grounding contacts above armature for generator charging indicator signal light control. See Signal Lights.
Cuts in—6.75-7.5 volts.
Cuts out—0-2.5 ampere discharge.
Relay Contact Gap—.015-.025".
Air Gap—.012-.017" (contacts closed).

LIGHTING:—Clum Switch Model 9463. Switch mounted at lower end of steering column controlled by lever on steering wheel. Special 'passing' position of switch provided between 'city driving' (depressed beam) and 'country driving' (bright beam). Passing position provides assymmetrical passing beam (depressed beam left hand headlight, bright beam right hand headlight). Headlights aimed straight ahead. Headlight bulbs are prefocused type.

Bulb Specifications

Lamp	Candlepower	Mazda No.
Headlight	32-21	2320-C
Parking, Instrument	3	63
Stop and Tail	21-2	1158
Signal Lights	3	64 (DC)

SIGNAL LIGHTS:—Consist of Generator Charging Indicator (left hand) and Oil Pressure Indicator (right hand) signal lights in instrument cluster, Signal lights are standard double contact 3 cp. bulbs Mazda 64.
Generator Charging Indicator. Signal should light when ignition is turned on and should go out when generator begins to charge battery. If lamp does not light with ignition on and engine not running, ground signal lamp lead at generator relay to ground. If lamp does not light, replace bulb. If signal does not go out at driving speeds, see that auxiliary contacts on cutout relay open when main contacts close.
Oil Pressure Indicator. Signal should light with engine idling and should go out when oil pressure reaches 25 pounds. If signal remains lighted or flashes at speeds above idling, check for excessive oil dilution, lack of oil or no oil pressure. To check signal lamp, ground signal lamp lead at oil pressure regulator on side of crankcase. Lamp should light with engine running at idling speed or faster. If lamp does not light, replace bulb.
If lamp does not light, replace bulb.

FUSES:—Lighting—Two 20 ampere Type 3AG-20 fuses on fuse block under dash. One extra fuse mounted on block.
Generator Field—(935-J Generator). 6 amperes in regulator case.

HORNS:—Klaxon, Model K-26L, Type 1608. Single horn or matched pair, blended tone.

GRAHAM

STANDARD AND SPECIAL EIGHT, MODEL 67 (1934)
DELCO-REMY ELECTRICAL SYSTEM

NOTE:—Supercharged Special Eights use the Custom Eight Model 69 engine. See data on Custom Eight for Engine Specifications, Carburetor, Distributor, and Ignition Timing for Supercharged Model 67.

SERIAL NUMBER:—First number, 1,805,001. On plate under floor mat near right rear door or under front seat cushion.

ENGINE NUMBER:—First number, 1,810,001. On plate on side of crankcase.

ENGINE:—Eight cylinder, In Line, 'L' head type. Cylinders cast enbloc.
Dimensions—Bore, 3⅛". Stroke, 4". Displacement, 245.5 cu. ins.
Horsepower—Rated, 31.25. Developed, 95 H.P. at 3400 R.P.M.
Compression—Std. 6.7-1. Compression pressure, 110 lbs. at cranking speed. Cylinder head is aluminum.

Pistons:—Nelson Bohnalite, Invar strut, split skirt type.
Weight—16 ozs. (stripped). Piston length, 3 19/32".
Removal—Piston and rod assembly removed through bottom of engine.
Clearance—.0015" (skirt).

Piston Rings:—Three rings per piston, #1 and 2—compression rings, #3—oil control ring.

Ring	Width	End Gap	Wall Thickness
Comp. (#1, 2)	⅛"	.008-.012"	.140"
Oil Cont. (#3)	3/16"	.008-.012"	.140"

Piston Pin:—Diameter, 13/16". Length, 2⅝". Pin is clamped in rod.
Pin Fit in Piston—Push fit.

Connecting Rod:—Length, 8⅝".
Big End Bearing—Spun babbitt-lined type. Shims used.
Clearance—.002" (radial), .005" (sideplay).
Adjustment—Shims provided for adjustment.

Crankshaft:—Five bearing type.
Journal Sizes—2½" diameter—all bearings.
Bearing Type—Removable bronze-backed, babbitt-lined type.
Clearance—.002" (radial).
Adjustment—None (no shims).
End Thrust—Taken by #1 (front) main bearing. Endplay, .006".

Camshaft:—Six bearing type. Camshaft drive—Adjustable chain.
Chain—Link belt. Width, 1¼". Length, 67 links. Pitch, ½".
Camshaft Setting—Sprockets are marked. Mesh chain so there are exactly ten links or eleven teeth (inclusive) between marks on sprockets.
Chain Adjustment—Chain adjusted by shifting accessory sprocket (water pump bracket). To adjust, loosen two flange mounting screws, back off adjustment set screw lock nut, turn up adjustment set screw until chain hums with engine running, back off set screw until chain runs noiselessly, tighten lock nut and mounting screws.

Valves:—

	Head Diameter	Stem Diameter	Length	Seat Angle	Lift
Intake	1.380-1.370"	.341-.3405"	4.906-4.876"	45°	.3145"
Exhaust	1.255-1.245"	.341-.3405"	4.906-4.897"	45°	3195"

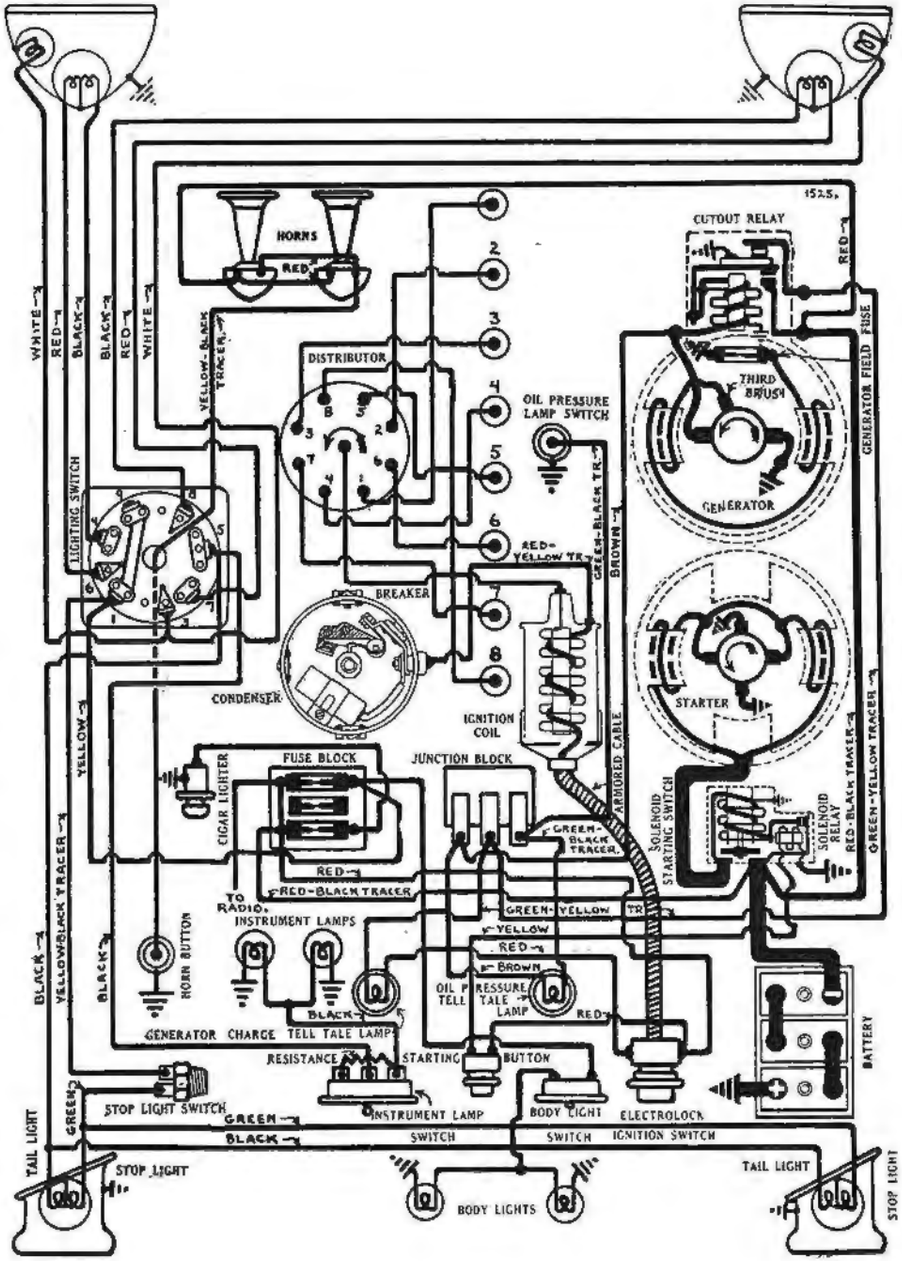
Tappet Clearance—.010" (all valves—engine hot).
Valve Springs—1⅞" with load of 103-109 pounds.

Valve Timing

Intake Valves Open—AT TDC. Close—40° ALDC.
Exhaust Valves Open—40° BLDC. Close—10° ATDC.
To Check Valve Timing—Set tappet clearance #8 exhaust valve at .012". This valve should close with piston 10° 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".

Lubrication:—Pressure type. Gear type oil pump located in crankcase.
Normal Oil Pressure—50 lbs. at 30 M.P.H.
Oil Pressure Relief Valve—Operates at 50 lbs. Located under plug on side of crankcase (oil pressure signal switch built in regulator case). Adjustable by adding or removing shims or washers above relief valve spring under plug.
Capacity and Oil—6 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.).
Oil Pressure Signal—See section on Signal Lights.

CARBURETION:—(Fuel System). See Carburetion Section for complete data on Carburetor, Fuel Pump, and Gasoline Gauge.
Carburetor:—Stromberg, Model URO-2, 1½" plain tube, updraft type.
Fuel Pump:—A.C., Type R.
Gasoline Gauge:—K-S Telegauge, hydrostatic type.



GRAHAM

STANDARD AND SPECIAL EIGHT, MODEL 67 (1934)
DELCO-REMY ELECTRICAL SYSTEM

IGNITION:—Coil Model 536-L (Std.), 536-M,K (Deluxe).
Ignition Current—2 amperes (running), 4 amperes (stopped).
Ignition Switch—Unit with coil connected by armored cable).

Distributor Model 661-X. Single breaker, 8 lobe cam, full automatic advance type with auxiliary vacuum spark control. No synchronization required.
Breaker Gap:—Set gap at .018".
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	500	2	1000
8½	2050	17	4100

Vacuum Spark Control Model 680-N. Provides additional spark advance for intermediate speed range 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 (closed throttle positions) as vacuum connection on carburetor is below throttle valve.

Vacuum Spark Advance

Advance (eng. Degs.)	Vacuum (Ins. of Mercury)
Start	7 minimum.
10-12	9-13

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" before top dead center, stop when flywheel mark '/SA-1' lines up with pointer on housing (inspection hole in right hand front face of flywheel 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, check spark plug cable connection (see diagram).
Synchronization—No synchronization required.

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

Spark Plugs:—Champion Type C-7. 18 MM. Metric type.
Spark Plug Gaps—.025". Limits, .023-.027".

BATTERY:—(Standard) Willard, Type WS-2-15. 6 volt, 15 plate 100 A.H. capacity (20 hour rate).
Starting Capacity—122 amperes for 20 minutes.
(Special—cars with radio). Willard, Type WH-2-15. 6 volt, 15 plate, 119 A.H. capacity (20 hour rate).
Starting Capacity—140 amperes for 20 minutes.
Grounded Terminal—Positive (+) terminal.
Location—Under right front seat.

STARTER:—Model 734-U, 738-D. Armature No. 823881. Model 738-A, 738-E (R.H.D.). Solenoid type starting switch used only with 734-U (Solenoid Switch Type 1517) and 738-A (Solenoid Switch Type 1512).
Rotation—Counter-clockwise at commutator end.
Brush Spring Tension—24-28 ounces.

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 1517. Push-button Switch Type 1388 (std.) 1386 (special). Starting switch and pinion shift operated by solenoid on starter field frame. Solenoid operated through relay and controlled by pushbutton switch on instrument panel. See Equipment Section for complete data.

Mounting:—Flange mounted on right hand front face of flywheel housing. To remove, take out flange mounting capscrews.

GENERATOR:—Model 967-M. Armature No. 1844827. Third brush control type.
Charging Rate Adjustment:—Take off commutator cover band, losen lockscrew on commutator end plate, shift third brush by hand, counter-clockwise to increase, or clockwise to decrease charging rate, tighten lockscrew.

Performance Data

	Amperes	Volts	R.P.M.
Cold	17-19	8.2-8.4	1900
Hot	13-15	7.7-8.0	1800-2000

Rotation—Counter-clockwise at commutator end.
Brush Spring Tension—20-28 ozs. (all brushes).
Field Current—1.75-2.25 amperes at 6.0 volts.

SPECIAL GENERATORS:—Model 967-N. Used only on cars equipped with radio. See Equipment Section for complete data.

Mounting:—Cradle mounted on right hand side of crankcase. Driven through hose coupling by water pump shaft. To remove, disconnect drive coupling, loosen mounting clamp band.

CUTOUT RELAY:—Model 265-S (967-M Generator). Relay has an extra set of grounding contacts above armature for generator charging indicator signal light control. See Signal Lights.
Cuts in—6.75-7.5 volts.
Cuts out—0-2.5 ampere discharge.
Relay Contact Gap—.015-.025".
Air Gap—.012-.017" (contacts closed).

LIGHTING:—Clum Switch Model 9463. Switch mounted at lower end of steering column controlled by lever on steering wheel. Special 'passing' position of switch provided between 'city driving' (depressed beam) and 'country driving' (bright beam). Passing position provides assymmetrical passing beam (depressed beam left hand headlight, bright beam right hand headlight). Headlights aimed straight ahead. Headlight bulbs are prefocused type.

Bulb Specifications

Lamp	Candlepower	Mazda No.
Headlight	32-21	2320-C
Parking, Instrument	3	63
Stop and Tail	21-2	1158
Signal Lights	3	64 (DC)

SIGNAL LIGHTS:—Consist of Generator Charging Indicator (left hand) and Oil Pressure Indicator (right hand) signal lights in instrument cluster, Signal lights are standard double contact 3 cp. bulbs Mazda 64.
Generator Charging Indicator. Signal should light when ignition is turned on and should go out when generator begins to charge battery. If lamp does not light with ignition on and engine not running, ground signal lamp lead at generator relay to ground. If lamp does not light, replace bulb. If signal does not go out at driving speeds, see that auxiliary contacts on cutout relay open when main contacts close.
Oil Pressure Indicator. Signal should light with engine idling and should go out when oil pressure reaches 25 pounds. If signal remains lighted or flashes at speeds above idling, check for excessive oil dilution, lack of oil or no oil pressure. To check signal lamp, ground signal lamp lead at oil pressure regulator on side of crankcase. Lamp should light with engine running at idling speed or faster. If lamp does not light, replace bulb.

FUSES:—Lighting—Two 20 ampere Type 3AG-20 fuses on fuse block under dash. One extra fuse mounted on block.
Generator Field—(967-N Generator). 6 amperes in regulator case.

HORNS:—Klaxon Model K-26L. Type 1603 and 1604. Twin horns with blended tone. Vibrator type. Horn current 6.0-8.5 amperes at 6.0 volts (low note), 5.0-6.5 amperes at 6.0 volts (high note).

GRAHAM

SUPERCHARGED SPECIAL EIGHT, MODEL 67 (1934)
SUPERCHARGED CUSTOM EIGHT, MODEL 69 (1934)
DELCO-REMY ELECTRICAL SYSTEM

NOTE:—Engine specifications, Carburetor, Distributor, and Ignition Timing data given below apply also to the Model 67 Supercharged Special Eight, See preceding page for remainder of data on Model 67 Supercharged Special Eight and for all data on Model 67 (not supercharged).

SERIAL NUMBER:—First number, 1,025,001. On plate under floor mat near right rear door or under front seat cushions.

ENGINE NUMBER:—First number, 1,030,001. On plate on side of crankcase.

ENGINE:—Eight cylinder, In Line, 'L' head type. Cylinders cast enbloc.
Dimensions—Bore, 3¼". Stroke, 4". Displacement, 265.4 cu. ins.
Horsepower—Rated, 33.8. Developed, 135 H.P. at 4000 R.P.M.
Compression—Std. 6.7-1. Compression pressure, 110 pounds at cranking speed. Cylinder head is aluminum.

Pistons:—Nelson Bohnalite, Invar strut, split skirt type.
Weight—17 ozs. (stripped). Piston length, 3 23/32".
Removal—Piston and rod assembly removed through bottom of engine.
Clearance—.0015" (skirt).

Piston Rings:—Three rings per piston, #1 and 2—compression rings, #3—oil control ring.

Ring	Width	End Gap	Wall Thickness
Comp (#1, 2)	⅛"	.008-.012"	.140"
Oil Cont. (#3)	3/16"	.008-.012"	.140"

Piston Pin:—Diameter, 13/16". Length, 2 13/16". Pin is clamped in rod.
Pin Fit in Piston—Push fit.

Connecting Rod:—Length, 8⅝".
Big End Bearing—Spun babbitt-lined type. Shims used.
Clearance—.002" (radial), .005" (sideplay).
Adjustment—Shims provided for adjustment.

Crankshaft:—Five main bearing type.
Journal Sizes—2½" diameter—all bearings.
Bearing Type—Removable bronze-backed, babbitt-lined type.
Clearance—.002" (radial).
Adjustment—None (no shims).
End Thrust—Taken by #1 (front) main bearing. Endplay, .006".

Camshaft:—Six bearing type. Camshaft drive—Adjustable chain.
Chain—Link belt. Width, 1½". Length, 68 links. Pitch, ½".
Camshaft Setting—Sprockets are marked. Mesh chain so there are exactly ten links or eleven teeth (inclusive) between marks on sprockets.
Chain Adjustment—Chain is adjusted manually by shifting accessory sprocket (water pump bracket). To adjust, loosen two flange mounting screws, back off locknut on adjustment set screw, turn up adjustment set screw until chain hums with engine running, back off set screw until chain runs noiselessly, tighten locknut and mounting screws.

Valves:—

	Head Diameter	Stem Diameter	Length	Seat Angle	Lift
Intake	1.505-1.495"	.3410-.3405"	4.906-4.876"	45°	.3145"
Exhaust	1.380-1.370"	.3410-.3405"	4.906-4.876"	45°	3195"

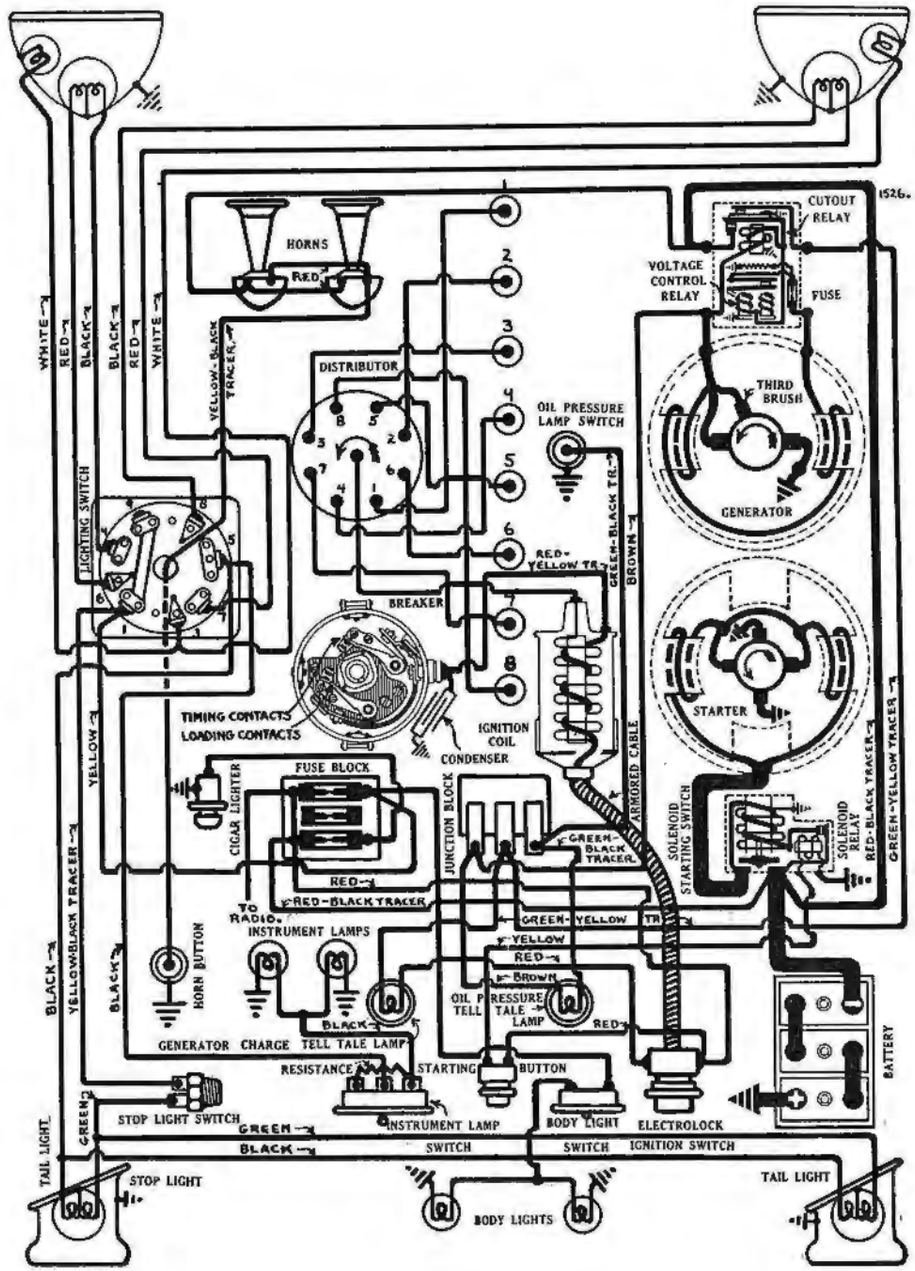
Tappet Clearance—.010" (all valves)—engine hot).
Valve Springs—1⅞" with load of 103-109 pounds.

Valve Timing

Intake Valves Open—At TDC. Close—40° ALDC.
Exhaust Valves Open—40° BLDC. Close—10° ATDC.
To Check Valve Timing—Set tappet clearance #8 exhaust valve at .012". This valve should close with piston 10° 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".

Lubrication:—Pressure type. Gear type oil pump located in crankcase.
Normal Oil Pressure—50 pounds at 30 M.P.H.
Oil Pressure Relief Valve—Operates at 50 lbs. Located under plug on side of crankcase (oil pressure signal switch built in regulator case). Adjustable by adding or removing shims or washers above relief valve spring under plug.
Oil Pressure Signal—See section on Signal Lights.
Capacity and Oil—6 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:—(Fuel System). See Carburetion Section for complete data on Carburetor, Fuel Pump, and Gasoline Gauge.
Carburetor:—Stromberg, Model EX-32, 1½" plain tube, downdraft type.
Fuel Pump:—A.C., Type R.
Gasoline Gauge:—K-S Telegauge, hydrostatic type.



GRAHAM

SUPERCHARGED SPECIAL EIGHT, MODEL 67 (1934)
SUPERCHARGED CUSTOM EIGHT, MODEL 69 (1934)
DELCO-REMY ELECTRICAL SYSTEM

Supercharger:—Supercharger consists of a centrifugal fan or blower mounted directly below the carburetor (downdraft type) which takes the fuel mixture from the carburetor and delivers it to the intake manifold. Supercharger is driven through a worm and gear from the accessory shaft at the right of the crankcase. Lubrication is entirely automatic. The upper half of the supercharger rotor casing is water-jacketed to control mixture temperature. Carburetor is adjusted in the usual manner.

IGNITION:—Coil Model 539-F. Assembled as unit with switch.
Ignition Current—2 amperes (running) 4 amperes (stopped).

Distributor Model 661-Y. Double breaker, 8 lobe cam, full automatic advance type with auxiliary Vacuum Spark Control. Stationary contacts are used to time ignition. Movable contacts are used to load coil (open and close 10° before stationary set). Contacts must be synchronized—See Timing.
Breaker Gap—Set at .015". Limits, .0125-.0175"
Breaker Arm Spring Tension—19-23 ounces.
Cam Angles (Distributor Degrees) — Closed 37°. Open 8°. With movable contacts properly set to load coil (see Synchronizing directions).

Automatic Advance

Distributor Degrees	R.P.M.	Engine Degrees	R.P.M.
Start	200	1½	400
5¼	1000	10½	2000
7¾	2000	15½	4000

Vacuum Spark Control Model 680-P. Provides additional spark advance for intermediate speed range except when car is suddenly accelerated or is operated with wide open throttle when spark will be retarded by return spring in unit. Vacuum unit not effective at idling speeds (closed throttle position) as vacuum connection on carburetor is above throttle valve.

Vacuum Advance

Degrees (engine)	Vacuum (Ins. of Mercury)
Start	10" minimum
10-12	16" maximum

IGNITION TIMING:— Flywheel Degs. Piston Position
Timing Contacts.....6° BTDC.....0135" BTDC.
Loading Contacts .....14-16° BTDC.....
Timing (Stationary Contacts):—With #1 piston on compression, turn engine over until piston is 6° or 5/8" before top dead center, stop when flywheel mark '/SA-1' lines up with pointer on housing (inspection hole in right hand 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 opposite #1 segment in distributor cap, check spark plug cable connections (see diagram).
Synchronization (Movable Contacts): — Movable contacts are set to open and close 8-10° before stationary or timing contacts. Use Delco-Remy special tool, Part #1838182, place tool in position on top of breaker cam, rotate distributor until stationary contacts just open, note point on center scale of tool 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 is opposite the same point on the distributor cup, loosen lockscrews on movable sub-plate carrying second set of contacts, turn eccentric adjusting screw until contacts just open, tighten lockscrew. This tool (#1838182) was developed for use in synchronizing Type 660 and 662 distributors (4 lobe cam—alternate opening) but can be used to set 661-Y distributors for this special irregular opening and closing interval.
Firing Order:—1-6-2-5-8-3-7-4. See diagram.
Spark Plugs:—Chammpion, Type C-7. 18 MM. Metric.
Spark Plug Gaps:—.023". Limits, .023-.027".

BATTERY:—(Std.) Willard, Type WS-2-15. 6 volt, 15 plate, 100 A.H. capacity (20 hour rate).
Starting Capacity—122 amperes for 20 minutes.
(Cars with radio). Willard, Type WH-2-15. 6 volt, 15 plate, 119 A.H. capacity (20 hour rate).
Starting Capacity—140 amperes for 20 minutes.
Grounded Terminal—Positive (+) terminal.
Location—Under right hand front seat.

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

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 1517. Push-button Switch Type 1388 (Std.), 1386 (Special). Starting switch and pinion shift operated by solenoid mounted on starter field frame. Solenoid operated through relay and controlled by push-button switch on instrument panel. See Equipment Section for complete data.
Mounting:—Flange mounted on right hand front face of flywheel housing. To remove, take out flange mounting capscrews.

GENERATOR:—Model 967-L. Armature No. 1855966. Third brush control type with external voltage regulation. Voltage Control Relay combined with Cutout Relay in case on generator field frame. See Equipment Section for complete data.
Charging Rate Adjustment:—Use test meters to check generator output. Connect jumper wire from 'F' generator terminal to ground—important as voltage regulator must be shorted out while adjustment being made. Take off commutator cover band, shift third brush by hand, counter-clockwise to increase or clockwise to decrease charging rate, tighten locking screw, remove jumper wire.

Performance Data

	Amperes	Volts	R.P.M.
Cold	19-22	8.3-8.7	2100
Hot	12-15	7.6-8.0	2800

Rotation—Counter-clockwise at commutator end.
Brush Spring Tension—24-28 ozs. (all brushes).
Field Current—2.1-2.5 amperes at 6.0 volts.
Field Fuse—6 ampere (in regulator cose).
Mounting:—Flange mounted on rear face of Supercharger gear housing at right of crankcase. To remove, take out flange mounting capscrews, pull generator to rear to disengage drive coupling.

RELAY-REGULATOR (CONTROL UNIT):—Model 5544 (967-L Generator). Consists of Cutout Relay and Voltage Control Relay in case on generator field frame. Cutout Relay has extra set of grounding contacts above armature for generator charging indicator signal light control. See Signal Lights. See Equipment Section for complete data on Voltage Control Relay.

Cutout Relay
Cuts in—7.0 volts. **Cuts out**—0-2.5 amp. discharge.
Relay Contact Gap—.015-.025".
Air Gap—.012-.017" (contacts closed).

Voltage Control Relay
Contacts Close—7.2 volts. **Contacts Open**—8.3 volts.
Contact Gap—.008-.013".
Air Gap—.038" between armature and core (armature down against lower stop).
.028" armature travel (between armature and lower stop).

LIGHTING:—Clum Switch Model 9463. Switch mounted at lower end of steering column controlled by lever on steering wheel. Special 'passing' position of switch provided between 'city driving' (depressed beam) and 'country driving' (bright beam). Passing position provides assymmetrical passing beam (depressed beam left hand headlight, bright beam right hand headlight). Headlights aimed straight ahead. Headlight bulbs are prefocused type.

Bulb Specifications

Lamp	Candlepower	Mazda No.
Headlight	32-21	2320-C
Parking, Instrument	3	63
Stop and Tail	21-2	1158
Signal Lights	3	64 (DC)

SIGNAL LIGHTS:—Consist of Generator Charging Indicator (left hand) and Oil Pressure Indicator (right hand) signal lights in instrument cluster, Signal lights are standard double contact 3 cp. bulbs Mazda 64.
Generator Charging Indicator. Signal should light when ignition is turned on and should go out when generator begins to charge battery. If lamp does not light with ignition on and engine not running, ground signal lamp lead at generator relay to ground. If lamp does not light, replace bulb. If signal does not go out at driving speeds, see that auxiliary contacts on cutout relay open when main contacts close.
Oil Pressure Indicator. Signal should light with engine idling and should go out when oil pressure reaches 25 pounds. If signal remains lighted or flashes at speeds above idling, check for excessive oil dilution, lack of oil or no oil pressure. To check signal lamp, ground signal lamp lead at oil pressure regulator on side of crankcase. Lamp should light with engine running at idling speed or faster.

FUSES:—Lighting—Two 20 ampere Type 3AG-20 fuses on fuse block under dash. One extra fuse mounted on block.
Generator Field—6 ampere in regulator case.

HORNS:—Klaxon Model K-26G. Types 1781, 1782 or 1779, 1778. Matched horns, blended tone. Vibrator type. Current draw—6.0-8.5 amperes at 6.0 volts (low note), 5.0-6.5 amperes at 6.0 volts (high note).

HUDSON

MODEL LTS (1934)
STANDARD MODEL LL-116"WB. DE LUXE MODEL LT-123"WB (1934)
AUTO-LITE SYSTEM

SERIAL NUMBER:—Stamped on plate on engine side of dash (under hood). First number, Model LL 252,000. Model LT 950,000.

ENGINE NUMBER:—Stamped on left hand side of engine block opposite No. 1 cylinder. First number, 30,000.

ENGINE:—Eight cylinder, in line, 'L' head type.

Dimensions—Bore, 3". Stroke, 4½". Displacement, 254.47 cubic inches.

Horsepower—Rated, 28.8 H.P. Developed— (5.75 head), 108 H.P. at 3200 R.P.M. (6.25 head), 113 H.P. at 3800 R.P.M. (7.00 head), 121 H.P. at 3800 R.P.M.

Compression—LL Std.—5.75-1. Compression pressure, 80 lbs. at 125 R.P.M. LT Std.—6.25-1. LL and LT Optional—7.00-1.

NOTE:—The 5.75-1 cylinder head is cast-iron. Both 6.25-1 and 7.00-1 heads are aluminum composite. Ethylized fuel must be used in engines with 7.00-1 head.

Pistons:—Own. Aluminum alloy, 'T' slot type. Pistons are 'cam' ground with greater clearance across pin bosses. Finished replacement pistons furnished as follows: 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"). Recondition cylinders to standard size as given above.

Weight—Piston only, 9.6 ounces. Complete, 14½ ounces.

Clearance—Top, .016". Bottom, .0005".

Removal—Piston and rod assembly removed from top of engine.

Fitting New Pistons—Use feeler gauge .0015-.002" thick to check clearance. It should be possible to withdraw feeler with thumb and forefinger from between piston and cylinder wall at point exactly opposite 'T' slot.

NOTE:—Install pistons with 'T' slot to left.

Piston Rings:—Two compression, two oil rings used per piston. Lower (oil ring) groove is drilled radially.

Ring	Width	End Gap	Wall Thickness	Groove Depth
Comp. (2)	3/32"	.006-.016"	.123"	.156"
Oil Ring (Upper)	⅛"	.006-.016"	.128"	.156"
Oil Ring (Lower)	3/16"	.006-.016"	.128"	.156"

Wrist Pin:—Diameter, ¾". Length, 2 7/16". Pin floats in piston and rod.

Clearance in Rod Bushing—.0003". Pin hole in connecting rod is broached, and diamond-bored in piston. Bearing in rod is bronze bushing.

Pin Fit in Piston—Snug fit with piston at 200°F.

Connecting Rod:—Weight, 29.44 ozs. Length, 8 3/16" center-to-center.

Big End Bearing Type—Spun babbitt. Diamond-bore finish.

Clearance—.001" (radial), .006-.010" (sideplay).

Adjustment—Shims (laminated type).

NOTE:—Connecting rod lower bearings are offset. Install rods with right hand offset in cylinders #1, 3, 5, 7 and left hand offset in cylinders #2, 4, 6, 8.

Crankshaft:—Five main bearing type with eight counterweights.

Journal Sizes—#1—2 9/32". #2—2 5/16". #3—2 11/32". #4—2⅜". #5—2 13/32".

Bearing Type—Separate babbitt-lined, bronze-backed type.

Bearing Clearance—.001".

Adjustment—Shims (laminated type).

End Thrust—Taken by #3 (center) bearing. End clearance, .006-.012".

Camshaft:—Gear driven from crankshaft.

Gear Type—Crankshaft gear, steel. Camshaft gear, GE. Bakelite.

Camshaft Setting—Gears are marked. Mesh marked tooth on crankshaft gear between two marked teeth on camshaft gear.

Valves:—	Head Diameter	Stem Diameter	Length	Seat Angle	Lift
Intake	1½"	5/16"	5 3/32"	45°	11/32"
Exhaust	1⅜"	5/16"	5 3/32"	45°	11/32"

Stem-to-Guide Clearance—.0015-.003" (intake), .003-.005" (exhaust).

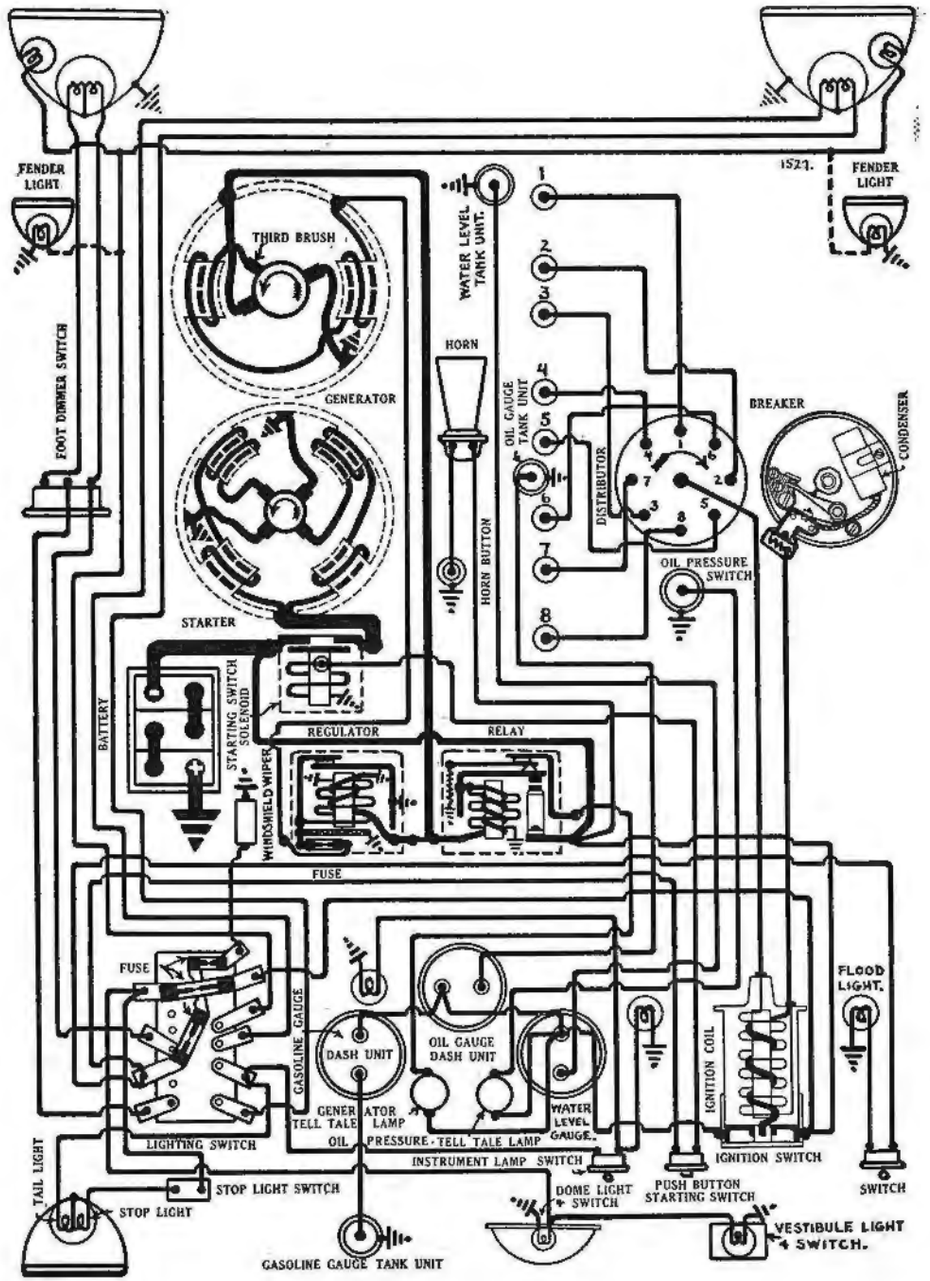
Tappet Clearance—	Running (hot)	Timing
Intake	.006"	.010"
Exhaust	.008"	.010"

Valve Springs:—	Spring Pressure	Spring Length
Valve Closed	44 pounds	2"
Valve Open	102 pounds	1 21/32"

Valve Timing

Intake Valves Open—10°40' BTDC. Close—60° ALDC.
Exhaust Valves Open—50° BLDC. Close—18°44' ATDC.

NOTE:—Timing figures are correct for .010" tappet clearance.



HUDSON

MODEL LTS (1934)
STANDARD MODEL LL-116"WB. DE LUXE MODEL LT-123"WB (1934)
AUTO-LITE SYSTEM

Lubrication:—Duo-flow (splash) system with positive pump feed to oil troughs and timing gears by oscillating plunger type pump. Pump mounted on right hand side of crankcase.
Normal Oil Pressure—3 pounds.
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 under Lighting for data.
Capacity and Oil—9 qts. (dry), 7 qts. (refill). Use SAE #30 (above 40°F.), #20-W (40° to 0°F.).

CARBURETION: — (Fuel System). See Carburetion Section for complete data on Carburetor, Automatic Choke (Climatic Control), Fuel Pump, and Gasoline and Oil Level Gauge.
Carburetor:—Carter, Model 282-S (LL, LT), 299-S (LTS). 1¼" plain tube, downdraft type.
Automatic Choke—Carter Climatic Control (282-S).
Fuel Pump:—A.C., Type R..
Gasoline Gauge:—Motometer, electric type.

IGNITION:—Coil Model CE-4304. Lock coil type. Resistor mounted on distributor.
Ignition Current—2.5 amperes (running), 4.5 amperes (stopped).
Distributor Model IGP-4001-A. Single breaker, 8 lobe cam, full automatic advance type. No synchronization required.
Breaker Gap—Set gap at .020". Limits, .018-.020".
Breaker Arm Spring Tension—18 ozs. (minimum), 20 ozs. (maximum).
Cam Angles (Distributor Degrees) — Closed 29°. Open 16°.

Automatic Advance

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

IGNITION TIMING:— Flywheel Degs. Piston Position Initial Setting (all engines) at TDC. ..... .0000" TDC.
Timing (Initial Setting):—With #1 piston on compression, turn engine over until piston reaches top dead center, stop when flywheel mark 'U.D.C.' registers with pointer in inspection hole (left hand front face of flywheel housing above starter), loosen hold-down screw in advance arm, rotate distributor clockwise to limit of advance arm slot, then rotate distributor slowly counter-clockwise until contacts begin to open, tighten hold-down screw, check rotor position and spark plug connections (see diagram). This top dead center setting should be checked by road-testing car and spark advanced as much as operating conditions and fuel rating will allow (see below).
Timing (Final Setting):—With engine at normal operating temperature and running at 8 M.P.H. in high gear on level road, accelerate engine rapidly and note performance from 10 to 15 M.P.H. With correct setting a slight spark knock should be noticed. If no knock is heard, loosen hold-down screw in advance arm and rotate distributor one graduation counter-clockwise. If knock is too severe, rotate distributor one graduation clockwise. Final setting must not be beyond maximum advance mark on flywheel (¾" before top dead center mark ('U.D.C.').
Firing Order:—1-6-2-5-8-3-7-4 (see diagram).
Spark Plugs:—Champion, Type J-7. 14 MM. Metric.
Spark Plug Gap—.022".

BATTERY:—Exide, Type XTL-19-17F, 6 volt, 19 plate, 120 ampere hour capacity.
Starting Capacity—106 amperes for 20 minutes.
Grounded Terminal—Positive (+) terminal.
Location—Under front floor boards, left hand side.

STARTER:—Model MAB-4061. Armature No. MAB-2113. Starter drive—Inboard Bendix.
Rotation—Counter-Clockwise at commutator end.
Brush Spring Tension—44-56 ozs. (new brushes).
Normal Cranking Speed—150 R.P.M.

Performance Data

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

NOTE:—Lock torque figures correct without switch.
Starting Switch: — Type SS-4001. Solenoid type switch mounted on starter field frame and controlled by pushbutton switch on instrument panel.
Mounting:—Flange mounted on left hand front face of flywheel housing. To remove, take out two flange mounting bolts.

GENERATOR: — Model GBK-4602. Armature No. GBK-2055. Ventilated, third brush control type with external voltage regulator. See Equipment Section for complete data on Voltage Regulator.
Charging Rate Adjustment:—Use test meters to check generator output. Short out voltage regulator by connecting short jumper wire from 'F' terminal on generator to ground. Take off commutator cover band, shift third brush by hand counter-clockwise to increase, or clockwise to decrease charging rate. Remove jumper wire.
Maximum Charging Rate—22 amperes (cold), 8.0 volts, 2400 R.P.M. or 28 M.P.H.

Performance Data
(Cold—without regulator field resistance)

Amperes	Volts	R.P.M.
0	6.4	800
4	6.7	980
8	7.0	1140
12	7.3	1300
16	7.55	1500
22	8.0	2200

Rotation—Counter-clockwise at commutator end.
Brush Spring Tension—18-22 ounces.
Field Current—3.75-4.15 amperes at 6.0 volts.
Motoring—4.46-4.94 amperes at 6.0 volts.
Field Fuse—7½ ampere capacity in knurled cup under regulator case.
Mounting:—Pivot mounted at left front of engine. Driven by fan belt. To remove, take out two pivot bolts and one clamp bolt.
Belt Adjustment—Loosen pivot bolts and clamp bolt, swing generator out or away from engine until slight pull is felt on belt, tighten clamp bolt before slacking off on generator, tighten pivot bolts.

CUT-OUT RELAY: — Model CBA-4002. Mounted on dash. Relay has extra set of contacts above armature for charge tell-tale light control.
Cuts in—6.4 volts, 750 R.P.M. or 8 M.P.H. Limits, 6.75-7.5 volts.
Cuts out—.5-2.5 ampere discharge.

VOLTAGE REGULATOR:—Model TC-4102-A. Voltage regulator contacts open when generator voltage reaches 8.6 volts, reducing charging rate approximately 50%. Maximum charging rate 22 amperes (regulator contacts closed), 10 amperes (contacts open). See Equipment Section for complete data on Regulator.

LIGHTING:—Soreng-Manegold Switch, Model 5640-A, C-5640-A (without windshield wiper fuse). Soreng Manegold Foot Control Switch. Foot control switch provides assymetric 'meeting' beam (lower beam left hand headlight, upper beam right hand headlight). Operative only with lighting switch in 'Country Driving' position. Headlight bulbs are pre-focused type.

Bulb Specifications

Lamp	Candlepower	Mazda No.
Headlights	32-21	2320-C
Parking, Instrument, Flood	3	63
Dome, Vestibule	15	87
Stop and Tail	21-2	1158
Signal	3	64 (DC.)

SIGNAL LIGHTS:—Battery charge tell-tale and oil pressure tell-tale light mounted on instrument panel. Light bulbs are standard 3 cp. DC. bulbs, Mazda No. 64. To remove bulbs, turn light counter-clockwise slightly to release bayonet socket pin.
Battery Charge Tell-tale. At left of instrument cluster. Tell-tale should light with ignition turned on and should go out when gentrator begins to charge battery (relay contacts closed). If tell-tale does not burn when ignition turned on, check bulb by grounding tell-tale terminal on relay to generator field frame. If tell-tale does not light, replace bulb. If lamp lights, check auxiliary contact spring, contacts and ground resistor. See that auxiliary contacts are closed with main contacts open. If tell-tale lights at speeds above idling (8 M.P.H.), generator or relay is defective.
Oil Pressure Tell-tale. At right of instrument cluster. Tell-tale should light with ignition turned on but should go out when engine is operated (light should flash at idling speeds). Tell-tale should not light or flash at speeds above idling. If tell-tale does not light when ignition is turned on, check bulb by grounding terminal on oil pressure check valve (right side of crankcase) to engine. If tell-tale does not light, replace bulb. If tell-tale does not flash at idling speeds, disassemble check valve and clean out by-pass hole behind plunger, see that terminal pin is straight and clean, and that plunger is free.

FUSES:—Lighting—Two 20 ampere capacity fuses on back of lighting switch.
Windshield Wiper—7½ ampere capacity fuse on lighting switch (not used on all cars).
Generator Field—7½ ampere capacity.

HUPMOBILE

MODEL 417, SERIES W (1934)
AUTO-LITE ELECTRICAL SYSTEM

SERIAL NUMBER:—First number, W-5001. On right hand side of dash under hood.

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

ENGINE:—Six cylinder, 'L' head type. Cylinders cast enbloc.
Dimensions—Bore, 3½". Stroke, 3⅞". Displacement, 224 cu. ins.
Horsepower—Rated, 29.42. Developed, 80 H.P. at 3400 R.P.M.
Compression—Std. 5.32-1. No optional compression ratios.

Pistons:—Bohn, aluminum alloy, Invar strut, split skirt type.
Removal—Piston and rod assembly removed through top of engine.
Clearance—Skirt, .002" (see Fitting New Pistons).
Fitting New Pistons—Use .002" feeler stock to check clearance. Pull required to withdraw feeler from between piston and cylinder wall should be 6-10 lbs.
NOTE:—Install pistons with slot to right.

Piston Rings:—Four rings per piston, all above pin. #1 and 2—compression rings, #3 and 4—oil control rings. Both oil control ring grooves drilled radially with oil drain holes.

Ring	Width	End Gap	Wall Thickness
Comp. (#1, 2)	⅛"	.007-.012"	.150"
Oil Cont. (#3, 4)	.1545-.1550"	.007-.015"	.150"

Piston Pin:—Diameter, ⅞". Length, 2 15/16". Pin floats in piston and rod.
NOTE:—Pin hole in piston is offset 1/16".

Connecting Rod:—Length, 8 7/16" (center-to-center).
Big End Bearing—Removable steel-backed, babbitt-lined type.
Clearance—.0015-.002" (radial), .005-.010" (sideplay).
Adjustment—None (no shims). Replace removable bearings.
NOTE:—Connecting rod lower bearings are offset. Install rods with widest half of bearing away from nearest main bearing.

Crankshaft:—Four main bearing type with integral counterweights.
Journal Sizes—#1—2.580". #2—2.560". #3—2.540". #4—2.520".
Bearing Type—Bronze-backed, babbitt-lined type. No shims.
Clearance—.0017-.0022" (radial).
Adjustment—None (no shims). Replace bearings.
End Thrust—Taken by #2 main bearing. Endplay, .004-.005".

Camshaft:—Drive—Non-adjustable chain.
Chain—Morse. Width, 1". Length, 51 links. Pitch, .500".
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	Seat Angle	Seat Width	Lift
Intake	1.651-1.661"	.3405-.3415"	45°	1/16-5/64"	11/32"
Exhaust	1.526-1.536"	.3405-.3415"	45°	3/32-7/64"	11/32"

Tappet Clearance—Running, .010" (intake), .013" (exhaust).

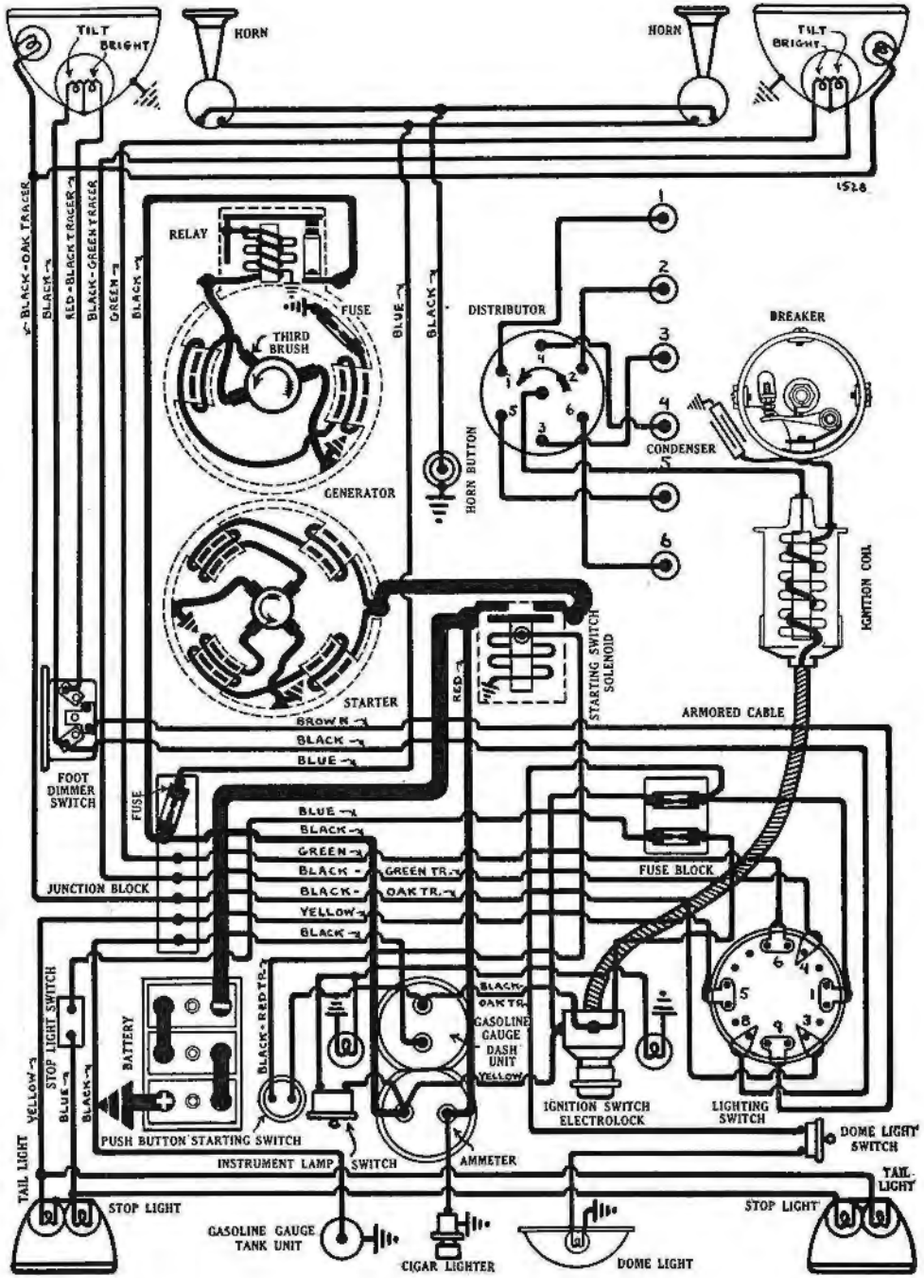
Valve Timing

Intake Valves Open—2° BTDC. Close—51° ALDC.
Exhaust Valves Open—44° BLDC. Close— 3° ATDC.

To Check Valve Timing:—Set tappet clearance #1 valves at .014" (intake), .021" (exhaust). With #6 piston on top dead center entering power stroke and flywheel mark 'DC/1-6' in line with finished bosses on right front face of clutch housing, #1 intake and exhaust valves should be closed. Reset tappet clearance at .010" (intake), .013" (exhaust).

Lubrication:—Pressure type. Gear type oil pump located at front of engine.
Normal Oil Pressure—3-5 lbs. (idling), 30 lbs. at 30 M.P.H. with warm engine.
Oil Pressure Relief Valve—Adjustable type. Turn adjusting screw on relief valve cover in or clockwise to increase pressure and out or counter-clockwise to decrease pressure. Screw controls relief valve spring tension.
Capacity and Oil—6 qts. Use SAE. #30 (normal summer weather), #40 (extremely warm temperatures), #20 (winter).

CARBURETION:—(Fuel System). See Carburetion Section for complete data on Carburetor, Fuel Pump, and Gasoline Gauge.
Carburetor:—Stromberg, Model EX-32, 1½" plain tube, downdraft type.
Fuel Pump:—Stewart-Warner, Type 706-E.
Gasoline Gauge:—Stewart Electric type.



HUPMOBILE
MODEL 417, SERIES W (1934)
AUTO-LITE ELECTRICAL SYSTEM

IGNITION:—Coil Model IG-4608. Ignition switch assembled as part of coil.
Ignition Current—1-3 amperes (running), 3-4.5 amperes (stopped).
Ignition Switch—Electrolock, Tyoe 16-B, Lock No. 5644-S. See Equipment Section for complete data.

Distributor Model IGB-4319. Single breaker, 6 lobe cam, full automatic advance type.
Breaker Gap—Set gap at .018". Limits, .015-.018".
Breaker Arm Spring Tension—16-22 ounces.
Cam Angles (Distributor Degrees)—Closed 40°. Open 20°.

Automatic Advance

Distributor Degrees	R.P.M.	Engine Degrees	R.P.M.
Start	400	0	800
2	685	4	1370
4	975	8	1950
6	1265	12	2530
7	1400	14	2800

IGNITION TIMING: Flywheel Degs. Piston Position
All engines ..... 7° BTDC. ..... .0195" BTDC.
Timing:—With #1 piston on compression, turn engine over until piston is 7° before top dead center, stop when ignition mark on flywheel (located 7° before top dead center mark 'DC/1-6' lines up with finished bosses on front face of clutch housing at right of engine, loosen advance arm clamp bolt, rotate distributor until contacts begin to open, tighten clamp bolt, see that rotor is opposite #1 segment in distributor cap, check spark plug cable connections (see diagram).

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

Spark Plugs:—Champion, Type C-7. 18 MM. Metric type.
Spark Plug Gaps—.028". Limits, .026-.030".

BATTERY:—Willard, Type WMB-17, 6 volt, 17 plate, 90 A.H. capacity (20 hour rate).
Starting Capacity—120 amperes for 20 minutes.
Grounded Terminal—Positive (+) terminal.
Location—On left hand side under floor boards.

STARTER:—Model MAB-4065. Armature No. MAB-2047. Starter drive—Inboard Bendix.
Rotation—Counter-clockwise at commutator end.
Brush Spring Tension—44-56 ozs.

Performance Data

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

NOTE:—Lock torque figures correct without switch.

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

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

GENERATOR:—Model GBK-4603. Armature No. GBK-2055. Third brush control. Ventilated type.
Charging Rate Adjustment:—Take off commutator cover band, shift third brush by prying on brush mounting plate, counter-clockwise to increase, or clockwise to decrease charging rate. Brush held in position by friction.

Performance Data
(Generator Cold)

Amperes	Volts	R.P.M.
0	6.4	850
4	6.7	1000
8	7.05	1160
12	7.4	1320
16	7.7	1550
20	8.0	2250

Rotation—Counter-clockwise at commutator end.
Brush Spring Tension—18-22 ounces.
Field Current—3.94-4.36 amperes at 6.0 volts.
Field Fuse—7½ ampere capacity (under cover on top of field frame.
Motoring Current—4.56-5.04 amperes at 6.0 volts.

Mounting:—Pivot mounted at left front of engine. Fan belt drive. To remove, take out two pivot bolts and one clamp bolt.
Belt Adjustment—Inspect belt at 1000-mile intervals. To adjust, loosen pivot bolts and clamp bolt, pull generator away from engine until all slack in belt has been taken up, tighten clamp bolt before releasing generator, tighten pivot bolts.

CUTOUT RELAY:—Model CB-4021. Mounted on generator field frame.
Cuts in—7.0-7.5 volts.
Cuts out—.5-2.5 ampere discharge current.
Relay Contact Gap—.025-.035".
Air Gap—.010-.030" (contacts closed).

LIGHTING:—Clum Switch, Model 9526. Clum Foot Control Switch, Model 9505. Foot Control Switch provides assymetrical passing beam (lower beam left hand headlight, upper beam right hand headlight). Headlights are aimed straight ahead. Headlight bulbs are prefocused type.

Bulb Specifications

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

FUSES:—LIGHTING—Two 20 ampere fuses on fuse block behind instrument board.
Horn—20 ampere fuse on junction block near steering gear.
Generator Field—7½ ampere on generator field frame.

HUPMOBILE

AERODYNAMIC SIX, MODEL 421, SERIES J (1934)

AUTO-LITE ELECTRICAL SYSTEM

SERIAL NUMBER:—First number, J-12001. On plate on right hand side of dash under engine hood.

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

ENGINE:—Six cylinder, 'L' head type. Cylinders cast enbloc.
Dimensions—Bore, 3½". Stroke, 4¼". Displacement, 245.3 cu. ins.
Horsepower—Rated, 29.42. Developed, 93 H.P. at 3400 R.P.M.
Compression—Std. 5.75-1. No optional compression ratios.

Pistons:—Bohn, aluminum alloy, Invar strut, split skirt type.
Removal—Piston and rod assembly removed through top of engine.
Clearance—Skirt, .002" (see Fitting New Pistons).
Fitting New Pistons—Use .002" feeler stock to check clearance. Pull required to withdraw feeler from between piston and cylinder wall should be 6-10 lbs.
NOTE:—Install pistons with slot to right.

Piston Rings:—Four rings per piston, all above pin. #1 and 2—compression rings, #3 and 4—oil control rings. Both oil control ring grooves drilled radially with oil drain holes.

Ring	Width	End Gap	Wall Thickness
Comp. (#1, 2)	⅛"	.007-.012"	.150"
Oil Cont. (#3, 4)	.1545-.1550"	.007-.015"	.150"

Piston Pin:—Diameter, ⅞". Length, 2 15/16". Pin floats in piston and rod.
NOTE:—Pin hole in piston is offset 1/16".

Connecting Rod:—Length, 8¼" (center-to-center).
Big End Bearing—Removable steel-backed, babbitt-lined type. No shims.
Clearance—.0015-.002" (radial), .005-.010" (sideplay).
Adjustment—None (no shims). Replace removable bearings.
NOTE:—Connecting rod lower bearings are offset. Install rods with widest half of bearing away from nearest main bearing.

Crankshaft:—Four main bearing type with integral counterweights.
Journal Sizes—#1—2.580". #2—2.560". #3—2.540". #4—2.520".
Bearing Type—Removable bronze-backed, babbitt-lined type.
Clearance—.0017-.0022" (radial).
End Thrust—Taken by #2 main bearing. Endplay, .004-.005".

Camshaft:—Drive—Non-adjustable chain.
Chain—Morse. Width, 1". Length, 51 links. Pitch, .500".
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	Seat Angle	Seat Width	Lift
Intake	1.651-1.661"	.3405-.3415"	45°	1/16-5/64"	11/32"
Exhaust	1.526-1.536"	.3405-.3415"	45°	3/32-7/64"	11/32"

Tappet Clearance—Running, .010" (intake), .013" (exhaust).

Valve Timing

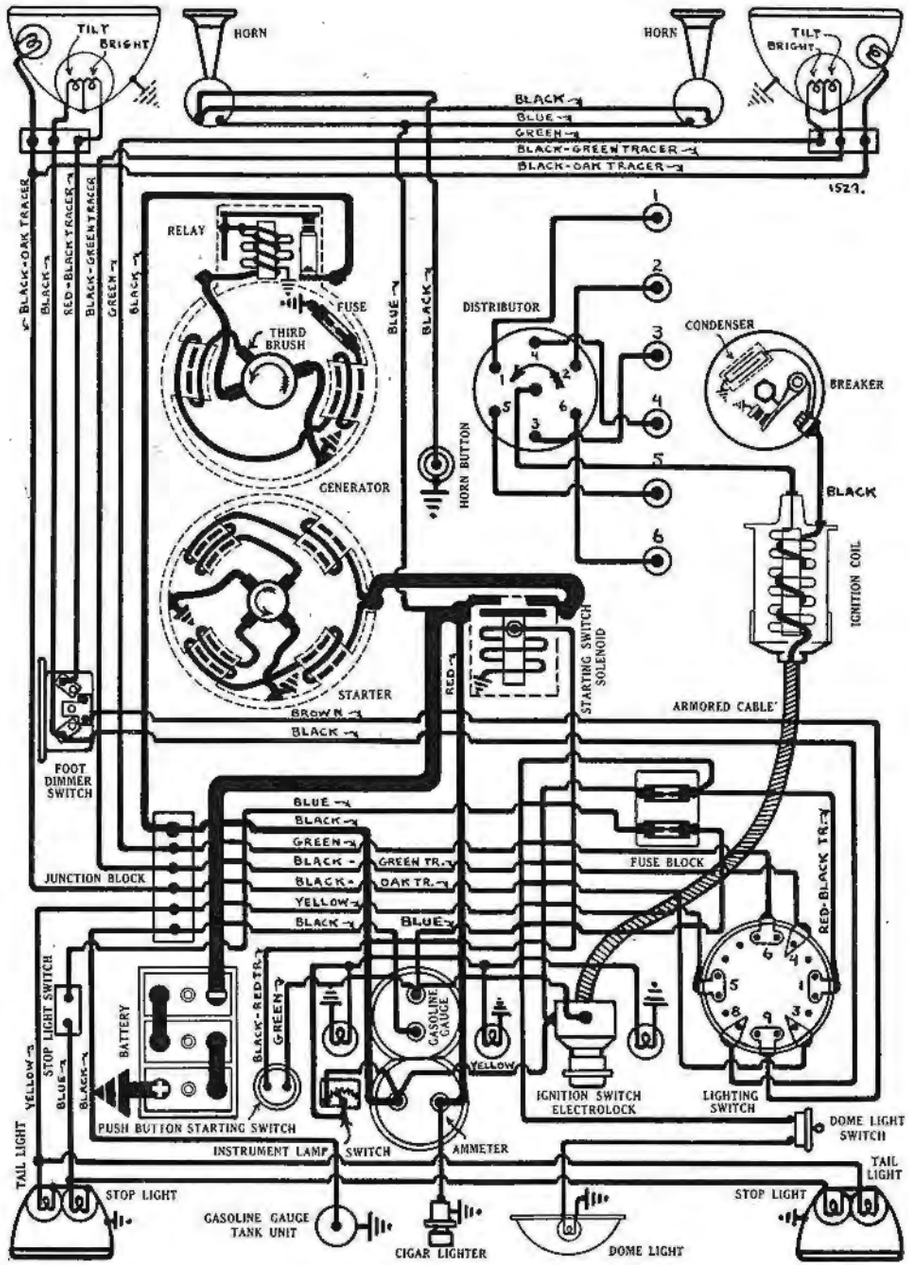
Intake Valves Open—2° BTDC. Close—51° ALDC.
Exhaust Valves Open—44° BLDC. Close— 3° ATDC.

To Check Valve Timing:—Set tappet clearance #1 valves at .014" (intake), .021" (exhaust). With #6 piston on top dead center entering power stroke and flywheel mark 'DC/1-6' in line with finished bosses on right hand front face of clutch housing, #1 intake and exhaust valves should be closed. Reset tappet clearance at .010" (intake), .013" (exhaust).

Lubrication:—Pressure type. Gear type oil pump located at front of engine.
Normal Oil Pressure—3-5 lbs. (idling), 30 lbs. at 30 M.P.H. with warm engine.
Oil Pressure Relief Valve—Adjustable. Turn adjusting screw on relief valve cover in or clockwise to increase oil pressure and out or counter-clockwise to decrease pressure. Adjusting screw controls relief valve spring tension.
Capacity and Oil—6 qts. Use SAE. #30 (normal summer weather, #40 (extremely warm temperatures), #20 (winter).

CARBURETION:—(Fuel System). See Carburetion Section for complete data on Carburetor, Fuel Pump, and Gasoline Gauge.
Carburetor:—Stromberg, Model EX-32, 1½" plain tube, downdraft type.
Fuel Pump:—A.C., Type F. Combination fuel and vacuum pump.
Gasoline Gauge:—Stewart Electric type.

IGNITION:—**Coil Model CE-4602.** Ignition switch assembled as part of coil.
Ignition Current—1-3 amperes (running), 3-4.5 amperes (stopped).
Ignition Switch:—Electrolock, Type 16-B, Lock No. 5588-S. See Equipment Section for complete data.



HUPMOBILE

AERODYNAMIC SIX, MODEL 421, SERIES J (1934)
AUTO-LITE ELECTRICAL SYSTEM

Distributor Model IGC-4058. Single breaker, 6 lobe cam, full automatic advance type.
Breaker Gap—Set gap at .018". Limits, .015-.018".
Breaker Arm Spring Tension—16-22 ounces.
Cam Angles (Distributor Degrees)—Closed 41.5°. Open 18.5°.

Automatic Advance

Distributor		Engine	
Degrees	R.P.M.	Degrees	R.P.M.
Start	400	0	800
2	685	4	1370
4	975	8	1950
6	1265	12	2530
7	1400	14	2800

IGNITION TIMING:

	Flywheel Degs.	Piston Position
All engines	7° BTDC.	.022" BTDC.

Timing—With #1 piston on compression, turn engine over until piston is 7° or .022" before top dead center, stop when ignition mark on flywheel (located 7° before top dead center mark 'DC/1-6') lines up with finished bosses on right hand front face of clutch 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, check spark plug connections (see diagram).

Firing Order:—1-5-3-6-2-4 (see diagram).
Spark Plugs:—Champion, Type C-7. 18 MM. Metric type.
Spark Plug Gaps—.028". Limits, .026-.030".

BATTERY:—Willard, Type WST-2-17, 6 volt, 17 plate, 112 A.H. capacity (20 hour rate).
Starting Capacity—134 amperes for 20 minutes.
Grounded Terminal—Positive (+) terminal.
Location—On left hand side under floor boards.

STARTER:—Model MAB-4065. Armature No. MAB-2047. Starter drive—Inboard Bendix.
Rotation—Counter-clockwise at commutator end.
Brush Spring Tension—44-56 ozs.

Performance Data

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

NOTE:—Lock torque figures correct without switch.

Starting Switch:—Type SS-4001. Solenoid type switch mounted on starter field frame and controlled by pushbutton on instrument panel.
Mounting:—Flange mounted on left hand front face of flywheel housing. To remove, take out two mounting cap screws.

GENERATOR:—Model GBK-4603. Armature No. GBK-2055. Third brush control. Ventilated type.
Charging Rate Adjustment:—Take off commutator cover band, shift third brush by prying on brush mounting plate, counter-clockwise to increase, or clockwise to decrease charging rate. Brush held in position by friction.

Performance Data
(Generator Cold)

Amperes	Volts	R.P.M.
0	6.4	850
4	6.7	1000
8	7.05	1160
12	7.4	1320
16	7.7	1550
20	8.0	2250

Rotation—Counter-clockwise at commutator end.
Brush Spring Tension—18-22 ounces.
Field Current—3.94-4.36 amperes at 6.0 volts.
Field Fuse—7½ ampere capacity (under cover on top of field frame.
Motoring Current—4.56-5.04 amperes at 6.0 volts.
Mounting:—Pivot mounted at left front of engine. Fan belt drive. To remove, take out two pivot bolts and one clamp bolt.
Belt Adjustment—Inspect belt at 1000-mile intervals. To adjust, loosen pivot bolts and clamp bolt, pull generator away from engine until all slack in belt has been taken up, tighten clamp bolt before releasing generator, tighten pivot bolts.

CUTOUT RELAY:—Model CB-4021. Mounted on generator field frame.
Cuts in—7.0-7.5 volts.
Cuts out—.5-2.5 ampere discharge current.
Relay Contact Gap—.025-.035".
Air Gap—.010-.030" (contacts closed).

LIGHTING:—Clum Switch, Model 9526. Clum Foot Control Switch, Model 9505. Foot Control Switch provides assymetrical passing beam (lower beam left hand headlight, upper beam right hand headlight). Headlights are aimed straight ahead. Headlight bulbs are prefocused type.

Bulb Specifications

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

FUSES:—LIGHTING—Two 20 ampere fuses on fuse block behind instrument board.
Generator Field—7½ ampere on generator field frame.

HUPMOBILE

AERODYNAMIC EIGHT, MODEL 427, SERIES T (1934)
AUTO-LITE ELECTRICAL SYSTEM

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

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

ENGINE:—Eight cylinder, In Line, 'L' head type. Cylinders cast enbloc.
Dimensions—Bore, 3 3/16". Stroke, 4¾". Displacement, 303.2 cu. ins.
Horsepower—Rated, 32.51. Developed, 115 H.P. at 3500 R.P.M.
Compression—Std. 5.80-1. No optional compression ratios.

Pistons:—Ray Day, aluminum alloy, split skirt type.
Removal—Piston and rod assembly removed through bottom of engine.
Clearance—.002" (skirt)—see Fitting New Pistons.
Fitting New Pistons—Use .002" feeler stock to check clearance. Pull required to withdraw feeler from between piston and cylinder wall should be 6-10 lbs.
NOTE:—Install pistons with slot to right.

Piston Rings:—Four rings per piston, all above pin. #1 and 2—compression rings, #3 and 4—oil control rings. Both oil ring grooves drilled radially with oil drain holes.

Ring	Width	End Gap	Maximum Wall Thickness
Comp. (#1, 2)	⅛"	.007-.012"	.140"
Oil Cont. (#3, 4)	5/32"	.007-.015"	.140"

Piston Pin:—Diameter, ⅞". Length, 2 23/32". Pin floats in piston and rod.
NOTE:—Pin hole in piston is offset 1/16".

Connecting Rod:—Length, 9½" (center-to-center).
Big End Bearing—Removable, steel-backed, babbitt-lined type.
Clearance—.0015-.002" (radial), .005-.010" (sideplay).
Adjustment—None (no shims). Replace removable bearings.
NOTE:—Connecting rod lower bearings are offset. Install rods with widest half of bearing away from nearest main bearing.

Crankshaft:—Five main bearing type with integral counterweights.
Journal Sizes—#1—2.705". #2—2.685". #3—2.665". #4—2.645". #5—2.625".
Bearing Type—Removable, bronze-backed, babbitt-lined type.
Clearance—.0017-.0022" (radial).
Adjustment—Shims are used. Do not file bearing caps.
End Thrust—Taken by #3 (center) main bearing. Endplay, .003-.005".

Camshaft:—Drive—Two sprocket non-adjustable chain drive.
Chain—Morse #766 double slide guide type. Width, 1¼". Length, 66 links. Pitch, .375".
Camshaft Setting—Sprockets are marked. Mesh chain so there are exactly 15 open links between marks on sprockets. With correct setting, #1 intake and exhaust valves should be closed with #8 piston on top dead center entering power stroke when flywheel mark '1o8' lines up with indicator on edge of insptction hole in flywheel housing on right hand side. Tappet clearance for checking valve timing should be .020" (intake), .026" (exhaust).

Valves:—	Head Diameter	Stem Diameter	Seat Angle	Seat Width	Lift
Intake	1.526-1.536"	.3405-.3415"	45°	1 16-5/64"	11/32"
Exhaust	1.401-1.411"	.3405-.3415"	45°	3/32-7/64"	11/32"

Tappet Clearance—Running, .018" all valves.

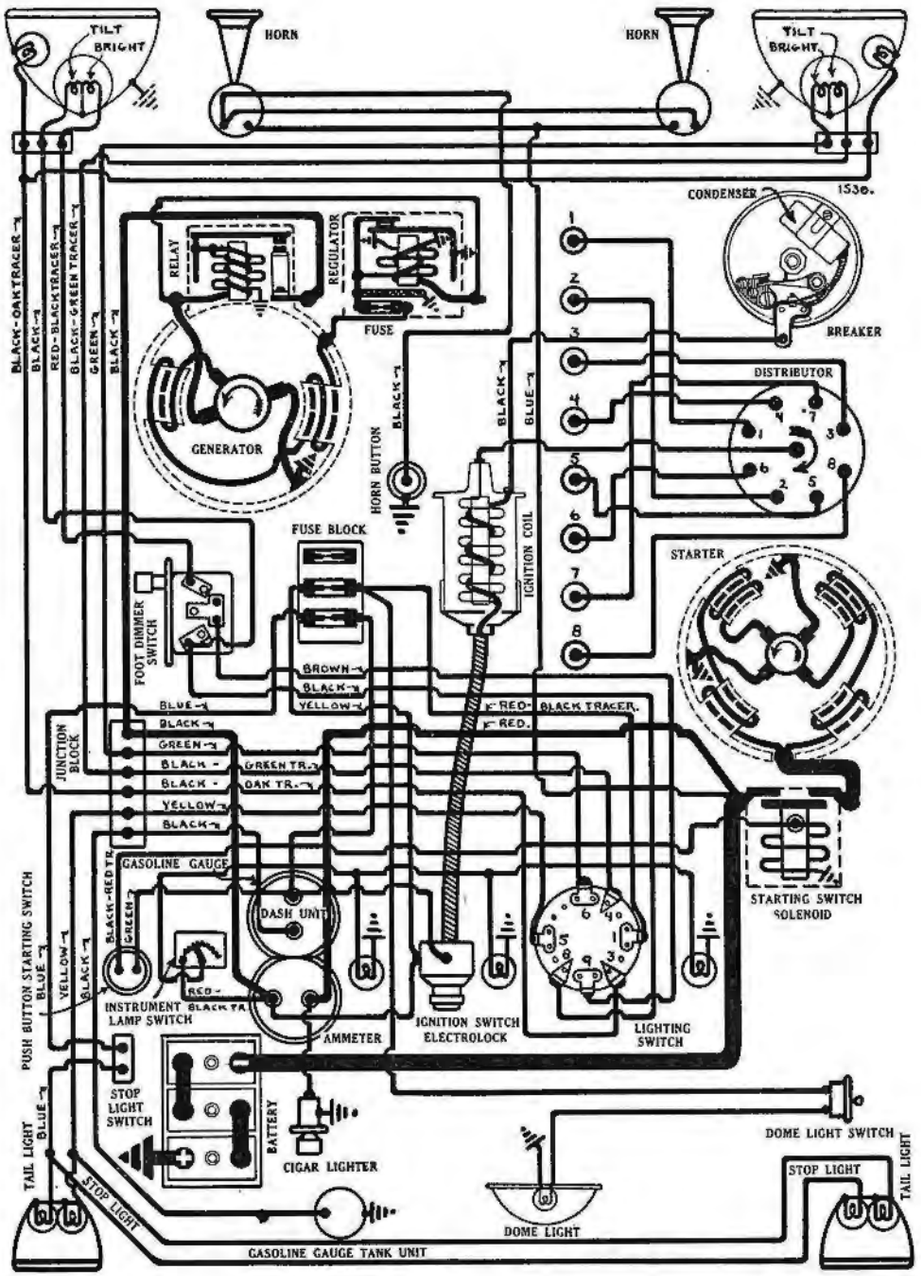
Valve Timing

Intake Valves Open—3° ATDC. Close—49° ALDC.
Exhaust Valves Open—41° BLDC. Close— 5° ATDC.

To Check Valve Timing:—Set tappet clearance #1 valves at .020" (intake), .026" (exhaust). With #8 piston on top dead center entering power stroke and flywheel mark '1o8' lined up with indicator on edge of inspection hole in right hand side of flywheel housing, #1 intake and exhaust valves should be closed. Reset tappet clearance at .018".

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

CARBURETION:—(Fuel System). See Carburetion Section for complete data on Carburetor, Fuel Pump, and Gasoline Gauge.
Carburetor:—Stromberg, Model EE-22, 1¼" dual, downdraft type.
Fuel Pump:—A.C., Type F. Combination fuel and vacuum pump.
Gasoline Gauge:—Stewart Electric type.



HUPMOBILE

AERODYNAMIC EIGHT, MODEL 427, SERIES T (1934)
AUTO-LITE ELECTRICAL SYSTEM

IGNITION:—Coil Model CE-4602. Ignition switch assembled as part of coil.
Ignition Current—1-3 amperes (running), 3-4.5 amperes (stopped).
Ignition Switch—Electrolock, Type 16-B, Lock No. 5588-S. See Equipment Section for complete data.
Distributor Model IGP-4003. Single breaker, 8 lobe cam, full automatic advance type. No synchronization required.
Breaker Gap—Set gap at .020". Limits, .018-.020".
Breaker Arm Spring Tension—18 ozs. (min.), 20 ozs. (max.).
Cam Angles (Distributor Degrees)—Closed 29°. Open 16°.

Automatic Advance

Distributor Degrees	R.P.M.	Engine Degrees	R.P.M.
Start	400	0	800
2	765	4	1530
4	1140	8	2280
6½	1600	13	3200

IGNITION TIMING: Flywheel Degs. Piston Position
All engines ..... 7° BTDC. ..... .0221" BTDC.
Timing:—With #1 piston on compression, turn engine over until piston is 7° before top dead center, stop when straight line mark '/' on flywheel (located 7° before top dead center mark '1o8') lines up with indicator in inspection hole in flywheel housing on right hand side, loosen advance arm clamp bolt, rotate distributor until contacts begin to open, tighten clamp bolt, see that rotor is opposite #1 segment in distributor cap, check spark plug cable connections (see diagram).
Synchronization—No synchronization required.
Firing Order:—1-4-7-3-8-5-2-6 (see diagram).
Spark Plugs:—Champion, Type C-7. 18 MM. Metric type.
Spark Plug Gaps—.028". Limits, .026-.030".

BATTERY:—Willard, Type WH-2-15, 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 hand side under driver's seat.

STARTER:—Model MAB-4066. Armature No. MAB-2046. Starter drive—Outboard Bendix.
Rotation—Counter-clockwise at commutator end.
Brush Spring Tension—44-56 ounces.

Performance Data

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

NOTE:—Lock torque figures correct without switch.

Starting Switch:—Solenoid type mounted on starter field frame. Controlled by pushbutton on instrument board.
Mounting:—Sleeve mounted in flywheel housing, right hand front face. To remove, take out large pilot mounting screw in flywheel housing.

GENERATOR:—Model GAR-4606-3. Armature No. GAR-2089. Ventilated, third brush control type with external voltage regulator. See Equipment Section for complete data on Voltage Regulator.
Charging Rate Adjustment—Use test meters to check generator output. Short out voltage regulator by connecting short jumper wire between 'F' generator terminal and ground. Take off commutator cover band, shift third brush by prying on brush mounting plate, counter-clockwise to increase or clockwise to decrease charging rate. Third brush held in any position by friction.

Performance Data

(Cold—without regulator field resistance)

Amperes	Volts	R.P.M.
0	6.4	760
4	6.75	920
8	7.05	1100
12	7.35	1300
16	7.7	1560
20	8.0	2300

Rotation—Counter-clockwise at commutator end.
Brush Spring Tension—24-36 ozs. (new brushes).
Field Current—3.70-4.10 amperes at 6.0 volts.
Field Fuse—7½ amperes (in voltage regulator case).
Motoring—4.65-5.15 amperes at 6.0 volts.
Mounting:—Pivot mounted at left front of engine. Fan belt drive. To remove, take out two pivot bolts, one clamp bolt.
Belt Adjustment—Inspect belt at 1000-mile intervals. To adjust, loosen pivot bolts and clamp bolt, pull generator away from engine until all slack has been taken up, tighten clamp bolt before releasing generator, tighten pivot bolts.

CUTOUT RELAY:—Model CB-4021. Mounted on generator field frame.
Cuts in—7.0-7.5 volts.
Cuts out—.5-2.5 ampere discharge current.
Relay Contact Gap—.025-.035".
Air Gap—.010-.030" (contacts closed).

VOLTAGE REGULATOR:—Model TC-4101-A. Regulator contacts open when generator voltage reaches 8.6 volts, reducing charging rate approximately 50%. This provides 'two-stage' charging with a lower rate when battery is charged. See Equipment Section for complete data on Regulator.

LIGHTING:—Clum Switch, Model 9526. Foot Control Switch Model 9505. Foot Control Switch provides assymetrical passing beam (lower beam left hand headlight, upper beam right hand headlight). Headlights are aimed straight ahead. Headlight bulbs are prefocused type.

Bulb Specifications

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

FUSES:—Lighting—Two 20 ampere fuses on fuse block behind instrument board.
Generator Field—7½ amperes in plug under regulator case.

HORNS:—Sparton Twin horns. Vibrator type.

LA FAYETTE

SERIES 110 (1934)
AUTO-LITE ELECTRICAL SYSTEM

SERIAL NUMBER:—First Number L-1001. On right hand side of frame under engine hood.

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

ENGINE:—Six cylinder, 'L' head type. Cylinders cast Enbloc.
Dimensions—Bore, 3¼". Stroke, 4⅜". Displacement, 217.7 cu. ins.
Horsepower—Rated, 25.35. Developed, 75 H.P. at 3200 R.P.M.
Compression—5.54-1. No optional compression ratio.

Pistons:—Aluminmum alloy, Invar strut type.
Weight—18¼ ounces.
Removal—Piston and rod assembly removed through top of engine.
Clearance—.002" (skirt). Use feeler stock to check clearance.

Piston Rings:—Four rings per pistion, #1 and 2, compression rings; #3 and 4, oil control rings.

Ring	Width	End Gap
Comp. (1 and 2)	⅛"	.010-.025"
Oil Cont. (3)	⅛"	.010-.025"
Oil Cont. (4)	3/16"	.010-.025"

Piston Pin:—Diameter, ⅞". Pin floats in piston and rod. Piston pin hole in connecting rod is bronze-bushed.
Pin Fit in Piston—Light push fit with piston heated.
Pin Fit in Rod—Light push fit.

Connecting Rod:—Weight, 36½ ozs. Length, 8¾" (center-to-center).
Big End Bearing—Removable steel-backed, babbitt-lined type.
Clearance—.001-.003" (radial), .008-.012" (sideplay).
Adjustment—One shim used on camshaft side of bearing only. Replace bearings. Do not file bearing caps.

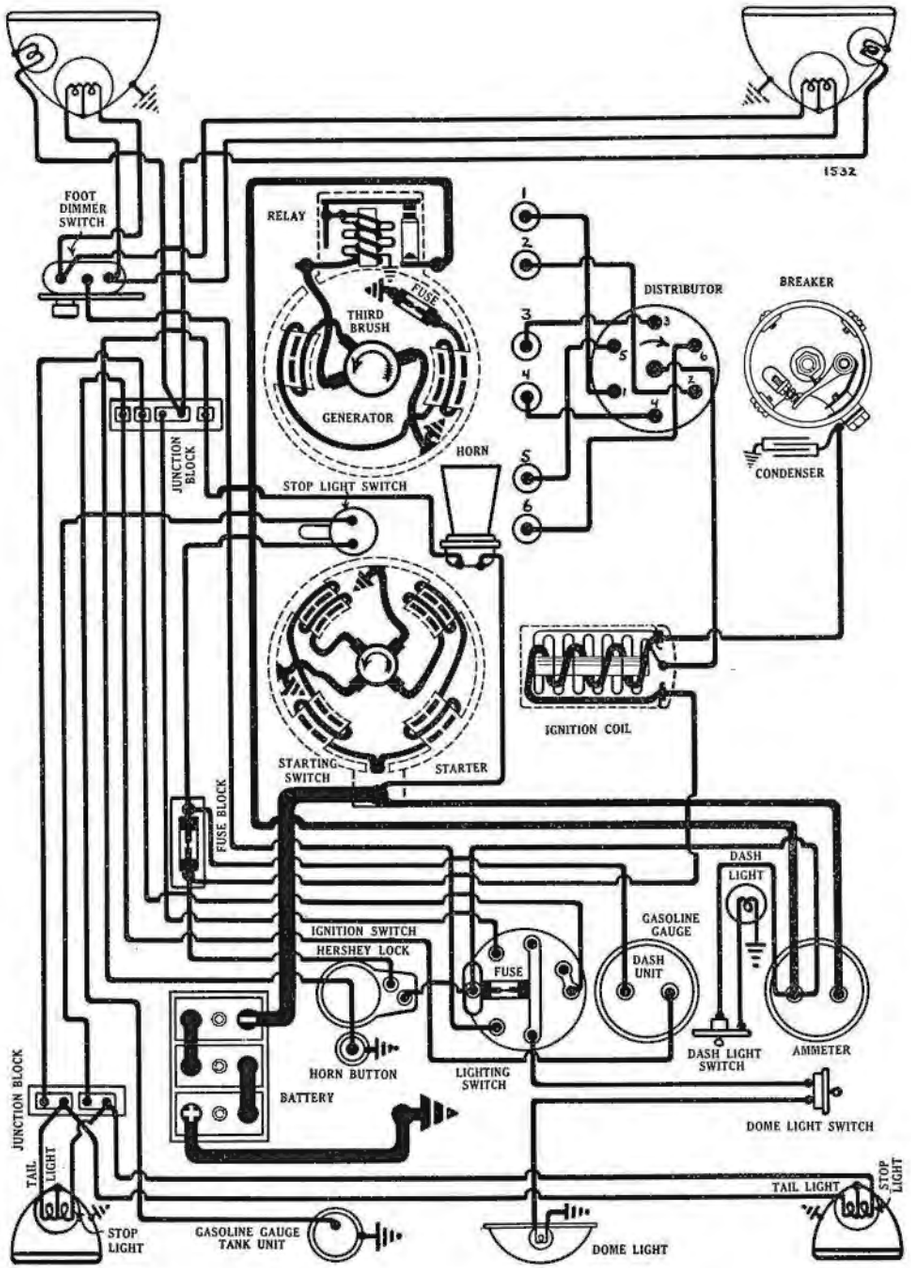
Crankshaft:—Seven main bearing type with integral counterweights.
Journal Sizes—2 31/64" diameter (all bearings).
Bearing Type—Removable steel-backed, babbitt-lined type. No shims.
Clearance—.002" (radial).
Adjustment—None (no shims). Replace bearings. Do not file bearing caps.
End Thrust—Taken by #4 (center) main bearing. Endplay, .004-.007"

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

Valves:—	Head Diam.	Seat Angles	Seat Width	Lift
Intake	1 21/32"	45°	1/16"	5/16"
Exhaust	1 17/32"	45°	1/16"	5/16"

Tappet Clearance—.012" (all valves—engine hot or cold).

Lubrication:—Pressure type. Gear type oil pump located in crankcase.
Normal Oil Pressure—20 lbs. at 20 M.P.H.
Oil Pressure Relief Valve—Opens at 20 lbs.
Capacity and Oil—7 qts. Use SAE. #30 (summer normal temperatures), #40 (summer—very hot weather), #20-W (winter).



LA FAYETTE

SERIES 110 (1934)

AUTO-LITE ELECTRICAL SYSTEM

CARBURETION:—(Fuel System). See Carburetion Section for compete data on Carburetor, Fuel Pump, and Gasoline Gauge.
Carburetor:—Marvel, Model B-2. 1¼" plain tube, downdraft type.
Fuel Pump:—AC. Type R.
Gasoline Gauge:—Stewart-Warner Electric type.

IGNITION:—**Coil Model CE-4401.** Mounted on dash.
Ignition Switch—Oakes 'Hershey' co-incidental ignition switch and steering post lock.
Distributor Model IGB-4317. Single breaker, 6 lobe cam, full automatic advance type.
Breaker Gap—Set gap at .020". Limits, .018-.020".
Breaker Arm Spring Tension—16-20 ounces.
Cam Angles (Distributor Degrees)—Closed 40.5°. Open 18.5°.

Automatic Advance

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

Advance is 1° for each 100 R.P.M. (distributor).
Mounting:—Distributor mounted on cylinder head. To remove, loosen locknut, take out mounting screw on side of cylinder head.

IGNITION TIMING:—With #1 piston on compression, turn engine over until 'IGN' mark (first line) on vibration dampener at front of engine lines up with pointer on chain case cover, loosen locknut and mounting set screw on side of cylinder head below distributor, rotate distributor until contacts begin to open, tighten screw and lock nut, see that rotor is opposite #1 segment in distributor cap, check spark plug connections (see diagram).
The second line on the vibration dampener is the top dead center mark for cylinders #1 and #6.
Firing Order:—1-5-3-6-2-4. See diagram.
Spark Plugs:—Champion Type C-15. 18 MM. Metric type.
Spark Plug Gaps—.025" (.030" on cars with radio).

BATTERY:—**Globe, Type No. 71.** 6 volt, 13 plate, 102 A.H. capacity (20 hour rate).
Starting Capacity—120 amperes for 20 minutes.
Grounded Terminal—Positive (+) terminal.
Location—On left hand side under driver's seat.

STARTER:—**Model MAB-4062. Armature No. MAB-2057.**
Starter Drive—Inboard Bendix.
Rotation—Counter-clockwise at commutator end.
Brush Spring Tension—44-56 ozs. (new brushes).

Performance Data

Torque	R.P.M.	Volts	Amperes
0 ft. lbs.	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:—Mounted on starter field frame. Controlled by button on instrument board through flexible cable. Pull required to close starter switch contacts must be not less than 2.3 pounds (measured at right angles to switch lever at extreme tip).
Mounting:—Flange mounted on left hand front face of flywheel housing. To remove, take out 2 flange mounting capscrews.

GENERATOR:—**Model GAR-4205. Armature No. GAR-2214.** Third brush control type.
Charging Rate Adjustment—Take off commutator cover band, shift third brush by prying on brush mounting stud, counter-clockwise to increase or clockwise to decrease charging rate. Third brush held in position by friction.
Maximum Charging Rate—17 amperes (hot), 1700 R.P.M.

Performance Data

Amperes	Volts	R.P.M.
2	6.4	750
6	6.9	885
10	7.3	1030
14	7.65	1230
17	8.0	1700
14	7.65	2200

Rotation—Counter-clockwise at commutator end.
Field Current—4.46-4.94 amperes at 6.0 volts.
Motoring—5.13-5.67 amperes at 6.0 volts.
Brush Spring Tension—24-36 ounces each.
Field Fuse—7½ ampere capacity.

Mounting:—Cradle mounted at left front of engine. Driven by fan belt. Drives water pump through shaft extension. To remove, disconnect water pump drive coupling, slack off fan belt, loosen mounting clamp band. When mounting generator see that dowel in field frame is in place to prevent generator moving in cradle.
Belt Adjustment—Loosen two cap screws on fan bracket, move bracket upward until fan belt can be moved 1" (sideplay) at point midway between pulleys, tighten bracket screws.

CUT-OUT RELAY:—**Model CB-4021.** Mounted on generator field frame.
Cuts in—7.0-7.5 volts or approximately 750 R.P.M.
Cuts out—.5-2.5 ampere discharge current.
Relay Contact Gap—.025-.035".
Air Gap—.010-.030" (contacts closed).

LIGHTING:—**Delco-Remy Switch Model 478-N. Foot Control Switch Model 465-Z.** Lighting switch mounted on back of instrument board. Foot control switch controls upper or driving beam and lower depressed or passing beam.

Bulb Specifications

Lamp	Candlepower	Mazda No.
Headlights	32-21	1116
Parking, Instrument	3	63
Stop and Tail	21-2	1158
Dome	4	64 (DC)

FUSES:—**Lighting**—20 ampere on lighting switch.
Accessory—20 ampere capacity on fuse block (connected in stop light and gasoline gauge circuits).
Generator Field—7½ ampere under fuse cover on generator.

LA SALLE
MODEL 350, SERIES 50 (1934)
DELCO-REMY ELECTRICAL SYSTEM

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

ENGINE NUMBER:—First number, 2,100,001. Located on left side of cylinder block at top front corner (below cylinder head).

ENGINE:—Eight cylinder 'in line', 'L' head type.
Dimensions—Bore, 3". Stroke, 4¼". Displacement, 240.3 cu. ins.
Horsepower—Rated, 28.8. Developed, 95 H.P. at 3700 R.P.M.
Compression—Std. 6.5-1. Compression pressure, 158 lbs. at 1000 R.P.M. or 176 lbs. at 2500 R.P.M. No optional compression ratios.

Pistons:—Lynite Lo-Ex aluminum alloy cam ground, 'T' slot type. Pistons finished by special 'Alumite' process (special hard oxide deposited on bearing surface). Pistons cannot be ground. Recondition cylinders to standard oversize. Standard oversize pistons .003", .005", .015", .030".
Piston Weight—(complete assembly) 18.160 ozs.
Piston Weight—(without rings, pin, or locking screw) 12.048 ozs.
Clearance—Top, .016". Skirt (bottom), .0017-.0019" (at 70°F.).
Removal—Pistons and rod assembly removed from bottom of engine.
Installing New Pistons—Pistons should not be fitted with a feeler gauge. Use micrometer gauge to check cylinder bore and piston. Measurement on piston should be made at point on skirt below and to left of 'T' slot junction midway between pin bosses with piston at 70°F. Finish cylinder bore to size giving correct clearance.

NOTE:—Install pistons with slot toward left of engine (opposite side from camshaft and valves).

Piston Rings:—Two notched compression rings, two oil rings used (all above piston pin). Lower grooves drilled radially with oil drain holes.

Ring	Width	End Gap	Wall Thickness	Groove Depth
Comp. (all)	.1235-.1240"	.007-.012"	.130"	.135"
Oil (#3)	.1235-.1240"	.007-.015"	.130"	.130"
Oil (#4)	.1545-.1550"	.007-.015"	.130"	.130"

NOTE:—Install compression rings with notch or step downward.

Wrist Pin:—Diameter, ⅞". Length, 2 11/16". Pin is locked in piston by locking screw. To remove pins, first heat piston in hot water.
Clearance—(Piston)—.0005" press fit (locking screw end), .0003" clearance (opposite or free end).
Installing New Pins—Lubricate pins with oil. Above clearances allow light thumb push fit in piston with piston heated to 200-210°F. (locking screw end), and with piston at normal (70°F.) temperature (opposite end).

Connecting Rod:—Weight, 29.565 ozs. Length, 9" (center-to-center).
Big End Bearing—Removable steel-backed, babbitt-lined bearing. No shims.
Clearance—.0015" (radial), .005" (sideplay).
Adjustment—No shims used. Replace removable bearings.

NOTE:—Install rods with oil hole in top of lower bearing toward right of engine (camshaft side of engine).

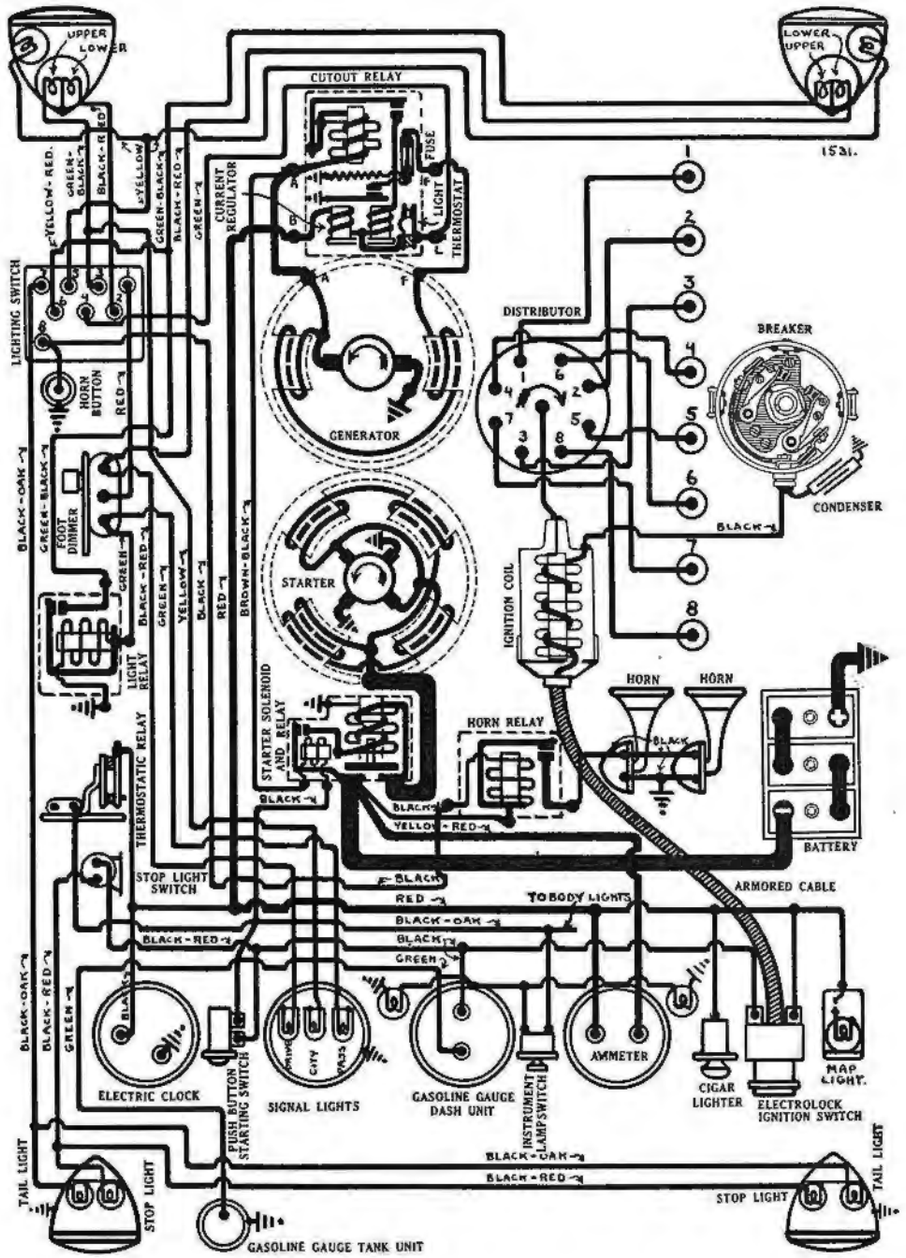
Crankshaft—Five main bearing type with eight counterweights.
Journal Sizes—#1—2⅜", #2—2 9/16", #3—2⅝", #4—2 11/16", #5—2¾".
Bearing Type—Bronze-backed, babbitt-lined type. No shims used.
Clearance—.002" (radial), .004" (endplay).
Adjustment—No shims used. Replace bearings. Do not file bearing caps.
End Thrust—Taken by upper half of #1 bearing (bearing end flanged and steel thrust washer installed on shaft behind sprocket).

Camshaft:—Chain driven (two sprocket non-adjustable type).
Chain—Whitney #CL-205. Length, 23" or 46 links. Pitch, ½".
Camshaft Setting—Sprockets are marked. Install chain with sprockets turned so that marks are adjacent and in line with a straightedge across the shaft centers.

Valves:—	Head Diameter	Stem Diameter	Length	Seat Angle	Lift
Intake	1 9/16"	11/32"	5 9/32"	30°	.291"
Exhaust	1 7/16"	11/32"	5 9/32"	30°	.289"

Stem-to-Guide Clearance—.002" (intake), .003" (exhaust).
Tappet Clearance—Running, .006" (intake), .009" (exhaust).
Timing, .015" (all valves—engine cold).

Valve Spring Cages—Spring cages are installed at top of valve springs. Cages exert slight pressure on valve springs and new cages should be used whenever new springs are installed. Pressure required to withdraw cages from springs should be 3-6 lbs.



LA SALLE
MODEL 350, SERIES 50 (1934)
DELCO-REMY ELECTRICAL SYSTEM

Valve Timing

Intake Valves open 6° ATDC. Close 37° ALDC.
Exhaust Valves open 34° BTDC. Close 5° ATDC.

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

Oil Pressure—30 lbs. at 60 M.P.H.

Oil Pressure Relief Valve—Operates at 30 lbs.

Capacity and Oil—7 qts. Use SAE. #30 (summer), 20-W or 10-W (winter).

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

Carburetor:—Stromberg, Model EE-23, 1¼" dual, downdraft type.

Automatic Choke—Stromberg.

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

Gasoline Gauge:—A.C., Electric type.

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

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

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

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

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

Breaker Arm Spring Tension—17-21 ounces (at tip of breaker arm).

Manual Advance—20° (engine) adjustment only.

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

Automatic Advance

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

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

IGNITION TIMING:—

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

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

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

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

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

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

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

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

Starting Capacity—156 amperes for 20 minutes.

Grounded Terminal—Positive (+) terminal.

Location—Under right front seat.

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

Rotation—Counter-clockwise at commutator end.

Brush Spring Tension—24-28 ounces.

Performance Data

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

Starting Switch:—Solenoid Switch, Model 1516. Pushbutton Switch, Model 1379. Solenoid (starting switch and pinion shift) mounted on starter field frame. Controlled by relay (on switch case) operated by pushbutton switch on instrument panel. Operative only with ignition 'on'. See Equipment Section 'Starter Controls' for complete data.

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

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

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

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

Performance Data

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

Rotation—Counter-clockwise at commutator end.

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

Brush Spring Tension—22-26 ounces.

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

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

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

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

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

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

Relay Cut-out

Cut in—6.75-7.25 volts or 12 M.P.H.

Cuts out—2.5 amperes discharge current at 6.3 volts.

Relay Contact Gap—.015-.025".

Air Gap—.012-.017" (contacts closed).

Current Regulator

Contact Gap—.015-.040".

Air Gap—.055-.075" between armature and center of core (armature down and fibre bumper just touching stop).
.006-.008" between fibre bumper and stop (armature up).

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

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

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

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

Bulb Specifications

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

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

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

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

Horn Relay, Model 266-T. Relay requires .25 amperes to close contacts.

Relay Contact Gap—.015-.025".

Air Gap—.012-.017" (contacts closed).

LINCOLN

TWELVE CYLINDER, MODELS V-12-136, V-12-145 (1934)
AUTO-LITE ELECTRICAL SYSTEM

SERIAL NUMBER:—First number, (136) 1501, (145) 3001. On plate on dash.

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

ENGINE:—Twelve cylinder, 67 degree 'V,' 'L' head type. Cylinders of each bank are cast Enbloc and separate from crankcase.
Dimensions—Bore, 3⅛". Stroke, 4½". Displacement, 414 cu. ins.
Horsepower—Rated, 46.8. Developed, 150 H.P. at 3400 R.P.M.
Compression—Std. Aluminum head—6.1-1.

Pistons:—Lynite, aluminum alloy, split skirt type. Pistons have oxidized surface.
Weight—12.5 ozs. (stripped—without rings, pin or locking screw).
Removal—Piston and rod assembly removed through bottom of engine.
Clearance—(Top) .015-.018", (skirt) .002".

NOTE:—Install pistons with slot to right (viewed from drivers seat), all pistons—both banks.

Piston Rings:—Four rings per piston, #1 and 2—compression rings, #3 and 4—oil control rings.

Ring	Width	End Gap
Comp. (both)	⅛"	.007-.012"
Oil Cont. (both)	5/32"	.007-.012"

Piston Pin:—Diameter, ⅞". Pin is clamped in piston.
Pin Fit in Rod—Tight thumb push fit.

Connecting Rod:—Weight, 34½ ozs. Length, 10⅞" (center-to-center).
Big End Bearing—Diameter, 2½". Length, 1".
Bearing Type—Removable 'aerotype' lead-bronze type.
Clearance—.0015" (radial), .006-.015" (endplay).
Adjustment—Shims are provided for adjustment.

Crankshaft:—Four main bearing type with integral counterweights.
Bearing Type—Bronze-backed, babbitt-lined type. Shims used.
Clearance—.002" (radial).
Adjustment—Shims provided on all bearings. Do not file bearing caps.
Journal Sizes—2⅝" diameter (all bearings).
End Thrust—Taken by #4 (rear) main bearing. Endplay, .003".

Camshaft:—Five bearing type. Camshaft drive, chain with automatic idler take-up. See Equipment Section for Morse Automatic Idler take-up.
Chain—Morse. Width, 1½". Length, 104 links. Pitch, ⅜".
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. See Equipment Section for data on assembly and setting of automatic idler sprocket.

Valves:—	Head Diam.	Stem Diam.	Length	Seat Angle	Lift
All Valves	1 11/16"	5/16"	6¼"	45°	5/16"

Tappet Clearance—.003" (intake), .005" (exhaust) cold.
Valve Springs—Spring pressure, 63 lbs. (valve closed).

Valve Timing

Intake Valves Open—21° Before TDC. Close—49° After LDC.
Exhaust Valves Open—57° Before LDC. Close—11° After TDC.

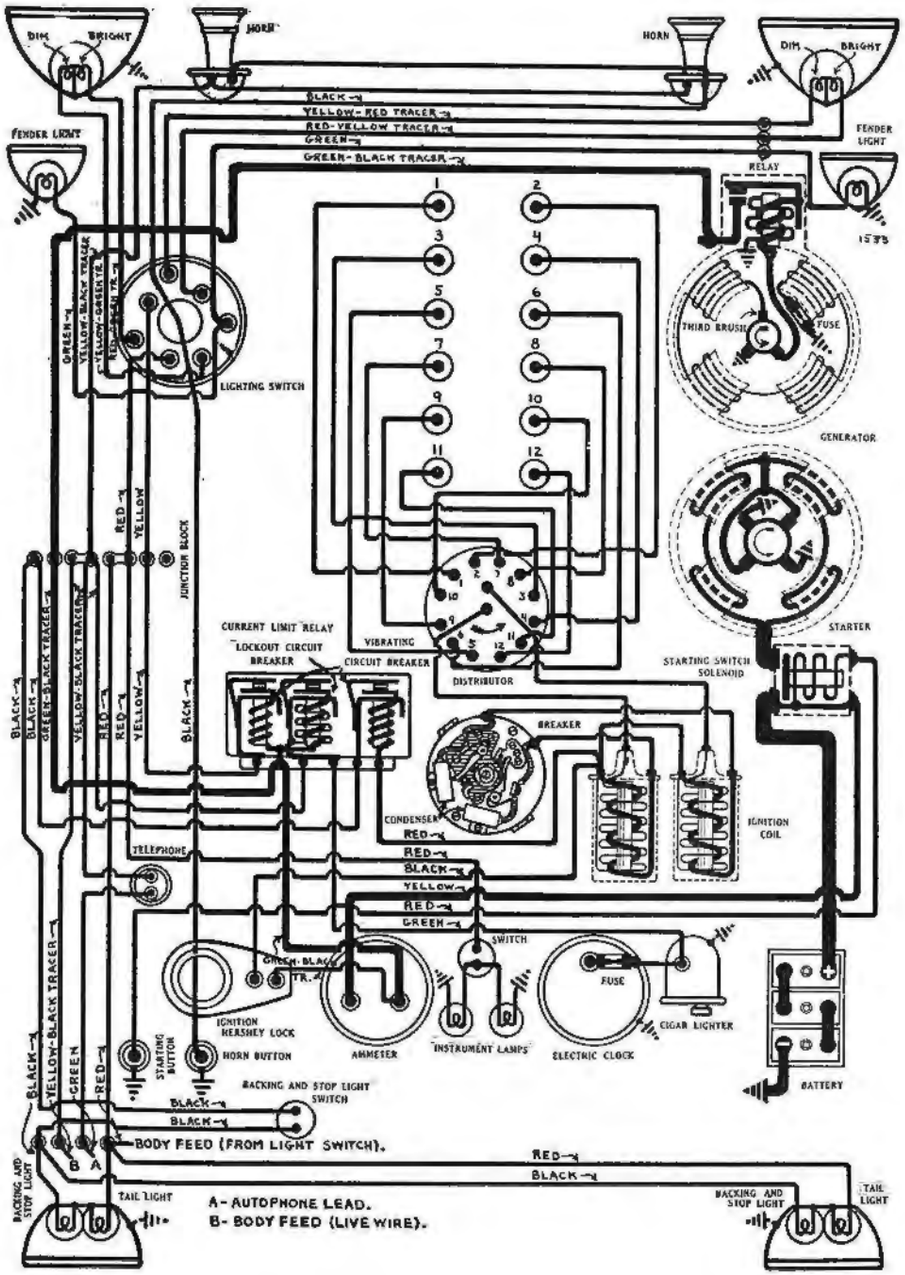
Lubrication:—Pressure type. Gear type oil pump located in crankcase.
Oil Pressure—40 lbs. with engine at normal temperature.
Oil Pressure Relief Valve—Operates at 40 lbs. Located under plug on right hand side of crankcase. Not adjustable.
Capacity and Oil—13 qts. Use SAE. #40 (summer), #30 (winter).

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

Carburetor:—Stromberg, Model EE-22, Dual, 1½" plain tube, downdraft type.

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

Gasoline Gauge:—K-S Telegauge, hydrostatic type.



LINCOLN

TWELVE CYLINDER, MODELS V-12-136, V-12-145 (1934)
AUTO-LITE ELECTRICAL SYSTEM

IGNITION:—Coil Model CE-4001-L (2 used). Coils mounted on dash.
Ignition Current—1.25 amperes (engine running), 4.5 amperes (stopped) per coil.
Ignition Switch—Oakes 'Hershey' type combination ignition switch and steering post lock.

Distributor Model IGM-4002,A. Double breaker, 6 lobe cam, semi-automatic advance type. Contacts open alternately at 33½ and 26½ degree intervals corresponding to unequal 67 and 53 degree firing intervals of the engine (caused by 67° included angle between cylinder banks). Contacts must be synchronized—see Timing. Manual advance is controlled by lower left hand button on instrument panel.
BreakerGap—Set gap at .020".
Breaker Arm Spring Tension—20-22 ounces.
Manual Advance—20° (engine-maximum).
Cam Angles (Distributor Degrees) — Closed 36°. Open 24°. Each set operates independently and controls one coil.

Automatic Advance

Distributor Degrees	R.P.M.	Engine Degrees	R.P.M.
Start	300	0	600
2	600	4	1200
4	900	8	1800
6	1200	12	2400
8	1500	16	3000
10	1800	20	3600
11½	2000	23	4000

IGNITION TIMING:—

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

Timing (Stationary Contacts):—Stationary contacts (right hand—mounted directly on breaker plate) control right hand coil and fire spark plugs of right cylinder bank. To set timing, first see that spark control button on instrument panel is advanced and distributor rotated clockwise to extent of advance arm slot, take off cover plate over inspection hole in flywheel housing. With #2 (front cylinder—right hand bank) on compression turn engine over until flywheel mark 'A-2' lines up with pointer on housing. This mark is 7° before top dead center mark 'D-2/12C'. Then loosen tapper lockscrew in center of breaker cam, carefully locate cam so that right hand contacts are beginning to open, tighten lockscrew, check rotor position and spark plug cable connections (see diagram). Check synchronization of second or movable contacts. They should open 33½° (distributor) or 67° (engine) after this point.
Synchronization (Movable Contacts):—After setting stationary contacts (above), turn engine over 67° to firing position for piston #1 (front cylinder—left hand bank) with flywheel mark 'A-1' lined up with indicator on housing. This mark is 7° before top dead center mark 'D1/11C'. Then loosen lockscrews on movable sub-plate (carrying second set of contacts), shift plate by turning eccentric adjusting screw until contacts begin to open, tighten lockscrews. This will provide correct 33½° interval between opening of stationary and movable contacts.
If distributor is synchronized by using rotary spark gap or other service equipment, set movable contacts to open 33½° after first or stationary set. Firing interval is unequal 33½-26½-33½ (distributor degrees).
Firing Order:—1-4-9-8-5-2-11-10-3-6-7-12 with cylinders numbered as shown on diagram (right bank—2, 4, 6, 8, 10, 12. Left bank, 1, 3, 5, 7, 9, 11).
Spark Plugs:—Champion Type C-7, 18 MM. Metric type.
Spark Plug Gaps—.022".

BATTERY:—Exide, Type LX-15-21L. 6 volt, 15 plate, 148 A.H. capacity (20 hour rate).
Starting Capacity—155 amperes for 20 minutes.
Grounded Terminal—Negative (-) terminal.
Location—Right hand side under front floor boards.

STARTER:—(V-12-136) Model MAO-4003. Armature No. MAO-2006. (V-12-145) Model MAO-4001, 3, 5. Armature No. MAO-2006.
Starter Drive—Outboard Bendix.
Rotation—Counter-clockwise at commutator end.
Brush Spring Tension—24-32 ounces measured at right angle bend at extreme end of spring overhang beyond brush.

Performance Data

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

Starting Switch:—Owen-Dyneto Type. Electric solenoid type switch mounted on starter field frame and controlled by button on instrument board.
Mounting:—Flange mounted on right hand front face of flywheel housing. To remove, take out 3 flange mounting screws.

GENERATOR:—(V-12-136) Model GBC-4101. Armature No. GBC-2035. (V-12-145) Model GBC-4001, 4101. Armature No. GBC-2006 (4001). Third brush control type.
Charging Rate Adjustment—Take off commutator cover band, shift third brush by prying on brush mounting stud, counter-clockwise to increase, or clockwise to decrease charging rate. Third brush held in position by friction.
Maximum Charging Rate—18 amperes, 1300 R.P.M. or 20 M.P.H.

Performance Data

Amperes	Volts	R.P.M.
0	6.4	400
4	6.9	460
8	7.0	520
12	7.3	600
16	7.5	725
20	7.8	940
21	8.0	1250
13	7.3	2800

Rotation—Counter-clockwise at commutator end.
Shunt Field Current—2.75-3.05 amperes at 6.0 volts.
Motoring—5.32-5.88 amperes at 6.0 volts.
Brush Spring Tension—22-27 ounces.
Field Fuse—7½ ampere capacity in plug on commutator endplate.
Mounting:—Flange mounted on right hand rear face of timing chain case. Water pump and oil temperature regulator mounted on commutator end of generator. To remove, drain radiator, disconnect hose couplings and oil leads or remove water pump, take out three flange mounting screws, pull generator to rear to disengage drive coupling. Do not disturb intermediate plate carrying drive sprocket.

CUT-OUT RELAY: — Model CB-4014-B (V-12-136), CB-4014-L (V-12-145). Mounted on generator field frame.
Cuts in—7.0-7.5 volts.
Cuts out—.5-2.5 ampere discharge.
Relay Contact Gap—.025-.035".
Air Gap—.010-.030" (contacts closed).

LIGHTING:—Lighting switch mounted at lower end of steering column controlled by lever on steering wheel. Special 'Passing' position of switch provides assymmetrical passing beam (lower beam left hand headlight, upper beam right hand headlight). Headlights are aimed straight ahead.

Bulb Specifications

Lamp	Candlepower	Mazda No.
Headlights	32-21	1116
Fender, Instrument, Tail	3	63
Stop and Backing	15	87
Dome, Corner	6	81

CIRCUIT BREAKER:—Auto-Lite design. Consists of two vibrating and one lock-out circuit breaker on dash (see diagram for circuits). Vibrating circuit breakers begin to operate with current load of 25-30 amperes limiting load to 10-15 amperes. Lock-out circuit breaker begins to operate with current load of 25-30 amperes limiting load to approximately 1 ampere.

HORNS:—Sparton Twin horns.

NASH

BIG SIX, SERIES 1220 (1934)
AUTO-LITE ELECTRICAL SYSTEM

SERIAL NUMBER:—First number, R-278,901. On right hand side of frame under engine hood.

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

ENGINE:—Six cylinder, Valve-in-head, Twin-Ignition type. Cylinders cast enbloc.
Dimensions—Bore, 3⅜". Stroke, 4⅜". Displacement, 234 cu. ins.
Horsepower—Rated, 27.34. Developed, 88 H.P. at 3200 R.P.M.
Compression—Std. 5.25-1. No optional compression ratios.

Pistons:—Aluminum alloy, Invar strut, split skirt type. Length, 3⅞".
Weight—19⅛ ozs. (stripped).
Removal—Piston and rod assembly removed through top of engine.
Clearance—.002" (skirt)—see Fitting New Pistons.
Fitting New Pistons—Use .002" feeler stock to check piston clearance.
NOTE:—Install pistons with slot toward camshaft side of engine.

Piston Rings:—Four rings per piston, #1 and 2—compression rings, #3 and 4—oil control rings.

Ring	Width	End Gap
Comp. (#1, 2)	⅛"	.010-.025"
Oil Cont. (#3)	⅛"	.010-.025"
Oil Cont. (#4)	3/16"	.010-.025"

Piston Pin:—Diameter, ⅞". Pin floats in piston and rod.
Pin Fit in Piston—Light push fit with piston heated.
Pin Fit in Rod—Light push fit with both parts cold.

Connecting Rod:—Weight, 35 ozs. Length, 8¾" (center-to-center).
Big End Bearing—Removable steel-backed, babbitt-lined type.
Clearance—.002" (radial), .006-.012" (sideplay).
Adjustment—None (no shims).

Crankshaft:—Seven main bearing type.
Journal Sizes—2 31/64" diameter (all bearings).
Bearing Type—Steel-backed, babbitt-lined type. No shims.
Clearance—.002" (radial).
Adjustment—None (no shims used).
End Thrust—Taken by #4 (center) main bearing. Endplay, .004-.007".

Camshaft:—Drive—Double strand roller chain.
Chain—Diamond double roller chain. Length, 22½" or 60 links. Pitch, ⅜".
Camshaft Setting—Remove and install chain endless. Use special gear pullers and pushers, keep sprockets lined up to avoid sidestrain on chain and sprockets. Sprockets are marked. Mesh chain with sprockets turned so that marks are adjacent and in line with a straightedge across the shaft centers.

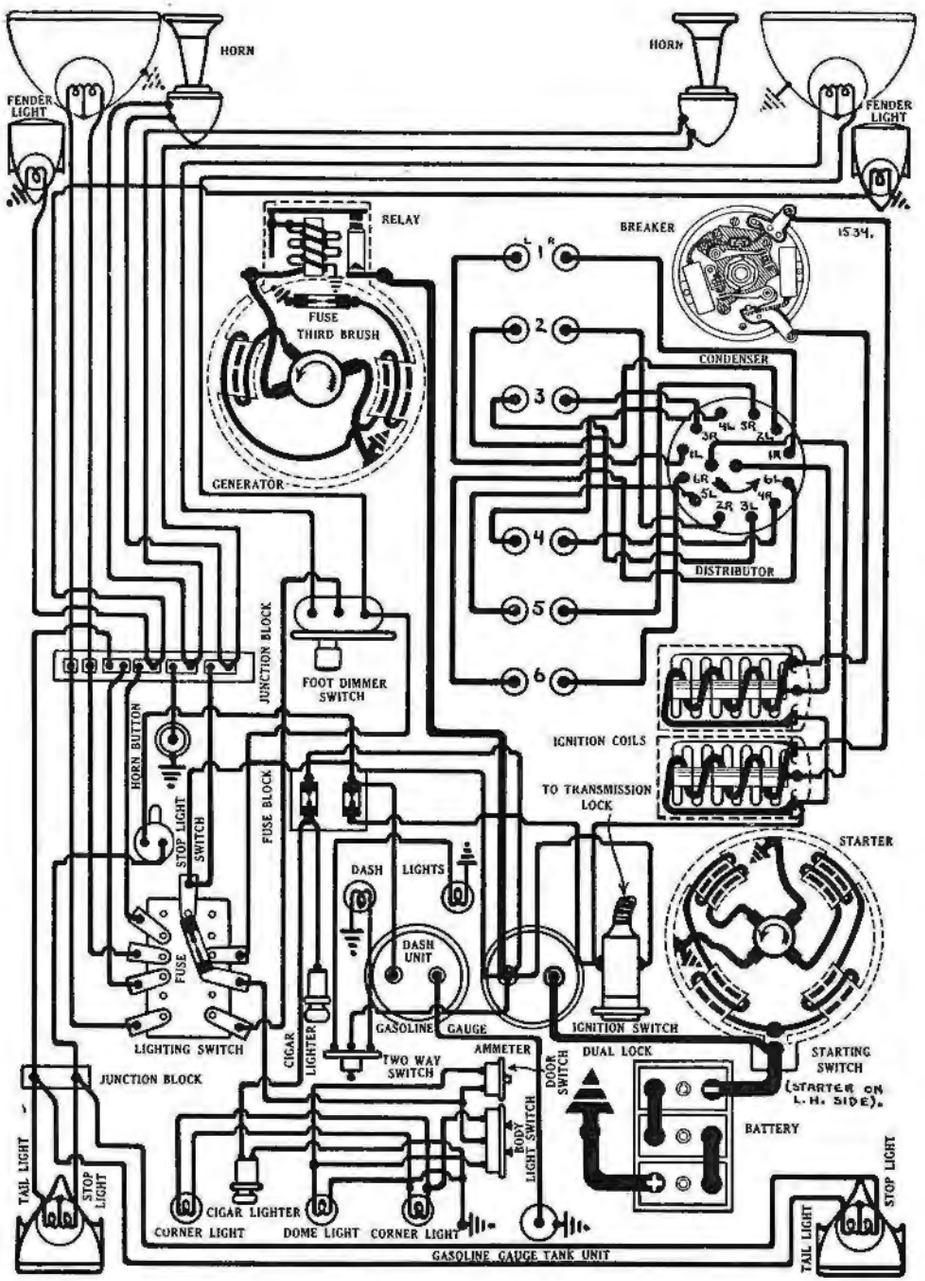
Valves:—	Head Diameter	Seat Angle	Seat Width	Lift
Intake	1¾"	45°	1/16"	11/32"
Exhaust	1 19/32"	45°	1/16"	11/32"

Tappet Clearance—.015". Set tappet clearance with engine hot and idling.

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

CARBURETION:—(Fuel System). See Carburetion Section for complete data on Carburetor, Fuel Pump, and Gasoline Gauge.
Carburetor:—Stromberg, Model EX-32, 1¼" plain tube, downdraft type.
Fuel Pump:—A.C., Type R.
Gasoline Gauge:—Stewart Electric type.

IGNITION:—**Coil Model CE-4402 (2 used).** Coils mounted on dash.
Ignition Current—2 amperes (running), 4 amperes (stopped).
Ignition Switch—Delco-Remy Dual Lock Model 425-U. Co-indidental ignition switch and transmission lock (see Equipment Section).
Distributor Model IGE-4012. Double breaker, 6 lobe cam, full automatic advance type. Each set of contacts controls one coil and fires one spark plug in each cylinder (Twin Ignition engine). Contacts must be synchronized (see Timing).
Breaker Gap—.020". Limits, .018-.020" (.020-.024" first 1000 miles with new contacts).
Breaker Arm Spring Tension—16-20 ounces.
Cam Angles (Distributor Degrees)—Closed 35°. Open 25°. Each set independently—double ignition type.



NASH

BIG SIX, SERIES 1220 (1934)
AUTO-LITE ELECTRICAL SYSTEM

Automatic Advance

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

IGNITION TIMING:—With #1 piston on compression, turn engine over until piston is slightly before top dead center, stop when 'IGN' line on vibration dampener at front of engine lines up with pointer on chain case cover (second line is top dead center point). Loosen advance arm clamp bolt, rotate distributor until fixed contacts (mounted directly on breaker plate) begin to open, tighten clamp bolt. See diagram for spark plug cable connections.
Synchronization:—After timing distributor (above) and without disturbing position of distributor or crankshaft, loosen lock screws on movable subplate (carrying second set of contacts), shift plate (by inserting screwdriver in slot on plate) until second set of contacts begin to open, tighten locking screws. With correct adjustment both sets of contacts should open simultaneously. See Equipment Section for data on Synchronziation.
Firing Order:—1-5-3-6-2-4. See diagram for distributor connections.
Spark Plugs:—A.C., Type K-12. 14 MM. Metric type.
Spark Plug Gaps—.022" (.030" cars with radio).

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

STARTER:—Model MAB-4053. Armature No. MAB-2057.
Starter Drive—Inboard Bendix.
Rotation—Counter-clockwise at commutator end.
Brush Spring Tension—44-56 ozs. (new brushes).

Performance Data

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

Starting Switch:—Type VC-4002. Mounted on starter field frame. Operated by depressing clutch pedal. Controlled by vacuum. See Equipment Section for complete data.

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

GENERATOR: — Model GAR-4601-3. Armature No. GAR-2214. Third brush control type.
Charging Rate Adjustment—Take off commutator cover band, shift third brush by prying on brush mounting plate, counter-clockwise to increase, or clockwise to decrease charging rate. Third brush held in position by friction.
Maximum Charging Rate—15 amperes (normal), may be increased to 25 amperes (total including ignition) on cars equipped with heater or radio (generator is air-cooled).

Performance Data
Generator cold

Amperes	Volts	R.P.M.
0	6.4	760
4	6.75	920
8	7.05	1115
12	7.35	1300
16	7.7	1560
20	8.0	2300

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

Mounting:—Cradle mounted at left front of engine. Fan belt drive. Water pump driven by generator shaft extension. To remove, disconnect water pump drive coupling, slack off belt adjustment, slip off drive belt, loosen mounting clamp band.
Belt Adjustment—Adjust belt when sideplay at point midway between generator and fan pulleys exceeds 1½". To adjust, loosen two cap screws on fan bracket, raise bracket until sideplay is about 1", tighten cap screws.

CUTOUT RELAY:—Model CB-4021. Mounted on generator field frame.
Cuts in—7.0-7.5 volts or 750 R.P.M.
Cuts out—.5-2.5 ampere discharge.
Relay Contact Gap—.025-.035".
Air Gap—.010-.030" (contacts closed).

LIGHTING: — Soreng-Manegold Light Switch, Model 5620-A. Delco-Remy Foot Control Switch, Model 465-Z. Foot control switch provides assymetrical passing beam (lower beam right hand headlight, upper beam left hand headlight). Headlights (without lenses) are aimed straight ahead, but lenses cause beams to cross.

Bulb Specifications

Lamp	Candlepower	Mazda No.
Headlights	32-21	1116
Fender, Instrument	3	63
Stop and Tail	21-2	1158
Dome, Corner	3	63

FUSES:—Lighting—20 ampere on lighting switch.
Body and Accessory—Two 20 ampere on fuse block.
Generator Field—7½ ampere (under cover on generator).

NASH

ADVANCED EIGHT, SERIES 1280 (1934)
AUTO-LITE ELECTRICAL SYSTEM

SERIAL NUMBER:—First number, B-70,801. On frame on right hand side under engine hood.

ENGINE HOOD:—On plate on right hand side of crankcase.

ENGINE:—Eight cylinder, 'In Line', valve-in-head, twin-ignition type.
Dimensions—Bore, 3⅛". Stroke, 4¼". Displacement, 260.8 cu. ins.
Horsepower—Rated, 31.25. Developed, 100 H.P. at 3400 R.P.M.
Compression—Std. 5.25-1. No optional compression ratios.

Pistons:—Aluminum alloy, Invar strut, split skirt type.
Weight—19 ounces (stripped).
Removal—Piston and rod assembly removed through top of engine.
Clearance—.002" (skirt). See Fitting New Pistons.
Fitting New Pistons—Use .002" feeler stock to check clearance.
NOTE:—Install pistons with slot toward camshaft side of engine.

Piston Rings:—Four rings per piston, all above pin. #1 and 2—compression rings, #3 and 4—oil control rings.

Ring	Width	End Gap
Comp. (#1, 2)	⅛"	.010-.025"
Oil Cont. (#3)	⅛"	.010-.025"
Oil Cont. (#4)	3/16"	.010-.025"

Piston Pin:—Diameter, ⅞". Pin floats in piston and rod.
Pin Fit in Piston—Light push fit with piston heated.
Pin Fit in Rod—Light push fit with both parts cold.

Connecting Rod:—Weight, 34 ozs. Length, 8¾" (center-to-center).
Big End Bearing—Removable steel-backed, babbitt-lined type.
Clearance—.002" (radial), .006-.012" (endplay).
Adjustment—None (no shims).

Crankshaft:—Nine main bearing type.
Journal Sizes—2 31/64" diameter (all bearings).
Bearing Type—Steel-backed, babbitt-lined type. No shims.
Clearance—.002" (radial).
End Thrust—Taken by #5 (center) main bearing. Endplay, .004-.007".

Camshaft:—Drive—Double strand roller chain.
Chain—Diamond double roller chain. Length, 22½" or 60 links. Pitch, ⅜".
Camshaft Setting—Remove and install chain endless. Use special gear pullers and pushers, keep sprockets lined up to avoid sidestrain on chain and sprockets. 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	Seat Angle	Seat Width	Lift
Intake	1 21/32"	45°	1/16"	11/32"
Exhaust	1 15/32"	45°	1/16"	11/32"

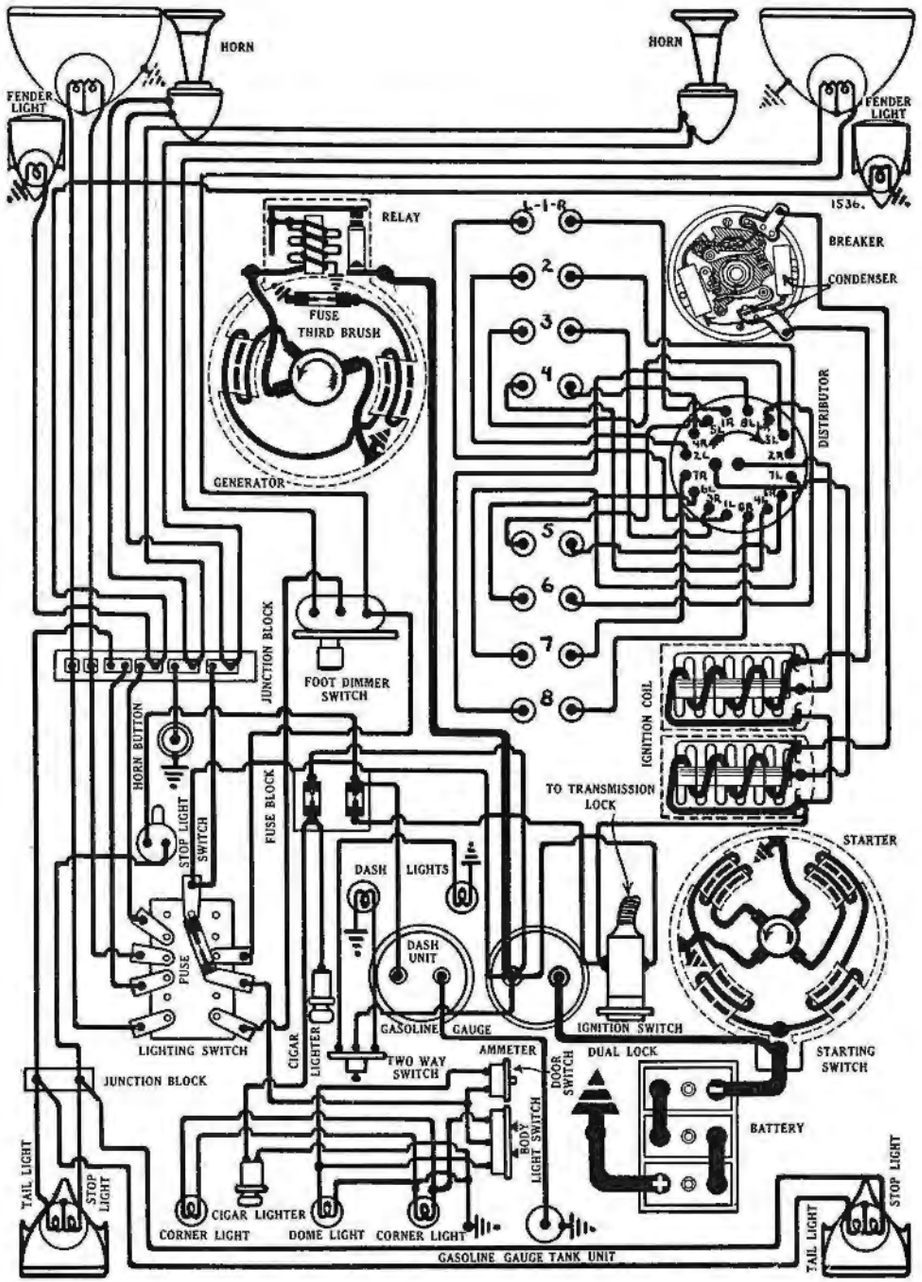
Tappet Clearance—.015". Set with engine hot and idling.

Lubrication:—Pressure type. Gear type oil pump located in crankcase.
Normal Oil Pressure—25 pounds.
Oil Pressure Relief Valve—Operates at 25 lbs. Located on oil pump cover. Adjustable by turning screw.
Capacity and Oil—8 qts. Use SAE. #30 (summer), #20-W (winter).

CARBURETION:—(Fuel System). See Carburetion Section for complete data on Carburetor, Fuel Pump, and Gasoline Gauge.
Carburetor:—Stromberg, Model EE-22, 1¼" plain tube, dual, downdraft type.
Fuel Pump:—A.C., Type R.
Gasoline Gauge:—Stewart Electric type.

IGNITION:—**Coil Model CE-4402 (2 used).** Coils mounted on dash.
Ignition Current—2 amperes (running), 4 amperes (stopped) each coil.
Ignition Switch—Delco-Remy Dual Lock, Model 425-V. Co-incidental ignition switch and transmission lock (see Equipment Section).

Distributor Model IGK-4101. Double breaker, 8 lobe cam, full automatic advance type. Each set of contacts controls one coil and fires one spark plug in each cylinder (Twin Ignition engine). Contacts must be synchronized (see Timing).
Breaker Gap—.013-.017" (.015-.019" first 1000 miles with new contacts).
Breaker Arm Spring Tension—20 ounces.
Cam Angles (Distributor Degrees)—Closed 28°. Open 17°. Each set independently—double ignition type.



NASH

ADVANCED EIGHT, SERIES 1280 (1934)
AUTO-LITE ELECTRICAL SYSTEM

Automatic Advance

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

IGNITION TIMING:—With #1 piston on compression, turn engine over until piston is slightly before top dead center, stop when 'IGN' line on vibration dampener at front of engine lines up with pointer on chain case cover (second line is top dead center point). Loosen advance arm clamp bolt, rotate distributor until fixed contacts (mounted directly on breaker plate) begin to open, tighten clamp bolt. See diagram for spark plug cable connections.
Synchronization:—After timing distributor (above) and without disturbing position of distributor or crankshaft, loosen lock screws on movable sub-plate (carrying second set of contacts), shift plate (by inserting screwdriver in slot on plate) until second set of contacts begin to open, tighten locking screws. With correct adjustment both sets of contacts should open simultaneously. See Equipment Section for data on Synchronziation.
Firing Order:—1-6-2-5-8-3-7-4. See diagram for distributor connections.
Spark Plugs:—AC., Type K-12. 14 MM. Metric type.
Spark Plug Gaps—.022" (.030" cars with radio).

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

STARTER:—**Model MAB-4054. Armature No.MAB-2047.** Starter drive—Inboard Bendix.
Rotation—Counter-clockwise at commutator end.
Brush Spring Tension—44-56 ozs. (new brushes).

Performance Data

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

Starting Switch:—**Type VC-4003.** Mounted on starter field frame. Operated by depressing clutch pedal. Controlled by vacuum. See Equipment Section for complete data.

Mounting:—Flange mounted on right hand front face of flywheel housing. To remove, take out three flange mounting cap screws.

GENERATOR:—**Model GAR-4601-3. Armature No. GAR-2214.** Third brush control type.
Charging Rate Adjustment—Take off commutator cover band, shift third brush by prying on brush mounting plate, counter-clockwise to increase, or clockwise to decrease charging rate. Third brush held in position by friction.
Maximum Charging Rate—15 amperes (normal), may be increased to 25 amperes (total including igntion) on cars equipped with heater or radia (generator is air-cooled).

Performance Data
Generator cold

Amperes	Volts	R.P.M.
0	6.4	760
4	6.75	920
8	7.05	1115
12	7.35	1300
16	7.7	1560
20	8.0	2300

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

Mounting:—Cradle mounted at left front of engine. Fan belt drive. Water pump driven by generator shaft extension. To remove, disconnect water pump drive coupling, slack off belt adjustment, slip off drive belt, loosen mounting clamp band.
Belt Adjustment—Adjust belt when sideplay at point midway between generator and fan pulleys exceeds 1½". To adjust, loosen two cap screws on fan bracket, raise bracket until sideplay is about 1", tighten cap screws.

CUTOUT RELAY:—**Model CB-4021.** Mounted on generator field frame.
Cuts in—7.0-7.5 volts or 750 R.P.M.
Cuts out—.5-2.5 ampere discharge.
Relay Contact Gap—.025-.035".
Air Gap—.010-.030" (contacts closed).

LIGHTING: — Soreng-Manegold Light Switch, Model 5620-A. Delco-Remy Foot Control Switch, Model 465-Z. Foot control switch provides assymetrical passing beam (lower beam right hand headlight, upper beam left hand headlight). Headlights (without lenses) are aimed straight ahead, but lenses cause beams to cross.

Bulb Specifications

Lamp	Candlepower	Mazda No.
Headlights	32-21	1116
Fender, Instrument	3	63
Stop and Tail	21-2	1158
Dome, Corner	3	63

FUSES:—**Lighting**—20 ampere on lighting switch.
Body and Accessory—Two 20 ampere on fuse block.
Generator Field—7½ ampere (under cover on generator).

NASH

AMBASSADOR EIGHT, SERIES 1290 (1934)
AUTO-LITE ELECTRICAL SYSTEM

SERIAL NUMBER:—First number, 521,801. On frame on right hand side under engine hood.

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

ENGINE:—Eight cylinder, 'In Line', valve-in-head, twin-ignition type.

Dimensions—Bore, 3⅜". Stroke, 4½". Displacement, 322 cu. ins.

Horsepower—Rated, 36.45. Developed, 125 H.P. at 3600 R.P.M.

Compression—Std. 5.25-1. No optional compression ratios.

Pistons:—Aluminum alloy, Invar strut, split skirt type.

Weight—19⅛ ounces (stripped).

Removal—Piston and rod assembly removed through bottom of engine.

Clearance—.002" (skirt). See Fitting New Pistons.

Fitting New Pistons—Use .002" feeler stock to check piston clearance.

NOTE:—Install pistons with slot toward camshaft side of engine.

Piston Rings:—Four rings per piston, all above pin. #1 and 2—compression rings, #3 and 4—oil control rings.

Ring	Width	End Gap
Comp. (#1, 2)	⅛"	.010-.025"
Oil Cont. (#3)	⅛"	.010-.025"
Oil Cont. (#4)	3/16"	.010-.025"

Piston Pin:—Diameter, ⅞". Pin floats in piston and rod.

Pin Fit in Piston—Light push fit with piston heated.

Pin Fit in Rod—Light push fit with both parts cold.

Connecting Rod:—Weight, 32 ozs. Length, 9 1/16" (center-to-center).

NOTE:—Connecting rod is aluminum alloy with steel bearing cap.

Big End Bearing—Spun babbitt-lined type.

Clearance—.002" (radial), .006-.012" (sideplay).

Adjustment—None (no shims).

Crankshaft:—Nine main bearing type.

Journal Sizes—2⅜" diameter (all bearings).

Bearing Type—Removable bronze-backed, babbitt-lined type.

Clearance—.002" (radial).

Adjustment—None (no shims).

End Thrust—Taken by #5 (center) main bearing. Endplay, .004-.007".

Camshaft:—Drive—Roller chain.

Chain—Diamond Triple roller chain. Width, 1". Length, 22½" or 60 links. Pitch, ⅜".

Camshaft Setting—Remove and install chain endless. Use special gear pullers and pushers, keep sprockets lined up to avoid sidestrain on chain and sprockets. 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	Seat Angle	Seat Width	Lift
Intake	1 24/32"	45°	1/16"	11/32"
Exhaust	1 19/32"	45°	1/16"	11/32"

Tappet Clearance—.015" all valves. Set with engine hot and idling.

Valve Timing—See Camshaft Setting above.

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

Normal Oil Pressure—25 pounds.

Oil Pressure Relief Valve—Operates at 25 lbs. Located in oil pump cover. Adjustable by turning screw.

Capacity and Oil—10 qts. Use SAE. #30 (summer), #20-W (winter).

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

Carburetor:—Stromberg, Model UUR-2, 1¼" plain tube, dual, updraft type.

Fuel Pump:—A.C., Type T.

Gasoline Gauge:—Stewart Electric type.

IGNITION:—**Coil Model CE-4402 (2 used).** Coils mounted on dash.

Ignition Current—2 amperes (running), 4 amperes (stopped) each coil.

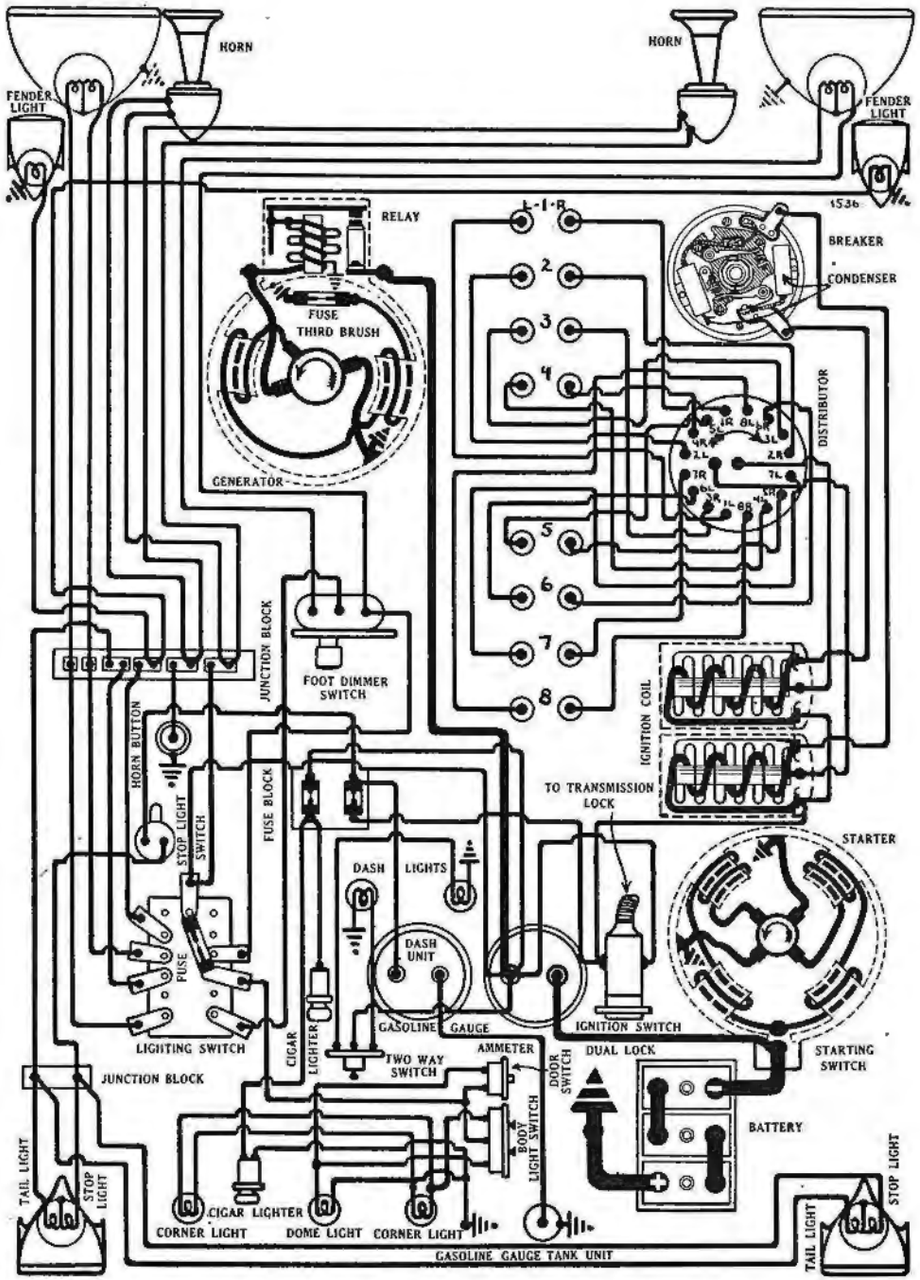
Ignition Switch—Delco-Remy Dual Lock, Model 425-V. Co-incidental ignition switch and transmission lock (see Equipment Section).

Distributor Model IGK-4005. Double breaker, 8 lobe cam, full automatic advance type. Each set of contacts controls one coil and fires one spark plug in each cylinder (Twin-Ignition engine). Contacts must be synchronized (see Timing).

Breaker Gap—.013-.017" (.015-.019" first 1000 miles with new contacts).

Breaker Arm Spring Tension—20 ounces.

Cam Angles (Distributor Degrees)—Closed 28°. Open 17°. Each set independently—double ignition type.



NASH

AMBASSADOR EIGHT, SERIES 1290 (1934)
AUTO-LITE ELECTRICAL SYSTEM

Automatic Advance

Distributor Degrees	R.P.M.	Engine Degrees	R.P.M.
Start	220	0	440
2	410	4	820
4	600	8	1200
6	800	12	1600
8	990	16	1980

IGNITION TIMING:—With #1 piston on compression, turn engine over until piston is slightly before top dead center, stop when 'IGN' line on vibration dampener at front of engine lines up with pointer on chain case cover (second line is top dead center point). Loosen advance arm clamp bolt, rotate distributor until fixed contacts (mounted directly on breaker plate) begin to open, tighten clamp bolt. See diagram for spark plug cable connections.
Synchronization:—After timing distributor (above) and without disturbing position of distributor or crankshaft, loosen lock screws on movable subplate (carrying second set of contacts), shift plate (by inserting screwdriver in slot on plate) until second set of contacts begin to open, tighten locking screws. With correct adjustment both sets of contacts should open simultaneously. See Equipment Section for data on Synchronziation.
Firing Order:—1-6-2-5-8-3-7-4. See diagram for distributor connections.
Spark Plugs:—A.C., Type J-9. 18 MM. Metric type.
Spark Plug Gaps—.022" (.030" cars with radio).

BATTERY:—**U.S.L., Type KR-17A,** 6 volt, 17 plate, 133 A.H. capacity (20 hour rate).
Starting Capacity—152 amperes for 20 minutes.
Grounded Terminal—Positive (+) terminal.
Location—Under right hand front seat.

STARTER:—**Model MAB-4055. Armature No. MAB-2073.** Starter drive—Outboard Bendix.
Rotation—Counter-clockwise at commutator end.
Brush Spring Tension—44-56 ozs. (new brushes).

Performance Data

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

Starting Switch:—**Type VC-4003.** Mounted on starter field frame. Operated by depressing clutch pedal. Controlled by vacuum. See Equipment Section for complete data.

Mounting:—Sleeve mounted in flywheel housing right hand front side. To remove, take out pilot mounting screw in housing above starter sleeve.

GENERATOR:—**Model GAR-4601-3. Armature No. GAR-2214.** Third brush control type.
Charging Rate Adjustment—Take off commutator cover band, shift third brush by prying on brush mounting plate, counter-clockwise to increase, or clockwise to decrease charging rate. Third brush held in position by friction.
Maximum Charging Rate—15 amperes (normal), may be increased to 25 amperes (total including igntion) on cars equipped with heater or radia (generator is air-cooled).

Performance Data
Generator cold

Amperes	Volts	R.P.M.
0	6.4	760
4	6.75	920
8	7.05	1115
12	7.35	1300
16	7.7	1560
20	8.0	2300

Rotation—Counter-clockwise at commutator end.
Brush Spring Tension—24-36 ozs. (new brushes).
Field Current—4.46-4.94 amperes at 6.0 volts.
Field Fuse—7½ ampere (under cover on generator).
Motoring Current—4.89-5.41 amperes at 6.0 volts.
Mounting:—Cradle mounted at left front of engine. Fan belt drive. Water pump driven by generator shaft extension. To remove, disconnect water pump drive coupling, slack off belt adjustment, slip off drive belt, loosen mounting clamp band.
Belt Adjustment—Adjust belt when sideplay at point midway between generator and fan pulleys exceeds 1½". To adjust, loosen two cap screws on fan bracket, raise bracket until sideplay is about 1", tighten cap screws.

CUTOUT RELAY:—**Model CB-4021.** Mounted on generator field frame.
Cuts in—7.0-7.5 volts or 750 R.P.M.
Cuts out—.5-2.5 ampere discharge.
Relay Contact Gap—.025-.035".
Air Gap—.010-.030" (contacts closed).

LIGHTING:—**Soreng-Manegold Light Switch, Model 5620-A. Delco-Remy Foot Control Switch, Model 465-Z.** Foot control switch provides assymetrical passing beam (lower beam right hand headlight, upper beam left hand headlight). Headlights (without lenses) are aimed straight ahead, but lenses cause beams to cross.

Bulb Specifications

Lamp	Candlepower	Mazda No.
Headlights	32-21	1116
Fender, Instrument	3	63
Stop and Tail	21-2	1158
Dome, Corner	3	63

FUSES:—**Lighting**—20 ampere on lighting switch.
Body and Accessory—Two 20 ampere on fuse block.
Generator Field—7½ ampere (under cover on generator).

OLDSMOBILE
SIX CYLINDER MODEL F-34 (1934)
DELCO-REMY ELECTRICAL SYSTEM

SERIAL NUMBER:—First number, 51,001. On plate on right hand side front compartment floor in front of seat (sedans) or under seat (coupes).

ENGINE NUMBER:—On car serial number plate.

ENGINE:—Six cylinder, 'L' head type.

Dimensions—Bore, 3 5/16". Stroke, 4⅛". Displacement, 213.3 cu. ins.

Horsepower—Rated, 26.3. Developed, 84 H.P. at 3200 R.P.M.

Compression—5.7-1. Compression pressure, 114 lbs. at 1000 R.P.M.

Pistons:—Electro-plated cast-iron. Pistons are tin-plated after being finished and cannot be ground. Replacement pistons furnished in standard oversizes of .003", .005", .0075", .010", .015", .020", .025", .030". Cylinders must be reconditioned to standard oversize. Piston length, 3⅞".

Weight—28 ozs. (stripped), 34 ozs. (with bushings, pin and rings).

Removal—Piston and rod assembly removed from top of engine.

Clearance—.013-.020" (top), .0015-.0025" (skirt).

Fitting New Pistons—Use .002" feeler stock ½" wide to check piston clearance. Pull required to withdraw feeler stock from between piston and cylinder wall should be 4-15 lbs.

NOTE:—Piston pin hole in piston is offset 3/32". Install pistons with this offset toward camshaft (right side of engine).

Piston Rings:—Three rings per piston, #1 and 2—compression rings, #3— oil control ring. Lower ring groove is drilled radially with oil drain holes.

Ring	Width	End Gap	Wall Thickness	Groove Depth (Piston)
Comp. (all)	.124"	.009-.014"	.145"	.163"
Oil Cont.	.1865"	.009-.014"	.145"	.183"

Piston Pin:—Diameter, .8558-.8554". Length, 3 1/16". Piston pin is locked in piston by locking screw and oscillates in connecting rod.

Pin Fit in Piston—Press fit.

Pin Fit in Rod—.0001-.0008" clearance.

Connecting Rod:—Weight, 29 ozs. Length, 7 13/16" (center-to-center).

Big End Bearing—Steel-backed, babbitt-lined type. No shims used.

Clearance—.0015-.003" (radial), .006-.010" (sideplay).

Adjustment—No shims used. Replace bearings.

Crankshaft:—Four main bearing type.

Journal Sizes—#1—2 15/32", #2—2 35/64", #3—2 21/32", #4—2 23/32".

Bearing Type—Steel-backed, babbitt-lined type. No shims used.

Clearance—.001-.003" (radial).

Adjustment—No shims used. Replace bearings.

End Thrust—Taken by #2 main bearing. Endplay, .0035-.0075".

Camshaft:—Camshaft drive—Non-adjustable chain.

Chain—Whitney. Width, 1¼". Length, 23½" or 47 links. Pitch, .500".

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	Seat Angle	Lift
Intake	1 9/16"	11/32"	5 27/32"	30°	.300"
Exhaust	1 7/16"	11/32"	5 27/32"	30°	.300"

Stem-to-Guide Clearance—.00125-.00325" (intake), .00225-.00425" (exhaust).

Tappet Clearance—.008" (intake), .010" (exhaust) cold, running clearance.

Valve Springs—	Pressure	Length
Valve Closed	43 lbs.	2¼"
Valve Open	96 lbs.	1 29/32"

Valve Timing

Intake Valves Open—At TDC. Close—50° ALDC.

Exhaust Valves Open—40° BLDC. Close—10° ATDC.

NOTE:—Timing figures correct with .010" tappet clearance.

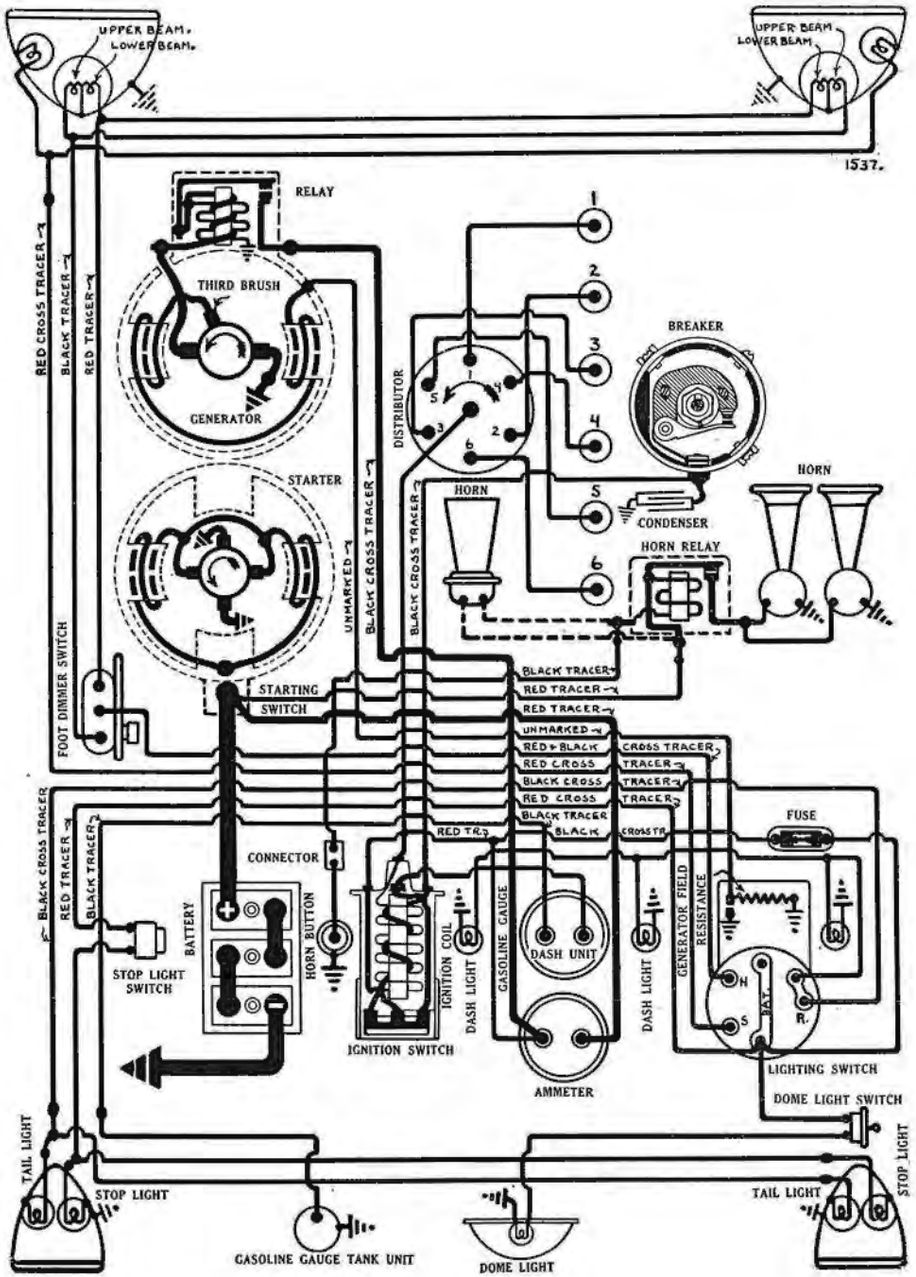
To Check Valve Timing:—Set tappet clearance #1 intake valve at .012". This valve should open with piston on top dead center when mark (TDC. Line) on vibration dampener at front of engine lines up with pointer on chain case. Reset tappet clearance at .008".

Lubrication:—Pressure type. Gear type oil pump located on lower end of inclined accessory shaft (right of crankcase).

Oil Pressure—30-35 lbs. (normal driving speeds).

Oil Pressure Relief Valve—Operates at 33 lbs. Not adjustable.

Capacity and Oil—6 qts. (refill). Use SAE. #30 (summer—normal driving 32°-80°F.), #40 (summer—high speed driving—above 80°F.), #20-W (winter 32° to 0°F.), #10-W (winter 0° to —15°F.).



OLDSMOBILE
SIX CYLINDER MODEL F-34 (1934)
DELCO-REMY ELECTRICAL SYSTEM

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

Carburetor:—Stromberg, Model EX-22 (Std.), EX-23 (optional), 1¼" plain tube, downdraft type.

Automatic Choke—Stromberg (optional equipment).

Fuel Pump:—A.C., Type V Combination fuel and vacuum pump (Std.), Type T fuel pump (optl.).

Gasoline Gauge:—A.C., Electric type.

IGNITION:—Coil Model 534-N. Lock coil type.

Ignition Current—0-2 amperes (idling), 4 amperes (stopped).

Distributor Model 622-S. Single breaker, 6 lobe cam, full automatic advance type. Distributor fitted with manual adjustment (10° advance and retard from center '0' position). Adjustment should be placed at '0' point on scale in checking and setting timing.

Breaker Gap—Set gap at .022". Limits, .018-.024".

Breaker Arm Spring Tension—17-21 ounces.

Manual Advance—20° engine (adjustment only).

Cam Angles (Distributor Degrees)—Closed 36°. Open 24°.

Automatic Advance

Distributor Degrees	Distributor R.P.M.
Start	300
13	1500
15	1900
Engine Degrees	**Engine R.P.M.**
.5	600
26	3000
30	3800

IGNITION TIMING:— Flywheel Degs. Piston Position

All engines ..... At TDC. ..... .0000" TDC.

Timing (using Timing Light):—Connect timing light between distributor terminal and ground. Turn on ignition, loosen hold-down screw, center pointer on scale ('0' center mark), tighten hold-down screw, turn engine over with #1 piston on compression, stop with piston at top dead center when mark on vibration dampener at front of engine lines up with pointer on chain case, loosen clamp bolt in advance arm, rotate distributor until timing lamp just lights (contact opening), tighten clamp bolt, see that rotor is opposite #1 segment in distributor cap, check spark plug connections (see diagram).

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

Spark Plug Gap—.025".

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

Starting Capacity—115 amperes for 20 minutes.

Grounded Terminal—Negative (—) terminal.

Location—Left hand side under driver's seat.

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

Rotation—Counter-clockwise at commutator end.

Brush Spring Tension—24-28 ounces each.

Performance Data

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

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

GENERATOR:—Model 935-F. Armature No. 1854856. Third brush regulation, lighting switch control. Field resistance on lighting switch is shorted out by switch when lamps are turned on, increasig generator output. See 'Lamp Control' generators in Equipment Section.

Charging Rate Adjustment—Ground field terminal on generator to frame. Use test ammeter to check output, shift third brush counter-clockwise to increase, or clockwise to decrease charging rate. Tighten locking screw after making adjustment.

Standard Charging Rate—17-19 amperes (cold), 8.4 volts, 2500 R.P.M. or 34 M.P.H.

Performance Data

	Amperes	Volts	R.P.M.
Cold	16-19	8.0-8.4	2400
Hot	13-15	7.7-8.0	3000

Rotation—Counter-clockwise at commutator end.

Shunt Field Current—2.3-2.6 amperes at 6.0 volts.

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

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

Belt Adjustment—Loosen mounting bolts and clamp bolt, pull generator out (away from engine), tighten clamp bolt before slacking off on generator, tighten pivot bolts.

CUT-OUT RELAY:—Model 265-H. Mounted on generator field frame.

Cuts in—6.75-7.5 volts or 12½ M.P.H.

Cuts out—0-2.0 ampere discharge current.

Relay Contact Gap—.015-.025".

Air Gap—.012-.017" (contacts closed).

LIGHTING:—Switch Model 478-V. Foot Control Switch Model 465-W. Foot control switch used to control headlights (driving or upper beams, and passing or lower or 'depressed' beams). Headlight bulbs are pre-focused type.

Bulb Specifications

Lamps	Candlepower	Mazda No.
Headlights	32-21	2320-C
Dome Lamp	6	81
All others	3	63

FUSES:—20 ampere capacity cartridge type assembled in ammeter-to-light switch lead on back of instrument board.

HORNS:—Klaxon, Model K-33D or K-26L matched set, twin horns. Vibrator type. Horns are operated by Horn Relay.

Horn Relay Model 268-L. Horn relay requires .25 amperes to close contacts. Current draw, .8 amps.

Contact Gap—.015-.025".

Air Gap—.012-.017" (contacts closed).

OLDSMOBILE
EIGHT CYLINDER MODEL L-34 (1934)
DELCO-REMY ELECTRICAL SYSTEM

SERIAL NUMBER:—First number, 18,001. On plate on right hand side front compartment floor in front of seat (sedans), or under seat (coupes).
ENGINE NUMBER:—On car serial number plate.
ENGINE:—Eight cylinder, 'L' head type. Cylinders cast enbloc.
Dimensions—Bore, 3". Stroke, 4¼". Displacement, 240.3 cu. ins.
Horsepower—Rated, 28.8. Developed, 90 H.P. at 3200 R.P.M.
Compression—Std. 5.7-1. Compression pressure, 114 lbs. at 1000 R.P.M.
Pistons:—Electro-plated cast-iron. Piston are tin plated after being finished and cannot be ground. Replacement pistons furnished in standard oversizes of .003", .005", .0075", .010", .015", .020", .025", .030". Recondition cylinders to standard oversize. Piston length, 3 11/16".
Weight—24½ ozs. (stripped), 30 ozs. (with bushings, rings and pin).
Removal—Piston and rod assembly removed at bottom of engine.
Clearance—.012-.019" (top), .0015-.0025" (skirt).
Fitting New Pistons—Use .002" feeler stock ½" wide to check clearance. Pull required to withdraw feeler from between piston and cylinder wall should be 4-15 lbs.
NOTE:—Piston pin hole in piston is offset 3/32". Install pistons with this offset toward right side of engine.
Piston Rings:—Four rings per piston, #1 and 2—compression rings, #3 and 4—oil control rings. Lower ring groove drilled radially with oil drain holes.

Ring	Width	End Gap	Wall Thickness	Groove Depth in Piston
Comp. (#1, 2)	.124"	.007-.012"	.135"	.155"
Oil Cont. (#3)	.124"	.007-.015"	.135"	.170"
Oil Cont. (#4)	.1865"	.007-.015"	.135"	.170"

Piston Pin:—Diameter, .8558-.8554". Length, 2 11/16". Pin is locked in piston and oscillates in connecting rod.
Pin Fit in Piston—Press fit.
Pin Fit in Connecting Rod—.0003-.0007" clearance.
Connecting Rod:—Weight, 32 ozs. Length, 9" (center-to-center).
Big End Bearing—Steel-backed, babbitt-lined type. No shims.
Clearance—.0015-.003" (radial), .006-.010" (sideplay).
Adjustment—None (no shims used). Replace removable bearings.
Crankshaft:—Five main bearing type with integral counterweights.
Journal Sizes—#1—2⅜", #2—2 9/16", #3—2⅝", #4—2 11/16", #5—2¾".
Bearing Type—Removable steel-backed, babbitt-lined type. No shims.
Clearance—.001-.003" (radial).
Adjustment—None (no shims used). Replace removable bearings.
End Thrust—Taken by #1 (front) main bearing. Endplay, .003-.006".
Camshaft:—Camshaft drive—Non-adjustable chain.
Chain—Whitney. Width, 1¼". Length, 23" or 46 links. Pitch, .500".
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.

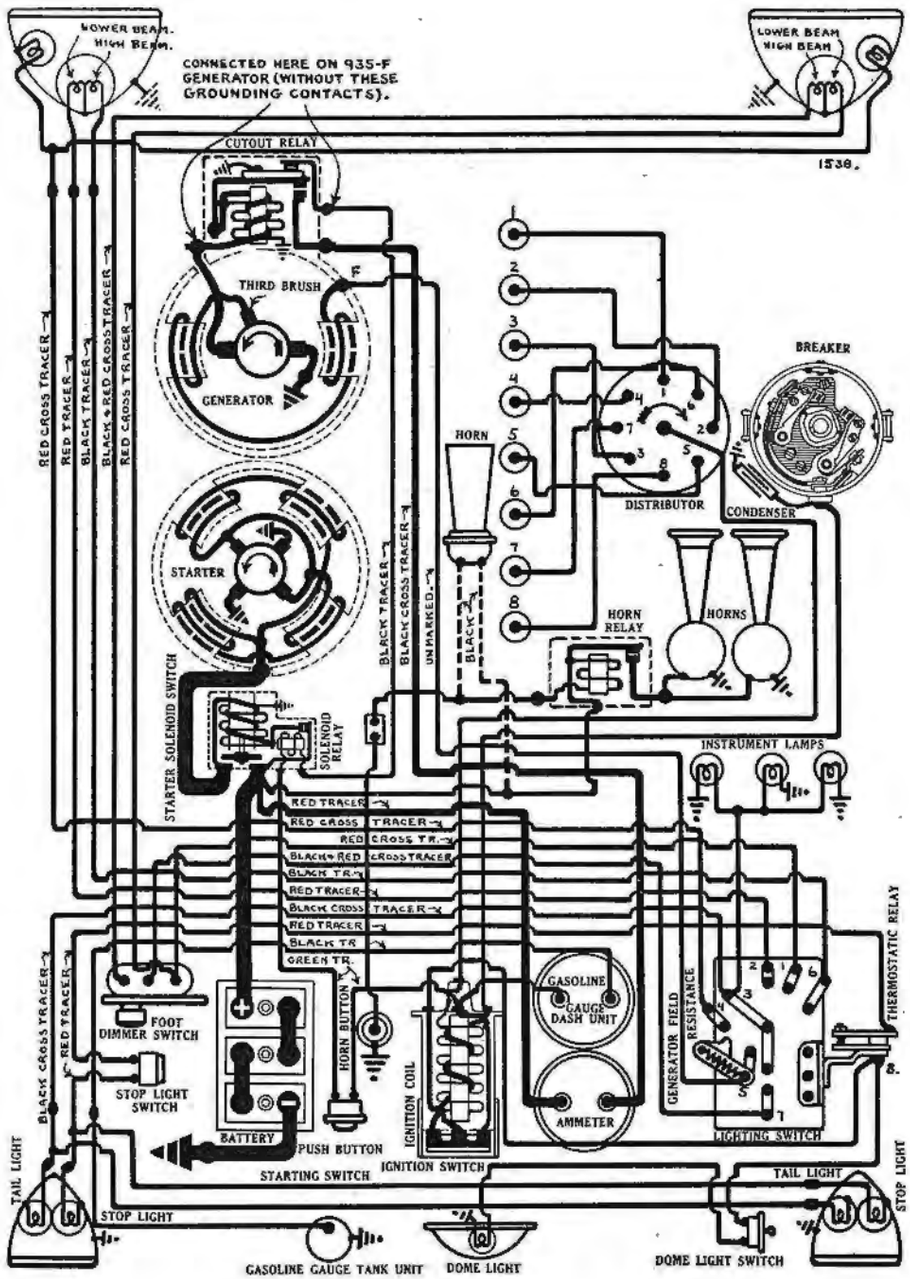
Valves:—	Head Diameter	Stem Diameter	Length	Seat Angles	Lift
Intake	1 9/16"	11/32"	5 9/32"	30°	.300"
Exhaust	1 7/16"	11/32"	5 9/32"	30°	.300"

Stem-to-Guide Clearance—.00125-.00325" (intake), .00225-.00425" (exhaust).
Tappet Clearance—.008" (intake), .010" (exhaust) cold running clearance.

Valve Springs—	Spring Pressure	Spring Length
Valve Closed	43 lbs.	2¼"
Valve Open	96 lbs.	1 29/32"

Valve Timing

Intake Valves Open—At TDC. Close—42° ALDC.
Exhaust Valves Open—40° BLDC. Close—10° ATDC.
NOTE:—Timing figures correct with .010" tappet clearance.
To Check Valve Timing:—Set tappet clearance #1 intake valve at .012". This valve should open with piston on top dead center when second mark (TDC. line) on vibration dampener at front of engine lines up with pointer on chain case. Reset tappet clearance at .008".
Lubrication:—Pressure type. Gear type oil pump located in crankcase.
Normal Oil Pressure—30-35 lbs.
Oil Pressure Relief Valve—Opens at 35 lbs. Not adjustable.
Capacity and Oil—7 qts (refill). Use SAE. #30 (summer—normal driving—32°-80°F.), #40 (summer—high speed driving above 80°F.), #20-W (winter 32° to 0°F.), #10-W (winter 0° to —15°F.).



OLDSMOBILE
EIGHT CYLINDER MODEL L-34 (1934)
DELCO-REMY ELECTRICAL SYSTEM

CARBURETION: — (Fuel System). See Carburetion Section for complete data on Carburetor, Automatic Choke, Fuel Pump, and Gasoline Gauge.
Carburetor:—Stromberg, Model EE-1, dual, 1" plain tube, downdraft type.
Automatic Choke—Stromberg, Model H.
Fuel Pump:—A.C., Type V combination fuel and vacuum pump (std.), Type T fuel pump (optl.).
Gasoline Gauge:—A.C., Electric type.

IGNITION:—Coil Model 534-N. Lock coil type.
Ignition Current—2.5 amperes (idling), 4.5 amperes (stopped).
NOTE:—Coil has extra accessory terminal for starter solenoid switch and gasoline gauge control.
Distributor Model 662-N. Double breaker, 4 lobe cam, full 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 .022". Limits, .018-.024".
Breaker Arm Spring Tension—19-23 ounces.
Cam Angles (Distributor Degrees)—Closed 34°. Open 11°. Both sets together when properly synchronized.

Automatic Advance

Distributor		Engine	
Degrees	R.P.M.	Degrees	R.P.M.
Start	300	4	600
13½	1630	27	3260

IGNITION TIMING:— Flywheel Degs. Piston Position
All engines ..... See Timing ..... .005" BTDC.
Timing (using Timing Light)—Stationary Contacts:—On cars after Serial No. 18081 stationary contacts fire even cylinders and distributor must be synchronigzed before timing distributor to engine. On cars before Serial No. 18081 distributon can be synchronized before or after timing, as desired. Connect timing light between distributor terminal and ground. Turn on ignition. Crank engine with #1 piston on compression, stop with piston .005" before top dead center when first mark (IGN line) on vibration dampener at front of engine lines up with pointer on chain case, loosen advance arm clamp bolt, rotate distributor until timing lamp just lights, indicating contacts are opening, tighten clamp bolt, see that rotor is opposite #1 segment in distributor cap, check spark plug connections (see diagram).
Synchronization—Movable Contacts:—No flywheel marks provided. Use special synchronizing tool, Oldsmobile Part #HM-J-185, Delco-Remy Part #1838182, follow complete directions in Equipment Section. Contact opening—regular 45—45—45 (distributor degrees.
Firing Order:—1-6-2-5-8-3-7-4 (see diagram).
Spark Plugs:—A.C., Type G-9. 18 MM. Metric type.
Spark Plug Gaps—.025".

BATTERY:—Delco, Type 17-GW, 6 volt, 17 plate, 107 A.H. capacity (20 hour rate).
Starting Capacity—131 amperes for 20 minutes.
Grounded Terminal—Negative (—) terminal.
Location—On left hand side under driver's seat.

STARTER:—Model 727-H. Armature No. 823881. Solenoid operated manual pinion shift type.
Rotation—Counter-clockwise at commutator end.
Brush Spring Tension—24-28 ounces each.

Performance Data

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

Starting Switch:—Solenoid Switch, Type 1514. Push-button Switch Type 1385. Starting switch and pinion shift operated by solenoid on starter field frame. Solenoid circuit controlled through solenoid relay by pushbutton on instrument panel. Operative only with ignition 'on'. See Equipment Section 'Starter Controls'.
Mounting:—Flange mounted on left hand front face of flywheel housing. To remove, take out flange mounting cap screws.

GENERATOR:—Model 935-F. Armature No. 1854856. Model 935-M. Armature No. 1853593. Third brush regulation, lighting switch control. Field resistance on lighting switch is shorted out by switch when lamps are turned on, increasing charging rate. See 'Lamp Control Generators' in Equipment Section.
Charging Rate Adjustment:—Ground field terminal on generator to frame. Use test ammeter to check output, shift third brush counter-clockwise to increase, or clockwise to decrease charging rate, tighten locking screw after making adjustment.
Maximum Charging Rate—19 amperes (cold), 8.4 volts, 2500 R.P.M. or 34 M.P.H.

Performance Data

	Amperes	Volts	R.P.M.
Cold	16-19	8.0-8.4	2400
Hot	13-15	7.7-8.0	3000

Rotation—Counter-clockwise at commutator end.
Field Current—2.3-2.6 amperes at 6.0 volts.
Brush Spring Tension—22-26 ozs. (main), 16-20 ozs. (third brush).
Mounting:—Pivot mounted at left front of engine. Driven by fan belt. To remove, take out two pivot bolts, one clamp bolt.
Belt Adjustment:—Loosen pivot bolts and clamp bolt, pull generator away from engine, tighten clamp bolt before slacking off on generator, tighten pivot bolts.

CUT-OUT RELAY:—Model 265-H (used on 935-F Generator).
Cuts in—6.75-7.5 volts or 12½ M.P.H.
Cuts out—0-2.5 ampere discharge.
Relay Contact Gap—.015-.025" (contacs closed).
Air Gap—.012-.017" (contacts closed).
Model 265-T (used on 935-M Generator). This model has extra set of contacts above armature for starter solenoid relay circuit control (see diagram). All data same as 265-H.

LIGHTING:—Switch Model 478-R. Foot Control Switch Model 465-W. Foot control switch operative with lighting switch in 'Country' position, provides asymetrical passing beam (right hand headlight beam depressed—headlights aimed so that beams cross). Headlight bulbs are Pre-focused type.

Bulb Specifications

Lamp	Candlepower	Mazda No.
Headlights	32-21	2320-C
Dome	6	81
All others	3	63

THERMOSTATIC RELAY: — New type thermostatic arm current limit relay (no winding). Mounted on lighting switch, protects lighting circuits. Contacts open with current load of 30 amperes.

HORNS:—Klaxon, Model K-33D matched set, blended tone. Type K-26-L (optional). Vibrator type. Horns operated by horn relay.
Horn Relay Model 266-T, 268-L:—Horn relay requires .25 amperes to close contacts. Current draw, .8 amperes.
Contact Gap:—.015-.025".
Air Gap:—.012-.017" (contacts closed).

PACKARD

EIGHT, MODELS 1100, 1101, 1102 (1934)

OWEN-DYNETO ELECTRICAL EQUIPMENT—DELCO-REMY IGNITION

SERIAL NUMBER:—First number—374,001. On plate on left hand front side of dash

ENGINE NUMBER:—On top of left hand front engine support arm.

ENGINE:—Eight cylinder In Line, 'L' head type. Cylinders cast enbloc.

Dimensions—Bore, 3 3/16". Stroke, 5". Displacement, 320 cu. ins.
Horsepower—Rated, 32.5. Developed, 120 H.P. at 3200 R.P.M.
Compression—Std. 6.0-1. Compression pressure, 95-100 lbs. at 125 R.P.M.
Optl. 6.36-1. Compression pressure, 123 lbs. at 125 R.P.M.

Pistons:—Aluminum alloy, Invar strut, split skirt type.
Removal—Piston and rod assembly removed through bottom of engine.
Clearance—.0015" (skirt).
NOTE:—Istall pistons with slot toward valve side of engine.

Piston Rings:—Four rings per piston, all above pin. #1 to 3, compression rings. #4, oil control ring. Lower ring groove drilled radially with twelve 1/8" oil drain holes.

Ring	Width	End Gap	Groove Depth
Comp. (all)	1/8"	.007" min.	.1575"
Oil Cont. (#4)	5/32"	.007" min.	.1575"

Piston Pin:—Diameter, 7/8". Length, 2 47/64". Pin floats in piston and rod.
Pin Fit in Piston—Push fit.
Pin Fit in Rod—Hand push fit. End play, 1/8".

Connecting Rod:—Weight, 2 lbs., 6 3/4 ozs. Length, 10 7/8".
Big End Bearing—Poured babbitt type.
Clearance—.0015" (radial), .003" (sideplay).
Adjustment—None (no shims).
NOTE:—Rods now installed with oil bleed holes (upper half lower bearing) toward valve side of engine.

Crankshaft:—Nine main bearing type.
Journal Sizes—2 5/8" diameter (all bearings).
Bearing Type—Removable steel-backed, babbitt-lined type.
Clearance—.001" (radial).
Adjustment—None (no shims). Replace removable bearings.
End Thrust—Taken by #7 main bearing. Endplay, .003"

Camshaft:—Drive, adjustable chain. Eight bearing type.
Chain—Morse #1866. Width, 1 1/2". Length, 32" or 64 links. Pitch, .500".
Camshaft Setting—Sprokets are marked. Mesh chain with sprockets turned so that marks are adjacent and in line with a straightedge across the shaft centers.
Chain Adjustment—See Generator Mounting.

Valves:—	Head Dia.	Stem Dia.	Length	Seat Angle	Lift
Intake	1 21/32"	.3405"	7 3/8"	45°	.358"
Exhaust	1 15/32"	.3405"	7 3/8"	45°	.358"

Stem-to-Guide Clearance—.0025" (intake), .004" (exhaust).
Tappet Clearance—.004" (intake), .006" (exhaust) warm.
Valve Springs—73 lbs. at 3 1/16" (valve closed).

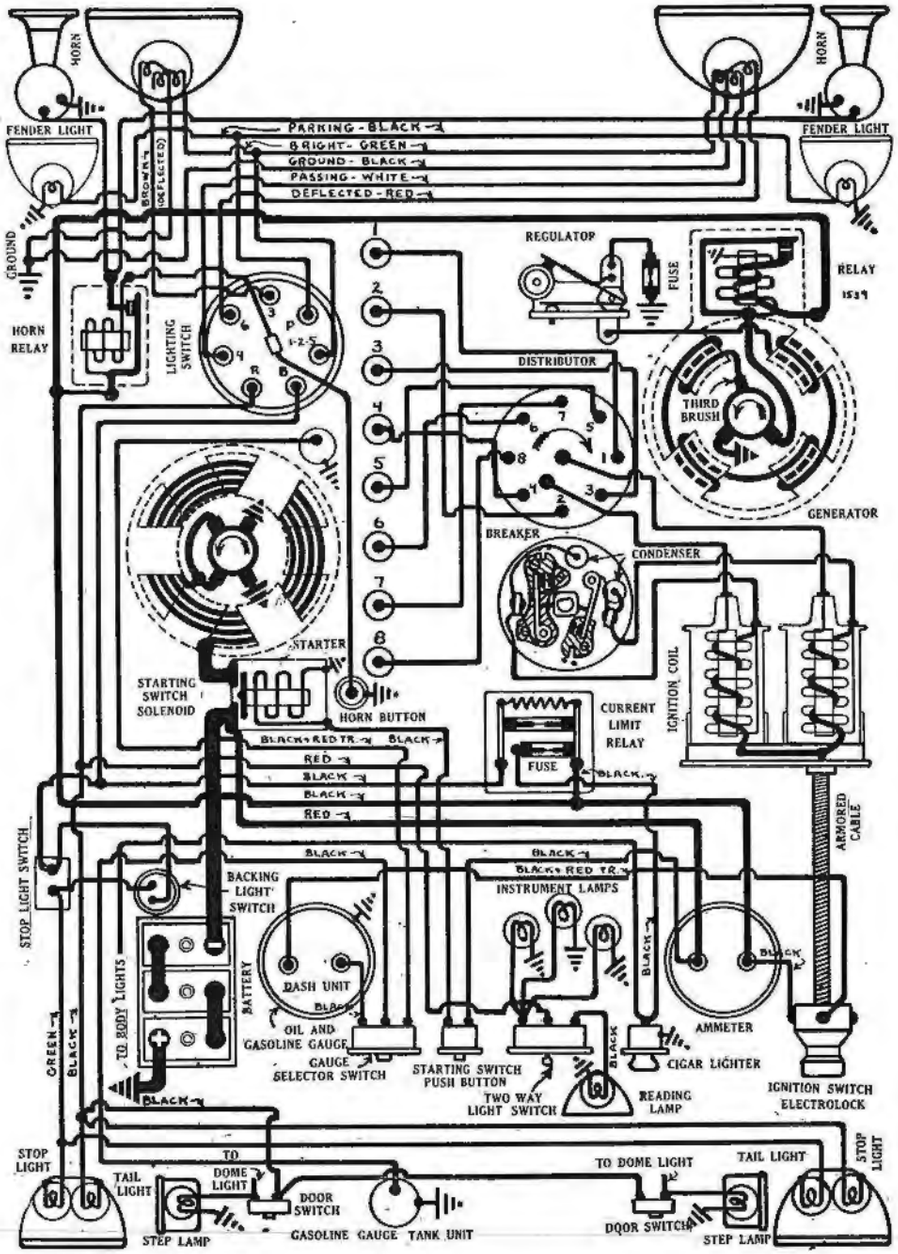
Valve Timing

Intake Valves Open—30° Before TDC.	Close—65° After LDC.
Exhaust Valves Open—65° Before LDC.	Close—30° After TDC.

Lubrication:—Full pressure type. Gear type oil pump located in crankcase.
Normal Oil Pressure—35 lbs.
Oil Pressure Relief Valve—Operates at 35 lbs. Located on left hand side of crankcase. Adjustable by turning screw.
Capacity and Oil—8 qts. Use SAE #30 (normal temperatures—30° to 100°F) #40 (above 100°F), #20-W (0° to 60°F), #10-W (—15° to 40°F).

CARBURETION:—(Fuel System). See Carburetion Section for complete data on Carburetor, Automatic Choke, Fuel Pump, and Gasoline Gauge.
Carburetor:—Stromberg, Model EE-22, 1 15/16" dual, downdraft type.
Automatic Choke—Stromberg.
Fuel Pump:—AC. Type F combination fuel and vacuum pump.
Gasoline Gauge:—Motometer Electric type combination gasoline and oil gauge. Oil reading secured by pressing button of selector switch.

IGNITION:—Coil Model 5033449. Two coil unit assembled with ignition switch.
Ignition Current—1.3 amperes (running), 5 amperes (stopped) each coil.
Ignition Switch—Electrolock Type 16-S, Lock No. 5002. See Equipment Section for complete data.



PACKARD

EIGHT, MODELS 1100, 1101, 1102 (1934)

OWEN-DYNETO ELECTRICAL EQUIPMENT—DELCO-REMY IGNITION

Distributor Model 5033450. Two breaker, 4 lobe cam, full automatic advance type. Contacts open alternately at regular 45° intervals corresponding to 90° firing interval of engine. Contacts must be synchronized—see Timing. Each set of contacts controls one coil and fires spark plugs in four cylinders.

Breaker Gap—Set gap at .020". Limits, .018-.022".
Breaker Arm Spring Tension—15-19 ounces.
Cam Angles (Distributor Degrees) — Closed 45°. Open 45°. Each set of contacts operates independently and controls one ignition coil.

Automatic Advance

Distributor Degrees	R.P.M.	Engine Degrees	R.P.M.
Start	300	0	600
7½	1400	15	2800

IGNITION TIMING:— Flywheel Degs. Piston Position
Std. (6-1) Engines.....6° BTDC.....0168" BTDC
H.C. (6.36-1) Engines..8° BTDC.....0299" BTDC
Timing (Stationary Contacts), all engines:—Vibration dampener at front of engine marked 'D.C.-1-8' at top dead center point for piston #1 and has 15 one-degree graduations before this point. To set timing with #1 piston on compression, turn engine over until pistion reaches firing position with correct mark on vibration dampener in line with pointer on chain case cover (sixth mark standard engines, eighth mark H.C. engines). Loosen advance arm clamp bolt, rotate distributor until first or stationary contacts (mounted directly on breaker plate) begin to open, tighten clamp bolt. Second or movable set of contacts should then be timed by synchronizing distributor.

Synchronization (Movable Contacts):—After timing distributor (above), turn engine over 90° or ¼ revolution to firing position for piston #6, stop with correct line on vibration dampener at front of engine lined up with pointer (sixth line standard engines, eighth line H.C. engines before dead center mark for piston #6). Loosen lockscrew on movable plate carrying second set of contacts, shift plate by inserting screwdriver in slot and prying on plate until contacts begin to open, tighten lockscrew.

Synchronization, second method:—If distributor is synchronized on rotary spark gap or other test equipment, set firing intervals at regular 45-45-45 (distributor degrees).
Firing Order:—1-6-2-5-8-3-7-4. Spark plug cables not connected in this order on distributor. See diagram.
Spark Plugs:—AC. Type K-7. 14 MM. Metric Type.
Spark Plug Gaps—.025" (all engines).

BATTERY:—Prest-O-Lite, Type 619-ST. 6 volt, 19 plate, 144 A.H. capacity (5 ampere rate).
Starting Capacity—170 amperes for 20 minutes.
Grounded Terminal—Positive (+) terminal.
Location—Under left front seat.

STARTER:—Model DI-1034, DI-1161. Armature No. 13292.
Starter Drive—Outboard Bendix.
Rotation—Counter-clockwise at commutator end.
Brush Spring Tension—26-28 ounces.

Performance Data

Torque	R.P.M.	Volts	Amperes
0 ft. lbs.	3500-4000	6.0	60
27 "	Lock	3.6	650

Starting Switch, Model 21518. Electro-magnetic (solenoid) type mounted on starter field frame and controlled by pushbutton on instrument panel.
Mounting:—Sleeve mounted in flywheel housing left hand front side. To remove, take out pilot mounting screw in flywheel housing.

GENERATOR:—Model CO-1177. Armature No. 23661. Third brush control used in conjunction with Battery Charge Regulator. See Equipment Section for complete data on Regulator.
Charging Rate Adjustment—Third brush shifted through rack-and-pinion control by slotted adjusting screw on endplate. To adjust, take off commutator end cover, turn adjusting screw to right or clockwise to increase, or left or counter-clockwise to decrease charging rate.

Performance Data

Amperes	Volts	R.P.M.
0	6.5	475
20	7.5	1000
24	8.0	1400
13	8.0	5000

Field Fuse—3 ampere capacity (in plug in regulator case).
Mounting:—Flange mounted on right hand rear face of timing chain case. To remove, take out three mounting screws, slide generator to rear to disengage drive coupling, lift out. Do not disturb intermediate flange carrying drive sprocket.
Chain Adjustment — Loosen generator flange mounting screws, pull generator away from engine until chain sideplay as measured at chain inspection plug hole in top of chain case cover is ¼", tighten mounting screws. Adjust chain whenever sideplay exceeds ½".

RELAY-REGULATOR:—Model 21262. Mounted on generator field frame. Consists of Cut-out Relay and Battery Charge Regulator.

Cut-out Relay

Cuts in—6.5 volts or 475 R.P.M.
Cuts out—0-2 ampere discharge current.
Relay Contact Gap—.015".
Air Gap—.010" (contacts closed).

Battery Charge Regulator

Set to operate at 8.0 volts (cold), 7.6 volts (hot). Reduces charging rate approximately ½ by cutting in a field resistance unit. See Equipment Section for complete data.

LIGHTING:—R.B.M. Lighting Switch. Switch mounted at lower end of steering column and controlled by lever on steering wheel. Switch has special passing position providing assymmetrical passing beam. Headlight bulbs are special triple filament type.

Bulb Specifications

Lamp	Candlepower	Mazda No.
Headlights	32-32-32	3003
Parking, Instrument, Tail	3	63
Stop light	15	87
Body Lights	6	81

FUSES:—Lighting—20 ampere capacity on block on dash. A resistor is connected across the lighting fuse to limit current load after fuse blows out
Generator Field—3 ampere in plug in regulator case.

HORNS:—Sparton twin horns. Horns operated by horn relay.

PACKARD

SUPER EIGHT, MODELS 1103, 1104, 1105 (1934)

OWEN-DYNETO ELECTRICAL EQUIPMENT—DELCO-REMY IGNITION

SERIAL NUMBER:—First number, 752001. On plate on left hand front side of dash.

ENGINE NUMBER:—On top of front left hand engine support arm.

ENGINE:—Eight cylinder, In Line, 'L' head type. Cylinders cast Enbloc.
Dimensions—Bore, 3½". Stroke, 5". Displacement, 384.8 cu. ins.
Horsepower—Rated, 39.2. Developed, 145 H.P. at 3200 R.P.M.
Compression—Std. 6.0-1. Compression pressure, 95-100 lbs. at 125 R.P.M. Optl. H.C. 6.38-1. Compression pressure, 123 lbs. at 125 R. P. M.

Pistons:—Aluminum alloy, Invar Strut, split skirt type.
Removal—Piston and rod assembly removed through bottom of engine.
Clearance—.0015" (skirt).
NOTE—Install pistons with slot toward valve side of engine.

Piston Rings:—Four rings per piston, all above pin, #1 to 3—compression rings, #4—oil control ring. Lower ring groove drilled radially with twelve ⅛" oil drain holes.

Ring	Width	End Gap	Groove Depth
Comp. (all)	⅛"	.007" min.	.1585"
Oil Cont. (#4)	5/32"	.007" min.	.1585"

Piston Pin:—Diameter, ⅞". Length, 3 3/64". Pin floats in piston and rod.
Pin Fit in Piston—Push fit.
Pin Fit in Rod—Hand push fit. Endplay, ⅛".

Connecting Rod:—Weight, 2 lbs., 13¾ ozs. Length, 10⅞".
Big End Bearing—Poured babbitt type.
Clearance—.0015" (radial), .003" (sideplay).
Adjustment—None (no shims).
NOTE:—Rods now installed with oil bleed holes (upper half lower bearing) toward valve side of engine.

Crankshaft:—Nine main bearing type.
Journal Sizes—2⅝" diameter (all bearings).
Bearing Type—Removable steel-backed, babbitt-lined type.
Clearance—.001" (radial).
Adjustment—None (no shims). Replace removable bearings.
End Thrust—Taken by #7 main bearing. Endplay, .003".

Camshaft:—Eight bearing type. Camshaft drive—Adjustable chain.
Chain—Morse #1866. Width, 1½". Length, 32" or 64 links. Pitch, .500".
Camshaft Setting—Sprockets are marked. Mesh chain with sprockets turned so that marks are adjacent and in line with straightedge across the shaft centers.
Chain Adjustment—See Generator Mounting.

Valves:—	Head Dia.	Stem Dia.	Length	Seat Angle	Lift
Intake	1 13/16"	.3405"	7⅜"	45°	.358"
Exhaust	1 11/16"	.3405"	7⅜"	45°	.358"

Stem-to-Guide Clearance—.0025" (intake), .004" (exhaust).
Tappet Clearance—.004" (intake), .006" (exhaust) warm.
Valves Springs—73 pounds at 3 1/16" (valve closed).

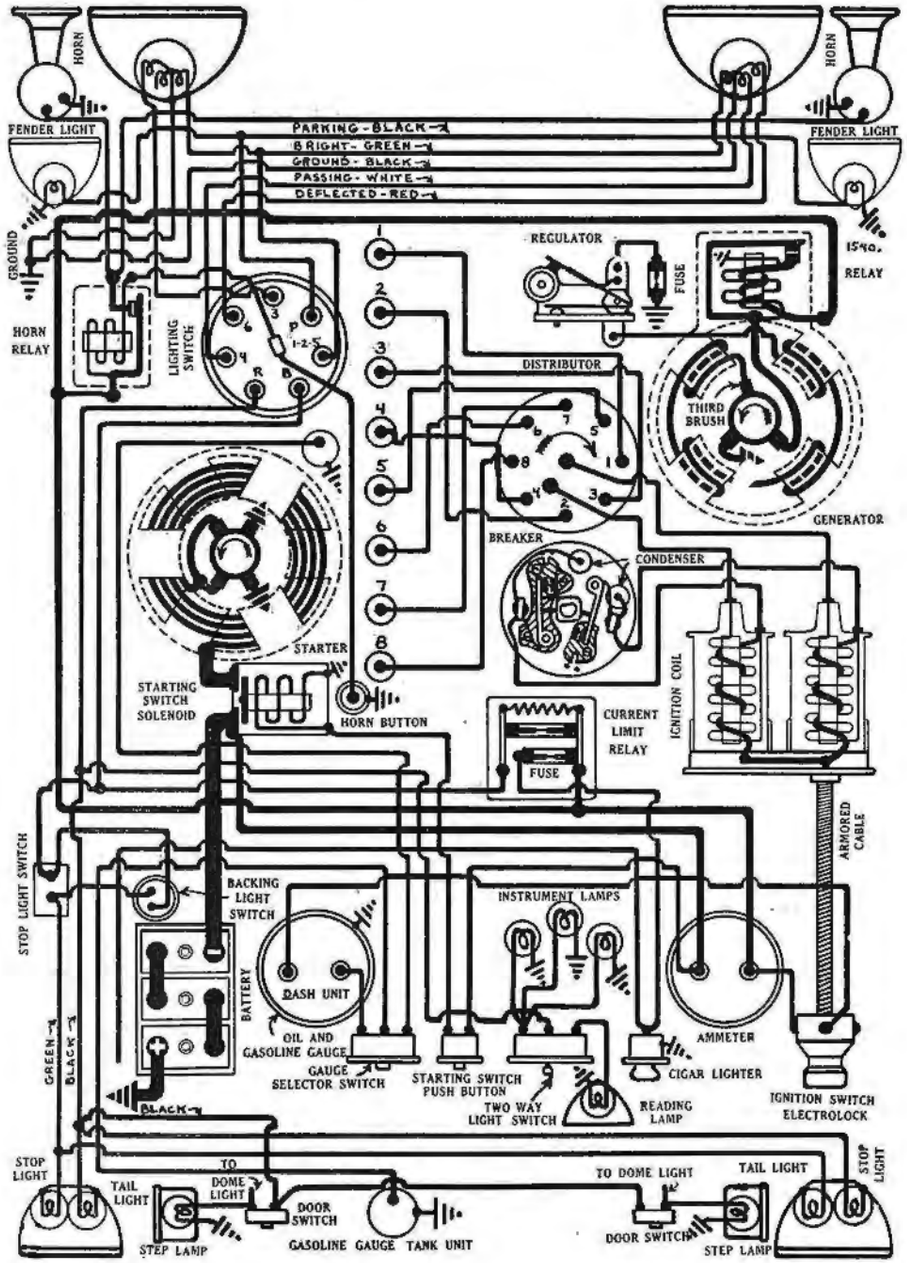
Valve Timing

Intake Valves Open—30° BTDC. Close—65° ALDC.
Exhaust Valves Open—65° BLDC. Close—30° ATDC.

Lubrication:—Full pressure type. Gear type oil pump located in crankcase.
Normal Oil Pressure—35 lbs.
Oil Pressure Relief Valve—Operates at 35 lbs. Located on left hand side of crankcase. Adjustable by turning screw.
Capacity and Oil—10 qts. Use SAE. #30 (normal temperatures—30° to 100°F), #40 (above 100°F), #20-W (0° to 60°F), #10-W (-15° to 40°F).

CARBURETION:—(Fuel System). See Carburetion Section for complete data on Carburetor, Automatic Choke, Fuel Pump, and Gasoline Gauge.
Carburetor:—Stromberg, Model EE-22, 2 1/16" dual, downdraft type.
Automatic Choke—Stromberg.
Fuel Pump:—AC. Type F combination fuel and vacuum pump.
Gasoline Gauge:—Motometer electric type gasoline and oil gauge. Oil reading obtained by pressing selector switch button.

IGNITION:—**Coil Model 5033449.** Two coil unit assembled with ignition switch.
Ignition Current—1.3 amperes (running), 5 amperes (stopped) each coil.
Ignition Switch—Electrolock Type 16-S, Lock No. 5002. See Equipment Section for complete data.



PACKARD

SUPER EIGHT, MODELS 1103, 1104, 1105 (1934)

OWEN-DYNETO ELECTRICAL EQUIPMENT—DELCO-REMY IGNITION

Distributor Model 5033450. Two breaker, 4 lobe cam, full automatic advance type. Contacts open alternately at regular 45° intervals corresponding to 90° firing interval of engine. Contacts must be synchronized—see Timing. Each set of contacts controls one coil and fires spark plugs in four cylinders.

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

Breaker Arm Spring Tension—15-19 ounces.

Cam Angles (Distributor Degrees) — Closed 45°. Open 45°. Each set of contacts operates independently and controls one ignition coil.

Automatic Advance

Distributor		Engine	
Degrees	R.P.M.	Degrees	R.P.M.
Start	300	0	600
7½	1400	15	2800

IGNITION TIMING:— Flywheel Degs. Piston Position

Std. (6-1) Engines.....6° BTDC.....0168" BTDC

H.C. (6.38-1) Engines..8° BTDC.....0299" BTDC

Timing (Stationary Contacts), all engines:—Vibration dampener at front of engine marked 'D.C.-1-8' at top dead center point for piston #1 and has 15 one-degree graduations before this point. To set timing with #1 piston on compression stroke, turn engine over until piston reaches firing position, stop when sixth graduation (standard engines), eighth graduation (H.C. engines) before top dead center mark lines up with pointer on chain case cover. Loosen advance arm clamp bolt, rotate distributor until stationary contacts (mounted directly on breaker plate) begin to open, tighten clamp bolt. Second or movable set of contacts timed by synchronizing distributor.

Synchronization (Movable Contacts):—After timing distributor (above), turn engine over 90° or ¼ revolution to firing position for piston #6, stop when sixth graduation (standard engine), eighth graduation (H.C. engine) before top dead center mark for piston #6 lines up with pointer, loosen lockscrews on movable sub-plate (carrying second set of contacts), shift plate by inserting screwdriver in slot and prying on plate until contacts begin to open, tighten lockscrews.

Synchronization, second method:—If distributor is synchronized on rotary spark gap or other test equipment, set firing intervals at regular 45-45-45 (distributor degrees).

Firing Order:—1-6-2-5-8-3-7-4. Spark plug cables not connected in this order on distributor. See diagram.

Spark Plugs:—AC. Type K-7. 14 MM. Metric Type.

Spark Plug Gaps—.025" (all engines).

BATTERY:—Prest-O-Lite, Type 619-ST. 6 volt, 19 plate, 144 A.H. capacity (5 ampere rate).

Starting Capacity—170 amperes for 20 minutes.

Grounded Terminal—Positive (+) terminal.

Location—Under left front seat.

STARTER:—Model DN-1107, DN-1162. Armature No. 13409.

Starter Drive—Outboard Bendix.

Rotation—Counter-clockwise at commutator end.

Brush Spring Tension—26-28 ounces.

Performance Data

Torque	R.P.M.	Volts	Amperes
0 ft. lbs.	3000	6.0	50
35 "	Lock	3.5	650

Starting Switch, Model 21518. Electro-magnetic (solenoid) type mounted on starter field frame and controlled by pushbutton on instrument panel.

Mounting:—Sleeve mounted in flywheel housing left hand front side. To remove, take out pilot mounting screw in flywheel housing.

GENERATOR:—Model CO-1177. Armature No. 23661. Third brush control used in conjunction with Battery Charge Regulator. See Equipment Section for complete data on Regulator.

Charging Rate Adjustment—Third brush shifted through rack-and-pinion control by slotted adjusting screw on endplate. To adjust, take off commutator end cover, turn adjusting screw to right or clockwise to increase, or left or counter-clockwise to decrease charging rate.

Performance Data

Amperes	Volts	R.P.M.
0	6.5	475
20	7.5	1000
24	8.0	1400
13	8.0	5000

Field Fuse—3 ampere capacity (in plug in regulator case).

Mounting:—Flange mounted on right hand rear face of timing chain case. To remove, take out three mounting screws, pull generator away from engine engage drive coupling, lift out. Do not disturb intermediate flange carrying drive sprocket.

Chain Adjustment — Loosen generator flange mounting screws, pull generator away from engine until chain sideplay as measured at chain inspection plug hole in top of chain case cover is ¼", tighten mounting screws. Adjust chain whenever sideplay exceeds ½".

RELAY-REGULATOR:—Model 21262. Mounted on generator field frame. Consists of Cut-out Relay and Battery Charge Regulator.

Cut-out Relay

Cuts in—6.5 volts or 475 R.P.M.

Cuts out—0-2 ampere discharge current.

Relay Contact Gap—.015".

Air Gap—.010" (contacts closed).

Battery Charge Regulator

Set to operate at 8.0 volts (cold), 7.6 volts (hot). Reduces charging rate approximately ½ by cutting in a field resistance unit. See Equipment Section for complete data.

LIGHTING:—R.B.M. Lighting Switch. Switch mounted at lower end of steering column and controlled by lever on steering wheel. Switch has special passing position providing assymmetrical passing beam. Headlight bulbs are special triple filament type.

Bulb Specifications

Lamp	Candlepower	Mazda No.
Headlights	32-32-32	3003
Parking, Instrument, Tail	3	63
Stop light	15	87
Body Lights	6	81

FUSES:—Lighting—20 ampere capacity on block on dash. A resistor is connected across the lighting fuse to limit current load after fuse blows out.

Generator Field—3 ampere in plug in regulator case.

HORNS:—Sparton twin horns. Horns operated by horn relay.

PACKARD

TWELVE CYLINDER, MODELS 1107, 1108 (1934)
OWEN-DYNETO ELECTRICAL EQUIPMENT—AUTO-LITE IGNITION

SERIAL NUMBER:—First number, 901,601. On plate on left front side of dash.

ENGINE NUMBER:—On left hand cylinder block below cylinder head.

ENGINE:—Twelve cylinder, 67 degree, Modified 'L' head type. Both cylinder banks and crankcase cast enbloc.
Dimensions—Bore, 3 7/16". Stroke, 4". Displacement, 445.5 cu. ins.
Horsepower—Rated, 56.7. Developed, 160 H.P. at 3200 R.P.M.
Compression—Std. 6.0-1. Compression pressure, 95-100 lbs. at 125 R.P.M.
Optl. H.C. 6.33-1. Compression pressure, 123 lbs. at 125 R.P.M.

Pistons:—Aluminum alloy, Invar strut, split skirt type.
Weight—1½ pounds (with rings and pin).
Removal—Pistons removed through top; rods through bottom of engine.
Clearance—.0015" (skirt).
NOTE:—Install pistons with slot toward valve side of engine.

Piston Rings:—Four rings per piston, all above pin. #1 to 3, compression rings; #4, oil control ring. Lower ring groove drilled radially with twelve ⅛" oil drain holes.

Ring	Width	End Gap	Groove Depth
Comp. (all)	⅛"	.007" min.	.1582"
Oil Cont. (#4)	5/32"	.007" min.	.1582"

Piston Pin:—Diameter, ⅞". Length, 2 63/64". Pin floats in piston and rod.
Pin Fit in Piston—Push fit.
Pin Fit in Rod—Hand push fit. Endplay, ⅛".

Connecting Rod:—Weight, 2 lbs. 5 ozs. Length, 9⅛" (center-to-center).
Big End Bearing—Poured babbitt type.
Clearance—.0015" (radial), .003" (sideplay).
Adjustment—None (no shims).

NOTE:—Rods now installed with oil bleed hole (upper half lower bearing) toward valve side of engine.

Crankshaft:—Four main bearing type.
Journal Sizes—2¾" diameter (all bearings).
Bearing Type—Removable steel-backed, babbitt lined type.
Clearance—.001" (radial).
Adjustment—None (no shims). Replace removable bearings.
End Thrust—Taken by #1 (front) main bearing. Endplay, .003":

Camshaft:—Four bearing type. Camshaft drive, non-adjustable chain.
Chain—Whitney Type 595-X. Width, 1½". Length, 28" or 56 links. Pitch, .500".
Camshaft Setting—Sprockets are marked. Mesh chain with sprockets turned so that marks are adjacent and in line with a straight edge aeross the shaft centers.

Valves:—Valves are mounted at 20° angle to horizontal and are operated directly by rocker arms which bear on cam face. Camshaft is mounted between cylinder banks directly above crankshaft. Hydraulic valve tappet take-up is built in rocker arm shaft.

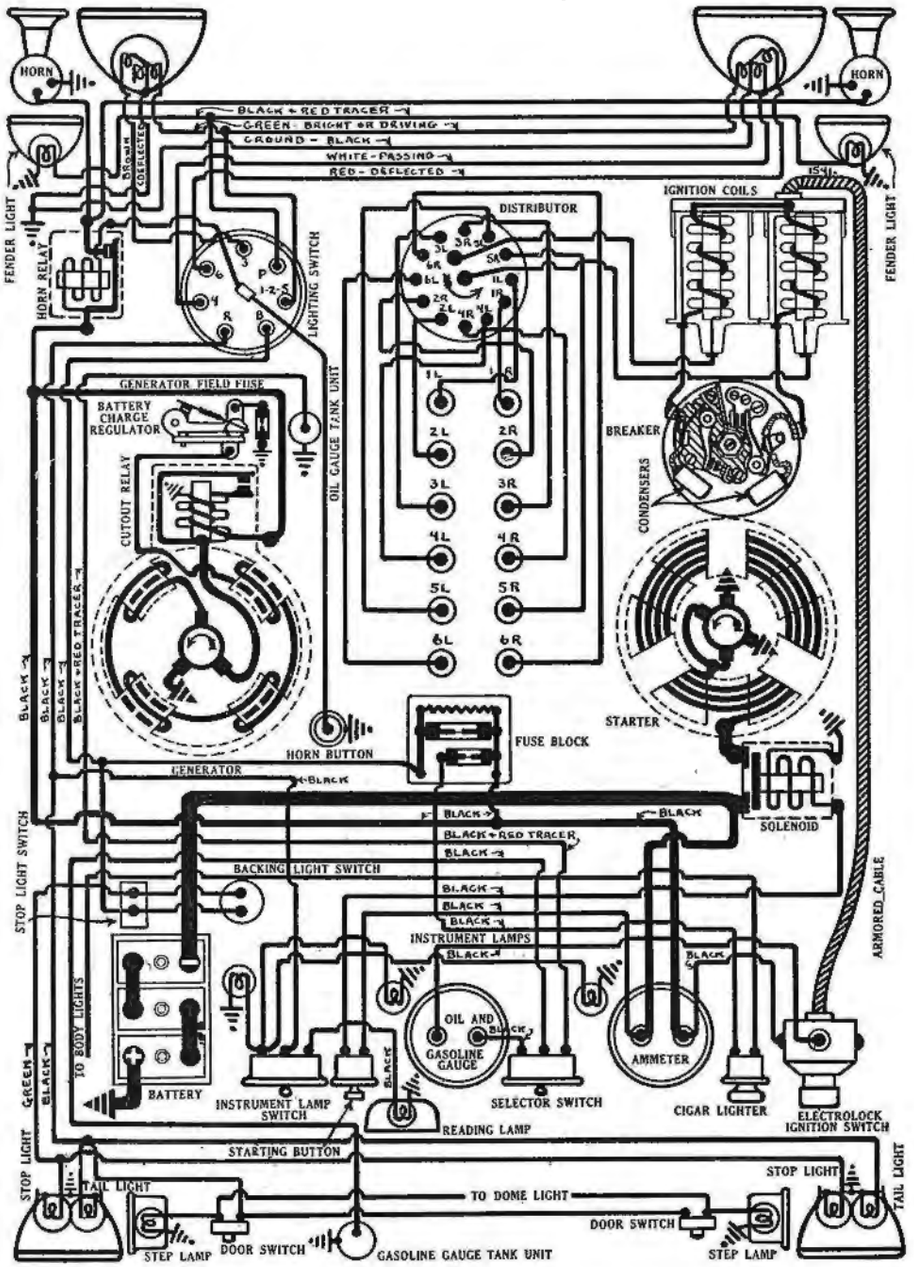
Valve	Head Diam.	Stem Diam.	Length	Seat Angle	Lift
Intake	1 21/32"	.3405"	6 35/64"	45°	5/16"
Exhaust	1 21/32"	.338"	6 35/64"	45°	5/16"

Stem-to-Guide Clearance—.0025" (intake), .005" (exhaust).
Tappet Clearance—None in service (hydraulic take-up used).
Valve Springs—70 lbs. at 2 7/32" (valves closed).

Valve Timing

Intake valves open 9° before TDC.

Lubrication:—Full Pressure type. Gear type oil pump located in crankcase.
Normal Oil Pressure—50 pounds.
Oil Pressure Relief Valve—Under plug on left hand side of crankcase below oil filler. Adjustable by turning screw.
Capacity and Oil—10 qts. Use SAE #30 (normal temperature ranges, 30° to 100° F), #40 (above 180° F), #20-W (0° to 60° F), #18-W (—15° to 40° F).



PACKARD

TWELVE CYLINDER, MODELS 1107, 1108 (1934)
OWEN-DYNETO ELECTRICAL EQUIPMENT—AUTO-LITE IGNITION

CARBURETION: — (Fuel System). See Carburetion Section for complete data on Carburetor, Automatic Choke, Fuel Pump, and Gasoline Gauge.
Carburetor:—Stromberg. Model EE-3, 1½" dual, downdraft type.
Automatic Choke—Stromberg.
Fuel Pump:—AC. Type I combination fuel and vacuum pump.
Gasoline Gauge:—Motometer electric type gasoline and oil gauge. Oil reading obtained by pressing button of selector switch.

IGNITION:—Coil Model CE-4022. Two coil unit assembled with ignition switch.
Ignition Current—6 amperes (running), 10 amperes (stopped) maximum current for both coils.
Ignition Switch—Electrolock Type 15-S, Lock No. 5039. See Equipment Section for complete data.
Distributor Model IGO-4001. Double breaker, 6 lobe cam, full automatic advance type. Contacts open alternately at 33½ and 26½ degree intervals corresponding to irregular 67 and 53 degree firing intervals of engine (irregular firing interval caused by 67° included angle between cylinder banks). Contacts must be synchronized—see Timing.
Breaker Gap—Set gaps at .020". Limits, .018-.022"
Breaker Arm Spring Tension—20 ozs. at tip of arm.
Cam Angles (Distributor Degrees) — Closed 40°. Open 20°. Each breaker operates independently and controls one coil.

Automatic Advance

Distributor Degrees	Distributor R.P.M.	Engine Degrees	Engine R.P.M.
Start	300	0	600
2	575	4	1150
4	850	8	1700
6	1125	12	2250
8	1400	16	2800

IGNITION TIMING:— Flywheel Degs. Piston Position
Std. (6.0-1) Engines....8° BTDC..... .0237" BTDC
H.C. (6.33-1) Engines..4° BTDC..... .0060" BTDC
Timing (Stationary Contacts), all engines:—Vibration dampener at front of engine marked '1R-UDC' at top dead center point for piston #1R and has fifteen one degree graduations before this point. To set timing with #1R piston on compression, turn engine over until piston reaches firing position with correct mark on dampener lined up with pointer on chain case cover (eighth mark standard engines, fourth mark H.C. engines before dead center mark). Loosen clamp screw on mounting bracket, rotate distributor until stationary contacts (mounted directly on breaker plate) begin to open, tighten clamp screw. Second or movable contacts should then be timed by synchronizing distributor.
Synchronization (Movable Contacts):—After timing distributor (above), crank engine over exactly 67° to firing position for piston #6L, stop when correct mark on vibration dampener lines up with pointer (eighth mark standard engines, fourth mark H.C. engines before dead center mark '6L-UDC'). Loosen lockscrews on movable subplate carrying second set of contacts, turn eccentric adjusting screw until contacts begin to open, tighten lockscrews.
Synchronization (Second Method):—If distributor is synchronized on rotary spark gap or other test equipment, set movable contacts to open 26½° after first or stationary set. Distributor intervals are irregular 26½-33½-26½ (distributor degrees).
Firing Order: — 1R-6L-5R-2L-3R-4L-6R-1L-2R-5L-4R-3L. #1 cylinder nearest radiator and cylinder banks right (R) and left (L) as viewed from driver's seat. Spark plug cables not connected in this order—see diagram.
Spark Plugs:—AC. Type K-7. 14 MM. Metric type.
Spark Plug Gaps—.025" (all engines).

BATTERY:—Prest-O-Lite, Type 619-ST. 6 volt, 19 plate, 144 A.H. capacity (5 hour rate).
Starting Capacity—170 amperes for 20 minutes.
Grounded Terminal—Positive (+) terminal.
Location—Under left hand front seat.

STARTER:—Model DN-1107, DN-1162. Armature No. 13409.
Starter Drive—Outboard Bendix.
Rotation—Counter-clockwise at commutator end.
Brush Spring Tension—26-28 ounces.

Performance Data

Torque	R.P.M.	Volts	Amperes
0 ft. lbs.	3000	6.0	50
35 "	Lock	3.5	650

Starting Switch:—Model 21518. Electro-magnetic (solenoid) type mounted on starter field frame and controlled by pushbutton on instrument panel.
Mounting:—Sleeve mounted in flywheel housing right hand front face. To remove, take out pilot mounting screw in flywhel housing.

GENERATOR:—Model CO-1166. Armature No. 23566. Third brush control used in conjunction with Battery Charge Regulator. See Equipment Section for complete data on Regulator.
Charging Rate Adjustment—Third brush shifted through rack-and-pinion control by slotted adjusting screw on end plate. To adjust, take off commutator end cover, turn adjusting screw to right or clockwise to increase, or to left or counter-clockwise to decrease charging rate.

Performance Data

Amperes	Volts	R.P.M.
0	6.5	475
20	7.5	1000
24	8.0	1400
13	8.0	5000

Field Fuse—3 ampere capacity in plug in regulator case.
Mounting:—On sliding bracket at left front of engine. Driven by fan belt. To remove, loosen nuts on two studs on mounting slide, slide generator toward engine, slip off drive belt, take off nuts on studs.
Belt Adjustment—Attach spring scale by wire looped over generator at slide bracket. Loosen bracket stud nuts, pull generator away from engine until scale reading is 180 pounds, tighten nuts.

RELAY-REGULATOR:—Model 21262. Mounted on generator field frame. Consists of Cut-out Relay and Battery Charge Regulator.

Cut-out Relay

Cuts in—6.5 volts or 475 R.P.M.
Cuts out—0-2 ampere discharge.
Relay Contact Gap—.015".
Air Gap—.010" (contacts closed).

Battery Charge Regulator

Set to operate at 8.0 volts (cold), 7.6 volts (hot). Reduces charging rate approximately one-half by cutting in field resistance. See Equipment Section for complete data.

LIGHTING:—R.B.M. Lighting Switch. Lighting switch mounted at lower end of steering column and controlled by lever on steering wheel. Switch has special passing position providing assymmetrical passing beam. Headlight bulbs are special triple-filament type.

Bulb Specifications

Lamp	Candlepower	Madza No.
Headlights	32-32-32	3003
Parking, Instrument, Tail	3	63
Stop light	15	87
Body lights	6	81

FUSES:—Lighting—20 ampere capacity on block on dash. Resistor connected across lighting fuse limits current load after fuse blows out.
Generator Field—3 ampere in plug in regulator case.

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

PIERCE ARROW
EIGHT CYLINDER, MODEL 8-36A (1934)
DELCO-REMY ELECTRICAL SYSTEM

SERIAL NUMBER:—First number—(136"WB.) 1,080,001, (144"WB.) 1,560,001. On plate on right hand frame member behind right front spring rear shackle.

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

ENGINE:—Eight cylinder In Line, 'L' head type. Cylinders cast enbloc.
Dimensions—Bore, 3½". Stroke, 4¾". Displacement, 366 cu. ins.
Horsepower—Rated, 39.2. Developed, 135 H.P. at 3400 R.P.M.
Compression—Standard 5.5-1. No optional compression ratios.

Pistons:—Bohn Bohnalite, Invar strut type. Pistons furnished in standard oversizes of .002", .004", .010", .020".
Weight—No variation allowed in complete set.
Removal—Piston and rod assembly removed from top of engine.
Clearance—Top, .019-.026". Bottom, .001-.007" (across bosses), .000-.005" (at right angles to bosses).
Fitting New Pistons—Pistons should be snug on .0015" feeler and locked on .002" feeler.

Piston Rings:—Four rings per piston, #1 and 2—compression rings, #3—oil scraper ring, #4—oil control ring. Lower ring groove is drilled radially with oil drain holes.

Ring	Width	End Gap	Wall Thickness	Side Clearance in Groove
Comp. (#1 & 2)	.1235"	.015-.020"	.145"	.001-.002"
Scraper (#3)	.1235"	.015-.020"	.145"	.001-.002"
Oil Cont. (#4)	.186"	.028"	.145"	.001-.002"

Piston Pin:—Diameter, .937". Length, 3 1/16". Pin is locked in rod.
Piston Pin Fit in Piston—Thumb push fit. Clearance, .0005-.0008".

Connecting Rod:—Weight, 21.89 ozs. Length, 9.029" (center-to-center).
Big End Bearing—Centrifugally cast babbitt-lined type. No shims.
Clearance—.001-.0025" (radial), .006-.009" (sideplay).
Adjustment—None (no shims used). Bearings .010" and .020" undersize furnished for service.

NOTE:—Oil spray holes are drilled in both sides of the connecting rod lower bearing upper half.

Crankshaft:—Nine main bearing type with integral counterweights.
Journal Sizes—2⅝" diameter (all bearings).
Bearing Type—Removable steel-backed, babbitt-lined type. No shims.
Clearance—.0015-.003" (radial).
Adjustment—None (no shims used).
End Thrust—Taken by #1 (front) main bearing. Endplay, .002-.004". Adjustable by adding or removing shims.

Camshaft:—Six bearing type. Camshaft drive—Non-adjustable chain.
Bearing Type—Steel-backed, babbitt-lined type.
Clearance—.002" (radial), .003-.009" (endplay).
Chain—Whitney. Width, 1½". Length, 50 links. Pitch, ½".
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 (center the two '0' marks on camshaft sprocket on straightedge).

Valves:—	Head Diameter	Stem Diameter	Length	Seat Angle	Lift
Intake	1 21/32"	.3715"	4¾"	45°	.359"
Exhaust	1 9/16"	.3715"	4¾"	45°	.359"

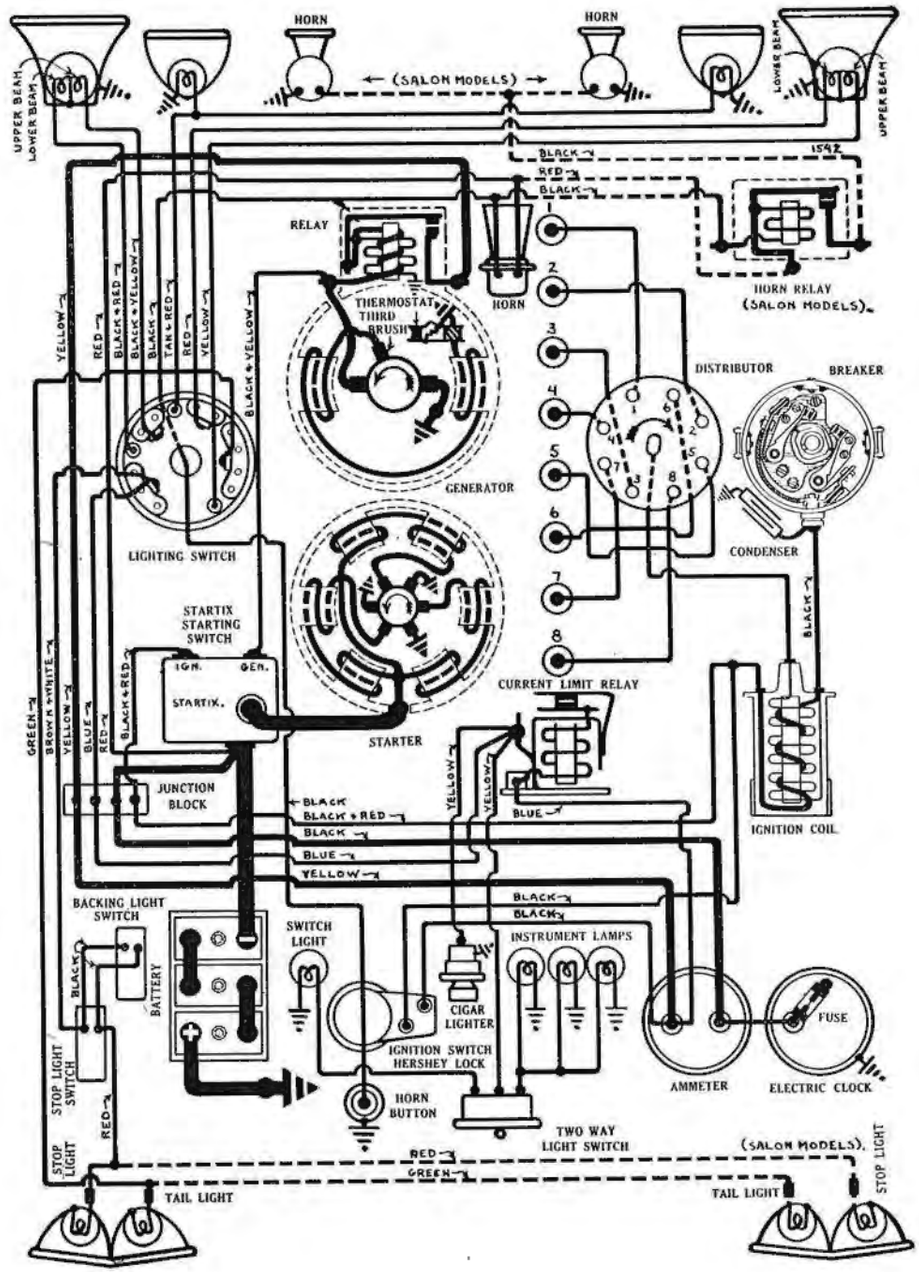
Stem-to-Guide Clearance—.002-.003" (intake and exhaust valves).
Tappet Clearance—.004" (intake), .006" (exhaust), engine hot.
Valve Springs—Install springs with small end up.

	Spring Pressure	Spring Length
Valve Open	100-125 lbs.	1¾"
Valve Closed	60-64 lbs.	2 1/16"

Valve Timing

Intake Valves Open—5° ATDC. Close—45° ALDC.
Exhaust Valves Open—40° BLDC. Close—12° ATDC.

To Check Valve Timing:—Set tappet clearance #1 intake valve at .006". This valve should open with piston slightly past top dead center when flywheel mark 'IN.OP/1-8' registers with indicator on flywheel housing. This mark is 5° after top dead center mark 'UDC/1-8'. Reset tappet clearance at .004" with engine hot.



PIERCE ARROW
EIGHT CYLINDER, MODEL 8-36A (1934)
DELCO-REMY ELECTRICAL SYSTEM

Lubrication:—Pressure type. Gear type oil pump located in crankcase.
Oil Pressure—123 lbs. at 123 R.P.M.
Oil Pressure Relief Valve—Located at pump. Adjusted by adding or removing spacing washers.
Capacity and Oil—10 qts. (dry), 9 qts (refill). Use SAE. #30 (summer or above 30°F.), #20-W (30° to 0°F.), #10-W (below 0°F.).

CARBURETION: — (Fuel System). See Carburetion Section for complete data on Carburetor, Automatic Choke, Fuel Pump, and Gasoline Gauge.
Carburetor:—Stromberg, Model EE-3, 1 11/16″ plain tube, dual, downdraft type.
Automatic Choke—Stromberg type.
Fuel Pump:—Stewart-Warner, Type 414-Z.
Gasoline Gauge:—K-S Telegauge, hydrostatic type.

BATTERY:—Willard, Type WH-4-17, 6 volt, 17 plates, 136 A.H. capacity (20 hr. rate).
Starting Capacity—160 amperes for 20 minutes.
Grounded Terminal—Positive (+) terminal.
Location—On left hand side under front floor boards.

IGNITION:—Coil Model 537-E. Mounted on engine side of dash.
Ignition Current—½-1½ amperes (idling), 4 amperes (stopped).
Ignition Switch—Oakes Hershey type co-incidental ignition switch and steering post lock.
Distributor Model 662-J. Double breaker, 4 lobe cam, semi-automatic advance type. Contacts open alternately at 45° intervals corresponding to 90° firing intervals of engine. Contacts must be synchronized (see Timing).
Breaker Gap—Set gap at .018″. Limits, .018-.024″.
Breaker Arm Spring Tension—17-21 ozs. (at tip of breaker arm).
Cam Angles (Distributor Degrees) — Closed 34°. Open 11°. Both sets together when properly synchronized.
Manual Advance—33° (engine—maximum). Spark is retarded for hand cranking or heavy pulling by pulling out spark control button on instrument panel.

Automatic Advance

Distributor		Engine	
Degrees	R.P.M.	Degrees	R.P.M.
Start	300	2	600
9	1550	18	3100

IGNITION TIMING:— Flywheel Degs. Piston Position
All engines ..... 5° BTDC ..... .0115″ BTDC.
Timing (Stationary Contacts): — Take off cover plate over inspection hole in flywheel housing, disconnect and tape wire on 'IGN' terminal of Startix to avoid automatic cranking (if ignition turned on or timing light is used), advance spark control button (push button in toward dash). With #4 piston on compression, turn engine over until flywheel mark 'IGN/5-4' (which is 5° before top dead center mark 'UDC/5-4') lines up with indicator on 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 opposite #4 segment in distributor cap, check spark plug connections (see diagram). Then synchronize second or movable contacts.
Synchronization (Movable Contacts)—First Method—Turn engine over 90° or ¼ revolution to firing point for cylinder #1, stop with flywheel mark 'IGN/1-8' (which is 5° before top dead center mark 'UDC/1-8') in line 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 special synchronizing tool, Delco-Remy Part #1838182, and follow complete directions in Equipment Section.
Firing Order:—1-6-2-5-8-3-7-4 (see diagram).
Spark Plugs:—Champion, Type C-45. 14 MM. Metric typ.e
Spark Plug Gaps—.025″. Limits, .022-.025″.

STARTER:—Model 497. Armature No. 1843420. Six pole type, Bendix drive.
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

Starting Switch:—Startix automatic starting controlled by ignition switch. See Equipment Section for complete data.
Mounting:—Flange mounted on left hand front face of flywheel housing. To remove, take out three flange mounting cap screws.

GENERATOR: — Model 927-V (Std.). Armature No. 1839078. Third brush regulation with thermostat control. Thermostat contacts open at 200°F., reducing generator output approximately 40%.
Charging Rate Adjustment—Take off commutator cover band, loosen small round lock screw on commutator end plate, shift third brush by hand counter-clockwise to increase, or clockwise to decrease charging rate, tighten locking screw.
Maximum Charging Rate—12-14 amperes (hot), 7.6 volts, 1800 R.P.M.

Performance Data

	Amperes	Volts	R.P.M.
Cold	20-22	8.5-8.7	1600
Hot	12-14	7.6-7.9	1800

Rotation—Counter-clockwise at commutator end.
Shunt Field Current—1.8-2.3 amperes at 6.0 volts.
Brush Spring Tension—20-28 ounces each.
Mounting:—Cradle mounted at left front of engine. Fan belt Double Vee Belt) drive. To remove, slack off belt, disconnect water pump drive coupling, loosen mounting clamp band.
Belt Adjustment—To adjust, loosen clamp bolt on fan bracket, turn eccentric shaft spindle, tighten clamp bolt. Additional adjustment secured by taking bracket off engine and moving bracket up until mounting bolts engage lower holes. Correct adjustment secured when 10-lb. pull necessary to deflect belt 1″ at center (midway between pulleys).

SPECIAL GENERATORS: — Model 929-A. Optional equipment on standard models. Standard equipment on Salon models. See Equipment Section for complete data.

CUT-OUT RELAY:—Model 265-B (927-V Generator). Mounted on generator field frame.
Cuts in—6.75-7.5 volts, 450 R.P.M. or 7 M.P.H. (cold), 9 M.P.H. (hot).
Cuts out—0-2.5 ampere discharge.
Relay Contact Gap—.015-.025″.
Air Gap—.012-.017″.

LIGHTING: — R.B.M. Lighting Switch. The lighting switch has 'Country Passing' position providing assymetric passing beam (upper beam left hand headlight, lower beam right hand headlight). Center of road is illuminated by right hand headlight.

Bulb Specifications

Lamp	Candlepower	Mazda No.
Headlights	32-32	1000
Auxiliary Headlights, Tail	6	81
Stop and Backing	21	1129
Dome	15	87
Instrument, Lock	3	63

CURRENT LIMIT RELAY:—Model 410-F. Vibrating circuit breaker. Starts to operate with load of 25-30 amperes, limiting load to 2-15 amperes.
Contact Gap—.012-.030″.
Air Gap—.015-.025″ (contacts closed).
Spring Tension—5 ozs. minimum at brass button.

HORNS: — Klaxon, Model K-24, Type 1914 (Std.). K-26G, Type 1775 (low note), 1776 (high note) De Luxe). Horns are vibrator type. K-26 matched set, blended tone operated by horn relay. Horn current, 6.0-8.5 amperes at 6.0 volts (Type 1775), 5.0-6.5 amperes at 6.0 volts (Type 1776).
Horn Relay:—Model 266-T. Relay requires .25 amperes to close contacts. Current draw, .8 amperes.
Relay Contact Gap—.015-.025″.
Air Gap—.012-.017″ (contacts closed).

PIERCE ARROW
EIGHT CYLINDER, MODEL 8-40A (1934)
DELCO-REMY ELECTRICAL SYSTEM

SERIAL NUMBER:—First number—(138"WB.) 2,080,001, (144"WB.) 2,580,001. On plate on right hand frame member behind right front spring rear shackle.

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

ENGINE:—Eight cylinder In line, 'L' head type. Cylinders cast enbloc.
Dimensions—Bore, 3½". Stroke, 5". Displacement, 385 cu. ins.
Horsepower—Rated, 39.2. Developed, 140 H.P. at 3500 R.P.M.
Compression—Standard 5.5-1. No optional compression ratios.

Pistons:—Bohn Aluminum Bohnalite, Invar Strut type. Pistons furnished in standard oversizes of .002", .004", .010", .020".
Weight—No variation allowed in complete set.
Removal—Piston and rod assembly removed from top of engine.
Clearance—Top, .019-.026", bottom, .001-.007" (across bosses), .000-.005" (at right angles to bosses).
Fitting New Pistons—Pistons should be snug on .0015" feeler and locked on .002" feeler.

Piston Rings:—Four rings per piston, #1 and 2—compression rings, #3—oil scraper ring, #4—oil control ring. Lower ring groove drilled radially with oil drain holes.

Ring	Width	End Gap	Wall Thickness	Side Clearance in Groove
Comp. (#1 & 2)	.1235"	.015-.020"	.145"	.001-.002"
Scraper (#3)	.1235"	.015-.020"	.145"	.001-.002"
Oil Cont. (#4)	.186"	.028"	.145"	.001-.002"

Piston Pin:—Diameter, .937". Length, 3 1/16". Pin is locked in rod.
Piston Pin Fit in Piston—Thumb push fit. Clearance, .0005-.0008".

Connecting Rod:—Length, 8.904". Weight, ⅛ oz. variation allowed in entire set.
Big End Bearing—Centrifugally cast babbitt-lined type. No shims.
Clearance—.001-.0025" (radial), .006-.009" (sideplay).
Adjustment—None (no shims used). Bearings .010" and .020" undersize furnished for service.
NOTE:—Oil spray holes are drilled in both sides of connecting rod lower bearing upper half.

Crankshaft:—Nine main bearing type with integral counterweights.
Journal Sizes—2⅝" diameter (all bearings).
Bearing Type—Steel-backed, babbitt-lined type. No shims.
Clearance—.0015-.003" (radial).
Adjustment—None (no shims used).
End Thrust—Taken by #1 (front) main bearing. Endplay, .002-.004". Adjustable by adding or removing shims.

Camshaft:—Six bearing type. Camshaft drive—Non-adjustable chain.
Bearing Type—Steel-backed, babbitt-lined type.
Clearance—.002" (radial), .003-.009" (endplay).
Chain—Whitney No. E-206. Width, 1½". Length, 50 links. Pitch, ½".
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 (center the two '0' marks on camshaft sprocket on straightedge).

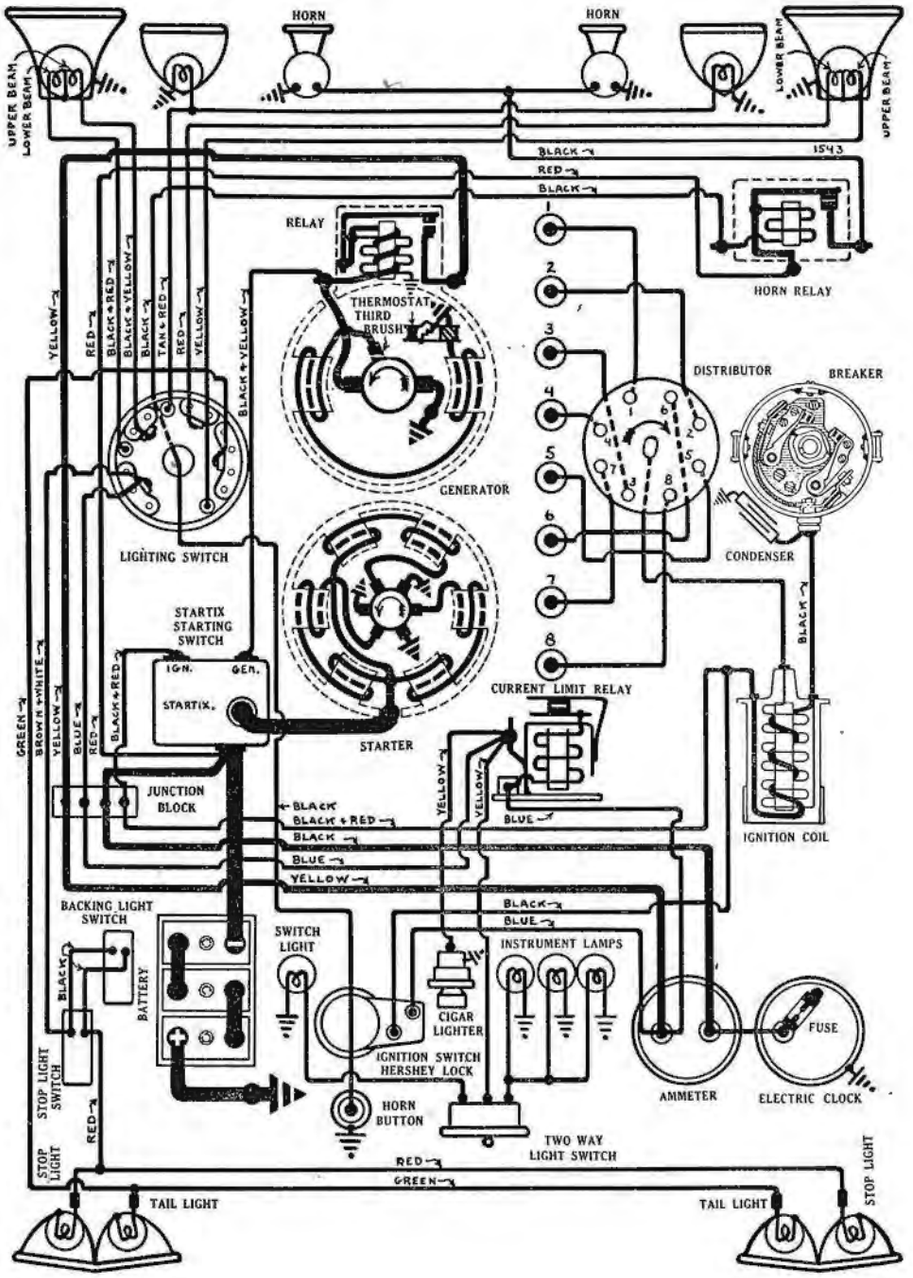
Valves—	Head Diameter	Stem Diameter	Length	Seat Angle	Lift
Intake	1 21/32"	.3725"	4¾"	45°	.359"
Exhaust	1 9/16"	.3725"	4¾"	45°	.359"

Stem-to-Guide Clearance—.002-.003" (intake and exhaust valves).
Tappet Clearance—None in service. Hydraulic valve lifters used (see data on valve lifters under Valve Timing Check).
Valve Springs—Install springs with small end up. Flat coil spring type dampener assembled on outside of all springs at top.

	Spring Pressure	Spring Length
Valve Closed	60-64 lbs.	2 1/16"
Valve Open	120-125 lbs.	1¾"

Valve Timing

Intake Valves Open—5° ATDC. Close—45° ALDC.
Exhaust Valves Open—40° BLDC. Close—12° ATDC.



PIERCE ARROW
EIGHT CYLINDER, MODEL 8-40A (1934)
DELCO-REMY ELECTRICAL SYSTEM

To Check Valve Timing:—Remove #1 intake hydraulic valve lifter, pull out plunger, remove spring, wash lifter assembly in gasoline, replace plunger, install lifter in bracket. Check clearance between end of plunger and valve stem (valve closed—clearance will be about .070″). Insert sufficient feeler stock to take up all except .010″ clearance, turn engine over until piston #1 is slightly past top dead center, stop when flywheel mark 'IN.OP/1-8' lines up with indicator on housing, #1 intake valve should begin to open at this point. Remove feeler stock, reassemble hydraulic valve lifter as directed below.

Hydraulic Valve Lifters:—Use spring clamp on top of each lifter when lifter assemblies are being removed or installed to prevent lifters falling out. Plungers are selective fit in body and must not be interchanged. Lifters should be free fit in guides (they should fall through bracket hole of own weight with lifters and brackets dry). Lifter bracket gasket should be lined up so that there is no oil leakage between case and bracket and oil supply and bleeder holes are not covered (gasket is 1/16″ wider than bracket). Do not tighten bracket attaching bolts so that bracket is distorted, causing lifters to stick. Lifters should spin in brackets with engine running. Shift bracket to front or rear until lifter assemblies spin. Lifter plunger must not rotate in lifter body (this may cause sticking of plunger). Plunger spring should be tight fit and square with plunger. Spring should be tight fit in lifter body bore when nearly compressed and should offer considerable resistance to rotation of plunger. If hydraulic valve lifters are noisy, check for leaking check ball seat. To test, clean oil from lifter assembly, put a drop of gasoline on ball and ball seat, attach air line to bottom of plunger, immerse plunger in gasoline, note air bubbles.

Installing Hydraulic Valve Lifters: — Hydraulic lifters should always be installed without oil. Oil in lifter will retard escape of air and delay quieting of lifter when engine operated. Remove plunger from lifter body and wash out all oil with clean gasoline. Important—do not interchange plungers, they are selective fit in lifter bodies. When lifters are installed (new or after grinding valves), check mechanical clearance with lifter dry (all oil removed from assembly). Clearance should be not less than .015″. To check clearance, compress plunger spring by prying between plunger cap and valve stem, use feeler to check clearance between these points. If clearance is insufficient, remove lifter from bracket, grind end of plunger to give correct clearance. Do not grind into check ball retaining pin.

Lubrication:—Pressure type. Helical gear type oil pump located in crankcase.
Oil Pressure Relief Valve—Located at pump. Adjust by adding or removing spacing washers.
Capacity and Oil—10 qts. (dry), 9 qts. (refill). Use SAE. #30 (summer or above 30°F.), #20-W (30° to 0°F.), #10-W (below 0°F.).

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

Carburetor:—Stromberg, Model EE-3, 1 11/16″ plain tube, dual, downdraft type.
Automatic Choke—Stromberg type.
Fuel Pump:—Stewart-Warner, Type 407-BW.
Gasoline Gauge:—K-S Telegauge, hydrostatic type.

BATTERY:—Willard, Type WH-4-17, 6 volt, 17 plates, 136 A.H. capacity (20 hr. rate).
Starting Capacity—160 amperes for 20 minutes.
Grounded Terminal—Positive (+) terminal.
Location—On left hand side under front floor.

IGNITION:—Coil Model 537-E. Mounted on dash.
Ignition Current—½-1½ amperes (idling), 4 amperes (stopped).
Ignition Switch—Oakes Hershey type co-incidental ignition switch and steering post lock.
Distributor Model 662-J. Double breaker, 4 lobe cam, semi-automatic advance type. Contacts open alternately at 45° intervals corresponding to 90° firing intervals of engine. Contacts must be synchronized (see Timing).
Breaker Gap—Set gap at .018″. Limits, .018-.024″.
Breaker Arm Spring Tension—17-21 ozs.
Cam Angles (Distributor Degrees) — Closed 34°. Open 11°. Both sets together when properly synchronized.
Manual Advance—33° (engine—maximum). Spark is retarded for hand cranking or heavy pulling by pulling out button on instrument panel.

Automatic Advance

Distributor Degrees	Distributor R.P.M.	Engine Degrees	Engine R.P.M.
Start	300	2	600
9	1550	18	3100

IGNITION TIMING:— Flywheel Degs. Piston Position
All engines.....5° BTDC.....0115″ BTD.
Timing (Stationary Contacts): — Take off cover plate over inspection hole in flywheel housing, disconnect and tape wire on 'IGN' terminal of Startix to avoid automatic cranking (if ignition turned on or timing light is used), advance spark control button (push button in toward dash). With #4 piston on compression, turn engine over until flywheel mark 'IGN/5-4' (which is 5° before top dead center mark 'UDC/5-4') lines up with indicator on housing, loosen advance arm clamp bolt, rotate distributor until stationary contacts (mounted directly on breaker plate) begin to open, tighten clamp bolt, synchronize.
Synchronization (Movable Contacts)—First Method—Turn engine over 90° or ¼ revolution to firing point for cylinder #1, stop with flywheel mark 'IGN/1-8' (which is 5° before top dead center mark 'UDC/1-8') in line 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 special synchronizing tool, Delco-Remy Part #1838182, and follow directions in Equipment Section.
Firing Order:—1-6-2-5-8-3-7-4 (see diagram).
Spark Plugs:—Champion, Type C-45. 14 MM. Metric.
Spark Plug Gaps—.025″. Limits, .022-.025″.

STARTER:—Model 497. Armature No. 1843420. Six pole type, Bendix drive.
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

Starting Switch:—Startix automatic starting controlled by ignition switch. See Equipment Section
Mounting:—Flange mounted on left hand front face of flywheel housing. To remove, take out three flange mounting cap screws.

GENERATOR: — Model 927-V (Std.). Armature No. 1839078. Third brush regulation with thermostat control. Thermostat contacts open at 200°F., reducing generator output approximately 40%.
Charging Rate Adjustment—Take off commutator cover band, loosen small round lock screw on commutator end plate, shift third brush by hand counter-clockwise to increase, or clockwise to decrease charging rate.

Performance Data

	Amperes	Volts	R.P.M.
Cold	20-22	8.5-8.7	1600
Hot	12-14	7.6-7.9	1800

Rotation—Counter-clockwise at commutator end.
Shunt Field Current—1.8-2.3 amperes at 6.0 volts.
Brush Spring Tension—20-28 ounces each.
Mounting:—Cradle mounted at left front of engine. Fan belt Double Vee Belt) drive. To remove, slack off belt, disconnect water pump drive coupling, loosen mounting clamp band.
Belt Adjustment—To adjust, loosen clamp bolt on fan bracket, turn eccentric shaft spindle, tighten clamp bolt. Additional adjustment secured by taking bracket off engine and moving bracket up until mounting bolts engage lower holes. Correct adjustment secured when 10-lb. pull necessary to deflect belt 1″ midway between pulleys.

SPECIAL GENERATORS: — Model 929-A. Optional equipment on standard models. Standard equipment on Salon models. See Equipment Section.

CUT-OUT RELAY:—Model 265-B (927-V Generator).
Cuts in—6.75-7.5 volts, 450 R.P.M. or 7 M.P.H.
Cuts out—0-2.5 ampere discharge.
Relay Contact Gap—.015-.025″.
Air Gap—.012-.017″.

LIGHTING: — R.B.M. Lighting Switch. The lighting switch has 'Country Passing' position providing assymetric passing beam (upper beam left hand headlight, lower beam right hand headlight).

Bulb Specifications

Lamp	Candlepower	Mazda No.
Headlights	32-32	1000
Auxiliary Headlights, Tail	6	81
Stop and Backing	21	1129
Dome	15	87
Instrument, Lock	3	63

CURRENT LIMIT RELAY:—Model 410-F. Vibrating circuit breaker. Starts to operate with load of 25-30 amperes, limiting load to 2-15 amperes.
Contact Gap—.012-.030″.
Air Gap—.015-.025″ (contacts closed).

HORNS:—Klaxon, Model K-26G. Type 1775 (low note), 1776 (high note). Matched set, blended tone, vibrator type, operated by horn relay.
Horn Relay:—Model 266-T. Relay requires .25 amperes to close contacts. Current draw, .8 amperes.
Relay Contact Gap—.015-.025″.
Air Gap—.012-.017″ (contacts closed).

PIERCE ARROW

TWELVE CYLINDER, MODELS 1240-A, 1248-A (1934)

DELCO-REMY ELECTRICAL SYSTEM

SERIAL NUMBER:—First number (1240A, 138"WB.), 3,110,001, (1240A, 144"WB.), 3,530,001. (1248A, 147"WB.), 3,560,001. On plate on right hand frame member behind right front spring rear shackle.

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

ENGINE:—Twelve cylinder, 80° V, 'L' head type. Cylinders cast enbloc for each bank.
Dimensions—Bore, 3½". Stroke, 4". Displacement, 462 cu. ins.
Horsepower—Rated, 58.8. Developed, 175 H.P. at 3800 R.P.M.
Compression—Standard 6.0-1. No optional compression ratios.

Pistons:—Bohn Aluminum, Bohnalite, Invar Strut type. Pistons furnished in standard oversizes of .002", .004", .010", .020".
Weight—No variation allowed in complete set.
Removal—Piston and rod assembly removed from top of engine.
Clearance—Top, .019-.026". Bottom, .001-.007" (across bosses), .000-.005" (at right angles to bosses).
Fitting New Pistons—New pistons should be snug on .0015" feeler and locked on .002" feeler.

Piston Rings:—Four rings per piston, #1 and 2—compression rings, #3—oil scraper ring, #4—oil control ring. Lower ring groove drilled radially with oil drain holes.

Ring	Width	End Gap	Wall Thickness	Side Clearance in Groove
Comp. (#1 & 2)	.1235"	.015-.020"	.145"	.001-.002"
Scraper (#3)	.1235"	.015-.020"	.145"	.001-.002"
Oil Cont. (#4)	.186"	.028"	.145"	.001-.002"

Piston Pin:—Diameter, .875". Length, 2.750". Pin floats in rod and piston and is held in place by two locking rings. Pin hole in upper end of connecting rod is bronze bushed.
Pin Fit in Piston—Thumb push fit at 160°F. Clearance, .0004-.0006".
Pin Fit in Rod—Bushing reamed to provide clearance of .0004-.0006".

Connecting Rod:—Length, 9.936". Weight, ⅛ oz. variation allowed in entire set.
Big End Bearing—Centrifugally cast babbit-lined type. No shims.
Clearance—.001-.002" (radial), .006-.009" (sideplay).
Adjustment—None (no shims used). Bearings .010" and .020" undersize furnished for service.

NOTE:—Oil spray holes are drilled in both sides of connecting rod lower bearing upper half.

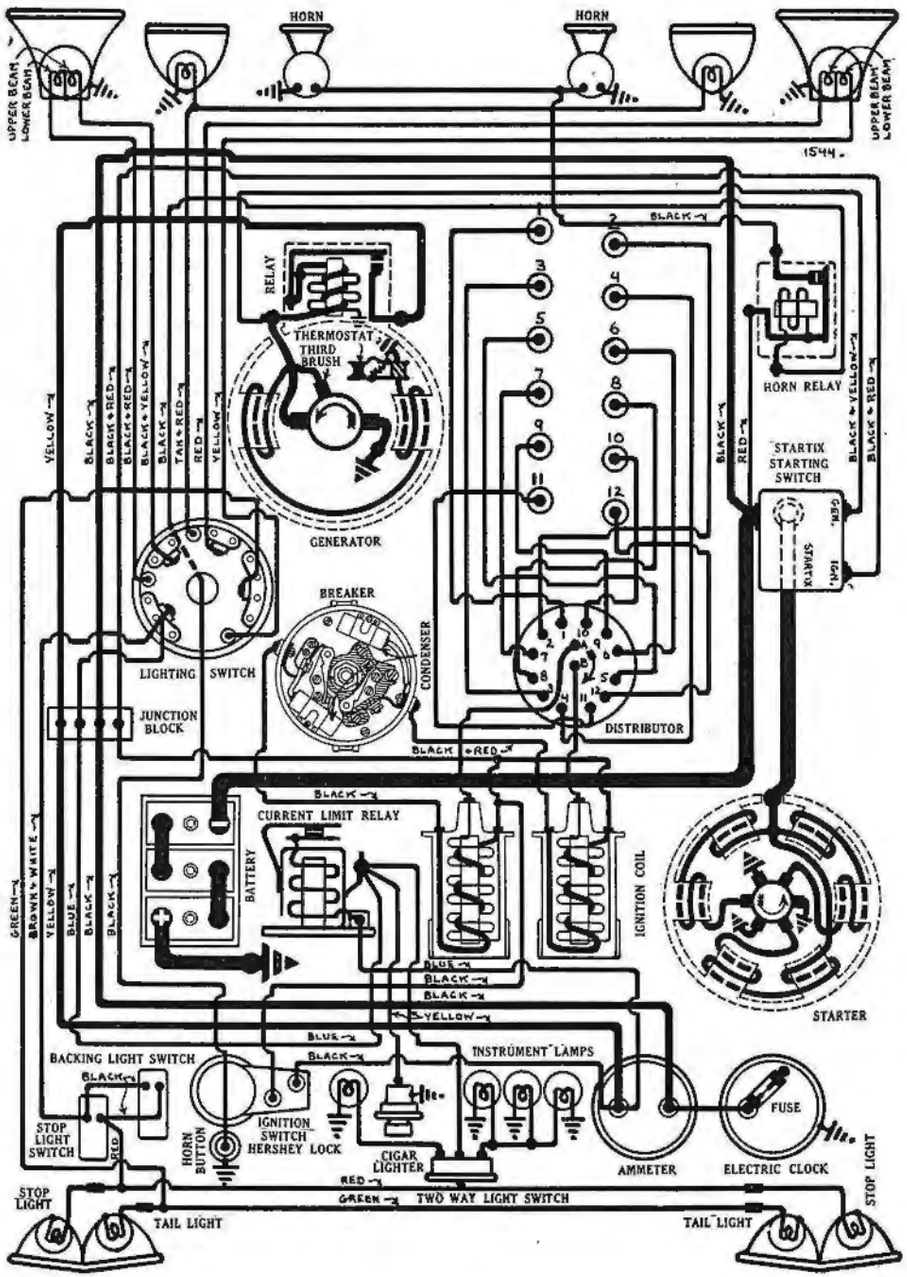
Crankshaft:—Seven main bearing type with integral counterweights.
Journal Sizes—2.49" diameter (all bearings).
Bearing Type—Removable steel-backed, babbitt-lined type. No shims.
Clearance—.0015-.003" (radial).
Adjustment—None (no shims used).
End Thrust—Taken by #1 (front) main bearing. Endplay, .002-.004". Adjustable by adding or removing shims.

Camshaft:—Four bearing type. Camshaft drive, non-adjustable chain.
Bearing Type—Steel-backed, babbitt-lined type.
Clearance—.002" (radial), .003-.009" (endplay).
Chain—Whitney, Type CL-206-G. Width, 1½". Length, 53 links. Pitch, .500".
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	Seat Angle	Lift
Intake	1 21/32"	.3725"	4¾"	45°	.312"
Exhaust	1 9/16"	.3725"	4¾"	45°	.312"

Stem-to-Guide Clearance—.002-.003" (all valves).
Tappet Clearance—None in service. Hydraulic Valve Lifters used—see data on Valve Lifters under Valve Timing Check.
Valve Springs—Install springs with small end up. Flat coil type dampener assembled on outside of all springs at top.

	Spring Pressure	Spring Length
Valve Closed	60-64 lbs.	2 1/16"
Valve Open	120-125 lbs.	1¾"



PIERCE ARROW

TWELVE CYLINDER, MODELS 1240-A, 1248-A (1934)

DELCO-REMY ELECTRICAL SYSTEM

Valve Timing

Intake Valves Open—19° BTDC. Close—69° ALDC.
Exhaust Valves Open—56° BLDC. Close—28° ATDC.

To Check Valve Timing:—Remove #1 intake hydraulic valve lifter, pull out plunger, remove spring, wash lifter assembly in gasoline to remove all oil, replace plunger, install lifter in bracket. Check clearance between end of plunger and valve stem (valve closed—clearance will be about .070"). Insert sufficient feeler stock to take up all except .004" clearance, turn engine over with #11 piston on compression, stop when flywheel mark 'IN.OP.#1/' lines up with indicator on housing, #1 intake valve should begin to open at this point. Remove feeler stock, reassemble hydraulic valve lifter as directed below.

Hydraulic Valve Lifters:—See data on Model 8-40A for complete description. Hydraulic valve lifters are interchangeable between 8 and 12 cylinder models except for plunger cap or plug. Short caps are used on 12 cylinder models and a longer cap on 8 cylinder models.

Installing Hydraulic Valve Lifters: — Hydraulic lifters should always be installed without oil. Oil in lifter will retard escape of air and delay quieting of lifter when engine operated. Remove plunger from lifter body and wash out all oil with clean gasoline. Important—do not interchange plungers, they are selective fit in lifter bodies. When lifters are installed (new or after grinding valves), check mechanical clearance with lifter dry (all oil removed from assembly). Clearance should be not less than .015". To check clearance, compress plunger spring by prying between plunger cap and valve stem, use feeler to check clearance between these points. If clearance is insufficient, remove lifter from bracket, pull plunger out, remove spring, grind off lower end of plunger to give correct clearance. Do not grind into check ball retaining pin.

Lubrication:—Full pressure type. Helical gear type oil pump located in crankcase.

Oil Pressure—123 lbs. at 123 R.P.M.

Oil Pressure Relief Valve—Located at oil pump. Adjustable by adding or removing spacing washers.

Capacity and Oil—14 qts. (dry), 12 qts. (refill). Use SAE. #30 (summer or above 30°F.), #20-W (30° to 0°F.), #10-W (below 0°F.).

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

Carburetor:—Stromberg, Model EX-3 (2 used), 1 11/16" plain tube, downdraft type. One carburetor used for each cylinder bank with connected throttles.

Automatic Choke—Stromberg.

Fuel Pump:—Stewart-Warner, Type 407-BZ.

Gasoline Gauge:—K-S Telegauge, hydrostatic type.

IGNITION:—Coil Model 537-E (2 used). Coils mounted on engine side of dash.

Ignition Current—½-1½ amperes (running), 4 amperes (stopped) each.

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

Distributor Model 4105. Double breaker, 6 lobe cam, semi-automatic type. Contacts open alternately at 20° and 40° intervals corresponding to 40° and 80° (unequal firing interval caused by 80° included angle between cylinder banks). Contacts must be synchronized (see Timing).

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

Breaker Arm Spring Tension—17-21 ounces.

Cam Angles (Distributor Degrees)—Closed 36°. Open 24°. Each set operates independently.

Manual Advance—33° (engine—maximum). Retard only. Spark is retarded by pulling out button on instrument panel.

Automatic Advance

Distributor Degrees	R.P.M.	Engine Degrees	R.P.M.
Start	400	2	800
7	1400	14	2800

IGNITION TIMING:—Flywheel Degs. Piston Position
All engines ..... 5° BTDC. ..... .0092" BTDC.

Timing (Stationary Contacts):—Take off cover plate over inspection hole in flywheel housing, disconnect and tape wire on 'IGN' terminal of Startix to avoid automatic cranking (if ignition turned on or timing light used to check contact opening), advance manual spark control (push button in toward dash). With #1 piston on compression, turn engine over until flywheel mark 'IGN.#1/' (which is 5° before top dead center mark 'UDC/No.1') lines up with indicator on housing, take off distributor cap and rotor, loosen locking 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 connections. Then synchronize.

Synchronization (Movable Contacts)—First Method:—Turn engine over 40° or approximately 1/9 revolution to firing position for piston #4 (#2—right hand bank), stop when flywheel mark 'IGN.#4/' (which is 5° before top dead center mark 'UDC/No.4') 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: — Synchronize with synchronizing tool or rotary spark gap, shift sub-plate until movable contacts open exactly 20° after first or fixed set. Fixed contacts should open 40° after this point. Firing intervals are 20-40-20 (distributor degrees).

Firing Order:—1-4-9-8-5-2-11-10-3-6-7-12 with cylinders numbered as shown on diagram (right bank—2, 4, 6, 8, 10, 12; left bank—1, 3, 5, 7, 9, 11).

Spark Plugs:—Champion, Type JN-5, 14 MM. Metric.

Spark Plug Gaps—.025". Limits, .022-.025".

BATTERY:—Willard, Type WH-5-19, 6 volt, 19 plate, 153 A.H. capacity (20 hr. rate).

Starting Capacity—180 amperes for 20 minutes.

Grounded Terminal—Positive (+) terminal.

Location—On left hand side under front floor.

STARTER:—Model 498. Armature No. 1843420. Six pole type. Bendix drive.

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	600

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

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

GENERATOR: — Model 927-V (Std.). Armature No. 1839078. Third brush regulation with thermostat control. Thermostat contacts open at 200°F., reducing generator output approximately 40%.

Charging Rate Adjustment—Take off commutator cover band, loosen small round lock screw on commutator end plate, shift third brush by hand counter-clockwise to increase, or clockwise to decrease charging rate.

Performance Data

	Amperes	Volts	R.P.M.
Cold	20-22	8.5-8.7	1600
Hot	12-14	7.6-7.9	1800

Rotation—Counter-clockwise at commutator end.

Shunt Field Current—1.8-2.3 amperes at 6.0 volts.

Brush Spring Tension—20-28 ounces each.

Mounting:—Cradle mounted at left front of engine. Fan belt Double Vee Belt) drive. To remove, slack off belt, disconnect water pump drive coupling, loosen mounting clamp band.

Belt Adjustment—To adjust, loosen clamp bolt on fan bracket, turn eccentric shaft spindle, tighten clamp bolt. Additional adjustment secured by taking bracket off engine and moving bracket up until mounting bolts engage lower holes. Correct adjustment secured when 10-lb. pull necessary to deflect belt 1" at center (midway between pulleys).

SPECIAL GENERATORS:—Model 929-A. See Equipment Section for complete data when this generator installed as special equipment.

CUT-OUT RELAY:—Model 265-B (927-V Generator).

Cuts in—6.75-7.5 volts, 450 R.P.M. or 7 M.P.H. (cold), 9 M.P.H. (hot).

Cuts out—0-2.5 ampere discharge.

Relay Contact Gap—.015-.025".

Air Gap—.012-.017".

LIGHTING:—R.B.M. Lighting Switch. The lighting switch has 'Country Passing' position providing assymetric passing beam (upper beam left hand headlight, lower beam right hand headlight).

Bulb Specifications

Lamp	Candlepower	Mazda No.
Headlights	32-32	1000
Auxiliary Headlights, Tail	6	81
Stop and Backing	21	1129
Dome	15	87
Instrument, Lock	3	63

CURRENT LIMIT RELAY:—Model 410-F. Vibrating circuit breaker. Starts to operate with load of 25-30 amperes, limiting load to 2-15 amperes.

Contact Gap—.012-.030".

Air Gap—.015-.025" (contacts closed).

Spring Tension—5 ozs. minimum at brass button.

HORNS:—Klaxon, Model K-26G, Type 1775 (low note), 1776 (high note). Matched set, blended tone, vibrator type. Operated by horn relay.

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

Relay Contact Gap—.015-.025".

Air Gap—.012-.017" (contacts closed).

PLYMOUTH

NEW SIX, MODEL PF (1934), SPECIAL SIX, MODEL PG (1934)
DELCO-REMY ELECTRICAL SYSTEM

SERIAL NUMBER:—First number, 1,859,001. Located on right front door hinge pillar post.

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

ENGINE:—Six cylinder, 'L' head type. Engine mounting, Floating Power.
Dimensions:—Bore, 3⅛". Stroke, 4⅜". Displacement, 201.3 cu. ins.
Horsepower:—Rated, 23.44. Developed, 77 H.P. at 3600 R.P.M. (Std. 5.8 head), or 82 H.P. at 3600 R.P.M. (optional 6.5 aluminum head).
Compression—Std. Cast-iron head—5.8-1. Optional high compression aluminum head—6.5-1.

NOTE:—Standard 5.8-1 head is cast-iron. The special 6.5-1 head is aluminum alloy. Special cylinder head gaskets, studs, and special length spark plugs (7/16" thread length) are used with the aluminum head. Aluminum heads must always be tightened cold.

Pistons:—Aluminum alloy 'T' slot type. Pistons are 'cam' ground with greatest clearance at ends of piston pin. Special equipment necessary to finish pistons and cylinders should be reconditioned to standard oversize. Pistons furnished in standard oversizes of .003", .005", .010", .015", .020", .023", .025", .030", .040", .050", .060". Reconditioned cylinders must not be out-of-round or tapered more than .0005". All cylinders should be finished to same size to maintain balance.
Clearance—.022" (head), .001" (at bottom of piston skirt).
Weight—Maximum allowable weight variation, ¼ oz.
Removal—Piston and rod assembly removed from top of engine.
Installing New Pistons—Install pistons with slot to left (opposite side from camshaft and valves).

Piston Rings:—Four rings per piston, #1 and #2—compression rings, #3—undercut oil wiper ring, #4—special oil control ring. Lower ring grooves are drilled radially with oil drain holes.

Ring	Width	End Gap	Side Clearance in Groove
Comp. (1 and 2)	⅛"	.007-.015"	.003" maximum
Comp. (3—Undercut)	⅛"	.007-.015"	.003" maximum
Oil Cont. (4)	5/32"	.007-.015"	.003" maximum

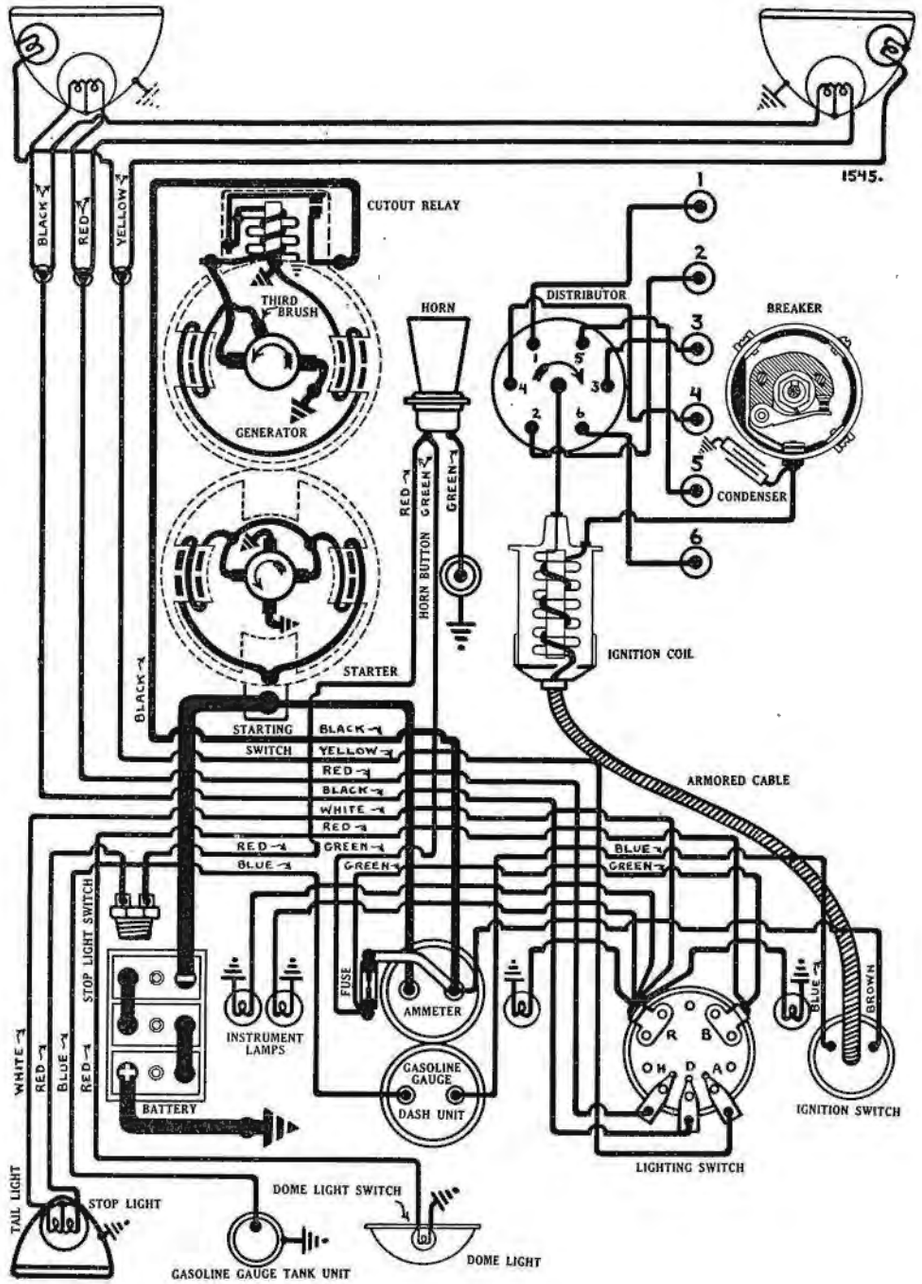
Piston Pin:—Diameter, 55/64". Pins float in piston and rod (retaining rings used). When installing pins, pistons can be heated in boiling water which will allow pin to be installed and centered easily.
Pin Fit in Piston—Tight thumb push fit with piston at 120°F.
Pin Fit in Rod—Light thumb push fit at room temperature (70°F.).
NOTE:—Pin hole in upper end of connecting rod is bronze bushed.

Connecting Rod:—Weight variation allowance, ¼ oz.
Big End Bearing—Removable steel-backed babbitt lined type. No shims.
Clearance—.001-.00275" (radial), .003-.009" (sideplay).
Adjustment—No shims used. Replace removable bearings when clearance exceeds maximum. Install new bearings with small boss on bearing registering with machined groove in connecting rod.
NOTE:—Lower bearings are offset. Install rods with offset (widest half of bearing) toward rear of engine (Cylinders #1, #3, #5), or toward front of engine (Cylinders #2, #4, #6). Oil hole in upper half of bearing must be toward camshaft side of engine on all rods.

Crankshaft:—Four main bearing type with integral counterweights.
Journal Sizes—2¼" diameter (all bearings).
Bearing Type—Steel-backed, babbit lined type. No shims used.
Clearance—.001-.002" (radial), .003-.007" (endplay).
Adjustment—No shims used. Replace bearings. Do not file bearing caps.
End Thrust—Taken by rear (#4) main bearing.

Camshaft:—Four bearing type. Camshaft drive non-adjustable chain.
Chain—Width, 1". Length, 48 links. Pitch, .500".
Camshaft Setting—Sprockets are marked. Mesh chain with sprockets turned so that marks are adjacent and in line with straightedge across the shaft centers.

Valves:—	Head Diameter	Stem Diameter	Seat Angle	Lift
Intake	1 15/32"	.340-.341"	45°	5/16"
Exhaust	1 15/32"	.340-.341"	45°	5/16"



PLYMOUTH

NEW SIX, MODEL PF (1934), SPECIAL SIX, MODEL PG (1934)
DELCO-REMY ELECTRICAL SYSTEM

Stem - to - Guide Clearance — .001-.003″ (intake), .003-.005″ (exhaust).
Guide Inside Diameter (new)—.342-.343″ (intake), .344-.345″ (exhaust).
Tappet Clearance—.005″ (intake—hot), .007″ (exhaust—hot).

Valve Springs—	Pressure	Length
Valve Closed	34-38 lbs.	1¾″
Valve Open	77-85 lbs. (do not compress springs to less than 1 7/16″).	

NOTE:—Special valve seat inserts are used for exhaust valves. The seat inserts cannot be recut and must be reground.

Valve Timing

Intake Valves—Open 6° ATDC. Close 46° ALDC.
Exhaust Valves—Open 42° BLDC. Close 8° ATDC.
To Check Valve Timing—Set tappet clearance #6 intake valve at .011″. Use regular timing gauge. This valve should open with piston .015″ past top dead center. Reset tappet clearance at .005″ (hot).

Lubrication:—Pressure type. Oil pump located at right of crankcase on lower end of inclined accessory drive shaft.
Oil Pressure—30-60 lbs. at normal driving speeds.
Oil Pressure Relief Valve—Operates at 45-55 lbs. Located under plug on left hand side of crankcase. Adjustable by replacing spring. Standard springs unpainted. Heavy spring (to increase oil pressure) painted green. Lighter spring (to decrease oil pressure) painted red.
Capacity and Oil—5 qts. Use SAE. #30 (summer), #29-W or 10-W (winter).

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

Carburetor:—Carter, Model C6B1, 1¼″ plain tube, downdraft type.
Automatic Choke—Sisson (special equipment).

Fuel Pump:—A.C., Type B, on right hand side of crankcase.

Gasoline Gauge:—Motometer, Electric type.

IGNITION:—Coil Model 540-A. Ignition switch is part of coil assembly (connected to coil by armored cable).

Distributor Models 622-H, 622-U. Single breaker, 6-lobe cam, full automatic advance type.
Breaker Gap—Set gap at .020″. Limits, .018-.024″.
Breaker Arm Spring Tension—19-23 ounces.
Cam Angles (Distributor Degrees)—Closed 36°. Open 24°.
Automatic Advance— Model 622-H

Degrees	Distributor	R.P.M.
Start		400
8.75		1100
9		1200

Degrees	Engine	R.P.M.
2		800
17.5		2200
18		2400

Model 622-U

Degrees	Distributor	R.P.M.
Start		400
10		1200

Degrees	Engine	R.P.M.
2		800
20		2400

Mounting—On left hand side of crankcase. Held in place by hold-down screw in advance arm.

IGNITION TIMING:— Flywheel Degs. Piston Position
Standard (cast-iron) head 9° BTDC..... .0342″ BTDC.
High Comp. (H.C. Al. Head). 6° BTDC. .0152″ BTDC.
Timing (Using Timing Light)—Connect timing light between distributor terminal and live terminal of generator relay. Turn engine over until No. 1 piston is on compression, stop when 'D/C' mark on flywheel registers with ignition (upper) pointer in inspection hole on left front face of flywheel housing, loosen advance arm clamp bolt, rotate distributor until timing light goes out, tighten clamp bolt, see that rotor is opposite No. 1 segment in distributor cap, check spark plug cable connections (see diagram).
High Comp. (Aluminum Head)—Ignition pointer correctly set for all cars with high compression aluminum heads when installed at factory.
Timing (using Gauge)—All cars can be timed using a Motor Gauge installed in timing plug hole over No. 6 piston.

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

Spark Plugs:—A.C., Type S-9 (Std. cast-iron head), Type SL-9 (aluminum head). 14 MM. Metric type. Type SL-9 plugs have a longer (7/16″) thread length.

Spark Plug Gap—.025″ (all engines).

BATTERY:—Willard, Type WS-1-13, 6 volt, 13 plate, 86 A.H. capacity (5 ampere rate).
Starting Capacity—105 amperes for 20 minutes.
Grounded Terminal—Positive (+) terminal.
Location—Under left front seat.

STARTER:—Model 734-H. Armature No. 823881.
Rotation—Counter-clockwise (commutator end).
Brush Spring Tension—24-28 ounces each.

Performance Data

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

Starting Switch:—Manual pinion shift connected to starting switch lever. Switch mounted on starter field frame. Shift pedal and accelerator linkage interconnected so that throttle is opened ¼-1/3 when starting pedal is depressed to start engine. See Equipment Section 'Starter Controls' for adjustment.

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

GENERATOR:—Model 937-G. Armature No. 817221. Third brush control type. Third brush setting should be adjusted by using test ammeter or by 'commutator bar' method (see below).
Charging Rate Adjustment (Ammeter)—Use test ammeter to check generator output. With generator at room temperature, remove commutator cover band, loosen small round lock screw on commutator end plate, shift third brush by hand counter-clockwise to increase, or clockwise to decrease, charging rate until output is 17 amperes at 8.2 volts. Tighten lock screw.
Commutator Bar Method—Remove generator from car, mount so that commutator can be seen, loosen lock screw on commutator end plate, shift third brush by hand so that there are exactly 2¾ commutator bars exposed between third brush and nearest main brush, tighten lock screw. This setting provides maximum safe output and must not be exceeded.
Standard Setting—17 amperes (cold), 8.2 volts.

Performance Data

	Amperes	Volts	R.P.M.
Cold—	15-17	7.95-8.15	1900
Hot—	10-13	7.45-7.75	2100

Rotation—Counter-clockwise at commutator end.
Shunt Field Current—3.5-4.5 amperes at 6.0 volts.
Brush Spring Tension—14-18 ounces each.
Mounting—Pivot mounting at left front of engine. Driven by fan belt. To remove, take out two hinge bolts and one clamp bolt.
Belt Adjustment—Loosen hinge bolts and clamp bolt. Use spring scale to pull generator horizontally away from engine until belt tension (scale reading) is 45-50 lbs., tighten clamp bolt and pivot bolts before slacking off scale tension.

RELAY CUT-OUT:—Model 265-G. Mounted on generator field frame.

Cuts in	Relay	Cuts out
6.5-7.3 volts		0-3 amperes discharge.

Relay Contact Gap—.015-.025″.
Relay Air Gap—.012-.017″ (contacts closed).

LIGHTING:—Clum Switch, Model 13786. Switch is mounted on instrument panel.

Bulb Sizes

Position	Candlepower	Mazda No.
Headlights	21-21	1110
Parking and Instrument	3	63
Stop and Tail	21-2	1158
Dome	15	87

FUSES:—20 ampere capacity lighting fuse on back of ammeter.

HORNS:—Klaxon, Model K-31 or K-26M (matched set blended tone). Vibrator type. Current draw, 4.0-6.5 amperes at 6.0 volts (K-31), 5.0-6.5 amperes at 6.0 volts (K-26 high note), 6.0-8.5 amperes at 6.0 volts (K-26 low note).

PLYMOUTH

DE LUXE SIX, MODEL PE (1934)

DELCO-REMY ELECTRICAL SYSTEM

SERIAL NUMBER:—First number, 2,188,001. Located on right front door hinge pillar post.

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

ENGINE:—Six cylinder, 'L' head type. Engine mounting, Floating Power.
Dimensions:—Bore, 3⅛". Stroke, 4⅜". Displacement, 201.3 cu. ins.
Horsepower:—Rated, 23.44. Developed, 77 H.P. at 3600 R.P.M. (Std. 5.8 head), or 82 H.P. at 3600 R.P.M. (optional 6.5 aluminum head).
Compression—Std. Cast-iron head—5.8-1. Optional high compression aluminum head—6.5-1.

NOTE:—Standard 5.8-1 head is cast-iron. The special 6.5-1 head is aluminum alloy. Special cylinder head gaskets, studs, and special length spark plugs (7/16" thread length) are used with the aluminum head. Aluminum heads must always be tightened cold.

Pistons:—Aluminum alloy 'T' slot type. Pistons are 'cam' ground with greatest clearance at ends of piston pin. Special equipment necessary to finish pistons and cylinders should be reconditioned to standard oversize. Pistons furnished in standard oversizes of .003", .005", .010", .015", .020", .023", .025", .030", .040", .050", .060". Reconditioned cylinders must not be out-of-round or tapered more than .0005". All cylinders should be finished to same size to maintain balance.

Clearance—.022" (head), .0015" (at bottom of piston skirt).
Weight—Maximum allowable weight variation, ¼ oz.
Removal—Piston and rod assembly removed from top of engine.
Installing New Pistons—Install pistons with slot to left (opposite side from camshaft and valves).

Piston Rings:—Four rings per piston, #1 and #2—compression rings, #3—undercut oil wiper ring, #4—special oil control ring. Lower ring grooves are drilled radially with oil drain holes.

Ring	Width	End Gap	Side Clearance in Groove
Comp. (1 and 2)	⅛"	.007-.015"	.003" maximum
Comp. (3—Undercut)	⅛"	.007-.015"	.003" maximum
Oil Cont. (4)	5/32"	.007-.015"	.003" maximum

Piston Pin:—Diameter, 55/64". Pins float in piston and rod (retaining rings used). When installing pins, pistons can be heated in boiling water which will allow pin to be installed and centered easily.
Pin Fit in Piston—Tight thumb push fit with piston at 120°F.
Pin Fit in Rod—Light thumb push fit at room temperature (70°F.).

NOTE:—Pin hole in upper end of connecting rod is bronze bushed.

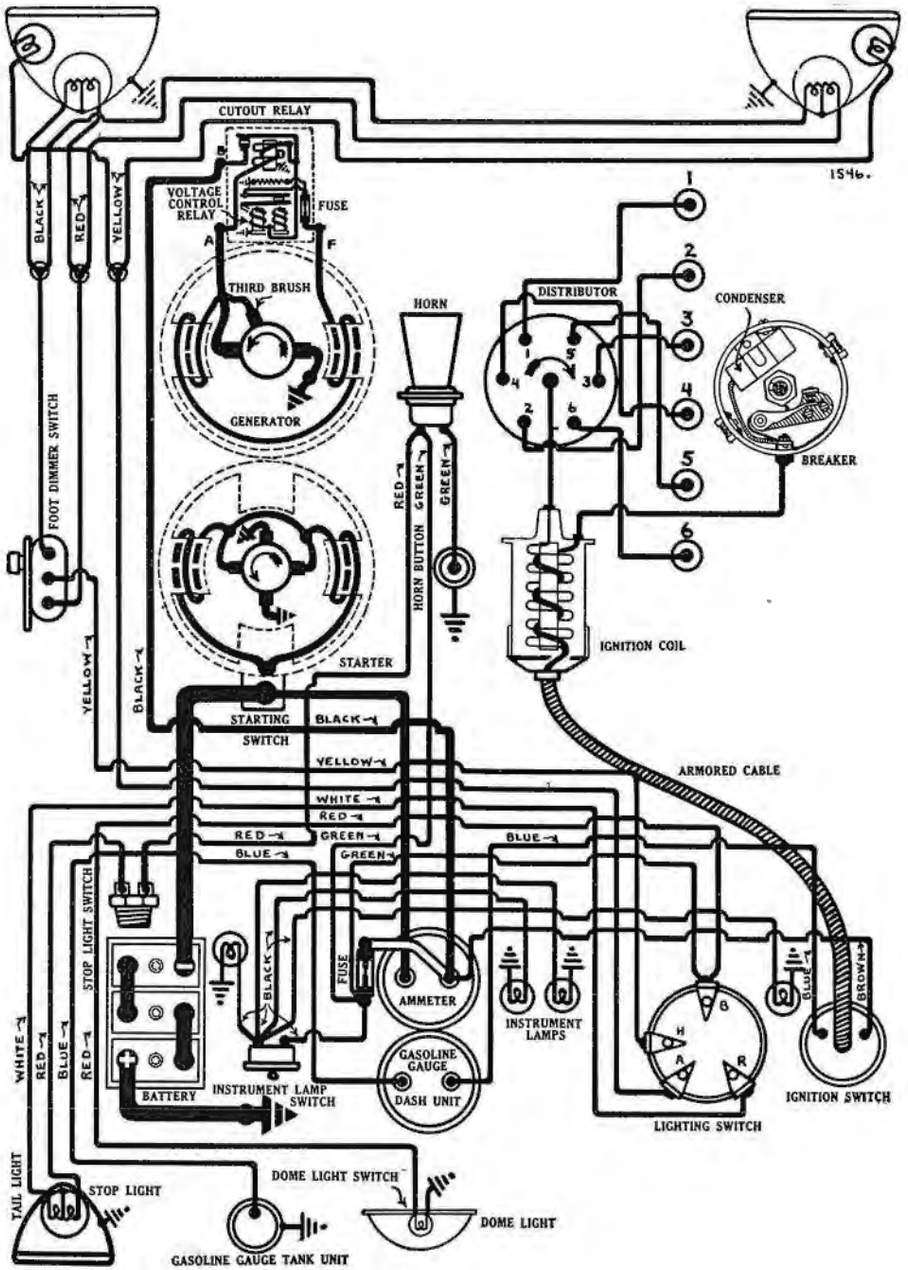
Connecting Rod:—Weight variation allowance, ¼ oz.
Big End Bearing—Removable steel-backed babbitt lined type. No shims.
Clearance—.001-.00275" (radial), .003-.009" (sideplay).
Adjustment—No shims used. Replace removable bearings when clearance exceeds maximum. Install new bearings with small boss on bearing registering with machined groove in connecting rod.

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

Crankshaft:—Four main bearing type with integral counterweights.
Journal Sizes—2¼" diameter (all bearings).
Bearing Type—Steel-backed, babbit lined type. No shims used.
Clearance—.001-.002" (radial), .003-.007" (endplay).
Adjustment—No shims used. Replace bearings. Do not file bearing caps.
End Thrust—Taken by rear (#4) main bearing.

Camshaft:—Four bearing type. Camshaft drive, non-adjustable chain.
Chain—Width, 1". Length, 48 links. Pitch, .500".
Camshaft Setting—Sprockets are marked. Mesh chain with sprockets turned so that marks are adjacent and in line with straightedge across the shaft centers.

Valves:—	Head Diameter	Stem Diameter	Seat Angle	Lift
Intake	1 15/32"	.340-.341"	45°	5/16"
Exhaust	1 15/32"	.340-.341"	45°	5/16"



PLYMOUTH
DE LUXE SIX, MODEL PE (1934)
DELCO-REMY ELECTRICAL SYSTEM

Stem - to - Guide Clearance — .001-.003″ (intake), .003-.005″ (exhaust).
Guide Inside Diameter (new)—.342-.343″ (intake), .344-.345″ (exhaust).
Tappet Clearance—.005″ (intake—hot), .007″ (exhaust—hot).

Valve Springs—	Pressure	Length
Valve Closed	34-38 lbs.	1¾″
Valve Open	77-85 lbs. (do not compress springs to less than 1 7/16″).	

NOTE:—Special valve seat inserts are used for exhaust valves. The seat inserts cannot be recut and must be reground.

Valve Timing

Intake Valves—Open 6° ATDC. Close 46° ALDC.
Exhaust Valves—Open 42° BLDC. Close 8° ATDC.
To Check Valve Timing—Set tappet clearance #6 intake valve at .011″. Use regular timing gauge. This valve should open with piston .015″ past top dead center. Reset tappet clearance at .005″ (hot).

Lubrication:—Pressure type. Oil pump located at right of crankcase on lower end of inclined accessory drive shaft.
Oil Pressure—30-60 lbs. at normal driving speeds.
Oil Pressure Relief Valve—Operates at 45-55 lbs. Located under plug on left hand side of crank- intake valve at .011″. Use regular timing gauge. case. Adjustable by replacing spring. Standard springs unpainted. Heavy spring (to increase oil pressure) painted green. Lighter spring (to decrease oil pressure) painted red.
Capacity and Oil—5 qts. Use SAE. #30 (summer), #20-W or 10-W (winter).

CARBURETION: — (Fuel System). See Carburetion Section for complete data on Carburetor, Fuel Pump, Gasoline Gauge, and Automatic Choke (special equipment).
Carburetor:—Carter, Model C6B1, 1¼″ plain tube, downdraft type.
Automatic Choke—Sisson (special equipment).
Fuel Pump:—A.C., Type B, on right hand side of crankcase.
Gasoline Gauge:—Motometer, Electric type.

IGNITION:—Coil Model 540-A. Ignition switch part of coil assembly (connected by armored cable).
Distributor Model 644-K:—Single breaker, 6-lobe cam, full automatic advance type.
Breaker Gap—Set gap at .020″. Limits, .018-24″.
Breaker Arm Spring Tension—19-23 ounces.
Cam Angles (Distributor Degrees)—Closed 36°. Open 24°.

Automatic Advance Data

Distributor Degrees	Distributor R.P.M.
Start	250
7.5	400
16	1200
Engine Degrees	**Engine R.P.M.**
4	500
15	800
32	2400

Mounting—On left hand side of crankcase. To remove, take out hold-down screw in advance arm.

IGNITION TIMING:— Flywheel Degs. Piston Position
Standard (cast-iron head) 3° ATDC. .0038″ ATDC.
High Comp. (H.C. Al. Head) 6° ATDC. .0152″ ATDC.
Timing (using Timing Light)—Connect timing light between distributor terminal and live terminal on generator relay. Turn engine over until #1 piston is on compression, stop with piston slightly past top dead center when 3° mark (cast-iron head) or 6° mark (aluminum head) on crankshaft impulse neutralizer (at front of engine) is directly under pointer on chain case cover. Loosen hold-down screw in advance plate, center pointer on scale, tighten hold-down screw, loosen clamp bolt in advance arm, rotate distributor until timing light just goes out, tighten clamp bolt, see that rotor is opposite #1 segment in distributor cap, check spark plug connections (see diagram).
Timing (using Gauge)—All cars can be timed using a Motor Gauge installed in timing plug hole over #6 piston.
Firing Order:—1-5-3-6-2-4 (see diagram).
Spark Plugs:—A.C., Type S-9 (Std. cast-iron head), Type SL-9 (aluminum head. 14 MM. Metric type. Type SL-9 plugs have a longer (7/16″) thread length.
Spark Plug Gap—.025″ (all engines).

BATTERY:—Willard, Type WS-1-13, 6 volt, 13 plate, 86 A.H. capacity (5 ampere rate).
Starting Capacity—105 amperes for 20 minutes.
Grounded Terminal—Positive (+) terminal.
Location—Under left hand front seat.

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

Performance Data

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

Starting Switch:—Manual pinion shift connected to starting switch lever. Switch mounted on starter field frame. Shift pedal and accelerator linkage interconnected so that throttle is opened ¼-1/3 when pedal is depressed to start engine. See Equipment Section Starter Controls for adjustment.
Mounting:—Flange mounted on left hand front face of flywheel housing. To remove, take out flange mounting screws.

GENERATOR:—Model No. 937-P. Armature No. 1234. Third brush current control with external voltage regulator (regulator combined with relay cut-out in case on generator field frame). Third brush setting should be adjusted by using test ammeter or by 'Commutator Bar' method.
Charging Rate Adjustment (Ammeter)—Use test ammeter to check generator output. Connect jumper wire from 'F' generator terminal to ground (this is important as voltage regulator must be shorted out while adjustment is being made). With generator at room temperature, remove commutator cover band, loosen small round lock screw on commutator end plate, shift third brush by hand, counter-clockwise to increase, or clockwise to decrease charging rate until output is 21 amperes at 8.6 volts, tighten lock screw, remove jumper from voltage regulator. See Equipment Section for compelte data on Voltage Regulator.
Commutator Bar Method—Remove generator from car, mount so that commutator can be seen, loosen lock screw on commutator end plate, shift third brush by hand so there are exactly 2½ commutator bars exposed between edge of third brush and nearest main brush, tighten lock screw. This setting provides maximum safe output and must not be exceeded.

Performance Data

	Amperes	Volts	R.P.M.
Cold—	19-22	8.3-8.7	2400
Hot—	12-15	7.6-8.0	2600

Rotation—Counter-clockwise at commuttor end.
Shunt Field Current—3.5-4.5 amperes at 6.0 volts.
Brush Spring Tension — 22-26 ounces (main brushes), 16-20 ounces (third brush).
Field Fuse—6 ampere capacity (in regulator case).
Mounting:—Pivot mounting at left front of engine. Driven by fan belt. To remove, take out two hinge bolts and one clamp bolt.
Belt Adjustment:—Loosen pivot bolts and clamp bolt, use spring scale to pull generator horizontally away from engine until belt tension (scale reading) is 45-50 lbs., tighten clamp bolt and pivot bolts before slacking off scale.

RELAY REGULATOR (CONTROL UNIT):—Model 5540. Control unit consists of relay cut-out and voltage regulator in case on generator field frame. See Equipment Section for complete data on Voltage Regulator.

Relay Cut-out

Cuts in—6.6-6.8 volts.
Cuts out—3 amperes discharge (max.).
Relay Contact Gap—.015-.025″.
Air Gap—.012-.017″ (contacts closed).

Voltage Regulator

Contacts Close—7.2 volts. **Contacts Open**—8.3 volts.
Regulator Contact Gap—.008-.013″.
Air Gap:—.038″ (between armature and core—armature down against lower stop).
.028″ (armature travel—between armature and lower stop).

LIGHTING:—Clum Switch. Model 13786. Delco-Remy **Foot Control Switch, Model 465-Z.** Foot control switch on toeboard used to control driving and passing light (upper and lower beams).

Bulb Sizes

Position	Candlepower	Mazda No.
Headlights	32-21	A1116
Parking, Instrument	3	63
Stop and Tail	21-2	1158
Dome	15	87

FUSES:—Lighting—20 ampere capacity on back of ammeter.
Generator Field—6 ampere capacity (under regulator cover on generator.

HORNS:—Klaxon, Model K-31 or K-26M (matched set blended tone). Vibrator type. Current draw, 4.0-6.5 amperes at 6.0 volts (K-31), 5.0-6.5 amperes at 6.0 volts (K-26 high note), 6.0-8.5 amperes at 6.0 volts (K-26 low note).

PONTIAC

MODEL 603, EIGHT CYLINDER (1934)
DELCO-REMY ELECTRICAL SYSTEM

SERIAL NUMBER:—First number, 838,501. On left hand frame side rail under left front fender.

ENGINE NUMBER:—First number, 987,401. On top left hand corner cylinder block.

ENGINE:—Eight cylinder 'In Line', 'L' head type.
Dimensions—Bore, 3 3/16". Stroke, 3½". Displacement, 223.4 cu. ins.
Horsepower—Rated, 32.52. Developed, 84 H.P. at 3600 R.P.M.
Compression—Standard 6.2-1. No optional compression ratios.

Pistons:—Electro-plated cast-iron. Pistons are tin-plated after being finished and cannot be ground. Cylinders must be reconditioned to standard oversize. Oversize pistons (up to .030") are held to standard weight and can be installed in one or more cylinders without destroying balance of engine.
Weight—Pistons held to ⅛ oz. weight variation in manufacturing.
Removal—Pistons and rod assembly removed from top of engine.
Clearance—(Skirt), .0015-.002" (see Fitting New Pistons).
Fitting New Pistons—Check clearance with feeler stock ½" wide. Piston should pass through cylinder with .0015" feeler and hold on .002" feeler. The .002" feeler should require 10-20 lb. pull to withdraw feeler from between piston and cylinder wall. Pistons should not be out-of-round more than .0005".

Piston Rings:—Four rings per piston, 3 compression rings above piston pin, 1 oil control ring below piston pin. Oil ring groove is drilled radially with ten ⅛" oil drain holes.

Ring	Width	End Gap	Side Clearance in Groove	Groove Depth
Comp. (all)	⅛"	.007-.017"	.0010-.0025"	.148"
Oil Cont.	3/16"	.007-.017"	.0010-.0025"	.148"

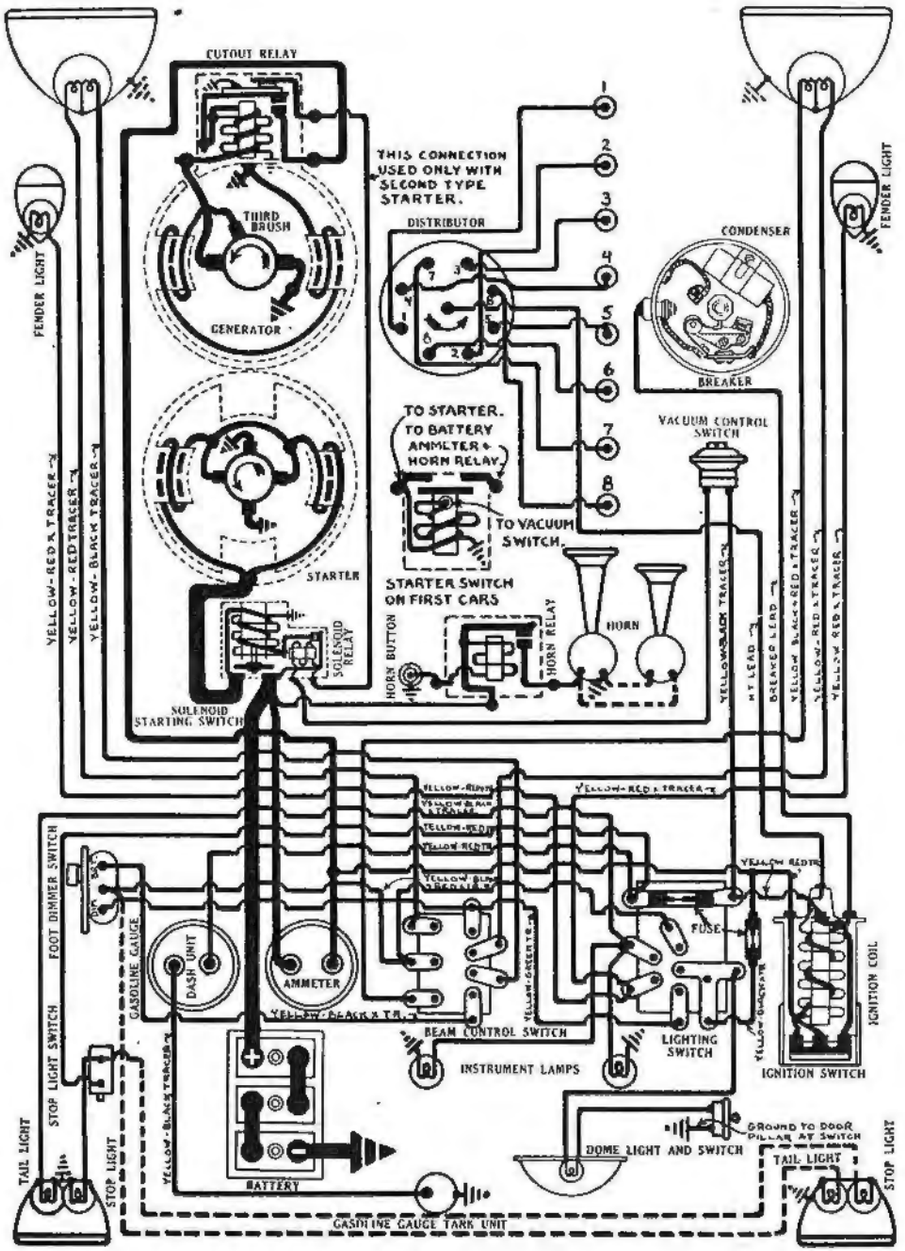
Piston Pin:—Diameter, 15/16". Pin is locked in piston and oscillates in bronze bushing in connecting rod. Free end of piston pin is slotted and should be a light press fit in the piston.
Clearance in Rod—.0003-.0005" (radial). Finish ream bushing to provide this clearance. Bushings are split type and burnishing bar must be used to expand bushing when installed.
Fitting New Pins—Coat inside of plain boss in piston with graphite. Insert pin in lock side (slotted end first). Use special HM-412 to insert pin. Gauge reading of tool should be 150-263 for pressure required to force pin into both piston bosses.

Connecting Rod:—Length, 7 11/16". Weight, held to ⅛ oz. maximum weight variation in manufacturing.
Big End Bearing—Spun babbitt type. No shims used.
Clearance—.0005-.002" (radial), .005-.010" (total sideplay).
Adjustment—No shims used. Replace rods. Do not file bearing caps.
NOTE:—Connecting rod lower bearings are offset. Install rods with offset (larger half) toward front of engine, #2, 4, 6, 8) or toward rear of engine (#1, 3, 5, 7). In all cases narrow side of bearing should be toward nearest main bearing.

Crankshaft:—Five main bearing type with integral counterweights.
Journal Sizes—#1—2¼", #2—2 9/32", #3—2 5/16", #4—2 11/32", #5—2⅜".
Bearing Type—Steel-backed, babbitt-lined type. No shims.
Clearance—.001-.003" (radial), .003-.008" endplay on #3, center).
Adjustment—No shims used. Replace bearings. Do not file bearing caps. New bearings should be line-reamed to correct clearance when installed.
End Thrust—Taken by #3 (center). Endplay, .003-.008".

Camshaft:—Five-bearing type. Camshaft drive, non-adjustable chain.
Bearing Type—Steel-backed, babbitt-lined type. Line reamed.
Clearance—.0015-.0025" (radial), .002-.005" (endplay).
Chain—Morse. Side-guide type. Width, 27/32".- Length, 56 links. Pitch, ⅜".
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	Seat Angle	Lift
Intake	1 13 32"	.310-.311"	30°	19/64"
Exhaust	1 11/32"	.310-.311"	45°	19/64"



PONTIAC
MODEL 603, EIGHT CYLINDER (1934)
DELCO-REMY ELECTRICAL SYSTEM

Stem-to-Guide Clearance—Free fit to .0006" (all valves).
Tappet Clearance—.009-.011" (all valves with engine hot).

Valve Springs—	Pressure	Length
Valve Closed	45-51 lbs.	1 29/32"
Valve Open	74-82 lbs.	1 19/32"

NOTE:—Springs are installed with two closed coils at top and single closed coil at bottom. Valve spring dampeners installed on top of each valve spring. Install new dampeners whenever dampener is removed from spring.

Valve Timing

Intake Valves open 5° BTDC. Close 39° ALDC.
Exhaust Valves open 45° BLDC. Close 5° ATDC.

NOTE:—Valve timing figures are correct with .0125" tappet clearance.

Lubrication:—Pressure type. Gear type pump located at right of crankcase on lower end of inclined accessory shaft.
Oil Pressure—20-30 lbs. at normal driving speeds.
Oil Pressure Relief Valve—Built in oil pump cover. Not adjustable. Relief valve ball clearance should be .0145-.0165".
Pump Clearances—.006-.008" (backlash between gears), .002-.006" (end clearance between gears and housing).

CARBURETION: — (Fuel System). See Carburetion Section for complete data on Carburetor, Fuel Pump, and Gasoline Gauge.
Carburetor:—Carter, Model 283-S, 1¼" plain tube, downdraft type.
Fuel Pump:—A.C., Type R.
Gasoline Gauge:—A.C., Electric type.

IGNITION:—Coil Model 539-Z. Lock coil type mounted on back of instrument panel.
Ignition Current—3.5 amperes at 6.2 volts.
Ignition Switch—Part of coil assembly. Switch has special position (key turned to left and held against spring) which allows engine to be cranked by starter with ignition 'off'. Regular running position with ignition 'on' secured by turning key to right.
Distributor Model 663-B. Single breaker, 8 lobe cam, full automatic advance type with auxiliary Vacuum Spark Advance and Gaselector.
Breaker Gap—Set at .018". Limits, .0125-.0175".
Breaker Arm Spring Tension—19-23 ozs.
Cam Angles (Distributor Degrees) — Closed 31°. Open 14°.
Manual Adjustment (Gaselector)—20° (engine)—See Gaselector data.

Automatic Advance

Distributor Degrees	Distributor R.P.M.
Start	300
5	600
11	1700
Engine Degrees	**Engine R.P.M.**
3	600
10	1200
22	3400

Gaselector:—Consists of manual adjustment at distributor with graduated scale marked for 10° advance and retard from center '0' position. Should be used to compensate for special fuels or driving conditions, such as high altitude (Gaselector must always be set at '0' when checking or setting ignition timing).
Vacuum Spark Control:—Vacuum unit on distributor provides additional advance except when engine is accelerated or is pulling heavily when spark will be retarded by return spring in unit. Maximum vacuum advance, 20° (engine).

IGNITION TIMING:—

Flywheel Degrees	Piston Position
All engines 9° BTDC.	.0264" BTDC.

Timing (using Timing Light):—Use a timing light connected across contacts to check contact opening (connect light between distributor terminal and ground). Turn on ignition. Set Gaselector at '0' by loosening thumbnut and moving indicator (tighten thumbnut after adjusting). Turn engine over with #1 piston on compression, stop when first line of ignition mark '/IGN.1&8/' is in line with pointer on flywheel housing (inspection hole in left front face of flywheel housing). Loosen advance arm clamp bolt, rotate distributor until timing lamp just lights (contacts opening), tighten clamp bolt, see that rotor is opposite #1 segment in distributor cap, check spark plug connections (see diagram). The two lines of the ignition mark on the flywheel indicate the allowable timing range (first mark 9° BTDC., second mark 4° BTDC.).
Timing (using Synchroscope):—See Equipment Section for complete data. Ignition mark on flywheel (9° line) should be marked with white chalk or paint so as to be easily distinguished. Idle engine at 6 M.P.H.
Firing Order:—1-6-2-5-8-3-7-4 (see diagram).
Spark Plugs:—A.C., Type K-7. 14 MM. Metric type.
Spark Plug Gaps—.025" (cars with radio, .022").

BATTERY:—Delco, Type 17-GW, 6 volt, 17 plate, 107 A.H. capacity (20 hour rate).
Starting Capacity—131 amperes for 20 minutes.
Grounded Terminal—Negative (—) terminal.
Location—Under front floor boards on left side.

STARTER:—Model 734-W. Armature No. 1847432. Model 738-B. Armature No. 123456.
Model 734-W with Bendix drive and magnetic switch used on approximately first 5000 cars. Model 738-B with solenoid switch pinion shift) used on later cars. See Starting Switch data.
Rotation—Counter-clockwise at commutator end.
Brush Spring Tension—24-28 ounces each.

Performance Data

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

Starting Switch:—734-W—Magnetic Switch, Type 1503. Vacuum Switch Type 1588, 1593 (RHD.). Magnetic switch mounted on starter field frame controlled by vacuum switch on manifold operated by accelerator pedal with ignition turned 'on'.
738-B—Solenoid Switch, Type 1513. Vacuum Switch Type 1588, 1593 (RHD.). Solenoid (switch and pinion shift) mounted on starter field frame controlled by vacuum switch operated by accelerator pedal. Generator relay (265-T) has extra set of contacts for solenoid relay circuit (see diagram). See Equipment Section for complete data on Starter controls.
Mounting:—Flange mounted on left hand front face of flywheel housing. To remove, take out two cap screws.

GENERATOR:—Model 935-C. Armature No. 1854856. Third brush control type. No thermostat.
Charging Rate Adjustment—Take off commutator cover band, loosen small round lock screw on commutator end plate, shift third brush by hand counter-clockwise to increase, or clockwise to decrease charging rate, tighten locking screw.
Maximum Charging Rate—14 amperes (hot) maximum, 7.7 volts, 3000 R.P.M. or 28 M.P.H.

Performance Data

Amperes	Volts	R.P.M.
Cold 16-19	8.0-8.4	2400
Hot 13-15	7.7-8.0	3000

Rotation—Counter-clockwise at commutator end.
Shunt Field Current—2.3-2.6 amperes at 6.0 volts.
Brush Spring Tension—22-26 ozs. (main), 16-20 ozs. (third brush).

SPECIAL GENERATORS:—Model 931-R. See Equipment Section for complete data on this type generator when installed as special equipment.
Mounting:—Pivot mounted at left front of engine. Driven by fan belt. To remove, take out two pivot bolts, one clamp bolt.
Belt Adjustment—Loosen pivot bolts and clamp bolt, pull generator out or away from engine, tighten mounting bolts.

RELAY CUT-OUT:—Model 265-H (734-W Starter), 265-T (738-B Starter). Mounted on generator field frame. Model 265-T has an extra set of contacts used to control starter solenoid relay (738-B starter only).
Cuts in—6.75-7.5 volts.
Cuts out—0-2.5 amperes discharge.
Relay Contact Gap—.015-.025".
Air Gap—.012-.017" (contacts closed).

LIGHTING:—Light Switch Model 478-W. Headlight Selector Switch Model 1384. Foot Control Switch Model 465-Z, 465-Y (RHD.). Light switch (right hand button on panel) controls instrument, fender indicator, tail and headlamps (on and off only). Selector switch (left hand button on panel) and foot control switch control headlamps providing city and country driving and passing beams (passing beam is assymmetrical and 'dims' right hand lamp only). Fender indicator lamps are lighted with switch in city passing and country passing positions. Headlight bulbs are prefocused type.

Bulb Specifications

Lamps	Candlepower	Mazda No.
Headlights	32-21	2320-C
All others	3	63

FUSES:—Lighting—20 ampere capacity fuse (on lighting switch) for stop light and gas gauge circuit. 20 ampere capacity (in wiring harness at left of coil) in Instrument, Fender, and Tail Lamp circuit.

HORNS:—Klaxon, Model 33-B. One horn standard. Twin set matched tone optional. Horns operated by horn relay mounted on horn bracket under engine hood. Horn current, 12-14 amperes (each) at 6.0 volts.
Horn Relay Model 266-T, 268-L:—Relay requires .25 amperes to close contacts. Current draw, .8 amperes.
Relay Contact Gap—.015-.025".
Air Gap—.012-.017" (contacts closed).

REO

FLYING CLOUD, MODEL S-4 (1934)
DELCO-REMY ELECTRICAL SYSTEM

SERIAL NUMBER:—Located on top of left frame member near steering gear.

ENGINE NUMBER:—Located on upper left hand corner of cylinder block.

ENGINE:—Six cylinder, 'L' head type. Cylinders cast enbloc.
Dimensions—Bore, 3⅜". Stroke, 5". Displacement, 268 cu. ins.
Horsepower—Rated, 27.3. Developed, 85 H.P. at 3200 R.P.M.
Compression—5.4-1. Compression pressure, 95 lbs. at 1000 R.P.M. or 78-82 lbs. at cranking speed.

Pistons:—Aluminum, Lo-Ex, 'T' slot, cam ground type. Pistons cannot be ground and cylinders should be finished to standard oversize. Finished pistons for service furnished in standard oversizes of .005", .010", .020", .030", .040". Exact size of piston stamped on top.
Weight—.81 lb. (stripped), 1.29 lbs. (with rings and pin).
Removal—Pistons removed from top of engine, connecting rods from bottom of engine. To remove assemblies, take off connecting rod bearing caps, install brass guards on rod bolts (this is important to avoid marring crankpin surface), push piston up in cylinder far enough to expose piston pin, remove locking rings, push pin out, remove piston from top of engine, remove connecting rod from bottom. Use new locking rings when installing pistons.
Clearance—.030" (top), .0006"-.0014" (bottom at right angles to piston pin bosses).
Fitting New Pistons—Use standard oversize piston (size stamped on head), recondition cylinder to finish size which will provide correct clearance. Piston clearance cannot be checked with feeler stock.

NOTE:—Pistons must be installed with slot to left (piston marked with arrow and word 'Front', arrow must point toward front of engine on all pistons).

Piston Rings:—Four rings per piston, all above piston pin, #1 and 2—compression rings, #3 and 4—oil control rings. Lower ring groove drilled radially with oil drain holes.

Ring	Width	End Gap	Wall Thickness	Groove Depth
Comp. (#1, 2)	3/32"	.007-.015"	.145"	.160"
Oil Cont. (3)	5/32"	.007-.015"	.145"	.180"
Oil Cont. (4)	3/16"	.007-.015"	.145"	.180"

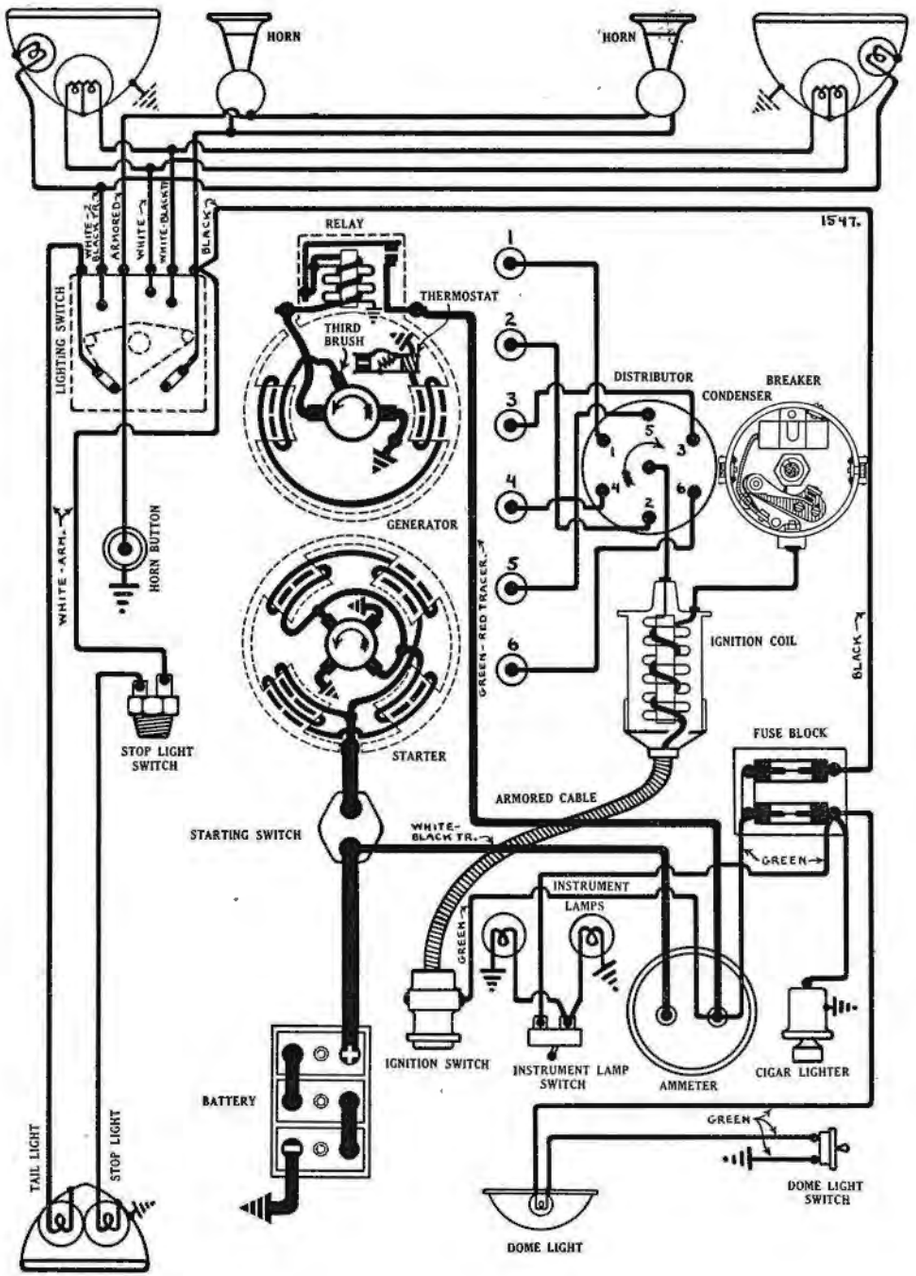
Piston Pin:—Diameter, .9834". Length, 2.903". Pin floats in piston and rod and is held in place by locking rings.
Pin Clearance in Rod and Piston—.0003".

Connecting Rod:—Weight, 2.47 lbs. Length, 10½" (center-to-center).
Big End Bearing—Babbitt-lined (integral with rod and cap). No shims.
Clearance—.0015-.0025" (radial), .003-.007" (sideplay).
Adjustment—None (no sims). Do not file bearing caps.

Crankshaft:—Seven main bearing type with integral counterweights.
Journal Sizes—2.625" diameter (all bearings).
Bearing Type—Precision type removable steel-backed, babbitt-lined bearings. No shims used.
Clearance—.002" (radial).
Adjustment—None (no shims). Replace removable bearings. Bearings held from rotating by lip on bearing shell engaged in slot in rod and cap. When installing bearings see that lip is engaged in slot. It is not necessary to line ream bearings. Replace all bearings as a set.
End Thrust—Taken by #7 (rear) main bearing. Endplay, .003-.007".

Camshaft:—Four bearing type. Camshaft drive—Non adjustable chain.
Bearing Type—Steel-backed, babbitt-lined type.
Clearance—.0015" (radial).
End Thrust—Taken by plunger or thrust plug in camshaft sprocket.
Chain—Morse, Type 766 'Bushed Joint. Width, 1½". Length, 24" or 48 links. Pitch, .500".
Camshaft Setting—Sprockets are marked. Mesh chain with sprockets turned so that marks are adjacent and in line with straightedge across shaft centers. One cap screw for camshaft mounting is dowel type with ground shoulder which fits into reamed-top hole on camshaft. This screw must be inserted first to center camshaft sprocket. Cap screw holes are offset so that sprocket cannot be assembled incorrectly.

Valves:—	Head Diameter	Stem Diameter	Length	Seat Angle	Lift
All Valves	1 13/16"	.3437"	5¾"	45°	5/16"



REO
FLYING CLOUD, MODEL S-4 (1934)
DELCO-REMY ELECTRICAL SYSTEM

Stem-to-Guide Clearance—.002-.004" (all valves).
Tapet Clearance—.007" (intake), .008" (exhaust) engine warm.

Valve Springs—	Spring Pressure	Spring Lgth.
Valves Closed	58-62 lbs.	2⅜"
Valves Open	90 lbs.	2 1/16"

Valve Timing

Intake Valves open—at TDC. Close—50° ALDC.
Exhaust Valves open—48° BLDC. Close— 2° ATDC.
To Check Valve Timing:—Set tappet clearance #1 intake valve at .012". This valve should open with piston on top dead center when flywheel mark 'UDC.#1' lines up with indicator in inspection hole in flywheel housing (right hand side of engine). Reset tappet clearance at .007" with engine warm.

Lubrication:—Pressure type. Gear type oil pump located in oil pan.
Normal Oil Pressure—30 lbs. at 35 M.P.H.
Oil Pressure Relief Valve—Operates at 30-35 lbs. Located under nut on left hand side of crankcase. Adjustable by turning nut. Turn nut in (clockwise) to increase, or out (counter-clockwise) to decrease oil pressure.
Capacity and Oil—6 qts. Use SAE. #30 (summer), #20 (winter).

CARBURETION: — (Fuel System). See Carburetion Section for complete data on Carburetor, Automatic Choke, Fuel Pump, and Gasoline Gauge.
Carburetor:—Stromberg, Model EX-32, 1½" plain tube, downdraft type.
Automatic Choke—Stromberg (standard on De Luxe models only).

Fuel Pump:—A.C.
Gasoline Gauge:—K-S Telegauge, hydrostatic type.

IGNITION:—**Coil Model 538-B.** Coil assembled as unit with ignition switch.
Ignition Current—1½-2 amperes (idling), 5 amperes (stopped).
Ignition Switch—Model 429-Z. Electrolock type switch.

Distributor Model 644-M. Single breaker, 6 lobe cam, full automatic advance type. Manual advance consists of adjustment at distributor only.
Breaker Gap—Set gap at .020". Limits, .018-.024".
Breaker Arm Spring Tension—17-21 ozs. (at tip of breaker arm).
Manual Advance—25° (engine—adjustment only).
Cam Angles (Distributor Degrees)—Closed 36°. Open 24°.

Automatic Advance

Distributor Degrees	Distributor R.P.M.	Engine Degrees	Engine R.P.M.
Start	300	2	600
9	1450	18	2900

IGNITION TIMING:— Flywheel Degs. Piston Position
All engines.....8½° or 3 teeth BTDC..... .031" BTDC.
Timing (using Timing Light):—Connect timing light between distributor terminal and ground, turn on ignition, turn engine over with #1 piston on compression, stop when ignition mark on flywheel, which is 8½° or three teeth before top dead center mark 'UDC.#1' lines up with reference mark on flywheel housing (right hand side of engine), loosen advance arm clamp bolt, rotate distributor until timing light just lights, indicating that contacts are opening, tighten clamp bolt, see that rotor is opposite #1 segment in distributor cap, check spark plug connections (see diagram).

NOTE:—Car can be road tested and ignition timing changed slightly for best performance in accordance with special fuel characteristics or operating conditions of the car. Setting should be just under the detonating or spark knock point (in general this will be 2-3 teeth or .012-.031" piston travel before top dead center).
Timing (using Gauge):—All engines can be timed using a motor gauge installed in #1 cylinder spark plug hole. See above for settings.
Firing Order:—1-5-3-6-2-4 (see diagram).
Spark Plugs:—Champion, Type C-7A. 18 MM. Metric type.
Spark Plug Gaps—Set gaps at .025".

BATTERY:—**Willard, Type WH-1-13,** 6 volt, 13 plate, 102 A.H. capacity (20 hour rate).
Starting Capacity—120 amperes for 20 minutes.
Grounded Terminal—Negative (—) terminal.
Location—On left hand side under driver's seat.

STARTER:—**Model 736-G. Armature No. 818002.**
Starter Drive—Bendix.
Rotation—Counter-clockwise at commutator end.
Brush Spring Tension—24-28 ounces each.

Performance Data

Torque	R.P.M.	Volts	Amperes
0 ft. lbs.	6000	5.0	65
15 "	Lock	3.15	570

Starting Switch:—Located on top of brake master cylinder. Operated by clutch pedal.
Mounting:—Flange mounted on left hand front face of flywheel housing. To remove, take out 3 flange mounting cap screws.

GENERATOR:—**Model 955-R. Armature No. 817807.** Third brush regulation, thermostat control. Thermostat contacts open at 200°F., reducing generator output approximately 40%.
Charging Rate Adjustment:—Take off commutator cover band, loosen small round lock screw on commutator end plate, shift third brush by hand counter-clockwise to increase, or clockwise to decrease charging rate, tighten locking screw.
Maximum Charging Rate:—18 amperes (cold), 8.5 volts, 1550 R.P.M.

Performance Data

	Amperes	Volts	R.P.M.
Cold	19-22	8.3-8.7	1550
Hot	9-12	7.3-7.7	1800-2000

Rotation—Counter-clockwise at commutator end.
Field Current—4.0-6.1 amperes at 6.0 volts.
Brush Spring Tension—14-18 ounces each.

Mounting:—Pivot mounted at left front of engine. Fan belt drive. To remove, take out two pivot bolts, and one calmp bolt.
Belt Adjustment—Loosen clamp bolt and pivot bolts, pull generator away from engine until belt is snug, tighten clamp bolt, and pivot bolts.

CUT-OUT RELAY:—**Model 265-G.** Mounted on generator field frame.
Cuts in—6.75-7.5 volts, 6.5-7 M.P.H.
Cuts out—0-2.5 ampere discharge.
Relay Contact Gap—.015-.025".
Air Gap—.012-.017" (contacts closed).

LIGHTING:—**Switch Model 486-X.** Lighting switch mounted at lower end of steering column controlled by lever on steering wheel. Double filament headlight bulbs controlled by lighting switch.

Bulb Specifications

Lamp	Candlepower	Mazda No.
Headlights	32-21	1116
Stop	15	87
All others	3	63

FUSES:—**Lighting**—Two 20 ampere capacity on fuse block in back of instrument board under cowl.

HORNS:—E.A. Broadway Model Vibrator type (standard). Sparton tuned, twin horns Model CL-5 (special De Luxe equipment). Horn current, 17 amperes total at 6 volts (Model CL-5).

STUDEBAKER

DICTATOR SIX AND DE LUXE DICTATOR, MODEL A (1934)
YEAR AHEAD DICTATOR MODEL—AFTER JUNE 26, 1934
AUTO-LITE ELECTRICAL SYSTEM

SERIAL NUMBER:—First number, 5,145,001 (first Model A), 5,200,001 (Year Ahead Model A). On plate on left frame member under front fender.

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

ENGINE:—Six cylinder, 'L' head type. Cylinders cast enbloc.
Dimensions—Bore, 3¼". Stroke, 4⅛". Displacement, 205.3 cu. inches.
Horsepower—Rated, 25.4. Developed, 88 H.P. at 3600 R.P.M.
Compression—6.3-1. Compression pressure, 137 lbs. at 1200 R.P.M. or 109.5-116 lbs. at 150 R.P.M. (cranking speed).
NOTE:—The standard 6.3-1 cylinder head is aluminum.

Pistons:—Lynite aluminum alloy, slotted skirt, cam ground type. Piston diameter is smaller (.00825-.01075") across pin bosses. Piston skirt is also tapered from top to bottom (.000-.001" larger diameter at bottom). Service pistons stamped with exact size as measured at right angles to piston pin bosses ¼" up from bottom of skirt. Standard oversizes, .002", .004", .010", .015", .020", .030".
Weight—15 ozs. (stripped), 22.08 ozs. (with rings and pin).
Removal—Piston and rod assembly removed from top of engine.
Clearance—Top, .032-.036", bottom, .0015" selective fit.
Installing New Pistons—Use .003" feeler stock 1" wide inserted in cylinder at right angles to piston pin boss on side opposite slot (invert piston, insert in bore with pin parallel to crankshaft). Use spring scale to measure feeler tension. Pull required to withdraw feeler should be 7-13 lbs. Piston selected for bore should be within this range.
NOTE:—Install pistons with slot on minimum pressure side (away from camshaft).

Piston Rings:—Four rings per piston, all above piston pin, #1 to #3, compression rings; #4, oil control ring. Lower ring groove drilled radially with ten 5/32" oil drain holes.

Ring	Width	End Gap	Wall Thickness	Groove Depth in Piston
Comp. (all)	⅛"	.013-.018"	.135-.145"	.146-.153"
Oil Cont. (#4)	3/16"	.013-.018"	.125-.135"	.184-.190"

NOTE:—Compression rings are Perfect Circle '70' and should be installed with the step downward. Oil control ring is Perfect Circle '85'.

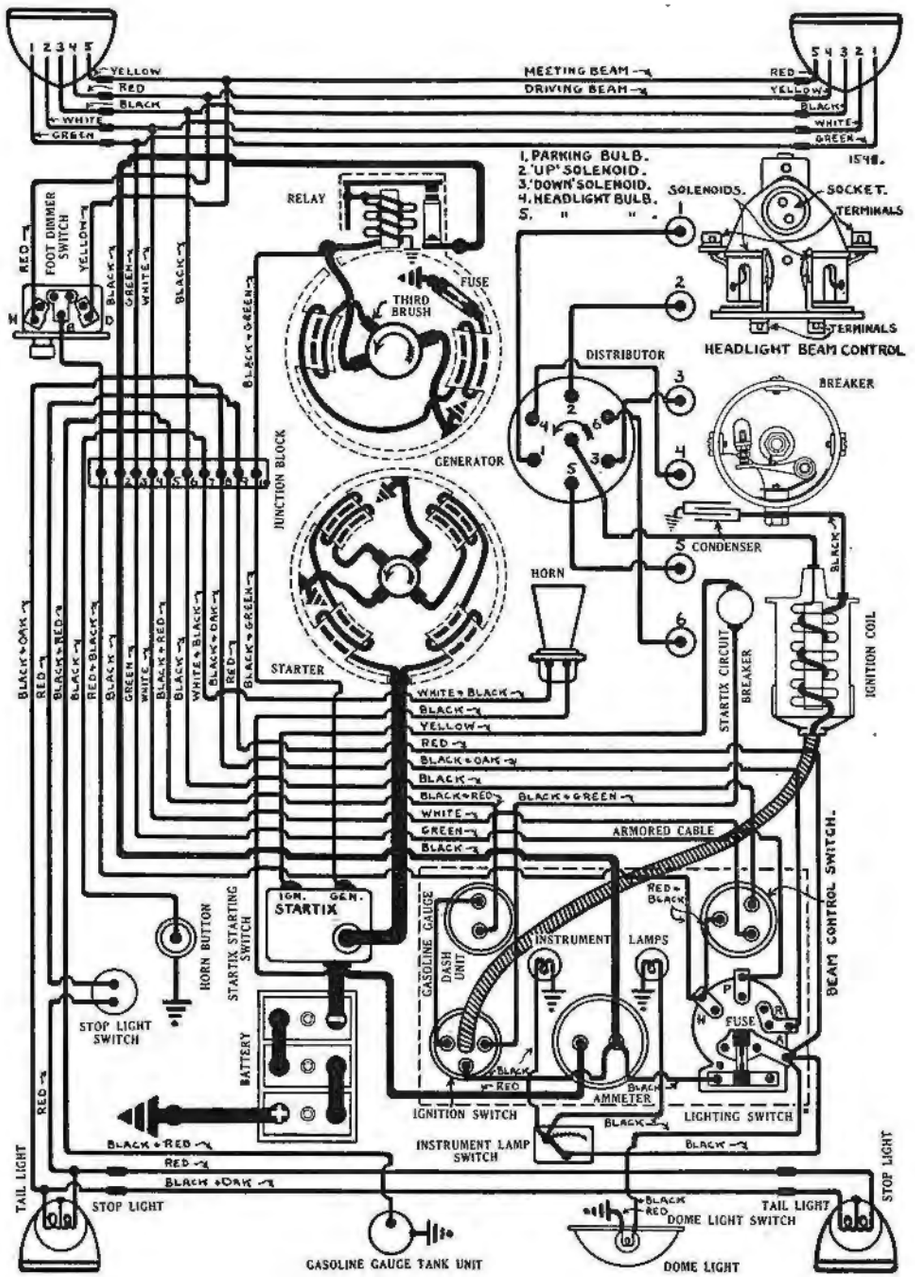
Piston Pin:—Diameter, .8741-.8745". Length, 2⅞". Pin is clamped in rod. Piston pin hole in piston is line-reamed and burnished.
Pin Fit in Piston—Light push fit. Clearance, .0001-.0003". With this clearance, rod should rock on piston of its own weight.
NOTE:—New pins are fitted and furnished with all replacement pistons.

Connecting Rod:—Weight, 33.44 ozs. Length, 8¼".
Big End Bearing—Spun babbitt-lined type. No shims used.
Clearance—.0005-.002" (radial), .005-.009" (sideplay).
Adjustment—None (no shims used). Do not file bearing caps.

Crankshaft:—Four main bearing type with integral counterweights.
Journal Sizes—2.2495-2.2500 (2¼") diameter (all bearings).
Bearing Type—Steel-backed, babbitt-lined type. No shims.
Clearance—.0005-.0025" (radial).
Adjustment—None (no shims used). Do not file bearing caps. Replace removable bearings.
End Thrust—Taken by #1 (front) bearing. Endplay, .003-.006". Adjusted by shims.

Camshaft:—Four bearing type. Camshaft drive—non-adjustable chain.
Bearing Type—Split, steel-backed, babbitt-lined type.
Clearance—.00075-.00225" (radial—front), .002-.00375" (all others).
Camshaft Endplay—Controlled by spring loaded plug in camshaft hub bearing on thrust plug plate on chain case cover. Thrust taken by thrust plate behind camshaft hub. Not adjustable—do not stretch or tamper with thrust plug spring. See that thrust plug is in place when replacing cover.
Chain—Morse #1866. Width, 1¼". Length, 23" or 46 links. Pitch, .500".
Camshaft Setting—Sprockets are marked. Mesh chain with sprockets turned so that marks are adjacent and in line with straightedge across shaft centers.

Valves:—	Head Diameter	Stem Diameter	Length	Seat Angle	Lift
Intake	1 15/32"	11/32"	5 7/32"	45°	.34375"
Exhaust	1 9/32"	11/32"	5 7/32"	45°	.34375"



STUDEBAKER

DICTATOR SIX AND DE LUXE DICTATOR, MODEL A (1934)
YEAR AHEAD DICTATOR MODEL—AFTER JUNE 26, 1934
AUTO-LITE ELECTRICAL SYSTEM

Stem-to-Guide Clearance—.001-.003" (all valves).
Tappet Clearance—.004" (intake), .006" (exhaust) engine hot.
Valve Springs—Taper type. Install springs with small end up. Flat coil type damper installed on all valve springs beginning with engine #D-1305. Damper should be threaded down over spring from top to provide minimum celarance of 7/32" between top of damper and top of valve spring (spring not compressed). Dampers can be installed on engines built previously without changing valve springs.

	Spring Pressure	Spring Length
Valve Closed	59-64 lbs.	2 3/32"
Valve Open	98-108 lbs.	1¾"

Valve Timing

Intake Valves Open—15° BTDC. Close—43° ALDC.
Exhaust Valves Open—48° BTDC. Close—10° ATDC.

To Check Valve Timing—Set tappet clearance #1 intake valve at .010". This valve should open with piston #1 15° or .0876" before top dead center when flywheel mark 'IN.OP./1-6' registers with indicator on housing (inspection hole in left front face of flywheel housing below starter). Reset tappet clearance at .004".

Lubrication:—Pressure type. Gear type oil pump located on lower end of inclined accessory shaft.
Oil Pressure—40 lbs. at 26.8 M.P.H.
Oil Pressure Relief Valve—Operates at 40 lbs.
Capacity and Oil—5 qts. Use SAE. #30 (summer 45°F. and up—Use #40 for high speed above 90°F.), #20 (45°F.), #10 (winter below 10°F.).

CARBURETION:—(Fuel System). See Carburetion Section for complete data on Carburetor, Automatic Choke, Fuel Pump, and Gasoline Gauge.
Carburetor:—Stromberg, Model UR-23, 1¼" plain tube, updraft type.
Automatic Choke—Stromberg.
Fuel Pump:—A.C., Type R.
Gasoline Gauge:—A.C., Electric type.

IGNITION:—Coil Model IG-4607. Lock coil type on back of instrument panel.
Ignition Current—½-1½ amperes (idling), 4.5 amperes (stopped).
Ignition Switch:—Two 'on' positions provided. Turn key to right for regular operation. Turn key to left for timing or operation with Startix inoperative.

Distributor Model IGB-4393. Single breaker, 6 lobe cam, full automatic advance type with auxiliary vacuum spark control.
Breaker Gap—Set at .020". Limits, .020-.024" new), .018-.020" (after 1000 miles).
Breaker Arm Spring Tension—16-20 ozs. (at tip of arm).
Cam Angles (Distributor Degrees)—Closed 40°. Open 20°.

Automatic Advance

Distributor Degrees	Distributor R.P.M.	Engine Degrees	Engine R.P.M.
0	400	0	800
4	600	8	1200
8	1000	16	2000
10.5	1400	21	2800

Vacuum Spark Control, Model VC-4001. Vacuum unit provides additional spark advance except when engine is accelerated, pulling heavily, or operated with wide open throttle when spark will be retarded by return spring in unit. Vacuum advance, 6° (engine—maximum).

Mounting:—On left hand side of crankcase. Driven by inclined accessory shaft. To remove, loosen advance arm clamp bolt (not necessary to take off vacuum connections).

IGNITION TIMING:—

	Flywheel Degs.	Piston Position
All engines	At TDC.	.0000" TDC.

Timing:—Use left hand 'on' position of ignition switch to avoid automatic cranking when turning on ignition to check contact opening. With #1 piston on compression, turn engine over until piston reaches top dead center, stop when flywheel mark 'UDC./1-6' registers with indicator on housing (inspection hole in left hand front face of housing below starter), loosen hold-down screw in advance arm, shift arm until center line of graduations lines up with reference line on engine, tighten hold-down screw, loosen advance arm clamp bolt, rotate distributor until contacts begin to open, tighten clamp bolt, see that rotor is opposite #1 segment in distributor cap, check spark plug connections (see diagram).

Car can be road-tested and setting changed slightly for best performanee by loosening hold-down screw and rotating advance arm toward 'A' (to advance) or 'R' (to retard) end of scale.

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

Spark Plugs:—Champion #7. 18 MM. Metric type.
Spark Plug Gaps—.025". Limits, .0225-.027".

BATTERY:—Willard, Type WH-1-13 (RH-1-13 Export), 6 volt, 13 plate, 102 A.H. capacity (20 hour rate).
Starting Capacity—120 amperes for 20 minutes.
Grounded Terminal—Positive (+) terminal.
Location—On left hand side under front floor.

STARTER:—Model MAN-4002. Armature No. MAD-2083. Starter drive—Outboard Bendix.
Rotation—Counter-clockwise at commutator end.
Brush Spring Tension—44-56 ozs. (new brushes).
Cranking Performance—90 R.P.M. (1050 armature), 240 amperes.

Performance Data

Torque	R.P.M.	Volts	Amperes
0 ft. lbs.	4000	5.5	65
.4 "	2400	5.5	100
3.0 "	1280	5.0	200
6.1 "	790	4.5	300
9.4 "	470	4.0	400
15.0 "	Lock	3.0	580
23.0 "	Lock	4.0	820

Starting Switch:—Startix automatic starting controlled by ignition switch. Startix circuit breaker or 'back-fire' unit used. See Equipment Section for complete data.

Mounting:—Flange mounted on left hand front face of flywheel housing. To remove, take out two cap screws.

GENERATOR:—Model GAM-4601. Armature No. GAM-2055. Third brush control type.
Charging Rate Adjustment—Take off commutator cover band. Shift third brush by prying on brush mounting stud, counter-clockwise to increase, or clockwise to decrease charging rate. Brush held in position by friction.
Maximum Charging Rate—16½ amperes (cold), 2000 R.P.M. or 18 M.P.H.

Performance Data

Amperes	Volts	R.P.M.
0	6.4	700
4	6.9	880
7	7.0	1000
10	7.2	1180
14	7.8	1520
16-18	8.0	2400

Rotation—Counter-clockwise at commutator end.
Field Current—4.08-4.52 amperes at 6.0 volts.
Motoring—4.94-5.46 amperes at 6.0 volts.
Brush Spring Tension—18-22 ozs. each.
Field Fuse—7½ ampere capacity on field frame.

SPECIAL GENERATORS:—Model GAR-4605. Used on cars equipped with radio. See Equipment Section for complete data.
Mounting:—Pivot mounted at left front of engine. Driven by fan belt. To remove, take out two pivot bolts, one clamp bolt.
Belt Adjustment—Loosen pivot bolts and clamp bolt, swing generator away from engine until fan can just be turned with belt held stationary, tighten mounting bolts.

CUT-OUT RELAY:—Model CB-4021. Mounted on generator field frame.
Cuts in—6.4 volts, 700 R.P.M. (generator), 6.3 M.P.H. Cut-in limits, 6.75-7.5 volts.
Cuts out—.5-2.5 ampere discharge.
Relay Contact Gap—.025-.035".
Air Gap—.010-.030" (contacts closed).

LIGHTING:—Clum Switches. Light Switch Model 9236. Foot Control Switch 9505. R.B.M. Beam Control Switch. Lights are turned on and off by lighting switch. Headlight system provides six beam patterns. Three driving beams (primary or clear road beam, secondary or lower beam, city or low beam) are controlled by Beam Control switch on instrument panel. A passing or deflected beam for each of the driving beams is provided by operation of the foot control switch.

Bulb Specifications

Lamp	Candlepower	Mazda No.
Headlights	32-32	1000
Parking, Instrument	3	63
Stop and Tail	21-2	1158
Dome	6	C81

FUSES:—Lighting—20 ampere capacity (on lighting switch).
Generator Field—7½ ampere capacity (on generator).

HORNS:—Sparton, Type RA. Vibrator type. Horn current, 6 amperes.

STUDEBAKER

DICTATOR, YEAR AHEAD DICTATOR, DELUXE DICTATOR, MODEL A (1934)
DELCO-REMY ELECTRICAL SYSTEM

SERIAL NUMBER:—First number, 5,145,001 (Year Ahead Model) 5,200,001. On plate on left frame side member under left front fender.

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

ENGINE:—Six cylinder, 'L' head type. Cylinders cast enbloc.
Dimensions—Bore, 3¼". Stroke, 4⅛". Displacement, 205.3 cu. ins.
Horsepower—Rated, 25.4. Developed, 88 H.P. at 3600 R.P.M.
Compression—6.3-1. Compression pressure, 137 lbs. at 1200 R.P.M. or 109.5-116 lbs. at 150 R.P.M. (cranking speed).

Pistons:—Lynite, aluminum alloy, slotted skirt, cam ground type. Piston diameter is smaller (.00825-.01075") across pin bosses. Piston skirt is also tapered from top to bottom (.000-.001" larger diameter at bottom). Service pistons stamped with exact size as measured at right angles to piston pin bosses ¼" up from bottom of skirt. Standard oversize pistons, 002", .004" .010", .015", .020", .030".
Weight—15 ozs. (stripped), 22.08 ozs. (with rings and pin).
Removal—Piston and rod assembly removed from top of engine.
Clearance—Top, .032-.036". Bottom, .0015" selective fit.
Installing New Pistons—Use .003" feeler stock ½" wide to check clearance. insert feeler in cylinder at right angles to pin bosses on side opposite slot (invert piston, insert in bore with pin parallel to crankpin). Pull required to withdraw feeler should be 7-13 lbs. Piston selected for bore should be within this range.
NOTE:—Install pistons with slot on minimum pressure side (away from camshaft).

Piston Rings:—Four rings per piston, all above piston pin, #1 to 3—compression rings, #4—oil control ring. Lower ring groove drilled radially with ten 5/32" oil drain holes.

Ring	Width	End Gap	Wall Thickness	Groove Depth
Comp. (all)	⅛"	.013-.018"	.135-.145"	.146-.153"
Oil Cont. (4)	3/16"	.013-.018"	.125-.135"	.184-.190"

NOTE:—Compression rings are Perfect Circle '70' and should be installed with the step downward. Oil control ring is Perfect Circle '85'.

Piston Pin:—Diameter .8741-.8745". Length, 2⅞". Pin is clamped in rod. Piston pin hole in piston is line reamed and burnished.
Pin Fit in Piston:—Light push fit. Clearance, .0001-.0003". With this clearance rod should rock on piston of its own weight.
NOTE:—New pins are fitted and furnished with all replacement pistons.

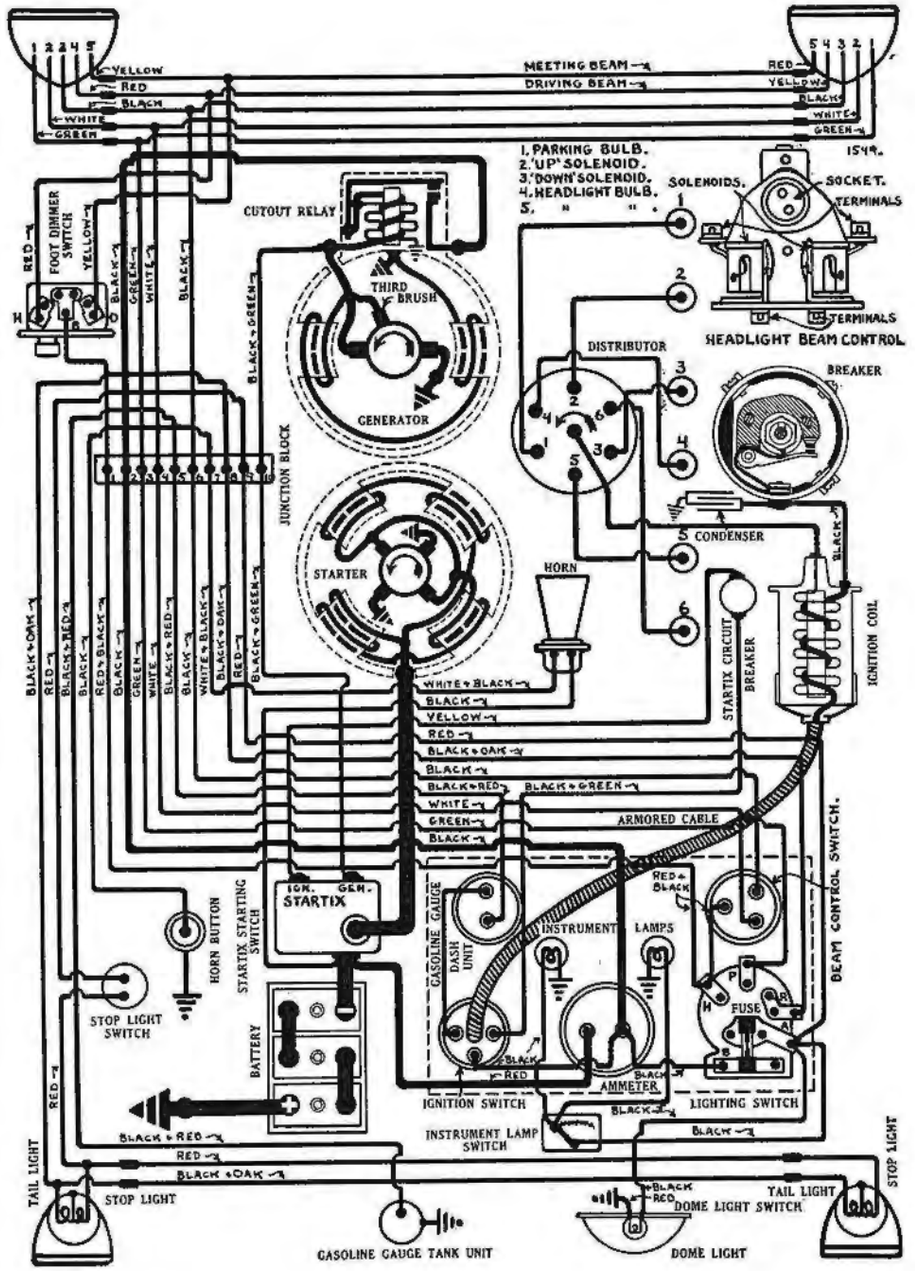
Connecting Rod:—Weight, 33.44 ozs. Length, 8¼"
Big End Bearing—Spun babbitt-lined type. No shims.
Clearance—.0005-.002" (radial), .005-.009" (sideplay).
Adjustment—None (no shims). Do not file bearing caps.

Crankshaft:—Four main bearing type with integral counterweights.
Journal Sizes—2.2495-2.5000" (2¼") diameter (all bearings).
Bearing Type—Steel-backed, babbitt-lined type. No shims.
Clearance—.0005-.0025" (radial).
Adjustment—None (no shims). Replace removable bearings. Do not file bearing caps.
End Thrust—Taken by #1 (front) main bearing. Endplay, 003-.006". Adjusted by shims.

Camshaft:—Four bearing type. Camshaft drive—Non-adjustable chain.
Bearing Type—Split, steel-backed, babbitt-lined type.
Clearance—.00075-.00225" (radial-front), .002-.00375" (all others).
Camshaft Endplay—Controlled by spring loaded plug in camshaft which bears on thrust plug plate on chain case cover. Thrust taken by thrust plate behind camshaft hub. Not adjustable. Do not stretch or tamper with thrust plug spring. See that thrust plug is in place when replacing cover.
Chain—Morse #1866. Width, 1¼". Length, 23" or 46 links. Pitch, .500".
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	Seat Angles	Lift
Intake	1 15/32"	11/32"	5 7/32"	45°	.3437"
Exhaust	1 9/32"	11/32"	5 7/32"	45°	.3437"

Stem-to-Guide Clearance—.001-.003" (all valves).
Tappet Clearance—.004" (intake), .006" (exhaust) engine hot.



STUDEBAKER

DICTATOR, YEAR AHEAD DICTATOR, DELUXE DICTATOR, MODEL A (1934)
DELCO-REMY ELECTRICAL SYSTEM

Valve Springs—Taper type with flat coil type damper installed on all springs at top. Thread damper down over spring from top to provide minimum clearance of 7/32" between top of damper and top of spring (spring not compressed). Install springs with small end up.

	Spring Pressure	Spring Length
Valve Closed	59-64 lbs.	2 3/32"
Valve Open	98-108 lbs.	1 ¾"

NOTE:—Valve lifter guides are integral with crankcase. Special support tools or clamps (HMJ-593) can be used to hold lifters up while camshaft is being removed. Valve lifters are removed from bottom of engine.

Valve Timing

Intake Valves Open—15° BTDC. Close—43° ALDC.
Exhaust Valves Open—48° BLDC. Close—10° ATDC.
To Check Valve Timing—Set tappet clearance #1 intake valve at .010". This valve should open with piston #1 15° or .0876" before top dead center when flywheel mark 'IN.OP./1-6' registers with indicator on housing (inspection hole on left hand front face of flywheel housing below starter). Reset tappet clearance at .004".

Lubrication:—Pressure type. Gear type oil pump located on lower end of inclined accessory shaft at right of crankcase.
Oil Pressure—40 lbs. at 26.8 M.P.H.
Oil Pressure Relief Valve—Operates at 40 lbs. Adjustable.
Capacity and Oil—5 qts. Use SAE. #30 (summer 45° and up—use #40 for high speed driving above 90°F), #20 (45° to 10°F), #10 (winter below 10°F).

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

Carburetor:—Stromberg, Model UR-23, 1¼" plain tube, updraft type.
Automatic Choke—Stromberg.

Fuel Pump:—A.C., Type R.

Gasoline Gauge:—A.C., Electric type.

IGNITION:—**Coil Model 538-A.** Ignition switch and coil assembled as single unit.
Ignition Current—½ to 1½ amperes (idling), 4-5 amperes (stopped).
Ignition Switch—Two 'on' positions provided. Turn key to right for regular operation (Startix operative). Turn key to left to check timing or for operation without Startix.

Distributor Model 622-X. Single breaker, 6 lobe cam, full automatic advance type with auxiliary vacuum spark control.
Breaker Gap—Set gap at .020". Limits, .018-024".
Breaker Arm Spring Tension—19-23 ounces.
Cam Angles (Distributor Degrees)—Closed 36°. Open 24°.

Automatic Advance

Distributor Degrees	Distributor R.P.M.	Engine Degrees	Engine R.P.M.
Start	400	2	800
6	700	12	1400
12½	1500	25	3000

Vacuum Spark Control—Vacuum Unit provides additional advance except when engine is accelerated, is pulling heavily, or operated with wide open throttle when spark will be retarded by return spring in unit.
Vacuum Advance—6° (engine—maximum).

Mounting:—On left hand side of crankcase. To remove, loosen advance arm camp bolt (not necessary to take off vacuum connections).

IGNITION TIMING:— Flywheel Degs. Piston Position
All engines ..... At TDC ..... .0000" TDC.
Timing:—Use left hand 'on' position of ignition switch to avoid automatic cranking when turning on ignition to check timing. With #1 piston on compression, turn engine over until piston reaches top dead center, stop when flywheel mark 'UDC/1-6' registers with indicator on housing (inspection hole in left hand front face of housing below starter), loosen hold-down screw in advance arm, shift arm until center line of graduation lines up with reference line on engine, tighten hold-down screw, loosen advance arm clamp bolt, rotate distributor until contacts begin to open, tighten clamp bolt, see that rotor is opposite #1 segment in distributor cap, check spark plug connections (see diagram).
Firing Order:—1-5-3-6-2-4. See diagram.
Spark Plugs:—Champion #7 (first cars), #8 (Year Ahead Model). 18 MM. Metric type.
Spark Plug Gaps—.025". Limits, .0225-.0275".

BATTERY:—**Williard, Type WH-1-13 (RH-1-13 Export).** 6 volt, 13 plate, 102 A.H. cpacity (20 hour rate).
Starting Capacity—120 amperes for 20 minutes.
Grounded Terminal—Positive (+) terminal.
Location—On left hand side under front floor.

STARTER:—**Model 736-R. Armature No. 1357578.**
Starter Drive—Outboard Bendix.
Rotation—Counter-clockwise at commutator end.
Brush Spring Tension—32-36 ounces each.

Performance Data

Torque	R.P.M.	Volts	Amperes
0 ft. lbs.	6000	5.0	65
15 "	Lock	3.15	570

Starting Switch:—Startix automatic starting controlled by ignition switch. Startix circuit breaker or 'back-fire' unit used. See Equipment Section.

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

GENERATOR:—**Model 937-U. Armature No. 1841027.** Third brush control type.
Charging Rate Adjustment:—Take off commutator cover band, loosen lockscrew on commutator end plate, shift third brush by hand counter-clockwise to increase, or clockwise to decrease charging rate, tighten locking screw.

Performance Data

	Amperes	Volts	R.P.M.
Cold	16-18	8.05-8.25	2000
Hot	11-13	7.5-7.8	2000-2100

Rotation—Counter-clockwise at commutator end.
Brush Spring Tension—14-18 ounces each.
Field Current—3.5-4.5 amperes at 6.0 volts.

Mounting:—Pivot mounted at left front of engine. Driven by fan belt. To remove, take out two pivot bolts, one clamp bolt.
Belt Adjustment:—Loosen pivot bolts and clamp bolt, swing generator away from engine until fan can just be turned with belt held stationery, tighten clamp bolt before slacking off on generator, tighten pivot bolts.

SPECIAL GENERATORS:—**Model 935-R.** Used on cars equipped with radio or heaters. See Equipment Section for complete data.

CUT OUT RELAY:—**Model 265-G (937-U).** Mounted on generator field frame.
Cuts in—6.75-7.5 volts.
Cuts out—0-2.5 amperes discharge.
Relay Contact Gap—.015-.025".
Air Gap—.012-.017" (contacts closed).

LIGHTING:—**Clum Switches. Light Switch Model 9236. Foot Control Switch Model 9505. R.B.M. Beam Control Switch.** Lights are turned on and off by lighting switch. Headlight system provides six beam patterns. Three driving beams (primary or clear road beam, secondary or lower beam, city or low beam) are controlled by Beam Control switch on instrument panel. A passing or deflected beam for each of the driving beams is provided by operation of the foot control switch.

Bulb Specifications

Lamp	Candlepower	Mazda No.
Headlights	32-32	1000
Parking, Instrument	3	63
Stop and Tail	21-2	1158
Dome	6	C81

FUSES:—**Lighting**—20 ampere (on lighting switch).
Generator Field—6 ampere (in regulator case).

HORNS:—**Sparton** Type RA. Vibrator type. Horn current 6 amperes.

STUDEBAKER

COMMANDER MODEL B AND YEAR AHEAD COMMANDER MODEL (1934)
DELCO-REMY ELECTRICAL SYSTEM

SERIAL NUMBER:—First number, 8,045,001 (first Model B), 8,100,001 (Year Ahead Model B). On plate on left hand frame side member under left front fender.

ENGINE NUMBER:—Stamped on boss on upper left center of engine block.

ENGINE:—Eight cylinder In Line, 'L' head type. Cylinders cast enblock.
Dimensions—Bore, 3 1/16". Stroke, 3¾". Displacement, 221 cu. ins.
Horsepower—Rated, 30. Developed, 103 H.P. at 4000 R.P.M.
Compression—6.3-1. Compression pressure, 128 lbs. at 1200 R.P.M. or 101.5-106 lbs. at 150 R.P.M. (cranking espeed).
NOTE:—The standard 6.3-1 cylinder head is aluminum.

Pistons:—Lynite aluminum alloy, slotted skirt, cam ground type. Piston diameter is smaller (.00825-.01075") across pin bosses. Piston skirt also tapered from top to bottom (000-.001" larger diameter at bottom). Service pistons stamped with exact size as measured at right angles to piston pin bosses ¼" up from bottom of skirt. Standard oversize pistons, .002", .004", .010", .015", .020", .030".
Weight—13.44 ozs. (stripped), 19.68 ozs. (with rings and pin).
Removal—Piston and rod assembly removed from top of engine.
Clearance—Top, .030-.036". Bottom, .0015" selective fit.
Installing New Pistons—Use .003" feeler stock 1" wide to check clearance (invert piston, insert in bore with pin parallel to crankshaft and feeler on side opposite slot). Use spring scale to check feeler tension. Pull required to withdraw feeler should 7-13 lbs. Piston selected for bore should be within this range.
NOTE:—Install pistons with slot on minimum pressure side (to left or away from camshaft).

Piston Rings:—Four rings per piston, all above piston pin, #1 to 3—compression rings, #4—oil control ring. Lower ring groove drilled radially with ten 5/32" oil drain holes.

Ring	Width	End Gap	Wall Thickness	Groove Depth in Piston
Comp. (all)	⅛"	.013-.018"	.125-.135"	.137-.143"
Oil Cont. (#4)	3/16"	.013-.021"	.115-.125"	.173-.178"

Compression rings are Perfect Circle '70' and should be installed with the step downward. Oil Control ring is Perfect Circle '85'.

Piston Pin:—Diameter, .8741-.8745". Length, 2⅝". Pin is clamped in rod. Piston pin hole in piston is line-reamed and burnished.
Pin Fit in Piston—Light push fit. Clearance, .0001-.0003". With this clearance, connecting rod should rock freely on piston of its own weight.
NOTE:—New pins are fitted and furnished with all replacement pistons.

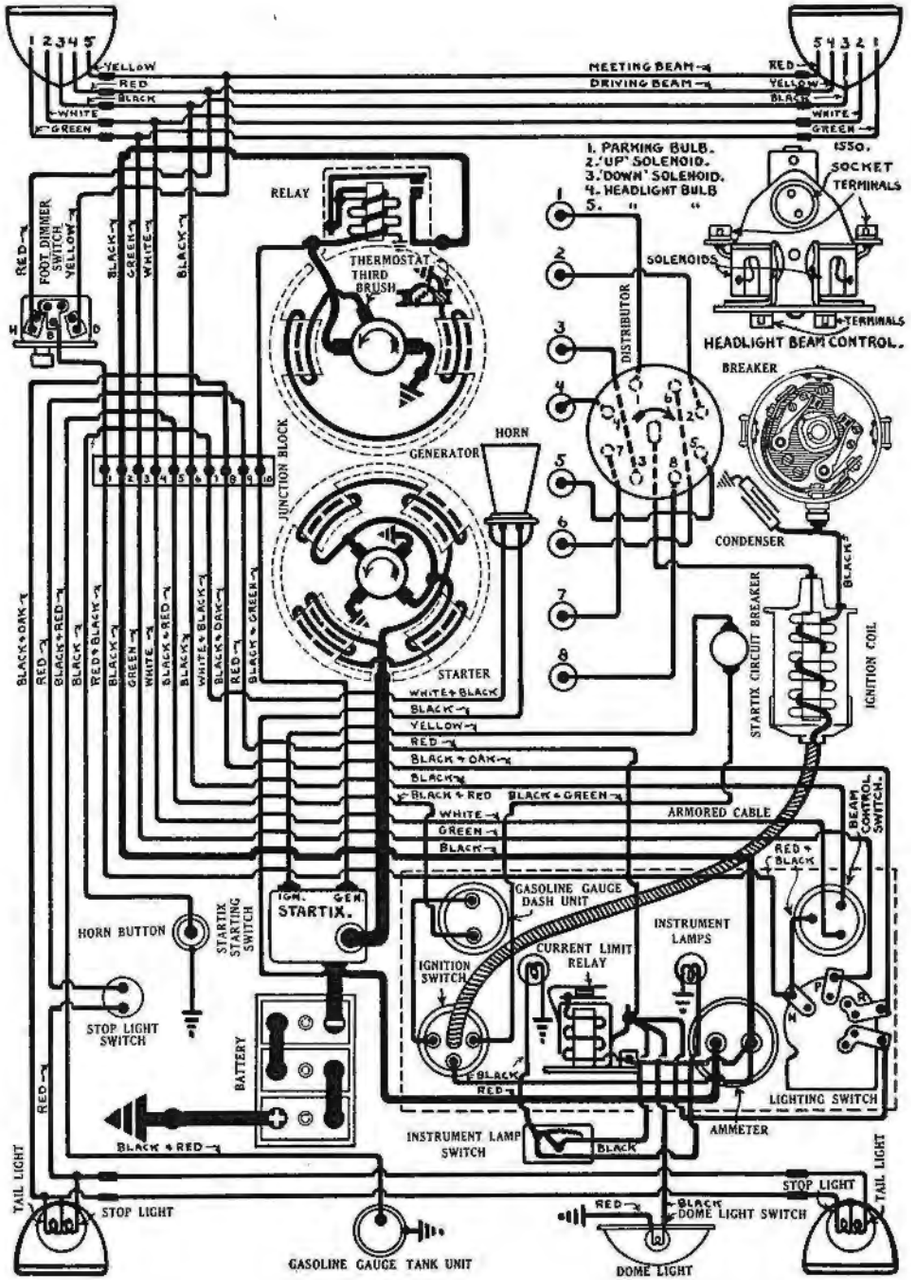
Connecting Rod:—Weight, 28.96 ozs. Length, 8¼".
Big End Bearing—Spun babbitt-lined type. No shims used.
Clearance—.0005-.002" (radial). .005-.010" (sideplay).
Adjustment—None (no shims used). Do not file bearing caps.

Crankshaft:—Nine main bearing type with bolted-on counterweights.
Journal Sizes—2.3435-2.3440" (2 11/32") diameter (all bearings).
Bearing Type—Steel-backed, babbitt-lined or lead-bronze (Clevite) type. No shims used.
Clearance—.0005-.0025" (radial).
Adjustment—None (no shims used). Do not file bearing caps. Replace removable bearings.
End Thrust—Taken by #1 (front) main bearing. Endplay, .003-.006". Adjustable by adding or removing shims.

Camshaft:—Six bearing type. Camshaft drive, helical gears.
Bearing Type—Split, steel-backed, babbitt-lined type.
Clearance—.00075-.00225" (radial—front), .002-.00375" (all others).
Camshaft Gears—Cast-iron (crankshaft), Bakelite and Fabric (camshaft).
Camshaft Setting—Gears are marked. Mesh marked tooth on crankshaft gear between two marked teeth on camshaft gear. Use gear pullers and pushers to remove and install gears.

Valves:—	Head Diameter	Stem Diameter	Length	Seat Angle
Intake	1 13/32"	11/32"	5 7/32"	45°
Exhaust	1 9/32"	11/32"	5 7/32"	45°

Valve Lift—.34375" (Model B), .28125" (after June 26, 1934).
Stem-to-Guide Clearance—.001-.003" (all valves).
Tappet Clearance—.004" (intake), .006" (exhaust) engine hot.



STUDEBAKER

COMMANDER MODEL B AND YEAR AHEAD COMMANDER MODEL (1934)
DELCO-REMY ELECTRICAL SYSTEM

Valve Springs—

	Spring Pressure	Spring Length
Valve Closed	59-64 lbs.	2 3/32"
Valve Open	98-108 lbs.	1¾"

Valve Timing—Model B

Intake Valves open 15° BTDC. Close 43° ALDC.
Exhaust Valves open 48° BLDC. Close 10° ATDC.

Valve Timing—Year Ahead Model

Intake Valves open at TDC. Close 40° ALDC.
Exhaust Valves open 45° BLDC. Close 11° ATDC.

To Check Valve Timing (Model B):—Set tappet clearance #1 intake valve at .010". This valve should open with piston #1 15° or .0876" before top dead center when flywheel mark 'IN.OP./1-8' lines up with indicator on housing. Reset tappet clearance at .004" with engine hot or cold.

Year Ahead Model—Set tappet clearance #1 intake valve at .010". This valve should open with piston #1 on top dead center when flywheel mark 'UDC/1-8' lines up with indicator. Reset tappet clearance at .004".

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

Oil Pressure—40 lbs. at 26 M.P.H.

Oil Pressure Relief Valve—Under plug on left hand side of crankcase in front of oil filler. Operates at 40 lbs.

Capacity and Oil—6½ qts. Use SAE. #30 (summer 45°F. and up—Use #40 for high speed above 90°F.), #20 (45° to 10°F.), #10 (winter below 10°F.).

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

Carburetor:—Stromberg, Model E-33, 1½" plain tube, downdraft type.

Automatic Choke—Stromberg.

Fuel Pump:—A.C., Type T (right side of crankcase).

Gasoline Gauge:—A.C., Electric type.

IGNITION:—**Coil Model 538-A.** Ignition switch and coil assembled as single unit.

Ignition Current—½-1½ amperes (idling), 4-5 amperes (stopped).

Ignition Switch, Type 430-A. Two 'on' positions provided. Turn key to right for regular operation (Startix operative). Turn key to left to check timing or for operation without Startix.

Distributor Model 662-M. Double breaker, 4 lobe cam, full automatic advance type with auxiliary vacuum spark control. 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—19-23 ounces.

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

Manual Advance—25° engine (adjustment only).

Automatic Advance

Distributor Degrees	Distributor R.P.M.	Engine Degrees	Engine R.P.M.
Start	300	2.5	600
14½	1800	29	3600

Vacuum Spark Control, Model 680-J:—Vacuum unit provides additional advance except when engine is accelerated, pulling heavily, or operated with wide open throttle when spark will be retarded by return spring in unit. Vacuum Advance—6° (engine—maximum).

Mounting:—On cylinder head. To remove, loosen advance arm clamp bolt (not necessary to remove vacuum connections).

IGNITION TIMING:—

	Flywheel Degs.	Piston Position
All engines	At TDC	.0000" TDC.

Timing (Stationary Contacts):—Use left hand 'on' position of ignition switch if ignition turned on to check contact opening to avoid automatic cranking. With #1 piston on compression, turn engine over until piston reaches top dead center, stop when flywheel mark 'UDC./1-8' lines up with indicator on 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 opposite #1 segment in distributor cap, check spark plug connections (see diagram). Then synchronize second or movable contacts.

Synchronization (Movable Contacts)—First Method:—Turn engine over 90° to firing position for piston #6, stop when flywheel mark 'UDC./3-6' lines up with indicator on housing. Loosen lock screws on movable sub-plate carrying second set of contacts, turn eccentric adjusting screw until contacts open, tighten lock screws, check contact gap.

Synchronization—Second Method:—Use special synchronizing tool, Delco-Remy Part #1838182, follow complete directions in Equipment Section, or synchronize distributor on rotary spark gap. Contact opening interval is regular 45-45-45 (distributor degrees).

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

Spark Plugs:—Champion #7 (Model B), #8 (Year Ahead Model), 18 MM. Metric type.

Spark Plug Gaps—.025". Limits, .0225-.0275".

BATTERY:—**Willard, Type WH-1-13 (RH-1-13 Export)**, 6 volt, 13 plate, 102 A.H. capacity (20 hour rate).

Starting Capacity—120 amperes for 20 minutes.

Grounded Terminal—Positive (+) terminal.

Location—On left hand side under front floor boards.

STARTER:—**Model 736-H. Armature No. 1838663.** Starter drive—Outboard Bendix.

Rotation—Counter-clockwise at commutator end.

Brush Spring Tension—24-28 ounces each.

Performance Data

Torque	R.P.M.	Volts	Amperes
0 ft. lbs.	6000	5.0	65
15 "	Lock	3.15	570

Cranking Performance—90 R.P.M. (1050 armature), 180 amperes.

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

Starting Switch:—Startix automatic starting switch and Startix circuit breaker (Anti-backfire unit) used. Controlled by ignition switch. See Equipment Section for complete data.

GENERATOR:—**Model 955-C. Armature No. 820370.** Third brush regulation, thermostat control. Thermostat contacts open at 200°F., reducing generator output approximately 40%.

Charging Rate Adjustment—Take off commutator cover band, loosen small round lock screws on commutator end plate, shift third brush by hand counter-clockwise to increase, or clockwise to decrease charging rate, tighten locking screws.

Maximum Charging Rate—20 amperes (cold), 8.4 volts, 1450 R.P.M. or 18.5 M.P.H.

Performance Data

	Amperes	Volts	R.P.M.
Cold	19-21	8.35-8.5	1450
Hot	9-12	7.35-7.65	1800-2000

Rotation—Counter-clockwise at commutator end.

Shunt Field Current—4.0-6.1 amperes at 6.0 volts.

Brush Spring Tension—14-18 ounces each.

SPECIAL GENERATORS:—**Model 935-H.** Used on cars equipped with radio. See Equipment Section for complete data.

Mounting:—Cradle mounted at left front of engine. Fan Belt drive. To remove, slack off belt, disconnect water pump drive coupling, loosen mounting clamp band.

Belt Adjustment:—Loosen nut back of fan bracket, lift up fan assembly until fan can just be turned with belt held stationary, tighten nut.

CUT-OUT RELAY:—**Model 265-B.** Mounted on generator.

Cuts in—6.4 volts, 700 R.P.M. (generator), 7.6 M.P.H. Cut-in limits, 6.75-7.5 volts.

Cuts out—0-2.5 amperes discharge.

Relay Contact Gap—.015-.025".

Air Gap—.012-.017" (contacts closed).

LIGHTING:—**Clum Switches. Light Switch Model 9498. Foot Control Switch 9492. R.B.M. Beam Control Switch.** Lights are turned off and on by lighting switch. Headlight system provides six beam patterns. Three driving beams (Primary or Clear Road Beam, Secondary or Lower Beam, City or Low Beam) are controlled by Beam Control Switch on instrument panel. A passing or deflected beam for each of the driving beams is provided by operation of the foot control switch.

Bulb Specifications

Lamp	Candlepower	Mazda No.
Headlights	32-32	1000
Parking, Instrument	3	63
Stop and Tail	21-2	1158
Dome	6	C81

CURRENT LIMIT RELAY:—**Model 410-L.** Vibrating circuit breaker in lighting circuits. Starts to operate with load of 30-35 amperes, limiting load to 5-18 amperes.

Contact Gap—.012-.020".

Air Gap—.015-.025" (contacts closed).

Spring Tension—5 ozs. min. (at brass button).

HORNS:—Sparton, Type **RA.** Vibrator type. Horn current, 6 amperes.

STUDEBAKER

PRESIDENT MODEL C AND YEAR AHEAD PRESIDENT MODEL (1934)
DELCO-REMY ELECTRICAL SYSTEM

SERIAL NUMBER:—First number, 7,045,001 (first Model C), 7,100,001 (Year Ahead Model C). On plate on left hand frame side member under left front fender.

ENGINE NUMBER:—Stamped on boss on upper left center of engine block.

ENGINE:—Eight cylinder In Line, 'L' head type. Cylinders cast enblock.

Dimensions—Bore, 3 1/16". Stroke, 4¼". Displacement, 250.4 cu. ins.

Horsepower—Rated, 30. Developed, 110 H.P. at 3600 R.P.M.

Compression—6.3-1. Compression pressure, 137 lbs. at 1200 R.P.M. or 114-117 lbs. at 150 R.P.M. (cranking speed).

NOTE:—Standard 6.3-1 cylinder head is aluminum.

Pistons:—Lynite aluminum alloy, slotted skirt, cam ground type. Piston diameter is smaller (.00825-.01075") across pin bosses. Piston skirt is also tapered from top to bottom (.000-.001" larger diameter at bottom). Service pistons are stamped with exact size as measured at right angles to piston pin bosses ¼" up from bottom of piston skirt. Standard oversize pistons, .002", .004", .010", .015", .020", .030".

Weight—13.44 ozs. (stripped), 19.68 ozs. (with rings and pin).

Removal—Piston and rod assembly removed from top of engine.

Clearance—Top, .030-.036". Bottom, .0015" selective fit.

Installing New Pistons—Use .003" feeler stock 1" wide inserted between piston and cylinder wall on pressure side (opposite side from slot) with piston inverted in bore and piston pin bosses parallel to slot. Use spring scale to check feeler tension. Pull required to withdraw feeler should be 7-13 lbs. Piston selected for bore should be within this range.

NOTE:—Install pistons with slot on minimum pressure side (to left or away from camshaft).

Piston Rings:—Four rings per piston, all above piston pin, #1 to 3—compression rings, #4—oil control ring. Lower ring groove is drilled radially with ten 5/32" oil drain holes.

Ring	Width	End Gap	Wall Thickness	Groove Depth in Piston
Comp. (all)	⅛"	.013-.018"	.125-.135"	.137-.143"
Oil Cont. (#4)	3/16"	.013-.021"	.115-.125"	.173-.178"

NOTE:—Compression rings are Perfect Circle '70' and should be installed with step downward. Oil Control Ring is Perfect Circle '85'.

Piston Pin:—Diameter, .8741-.8745". Length, 2⅝". Pin is clamped in rod. Piston pin hole in piston is line-reamed and burnished.

Pin Fit in Piston—Light push fit. Clearance, .0001-.0003". With this clearance, rod should rock freely in piston of its own weight.

NOTE:—New pins are fitted and furnished with all replacement pistons.

Connecting Rod:—Weight, 32 ozs. Length, 8" (center-to-center).

Big End Bearing—Removable lead-bronze (Clevite) bearings. No shims.

Clearance—.00075-.00275" (radial), .005-.010" (sideplay).

Adjustment—None (no shims). Do not file bearing caps. Replace removable bearings. Bearings furnished for service in standard, .005", .010", .020" undersize. Bearings cannot be reamed and crankshaft journals must be turned down to provide correct clearance (.0005-.002") when new bearings are installed.

NOTE:—Bearings are provided with small integral tongue which fits into recess in rod and bearing cap. In installing new bearings, see that tongue enters recess so that bearings are restrained from turning, see that oil holes line up, and that bearings do not project beyond edges of rod and bearing cap after bearings have been pressed into place.

Crankshaft:—Nine main bearing type with bolted-on counterweights.

Journal Sizes—2.3435-2.3440" (2 11/32") diameter (all bearings).

Bearing Type—Removable lead-bronze (Clevite) type. No shims used.

Clearance—.001-.003" (radial).

Adjustment—None (no shims). Do not file bearing caps. Replace removable bearings.

End Thrust—Taken by #1 (front) main bearing. Endplay, .003-.006". Adjustable by adding or removing shims.

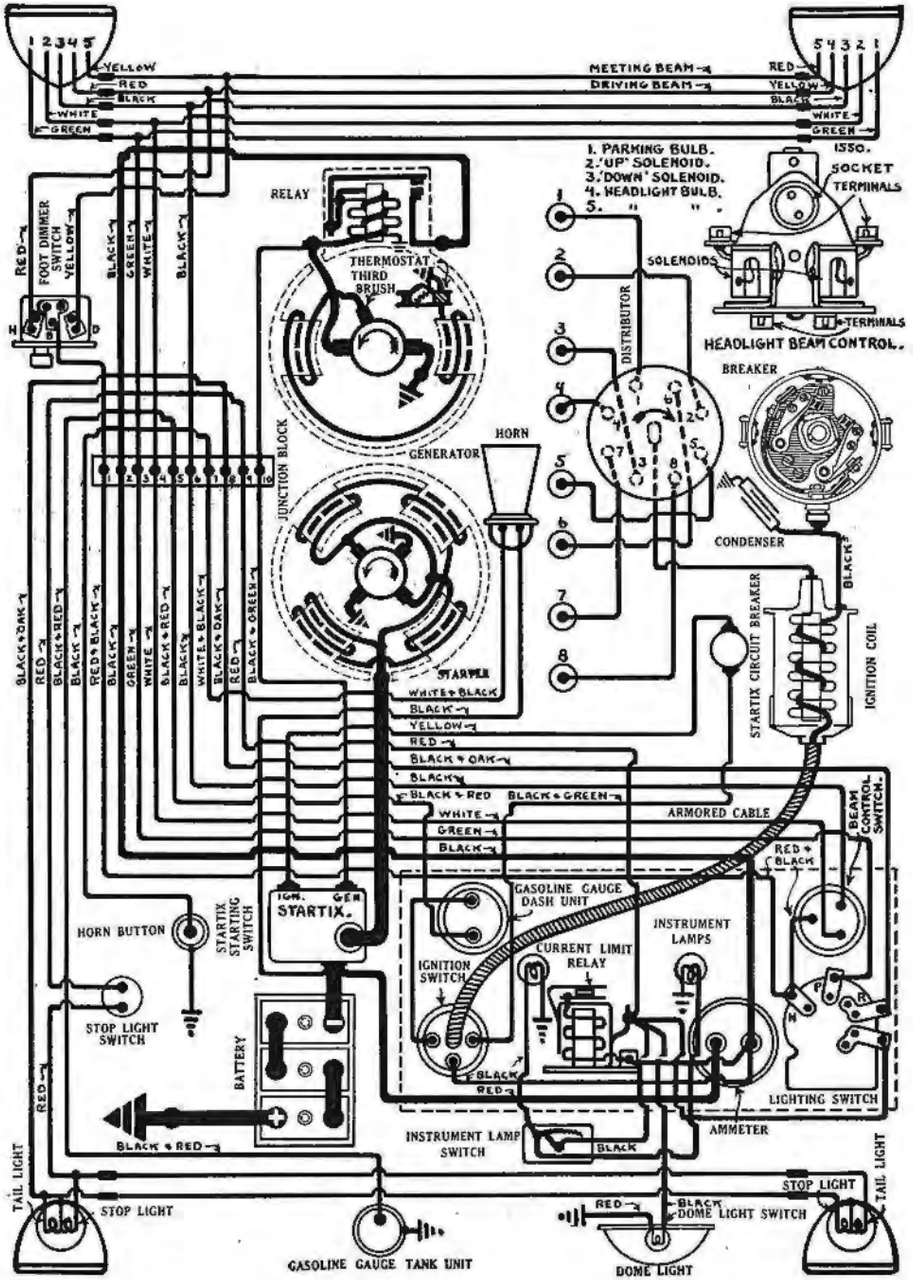
Camshaft:—Six bearing type. Camshaft drive, helical gears.

Bearing Type—Split, steel- backed, babbitt-lined type.

Clearance—.00075-.00225" (radial—front), .002-.00375" (all others).

Camshaft Gears—Cast-iron (crankshaft), Bakelite and Fabric (camshaft).

Camshaft Setting—Gears are marked. Mesh marked tooth on crankshaft gear between two marked teeth on camshaft gear. Use gear pullers and pushers to remove and install gears.



STUDEBAKER

PRESIDENT MODEL C AND YEAR AHEAD PRESIDENT MODEL (1934)
DELCO-REMY ELECTRICAL SYSTEM

Valves:—

	Head Diameter	Stem Diameter	Length
Intake	1 13/32"	11/32"	5 7/32"
Exhaust	1 9/32"	11/32"	5 7/32"

Seat Angle—45° (all valves). Lift, .34375".
Stem-to-Guide Clearance—.001-.003" (all valves).
Tappet Clearance—.004" (intake), .006" (exhaust) engine hot.

Valve Springs—	Spring Pressure	Spring Length
Valves Closed	59-64 lbs.	2 3/32"
Valves Open	98-108 lbs.	1¾"

Valve Timing

Intake Valves open 15° BTDC. Close 43° ALDC.
Exhaust Valves open 48° BLDC. Close 10° ATDC.
To Check Valve Timing:—Set tappet clearance #1 intake valve at .010". This valve should open with piston #1 15° or .0915" before top dead center when flywheel mark 'IN.OP./1-8' lines up with indicator on housing. Reset tappet clearance at .004" with engine hot or cold.

Lubrication:—Pressure type. Gear type oil pump located in crankcase.
Oil Pressure—40 lbs. at 27.4 M.P.H.
Oil Pressure Relief Valve—Under plug on left hand side of crankcase in front of oil filler. Operates at 40 lbs.
Capacity and Oil—6½ qts. Use SAE. #30 summer 45° and up—Use #40 for high speed driving above 90°F.), #20 45° to 10°F.), #10 (winter below 10°F.).

CARBURETION:—(Fuel System). See Carburetion Section for complete data on Carburetor, Automatic Choke, Fuel Pump, and Gasoline Gauge.
Carburetor:—Stromberg, Model EE-22, 1¼" dual, plain tube, downdraft type.
Automatic Choke—Stromberg.
Fuel Pump:—A.C., Type J Combination fuel and vacuum pump.
Gasoline Gauge:—A.C., Electric type.

IGNITION:—Coil Model 538-A. Ignition switch and coil assembled as single unit.
Ignition Current—½-1½ amperes (idling), 4-5 amperes (stopped).
Ignition Switch, Type 430-A. Two 'on' positions provided. Turn key to right for regular operation (Startix operative). Turn key to left to check timing or for operation without Startix.
Distributor Model 662-M. Double breaker, 4 lobe cam, full automatic advance type with auxiliary vacuum spark control. 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—19-23 ounces.
Cam Angles (Distributor Degrees) — Closed 34°. Open 11°. Both sets together when properly synchronized.
Manual Advance—25° engine (adjustment only).

Automatic Advance

Distributor Degrees	Distributor R.P.M.	Engine Degrees	Engine R.P.M.
Start	300	2.5	600
14½	1800	29	3600

Vacuum Spark Control, Model 680-J:—Vacuum unit provides additional advance except when engine is accelerated, pulling heavily, or operated with wide open throttle when spark will be retarded by return spring in unit. Vacuum Advance—6° (engine—maximum).
Mounting:—On cylinder head. To remove, loosen advance arm clamp bolt (not necessary to remove vacuum connections).

IGNITION TIMING:—

	Flywheel Degs.	Piston Position
All engines	At TDC	.0000" TDC.

Timing (Stationary Contacts):—Use left hand 'on' position of ignition switch if ignition turned on to check contact opening to avoid automatic cranking. With #1 piston on compression, turn engine over until piston reaches top dead center, stop when flywheel mark 'UDC./1-8' lines up with indicator on 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 opposite #1 segment in distributor cap, check spark plug connections (see diagram). Then synchronize second or movable contacts.
Synchronization (Movable Contacts)—First Method:—Turn engine over 90° to firing position for piston #6, stop when flywheel mark 'UDC./3-6' lines up with indicator on housing. Loosen lock screws on movable sub-plate carrying second set of contacts, turn eccentric adjusting screw until contacts open, tighten lock screws, check contact gap.
Synchronization—Second Method:—Use special synchronizing tool, Delco-Remy Part #1838182, follow complete directions in Equipment Section, or synchronize distributor on rotary spark gap. Contact opening interval is regular 45-45-45 (distributor degrees).
Firing Order:—1-6-2-5-8-3-7-4 (see diagram).
Spark Plugs:—Champion #7 (Model B), #8 (Year Ahead Model), 18 MM. Metric type.
Spark Plug Gaps—.025". Limits, .0225-.0275".

STUDEBAKER PRES., MODEL C

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—On left hand side under front floor boards.

HORNS:—Sparton SOS, Type A2. Vibrator type. Horn current, 6 amperes

STARTER: — Model 736-H. Armature No. 1838663. Starter drive—Outboard Bendix.
Rotation—Counter-clockwise at commutater end.
Brush Spring Tension—24-28 ounces each.

Performance Data

Torque	R.P.M.	Volts	Amperes
0 ft. lbs.	6000	5.0	65
15 "	Lock	3.15	570

Cranking Performance—90 R.P.M. (1050 armature), 180 amperes.

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

Starting Switch:—Startix automatic starting switch and Startix circuit breaker (Anti-backfire unit) used. Controlled by ignition switch. See Equipment Section for complete data.

GENERATOR:—Model 955-C. Armature No. 820370. Third brush regulation, thermostat control. Thermostat contacts open at 200°F., reducing generator output approximately 40%.
Charging Rate Adjustment—Take off commutator cover band, loosen small round lock screws on commutator end plate, shift third brush by hand counter-clockwise to increase, or clockwise to decrease charging rate, tighten locking screws.
Maximum Charging Rate—20 amperes (cold), 8.4 volts, 1450 R.P.M. or 18.5 M.P.H.

Performance Data

	Amperes	Volts	R.P.M.
Cold	19-21	8.35-8.5	1450
Hot	9-12	7.35-7.65	1800-2000

Rotation—Counter-clockwise at commutator end.
Shunt Field Current—4.0-6.1 amperes at 6.0 volts.
Brush Spring Tension—14-18 ounces each.

SPECIAL GENERATORS:—Model 935-H. Used on cars equipped with radio. See Equipment Section for complete data.
Mounting:—Cradle mounted at left front of engine. Fan Belt drive. To remove, slack off belt, disconnect water pump drive coupling, loosen mounting clamp band.
Belt Adjustment:—Loosen nut back of fan bracket, lift up fan assembly until fan can just be turned with belt held stationary, tighten nut.

CUT-OUT RELAY:—Model 265-B. Mounted on generator.
Cuts in—6.4 volts, 700 R.P.M. (generator), 7.6 M.P.H. Cut-in limits, 6.75-7.5 volts.
Cuts out—0-2.5 amperes discharge.
Relay Contact Gap—.015-.025".
Air Gap—.012-.017" (contacts closed).

LIGHTING:—Clum Switches. Light Switch Model 9498. Foot Control Switch 9492. R.B.M. Beam Control Switch. Lights are turned off and on by lighting switch. Headlight system provides six beam patterns. Three driving beams (Primary or Clear Road Beam, Secondary or Lower Beam, City or Low Beam) are controlled by Beam Control Switch on instrument panel. A passing or deflected beam for each of the driving beams is provided by operation of the foot control switch.

Bulb Specifications

Lamp	Candlepower	Mazda No.
Headlights	32-32	1000
Parking, Instrument	3	63
Stop and Tail	21-2	1158
Dome	6	C81

CURRENT LIMIT RELAY:—Model 410-L. Vibrating circuit breaker in lighting circuits. Starts to operate with load of 30-35 amperes, limiting load to 5-18 amperes.
Contact Gap—.012-.020".
Air Gap—.015-.025" (contacts closed).
Spring Tension—5 ozs. min. (at brass button).

HORNS:—Sparton SOS, Type A2. Vibrator type. Horn current, 6 amperes.

TERRAPLANE

CHALLENGER SERIES, MODEL KS (1934)
STANDARD MODEL K-112"WB. DE LUXE MODEL KU-116"WB. (1934)
AUTO-LITE ELECTRICAL SYSTEM

SERIAL NUMBER:—First number (K), 373,000. (KU), 21,500. (KS), 396,727. On plate on dash (under hood).

ENGINE NUMBER:—Stamped on left hand side of cylinder opposite #1 cylinder. First number, 48000.

ENGINE:—Six cylinder, 'L' head type. Cylinders cast enbloc.
Dimensions—Bore, 3". Stroke, 5". Displacement, 212 cu. ins.
Horsepower—Rated, 21.6. Developed—(5.75-1 head), 80 H.P. at 3600 R.P.M. (6.25-1 head), 85 H.P. at 3600 R.P.M. (7.00-1 head), 89½ H.P. at 3600 R.P.M.
Compression—Std. 5.75-1. Compression pressure, 80 lbs. at 125 R.P.M.
Opt. 6.25-1 and 7.00-1. Both these heads are aluminum composite. Ethylized fuel must be used in engines with the high compression 7.00-1 'Super Power Dome' head.

Pistons:—Own. Aluminum alloy, 'T' slot, 'Cam' ground type with greater greater clearance across pin bosses. Finished replacement pistons furnished as follows: 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"). Recondition cylinders to standard size as given above.
Weight—Piston only, 9.6 ozs. Complete assembly, 14½ ozs.
Removal—Piston and rod assembly removed through top of engine.
Clearance—Top, .016". Bottom, .0005".
Fitting New Pistons—Use feeler gauge .0015-.002" thick to check clearance. It should be possible to withdraw feeler with thumb and forefinger from between piston and cylinder wall at point exactly opposite 'T' slot.
NOTE:—Install pistons with 'T' slot to left.

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

Ring	Width	End Gap	Wall Thickness	Groove Depth
Comp. (both)	3/32"	.006-.016"	.123"	.156"
Oil Cont. (Upper)	⅛"	.006-.016"	.128"	.156"
Oil Cont. (Lower)	3/16"	.006-.016"	.128"	.156"

Piston Pin:—Diameter, ¾". Length, 2 7/16". Pin floats in piston and rod and is held by retaining rings. Pin hole in connecting rod is bronze-bushed.
Pin Fit in Piston—Snug fit with piston heated to 200°F.
Pin Clearance in Rod Bushing—.0003".

Connecting Rod:—Weight, 29.44 ozs. Length, 8 3/16" (center-to-center).
Big End Bearing—Spun babbitt type. Laminated shims used.
Clearance—.001" (radial), .006-.010" (sideplay).
Adjustment—Shims (laminated type).
NOTE:—Connecting rod lower bearings are offset. Install rods with right hand offset in cylinders #1, 2, 4 and left hand offset in cylinders #3, 5, 6.

Crankshaft:—Three main bearing type with integral counterweights.
Journal Sizes—#1—2 11/32", #2—2⅜", #3—2 13/32" diameter.
Bearing Type—Removable bronze-backed, babbitt-lined type. Shims used.
Bearing Clearance—.001" (radial).
Adjustment—Shims (laminated type).
End Thrust—Taken by #2 (center) main bearing. Endplay, .006-.012"

Camshaft:—Gear driven from crankshaft.
Gear Type—Crankshaft gear—steel. Camshaft gear—GE. Bakelite.
End Thrust—Taken by spring and plunger on front end of shaft.
Camshaft Setting—Gears are marked. Mesh marked tooth on crankshaft gear between two marked teeth on crankshaft gear.

Valves:	Head Diameter	Stem Diameter	Length	Seat Angle	Lift
Intake	1⅜"	5/16"	5 11/32"	45°	11/32"
Exhaust	1⅜"	5/16"	5 11/32"	45°	11/32"

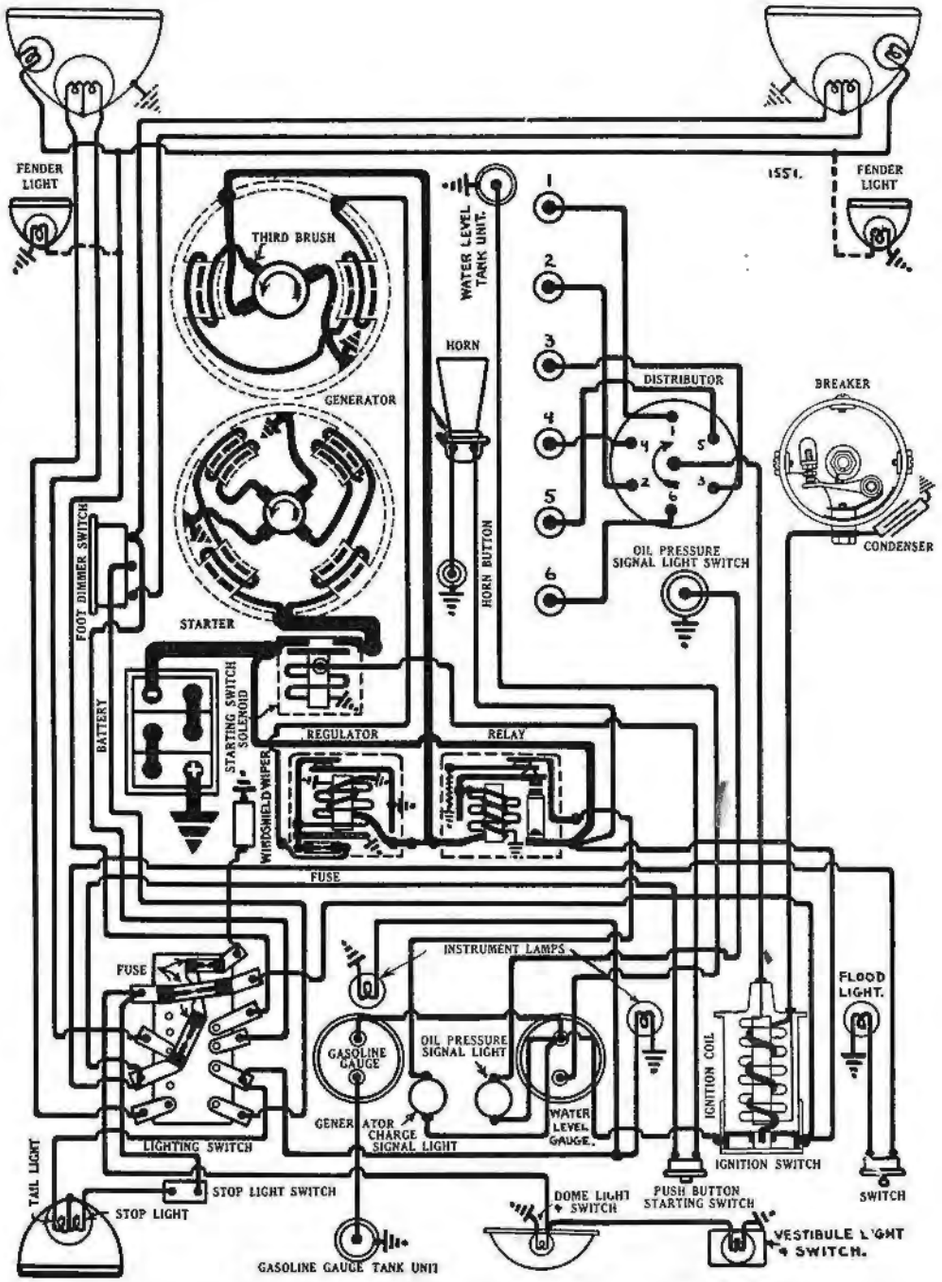
Stem-to-Guide Clearance—.0015-.003" (intake), .003-.005" (exhaust).

Tappet Clearance—	Running (engine hot)	Timing
Intake	.006"	.010"
Exhaust	.008"	.010"

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

Valve Timing

Intake Valves Open—10°40' BTDC. Close—60° ALDC.
Exhaust Valves Open—50° BLDC. Close—18°44' ATDC.
NOTE:—Timing figures are correct for .010" tappet clearance.



TERRAPLANE

CHALLENGER SERIES, MODEL KS (1934)
STANDARD MODEL K-112"WB. DE LUXE MODEL KU-116"WB. (1934)
AUTO-LITE ELECTRICAL SYSTEM

Lubrication:—Duo-flow (splash) system with positive pump feed to oil troughs and timing gears by oscillating plunger type pump. Pump mounted on right hand side of crankcase.
Normal Oil Pressure—3 pounds.
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 under Lighting for data.
Capacity and Oil—7 qts. (dry), 6 qts. (refill). Use SAE #30 (above 40°F.), #20-W (40° to 0°F.).

CARBURETION: — (Fuel System). See Carburetion Section for complete data on Carburetor, Automatic Choke (Climatic Control), Fuel Pump, and Gasoline and Oil Level Gauge.
Carburetor:—Carter, Model 281-S (K, KU), 295-S (KS), 1¼" plain tube, downdraft type.
Automatic Choke—Carter Climatic Control (281-only).
Fuel Pump:—A.C., Type R.
Gasoline Gauge:—Motometer, electric type.

IGNITION:—**Coil Model IG-4311.** Lock coil type. Resistor mounted on distributor.
Ignition Current—2.5 amperes (idling), 4.5 amperes (stopped).
Distributor Model IGB-4301-A. Single breaker, 6 lobe cam, full automatic advance type.
Breaker Gap—Set gap at .020". Limits, .018-.020".
Breaker Arm Spring Tension—16-22 ounces.
Cam Angles (Distributor Degrees)—Closed 40.5°. Open 18.5°.

Automatic Advance

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

IGNITION TIMING:— Flywheel Degs. Piston Position
Initial Setting (all engines) at TDC. ..... .0000" TDC.
Timing (Initial Setting):—With #1 piston on compression, turn engine over until piston reaches top dead center, stop when flywheel mark 'UDC.1-6/' registers with pointer in inspection hole (left hand front face of flywheel housing above starter), loosen hold-down screw in advance arm, rotate distributor clockwise to limit of advance arm slot, then rotate distributor slowly counter-clockwise until contacts begin to open, tighten hold-down screw, check rotor position and spark plug connections (see diagram). This top dead center setting should be checked by road-testing car and spark advanced as much as operating conditions and fuel rating will allow (see below).
Timing (Final Setting):—With engine at normal operating temperature and running at 8 M.P.H. in high gear on level road, accelerate engine rapidly and note performance from 10 to 15 M.P.H. With correct setting a slight spark knock should be noted under these conditions. If no knock is heard, loosen hold-down screw in advance arm and rotate distributor one graduation counter-clockwise (advance). If knock is too severe, rotate distributor one graduation colckwise (retard). Repeat test until satisfactory setting is secured. Final setting must not be beyond maximum advance mark on flywheel (¾" before top dead center mark 'UDC.1-6/').
Firing Order:—1-5-3-6-2-4 (see diagram).
Spark Plugs:—Champion, Type J-7. 14 MM. Metric.
Spark Plug Gaps—.022".

BATTERY:—**National, Type ST-3-17X,** 6 volt, 17 plate, 100 ampere hour capacity.
Starting Capacity—122 amperes for 20 minutes.
Grounded Terminal—Positive (+) terminal.
Location—Left hand side under front floor boards.

STARTER:—**Model MAB-4060. Armature No. MAB-2114.** Starter drive—Inboard Bendix.
Rotation—Counter-Clockwise at commutator end.
Brush Spring Tension—44-56 ozs. (new brushes).
Normal Cranking Speed—150 R.P.M.

Performance Data

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

NOTE:—Lock torque figures correct without switch.

Starting Switch: — Type SS-4001. Solenoid type switch mounted on starter field frame and controlled by pushbutton switch on instrument panel.
Mounting:—Flange mounted on left hand front face of flywheel housing. To remove, take out two flange mounting bolts.

GENERATOR: — **Model GBK-4602. Armature No. GBK-2055.** Ventilated, third brush control type with external voltage regulator. See Equipment Section for complete data on Voltage Regulator.
Charging Rate Adjustment:—Use test meters to check generator output. Short out voltage regulator by connecting short jumper wire from 'F' terminal on generator to ground. Take off commutator cover band, shift third brush by hand counter-clockwise to increase, or clockwise to decrease charging rate. Remove jumper wire.
Maximum Charging Rate—22 amperes (cold), 8.0 volts, 2400 R.P.M. or 28 M.P.H.

Performance Data
(Cold—without regulator field resistance)

Amperes	Volts	R.P.M.
0	6.4	800
4	6.7	980
8	7.0	1140
12	7.3	1300
16	7.55	1500
22	8.0	2200

Rotation—Counter-clockwise at commutator end.
Brush Spring Tension—18-22 ounces.
Field Current—3.75-4.15 amperes at 6.0 volts.
Motoring—4.46-4.94 amperes at 6.0 volts.
Field Fuse—7½ ampere capacity in knurled cup under regulator case.
Mounting:—Pivot mounted at left front of engine. Driven by fan belt. To remove, take out two pivot bolts and one clamp bolt.
Belt Adjustment—Loosen pivot bolts and clamp bolt, swing generator out or away from engine until slight pull is felt on belt, tighten clamp bolt before slacking off on generator, tighten pivot bolts.

CUT-OUT RELAY: — **Model CBA-4002.** Mounted on dash. Relay has extra set of contacts above armature for charge tell-tale light control.
Cuts in—6.4 volts, 750 R.P.M. or 8 M.P.H.
Cuts out—.5-2.5 ampere discharge.

VOLTAGE REGULATOR:—**Model TC-4102-A.** Voltage regulator contacts open when generator voltage reaches 8.6 volts, reducing charging rate approximately 50%. Maximum charging rate 22 amperes (regulator contacts closed), 10 amperes (contacts open). See Equipment Section for complete data on Regulator.

LIGHTING:—**Soreng-Manegold Switch, Model 5640-A, C-5640-A (without windshield wiper fuse). Soreng-Manegold Foot Control Switch.** Foot control switch provides assymetric 'meeting' beam (lower beam right hand headlight, upper beam left hand headlight). Headlight beams are crossed (left hand headlight lights right side of road). Operative only with lighting switch in 'Country Driving' position. Headlight bulbs are pre-focused type.

Bulb Specifications

Lamp	Candlepower	Mazda No.
Headlights	32-21	2320-C
Parking, Instrument, Flood	3	63
Dome, Vestibule	15	87
Stop and Tail	21-2	1158
Signal	3	64 (DC.)

SIGNAL LIGHTS:—Battery charge tell-tale and oil pressure tell-tale light mounted on instrument panel. Light bulbs are standard 3 cp. DC. bulbs.
Battery Charge Tell-tale. At left of instrument cluster. Tell-tale should light with ignition turned on and should go out when gentrator begins to charge battery (relay contacts closed). If tell-tale does not burn when ignition turned on, check bulb by grounding tell-tale terminal on relay to generator field frame. If tell-tale does not light, replace bulb. If lamp lights, check auxiliary contact spring, contacts and ground resistor. See that auxiliary contacts are closed with main contacts open. If tell-tale lights at speeds above idling (8 M.P.H.), generator or relay is defective.
Oil Pressure Tell-tale. At right of instrument cluster. Tell-tale should light with ignition turned on but should go out when engine is operated (light should flash at idling speeds). Tell-tale should not light or flash at speeds above idling. If tell-tale does not light when ignition is turned on, check bulb by grounding terminal on oil pressure check valve (right side of crankcase) to engine. If tell-tale does not light, replace bulb. If tell-tale does not flash at idling speeds, disassemble check valve and clean out by-pass hole behind plunger, see that terminal pin is straight and clean, and that plunger is free to move.

FUSES:—**Lighting**—Two 20 ampere capacity fuses on back of lighting switch.
Windshield Wiper—7½ ampere capacity fuse on lighting switch (not used on all cars).
Generator Field—7½ ampere capacity.

WILLYS
FOUR CYLINDER, MODEL 77 (1934)
AUTO-LITE ELECTRICAL SYSTEM

SERIAL NUMBER:—On plate on left hand frame side member near front spring rear shackle and on body sill at left door opening.

ENGINE NUMBER:—Stamped on right front upper corner of cylinder block.

ENGINE:—Four cylinder, 'L' head type. Cylinders cast enbloc.
Dimensions—Bore, 3⅛". Stroke, 4⅜". Displacement, 134.2 cu. ins.
Horsepower—Rated, 15.6. Developed, 48 H.P. at 3200 R.P.M.
Compression—5.13-1. No optional compression ratios.

Pistons:—Light weight cast-iron, relieved at piston pin bosses.
Removal—Piston and rod assembly removed through bottom of engine.
Clearance—Skirt, .002-.003".

Piston Rings:—Four rings per piston, all above piston pin, #1 to 3—compression rings, #4—slotted oil control ring. Lower ring groove is drilled radially with oil drain holes.

Ring	Width	End Gap
Comp. (all)	3/32"	.007-.012"
Oil Cont.	3/16"	.007-.015"

Piston Pin:—Diameter, ⅞". Pin floats in piston and rod and is retained by locking rings. Pin hole in connecting rod is bronze bushed.

Connecting Rod:—Length, 9 3/16" (center-to-center).
Big End Bearing—Removable centrifugally cast babbitt-lined type.
Clearance—.001" (radial), .004-.009" (sideplay).
Adjustment—None (no shims).
NOTE:—Connecting rod lower bearings are offset. Install rods with shortest side of bearing toward nearest main bearing (short side forward on #1 and #3 rods, toward rear of engine on #2 and #4 rods) . Oil hole in upper half of connecting rod lower bearing must be toward right of engine (opposite side from camshaft) on all rods.

Crankshaft:—Three main bearing type.
Journal Sizes—2 3/16" diameter (all bearings).
Bearing Type—Removable steel-backed, babbitt-lined type. No shims used.
Clearance—.002" (radial).
Adjustment—None (no shims).
End Thrust—Taken by #1 (front) main bearing. Endplay, .005".

Camshaft:—Four bearing type. Camshaft drive—Non-adjustable chain.
Camshaft Setting—Sprockets are punchmarked. 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	Seat Angle	Lift
Intake	1 17/32"	.372"	45°	21/64"
Exhaust	1 15/32"	.371"	45°	21/64"

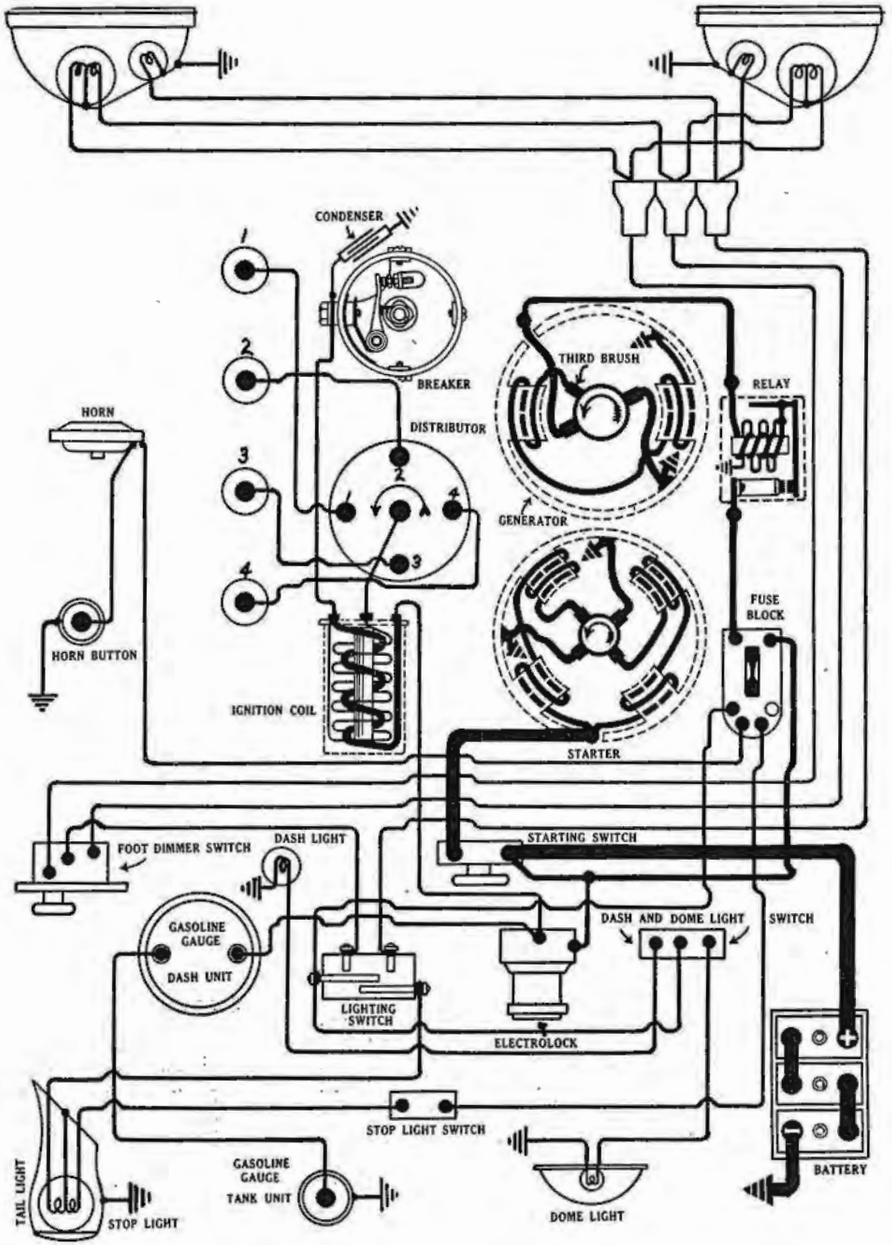
Tappet Clearance—.004" (intake), .006" (exhaust) engine hot.
Valve Springs—Spring pressure, 85 lbs. Length, 1 15/16".

Valve Timing

Intake Valves Open—At TDC. Close—45° ALDC.
Exhaust Valves Open—40° BLDC. Close— 5° ATDC.
To Check Valve Timing—Set tappet clearance #1 intake and exhaust valves at .010". Intake valve should open with piston on top dead center when flywheel mark 'T.C. I.O.1-4' lines up with pointed end of inspection hole cover plate screw (top left hand surface of flywheel housing). Exhaust valve closes with piston 5° or .0103" past top dead center when flywheel mark 'E.C./' lines up with indicator. Reset tappet clearance at .004" (intake), .006" (exhaust) with engine hot.

Lubrication:—Pressure type. Gear type oil pump located at lower end of inclined accessory shaft at left of crankcase.
Normal Oil Pressure—30 lbs. at 1500 R.P.M. or 30 M.P.H.
Oil Pressure Relief Valve—Operates at 30-35 lbs. Located in oil pump cover. Adjustable by adding or removing shims in plug above spring.
Capacity and Oil—4 qts. Use SAE. #30 (normal summer temperatures), #20 (normal winter temperatures), #10 (extreme winter temperatures and first 1000 miles with new engine).

CARBURETION:—(Fuel System). See Carburetion Section for complete data on Carburetor, Fuel Pump, and Gasoline Gauge.
Carburetor:—Tillotson, Model D-1A, 1⅛", plain tube, downdraft type.
Fuel Pump:—A.C., Type P (left hand side of crankcase).
Gasoline Gauge:—National Electric type.



WILLYS
FOUR CYLINDER, MODEL 77 (1934)
AUTO-LITE ELECTRICAL SYSTEM

IGNITION:—Coil Model IG-4406. Mounted on right hand side of engine block.
Ignition Current—3.1 amperes (running), 4.98 amperes (stopped).
Ignition Switch—Electrolock, Type 17-A (new type—no cable). See Equipment Section.
Distributor Model IGB-4078. Single breaker, 4 lobe cam, full automatic advance type.
Breaker Gap—Set at .018". Limits, .018-.020"
Breaker Arm Spring Tension—16-22 ounces.
Cam Angle—46.5° (closed), 43.5° (open) distributor degrees.

Automatic Advance

Distributor Degrees	R.P.M.	Engine Degrees	R.P.M.
Start	300	0	600
2	510	4	1020
4	750	8	1500
6	970	12	1940
8	1190	16	2380
10	1415	20	2830
12½	1700	25	3400

IGNITION TIMING:— Flywheel Degs. Piston Position
All engines ..... 4° BTDC. ..... .0066" BTDC.
Timing—Take off cover plate over inspection hole (top surface left hand side flywheel housing). Turn engine over with #1 piston on compression, stop with piston 4° or .0066" before top dead center when flywheel mark 'IGN' lines up with pointed end of inspection plate screw, loosen advance arm clamp bolt, rotate distributor until contacts begin to open, tighten clamp bolt, see that rotor is opposite #1 segment in distributor cap, check spark plug connections (see diagram). Flywheel mark 'IGN' is 4° before top dead center mark 'T.C./I.O.1-4'.

Firing Order:—1-3-4-2 (see diagram).
Spark Plugs:—Champion, Type C-7. 18 MM. Metric type.
Spark Plug Gaps—.025".

BATTERY:—U.S.L., Type CW-11A, 6 volt, 11 plate, 84 A.H. capacity (20 hour rate).
Starting Capacity—96 amperes for 20 minutes.
Grounded Terminal—Negative (—) terminal.
Location—On 'X' member under right front seat.

STARTER:—Model MZ-4033. Armature No. MZ-2089.
Starter Drive—Special outboard Bendix.
Rotation—Counter-clockwise at commutator end.
Brush Spring Tension—44-56 ozs. (new brushes).

Performance Data

Torque	R.P.M.	Volts	Amperes
0 ft. lbs.	4900	5.5	47
.65 "	2500	5.5	100
2.55 "	1325	5.0	200
4.95 "	750	4.5	300
7.65 "	220	4.0	400
10.1 "	Lock	3.5	470
12.25 "	Lock	4.0	545

Starting Switch:—Model SW-4191. Foot plunger type mounted on toeboard.
Mounting:—Flange mounted on right hand front face of flywheel housing. To remove, take out two flange mounting screws.

GENERATOR:—Model GAM-4504. Armature No. GAM-2055. Third brush control type.
Charging Rate Adjustment—Take off commutator cover band, shift third brush by hand by prying on brush mounting stud, counter-clockwise to increase, or clockwise to decrease charging rate. Third brush is held in position by friction.
Maximum Charging Rate—17 amperes (cold), 8.0 volts, 2400 R.P.M.

Performance Data

Amperes	Volts	R.P.M.
0	6.4	700
4	6.9	880
7	7.0	1000
10	7.2	1180
14	7.8	1520
17	8.0	2375
15.2	7.9	3200

Rotation—Counter-clockwise at commutator end.
Brush Spring Tension—18-22 ozs. (new brushes).
Field Current—4.08-4.52 amperes at 6.0 volts.
Motoring Current—4.94-5.46 amperes at 6.0 volts.
Mounting:—Pivot mounted at right front of engine. Fan belt drive. To remove, take out two pivot bolts, one clamp bolt.
Belt Adjustment—Loosen two pivot bolts and adjustment clamp bolt, pull generator away from engine until fan can just be turned with belt held stationary, tighten clamp bolt and pivot bolts.

RELAY:—Model CB-4008. Mounted on top of right hand frame side rail near generator.
Cuts in—7.0-7.5 volts, 700-800 R.P.M. of generator.
Cuts out—.5-2.5 amperes discharge.
Relay Contact Gap—.025-.035".
Air Gap—.010-.030" (contacts closed).

LIGHTING:—Lighting switch mounted on instrument panel. Soreng-Manegold Foot Control Switch, Model D-2100-A, used to control headlights (upper and lower beams).

Bulb Specifications

Lamp	Candlepower	Mazda No.
Headlights	21-21	1110
Stop and Tail Light	21-2	1158
All others	3	63

FUSES:—20 ampere capacity lighting fuse mounted on fuse block on right hand side lower cowl under hood.

HORNS:—Schwartze vibrator type disc horn.