

Page	Car	Model	Year	Make	Price	Options	Notes
11	1932	1932	1932	1932	1932	1932	1932
12	1932	1932	1932	1932	1932	1932	1932
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99	1932	1932	1932	1932	1932	1932	1932
100	1932	1932	1932	1932	1932	1932	1932

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Page	CAR	Model	Serial Nos.	Year	BATTERY			LIGHTING									
					Make	Type	Gr. Ter.	Switch Make	Circuit Model Fuses	Breaker Head	Edison Aux.	Mazda Side Dsh.	Lamp Numbers Stop Dome				
1810	AUBURN	8-100	8-100-1001 Up	1932	U.S.L.	XY-15X-6A	Pos.	Sor. Man.	5670-A	20	*	1000	*	63	63-1158.1158	81	
1812	AUBURN	12-160	12-160-1001 Up	1932	U.S.L.	XY-17A	Pos.	Sor. Man.	5670-A	20	*	1000	*	63	63-1158.1158	81	
*1672	AUSTIN	Bantam		1932	U.S.L.	3-CYX-4X-7A	Neg.	B. & S.	50518	20	*	1110	*	63	*	—	
1814	BUICK	32-50	2,602,732 Up	1932	Delco	13-EW	Neg.	Delco-Remy	486-X	*	D.R.410-K.1110	63	*	63	87	81	
1816	BUICK	32-60		1932	Delco	15-CW	Neg.	Delco-Remy	486-X	*	D.R.410-K.1110	63	*	63	87	81	
1816	BUICK	32-80,90		1932	Delco	17-BW	Neg.	Delco-Remy	486-X	*	D.R.410-K.1110	63	*	63	87	81	
1818	CADILLAC	255-B	1,200,001 Up	1932	Delco	17-BW	Pos.	Delco-Remy	486-S	10	D.R.480-Z.3001	63	*	63	87	81	
1820	CADILLAC	370-B	1,300,001 Up	1932	Delco	21-CW	Pos.	Delco-Remy	486-S	10	D.R.480-Z.3001	63	*	63	87	81	
1822	CADILLAC	452-B	1,400,001 Up	1932	Delco	25-AW	Pos.	Delco-Remy	486-S	10	D.R.480-Z.3001	63	*	63	87	81	
1824	CHEVROLET	BA		1932	Various		Neg.	Delco-Remy	478-E	20	*	1110	63	63	87	63	
1826	CHRYSLER	*CD		1931-32	Willard	WS-4-17	Pos.	Clum	9150	20	*	1000	*	63	63	87	87
1828	CHRYSLER	CI	6,557,401 Up	1932	Willard	WS-2-15	Pos.	Clum	9271	20	*	1000	*	63	63	87	87
1830	CHRYSLER	CP	7,523,601 Up	1932	Willard	WS-4-17	Pos.	Clum	9271	20	*	1000	*	63	63	87	87
1832	CHRYSLER	CH	7,900,001 Up	1932	Willard	SJWR-6	Pos.	Clum	9271	*	D.R.410-H.1000	*	63	63	87	87	
1832	CHRYSLER	CL	7,803,301 Up	1932	Willard	SJWR-6	Pos.	Clum	9271	*	D.R.410-H.1000	63	*	63	87	87	
*1692	CORD	L-29		1932	U.S.L.	XY-15X-6A	Pos.	Sor. Man.	5650-A	*	D.R.410-C.1110	*	63	63-87	87	63	
1834	CUNNINGHAM	V-10		1932	Willard	RH-4-15	Neg.	Delco-Remy	486-D	*	D.R.5759.1133	63	63	63	1129	64	
1836	DE SOTO	SC	5,040,201 Up	1932	Willard	WS-1-13	Pos.	Clum	9271	20	*	1000	63	*	63-1158.1158	87	
1838	DE VAUX	6-75	1,001 Up	1931-32	P-O-L	615-J	Neg.	Sor. Man.	5670-AA	20	*	1110	63	*	63-1158.1158	—	
1838	DE VAUX	6-80		1932	P-O-L	615-B	Neg.	Sor. Man.	5670-AA	20	*	1110	63	*	63-1158.1158	—	
1840	DODGE	DL	3,558,101 Up	1932	Willard	WS-2-15	Pos.	Clum	9271	20	*	1000	*	63	63-1158.1158	87	
1842	DODGE	DK	4,520,101 Up	1932	Willard	WS-4-17	Pos.	Clum	9271	20	*	1000	*	63	63-1158.1158	87	
1844	DUESENBERG	J		1932	Exide	3-LXRV-21-2G	Neg.	Delco-Remy	486-D	*	D.R.5759.1110	*	63	63	1129	—	
*1710	DU PONT	G		1932	Exide	3-XC-15-1	Pos.	Sor. Man.	5110	15	*	1110	81	63	63	1129	63
1846	DURANT	6-19	1,001 Up	1931-32	U.S.L.	3-CVX-6X-7A	Neg.	Clum	5192	20	*	1110	63	63	63-1158.1158	63	
1846	DURANT	6-21,22		1932	U.S.L.	CW-13A	Neg.	Clum	5192	20	*	1110	63	63	63-1158.1158	63	
1848	ESSEX	Pacemaker	1,281,685 Up	1932	Exide	3-VXA-15-1	Neg.	Sor. Man.	B-5670-A	30	*	1000	*	63	63	87	63
1848	ESSEX	Std.		1932	Exide	3-VXA-15-1	Neg.	Sor. Man.	B-5670-A	30	*	1000	63	*	63	87	63
1850	FORD	Four		1932	Ford		Pos.	Essex		*	1110	63	63	63	1129	63	
1852	FORD	V-8		1932	Ford		Pos.	Essex	V-8	*	1110	63	63	63	1129	63	
1854	FRANKLIN	16		1932	National	H3-21M	Pos.	Delco-Remy	486-V	30	20	1110	63	*	63	87	63
1856	FRANKLIN	17		1932	Willard	RH-5-19	Pos.	Delco-Remy	486-V	30	20	1110	63	*	63	87	63
1858	GRAHAM	Pros. 6		1931	Willard	WS-1-13	Pos.	B. & S.	50239	20	*	1110	63	*	63	87	81
1858	GRAHAM	Six		1932	Willard	WS-1-13	Pos.	Clum	9218	20	*	1110	63	*	63	87	81
1860	GRAHAM	57		1932	Willard	WS-2-15	Pos.	Clum	9318	20	*	1116	63	*	63-1158.1158	63	
1862	HUDSON	8	See Page	1932	Exide	3-VXA-15-1	Neg.	Sor. Man.	B-5670-A	30	*	1000	*	63	63	87	87
*1736	HUPMOBILE	214		1932	Willard	WS-2-15	Pos.	B. & S.	40956	20	*	1110	63	*	63	87	63
1864	HUPMOBILE	216	5001 Up	1932	Willard	WH-2-15	Pos.	B. & S.	40956	20	*	1000	63	*	63	87	81
*1738	HUPMOBILE	218		1932	Willard	WJ-2-13	Pos.	B. & S.	40956	20	*	1110	63	*	63	87	63
*1740	HUPMOBILE	221		1932	Willard	WJ-2-13	Pos.	Sor. Man.	6050-A	15	*	1110	63	*	63	87	63
1866	HUPMOBILE	222	5001 Up	1932	Willard	WH-2-15	Pos.	Sor. Man.	A-5670-A	15	*	1000	63	*	63	87	81
*1742	HUPMOBILE	225, 37		1932	Willard	WJ-4-15	Pos.	Sor. Man.	6050-A	15	*	1110	63	*	63	87	63
1868	HUPMOBILE	226	5001 Up	1932	Willard	WH-2-15	Pos.	Sor. Man.	A-5670-A	15	*	1000	63	*	63	87	81
1870	LA SALLE	345-B	1,100,001 Up	1932	Delco	17-BW	Pos.	Delco-Remy	486-H	10	D.R.480-Z.1000	63	*	63	87	81	

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Make	IGNITION			STARTER		GENERATOR			Year	Model	CAR	Page	
	Coil Model	Dist. Model	Switch Make	Model	Make	Model	Make	Relay Regulator					
Delco-Remy	528-C	660-Z	Electrolock	15-S	Delco-Remy	722-F, Q	Delco-Remy	955-H	265-B	1932	8-100	AUBURN	1810
Delco-Remy	528-C	667-Z	Electrolock	15-SD	Delco-Remy	543, 46	Delco-Remy	931-E, F	265-B	1932	12-160	AUBURN	1812
Auto-Lite	IG-4065	IGB-4034-A	B & S	50518	Auto-Lite	MAK-4001	Auto-Lite	GAS-4101	CB-4008	1932	Bantam	AUSTIN	*1672
Delco-Remy	528-H	660-L	Oakes	Hershey	Delco-Remy	725-T	Delco-Remy	940-T	265-B	1932	32-50	BUICK	1814
Delco-Remy	528-H	662-B	Oakes	Hershey	Delco-Remy	725-S	Delco-Remy	940-T	265-B	1932	32-60	BUICK	1816
Delco-Remy	528-H	662-B	Oakes	Hershey	Delco-Remy	725-S	Delco-Remy	940-T	265-B	1932	32-80, 90	BUICK	1816
Delco-Remy	528-G	660-Y, 62-Y	Delco-Remy	426-T	Delco-Remy	728-P	Delco-Remy	927-S		1932	355-B	CADILLAC	1818
Delco-Remy	530-K	4092	Delco-Remy	426-T	Delco-Remy	495	Delco-Remy	931-D		1932	370-B	CADILLAC	1820
Delco-Remy	530-K	4093	Delco-Remy	426-T	Delco-Remy	495	Delco-Remy	931-D		1932	452-B	CADILLAC	1822
Delco-Remy	528-B	633-J	Delco-Remy	427-H	Delco-Remy	714-L	Delco-Remy	943-J	265-H	1932	BA	CHEVROLET	1824
Delco-Remy	526-T	660-U	Coil Lock		Delco-Remy	728-K	Delco-Remy	943-R	265-G	1931-32	*CD	CHRYSLER	1826
Delco-Remy	534-Z	632-K, L	Coil Lock		Delco-Rem.	725-Q, 28-N	Delco-Remy	943-R, S	265-G	1932	CI	CHRYSLER	1828
Delco-Remy	534-Z	661-G	Coil Lock		Delco-Remy	728-K	Delco-Remy	943-S	265-G	1932	CP	CHRYSLER	1830
Delco-Remy	534-Z	661-F	Coil Lock		Delco-Remy	728-L	Delco-Remy	957-G	265-B	1932	CH	CHRYSLER	1832
Delco-Remy	534-Z	661-E	Coil Lock		Delco-Remy	728-S	Delco-Remy	957-U	265-B	1932	CL	CHRYSLER	1832
Delco-Remy	526-V	658-W	Coil Lock		Delco-Remy	728-N	Delco-Remy	957-J	265-J	1932	L-29	CORD	*1692
NorthEast	5023660	10874	Coil Lock		Delco-Remy	350	Delco-Remy	285	265-B	1932	V-10	CUNNINGHAM	1834
Delco-Remy	534-Z	632-L	Coil Lock		Delco-Remy	725-Q	Delco-Remy	943-S	265-G	1932	SC	DE SOTO	1836
Auto-Lite	IG-4303	IGB-4031-A	Coil Lock		Auto-Lite	MAB-4037	Auto-Lite	GAL-4330	CB-4014	1931-32	6-75	DE VAUX	1838
Auto-Lite	IG-4303	IGB-4031-A	Coil Lock		Auto-Lite	MAB-4037	Auto-Lite	GAL-4330	CB-4014	1932	6-80	DE VAUX	1838
Delco-Remy	534-Z	632-L	Coil Lock		Delco-Remy	725-Q	Delco-Remy	943-S	265-G	1932	DL	DODGE	1840
Delco-Remy	534-Z	661-D	Coil Lock		Delco-Remy	728-K	Delco-Remy	943-S	265-G	1932	DK	DODGE	1842
Delco-Remy	553-A, B	4044	Coil Lock		Delco-Remy	429	Delco-Remy	428	265-B	1932	J	DUESENBERG	1844
Delco-Remy	528-C	668-B	Clum		Delco-Remy	720-Q	Delco-Remy	945-U	265-B	1932	G	DU PONT	*1710
Auto-Lite	IG-4302	IGB-4031-A	Coil Lock		Auto-Lite	MAJ-4001	Auto-Lite	GAL-4330	CB-4014	1931-32	6-19	DURANT	1846
Auto-Lite	IG-4302	IGB-4031-A	Coil Lock		Auto-Lite	MAJ-4001	Auto-Lite	GAL-4330	CB-4014	1932	6-21, 22	DURANT	1846
Auto-Lite	IG-4088	IGB-4052-A	Electrolock	15-S	Auto-Lite	MAJ-4025	Auto-Lite	GAL-4344	CBA-4001	1932	Pacemaker	ESSEX	1848
Auto-Lite	IG-4088	IGB-4052-A	Electrolock	15-S	Auto-Lite	MAJ-4025	Auto-Lite	GAL-4344	CBA-4001	1932	Std.	ESSEX	1848
Auto-Lite			Co-incidental		Ford		Auto-Lite	Ford		1932	Four	FORD	1850
Mallory			Co-incidental		Ford		Auto-Lite	Ford		1932	V-8	FORD	1852
Delco-Remy	532-C	643-N	Clum	9193	Delco-Remy	723-C	Delco-Remy	957-E	265-B	1932	16	FRANKLIN	1854
Delco-Remy	532-C	667-A	Delco-Remy	427-Z	Delco-Remy	545	Delco-Remy	931-G	265-B	1932	17	FRANKLIN	1856
Delco-Remy	528-C	632-F	Oakes	Hershey	Delco-Remy	714-Y	Delco-Remy	957-B	265-B	1931	Pros. 6	GRAHAM	1858
Delco-Remy	528-C	632-F	Oakes	Hershey	Delco-Remy	714-Y	Delco-Remy	957-B	265-B	1932	Six	GRAHAM	1858
Delco-Remy	528-C	662-E	Oakes	Hershey	Delco-Remy	725-K	Delco-Remy	957-B	265-B	1932	57	GRAHAM	1860
Auto-Lite	CE-4017	IGH-4009-B	Electrolock	15-S	Auto-Lite	MAB-4041	Auto-Lite	GAL-4344	CBA-4001	1932	8	HUDSON	1862
Auto-Lite	IG-4080	IGC-4046	Electrolock	9-B	Auto-Lite	MAJ-4003	Auto-Lite	GAL-4124	CB-4014	1932	214	HUPMOBILE	*1736
Auto-Lite	IG-4080	IGC-4053	Electrolock	5-B	Auto-Lite	MAJ-4003	Auto-Lite	GAL-4324	CB-4014	1932	216	HUPMOBILE	1864
Auto-Lite	CE-4014	IGH-4008-C	Electrolock	9-B	Auto-Lite	MAD-4113	Auto-Lite	GAL-4138	CB-4012	1932	218	HUPMOBILE	*1738
Auto-Lite	CE-4001	IGH-4008	Electrolock	5-B	Auto-Lite	MAB-4021	Auto-Lite	GAG-4118	CB-4012	1932	221	HUPMOBILE	*1740
Auto-Lite	CE-4402	IGH-4021	Electrolock	5-B	Auto-Lite	MAD-4118	Auto-Lite	GAR-4317	CB-4011-A	1932	222	HUPMOBILE	1866
Auto-Lite	CE-4001	IGH-4008	Electrolock	5-B	Auto-Lite	MR-4102	Auto-Lite	GAG-4118	CB-4012	1932	225, 37	HUPMOBILE	*1742
Auto-Lite	CE-4402	IGH-4021	Electrolock	5-B	Auto-Lite	MAB-4042	Auto-Lite	GAG-4138	XA-407-B*	1932	226	HUPMOBILE	1868
Delco-Remy	528-G	660-Y, 62-Y	Delco-Remy	426-T	Delco-Remv	728-P	Delco-Remy	927-S	480-Z	1932	345-B	LA SALLE	1870

# 1932 CAR MODELS—EQUIPMENT USED

Page	CAR	Model	Serial No.	Year	Make	BATTERY		Gr. Ter.	Switch Make	Model	LIGHTING					
						Type					Fuses	Circuit Breaker	Head	Edison Mazda Lamp Numbers	Au.	Side Dsh.-tail Stop Dome
1872	LINCOLN	V-8		1932	Exide	3-LXV-15-1RD	Neg.	Essex			* D.R.	1000	81	* 63	1129	81
1874	LINCOLN	V-12		1932	Exide	3-LXV-15-1RD	Neg.	Essex			* D.R.	1000	81	* 63	1129	81
1876	MARMON	8-125		1932	National	K3-19XR	Pos.	Pines	A-808		* D.R.410-C	1110	63	63	63-1158	1158
1878	MARMON	16		1931-32	Exide	3-XCH-21-1	Pos.	Pines	A-808		* D.R.410-E	1000	63	* 87-88	88-87	63
1880	NASH	9-60	Early	1932	U.S.L	3-HVX-5X-6A	Neg.	Sor. Man.	4210-A	20	*	1110	63	* 63	87	64
1882	NASH	9-70	Early	1932	U.S.L	3-HVX-6X-6A	Neg.	Sor. Man.	4210-A	20	*	1110	63	* 63	87	64
1884	NASH	9-80	Early	1932	U.S.L	3-HVX-6X-6A	Pos.	Delco-Remy	486-C	20	*	1110	63	* 63	87	64
1886	NASH	9-90	Early	1932	Exide	3-MXC-17-1N	Pos.	Delco-Remy	486-K	20	*	1110	63	* 63	87	64
1880	NASH	10-60	R-267,690 Up	1932	U.S.L	HW-11A-KAW	Neg.	Sor. Man.	4210-A	20	*	1110	63	* 63-1158	1158	64
1882	NASH	10-70	X-21,318 Up	1932	U.S.L	HW-13A-BV	Neg.	Sor. Man.	4210-A	20	*	1110	63	* 63-1158	1158	64
1884	NASH	10-80	B-66,800 Up	1932	U.S.L	HW-13A-BV	Pos.	Delco-Remy	486-C	20	*	1110	63	* 63-1158	1158	64
1886	NASH	10-90	519,300 Up	1932	Exide	3-MXC-17-1N	Pos.	Delco-Remy	486-K	20	*	1110	63	* 63-1158	1158	64
1888	OLDSMOBILE	F-32	10,001 Up	1932	Delco	13-C	Neg.	Delco-Remy	478-J	*	(478-J)	1110	63	* 63	87	63
1890	OLDSMOBILE	L-32	1,001 Up	1932	Delco	13-E	Neg.	Delco-Remy	478-J	*	(478-J)	1110	63	* 63	87	63
1892	PACKARD	900	360,001 Up	1932	P-O-L	619-ST	Pos.	Clum	9170	20	*	1000	63	* 63	1129	81
1894	PACKARD	901, 2		1931-32	P-O-L	A-6175G	Pos.	Clum	9170	20	*	1000	63	* 63	1129	81
1894	PACKARD	903, 4		1931-32	P-O-L	A-6175G	Pos.	Clum	9170	20	*	1000	63	* 63	1129	81
1896	PACKARD	905, 6	900,001 Up	1932	P-O-L	A-6175G	Pos.	Clum	9170	20	*	1000	63	* 63	1129	81
1898	PEERLESS	Cust.	Deluxe	1932	Willard	WSB-19	Pos.	Pines	A-808	*	D.R.	1110	63	* 63	87	63
1898	PEERLESS	Master	Deluxe	1932	Willard	WSB-19	Pos.	Pines	A-808	*	D.R.	1110	63	* 63	87	63
1900	PIERCE ARROW	51, 52, 53	See Page	1932	Willard	WH-5-19	Pos.	Delco-Remy	486-U	5	D.R.410-F	1000	81	* 63-81	1129	87
1902	PIERCE ARROW	54	See Page	1932	Willard	WH-4-17	Pos.	Delco-Remy	486-U	5	D.R.410-F	1000	81	* 63-81	1129	87
1904	PLYMOUTH	PA		1931-32	Willard	WS-1-13	Pos.	Clum	9150	20	*	1110	63	* 63-1158	1158	87
1904	PLYMOUTH	PB	1,680,001 Up	1932	Willard	WS-1-13	Pos.	Clum	9271	20	*	1110	63	* 63-1158	1158	87
1906	PONTIAC	402-6	729,001 Up	1932	Delco	13-D	Neg.	Clum	9191	20	*	1116	63	* 63	87	81
1908	PONTIAC	302-8	310,001 Up	1932	Delco	15-A	Neg.	Clum	9191	20	*	1116	63	* 63	87	81
1910	REO	S	New Flying Cloud	1932	Willard	WH-1-13	Neg.	Delco-Remy	486-X	20	*	1110	63	* 63	87	63
1912	REO	6-21	Flying Cloud 6	1931-32	Willard	WH-2-15	Neg.	Sor. Man.	5670-AA	20	*	1110	63	* 63	87	64
1914	REO	8-21,25	Fly. Cloud 8	1931-32	Willard	WH-2-15	Neg.	Sor. Man.	5670-AA	20	*	1110	63	* 63	87	64
1916	REO	8-31,35,53	Royale 8	1932	Willard	RJ-4-15	Neg.	Delco-Remy	482-F	20	*	1110	63	* 63	87	64
1918	ROCKNE	65	00001 Up	1932	Willard	WH-1-13	Pos.	Clum	9236	20	*	1110	81	* 63-1158	1158	81
1920	ROCKNE	75	1,500,001 Up	1932	Willard	WJ-1-13	Pos.	Clum	9115	20	*	1110	81	* 63-1158	1158	81
1922	STUDEBAKER	55	5,120,001 Up	1932	Willard	WH-1-13	Pos.	Clum	9115	*	D.R.410-L	1110	63	* 63	87	81
1924	STUDEBAKER	62	9,015,001 Up	1932	Willard	WH-1-13	Pos.	Clum	9115	*	D.R.410-L	1110	63	* 63	87	81
1924	STUDEBAKER	71	8,036,001 Up	1932	Willard	WH-4-17	Pos.	Clum	9115	*	D.R.410-L	1110	63	* 63	87	81
1926	STUDEBAKER	91	6,025,001 Up	1932	Willard	WH-4-17	Pos.	Clum	9115	*	D.R.410-L	1110	63	* 63	87	81
1928	STUTZ	LAA		1932	P-O-L	A-617-SP	Neg.	Delco-Remy	486-G	*	D.R.410-C	1133	63	* 63	87	87
1930	STUTZ	SV-16		1932	P-O-L	A-617-SP	Neg.	Delco-Remy	486-G	*	D.R.410-C	1133	63	* 63	87	87
1932	STUTZ	DV-32		1931-32	P-O-L	A-617-SP	Neg.	Delco-Remy	486-G	*	D.R.410-C	1133	63	* 63	87	87
1934	WILLYS KNG'T	95	1001 Up	1931-32	U.S.L	3-HVX-6X-6A	Neg.	Pines	A-805	20	*	1110	63	* 63-1158	1158	—
1934	WILLYS KNG'T	95	1001 Up	1931-32	U.S.L	3-HVX-6X-6A	Neg.	Pines	A-805	20	*	1110	63	* 63-1158	1158	—
1936	WILLYS KNG'T	66-D		1932	U.S.L	HW-17A	Neg.	Pines	A-805	20	*	1110	63	* 63-1158	1158	63
1938	WILLYS	6-90	1001 Up	1932	U.S.L	XY-13X-7A	Neg.	Pines	A-805	20	*	1110	63	* 63-1158	1158	—
1940	WILLYS	8-88	1001 Up	1932	U.S.L	3-HVX-7X-6A	Neg.	Pines	A-805	20	*	1110	63	* 63-1158	1158	—

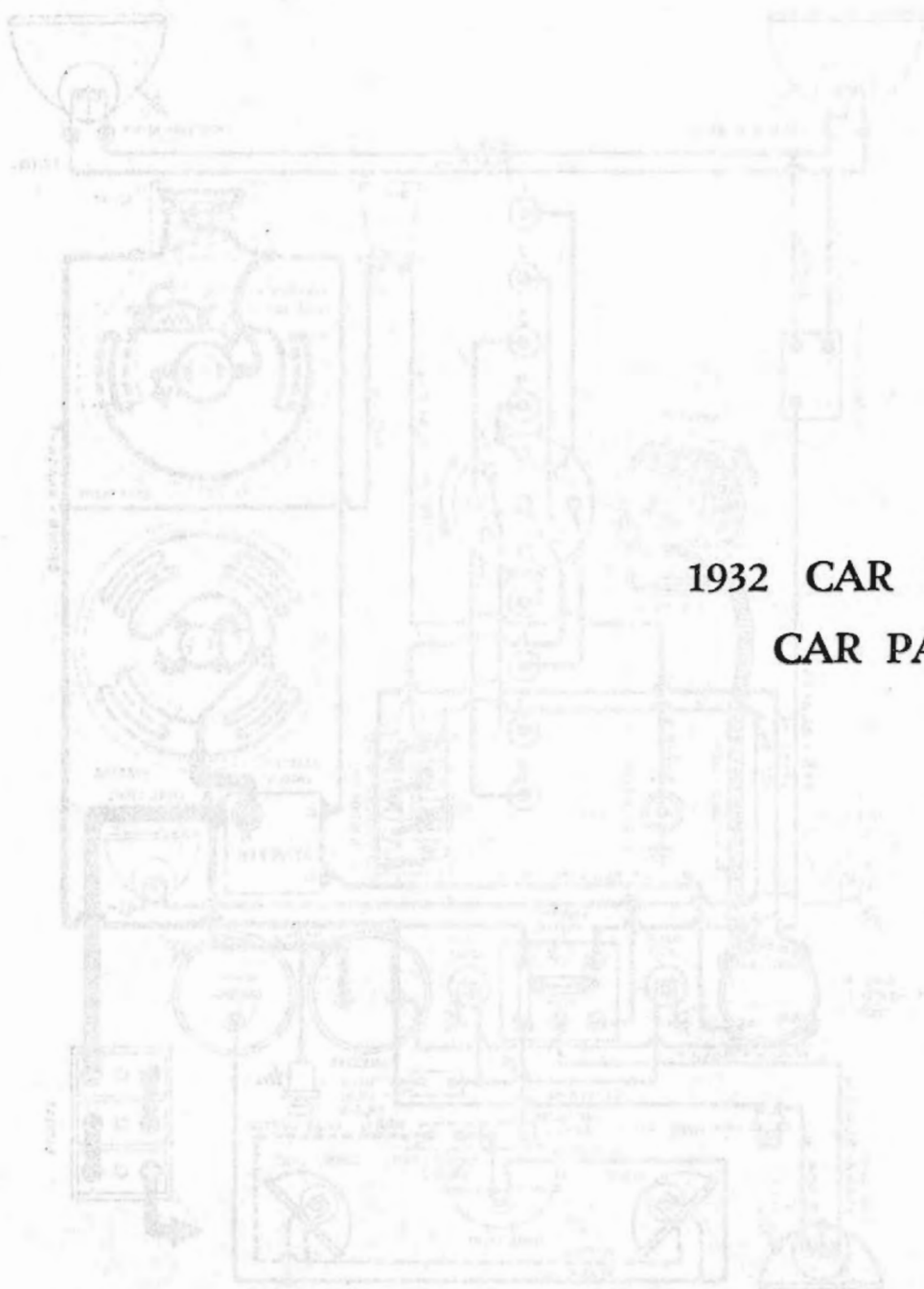
Page numbers indicated by (\*) refer to the Twenty-fourth Supplement.

# 1932 CAR MODELS—EQUIPMENT USED

Make	IGNITION			STARTER		GENERATOR		Year	Model	CAR	Page		
	Coil Model	Dist. Model	Switch Make	Model	Make	Model	Make					Relay Regulator	
Auto-Lite	CE-4001-L	IGL-4001	Co-incident	Auto-Lite	MAL-4001, 2	Auto-Lite	GAU-4001	CB-4014-B	1932	V-8	LINCOLN	1872	
Auto-Lite	CE-4001-L	IGM-4001	Co-incident	Auto-Lite	MAO-4001	Auto-Lite	GBC-4001	CB-4014-L	1932	V-12	LINCOLN	1874	
Delco-Remy	526-P	652-D	Coil Lock	Delco-Remy	718-M	Delco-Remy	949-F, 65L	265-B	1932	8-125	MARMON	1876	
Delco-Rem.	528-A, 33-S	4084	Coil Lock	Delco-Remy	489	Delco-Remy	927-N	265-B	1931-32	16	MARMON	1878	
Auto-Lite	IG-4065-C	IGB-4015	Oakes	Hershey	Auto-Lite	MAB-4026	Auto-Lite	GAL-4329	CB-4014	1932	9-60	NASH	1880
Auto-Lite	CE-4001	IGH-4017	Oakes	Hershey	Auto-Lite	MAB-4026	Auto-Lite	GAL-4329	CB-4014	1932	9-70	NASH	1882
Auto-Lite	CE-4402	IGK-4004	Oakes	Hershey	Auto-Lite	MAB-4033	Auto-Lite	GAR-4205	CB-4014	1932	9-80	NASH	1884
Auto-Lite	CE-4402	IGK-4001	Delco-Remy	425-S	Auto-Lite	MAB-4024	Auto-Lite	GAR-4205	CB-4014	1932	9-90	NASH	1886
Auto-Lite	CE-4001	IGB-4071	Oakes	Hershey	Auto-Lite	MAB-4026	Auto-Lite	GAL-4329	CB-4014	1932	10-60	NASH	1880
Auto-Lite	CE-4001	IGH-4017	Oakes	Hershey	Auto-Lite	MAB-4026	Auto-Lite	GAL-4329	CB-4014	1932	10-70	NASH	1882
Auto-Lite	CE-4402	IGK-4004	Oakes	Hershey	Auto-Lite	MAB-4033	Auto-Lite	GAR-4205	CB-4014	1932	10-80	NASH	1884
Auto-Lite	CE-4402	IGK-4001	Delco-Remy	425-S	Auto-Lite	MAB-4024	Auto-Lite	GAR-4205	CB-4014	1932	10-90	NASH	1886
Delco-Remy	534-W	632-P	Coil Lock	Delco-Remy	734-B	Delco-Remy	953-H	265-G	1932	F-32	OLDSMOBILE	1888	
Delco-Remy	534-W	660-T	Coil Lock	Delco-Remy	725-R	Delco-Remy	953-H	265-G	1932	L-32	OLDSMOBILE	1890	
NorthEast	5027936	5031262	Coil Lock	Owen-Dyneto	DI-955	Owen-Dyneto	CL-1005	20530	1932	900	PACKARD	1892	
NorthEast	5025430	5028025	Coil Lock	Owen-Dyneto	DI-955	Owen-Dyneto	CL-1005	20530	1931-32	901, 2	PACKARD	1894	
NorthEast	5025430	5028269	Coil Lock	Owen-Dyneto	DN-952	Owen-Dyneto	CL-1005	20530	1931-32	903, 4	PACKARD	1894	
Auto-Lite	CE-4001	IGO-4001		Owen-Dyneto	DN-1072	Owen-Dyneto	CL-1033	21732	1932	905, 6	PACKARD	1896	
Auto-Lite	CE-4013	IGH-4010	Coil Lock	Auto-Lite	ML-4146	Auto-Lite	GAR-4111	CB-4014	1932	Cust.	PEERLESS	1898	
Auto-Lite	CE-4013	IGH-4010	Coil Lock	Auto-Lite	ML-4146	Auto-Lite	GAR-4111	CB-4014	1932	Mstr.	PEERLESS	1898	
Delco-Remy	528-E	4096	Oakes	Hershey	Delco-Remy	498	Delco-Remy	927-U	265-G	1932	51, 52, 53	PIERCE ARROW	1900
Delco-Remy	528-E	660-P	Oakes	Hershey	Delco-Remy	497	Delco-Remy	927-U	265-G	1932	54	PIERCE ARROW	1902
Delco-Remy	526-T	629-H	Coil Lock	Delco-Remy	714-Q	Delco-Remy	943-R	265-G	1931-32	PA	PLYMOUTH	1904	
Delco-Remy	526-T	629-M	Coil Lock	Delco-Remy	714-Q	Delco-Remy	943-S	265-G	1932	PB	PLYMOUTH	1904	
Delco-Remy	534-W	639-U	Coil Lock	Delco-Remy	734-A	Delco-Remy	943-Y	265-G	1932	402-6	PONTIAC	1906	
Delco-Remy	534-W	661-C	Coil Lock	Delco-Remy	726-K	Delco-Remy	959-Z	265-G	1932	302-8	PONTIAC	1908	
Delco-Remy	528-E	641-H	Electrolock	15-S	Delco-Remy	718-H	Delco-Remy	955-R	265-B	1932	S	REO	1910
Delco-Remy	533-R	640-S	Coil Lock	Delco-Remy	722-J	Delco-Remy	955-G	265-B	1931-32	6-21	REO	1912	
Delco-Remy	533-R	660-S	Coil Lock	Delco-Remy	722-K	Delco-Remy	940-X	265-B	1931-32	8-21, 25	REO	1914	
Delco-Remy	528-E	660-K	Delco-Rem.	425-R, T	Delco-Remy	728-M	Delco-Remy	955-G	265-B	1932	8-31, 35, 53	REO	1916
Auto-Lite	IG-4307	IGB-4070	Coil Lock	Auto-Lite	MAJ-4026	Auto-Lite	GAM-4401	CB-4022	1932	65	ROCKNE	1918	
Auto-Lite	IG-4306	IGB-4062	Coil Lock	Auto-Lite	MAN-4001	Auto-Lite	GAM-4401	CB-4022	1932	75	ROCKNE	1920	
Delco-Remy	534-X	632-M	Coil Lock	Delco-Remy	718-Z	Delco-Remy	943-V	265-G	1932	55	STUDEBAKER	1922	
Delco-Remy	534-X	660-M	Coil Lock	Delco-Remy	718-Y	Delco-Remy	955-C	265-B	1932	62	STUDEBAKER	1924	
Delco-Remy	534-X	660-M	Coil Lock	Delco-Remy	718-Y	Delco-Remy	955-C	265-B	1932	71	STUDEBAKER	1924	
Delco-Remy	534-X	662-A	Coil Lock	Delco-Remy	497	Delco-Remy	927-J	265-B	1932	91	STUDEBAKER	1926	
Delco-Remy	528-C	4043	Delco-Remy	426-K	Delco-Remy	726-C	Delco-Remy	391	266-N	1932	LAA	STUTZ	1928
Delco-Remy	531-C	4028	Oakes	Hershey	Delco-Remy	726-C	Delco-Remy	391	266-N	1932	SV-16	STUTZ	1930
Delco-Remy	531-C	660-W	Oakes	Hershey	Delco-Remy	726-C	Delco-Remy	391	266-N	1931-32	DV-32	STUTZ	1932
Auto-Lite	IGC-4303	IGC-4045-A	Coil Lock	Auto-Lite	MAD-4115	Auto-Lite	GAL-4103	CB-4014	1931-32	95	WILLYS KNG'T	1934	
Auto-Lite	IGC-4303	IGC-4045-A	Coil Lock	Auto-Lite	MAD-4115	Auto-Lite	GAG-4134	CB-4014	1931-32	95	WILLYS KNG'T	1934	
Auto-Lite	IG-4303	IGC-4052	Coil Lock	Auto-Lite	MAB-4018	Auto-Lite	GAG-4134	CB-4014	1932	66-D	WILLYS KNG'T	1936	
Auto-Lite	IG-4305	IGB-4032	Coil Lock	Auto-Lite	MZ-4024	Auto-Lite	GAL-4331	CB-4014	1932	6-90	WILLYS	1938	
Auto-Lite	IG-4303	IGH-4013	Coil Lock	Auto-Lite	MAB-4035	Auto-Lite	GAL-4331	CB-4014	1932	8-88	WILLYS	1940	

AUBURN

MODEL 5100 (TYPE) SERIAL NUMBER 5100000000 IN  
COMPONENT PARTS



1932 CAR MODELS  
CAR PAGES

CAR SERIAL NUMBER—on the right hand side of the car.

ENGINE NUMBER—located on the front of the engine.

BATTERY—Type XY-17X-60, 60 amp, 12 volt, 100 amp hour capacity. The battery is located in the front of the car, under the hood.

IGNITION—The ignition system consists of a battery, a coil, a distributor, and a set of spark plugs. The battery is connected to the coil, which is connected to the distributor. The distributor is connected to the spark plugs.

HEADLIGHTS—The headlights are connected to the battery through a fuse block. The fuse block is located in the front of the car, near the battery.

HORN—The horn is connected to the battery through a fuse block. The fuse block is located in the front of the car, near the battery.

WIPERS—The wipers are connected to the battery through a fuse block. The fuse block is located in the front of the car, near the battery.

TRUNK LIGHTS—The trunk lights are connected to the battery through a fuse block. The fuse block is located in the front of the car, near the battery.

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# AUBURN

## MODEL 8-100 (1932), SERIAL NUMBERS 8-100-1001 UP DELCO-REMY SYSTEM

**CAR SERIAL NUMBER:**—On plate on right hand body sill at front door.

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

**BATTERY:**—U.S.L., Type XY-15X-6A, 6 volt, 104 ampere hour capacity (5 ampere rate). Starting capacity 110 amperes for 20 minutes. Positive (+) terminal grounded. Battery mounted under right hand front seat. Battery size, 7¼ inches wide, 10¼ inches long, 8⅝ inches high.

**IGNITION:**—Coil Model 52½-C. Coil mounted under cowl. Ignition current .6-3 amperes at 6 volts (engine running), 4.6 amperes at 6 volts (engine stopped). Ignition switch Type 'B' Electrolock. See Equipment Section for complete data on Electrolocks.

**Distributor Model 66½-Z.** Two breaker arm, 4 lobe cam type with semi-automatic advance. Breaker contacts open alternately at 45 degree intervals corresponding to 90 degree firing interval of engine. Contacts must be synchronized—see Timing. Breaker contact gap set at .018-.024 inch. To set gap, loosen lock screw on stationary contact mounting plate and turn eccentric adjusting screw, tighten lock screw. Breaker arm spring tension 17-21 ounces (measured at tip of breaker arm with spring scale at right angles to contact surface). Maximum manual advance 15 degrees (engine).

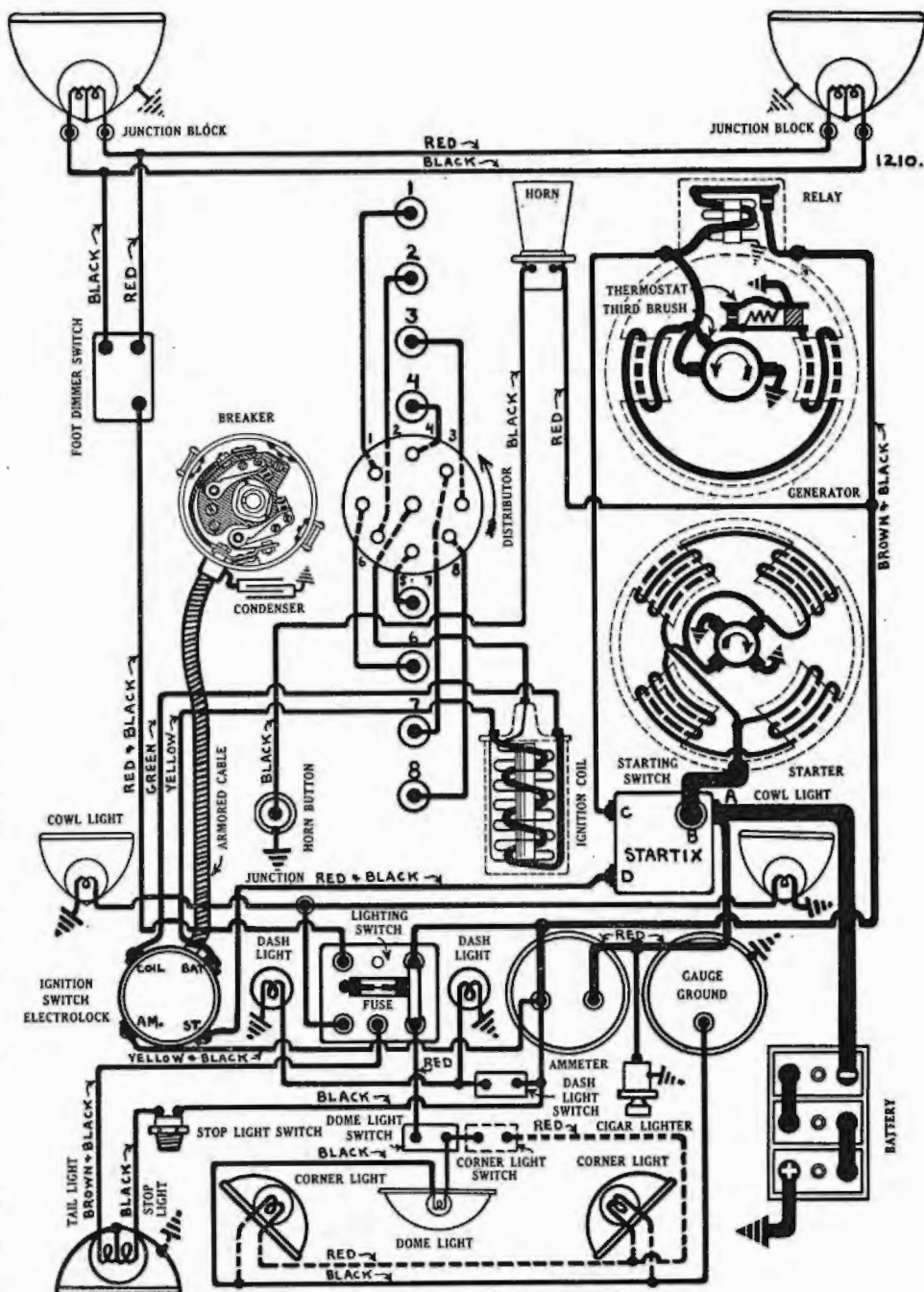
Engine	Degrees	Automatic Advance	R.P.M.	Engine
		Distributor		Distributor
2.5	Start	250	500	
26.5	13.25	1300	2600	

**Mounting:**—Distributor is mounted on the cylinder head. Electrolock must be removed as a unit with distributor whenever distributor is taken off the car. See Equipment Section for complete details on removing Electrolock. To remove distributor, disconnect all wires and free Electrolock at dash, take off distributor cap, take out hold-down screw in advance arm, lift distributor out.

**Oiling:**—1000 Miles. Turn down grease cup under distributor head one full turn. Keep cup filled with medium cup grease. Take off distributor cap and rotor, fill wick oiler in center of shaft with light engine oil, put one drop oil on breaker arm pivot pins, apply thin film vaseline to face of breaker cam.

**Timing:**—Standard setting 12 1/2° or 3 1/4 teeth on flywheel before top dead center with manual spark control fully advanced. To set timing, fully advance manual spark control, see that distributor is rotated clockwise to full extent of advance arm slot. With No. 1 piston on compression stroke turn engine over until a point on the flywheel 3 1/4 teeth before the top dead center mark for pistons 1 and 8 is directly opposite indicator on flywheel housing. Loosen advance arm clamp screw, rotate distributor until first set of contacts (mounted directly on breaker plate) begin to open, tighten clamp screw, connect spark plugs as indicated on diagram. Use test lamp to determine contact opening.

**Synchronization of Contacts.** Synchronize contacts on a rotary spark gap or use special Delco-Remy tool, Part No. 1838182, and follow complete directions in Equipment Section. Contacts can be synchronized after distributor has been timed to engine by turning engine over 90° to firing position of piston No. 6 (3 1/4 teeth before top dead center), then loosen lock screws on movable sub-plate (carrying second set of contacts), turn eccentric adjusting screw until contacts begin to open, tighten lock screws, check contact gap. If outside limits of .018-.024 inch, reset at .022 inch, repeat synchronization.



# AUBURN

MODEL 8-100 (1932), SERIAL NUMBERS 8-100-1001 UP.  
DELCO-REMY SYSTEM

**Firing Order:**—1-6-2-5-8-3-7-4. No. 1 cylinder nearest radiator.

**Spark Plugs:**—7/8-18 SAE. Champion Type C-4. Set gaps at .020-.025 inch.

**VALVE TIMING:**—Valves at left of engine. Camshaft driven by two-sprocket non-adjustable chain drive.

	Head Diameter	Stem Diameter	Length	Seat Angle	Lift
Intake	1 7/16"	3410-.3425"	5 1/4"	30°	11/32"
Exhaust	1 13/32"	3410-.3425"	5 1/4"	45°	11/32"

	Tappet Clearance	Spring Pressure
Intake	.006-.008" (hot)-.010" (cold)	Open ..... 87-92 pounds
Exhaust	.006-.008" (hot)-.010" (cold)	

### Timing

Intake valves open 5° before top dead center. Close 40° after lower dead center.

Exhaust valves open 50° before lower dead center. Close 10° after top dead center.

**To Check Valve Timing:**—Set tappet clearance No. 1 intake valve at .010 inch (cold). With No. 8 piston on compression turn engine over until piston is slightly before top dead center with a point on the flywheel approximately 1.35 teeth before the top dead center mark is opposite the indicator on housing. No. 1 intake valve should begin to open at this point.

**STARTER:**—Model 722-F or 722-Q. Starter drives engine through a set of reduction gears and a Bendix drive. Rotation of armature shaft is clockwise at commutator end. Brush spring tension 24-28 ounces. Starter drives engine at 134 R.P.M. (normal speed) drawing 175 amperes (722-F).

Model 722-F—Starter Data			
Torque	R.P.M.	Volts	Amperes
0 lb. ft.	3500	5.0	70
22 " "	Lock	3.0	600
Model 722-Q—Starter Data			
0 " "	8000	5.0	65
15 " "	Lock	3.15	570

**Startix:**—This model equipped with Startix automatic starting switch. Not necessary to disconnect Startix when timing engine if special timing position of Electrolock ignition switch is used (turn ignition key to left).

**Mounting:**—Starter is flange mounted on forward face of flywheel housing at right of engine. To remove, disconnect cable and starting switch control, take out three flange mounting capscrews, pull starter forward to clear Bendix, lift out.

**Oiling:**—1000 Miles. Put 8-10 drops light engine oil in oiler at each end of armature shaft.

**Six Months.** Take out grease plug in reduction gear case. Repack gears with graphite grease.

**GENERATOR:**—Model 955-H. Third brush regulation, thermostat control. Thermostat operates at 165° F. (contacts open—cuts in resistance) reducing generator output approximately 40%. To adjust generator output, loosen small round headed lock screw on commutator end plate, take off commutator cover band, shift third brush by hand counter-clockwise to in-

crease, or clockwise to decrease charging rate, tighten locking screw. Rotation counter-clockwise at commutator end. Maximum charging rate 19-21 amperes (cold) at 8.5 volts reached at 1450 R.P.M. or 20 M.P.H.

### Generator Data

Cold Test			Hot Test		
Amperes	Volts	R.P.M.	Amperes	Volts	R.P.M.
19-21	8.35-8.5	1450	9-12	7.35-7.65	1800-2000

Brush spring tension 14-18 ounces. Shunt field current 4.0-6.1 amperes at 6 volts. Motoring generator draws 5.5 amperes at 6 volts.

**Mounting:**—Generator mounted on swinging bracket at right front of engine. Belt driven from the crankshaft. The water pump is mounted on the commutator end of the generator and is driven by the armature shaft extension. To remove generator, disconnect lead, drain radiator, disconnect water pump hose connections, loosen adjustment clamp bolt, swing generator toward engine, slip off drive belt, take out two bolts forming bracket hinge under generator, lift generator and water pump out. Water pump can be removed by taking out capscrews in generator end plate bosses.

**Belt Adjustment.** To take up drive belt, loosen adjustment clamp bolt and bracket hinge bolts, pull generator away from engine, tighten clamp bolt and mounting bolts. The belt tension should be just enough to drive generator and water pump without slipping.

**Oiling:**—1000 Miles. Put 8-10 drops light engine oil in oiler at each end of generator.

**RELAY:**—Model 265-B. Relay is mounted on generator field frame. Relay contacts close at 600 R.P.M. (generator) with generator voltage of 6.75-7.5 volts and open with 0-2.5 ampere discharge current. Relay contact gap limits .015-.025 inch. Air gap limits .012-.017 inch (contacts closed).

**LIGHTING:**—Soreng Manegold Switch Model 5670-A. Delco-Remy Dimmer Switch Model 465-K, 465-W, 465-C (R.H.D.) Lighting switch mounted on back of instrument board controlled by push-pull button on instrument panel. Dimmer system 'depressed beam' double filament headlight bulbs controlled by foot operated dimmer switch on toeboard.

### Lamp Sizes

Position	Voltage	Candlepower	Base	Mazda Number
Headlights	6-8	21-21	DC	1110
Cowl lights	6-8	3	SC	63
Instrument lights	6-8	3	SC	63
Stop and tail light	6-8	21-2	DC	1158
Dome and corner lights	6-8	6	SC	81

**Note:**—Stop and tail light is a special double filament bulb. The tail light lead (Brown and Black wire) must be connected to the 2 cp. filament.

**FUSES:**—20 ampere capacity Type 4AG. fuse mounted on back of lighting switch.

**GASOLINE GAUGE:**—K-S Telegauge hydrostatic type (See Equipment Section).

**FUEL PUMP:**—Stewart-Warner mechanical fuel pump (see Equipment Section).

**HORNS:**—Klaxon Model K-22 twin horns (matched tone) optional equipment. Current draw 6.0-8.0 amperes at 6 volts for each horn.



# AUBURN

**TWELVE CYLINDER MODEL 12-160 (1932)**  
**LYCOMING BB ENGINE—SERIAL NUMBERS 12-160-1001 UP**  
**DELCO-REMY SYSTEM**

**CAR SERIAL NUMBER:**—Stamped on plate right hand body sill at front door.

**ENGINE NUMBER:**—Stamped on right side of crankcase midway of engine.

**BATTERY:**—U.S.L., Type XY-17A, 6 volt, 17 plate, 121 ampere hour capacity (5 ampere rate). Starting capacity 136 amperes (20 minute rate). Positive (+) terminal grounded. Battery mounted on outside right hand frame rail under right front fender. Battery size, 7¼" wide, 11 5/16" long, 8⅝" high.

**IGNITION:**—Coil Model 528-C (2 used). Coils mounted on bracket on chain case at right front of engine. Ignition current .6-3 amperes (engine idling), 4.6 amperes (engine stopped) for each coil. Ignition switch Type 'B' Electrolock (see Equipment Section). Switch positions: Left—ignition on but Startix inoperative—timing position. Right—ignition on—Startix on—running position.

**Distributor Model 667-Z.** Two-breaker arm, 6-lobe cam type with semi-automatic advance. Breaker contacts open alternately at 22½ and 37½ degree intervals (corresponding to engine firing intervals of 45 and 75 degrees—engine has blocks set at 45 degree angle and fires at unequal intervals). Contacts must be synchronized (see Timing). Breaker contact gap .018-.024 inch (breaker arm on lobe of cam). To set gap, loosen lock screw on stationary contact mounting plate and turn eccentric adjusting screw. Resurface contacts when necessary with fine flat contact file. Breaker arm spring tension 17-21 ounces (measured at tip of breaker arm with spring scale at right angles to contact surface). Maximum manual advance 25 degrees (engine).

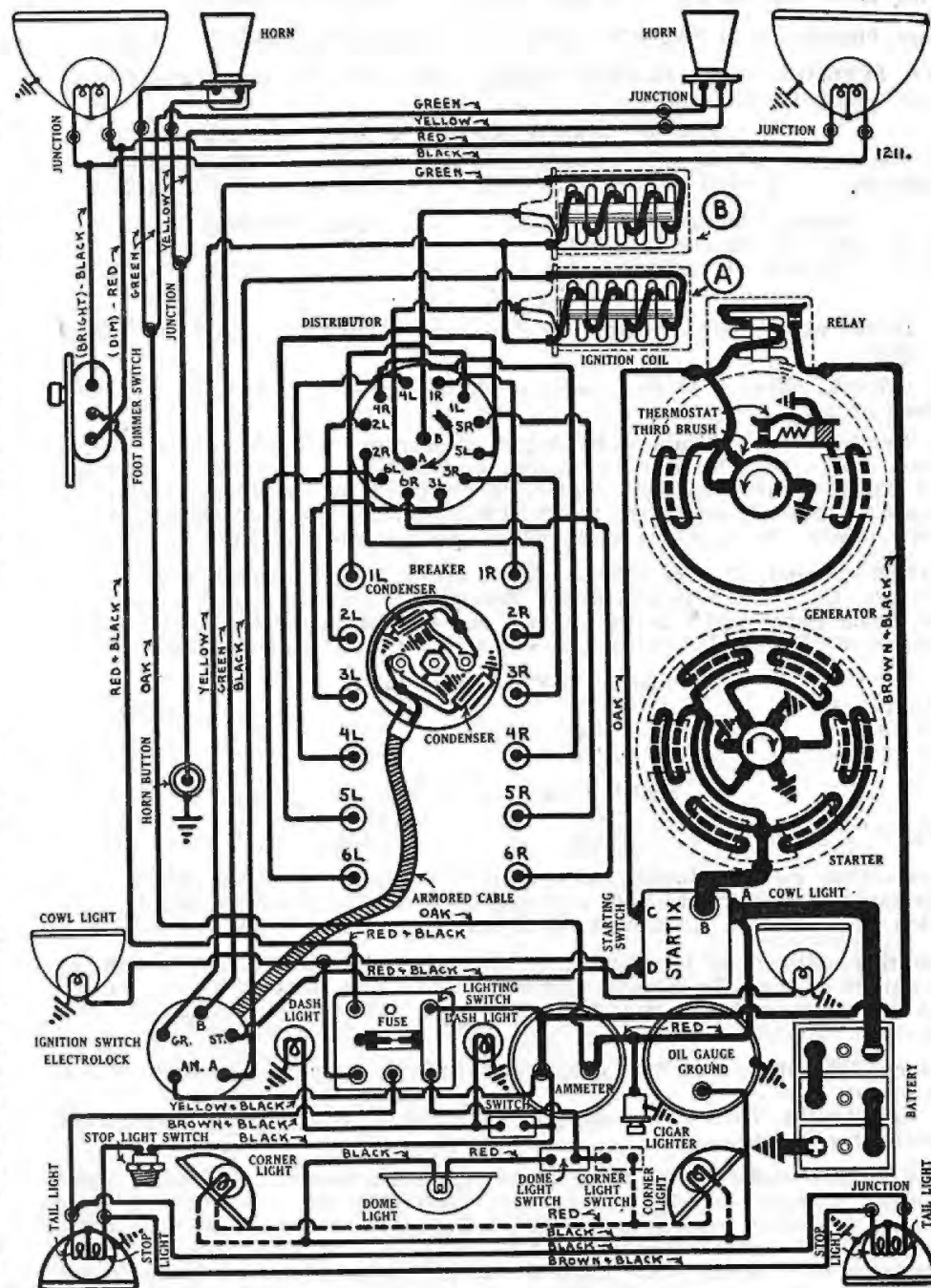
Engine	Degrees	Automatic Advance	R.P.M.	Engine
0		Start	300	600
20-22		10-11	1600	3200

**Mounting:**—Distributor mounted at right front of engine between cylinder banks. Electrolock must be removed with distributor as a unit (see Equipment Section for directions on disconnecting Electrolock). To remove distributor, disconnect ignition wires and free Electrolock at dash, take off distributor cap, take out hold-down screw in advance arm, lift out distributor and Electrolock.

**Oiling:**—1000 Miles. Turn down grease cup on side of shaft housing one turn. Keep cup filled with medium cup grease. Take off distributor cap and rotor. Put one drop oil on breaker arm pivot pins. Fill wick oiler in center of shaft with light oil. Apply thin film of vaseline to face of breaker cam.

**Timing:**—Standard setting 12½ degrees or 3¼ teeth (on flywheel) before top dead center with manual spark control fully advanced. To set timing, remove cover plate over inspection hole in flywheel housing, fully advance manual spark control. With No. 1 piston (right hand block) on compression stroke, turn engine over until a point on flywheel 3¼ teeth before the top dead center mark for piston No. 1R is directly opposite indicator on flywheel housing. Take off distributor cap, loosen advance arm clamp bolt, rotate distributor cup until first set of contacts (mounted directly on breaker plate) begin to open (use test lamp). Tighten clamp bolt, connect spark plugs as indicated on diagram.

**Synchronization of Contacts**—first method as part of timing operation. After timing distributor (above), turn crankshaft over 45° to firing position of piston No. 6L (no marks are provided for synchronization but firing position can be determined by counting off 14 teeth on the flywheel from fir-



# AUBURN

## TWELVE CYLINDER MODEL 12-160 (1932) LYCOMING BB ENGINE—SERIAL NUMBERS 12-160-1001 UP DELCO-REMY SYSTEM

ing position of piston No. 1R), loosen lock screws on movable sub-plate (carrying second set of contacts), turn eccentric adjusting screw until contacts begin to open, tighten lock screws, check contact gap.

**Second Method.** Synchronize contacts on a rotary spark gap, setting intervals so that movable contacts open 22½ degrees after fixed contacts, with fixed contacts opening again after a 37½ degree interval.

**Firing Order:**—1L-2R-5L-4R-3L-1R-6L-5R-2L-3R-4L-6R with cylinder banks right (R) and left (L) as viewed from driver's seat. No. 1 cylinder nearest the radiator. Connect spark plugs as shown on diagram.

**Spark Plugs:**—18 MM. Champion Type C-7. Set gap at .025 inch.

**VALVE TIMING:**—Valves mounted horizontally between cylinder banks operated through vertical rocker arms from single camshaft directly above crankshaft. Tappet adjustment on upper end of rocker arm. Valves may be removed by taking off secondary plate on head carrying spark plugs without disturbing main cylinder head. Camshaft chain driven from crankshaft in tandem with generator sprocket. Chain adjusted manually by shifting generator (see Generator Mounting).

	Head Diameter	Stem Diameter	Length	Seat Angle	Lift
Intake	1 21/32" (1 27/32" overall)	3/410"	5 1/64"	30°	11/32"
Exhaust	1 17/32"	3/410"	5 1/64"	30°	11/32"

	Tappet Clearance	Operating Timing	Spring Pressure
Intake	.006-.008" (hot)	.015" (cold)	Closed .....46-51 pounds (2 3/16")
Exhaust	.006-.008" (hot)	.015" (cold)	Open .....92-97 pounds (1 27/32")

### Timing

Intake valves open at top dead center. Close 45° after lower dead center. Exhaust valves open 50° before lower dead center. Close 10° after top dead center.

**To Check Valve Timing.** Set tappet clearance intake valve No. 1 cylinder, right hand bank, at .015" (cold). With No. 6 piston right hand bank on compression stroke, turn engine over until piston reaches top dead center with flywheel mark for pistons 1R and 6R at indicator on flywheel housing. No. 1R intake valve should open at this point. Reset tappet clearance at .006-.008" with engine hot.

**STARTER:**—Model 543.6. Starter drives engine through reduction gears and Bendix drive. Rotation (armature shaft) clockwise at commutator end. Brush spring tension 36-40 ounces.

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

**Startix:**—This model equipped with Startix automatic starting switch (see Equipment Section for complete article on Startix). Not necessary to disconnect Startix when timing engine if special timing position of ignition switch is used (turn ignition key to left).

**Mounting:**—Starter flange mounted at right of engine on front face flywheel housing. To remove, disconnect cable, take out flange mounting screws, pull starter forward to clear Bendix, lift from place.

**Oiling:**—1000 Miles. Put 8-10 drops light engine oil in drive end bearing oiler. Commutator end bearing oilless.

**Six Months.** Take out grease plug in reduction gear case. Repack gears with graphite grease.

**GENERATOR:**—Model 931-E, F. Third brush regulation, thermostat control. Thermostat operates at 165°F. (contacts open, cuts in resistance) reducing output approximately 40%. To adjust charging rate, loosen round headed lock screw on commutator end plate, take off cover band, shift third brush by hand counter-clockwise to increase or clockwise to decrease charging rate, tighten lock screw. Rotation counter-clockwise at commutator end. With standard setting maximum charging rate is 22-24 amperes (cold) at 8.6-9.0 volts reached at 1300-1500 R.P.M.

Generator Data					
Cold Test		R.P.M.	Hot Test		R.P.M.
Amperes	Volts		Amperes	Volts	
21-23	8.4-8.8	1400	10-13	7.4-7.8	1500-1700
Brush spring tension 20-28 ounces. Shunt field current 3.5-4.0 amperes at 6 volts.					

**Mounting:**—Generator flange mounted at right of engine on rear face of timing chain case. To remove, disconnect lead, take off nuts on 3 flange mounting bolts, pull generator out, being careful not to disturb intermediate plate carrying generator sprocket.

**Chain Adjustment.** Loosen flange mounting bolts, pull generator away from engine, tighten mounting bolts. With correct adjustment chain should operate noiselessly. If chain hums, back off adjustment slightly.

**Oiling:**—1000 Miles. Put 4-5 drops light engine oil in each oiler (2 oilers).

**RELAY:**—Model 265-G. Mounted on generator. Relay contacts close with generator voltage of 6.75-7.5 volts and open with discharge current of 0-2.5 amperes. Contact gap limits .015-.025 inch. Air gap limits .012-.017 inch (contacts closed).

**LIGHTING:**—Soreng-Manegold Switch, Model 5670-A. Lighting switch mounted on back of instrument board controlled by push-pull button on lower left center instrument panel. Dimmer system 'depressed beam' double filament headlight bulbs controlled by foot operated dimmer switch. Dimmer switch model 465-Z or 465-W.

Lamp Sizes				
Position	Voltage	Candlepower	Base	Mazda No.
Headlights	6-8	32-32	D.C.	1000
Side (cowl) Lights	6-8	3	S.C.	63
Instrument Lights	6-8	3	S.C.	63
Stop and Tail Lights	6-8	21-2	D.C.	1158
Dome and Corner Light	6-8	6	S.C.	81

**NOTE:**—Stop and tail light is combination double filament bulb. Connect tail light lead (brown and black) wire to 2 cp. filament.

**FUSES:**—20 ampere capacity Type 4AG fuse mounted on back of lighting switch.

**GASOLINE GAUGE:**—K-S Telegauge hydrostatic type (see Equipment Section).

**FUEL PUMP:**—Stewart Warner mechanical fuel pump mounted at left front of engine (see Equipment Section).

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

# BUICK

SERIES 32-50 (1932), SERIAL NUMBERS 2,602,732 UP  
 PRODUCTION STARTED AUGUST 26, 1931  
 DELCO-REMY SYSTEM

**CAR SERIAL NUMBER:**—On plate, right side of frame beneath front fender. This series 2,602,732 up.

**ENGINE NUMBER:**—On right side upper crankcase wall above oil filler.

**ENGINE NOTE:**—Engines furnished with two optional compression ratios. Standard compression engines have special thick cylinder head gasket (steel insert). High compression engines use regular type gasket and are designed to operate with anti-knock fuel. Engines can be changed to high compression by changing gasket and spark plugs (valve push rod adjustment must be backed off to permit head to be bolted down). All high compression engines shipped from the factory are marked 'HC' on red label on top of valve rocker cover.

**BATTERY:**—Delco, Type 13-EW, 6 volt, 100 ampere hour capacity (20 hour rate). Negative (—) terminal grounded. Battery mounted under front compartment floor boards on right side.

**IGNITION:**—Coil Model 528-H. Coil mounted on top of timing gear case right front of engine. Ignition current 2.75 amperes at 6.8 volts (engine running), 4.0 amperes at 5.9 volts (engine stopped). Ignition switch is Oakes 'Hershey' type co-incidental ignition switch and steering post lock.

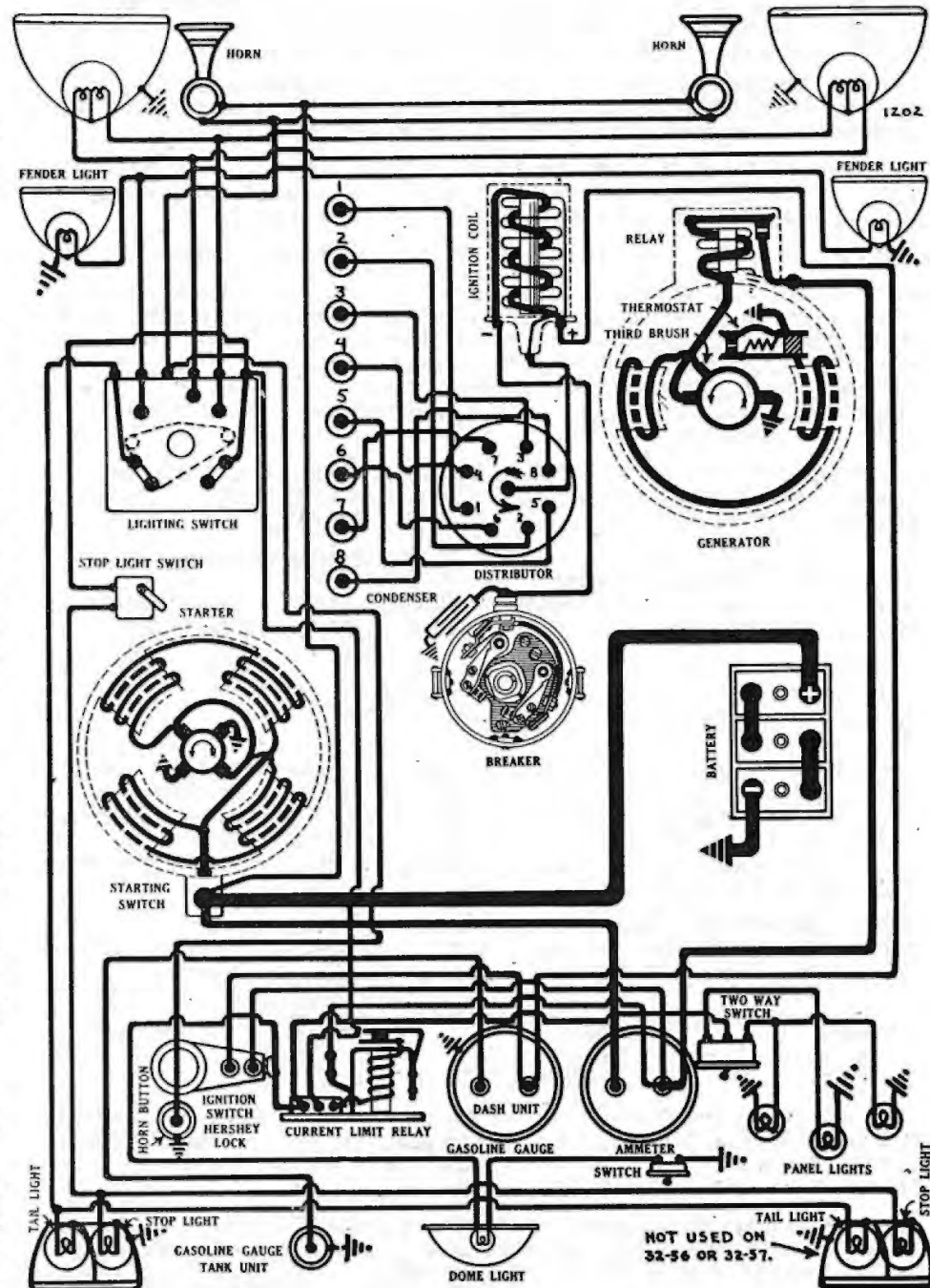
**Distributor Model 660-L.** Two breaker arm, 4 lobe cam type with semi-automatic advance. Must be synchronized (see Timing). Manual advance controlled by button on dash, full advance position with button pushed in and distributor cup rotated clockwise to limit of advance arm slot. Pull out button to retard spark. Set breaker gap at .020 inch. Hold within limits of .018-.024 inch. Gap is adjusted by loosening lock screw on stationary contact mounting plate and turning eccentric adjusting screw. Breaker arm spring tension 17-21 ounces (measured at tip of breaker arm with spring scale held at right angles to contact surface). Maximum manual advance is 24° (engine).

Degrees	Automatic Advance	R.P.M.
0	Start.....250	500
10-14	7.....400	800
21	10.5.....800	1600

**Mounting:**—Distributor mounted on commutator end of generator at right of engine. Driven by extension of generator shaft. To remove, disconnect primary lead, disconnect manual spark control wire, take off distributor cap, take out hold-down screw in advance arm, lift distributor out.

**Oiling:**—500 Miles. Fill Zerk fitting on distributor gear housing, using Zerk gun and cup grease until grease appears at overflow at top of distributor well.  
 2000 Miles. Take off distributor cap and rotor. Put a few drops light oil in wick oiler in center of shaft. Apply thin film of vaseline to face of breaker cam.

**Timing:**—Standard setting 7° before top dead center with full manual advance. No special setting necessary for high compression engines. To set timing, advance spark control button (push button in toward dash), see that distributor is rotated clockwise to full extent of advance arm slot, remove cover on inspection hole in front face right hand rear motor support. With No. 1 piston on compression crank engine over until flywheel mark 'ADV/7°' is directly opposite reference line on edge of inspection hole. Loosen advance arm clamp bolt, rotate distributor cup until first set of contacts (mounted directly on breaker plate) begin to open (use test lamp). Tighten advance arm clamp bolt. Connect spark plugs as indicated on diagram (No. 1 terminal as designated).



# BUICK

**SERIES 32-50 (1932), SERIAL NUMBERS 2,602,732 UP**  
**PRODUCTION STARTED AUGUST 26, 1931**  
**DELCO-REMY SYSTEM**

**Synchronization of Contacts**—first method as part of timing operation. After timing of distributor is completed (above), rotate crankshaft 90 degrees until piston No. 6 reaches firing position with flywheel mark 'SYN/#6' opposite reference line on edge of inspection hole. Loosen two lock screws on movable breaker plate (carrying second set of contacts), turn eccentric adjusting screw until contacts begin to open, tighten locking screws. Check contact gap; if outside limits of .018-.024 inch, reset at .022 inch, repeat synchronization.

**Second method**—using synchronizing tool. Use Delco-Remy tool, Part No. 1838182, follow complete directions in Equipment Section.

**Firing Order**:—1-6-2-5-8-3-7-4. No. 1 cylinder nearest radiator.

**Spark Plugs**:—Standard Compression Engines. 18 MM. A.C. Type J-12. Hold gap within limits of .025-.030 inch. High Compression Engines. 18 MM A.C. Type H-9. Hold gap within limits of .020-.025 inch. High compression plugs may be identified by red washer under terminal.

**VALVE TIMING**:—Valves located in cylinder head and operated by rocker arm on head and pushrods at right of engine. Tappet adjustment at upper end of pushrod. Camshaft at right of engine. Textolite camshaft gear, driven by steel crankshaft gear and drives steel generator gear.

	Head Diameter	Stem Diameter	Seat Angle	Lift
Inlet	1 15/32" (1 5/16" clear)	.3407-.3417"	45°	.340"
Exhaust	1 11/32" (1 3/16" clear)	.3392-.3402"	45°	.340"

**Tappet Clearance or Lash**

Intake and Exhaust.....008" (hot). Set with engine hot and idling.

**Spring Pressure**

	Inner Spring	Outer Spring	Total
Closed	7½-12½ pounds (1 13/16")	25-30 pounds (1 15/16")	32½-42½ pounds
Open	25-30 pounds (1 15/32")	74-80 pounds (1 19/32")	99-110 pounds

**Timing**

Inlet valves open 4½ degrees before top dead center. Inlet valves close 54 degrees after lower dead center.

Exhaust valves open 58 degrees before lower dead center. Exhaust valves close 30 degrees after top dead center. These 'timing points' indicate effective opening and closing points with valve .004" off seat with tappet clearance or lash of .008".

**To Set Valve Timing.** Camshaft gear and crankshaft gear are marked. Mesh gears so that marked tooth is directly opposite marked space between teeth on other gear.

**STARTER**:—Model 725-T. Manual pinion engagement connected to starting switch lever (switch mounted on starter field frame). Starter drives through overrunning clutch. Ratio of gear reduction 16.66 to 1 (9 tooth starter pinion drives to 150 tooth flywheel). Rotation counter-clockwise at commutator end. Brush spring tension 24-28 ounces. Starter cranks engine at 135 R.P.M. drawing 147 amperes at 5.3 volts.

**Starter Data**

Torque	R.P.M.	Volts	Amperes
0 lb. ft.	6000	5	60
15 "	Lock	3	600

**Mounting**:—Starter flange mounted on left front face flywheel housing. To remove, disconnect cable, take out cotter pin and clevis pin in pedal shift linkage, take out 2 flange mounting cap screws, pull starter straight forward to clear housing, lift from place.

**Oiling**:—1000 Miles. Put 8-10 drops light oil in commutator end oiler. Drive end bearing (pinion housing) oilless graphite bronze.

**GENERATOR**:—Model 940-T. Third brush regulation, thermostat control. Thermostat operates at 200°F. (contacts open, cuts in resistance), reducing out-

put approximately 40%. To adjust charging rate, loosen small round headed lock screw on commutator end plate, take off cover band, shift third brush (by hand) counter-clockwise to increase or clockwise to decrease charging rate, tighten locking screw. Rotation counter-clockwise at commutator end. Maximum charging rate 18-20 amperes (cold) at 8.3 volts reached at 1450 R.P.M. or 18-25 M.P.H.

**Generator Data**

Cold Test			Hot Test		
Amperes	Volts	R.P.M.	Amperes	Volts	R.P.M.
18-20	8.35-8.5	1450	9-12	7.35-7.65	1800-2000

Brush spring tension 20-28 ounces. Shunt field current 4.0-6.1 amperes at 6 volts. Generator motoring draws 6 amperes at 6 volts (without distributor).

**Mounting**:—Generator flange mounted at left front of engine driven by gear from timing gear case. Distributor mounted on commutator end of generator. Water pump driven by generator shaft extension. To remove, disconnect lead and all distributor wires or remove distributor, disconnect water pump drive coupling, take out flange mounting screws, pull generator out, lift from place.

**Oiling**:—1000 Miles. Put 8-10 drops light oil in commutator end oiler. Drive end bearing oiled from rocker arm overflow. See Distributor Oiling.

**RELAY**:—Model 265-B. Mounted on generator. Contacts close at 7 M.P.H., 60° R.P.M. of generator with generator voltage of 6.75-7.5 volts. Charging current approximately 1.5 amperes at closing. Contacts open with discharge current of 0-2.5 amperes. Contact gap limits .015-.025 inch. Air gap limits .012-.017 inch (contacts closed).

**LIGHTING**:—Delco-Remy Switch, Model 486-X (486-R on R.H.D.). Lighting switch mounted at lower end of steering column controlled by lower lever on steering wheel. Dimmer system 'depressed beam' double filament headlight bulbs controlled by lighting switch.

**Lamp Sizes**

Position	Voltage	Candlepower	Base	Mazda No.
Headlights	6-8	21-21	D.C.	1110
Fender Lights	6-8	3	S.C.	63
Instrument Lights	6-8	3	S.C.	63
Tail Lights	6-8	3	S.C.	63
Stop Light	6-8	15	S.C.	87
Dome Light	6-8	6	S.C.	81
Pillar and Tonneau Lights	6-8	3	S.C.	63

NOTE:—Instrument light switch Delco-Remy, Model 1364. Stop light switch Delco-Remy, Model 466-G.

**CURRENT LIMIT RELAY**:—Model 410-K. Vibrating circuit breaker mounted on dash. Starts with load of 30-35 amperes, limits load to 5-18 amperes with direct short-circuit. Contact gap limits .012-.030 inch. Air gap limits .015-.025 inch (contacts closed). Spring tension at brass button 5 ounces minimum (measured by spring scale hooked under contact spring at right angles to contact spring arm).

**GASOLINE GAUGE**:—A.C. electric type. See Equipment Section.

**FUEL PUMP**:—A.C. Type 'B'. See Equipment Section.

**HORNS**:—Klaxon twin installation with horns matched (the right horn having a higher tone than the left). Right horn Model K-26 Type 1376 (all except 32-56 and 32-57), Model K-26 Type 1378 (32-56, 57). Left horn Model K-26 Type 1375 (all except 32-56 and 32-57), Model K-26 Type 1377 (32-56, 57). Current draw 6.0-8.5 amperes at 6 volts (Type 1375 and 1377), 5.0-6.5 amperes at 6 volts (Type 1376 and 1378).

# BUICK

SERIES 32-60, 32-80, 32-90 (1932)  
 PRODUCTION STARTED AUGUST 26, 1931  
 DELCO-REMY SYSTEM

**CAR SERIAL NUMBER:**—On plate, right side of frame beneath front fender.

**ENGINE NUMBER:**—On right side upper crankcase wall, above oil filler.

**ENGINE NOTE:**—Engines furnished with two optional compression ratios. Standard compression engines have special thick cylinder head gasket (steel insert). High compression engines use regular type gasket and are designed to operate with anti-knock fuel. Engines can be changed to high compression by changing gasket and spark plugs (valve push rod adjustment must be backed off to permit head to be bolted down). All high compression engines shipped from the factory are marked 'HC' on red label on top of valve rocker cover.

**BATTERY:**—(36-60) Delco, Type 15-CW, 6 volt, 15 plate, 120 ampere hour (20 hour rate). (32-80, 32-90) Delco, Type 17-BW, 6 volt, 17 plate, 135 ampere hour capacity (20 hour rate). Battery mounted under front compartment floor boards. Negative (—) terminal grounded.

**IGNITION:**—Coil Model 528-H. Coil mounted on top of timing gear case at right front of engine. Ignition current 2.75 amperes at 6.8 volts (engine running), 4.0 amperes at 5.9 volts (engine stopped). Ignition switch is Oakes 'Hershey' type coincidental ignition switch and steering post lock.

**Distributor Model 662-B.** Two breaker arm, 4 lobe cam type with semi-automatic advance. Must be synchronized (see Timing). Manual advance controlled by button on dash, full advance position with button pushed in toward dash and distributor rotated clockwise to limit of advance arm slot. Pull button out to retard spark. Set breaker gap at .020 inch. Hold within limits of .018-.024 inch. Gap is adjusted by loosening lock screw on stationary contact mounting plate and turning eccentric adjusting screw. Breaker arm spring tension 17-21 ounces (measured at tip of breaker arm with spring scale at right angles to contact surface). Maximum manual advance 24° (engine).

Engine	Degrees	Automatic Advance Distributor	R.P.M. Distributor	Engine
0		Start.....	250.....	500
10-14		5-7 .....	400.....	800
19-23		9.5-11.5 .....	900.....	1800
90		15 .....	1300.....	2600

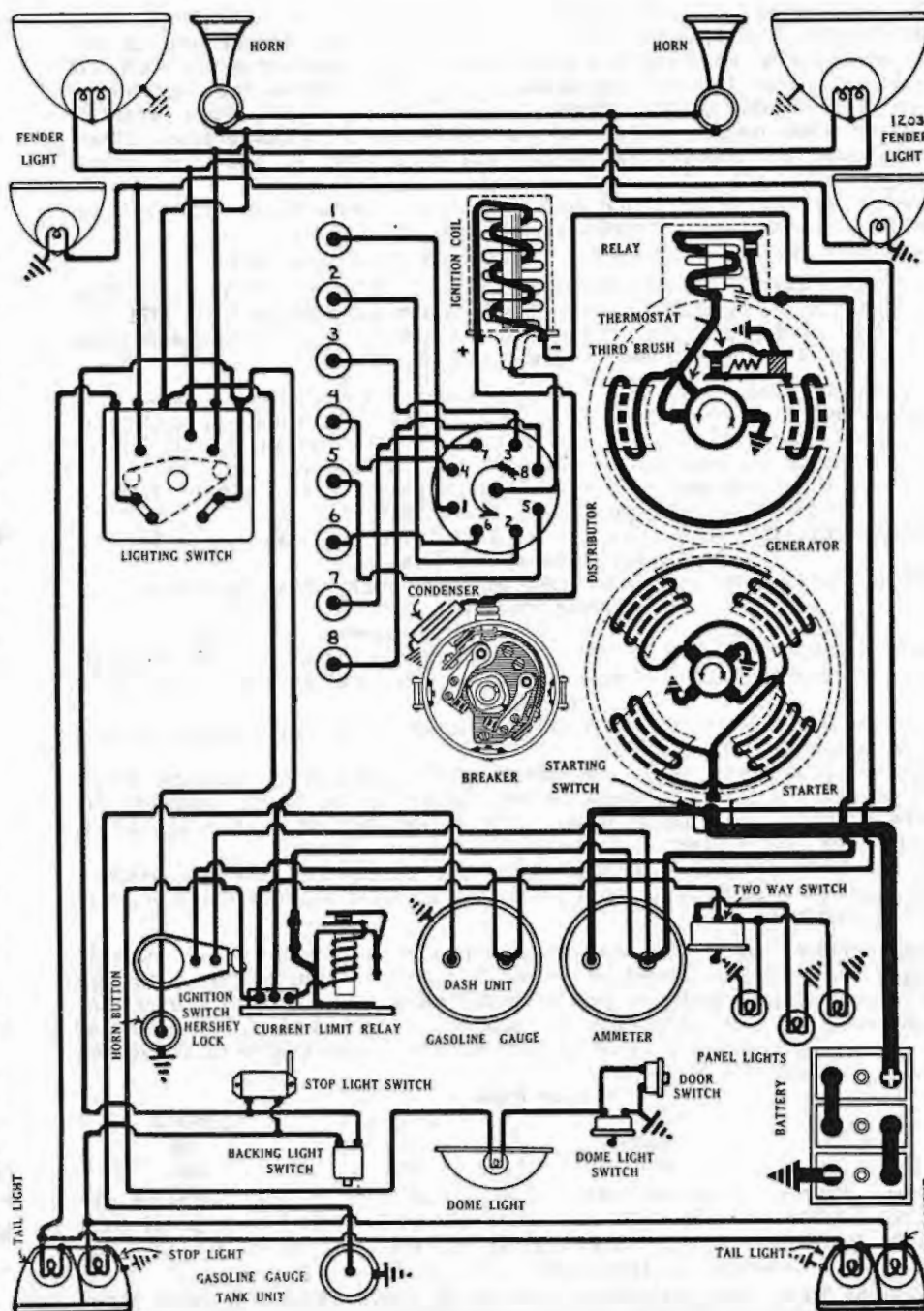
**Mounting:**—Distributor mounted on generator at right front of engine. Driven by gear on generator shaft extension. To remove, disconnect primary lead, disconnect manual spark control wire, take off distributor cap, take out hold-down screw in advance arm, lift distributor out.

**Oiling:**—500 Miles. Fill Zerk fitting on distributor gear housing using Zerk gun and cup grease until grease appears at overflow at top of distributor well.

**2000 Miles.** Take off distributor cap and rotor. Put a few drops light oil in wick oiler in center of shaft. Apply thin film of vaseline to face of breaker cam.

**Timing:**—Standard setting 11° (32-60), 10° (32-80, 32-90) before top dead center with full manual advance. No special setting necessary for high compression engines. To set timing, advance spark control button (push button in toward dash), see that distributor is rotated clockwise to full extent of advance arm slot, remove cover on inspection hole on top face of right hand rear motor support. With No. 1 piston on compression stroke crank engine over until flywheel mark 'ADV/11°' (32-60), or 'ADV/10°' (32-80, 90) is directly opposite reference line on edge of inspection hole. Loosen advance arm clamp bolt, rotate distributor cup until first set of contacts (mounted directly on breaker plate) begin to open (use test lamp), tighten advance arm clamp bolt. Connect spark plugs as indicated on diagram (No. 1 terminal as designated).

**Synchronization of Contacts**—first method as part of timing operation.



# BUICK

SERIES 32-60, 32-80, 32-90 (1932)  
 PRODUCTION STARTED AUGUST 26, 1931  
 DELCO-REMY SYSTEM

After distributor has been timed to engine (as above), rotate crankshaft 90 degrees until No. 6 piston reaches firing position with flywheel mark 'SYN/#6' opposite reference line on edge of inspection hole. Loosen two lock screws on movable sub-plate (carrying second set of contacts), turn eccentric adjusting screw until contacts begin to open, tighten lock screws. Check contact gap; if outside limits of .018-.024 inch, reset at .022 inch and repeat synchronization.

**Second Method**—using synchronizing tool. Use Delco-Remy tool, Part No. 1838182, and follow complete directions in Equipment Section.

**Firing Order**:—1-6-2-5-8-3-7-4. No. 1 cylinder nearest radiator.

**Spark Plugs**:—Standard Compression Engines. 18 MM. A.C. Type J-12. Hold gap within limits of .025-.030 inch. High Compression Engines. 18 MM. A.C. Type H-9. Hold gap within limits of .020-.025 inch. High compression plugs may be identified by red washer under terminal.

**VALVE TIMING**:—Valves located in cylinder head and operated by rocker arm on head and pushrods at right of engine. Tappet adjustment at upper end of pushrod (adjustment screw in end of rocker arm). Camshaft at right of engine. Textolite camshaft gear driven by steel crankshaft gear and drives steel generator gear.

	Head Diameter	Stem Diameter	Seat Angle	Lift
32-60 Inlet	1 9/16" (1 13/32" clear)	.3715/.3725"	45°	.340"
Exhaust	1 7/16" (1 9/32" clear)	.370/.371"	45°	.340"
	Head Diameter	Stem Diameter	Seat Angle	Lift
32-80, 32-90 Inlet	1 25/32" (1 5/8" clear)	.3715/.3725"	45°	.340"
Exhaust	1 19/32" (1 7/16" clear)	.370/.371"	45°	.340"

### Tappet Clearance or Lash

Inlet and Exhaust.....008" (hot). Set with engine hot and idling.

### Spring Pressure

	Inner Spring	Outer Spring	Total
Closed	11½-16½ pounds (1 21/32")	28-33 pounds (1 15/16")	39½-49½ pounds
Open	49 -55 pounds (1 5/16")	32-39 pounds (1 19/32")	131-144 pounds

### Timing

Inlet valves open 4½ degrees before top dead center. Inlet valves close 54 degrees after lower dead center.

Exhaust valves open 58 degrees before lower dead center. Exhaust valves close 30 degrees after top dead center. These 'timing points' indicate effective opening and closing points with valve .004" off seat with tappet clearance or lash of .008" (hot).

**To Set Valve Timing.** Gears are marked. Mesh gears so that marked tooth is directly opposite marked space between teeth on other gear.

**STARTER**:—Model 725-S. Manual pinion engagement connected to starting switch lever (starting switch mounted on starter field frame). Starter drives through overrunning clutch. Ratio of gear reduction 17.33 to 1 (9 tooth starter pinion to 156 tooth flywheel). Rotation counter-clockwise at commutator end. Brush spring tension 24-28 ounces. Starter cranks engine at 118 R.P.M. drawing 152 amperes at 5.25 volts (32-60), and at 120 R.P.M. drawing 156 amperes at 5.35 volts (32-80, 90).

### Starter Data

Torque	R.P.M.	Volts	Amperes
0 lb. ft.	6000	5	60
16 "	Lock	3.0	800

**Mounting**:—Starter flange mounted on right front face of flywheel housing. To remove, disconnect cable, take out cotter pin and clevis pin in switch linkage, take out 3 flange mounting cap screws, pull starter straight forward to clear housing, lift from place.

**Oiling**:—1000 Miles. Put 8-10 drops light oil in commutator end oiler. Drive

end bearing (in outer end pinion housing) oilless graphite bronze.

**GENERATOR**:—Model 940-T. Third brush regulation, thermostat control. Thermostat operates at 200°F. (contacts open, cut in resistance) reducing output approximately 40%. To adjust charging rate, loosen small round headed lock screw on commutator end plate, take off cover band, shift third brush (by hand) counter-clockwise to increase and clockwise to decrease charging rate, tighten locking screw. Rotation counter-clockwise at commutator end. Maximum charging rate 18-20 amperes (cold) at 8.3 volts reached at 1450 R.P.M. or 18-25 M.P.H.

### Generator Data

Cold Test			Hot Test		
Amperes	Volts	R.P.M.	Amperes	Volts	R.P.M.
18-20	8.35-8.5	1450	9-12	7.35-7.65	1800-2000

Brush spring tension 20-28 ounces. Shunt field current 4.0-6.1 amperes at 6 volts. Generator motoring draws 6 amperes at 6 volts (without distributor).

**Mounting**:—Generator flange mounted at right front of engine, driven by gear from gear case. Distributor mounted on commutator end of generator. Water pump driven by generator shaft extension. To remove, disconnect lead and distributor wiring or remove distributor, disconnect water pump drive coupling, take out flange mounting screws, pull generator out, lift from place.

**Oiling**:—1000 Miles. Put 8-10 drops light oil in commutator end oiler. Drive end bearing oiled by rocker arm overflow. See also Distributor Oiling.

**RELAY**:—Model 265-B. Mounted on generator. Contacts close at 8 M.P.H., 600 R.P.M. of generator when voltage reaches 6.75-7.5 volts (generator) with charging current of approximately 1.5 amperes. Contacts open with discharge current of 0-2.5 amperes. Contact gap limits .015-.025 inch. Air gap limits .012-.017 inch (contacts closed).

**LIGHTING**:—Delco-Remy Switch, Model 486-X (486-R on R.H.D.). Switch is mounted at lower end of steering column controlled by lever on steering wheel. Dimmer system 'depressed beam' double filament headlight bulbs controlled by lighting switch.

### Lamp Sizes

Position	Voltage	Candlepower	Base	Mazda No.
Headlights	6-8	21-21	D.C.	1110
Fender Lights	6-8	3	S.C.	63
Instrument Lights	6-8	3	S.C.	63
Tail Lights	6-8	3	S.C.	63
Stop and Backing Lights	6-8	15	S.C.	87
Dome Light	6-8	6	S.C.	81
Pillar and Tonneau Lights	6-8	3	S.C.	63

**NOTE**:—Instrument light switch Delco-Remy, Model 1364. Stop light switch Model 466-G (domestic), 466-U (R.H.D. for export). Backing light switch Model 440-D.

**CURRENT LIMIT RELAY**:—Model 410-K. Vibrating circuit breaker mounted on dash. Starts with current load of 30-35 amperes, limits load to 5-18 amperes with dead short-circuit. Contact point gap limits .012-.030 inch. Air gap limits .015-.025 inch (contacts closed). Spring tension at brass plug 5 ounces minimum (measured by spring scale hooked under contact spring at right angles to contact spring arm).

**FUEL PUMP**:—A.C. Type 'F'. See Equipment Section.

**GASOLINE GAUGE**:—A.C. Electric type. See Equipment Section.

**HORNS**:—Klaxon twin installation matched horns with blended tone (right horn higher note than left). Right horn Model K-26, Type 1376. Left horn Model K-26, Type 1375. Current draw 6.0-8.5 amperes at 6 volts (Type 1375), 5.0-6.5 amperes at 6 volts (Type 1376).

# CADILLAC

V-8 MODEL 355-B (1932), SERIAL NUMBERS 1,200,001 UP

PRODUCTION STARTED JANUARY, 1932

DELCO-REMY SYSTEM

**CAR SERIAL NUMBER:**—Same as engine number.

**ENGINE NUMBER:**—Stamped on right side of crankcase below water inlet.

**BATTERY:**—Delco, Type 17-BW, 6 volt, 17 plate, 130 ampere hour (20 hour rate). The positive (+) terminal is grounded. Battery is mounted under the right front fender (accessible by removing four screws and lifting up portion of fender which serves as battery box cover).

**IGNITION:**—Coil Model 528-G. Coil is mounted on rear of dash under cowl in front compartment. Ignition current 2.5 amperes (engine running), 2.0 amperes (engine stopped). Ignition switch Delco-Remy Dual-lock, Model 426-T coincidental ignition switch and transmission lock.

**Distributor Model 660-Y or 662-Y.** Two breaker arm, 4 lobe cam type with full automatic advance. Must be synchronized (see Timing). Breaker gap .018-.022 inch (breaker arm on lobe of cam). To set gap, loosen lock screw on stationary contact mounting plate and turn eccentric adjusting screw. Resurface contacts when necessary with a fine flat contact file. Breaker arm spring tension 17-21 ounces (measured at tip of breaker arm with spring scale at right angles to contact surface).

Engine	Degrees	Automatic Advance	Distributor	R.P.M.	Engine
0		Start	250		500
660-Y 20	10		1475		2950
662-Y 11	5.5		900		1800

**Mounting:**—Distributor is mounted at front of engine between cylinder banks. Driven by gears from the camshaft. To remove, disconnect primary lead, take off distributor cap, take out two cap screws in distributor bracket, lift distributor out.

**Oiling:**—1000 Miles. Use Alemite grease and gun on Alemite fitting under distributor until grease appears at relief hole above fitting. Take off distributor cap and rotor. Put light oil on breaker arm pivot pins and fill wick oiler in center of shaft. Apply thin film of vaseline to face of breaker cam.

**Timing:**—Standard setting 1 3/16 inches (on flywheel) before top dead center. To set timing, remove inspection cover on flywheel housing. Center distributor pointer on quadrant scale by loosening hold-down screw in pointer arm and rotating distributor cup, tighten hold-down screw. With No. 1 piston (right hand block) on compression stroke rotate crankshaft until flywheel mark 'IG/A-1' is directly opposite indicator on flywheel housing. Loosen advance arm clamp bolt, rotate distributor cup until first set of contacts (mounted directly on breaker plate) begin to open (use test lamp). Tighten clamp bolt, connect spark plugs as indicated on diagram.

**Synchronization of Contacts**—first method as part of timing operation. After timing has been completed (as above), turn crankshaft 90 degrees to firing position of piston No. 2 when flywheel mark 'IG/A-2' should be opposite indicator. Loosen two lock screws on movable sub-plate (carrying second set of contacts), turn eccentric adjusting screw until contacts begin to open, tighten lock screws. Check contact gap; if outside limits of .018-.022 inch, reset at .020 inch and repeat synchronization.

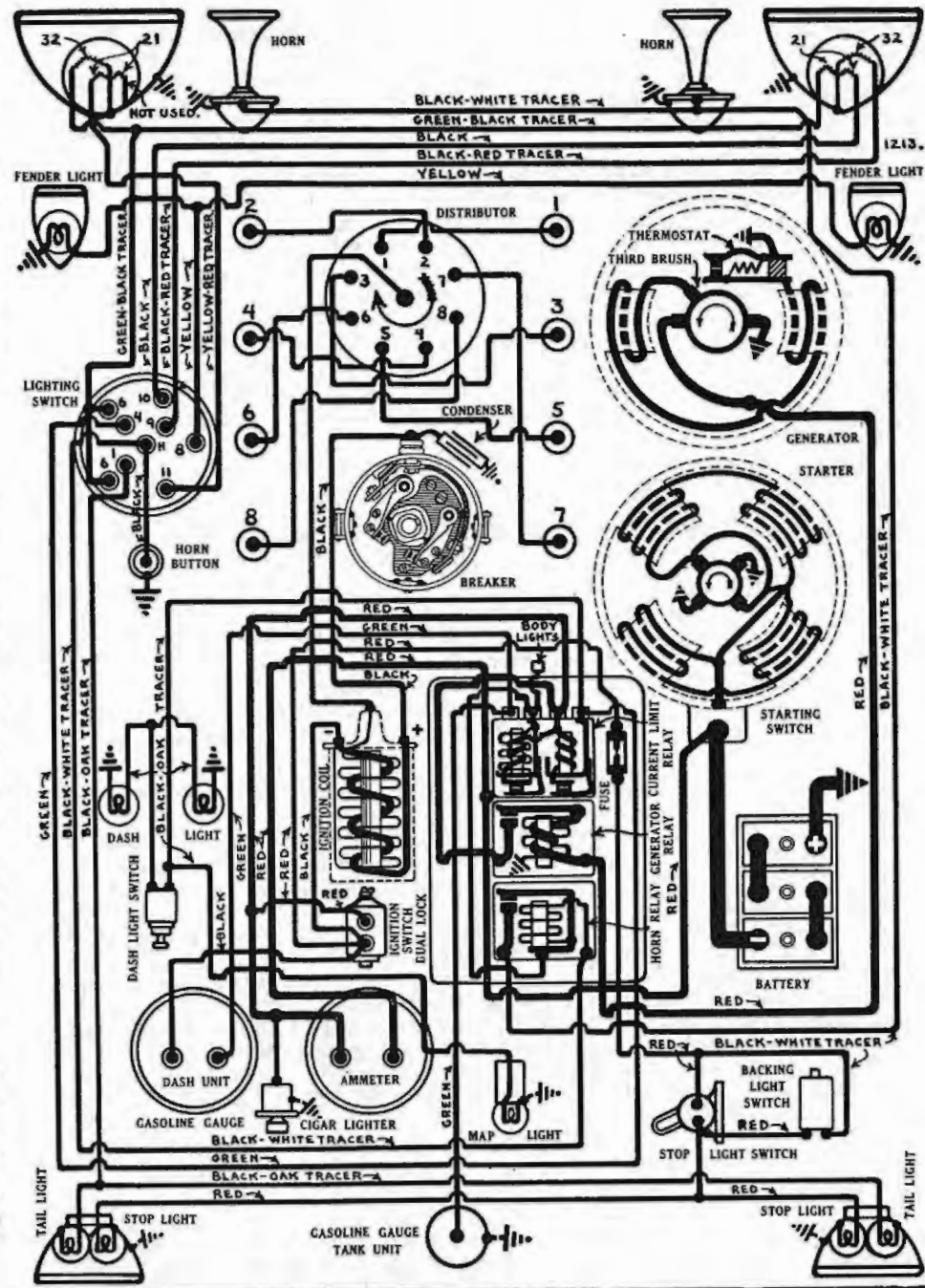
**Second Method**—using synchronizing tool. Use Delco-Remy tool, Part No. 1838182, and follow complete directions in Equipment Section.

**Firing Order:**—1-2-7-8-4-5-6-3 with cylinders numbered as shown on diagram, or 1R-1L-4R-4L-2L-3R-3L-2R with cylinder banks right (R) and left (L) as viewed from the driver's seat. No. 1 cylinder nearest radiator in each case.

**Spark Plugs:**—18 MM. A.C. Type D-8. Hold gap within limits of .025-.028 inch.

**VALVE TIMING:**—Camshaft mounted directly above crankshaft driven by two-sprocket non-adjustable chain drive. Valves adjustable at center of engine between cylinder banks. New manifolding on 355-B engine requires new location of valves. With valves numbered 1 to 8, beginning at radiator, valves are #1—exhaust, #2—intake, #3—exhaust, #4 and #5—intake, #6—exhaust, #7—intake, #8—exhaust. Both cylinder blocks are identical.

	Head Diameter	Stem Diameter	Length	Seat Angle	Lift
Intake	1.660-1.666"	3/8"	6 17/32"	30°	23/64"
Exhaust	1.634-1.640"	3/8"	6 1/2"	45°	23/64"



# CADILLAC

V-8 MODEL 355-B (1932), SERIAL NUMBERS 1,200,001 UP  
 PRODUCTION STARTED JANUARY, 1932  
 DELCO-REMY SYSTEM

<b>Tappet Clearance</b>		<b>Spring Pressure</b>	
Intake	.004" (hot)	Closed	79 pounds (2 1/2")
Exhaust	.006" (hot)	Open	160 pounds (2.148")

**Timing**

Intake valves open 6 degrees before top dead center. Intake valves close 42 degrees after lower dead center. This applies with .004" tappet clearance. Exhaust valves open 38 degrees before lower dead center. Exhaust valves close 2 degrees after top dead center. This applies with .006" tappet clearance.

**To Set Valve Timing:**—Camshaft sprocket and crankshaft sprocket are marked. Chain should be assembled with crankshaft and camshaft turned so that sprocket marks are directly opposite and in line with a straightedge across the shaft centers.

**STARTER:**—Model 728-P. Manual pinion engagement connected to starting switch lever (not adjustable). Starter drives through reduction gears and an overrunning clutch. Rotation (armature shaft) counter-clockwise at commutator end. Brush spring tension 24-28 ounces. Starter cranks engine at 80-90 R.P.M.

<b>Starter Data</b>			
Torque	R.P.M.	Volts	Amperes
0 lb. ft.	2500	5	70
28 "	Lock	3.0	600

**Mounting:**—Starter flange mounted on rear face of flywheel housing at right of transmission. To remove, disconnect cable, disconnect starting pedal linkage, take out 3 flange mounting cap screws, pull starter to rear to clear housing, lift from place.

**Oiling:**—1000 Miles. Put 8-10 drops light oil in oiler at each end of armature shaft. Outer bearing in pinion housing is oilless.

**Six Months.** Take out grease plug in reduction gear case. Repack gears with graphite grease.

**GENERATOR:**—Model 927-S. Third brush regulation, thermostat control. Thermostat operates at 165°F. (contacts open—cuts in resistance), reducing output approximately 40%. To adjust charging rate, loosen hexagonal lock screw on commutator end plate, take off cover band, shift third brush (by hand) counter-clockwise to increase or clockwise to decrease charging rate, tighten the lock screw. With standard setting, charging rate is 13 1/2-16 1/2 amperes at 8.6-9.0 volts reached at 1450-1650 R.P.M. or 22 M.P.H. Generator is air cooled and may be set at 24 amperes maximum output without damage.

**Generator Data**

<b>Cold Test</b>		<b>Hot Test</b>	
Amperes	Volts	R.P.M.	Amperes
22-24	8.6-9.0	1450-1650	14-17
			7.8-8.2
			1800-2000

Shunt field current 4.25-4.65 amperes at 6 volts. Brush spring tension 20-28 ounces.

**Mounting:**—Generator flange mounted at right of engine on rear of accessory drive chain case. Water pump mounted on front of chain case. Driven by special chain from crankshaft. To remove, drop mud pan at right of engine, disconnect lead, take off nuts on two upper flange mounting bolts, take out lower flange mounting cap screw, pull generator to rear to disengage drive coupling, take out from underneath car.

**Chain Adjustment.** Loosen nuts on flange mounting bolts, loosen two pivot screws (second screw on front of chain case), pull generator away from engine until chain is tight, slack off 1/8 inch, tighten bolts and screws.

**Oiling:**—1000 Miles. Put 8-10 drops light engine oil in oiler at each end of generator.

**RELAY:**—See paragraph on 'Apparatus Box'.

**LIGHTING:**—Delco-Remy Lighting Switch, Model 486-S. Switch is mounted at lower end of steering column controlled by lever on steering wheel. Lighting system new Cadillac 'Super-Safe' system equipped with new type three-filament bulbs Mazda No. 3001 (32-21-21 cp.). Bulbs are interchangeable but are installed in left head lamp with 32 cp. filament at the top and in the right hand head lamp with 32 cp. filament at the bottom. Sockets are designed so that bulb cannot be inserted incorrectly. Headlight doors, lenses

and reflectors are not interchangeable, being designed to give a particular pattern of light for each head lamp filament. Switch positions as follows:

<b>City Driving</b>		<b>City Passing</b>	
R.H. Lamp—Lower 21 cp. filament		R.H.—Upper or 'depressed' 21 cp. filament	
L.H. Lamp—Lower 21 cp. filament		L.H.—32 cp. filament lighted	
<b>Country Driving</b>		<b>Country Passing</b>	
R.H. Lamp—Lower 21 cp. filament		R.H.—Upper or 'depressed' 21 cp. filament	
	32 cp. filament	L.H.—Lower 21 cp. filament	
L.H. Lamp—Lower 21 cp. filament			32 cp. filament

**SPECIAL NOTE:**—As in 'Tilt Ray Depressed Beam' practise, the lower filament gives a higher or farther range of light than the upper filament which is used for the 'depressed beam' or passing light. The 32 cp. filament in the right hand headlight being installed at the bottom gives a high and far-reaching light for country driving. In the left hand headlight this 32 cp. filament is installed at the top and gives a 'depressed' light. The manufacturer recommends in states which prohibit direct light above the horizontal that the 32 cp. filament in the right hand headlight not be used. Insulate wire to No. 3 in headlight plug (black wire with red tracer—tip has shortest shank). Head lamps are aimed so that right hand head lamp points straight ahead, left hand lamp illuminates the right side of the road.

Position	Voltage	Candlepower	Base	Mazda No.
Headlights	6-8	32-21-21	Triple	3001
Fender Lights	6-8	3	S.C.	63
Dash and Tail Lights	6-8	3	S.C.	63
Backing and Stop Lights	6-8	15	S.C.	87
Map Reading Lights	6-8	3	S.C.	63
Dome and Corner Lights	6-8	6	S.C.	81

**Switches:**—Stop light switch Delco-Remy, Model 474-Z. Backing light switch Delco-Remy, Model 440-E.

**NOTE:**—The map reading light in the center of the instrument panel has a switch built in the socket. Switch is operated by pulling the light out against the stop. To remove map reading lamp bulb, pull lamp out part way until the end of the threaded shaft on the lamp plunger is flush with the end of the cylinder (behind instrument panel), turn bulb shield until the hole in the plunger lines up with the hole in the cylinder, insert a nail to prevent plunger turning, unscrew bulb shield (right hand thread).

**APPARATUS BOX:**—Delco-Remy, Model 480-Z. Mounted on rear of dash under cowl. Consists of current limit relay (vibrating and lock-out circuit breaker), generator cut-out relay, horn relay, and a 10-ampere capacity fuse (in circuit to backing and stop lights).

**Current Limit Relay:**—Vibrating circuit breaker begins to operate with current load of 35-40 amperes limiting current to 5-20 amperes maximum with direct short-circuit. Lock-out circuit breaker begins to operate with current load of 25-30 amperes limiting current to less than 1 ampere with direct short-circuit. Circuit breaker contact gap limits .012-.030 inch. Air gap limits .015-.025 inch (contacts closed). Spring tension 5 ounces minimum (measured at brass button with spring scale at right angles to contact arm).

**Cut-out Relay:**—Contacts close at 8-9 M.P.H. or 420 R.P.M. (generator) with a generator voltage of 6.75-7.5 volts and open with a discharge current of 0-2 amperes. Contact gap limits, .015-.025 inch. Air gap limits, .012-.017 inch (contacts closed).

**Horn Relay:**—Model 266-T. Pressing horn button energizes horn relay winding, closing horn relay contacts and completing horn circuit. Horn current does not pass through horn button. Horn relay requires .25 amperes to close contacts. Horn relay contact gap limits, .015-.025 inch. Air gap limits, .012-.017 inch (contacts closed).

**FUSES:**—Backing and stop light fuse mounted in Apparatus Box, 10 ampere capacity.

**GASOLINE GAUGE:**—A.C. Electric Type (see Equipment Section).

**HORNS:**—Klaxon vibrator type matched set with blended note, Model K-22-C Type 1160 (low note) and Model K-22-C Type 1161 (high note). Horns draw 6.0-8.0 amperes at 6 volts each.



# CADILLAC

V-12 MODEL 370-B (1932), SERIAL NUMBERS 1,300,001 UP  
 PRODUCTION STARTED JANUARY, 1932  
 DELCO-REMY SYSTEM

**CAR SERIAL NUMBER:**—Same as engine number.

**ENGINE NUMBER:**—Stamped on right side of crankcase below water inlet.

**BATTERY:**—Delco, Type 21-CW, 6 volt, 21 plate, 160 ampere hour capacity (20 hour rate. The positive (+) terminal grounded. Battery mounted under right front fender (accessible by taking out four screws and removing portion of the fender which serves as battery box cover).

**IGNITION:**—Coil Model 530-K (2 used). Coils mounted in recess of radiator top tank directly above distributor. Ignition current 2½ amperes (engine running), 4 amperes (engine stopped). Ignition switch Delco-Remy Dual-lock, Model 426-T co-incidental ignition switch and transmission lock.

**Distributor Model 4092.** Two breaker arm, 6 lobe cam type with full automatic advance. Breaker contacts open alternately at 22½ and 37½ degree intervals (corresponding to the engine firing intervals of 45 and 75 degrees). Contacts must be synchronized (see Timing). Breaker gap .018-.024 inch (breaker arm on lobe of cam). To set gap, loosen lock screw on stationary contact mounting plate, turn eccentric adjusting screw. Resurface contacts when necessary with a fine flat contact file. Breaker arm spring tension is 17-21 ounces (measured at tip of breaker arm with spring scale at right angles to contact surface).

Engine	Degrees	Automatic Advance	R.P.M.	Engine
0	Distributor	Distributor	300	600
32	Start	800	1600	

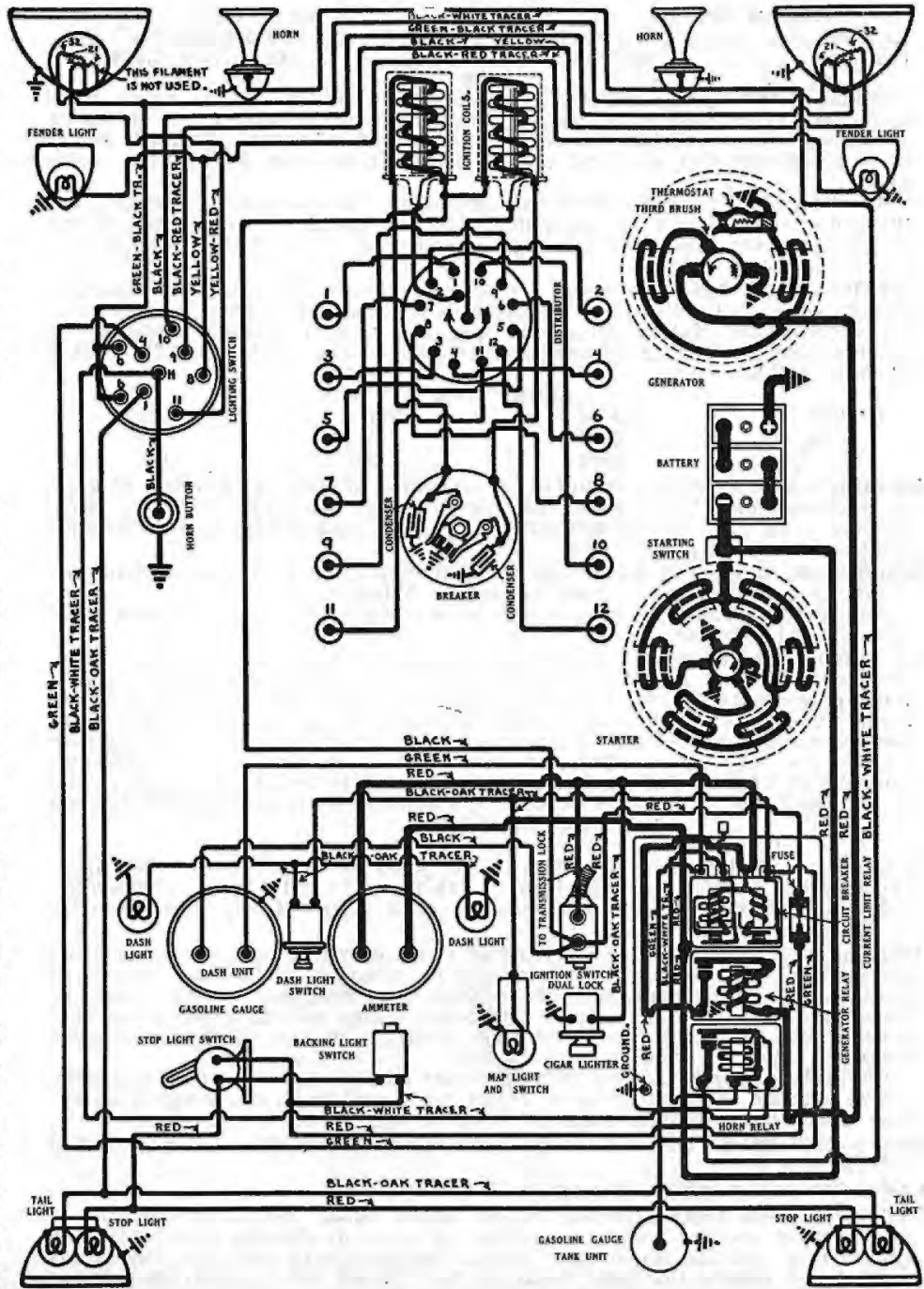
**Mounting:**—Distributor mounted at front of engine between cylinder banks. Driven by gears from camshaft. To remove, disconnect primary leads, take off distributor cap, take out two mounting screws in distributor bracket, lift distributor out.

**Oiling:**—1000 Miles. Use Alemite grease in Alemite gun on fitting under distributor until grease appears at overflow above fitting (for lower bearing). Put 8-10 drops light oil in oiler on side of distributor cup (upper bearing). Take off distributor cap and rotor, oil breaker arm pivot pins, put 4-5 drops light oil on top of cam locking screw (oiler for breaker arm rubbing blocks on cam).

**Timing:**—Standard setting 1 13/16 inches (on flywheel) before top dead center. To set timing, remove inspection cover over inspection hole in flywheel housing. Center distributor pointer on quadrant scale by loosening hold-down screw in advance arm and rotating distributor cup, tighten hold-down screw. With No. 1 piston on compression stroke crank engine over until flywheel mark 'C/2-12' appears at inspection hole and stop when mark 'IG/A' (which is 3 11/16" after the 'C/2-12' mark) is opposite the indicator on the housing (this is necessary because the 'IG/A' ignition marks are not numbered to indicate the cylinder to which they refer). Then take off distributor cap and rotor, loosen locking screw in center of breaker cam, carefully locate cam so that right hand contacts are beginning to open (use test lamp) with rotor terminal connected to center terminal in distributor head directly opposite No. 1 terminal in head (see diagram), tighten cam locking screw. Connect spark plugs as indicated on diagram (No. 1 terminal as designated).

**Synchronization of Contacts**—using synchronizing tool, Cadillac Part No. 109224. This tool developed for use on V-16 engines has special markings for use in synchronizing V-12 distributors with unequal firing intervals (see 1931 V-16 diagram in National Service Manual). Install tool and adjust so that right hand (stationary) set of breaker contacts begin to open with pointer on farthest indicating point on quadrant 'RH'. Crank engine over until pointer is directly opposite '12 L.H.' mark on quadrant. Loosen lock screws on movable sub-plate (carrying second set of breaker contacts), turn eccentric adjusting screw until contacts begin to open, tighten locking screws. Right hand contacts should open again when pointer is opposite '12 R.H.' mark on quadrant. These marks are 37½ and 22½ degrees apart, respectively.

**Second Method**—as part of timing operation. After distributor has been timed to engine (second paragraph above), crank engine over 75 degrees to firing position of piston No. 4 with 'IG/A' opposite indicator in inspection hole. Loosen locking screws on movable sub-plate (carrying second set of



# CADILLAC

V-12 MODEL 370-B (1932), SERIAL NUMBERS 1,300,001 UP  
 PRODUCTION STARTED JANUARY, 1932  
 DELCO-REMY SYSTEM

contacts), turn eccentric adjusting screw until contacts begin to open (left hand set), tighten locking screws, check contact gap.

**Firing Order:**—1-4-9-8-5-2-11-10-3-6-7-12 with cylinders numbered as shown on diagram, or 1L-2R-5L-4R-3L-1R-6L-5R-2L-3R-4L-6R with cylinder banks right (R) and left (L) as viewed from driver's seat. No. 1 cylinder nearest radiator in each case.

**Spark Plugs:**—18 MM. A.C. Type D-8. Hold gap within limits of .025-.028 inch.

**VALVE TIMING:**—Camshaft mounted directly above crankshaft driven by silent chain. Chain adjustment automatic. Generator also driven by timing chain. Engine valve-in-head type with valves operated by rocker arms on head and pushrods between cylinder banks. Valve tappet clearance adjustment automatic (see Special Note).

	Head Diameter	Stem Diameter	Length	Seat Angle	Lift
Intake	1.446-1.452"	11/32"	6 9/64"	45°	11/32"
Exhaust	1.446-1.452"	11/32"	6 9/64"	45°	11/32"

Tappet Clearance		Spring Pressure	
No appreciable clearance or lash in service (see Special Note).	Closed	70 pounds	Open
	Open	167 pounds	

**Timing**

Intake valves open at top dead center. Intake valves close 44 degrees after lower dead center.

Exhaust valves open 39 degrees before lower dead center. Exhaust valves close 5 degrees after top dead center.

**SPECIAL NOTE:**—Special automatic valve tappet take-up is used. Rocker arm is mounted on eccentric bushing which is rotated to take up all valve lash or clearance by a spring under the plunger which bears on an arm of the eccentric. Plunger operates in an oil cylinder or dashpot. This device requires no attention in service and there will be no appreciable tappet clearance or lash. It must be reset when replacing valves by using special combination screwdriver and wrench, Cadillac Part No. 109627-T, and adjusting clearance to .030 inch with plunger held down at the bottom of the dashpot. Adjust with engine running and use special tool, Cadillac Part No. 109624, to hold plunger down at end of stroke.

**STARTER:**—Model 495. Manual pinion engagement connected to starting switch lever. Starter drives engine through reduction gears and overrunning clutch. Rotation (armature shaft) counter-clockwise at commutator end. Brush spring tension 36-40 ounces. Starter cranks engine at 80-90 R.P.M.

**Starter Data**

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

**Mounting:**—Starter flange mounted on rear face flywheel housing at right of transmission. To remove, disconnect cable, disconnect starting pedal linkage, take out 3 flange mounting cap screws, pull starter to rear to clear housing, lift from place.

**Oiling:**—1000 Miles. Put 8-10 drops light oil in oiler at drive end of armature shaft. Commutator end bearing and pinion housing bearing oilless.

**Six Months.** Take out grease plug in reduction gear housing, repack gears with graphite grease.

**GENERATOR:**—Model 931-D. Third brush regulation, thermostat control. Thermostat operates at 165°F. (contacts open—cuts in resistance), reducing output approximately 40%. To adjust charging rate, loosen hexagonal lock screw on commutator end plate (use wrench), take off cover band, shift third brush (by hand) counter-clockwise to increase or clockwise to decrease charging rate, tighten lock screw. With standard setting charging rate is 13½-16 amperes at 7-7.2 volts reached at 1600 R.P.M. (armature) or 23 M.P.H. Generator is air cooled and charging rate may be set at 24 amperes maximum output without danger to generator windings.

**Generator Data**

Cold Test			Hot Test		
Amperes	Volts	R.P.M.	Amperes	Volts	R.P.M.
22-24	8.6-9.0	1300-1500	13.5-16.5	7.7-8.1	1600-1800

Brush spring tension 20-28 ounces. Shunt field current 3.5-4.0 amperes at 6 volts.

**Mounting:**—Generator flange mounted on rear face timing chain case at right of engine. Driven by timing chain. Chain adjustment automatic, requires no attention during life of chain. To remove, disconnect lead, disconnect water pump drive coupling, take out 3 flange mounting screws, slide generator to rear to disengage coupling, lift from place.

**Oiling:**—1000 Miles. Put 8-10 drops light oil in oiler at each end of generator.

**RELAY:**—See paragraph on 'Apparatus Box'.

**LIGHTING:**—Delco-Remy Lighting Switch, Model 486-S. Switch mounted at lower end of steering column controlled by lever on steering wheel. Lighting system new Cadillac 'Super-Safe' system equipped with new type three filament bulbs Mazda No. 3001 (32-21-21 cp.). Bulbs are interchangeable but are installed in left head lamp with 32 cp. filament at the top, and in the right hand head lamp with 32 cp. filament at the bottom. Sockets are designed so that bulb cannot be inserted incorrectly. Headlight doors, lenses and reflectors are not interchangeable, being designed to give a particular pattern of light for each head lamp filament. Switch positions are as follows:

City Driving		City Passing	
R.H. Lamp—Lower 21 cp. filament	R.H.—Upper or 'depressed' 21 cp. filament	L.H.—32 cp. filament lighted	
L.H. Lamp—Lower 21 cp. filament			
Country Driving		Country Passing	
R.H. Lamp—Lower 21 cp. filament	R.H.—Upper or 'depressed' 21 cp. filament	L.H.—Lower 21 cp. filament	
	32 cp. filament		32 cp. filament
L.H. Lamp—Lower 21 cp. filament			

**NOTE:**—For special instructions in regard to headlights and procedure in removing Map light bulb see page on Cadillac V-8.

**Lamp Sizes**

Position	Voltage	Candlepower	Base	Mazda No.
Headlights	6-8	32-21-21	Triple	3001
Fender Lights	6-8	3	S.C.	63
Dash and Tail Lights	6-8	3	S.C.	63
Backing and Stop Lights	6-8	15	S.C.	87
Map Reading Lights	6-8	3	S.C.	63
Dome and Corner Lights	6-8	6	S.C.	81

**Switches:**—Stop light switch Delco-Remy, Model 474-Z. Backing light switch Delco-Remy, Model 440-E.

**APPARATUS BOX:**—Delco-Remy, Model 480-Z. Mounted on rear of dash under cowl. Consists of current limit relay (vibrating and lock-out circuit breaker), generator cut-out relay, horn relay, and a 10 ampere capacity fuse (in circuit to backing and stop lights).

**Current Limit Relay:**—Vibrating circuit breaker begins to operate with current load of 35-40 amperes limiting current to 5-20 amperes maximum with direct short-circuit. Lock-out circuit breaker begins to operate with current load of 25-30 amperes limiting current to less than 1 ampere with direct short-circuit. Circuit breaker contact gap limits, .012-.030 inch. Air gap limits, .015-.025 inch (contacts closed). Spring tension 5 ounces minimum (measured at brass button with spring scale at right angles to contact arm).

**Cut-out Relay:**—Contacts close at 7-9 M.P.H. or 520 R.P.M. (generator) with a generator voltage of 6.75-7.5 volts and open with a discharge current of 0-2 amperes. Contact gap limits, .015-.025 inch. Air gap limits, .012-.017 inch (contacts closed).

**Horn Relay:**—Model 266-T. Pressing horn button energizes horn relay winding, closing horn relay contacts and completing horn circuit. Horn current does not pass through horn button. Horn relay requires 25 amperes to close contacts. Horn relay contact gap limits, .015-.025 inch. Air gap limits, .012-.017 inch (contacts closed).

**FUSES:**—Backing and stop light fuse mounted in Apparatus Box, 10 ampere capacity.

**HORNS:**—Klaxon vibrator type matched set with blended note. Model K-22-C Type 1160 (low note), and Model K-22-C Type 1161 (high note). Horns should draw 6.0-8.0 amperes at 6 volts.

**GASOLINE GAUGE:**—A.C. Electric Type (see Equipment Section).

# CADILLAC

V-16 MODEL 452-B (1932), SERIAL NUMBERS 1,400,001 UP  
 PRODUCTION STARTED JANUARY, 1932  
 DELCO-REMY SYSTEM

**CAR SERIAL NUMBER:**—Same as engine number.

**ENGINE NUMBER:**—Stamped on right side of crankcase below water inlet.

**BATTERY:**—Delco, Type 25-AW, 6 volt, 25 plate, 190 ampere hour capacity (20 hour rate). Positive (+) terminal grounded. Battery mounted under right front fender (accessible by taking out four screws and lifting portion of fender which serves as battery box cover).

**IGNITION:**—Coil Model 530-K (2 used). Coils mounted in recess of radiator top tank directly above distributor. Ignition current 2½ amperes (engine running), 4 amperes (engine stopped). Ignition switch Delco-Remy Dual-lock Model 425-T co-incidental ignition switch and transmission lock.

**Distributor Model 4093.** Two breaker arm, 8 lobe cam type with full automatic advance. Breaker contacts open alternately at 22½ degree intervals (corresponding to the engine firing interval of 45 degrees). Contacts must be synchronized (see Timing). Breaker gap .014-.018 inch (breaker arm on lobe of cam). To set gap, loosen lock screw on stationary contact mounting plate, turn eccentric adjusting screw. Resurface contacts when necessary with a fine flat contact file. Breaker arm spring tension 17-21 ounces (measured at tip of breaker arm with spring scale at right angles to contact surface).

Engine	Degrees	Automatic Advance	Distributor	R.P.M.	Engine
0	Start		300		600
34.5	17.25		1400		2800

**Mounting:**—Distributor mounted at front of engine between cylinder banks. Driven by gears from camshaft. To remove, disconnect primary leads, take off distributor cap, take out two mounting screws in distributor bracket, lift distributor out.

**Oiling:**—1000 Miles. Use Alemite grease in Alemite gun on fitting under distributor cup until grease appears at overflow above fitting (lower bearing). Put 8-10 drops light oil in oiler on side of distributor cup (upper bearing). Take off distributor cap and rotor, put 4-5 drops light oil on top of cam locking screw (oiler for breaker arm rubbing blocks on cam), oil breaker arm pivot pins.

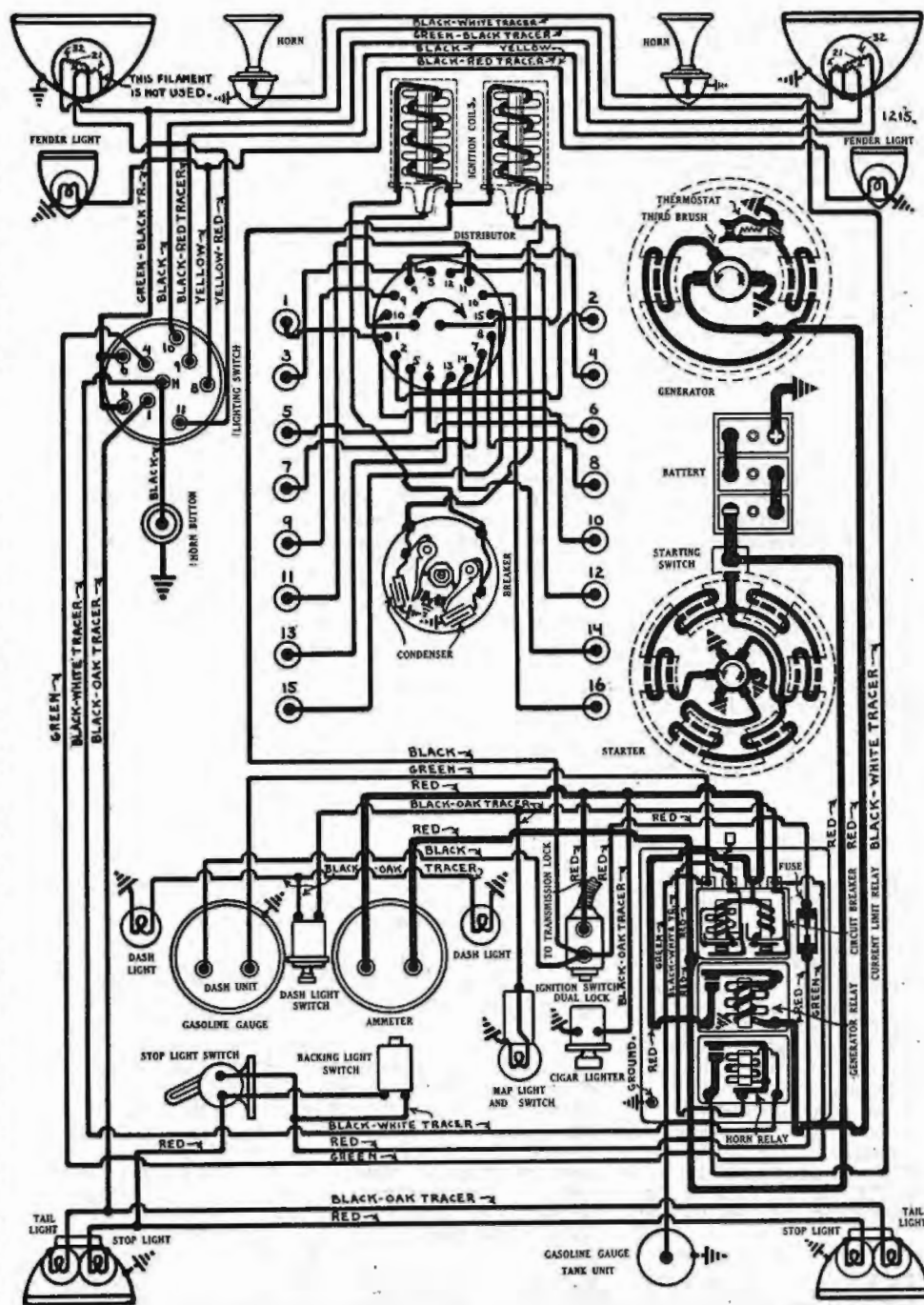
**Timing:**—Standard setting 1¼ inches (on flywheel) before top dead center. To set timing, remove inspection cover over inspection hole in flywheel housing. Center distributor pointer on quadrant scale by loosening hold-down screw in advance arm and rotating distributor cup, tighten hold-down screw. With No. 1 piston on compression stroke, turn engine over (see note) until flywheel mark 'IG/A' (which is 1¼" before the dead center mark 'C/1-15') is directly opposite indicator on flywheel housing. Then take off distributor cap and rotor, loosen locking screw in center of breaker cam, carefully locate cam so that first set of breaker contacts (mounted directly on breaker plate) are beginning to open, tighten locking screw. Connect spark plugs as indicated on diagram.

**Synchronizing Contacts**—using synchronizing tool, Cadillac Part No. 109224. Install tool and adjust so that first set of contacts begin to open with the pointer on farthest indicating point on quadrant 'R.H.' Crank engine over until pointer is directly opposite next graduation on the quadrant '16 L.H.' Loosen lock screws on movable sub-plate (carrying second set of breaker contacts), turn eccentric adjusting screw until contacts begin to open, tighten lock screws. The first set or "stationary" set of contacts should open again when pointer is directly opposite center point on quadrant. These marks are 22½ degrees apart (see illustration on 1931 V-16 wiring diagram).

**Second Method**—as part of timing operation. After distributor has been timed to engine (second paragraph above), turn engine over 45 degrees to firing position of piston No. 8. Loosen lock screws on movable sub-plate, turn eccentric adjusting screw until contacts begin to open, tighten locking screws, check contact gap.

**NOTE:**—No provision is made for hand cranking of engine. Manufacturer recommends that transmission be engaged, the car jacked up and engine cranked by turning one of the rear wheels.

**Firing Order:**—1-8-9-14-3-6-11-2-15-10-7-4-13-12-5-16 with cylinders numbered as shown on diagram, or 1L-4R-5L-7R-2L-3R-6L-1R-8L-5R-4L-2R-7L-6R-3L-8R with cylinder banks right (R) and left (L) as viewed from the driver's seat. No. 1 cylinder nearest radiator in each case.



# CADILLAC

V-16 MODEL 452-B (1932), SERIAL NUMBERS 1,400,001 UP  
 PRODUCTION STARTED JANUARY, 1932  
 DELCO-REMY SYSTEM

**Spark Plugs:**—18 MM. A.C. Type D-8. Set gap at .028 inch.

**VALVE TIMING:**—Camshaft mounted directly above crankshaft driven by silent chain. Chain adjustment automatic. Generator also driven by timing chain. Engine valve-in-head type with valves operated by rocker arms on head and pushrods between cylinder banks. Valve tappet clearance adjustment automatic (see Special Note).

	Head Diameter	Stem Diameter	Length	Seat Angle	Lift
Intake	1.446-1.452"	11/32"	6 9/64"	45°	11/32"
Exhaust	1.446-1.452"	11/32"	6 9/64"	45°	11/32"

	Tappet Clearance	Spring Pressure
No appreciable clearance or lash in service (see Special Note).	Closed	70 pounds
	Open	167 pounds

**Timing**

Intake valves open at top dead center. Intake valves close 44 degrees after lower dead center.

Exhaust valves open 39 degrees before lower dead center. Exhaust valves close 5 degrees after top dead center.

**SPECIAL NOTE:**—Special automatic valve tappet take-up is used. Rocker arm is mounted on eccentric bushing which is rotated to take up all valve lash or clearance by a spring under the plunger which bears on an arm of the eccentric. Plunger operates in an oil cylinder or dashpot. This device requires no attention in service and there will be no appreciable tappet clearance or lash. It must be reset when replacing valves by using special combination screwdriver and wrench, Cadillac Part No. 109627-T, and adjusting clearance to .030 inch with plunger held down at the bottom of the dashpot. Adjust with engine running and use special tool, Cadillac Part No. 109624, to hold plunger down at end of stroke.

**STARTER:**—Model 495. Manual pinion engagement connected to starting switch lever. Starter drives engine through reduction gears and overrunning clutch. Rotation (armature shaft) counter-clockwise at commutator end. Brush spring tension 36-40 ounces. Starter cranks engine at 80-90 R.P.M.

**Starter Data**

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

**Mounting:**—Starter flange mounted on rear face flywheel housing at right of transmission. To remove, disconnect cable, disconnect starting pedal linkage, take out 3 flange mounting cap screws, pull starter to rear to clear housing, lift from place.

**Oiling:**—1000 Miles. Put 8-10 drops light oil in oiler at drive end of armature shaft. Commutator end bearing and pinion housing bearing oilless.

**Six Months.** Take out grease plug in reduction gear housing, repack gears with graphite grease.

**GENERATOR:**—Model 931-D. Third brush regulation, thermostat control. Thermostat operates at 165°F. (contacts open—cuts in resistance), reducing output approximately 40%. To adjust charging rate, loosen hexagonal lock screw on commutator end plate (use wrench), take off cover band, shift third brush (by hand) counter-clockwise to increase or clockwise to decrease charging rate, tighten lock screw. With standard setting charging rate is 13½-16 amperes at 7-7.2 volts reached at 1600 R.P.M. (armature) or 23 M.P.H. Generator is air cooled and charging rate may be set at 24 amperes maximum output without danger to generator windings.

**Generator Data**

Cold Test			Hot Test		
Amperes	Volts	R.P.M.	Amperes	Volts	R.P.M.
22-24	8.6-9.0	1300-1500	13.5-16.5	7.7-8.1	1600-1800

Brush spring tension 20-28 ounces. Shunt field current 3.5-4.0 amperes at 6 volts.

**Mounting:**—Generator flange mounted on rear face timing chain case at right of engine. Driven by timing chain. Chain adjustment automatic, requires

no attention during life of chain. To remove, disconnect lead, disconnect water pump drive coupling, take out 3 flange mounting screws, slide generator to rear to disengage coupling, lift from place.

**Oiling:**—1000 Miles. Put 8-10 drops light oil in oiler at each end of generator.

**RELAY:**—See paragraph on 'Apparatus Box'.

**LIGHTING:**—Delco-Remy Lighting Switch, Model 486-S. Switch mounted at lower end of steering column controlled by lever on steering wheel. Lighting system new Cadillac 'Super-Safe' system equipped with new type three filament bulbs Mazda No. 3001 (32-21-21 cp.). Bulbs are interchangeable but are installed in left head lamp with 32 cp. filament at the top, and in the right hand head lamp with 32 cp. filament at the bottom. Sockets are designed so that bulb cannot be inserted incorrectly. Headlight doors, lenses and reflectors are not interchangeable, being designed to give a particular pattern of light for each head lamp filament. Switch positions are as follows:

City Driving		City Passing	
R.H. Lamp—Lower 21 cp. filament		R.H.—Upper or 'depressed' 21 cp. filament	
L.H. Lamp—Lower 21 cp. filament		L.H.—32 cp. filament lighted	
Country Driving		Country Passing	
R.H. Lamp—Lower 21 cp. filament		R.H.—Upper or 'depressed' 21 cp. filament	
	32 cp. filament	L.H.—Lower 21 cp. filament	
L.H. Lamp—Lower 21 cp. filament			32 cp. filament

**NOTE:**—For special instructions in regard to headlights and procedure in removing Map light bulb see page on Cadillac V-8.

**Lamp Sizes**

Position	Voltage	Candlepower	Base	Mazda No.
Headlights	6-8	32-21-21	Triple	3001
Fender Lights	6-8	3	S.C.	63
Dash and Tail Lights	6-8	3	S.C.	63
Backing and Stop Lights	6-8	15	S.C.	87
Map Reading Lights	6-8	3	S.C.	63
Dome and Corner Lights	6-8	6	S.C.	81

**Switches:**—Stop light switch Delco-Remy, Model 474-Z. Backing light switch Delco-Remy, Model 440-E.

**APPARATUS BOX:**—Delco-Remy, Model 480-Z. Mounted on rear of dash under cowl. Consists of current limit relay (vibrating and lock-out circuit breaker), generator cut-out relay, horn relay, and a 10 ampere capacity fuse (in circuit to backing and stop lights).

**Current Limit Relay:**—Vibrating circuit breaker begins to operate with current load of 35-40 amperes limiting current to 5-20 amperes maximum with direct short-circuit. Lock-out circuit breaker begins to operate with current load of 25-30 amperes limiting current to less than 1 ampere with direct short-circuit. Circuit breaker contact gap limits, .012-.030 inch. Air gap limits, .015-.025 inch (contacts closed). Spring tension 5 ounces minimum (measured at brass button with spring scale at right angles to contact arm).

**Cut-out Relay:**—Contacts close at 7-9 M.P.H. or 520 R.P.M. (generator) with a generator voltage of 6.75-7.5 volts and open with a discharge current of 0-2 amperes. Contact gap limits, .015-.025 inch. Air gap limits, .012-.017 inch (contacts closed).

**Horn Relay:**—Model 266-T. Pressing horn button energizes horn relay winding, closing horn relay contacts and completing horn circuit. Horn current does not pass through horn button. Horn relay requires .25 amperes to close contacts. Horn relay contact gap limits, .015-.025 inch. Air gap limits, .012-.017 inch (contacts closed).

**FUSES:**—Backing and stop light fuse mounted in Apparatus Box, 10 ampere capacity.

**HORNS:**—Klaxon vibrator type matched set with blended note. Model K-22-C Type 1160 (low note), and Model K-22-C Type 1161 (high note). Horns should draw 6.0-8.0 amperes at 6 volts.

**GASOLINE GAUGE:**—A.C. Electric Type (see Equipment Section).

# CHEVROLET

**CONFEDERATE SERIES BA (1932) AND SERIES BB (COMMERCIAL CARS)**  
**PRODUCTION STARTED DECEMBER, 1931**  
**DELCO-REMY SYSTEM**

**CAR SERIAL NUMBER:**—Stamped on plate on right front seat frame (open cars) or on right front sill (closed cars).

**ENGINE NUMBER:**—Stamped on boss on right side of cylinder block directly back of fuel pump.

**BATTERY:**—Various types used, including Delco, Type 13-H, 6 volt, 90 ampere hour capacity. Negative (—) terminal grounded. Battery mounted on right frame member under front compartment floor boards.

**IGNITION:**—Coil Model 528-B. Coil mounted on engine side of dash. Ignition current 1.9 amperes at 7.5 volts (engine running at 40 M.P.H.), 4 amperes at 6 volts (engine stopped). Ignition switch is Delco-Remy Electrolock, Model 427-H. See Equipment Section for description of Electrolock.

**Distributor Model 633-J.** Single breaker arm, 6-lobe cam type with semi-automatic advance. Manual advance controlled by button at lower right of instrument panel. Ordinary running position with button pushed in, spark advanced. Pull out button to retard spark. Breaker gap set at .018-.024 inch. To set gap, loosen lock screw on stationary contact plate, turn eccentric adjusting screw, tighten lock screw. Breaker arm spring tension 17-21 ounces (measured at tip of breaker arm with spring scale at right angles to contact surface). Maximum manual advance 15 degrees (engine).

Engine	Degrees	Automatic Advance	R.P.M.	Engine
0		Distributor	Distributor	700
31	15½	350	1300	2600

**Mounting:**—Distributor mounted at right of engine. Driven by inclined shaft from the camshaft. Electrolock must be removed as a unit with distributor whenever distributor is taken off car (see Equipment Section for complete details on Electrolock). To remove distributor, disconnect all wiring on Electrolock and free Electrolock from dash. Disconnect manual spark control wire, take off distributor cap, take out hold-down screw in advance arm, lift out distributor and Electrolock.

**Oiling:**—500 Miles. Turn down grease cup on side of shaft housing ¼-1 turn. Keep cup filled with No. 2½ cup grease.

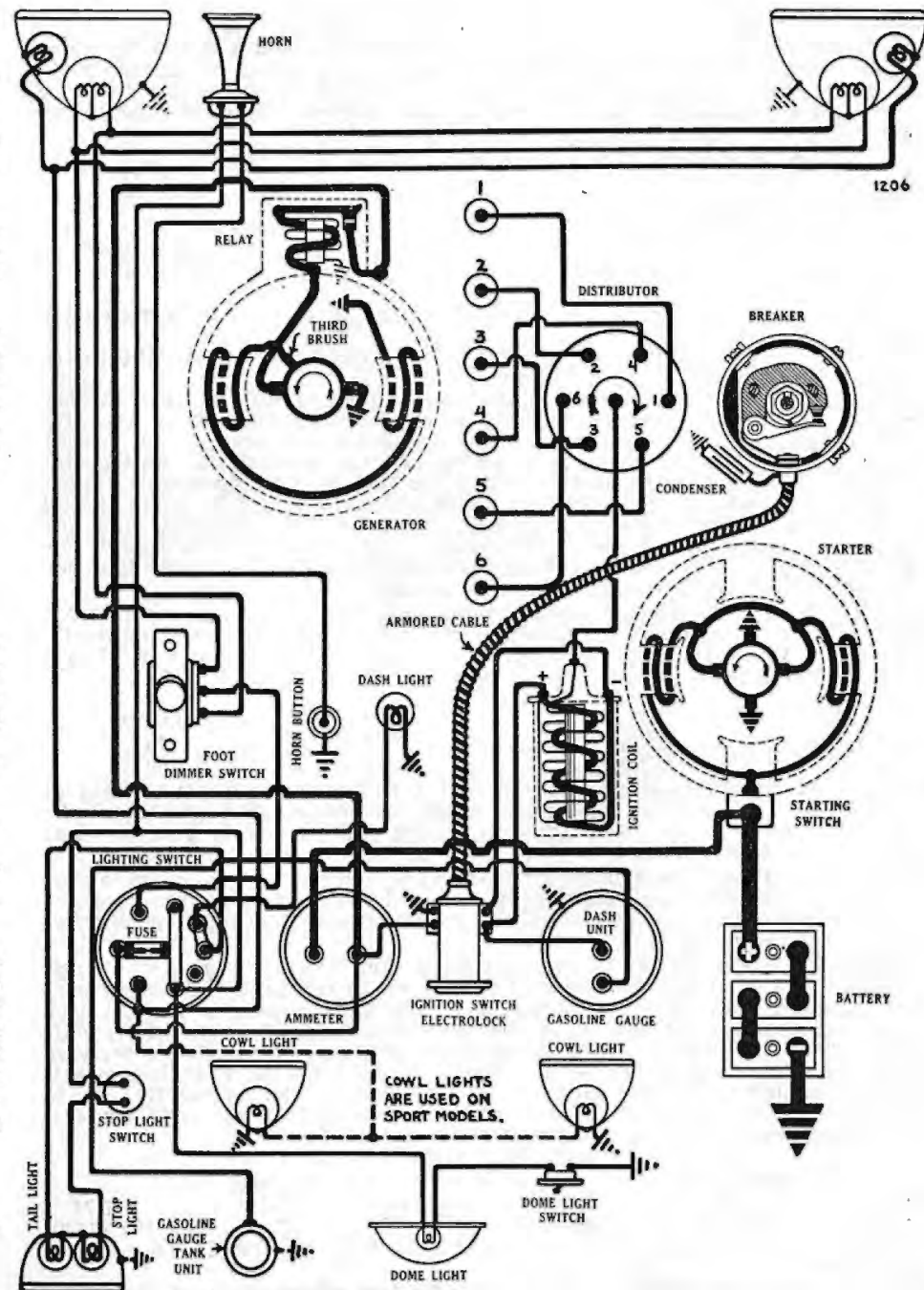
1000 Miles. Take off distributor cap and rotor. Fill wick oiler in center of shaft with light engine oil, put one drop oil on breaker arm pivot pin, apply thin film vaseline to face of breaker cam.

**Timing:**—Standard setting 12° (on flywheel) before top dead center with full manual advance. To set timing, advance spark control button (push button in toward dash) and see that distributor is rotated counter-clockwise to limit of advance arm slot. With No. 1 piston on compression stroke, turn engine over until flywheel mark '12°/' (which is 12° before top dead center mark 'U.C./' is directly in line with indicator in peephole in right front face of flywheel housing, loosen advance arm clamp screw, rotate distributor until contacts begin to open, tighten clamp screw, connect spark plugs as indicated on diagram (No. 1 terminal as designated).

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

**Spark Plugs:**—18 MM. Metric A.C. Type G-12 (use Type G-10 for replacement). Set gaps at .024 inch.

**VALVE TIMING:**—Valves located in cylinder head (overhead valve engine) operated by rocker arms and pushrods at right of engine. Tappet adjustment



# CHEVROLET

## CONFEDERATE SERIES BA (1932) AND SERIES BB (COMMERCIAL CARS)

### PRODUCTION STARTED DECEMBER, 1931

#### DELCO-REMY SYSTEM

in end of rocker arm directly above pushrods. Camshaft at right of engine and gear driven from crankshaft. Crankshaft gear steel. Camshaft gear fabric.

	Head Diameter	Stem Diameter	Length	Seat Angle	Lift
Intake	1 15/32"	5/16"	4 3/4"	45°	309"
Exhaust	1 11/32"	5/16"	4 3/4"	45°	309"

	Tappet Clearance	Spring Pressure
Intake	.008" (hot)	Closed .....45 pounds
Exhaust	.008" (hot)	Open .....80 pounds

#### Timing

Intake valves open 4° before top dead center. Close 34° after lower dead center.

Exhaust valves open 47° before lower dead center. Close 4° after top dead center.

**To Set Valve Timing.** Tooth on crankshaft gear and space between teeth on camshaft gear are marked. Mesh gears so that marked tooth is directly opposite marked space with both marks in line with center between shafts. Mark on camshaft gear is 11 spaces clockwise around the gear from the keyway. Mark on crankshaft gear is 4 1/2 teeth counter-clockwise around gear from keyway (keyway directly opposite space between teeth). These directions should be followed in marking new gears.

**STARTER:—Model 714-L.** Starter drives engine through outboard Bendix drive. Rotation counter-clockwise at commutator end. Brush spring tension 24-28 ounces. Starter switch mounted on starter field frame operated by foot pedal on toeboard.

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

**Mounting:—**Starter flange mounted on right front face of flywheel housing. To remove, disconnect cable, disconnect starting pedal linkage, take out 2 flange mounting screws, pull starter forward to clear Bendix housing, lift out.

**Oiling:—1000 Miles.** Put 8-10 drops light engine oil in commutator end oiler.

**GENERATOR:—Model 943-J.** Third brush regulation. To adjust generator output, loosen small round headed screw on commutator end plate, take off cover band, shift third brush counter-clockwise to increase or clockwise to decrease charging rate, tighten locking screw. Rotation counter-clockwise at commutator end. Maximum charging rate 18 amperes (cold) at 8.2 volts reached at 1700 R.P.M.

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

Brush spring tension 14-18 ounces. Shunt field current 3.5-4.5 amperes at 6 volts. Motoring generator draws 3 amperes at 6 volts.

**Mounting:—**Generator mounted on swinging bracket at left front of engine. Driven by fan belt. To remove generator, disconnect lead, loosen adjustment clamp bolt, swing generator toward engine, slip off drive belt, take out adjustment bolt and two bolts under generator forming bracket hinge, lift generator out.

**Belt Adjustment.** To take up drive belt, loosen adjustment clamp bolt, swing generator out from engine, tighten adjustment bolt. Belt tension should be just sufficient to drive fan and generator without slipping.

**Oiling:—500 Miles.** Put 4-5 drops light engine oil in oiler at each end of generator.

**RELAY:—Model 265-H.** Relay mounted on generator field frame. Relay contacts close at 750 R.P.M. of generator with generator voltage of 6.75-7.5 volts and open with discharge current of 0-2.5 amperes. Relay contact gap limits .015-.025 inch. Air gap limits .012-.017 inch (contacts closed).

**LIGHTING:—Delco-Remy Switch Model 478-E. Dimmer Switch Model 465-H or Z.** Lighting switch mounted on back of instrument board controlled by push-pull button at lower left of instrument panel. Dimmer system 'depressed beam' double filament headlight bulbs controlled by foot operated dimmer switch on toeboard.

Position	Lamp Sizes		Base	Mazda No.
	Voltage	Candlepower		
Headlights	6-8	21-21	D.C.	1110
Parking Lights	6-8	3	S.C.	63
Cowl Lights (when used)	6-8	3	S.C.	63
Dash and Tail Lights	6-8	3	S.C.	63
Stop Light	6-8	15	S.C.	87
Dome Light	6-8	3	S.C.	63

**NOTE:—**Stop light switch is Model 474-Y.

**FUSES:—**20 ampere capacity fuse mounted on back of lighting switch.

**GASOLINE GAUGE:—**A.C. Electric type (see Equipment Section).

**FUEL PUMP:—**A.C. Type 'B' mechanical fuel pump mounted at right front of engine (see Equipment Section).

**TEMPERATURE GAUGE:—**A.C. 'Vapor Tension' type (see Equipment Section).

**HORNS:—**Klaxon Model K-31, Type 1355 (vibrator type), standard equipment. When twin horns (matched tone) are furnished this horn is used as the low note unit with Model K-31 Type 1356-A for the high note. Type 1356-A is sold separately. Current draw 4.0-6.5 amperes at 6 volts. Model K-16 horn used on Series BB commercial cars.

# CHRYSLER

EIGHT DeLUXE SERIES ★CD (1931) AFTER JUNE, 1931  
 DELCO-REMY GENERATING, STARTING SYSTEM  
 DELCO-REMY IGNITION

**CAR SERIAL NUMBER:**—Stamped on right front door hinge pillar post.

**ENGINE NUMBER:**—Stamped on boss left side of engine block between No. 1 and 2 cylinders.

**BATTERY:**—Willard, Type WS-4-17. 6 volt, 17 plate, 115 ampere hour capacity (20 hour rate). Starting capacity 140 amperes for 20 minutes. Positive (+) terminal grounded. Battery mounted on left frame member under front compartment floor boards. Battery size 7 1/16 inches wide, 11 11/16 inches long, 8 13/16 inches high.

**IGNITION:**—Coil Model 526-T. The ignition switch is built in the base of the coil. Coil is mounted on the back of the instrument board with the ignition switch extending through to the face of the instrument panel. Ignition current is 1-3 amperes at 6 volts with engine running and 3.4-5 amperes at 6 volts with engine stopped.

**Distributor Model 660-U.** Breaker contacts separate .018-.023 inch. Set contact gap by loosening lock screw on stationary contact mounting plate and turning eccentric adjusting screw until gap is .020 inch. Resurface contacts with a fine flat contact file or on a medium hard oilstone. Breaker arm spring tension is 17-21 ounces (measured at tip of breaker arm with spring scale at right angles to contact surface). Breaker has two sets of contacts on a four lobe cam. Contacts open alternately at 45 degree intervals corresponding to the 90 degree firing interval of the engine. Contacts must be synchronized—see Timing. Distributor is full automatic (manual advance not used).

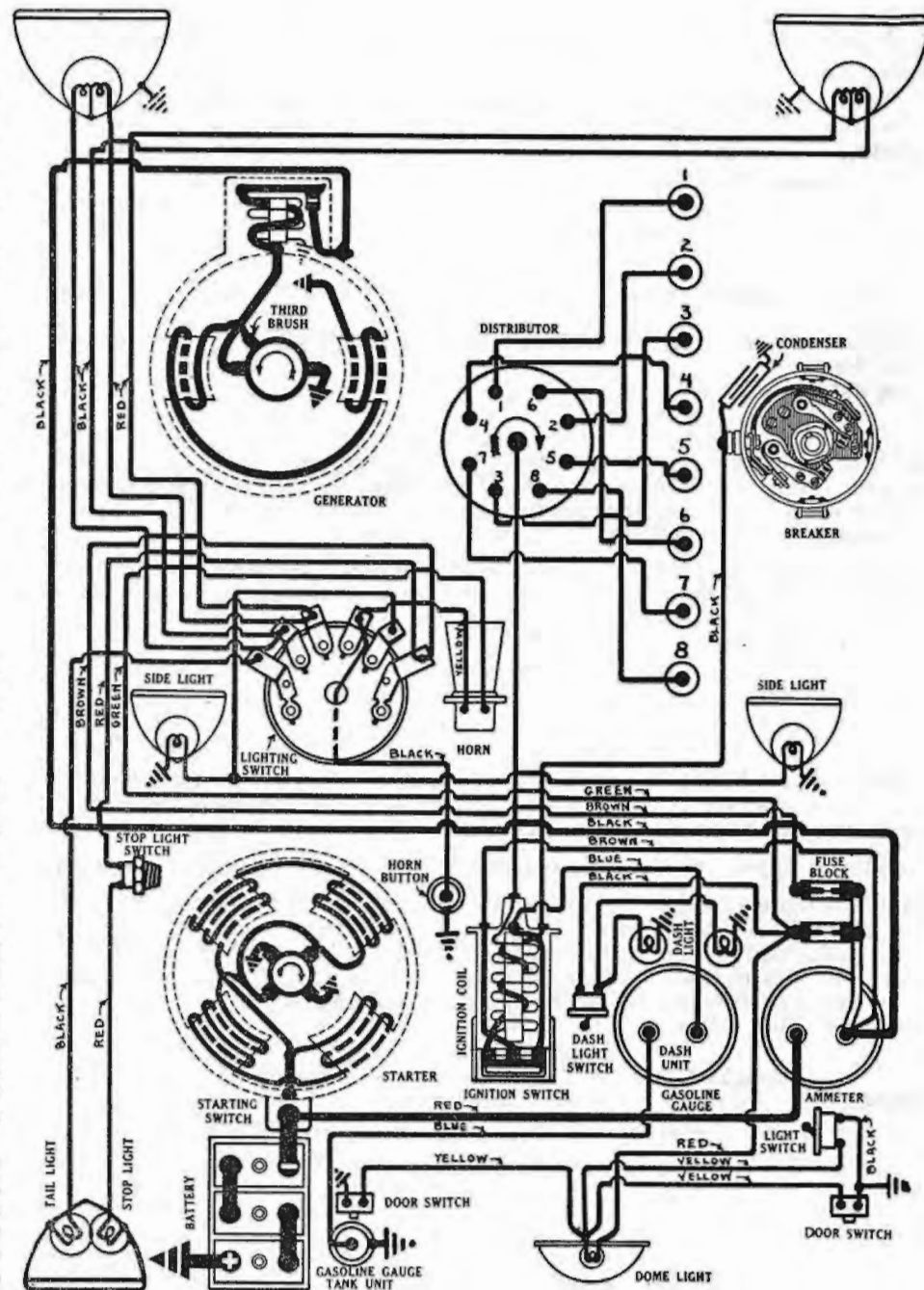
Engine	Degrees	Automatic Advance	R.P.M.	Engine
0	Start	Distributor	400	800
14	7	Distributor	1040	2080
17	8 1/2	Distributor	1100	2200

**Mounting:**—Distributor is mounted at the left of the engine and is driven by an inclined shaft from the camshaft. The oil pump is located on the lower end of the shaft. To remove distributor, disconnect primary lead and take off distributor cap with cables intact. Then take out hold-down screw in advance plate and lift distributor from place.

**Oiling:**—Fill the grease cup under the distributor head with medium cup grease and turn down one full turn every 1000 miles of operation. At the same time remove the distributor cap and rotor and saturate the wick oiler in the center of the shaft with light engine oil. Every 2000 miles put a small bit of vaseline on the face of the breaker cam.

**Timing:**—Synchronization of Contacts. Use special Delco-Remy tool, Part No. 1838182, and follow complete directions in Equipment Section to synchronize contacts. The contacts can be synchronized using the regular timing gauge if an adapter is available so that the gauge can be mounted in the spark plug port of cylinder No. 6. The gauge should be set at zero on top dead center and the piston turned to firing position exactly as for timing (see next paragraph) and the lock screws on the movable sub-plate should then be loosened and the eccentric adjusting screw turned until the second set of contacts (mounted on the sub-plate) begin to open. Tighten the lock screws and check the contact gap. It must be within limits of .018-.024 inch.

**Timing Distributor to Engine.** Breaker contacts begin to open when the piston entering power stroke reaches a position .040 inch before top dead center (5.2-1 compression A.S. Standard head). To set timing, remove the 1/8 inch pipe plug in the cylinder head directly over No. 8 piston and screw the special timing gauge (see Equipment Section) in place. Connect one gauge lead to the coil high tension cable at the distributor and ground the other gauge lead to the cylinder block. Set breaker contact gap at .020 inch. Turn engine over until No. 8 piston is on top dead center and set gauge dial at zero. Then turn engine over until No. 1 piston enters com-



# CHRYSLER

## EIGHT DeLUXE SERIES ★CD (1931) AFTER JUNE, 1931 DELCO-REMY GENERATING, STARTING SYSTEM DELCO-REMY IGNITION

pression stroke (the up stroke with both valves closed) and stop when gauge indicates that piston is .040 inch before top dead center. See that distributor rotor is opposite No. 1 segment in the distributor head (see diagram). Then loosen advance plate clamp screw and rotate distributor until the contacts begin to open when a spark will be seen at the spark gap on the gauge dial. Tighten the clamp screw and connect the spark plugs as indicated on the diagram. The second set of contacts should open 45 degrees after this point when piston No. 6 reaches firing position.

Check timing by cranking engine over several times and stopping with No. 1 piston on compression stroke at the instant the spark is seen at the spark gap. The gauge reading must be within .037-.043 inch before top dead center.

**Firing Order:**—The firing order is 1-6-2-5-8-3-7-4.

**Spark Plugs:**—Spark plugs are 14MM. Metric. A.C. Type K-12. Gaps are .022 inch.

**VALVE TIMING:**—Valves at right of engine. Camshaft driven by two-sprocket non-adjustable chain drive.

	Head Diameter	Stem Diameter	Length	Seat Angle	Lift
Intake	1 15/32"	.3405"	5 1/4"	45°	.3125"
Exhaust	1 13/32"	.3405"	5 1/4"	45°	.3125"

Spring Pressure		Timing		Tappet Clearance	
Operating	Timing				
Intake	.005" (hot) .011" (cold)	Closed	40-44 pounds (2 1/16")		
Exhaust	.007" (hot) .012" (cold)	Open	115 pounds (1 3/4")		

### Timing

Intake valves open 6° after top dead center with piston .014 inch down on intake stroke. Intake valves close 46° after lower dead center.

Exhaust valves open 42° before lower dead center. Exhaust valves close 8° after top dead center with piston .026 inch down on intake stroke.

**To Check Valve Timing.** Remove the pipe plug in the cylinder head over No. 8 piston and screw the special timing gauge in place. Turn engine over until No. 8 piston is on top dead center and set gauge dial at zero. Crank engine over until No. 1 piston is on top dead center entering power stroke and set tappet clearance at .011 inch (No. 1 inlet valve) and .012 inch (No. 1 exhaust valve). Turn engine over one complete revolution and stop with piston slightly past top dead center when the gauge reading is .014 inch. No. 1 inlet valve should begin to open at this point. Turn engine over 2 degrees until gauge reading is .026 inch. No. 1 exhaust valve should begin to close at this point. Reset tappet clearance with engine hot at .005 inch (inlet) and .007 inch (exhaust).

**To Set Valve Timing.** Turn crankshaft until No. 1 piston is on top dead center. Rotate camshaft until the mark on the camshaft sprocket is directly opposite the mark on the crankshaft sprocket with both marks in line with a straightedge laid across the two shaft centers. Assemble the timing chain.

**STARTER:**—Model 728-K. Starter is connected to the engine through a set of reduction gears and a manual pinion shift interconnected with the starting switch pedal. The direction of rotation (armature shaft) is clockwise, viewed from the commutator end. Brush spring tension is 24-28 ounces.

### Starter Data

Torque	R.P.M.	Volts	R.P.M.
0 lb. ft.	2500	5.0	70
5 "	860	5.0	200
10 "	460	4.5	300
15.5 "	275	4.0	400
22 "	100	3.5	500
28 "	Lock	3.0	600

**Mounting:**—Starter is flange mounted at the left of the engine on the forward side of the flywheel housing. To remove starter, disconnect cable and

starting pedal linkage and take out two flange mounting cap screws. Then pull starter forward to clear drive and lift from place.

**Oiling:**—Put 8 or 10 drops of light engine oil in the oiler at the commutator end of the armature shaft every 5000 miles of operation. Every 10,000 miles remove the grease plug in the reduction gear compartment and repack the reduction gears with medium grease.

**GENERATOR:**—Model 943-R. The direction of rotation is counter-clockwise, viewed from the commutator end. Generator current regulation is by third brush field. To adjust generator output, remove the commutator cover band and loosen the small round headed lock screw on the end plate. Then shift the third brush by hand in a counter-clockwise direction to increase the charging rate and in the opposite direction to decrease the charging rate. Tighten the lock screw after making the adjustment. With standard car setting, the maximum charging rate is 18 amperes (cold) reached at 2300 R.P.M. or 20-22 M.P.H. On cars equipped with 21 cp. headlight bulbs, the maximum charging rate should be set at 16 amperes.

### Generator Data

Cold Test			Hot Test		
Amperes	Volts	R.P.M.	Amperes	Volts	R.P.M.
0	6.4	800	0	6.4	875
4	6.8	920	4	6.8	1075
8	7.2	1075	8	7.2	1400
12	7.65	1250	12	7.7	2400
18	8.3	2300	10.8	7.5	3000

Shunt field current is 3.5-4.5 amperes at 6 volts. Generator motoring draws 5 amperes at 6 volts. Brush spring tension is 24-28 ounces.

**Mounting:**—Generator is mounted at left of engine on a special swinging bracket and is driven by the fan belt. To remove generator, disconnect lead and loosen adjustment clamp bolt. Then swing generator toward engine and slip off drive belt. Then take out the two bolts under the generator forming the bracket hinge and lift generator from place.

**Belt Adjustment.** To take up drive belt, loosen mounting bolts and adjustment clamp bolt and swing generator away from the engine. Tighten the adjustment bolt to hold setting. The belt tension should be just sufficient to drive the generator and fan without slipping.

**Oiling:**—Fill the oiler at each end of the generator with light engine oil every 2000 miles of operation.

**RELAY:**—Model 265-G. Relay is mounted on the generator field frame. Relay closes at 8-10 M.P.H. when the voltage of the generator reaches 7-7.5 volts and opens with a discharge current of 0-2.5 amperes. Charging current is approximately 2 amperes at closing of contacts. Relay contact gap is .015-.025 inch. Air gap is .014-.020 inch with contacts closed.

**LIGHTING:**—Clum Switch, Model 9150. Lighting switch is mounted at lower end of the steering column and is controlled by a lever on the steering wheel. Dimmer system 'depressed beam' double filament headlight bulbs controlled by lighting switch.

### Lamp Sizes

Position	Voltage	Candlepower	Base	Mazda Number
Headlights	6-8	32-32	DC	1000
Cowl lights	6-8	3	SC	63
Dash and tail lights	6-8	3	SC	63
Stop and dome lights	6-8	15	SC	87
Corner lights	6-8	3	SC	63

**FUSES:**—Two lighting fuses are mounted on the back of the ammeter. They are each 20 ampere capacity.

**GASOLINE GAUGE:**—Motometer electrical type (see Equipment Section).

**FUEL PUMP:**—AC mechanical fuel pump mounted at right of engine (see Equipment Section).



# CHRYSLER

SIX CYLINDER MODEL CI (1932)  
SERIAL NUMBERS 6,557,401 UP  
DELCO-REMY SYSTEM

**CAR SERIAL NUMBER:**—On right front door hinge pillar post. This series 6,557,401 up.

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

**BATTERY:**—Willard, Type WS-2-15, 6 volt, 100 ampere hour (20 hour rate). Starting capacity 122 amperes for 20 minutes. Positive (+) terminal grounded to transmission case. Battery mounted under driver's seat. Battery size 7 1/16 inches wide, 10 5/16 inches long, 8 13/16 inches high.

**IGNITION:**—Coil Model 534-Z. Lock coil type with ignition switch in base. Coil mounted on back of instrument panel at extreme left. Ignition current is .5-2.5 amperes at 6 volts (engine running), 4.5 amperes at 6 volts (engine stopped).

**Distributor Model 632-K (first cars), 632-L (later cars).** Single breaker arm type with semi-automatic advance (manual advance set in timing and not controllable by driver). Breaker gap set at .020 inch. Hold within limits of .018-.024 inch. To set gap, loosen lock screw on stationary contact mounting plate and turn eccentric adjusting screw. Breaker arm spring tension 17-21 ounces (measured at tip of breaker arm with scale at right angles to contact surface). Maximum manual advance 20 degrees (engine).

Engine	Degrees	Automatic Advance	R.P.M.	Engine
		Distributor	Distributor	
0.....	Start.....	400.....	800	
632-K 18.....	9 .....	1250.....	2500	
632-L 16.....	8 .....	1300.....	2600	

**Mounting:**—Distributor mounted left side of engine driven by inclined shaft from camshaft. To remove, disconnect lead, take off distributor cap, take out hold-down screw in advance plate, lift distributor out.

**Oiling:**—500 Miles. Turn down grease cup on side of shaft housing one turn. Keep cup filled with medium cup grease.

2000 Miles. Take off distributor cap and rotor. Put 4-5 drops light oil in wick oiler in center of shaft. Apply thin film vaseline to face of breaker cam.

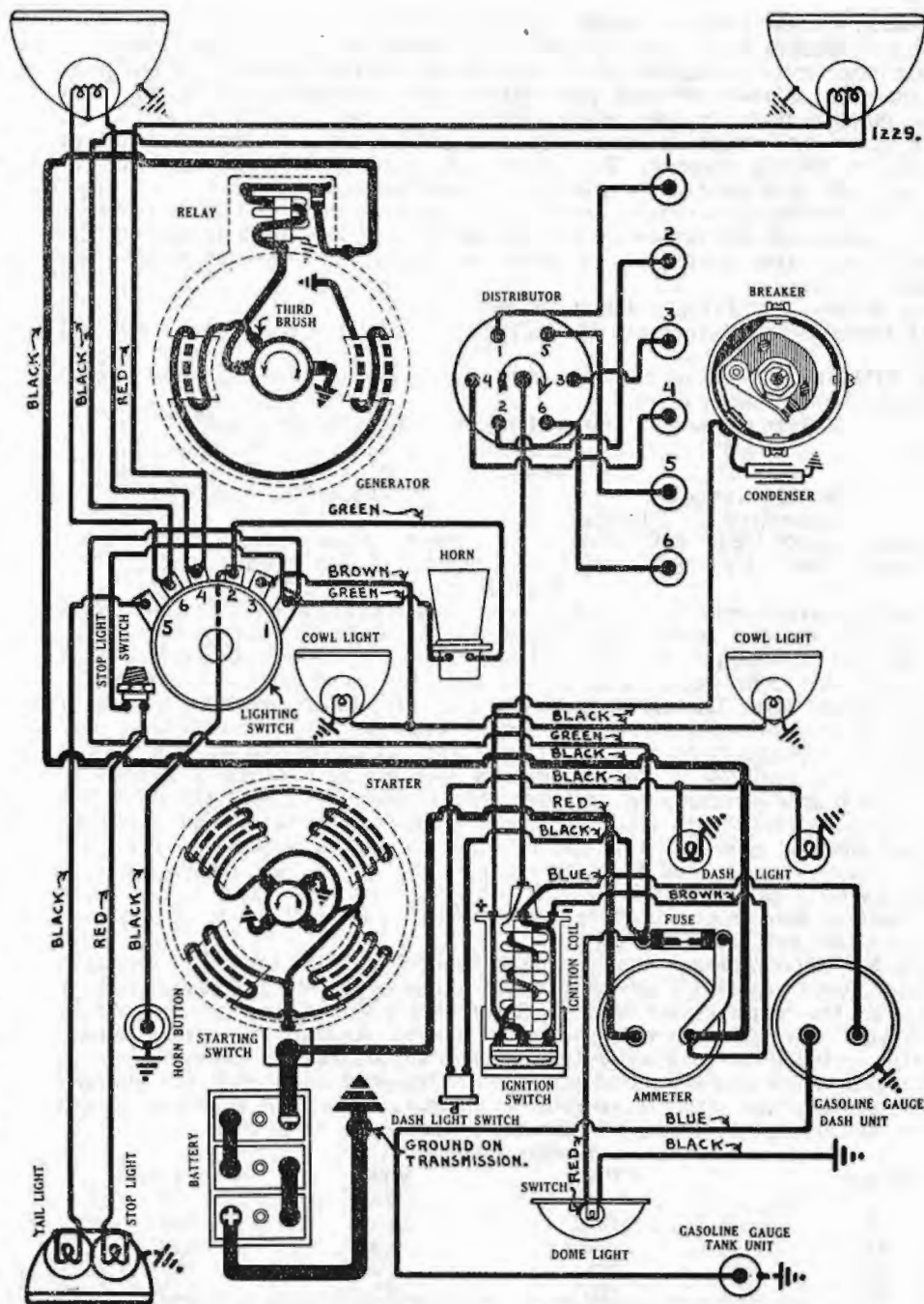
**Timing:**—Standard setting 10° ('Silver Dome' Head), 8° (Red Head engines) before top dead center with full manual advance. To set timing, remove inspection cover left front flywheel housing directly under starter. Turn engine over with No. 1 piston on compression until mark 'D/C' is opposite upper pointer on housing. Loosen advance plate clamping bolt, rotate distributor cup until contacts begin to open (use test lamp), tighten clamp bolt. Connect spark plugs as indicated on diagram (No. 1 terminal as designated).

**NOTE:**—No special directions necessary for timing engine with high compression 'Red Heads'. Ignition pointer properly set at factory on all engines equipped with high compression heads. No provision made for timing engines where heads are changed in the field.

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

**Spark Plugs:**—14 MM. A.C. Type K-12. Set gap at .028 inch. Hold within limits of .025-.030 inch.

**VALVE TIMING:**—Valves on right side of engine with camshaft driven by two-sprocket non-adjustable chain drive.



# CHRYSLER

SIX CYLINDER MODEL CI (1932)  
SERIAL NUMBERS 6,557,401 UP  
DELCO-REMY SYSTEM

Head Diameter	Stem Diameter	Stem Lgth.	Seat Angle	Lift
Inlet .....1.521" (13/8" clear)	.....340-.341"	.....5 1/4"	.....45°	.....5/16"
Exhaust 1.459" (1 5/16" clear)	.....340-.341"	.....5 1/4"	.....45°	.....5/16"

Tappet Clearance		Spring Pressure
Operating	Timing	
Inlet .....005" (hot)	.011" (cold)	Closed .....40-44 pounds (2 1/16")
Exhaust .007" (hot)	.012" (cold)	Open .....75-81 pounds (1 3/4")

**SPECIAL NOTE:**—Do not compress springs to over-all length of less than 1 3/4" to avoid damage through springs taking on permanent set. Valve stem clearance in guide, .001-.003" (inlet), .002-.004" (exhaust).

**Timing**

Intake valves open 6 degrees past top dead center, close 46 degrees past lower dead center.

Exhaust valves open 42 degrees before lower dead center and close 8 degrees past top dead center with piston .0265 inch down on intake stroke.

**To Check Valve Timing.** Remove 1/8 inch pipe plug in cylinder head over No. 6 piston and install regular Chrysler timing gauge. Set gauge at '0' on top dead center. Set tappet clearance No. 1 inlet valve at .011 inch, No. 1 exhaust valve at .012 inch (cold). Rotate crankshaft until No. 6 piston on compression stroke is .015 inch past top dead center. No. 1 inlet valve should be tight and about to open. Turn crankshaft 2 degrees and stop with piston .0265 inch past top dead center. No. 1 exhaust valve should be closing. Reset tappet clearance at .005 inch (inlet), .007 inch (exhaust) with engine hot.

**To Set Valve Timing.** Remove inspection cover on left forward face of flywheel housing directly under starter. Rotate crankshaft until flywheel mark 'D/C' is directly opposite lower pointer on housing (the dead center position for pistons Nos. 1 and 6). Rotate camshaft until mark between teeth on camshaft sprocket is directly opposite crankshaft mark with both marks in line with a straightedge across the shaft centers. Mesh chain. Camshaft sprocket mounting cap screws offset so that sprocket can only be mounted in one position.

**Valve Grinding.** Inlet valves chrome nickel steel. Exhaust valves are silchrome. Manufacturer recommends that valves be refaced in valve grinder and then lapped in in cylinder block with compound.

**STARTER:**—Model 725-Q or 728-N. Manual engagement hooked up with starting switch lever (switch mounted on field frame). Starter drives through over-running clutch. Rotation clockwise at commutator end (728-N with reduction gears) or counter-clockwise at commutator end (725-Q without gear reduction). Brush spring tension 24-28 ounces.

725-Q Starter Data			
Torque	R.P.M.	Volts	Amperes
0 lb. ft.	6000	5	60
15 "	Lock	3	600

728-N Starter Data			
Torque	R.P.M.	Volts	Amperes
0 lb. ft.	2500	5	70
28 "	Lock	3	600

**Mounting:**—Flange mounted on left front face of flywheel housing. To remove, disconnect cables, take out cotter pin and clevis pin in switch linkage, take out two flange mounting cap screws, pull starter straight forward to clear housing, lift from place.

**Oiling:**—5000 Miles. Put 8-10 drops light oil in oiler on commutator end (725-Q) or oiler at each end of armature shaft (728-N).

10,000 Miles. Remove grease plug in reduction gear case. Repack gears with graphite grease (728-N only).

**GENERATOR:**—Model 943-R or S. Third brush control. To adjust, loosen small round headed lock screw on commutator end plate, take off cover band, shift third brush counter-clockwise to increase output, clockwise to decrease output, tighten locking screw. Manufacturer recommends that charging rate be set at 8 amperes to battery (with all lights on—headlights bright), maximum output at 20 M.P.H. or 10 amperes on cars equipped with radio. Rotation counter-clockwise at commutator end. Brush spring tension 24-28 ounces.

943-R Generator Data					
Cold Test			Hot Test		
Amperes	Volts	R.P.M.	Amperes	Volts	R.P.M.
19-21	8-1-8.3	2300	11-14	7.3-7.6	2400

943-S Generator Data					
17-19	8.1-8.3	2300	13-15	7.7-8.0	2400

Shunt field current 3.5-4.5 amperes at 6 volts.

**Mounting:**—Generator mounted on swinging bracket at left front of engine. Driven by fan belt. To remove, disconnect lead, loosen adjustment clamp bolt and mounting bolts, swing generator toward engine, slip off drive belt, take out mounting bolts forming bracket hinge and lift generator out.

**Belt Adjustment.** Loosen mounting bolts and adjustment clamp bolt. Attach spring scale by wire looped over generator field frame so that force of spring is tangent to top of generator and parallel to slot in adjustment clamp. Pull generator away from engine until scale reading is 45-50 pounds. Tighten adjustment clamp bolt and mounting bolts before slacking off on scale.

**Oiling:**—2000 Miles. Fill oiler at each end of generator with light oil.

**RELAY:**—Model 265-G. Mounted on generator field frame. Contacts close at 6.75-7.5 volts (generator) and open with 0-2.5 ampere discharge. Contact gap limits .015-.025 inch. Air gap limits .012-.017 inch (contacts closed).

**LIGHTING:**—Clum Switch, Model 9271. Mounted at lower end of steering column controlled by lower lever on steering wheel. Dimmer system 'depressed beam' double filament headlight bulbs controlled by lighting switch. Switch positions:

1. Vertical—All lights off.
2. Right—Parking (cowl) and tail lights on. Headlights off.
3. No. 1 Left—Bright headlights and tail light on. Cowl lights off.
4. No. 2 Left—Dim (depressed beam) head and tail lights on.

Lamp Sizes				
Position	Voltage	Candlepower	Base	Mazda No.
Headlights	6-8	32-32	D.C.	1000
Cowl Lights	6-8	3	S.C.	63
Dash Lights	6-8	3	S.C.	63
Tail Light	6-8	3	S.C.	63
Stop Light	6-8	15	S.C.	87
Dome Light	6-8	15	S.C.	87

**FUSES:**—20 ampere capacity mounted on bracket under ammeter.

**HORN:**—Klaxon Model K-14. Vibrator type mounted under engine hood. Current draw 7 amperes.

**GASOLINE GAUGE:**—Motometer electric type (see Equipment Section).

**TEMPERATURE GAUGE:**—Motometer 'vapor tension' type (see Equipment Section).

**FUEL PUMP:**—A.C. mechanical fuel pump (see Equipment Section).

# CHRYSLER

## EIGHT CYLINDER MODEL CP (1932)

### SERIAL NUMBERS 7,523,601 UP

### DELCO-REMY SYSTEM

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

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

**BATTERY:**—Willard, Type WS-4-17, 6 volt, 17 plate, 115 ampere hour (20 hour rate.) Starting capacity 140 amperes for 20 minutes. Positive (+) terminal grounded to transmission case. Battery mounted under driver's seat. Battery size, 7 1/16 inches wide, 11 11/16 inches long, 8 13/16 inches high.

**IGNITION:**—Coil Model 534-Z. Lock coil type with ignition switch in base. Coil mounted on back of instrument panel at extreme left. Ignition current, .5-2.5 amperes at 6 volts (engine running), 4.5 amperes at 6 volts (engine stopped).

**Distributor Model 661-G.** Single breaker arm type with semi-automatic advance (manual advance set in timing and not controllable by driver). No synchronization necessary. Set breaker gap at .020 inch. Hold within limits of .018-.024 inch. To set gap loosen lock screw on stationary contact mounting plate and turn eccentric adjusting screw. Breaker arm spring tension 19-23 ounces (measured behind contacts with scale at right angles to back of breaker arm).

Engine	Degrees	Automatic Advance	R.P.M.	Engine
0	Start	Distributor	400	800
12	6	1400	2800	

**Mounting:**—Distributor mounted on left side of engine. Driven by inclined shaft from the camshaft. To remove, disconnect primary lead, take off distributor cap, take out hold-down screw in advance plate, lift distributor out.

**Oiling:**—500 Miles. Turn down grease cup on side of shaft housing one turn. Keep cup filled with medium cup grease.

2000 Miles. Take off distributor cap and rotor. Put 4-5 drops light oil in wick oiler in center of shaft. Apply thin film vaseline to face of breaker cam.

**Timing:**—Standard setting 9° ('Silver Dome' head), 7° (Red Head engines) before top dead center with full manual advance. To set timing, remove inspection cover on left front face of flywheel housing directly below starter. Turn engine over with No. 1 piston on compression until flywheel mark 'D/C' is opposite upper pointer on housing. Loosen hold-down screw in advance plate, rotate distributor cup until pointer is opposite '0' on scale (center of scale), tighten hold-down screw. Loosen advance plate clamp bolt, rotate distributor cup until contacts begin to open (use test lamp), tighten clamp bolt. Connect spark plugs as indicated on diagram (No. 1 terminal as designated).

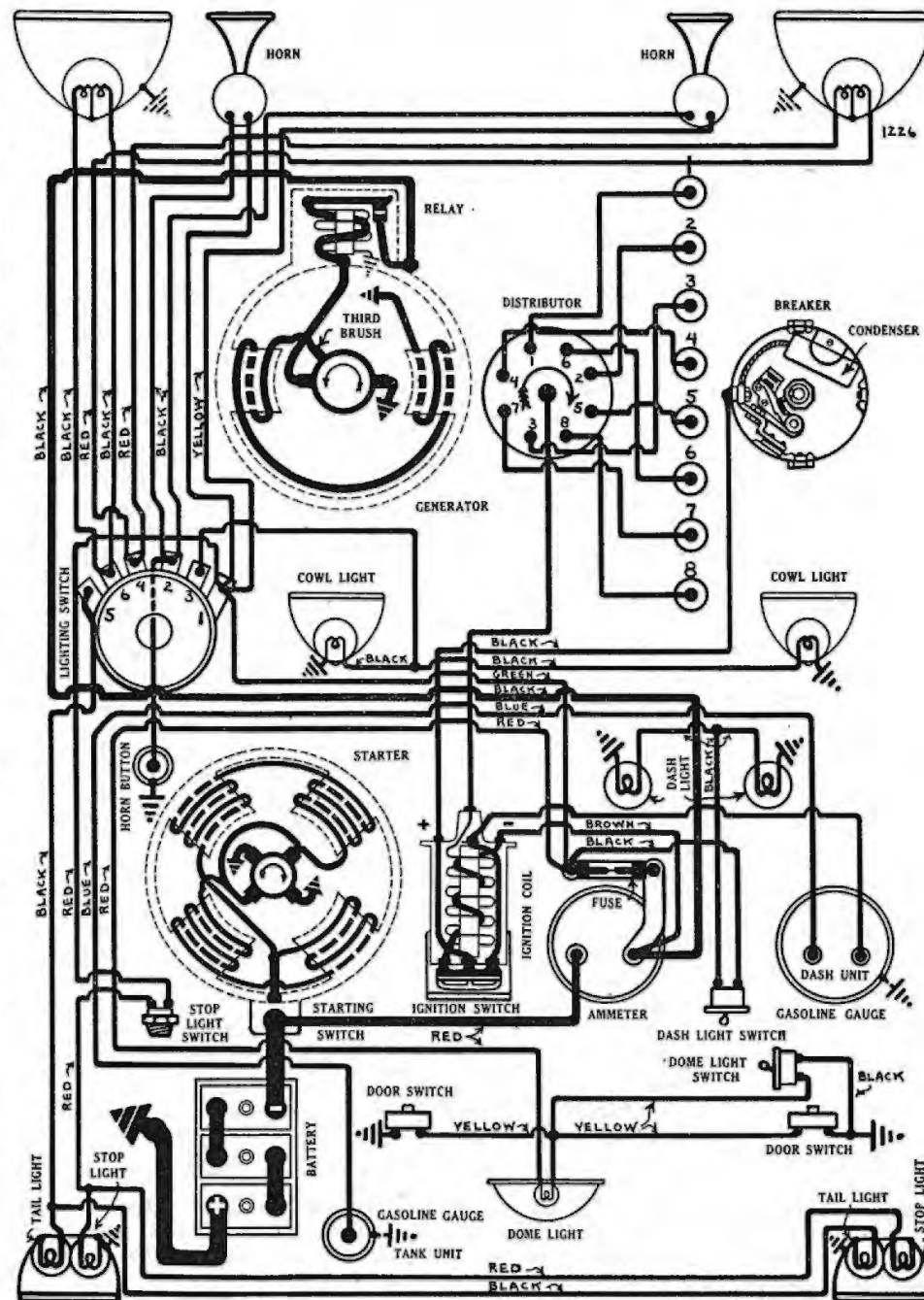
**Synchronization of Contacts.** No synchronization necessary.

**NOTE:**—No special directions necessary for timing 'Red Head' engines as ignition pointer is properly placed at factory on all engines equipped with high compression heads. No provision made for timing where heads are changed in the field.

**Firing Order:**—1-6-2-5-8-3-7-4. No. 1 cylinder nearest radiator.

**Spark Plugs:**—14 MM. A.C. Type K-12. Set gap at .028 inch. Hold within limits of .025-.030 inch.

**VALVE TIMING:**—Valves on right side of engine. Camshaft driven by two-sprocket non-adjustable chain drive.



# CHRYSLER

## EIGHT CYLINDER MODEL CP (1932)

### SERIAL NUMBERS 7,523,601 UP

### DELCO-REMY SYSTEM

	Head Diameter	Stem Diameter	Stem Lgth.	Seat Angle	Lift
Inlet	1 15/32" (1 5/16" clear)	.340-.341"	5 1/2"	45°	5/16"
Exhaust	1 13/32" (1 1/4" clear)	.340-.341"	5 1/2"	45°	5/16"

	Tappet Clearance	Spring Pressure
	Operating	Timing
Inlet	.005" (hot) .011" (cold)	Closed .....40-44 pounds (2 1/16")
Exhaust	.007" (hot) .012" (cold)	Open .....75-81 pounds (1 3/4")

**SPECIAL NOTE:**—Do not compress springs to over-all length of less than 1 5/8" to avoid damage through springs taking on permanent set. Valve stem clearance in guide, .001-.003" (inlet), .004" (exhaust).

#### Timing

Inlet valves open 6° after top dead center with piston .014" down on intake stroke. Intake valves close 46° after lower dead center.

Exhaust valves open 42° before lower dead center. Exhaust valves close 8° after top dead center with piston .025" down on intake stroke.

**To Check Valve Timing.** Remove 1/8 inch pipe plug in cylinder head over No. 8 piston and install regular Chrysler timing gauge. Set gauge dial at '0' with piston on top dead center. Set tappet clearance of No. 1 inlet valve at .011" (cold) and No. 1 exhaust valve at .012" (cold). Rotate crankshaft until No. 8 piston on compression stroke is .014" past top dead center. No. 1 inlet valve should be tight and about to open. Turn crankshaft 2 degrees until piston is .025" past top dead center. No. 1 exhaust valve should be closing. Reset tappet clearance at .005" (inlet) and .007" (exhaust) with engine hot.

**To Set Valve Timing.** Remove inspection cover on left front face of flywheel housing below starter. Rotate crankshaft until flywheel mark 'D/C' is directly opposite lower pointer on housing (top dead center position for pistons 1 and 8). Rotate camshaft until mark on camshaft sprocket between teeth is directly opposite marked tooth on crankshaft sprocket with both marks in line with straightedge across the shaft centers. Mesh chain. Camshaft sprocket mounting cap screws are offset so that sprocket can only be assembled in one position.

**Valve grinding.** Inlet valves chrome nickel steel. Exhaust valves silchrome. Manufacturer recommends that valves be refaced on valve grinder and then lapped in in cylinder block with compound.

**STARTER:**—Model 728-K. Manual pinion shift connected to starting switch lever (switch mounted on field frame). Starter drives through reduction gears and overrunning clutch. Rotation clockwise (armature shaft) at commutator end. Brush spring tension 24-28 ounces.

Starter Data			
Torque	R.P.M.	Volts	Amperes
0 lb. ft.	2500	5	70
28 "	Lock	3	600

**Mounting:**—Flange mounted on left front face of flywheel housing. To remove, disconnect cables, take out cotter pin and clevis pin in switch linkage, take out 2 flange mounting cap screws, pull starter straight forward to clear housing, lift from place.

**Oiling:**—5000 Miles. Put 8-10 drops light oil in oiler at each end of armature shaft.

**10,000 Miles.** Remove grease plug in reduction gear case. Repack gears with graphite grease.

**GENERATOR:**—Model 943-S. Third brush control. To adjust, loosen small round headed lock screw on commutator end plate, take off cover band, shift third brush (by hand) counter-clockwise to increase charging rate, clockwise to decrease charging rate, tighten lock screw. Manufacturer recommends that charging rate be set at 8 amperes maximum to battery at 20 M.P.H. with all lights on (headlights bright), or 10 amperes on cars equipped with radio. Rotation counter-clockwise at commutator end.

Generator Data					
Cold Test			Hot Test		
Amperes	Volts	R.P.M.	Amperes	Volts	R.P.M.
19-21	8.1-8.3	2300	13-15	7.7-8	2400
Brush spring tension 24-28 ounces. Shunt field current 3.5-4.5 amperes at 6 volts.					

**Mounting:**—Generator mounted on swinging bracket at left front of engine. Driven by fan belt. To remove, disconnect lead, loosen adjustment clamp bolt and mounting bolts, swing generator toward engine, slip off drive belt, take out adjustment bolt and mounting pivot bolts, lift generator from place.

**Belt Adjustment.** Loosen mounting bolts and adjustment clamp bolt. Attach spring scale by wire looped over generator field frame so that force of scale is tangent to top of generator and parallel to slot in adjustment arm. Pull generator away from engine until scale reading is 45-50 pounds. Tighten adjustment clamp bolt and mounting bolts before slacking off on scale.

**Oiling:**—2000 Miles. Fill oiler at each end of generator with light oil.

**RELAY:**—Model 265-G. Mounted on generator field frame. Contacts close at 6.75-7.5 volts of generator and open with 0-2.5 ampere discharge current. Contact gap limits .015-.025 inch. Air gap limits .014-.017 inch (contacts closed).

**LIGHTING:**—Clum Switch, Model 9271. Mounted at lower end of steering column, controlled by lever on steering wheel. Dimmer system 'depressed beam' double filament headlight bulbs controlled by lighting switch. Switch positions:

1. Vertical—All lights off.
2. Right—Cowl lights and tail lights on. Headlights off.
3. No. 1 Left—Bright headlights and tail lights on. Cowl lights off.
4. No. 2 Left—Dim (depressed beam) headlights and tail lights on.

Lamp Sizes				
Position	Voltage	Candlepower	Base	Mazda No.
Headlights	6-8	32-32	D.C.	1000
Cowl Lights	6-8	3	S.C.	63
Dash Lights	6-8	3	S.C.	63
Tail Light	6-8	3	S.C.	63
Stop Light	6-8	15	S.C.	87
Dome Light	6-8	15	S.C.	87

**FUSES:**—20 ampere capacity mounted on bracket under ammeter.

**GASOLINE GAUGE:**—Motometer electric type (see Equipment Section).

**TEMPERATURE GAUGE:**—Motometer 'vapor tension' type (see Equipment Section).

**FUEL PUMP:**—A.C. mechanical fuel pump (see Equipment Section).

**HORNS:**—Klaxon Model K-26 twin horns (matched tone) Type 1397, (low note) Type 1398 (high note). Current draw 6.0-8.5 amperes at 6 volts (Type 1397), 5.0-8.5 amperes at 6 volts (Type 1398).

# CHRYSLER

## IMPERIAL EIGHT MODEL CH, CUSTOM IMPERIAL MODEL CL, (1932)

SERIAL NOS. (CH) 7,900,001 UP, (CL) 7,803,301 UP  
 PRODUCTION STARTED JANUARY, 1932  
 DELCO-REMY SYSTEM

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

**ENGINE NUMBER:**—Stamped on boss left side of engine block between Nos. 1 and 2 cylinders above water jacket cover plate.

**BATTERY:**—Willard, Type SJWR-6, 6 volt, 147 ampere hour capacity (20 hour rate). Starting capacity 160 amperes for 20 minutes. Positive (+) terminal grounded. Battery mounted under driver's seat and grounded to transmission (CH) or in right front fender grounded to right frame member (CL). Battery size 7 1/16 inches wide, 13 inches long, 9 3/4 inches high.

**IGNITION:**—Coil 534-Z. Lock coil type with ignition switch in base. Coil is mounted on back of instrument panel at extreme left. Ignition current is of instrument panel. Ignition current 5.2-5.5 amperes at 6 volts (engine running), 4.5 amperes at 6 volts (engine stopped).

**Distributor Model 661-F (CH), 661-E (CL).** Single breaker arm, 8-lobe cam type with semi-automatic advance (manual advance set in timing and not controllable by driver). No synchronization necessary. Breaker gap set at .020 inch. Hold within limits of .018-.024 inch. To set gap, loosen lock screw on stationary contact mounting plate, turn eccentric adjusting screw, tighten lock screw. Breaker arm spring tension 19-23 ounces (measured directly behind contacts with spring scale at right angles to back of breaker arm). Maximum manual advance 25 degrees (engine).

Engine	Degrees	Automatic Advance	R.P.M.	Engine
	Distributor	Distributor		
0.....	Start.....	400.....		800
18.....	9.....	1250.....		2500

**Mounting:**—Distributor mounted on cylinder head at right of engine. To remove, disconnect primary lead, take off distributor cap, take out hold-down screw in advance arm, lift distributor out.

**Oiling:**—500 Miles. Turn down grease cup on side of shaft housing one turn. Keep cup filled with medium cup grease.

2000 Miles. Take off distributor cap and rotor. Put 4-5 drops light oil in wick oiler in center of shaft. Apply thin film vaseline to face of breaker cam.

**Timing:**—Standard setting all engines .038 inch (piston travel) before top dead center. To set timing, remove 1/8 inch pipe plug in cylinder head directly over No. 8 piston, install regular Chrysler timing gauge, set gauge dial at '0' with piston on top dead center. With No. 1 piston on compression stroke, turn engine over until gauge dial indicates piston is .038 inch before top dead center, loosen advance arm clamp bolt, rotate distributor until contacts begin to open (use test lamp), tighten clamping bolt, connect spark plugs as indicated on diagram.

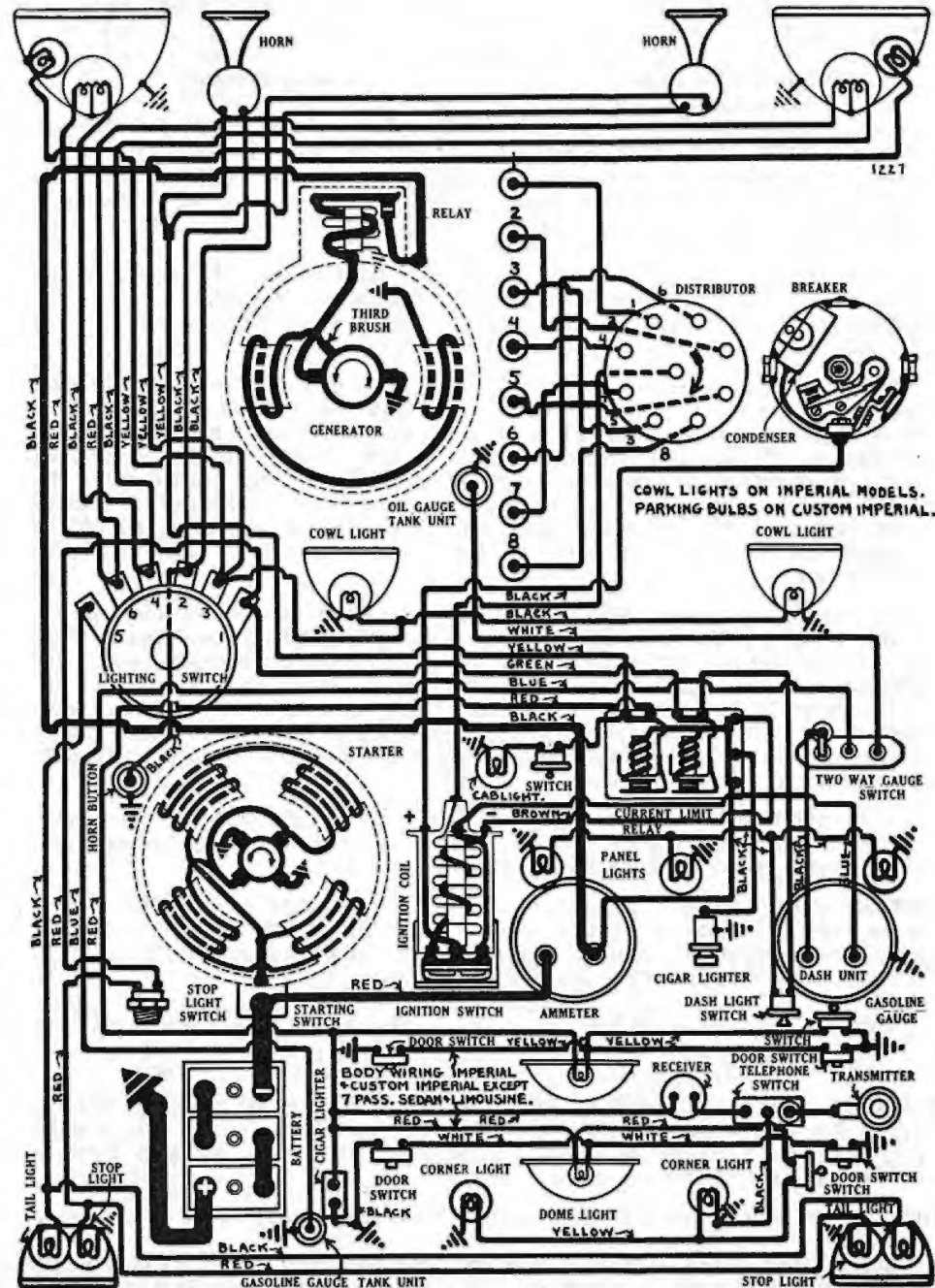
**Synchronization of Contacts.** No synchronization necessary.

**Firing Order:**—1-6-2-5-8-3-7-4. No. 1 cylinder nearest radiator. Distributor Model 661-F side outlet type with spark plug cable connections as shown. Model 661-E connected as shown on Chrysler Eight diagram (previous page).

**Spark Plugs:**—14 MM. Metric. A.C. Type K-12. Set gaps at .028 inch.

**VALVE TIMING:**—Valves at right of engine. Camshaft driven by two-sprocket non-adjustable chain drive.

	Head Diameter	Stem Diameter	Lgth.	Seat Angle	Lift
Intake	...1 23/32" (1 9/16" clear)	...340-.341"	...6 9/16"	...45°	...5/16"
Exhaust	...1 21/32" (1 7/16" clear)	...340-.341"	...6 9/16"	...45°	...5/16"



# CHRYSLER

IMPERIAL EIGHT MODEL CH, CUSTOM IMPERIAL MODEL CL, (1932)  
 SERIAL NOS. (CH) 7,900,001 UP, (CL) 7,803,301 UP  
 PRODUCTION STARTED JANUARY, 1932  
 DELCO-REMY SYSTEM

## Tappet Clearance

Operating Timing		Spring Pressure	
Intake	.005" (hot) .008" (cold)	Closed	50-55 pounds (2 3/4")
Exhaust	.007" (hot) .009" (cold)	Open	80-85 pounds (2 7/16")

NOTE:—Do not compress valve springs to over-all length of less than 2 1/8" to avoid possible damage through springs taking on permanent set. Valve stem clearance in guide .001-.003" (intake), .002-.004" (exhaust).

## Timing

Intake valves open 6° after top dead center with piston .017" down on intake stroke. Intake valves close 46° after lower dead center.

Exhaust valves open 42° before lower dead center. Exhaust valves close 8° after top dead center with piston .030" down on intake stroke.

**To Check Valve Timing.** Take out 1/8 inch pipe plug in cylinder head directly over No. 8 piston, install regular Chrysler timing gauge, set gauge dial at '0' with piston on top dead center, set tappet clearance No. 1 intake valve at .008 inch, No. 1 exhaust valve at .009 inch. Turn engine over until No. 8 piston on compression stroke is .017 inch past top dead center. No. 1 intake valve should begin to open at this point. Turn crankshaft 2° and stop with gauge reading of .030 inch past top dead center. No. 1 exhaust valve should close at this point. Reset tappet clearance at .005 inch (intake) and .007 inch (exhaust) with engine hot.

**To Set Valve Timing.** Use gauge rod and turn crankshaft to top dead center position pistons Nos. 1 and 8. Turn camshaft until mark on camshaft sprocket is directly opposite mark on crankshaft sprocket with both marks in line with a straightedge across the shaft centers. Mesh chain. Camshaft sprocket mounting cap screws offset so that sprocket can only be mounted in one position.

**Valve Grinding.** Intake valves chrome nickel steel. Exhaust valves CNS steel. Manufacturer recommends that valves be refaced in valve grinder and then lapped in in cylinder block with compound.

**STARTER:—Model 728-L (CH), 728-S (CL).** Manual pinion engagement connected to starting switch lever (switch mounted on starter field frame). Starter drives through reduction gears and over running clutch. Rotation clockwise (armature shaft) at commutator end. Brush spring tension 24-28 ounces.

## Starter Data

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

**Mounting:—**Starter sleeve mounted in front of flywheel housing at left of engine. To remove, disconnect cable, disconnect starting pedal linkage, take out large pilot mounting screw in flywheel housing directly above starter sleeve, pull starter forward to clear drive housing, lift out.

**Oiling:—2000 Miles.** Put 8-10 drops light oil in oiler at each end of armature shaft.

**10,000 Miles.** Take out plug in reduction gear case and repack gears with graphite grease.

**GENERATOR:—Model 957-G (CH), 957-U (CL).** Third brush regulation. To adjust charging rate, loosen small round headed lock screw on commutator end plate, take off cover band, shift third brush by hand counter-clockwise to increase or clockwise to decrease charging rate, tighten lock screw. Rotation counter-clockwise at commutator end. Manufacturer recommends that charging rate be set at 8 amperes maximum charge to battery at 20 M.P.H. with all lights on (headlights bright) or 10 amperes on cars equipped with radio.

## Generator Data

Cold Test		Hot Test	
Amperes	Volts	R.P.M.	Amperes
17-19	8.2-8.4	1700	13-15
			7.7-8.0
Brush spring tension 24-28 ounces.		Shunt field current 1.75-2.25 amperes at 6 volts.	

**Mounting:—**Generator mounted on swinging bracket at left front of engine. Driven by fan belt. To remove, disconnect lead, take out adjustment clamp bolt, loosen mounting bolts, swing generator toward engine, slip off drive belt, take out two bolts forming bracket hinge, lift generator out.

**Belt Adjustment.** Loosen mounting bolts and adjustment clamp bolt. Attach spring scale by wire looped over generator field frame so that force on scale is tangent to top of generator and parallel to slot in adjustment arm. Pull generator away from engine until scale reading is 45-50 pounds, tighten adjustment clamp bolt and mounting bolts before slacking off on scale.

**Oiling:—2000 Miles.** Fill oiler at each end of generator with light oil.

**RELAY:—Model 265-B.** Relay mounted on generator field frame. Relay contacts close at 600 R.P.M. of generator when voltage reaches 7.0-7.5 volts and open with discharge current of 0-2.5 amperes. Contact gap limits .015-.025 inch. Air gap limits .012-.017 inch (contacts closed).

**LIGHTING:—Clum Switch, Model 9271.** Lighting switch mounted at lower end of steering column controlled by lower lever on steering wheel. Dimmer system 'depressed beam' double filament headlight bulbs controlled by lighting switch. Cowl lights used on Model CH or parking bulbs (in headlights) on Model CL. Lighting switch positions:

1. Vertical—All lights off.
2. Right—Cowl lights (or parking bulbs) on, tail lights on.
3. No. 1 Left—Bright headlights and taillights on. Cowl lights off.
4. No. 2 Left—Dim (depressed beam) headlights and tail lights on.

## Lamp Sizes

Position	Voltage	Candlepower	Base	Mazda No.
Headlights	6-8	32-32	D.C.	1000
Cowl or Parking Lights	6-8	3	S.C.	63
Dash and Tail Lights	6-8	3	S.C.	63
Stop Light	6-8	15	S.C.	87
Dome Light	6-8	15	S.C.	87
Corner Lights	6-8	3	S.C.	63

**CURRENT LIMIT RELAY:—Model 410-H.** Mounted on dash, consists of two vibrating circuit breakers. Circuit breakers begin to vibrate with current load of 25-30 amperes limiting load to 2-15 amperes with direct short-circuit. Contact gap limits .012-.030 inch. Air gap limits .015-.025 inch (contacts closed). Spring tension 5 ounces minimum (measured at brass button with spring scale at right angles to contact arm).

**GASOLINE GAUGE:—**Combination gasoline and oil gauge. Gasoline gauge registers whenever ignition is turned on. Oil reading obtained by pressing selector switch button under instrument board. Gauge is electrical type. Motometer design (see Equipment Section).

**TEMPERATURE GAUGE:—**Motometer 'vapor tension' type (see Equipment Section).

**FUEL PUMP:—**A.C. Mechanical fuel pump (see Equipment Section).

**HORNS:—**Klaxon Model K-26 matched tone twin horns Type 1397 (low note), Type 1398 (high note). Current draw 6.0-8.5 amperes at 6 volts (Type 1397), 5.0-6.5 amperes at 6 volts (Type 1398).

# CUNNINGHAM

## SERIES V-10 (1932)

### DELCO-REMY GENERATING, STARTING SYSTEM NORTH EAST IGNITION

**BATTERY:**—Willard, Type RJ-4-15. 6 volt, 15 plate, 128 ampere hour capacity (20 hour rate). Negative (—) terminal grounded. Battery mounted on right frame member under front compartment floor boards. Battery size 7 1/16 inches wide, 11 11/16 inches long, 9 3/4 inches high.

**IGNITION:**—Coil Type 5023660. The ignition switch is built in the base of the coil. The coil is mounted on the back of the dash with the ignition switch extending through to the face of the instrument panel. Ignition current is 2.75 amperes at 400 R.P.M., dropping off to .8 amperes at 4000 R.P.M. Ignition current with engine stopped is 4.75 amperes at 6 volts.

**Distributor Type 10874.** Two breaker arm, 8 lobe cam type with semi-automatic advance. Breaker contacts open simultaneously at 45 degree intervals corresponding to the 90 firing interval of the engine. Contacts must be synchronized—see Timing. Breaker contact gap set at .018 inch. Hold within limits of .018-.020 inch. To set gap, loosen locknut on stationary contact mounting stud, turn up stud, tighten locknut. Breaker arm spring tension 16 ounces. Maximum manual advance 40 degree (engine).

Degrees Engine	Automatic Advance Distributor	Distributor	R.P.M. Engine
0	Start	300	600
16	8	1500	3000

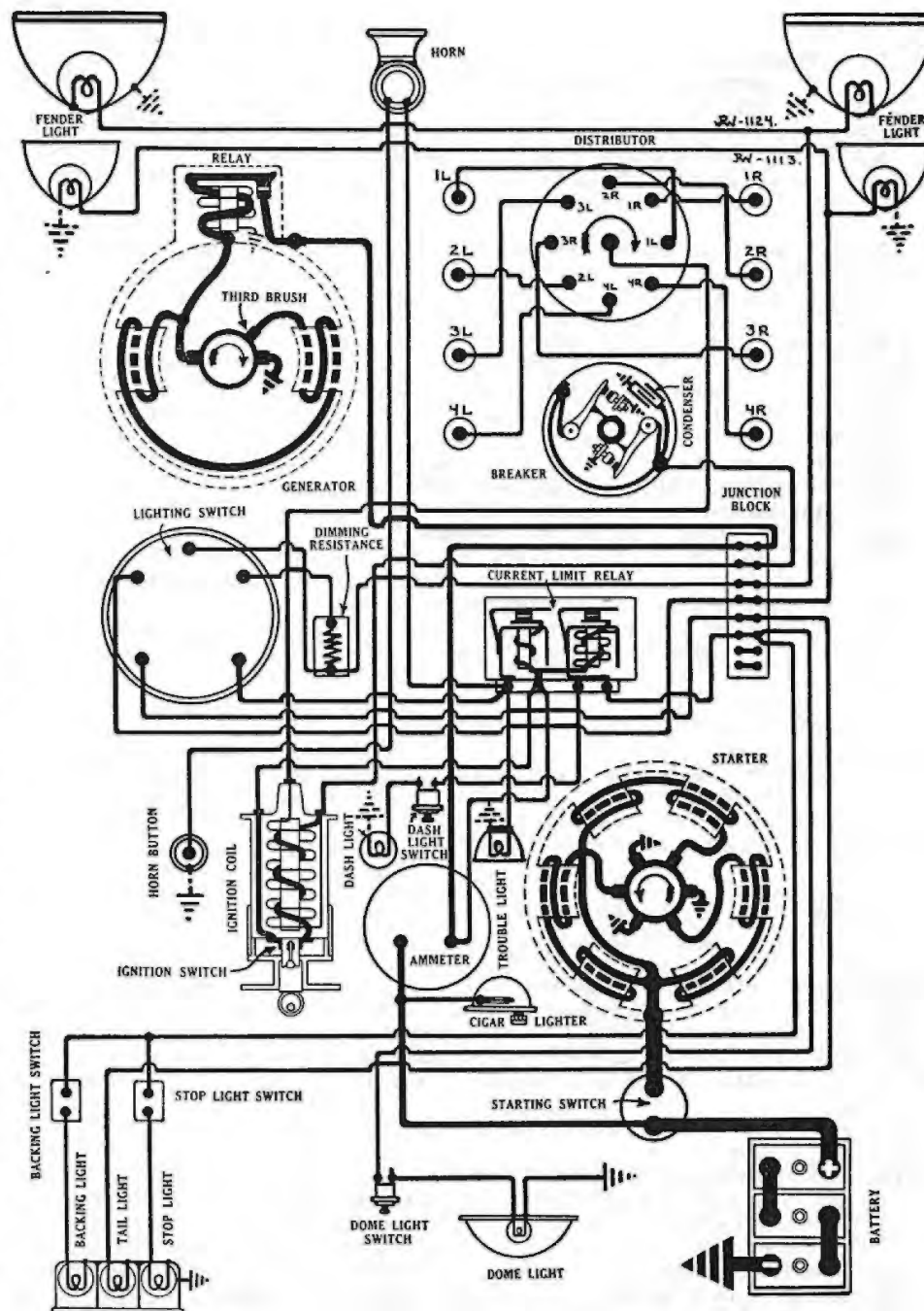
**Mounting:**—Distributor is mounted at the forward end of the engine between the cylinder banks. To remove the distributor, disconnect the manual spark control and primary lead and remove the distributor head with the cables intact. Then take out mounting screw and lift distributor from place.

**Oiling:**—Fill the grease cup under the distributor head and turn down one turn every 1000 miles of operation. At the same time remove the distributor head and rotor and put a drop of oil on the breaker arm pivot pins and place a small bit of vaseline or grease on the face of the breaker cam.

**Timing:**—Breaker contacts begin to open when the piston entering power stroke reaches a position 1 1/2 inches after top dead center (measured on the flywheel) with the manual spark control fully retarded. To set timing, crank engine over until piston No. 1 of the right hand bank enters compression stroke (the up stroke with both valves closed). Fully retard the manual spark control and remove the timing inspection cover plate in the flywheel housing. Turn engine over until a point on the flywheel 1 1/2 inches past the top dead center mark '#1 UP' is opposite the indicator on the flywheel housing. Then loosen the advance arm clamp screw and rotate the distributor until both sets of contacts begin to open. Tighten the clamp screw and see that the segment in the distributor head opposite the rotor is connected to the spark plug in cylinder No. 1.

**Synchronization of Contacts.** Contacts should be synchronized whenever ignition timing is checked or contact adjustment changed. Use test lamps connected across each set of contacts to accurately determine when contacts open. The breaker plate is constructed with .020 inch clearance inside the housing and the entire plate can be shifted after the two hold-down screws have been loosened. To synchronize contacts, loosen the hold-down screws and shift the plate until both contacts open at the same instant. Tighten the hold-down screws after making the adjustment.

**Firing Order:**—1-5-4-8-6-3-7-2 with right hand cylinder bank numbered 1-2-3-4 and left hand bank 5-6-7-8 beginning at radiator or 1R-1L-4R-4L-2L-3R-3L-2R with cylinder banks right (R) and left (L) as viewed from the driver's seat and No. 1 cylinder nearest the radiator.



# CUNNINGHAM

SERIES V-10 (1932)  
DELCO-REMY GENERATING, STARTING SYSTEM  
NORTH EAST IGNITION

**Spark Plugs:**—7/8-18 SAE. Short body. Champion Type C-4. Set gaps at .031 inch.

**VALVE TIMING:**—Valves on inner side of cylinder block. Adjusted between cylinder bank. Camshaft directly above crankshaft and gear driven. Crankshaft gear steel. Camshaft gear GE Textolite.

	Head Diameter	Stem Diameter	Length	Seat Angle	Lift
Intake	2"	.432"	6 1/8"	45°	3/8"
Exhaust	1 7/8"	.432"	6 1/8"	45°	3/8"
	Tappet Clearance		Spring Pressure		
Intake	.0015"		95 pounds		
Exhaust	.003"				

**Timing**

Intake valves open 5° after top dead center. Intake valves close 51° after lower dead center.

Exhaust valves open 41° before lower dead center. Exhaust valves close 5° after top dead center.

**To Check Valve Timing.** Turn engine over until piston No. 1R is on top dead center entering power stroke. Check tappet clearance of No. 1R inlet and exhaust valves. Turn engine over one complete revolution and stop with piston 5 degrees after top dead center with the flywheel mark 'EX.C.IN.0.' (which is 5 degrees after the top dead center mark '#1.UP') directly opposite the indicator. The exhaust valve should close and the inlet valve open at this point. The flywheel is also marked 'EX.C.IN.0.' at a point 5 degrees after the mark '#5.UP.' This is the top dead center mark for piston No. 1L.

**STARTER:**—Model 350. Starter is connected to the engine through a Bendix drive. The direction of rotation is counter-clockwise, viewed from the commutator end. Starter brush spring tension is 36-40 ounces. Starter switch is Model 406-G.

Starter Data			
Torque	R.P.M.	Volts	Amperes
0 lb. ft.	4000	4	60
19 "	Lock	3	500

**Mounting:**—Starter is flange mounted at right of engine on forward side of flywheel housing. To remove starter, disconnect cable and take out three flange mounting cap screws. Then pull starter forward to clear Bendix and lift from place.

**Oiling:**—Starter bearings are oilless. They require no attention.

**GENERATOR:**—Model 285. The direction of rotation is clockwise, viewed from the commutator end. Generator current regulation is by third brush shunt field. To adjust the generator output, remove the commutator cover band and shift the third brush by hand. There is a handle on the brush

mounting plate for this purpose. Shift the third brush in a clockwise direction to increase the charging rate and in the opposite direction to decrease the charging rate. With standard car setting the maximum charging rate is 18-20 amperes reached at 1600 R.P.M. or 25 miles per hour.

**Generator Data**

Amperes	Volts	R.P.M.
3	6	600
9	6	800
18-20	7.5	1600

Shunt field current is 3 amperes at 6 volts. Brush spring tension is 24-28 ounces. Generator, motoring, draws 6 amperes at 6 volts.

**Mounting:**—Generator is cradle mounted at the front of the engine and is accessible from the left side. To remove generator, disconnect the lead and loosen the mounting clamp band by taking off the lock nut and holding nut on the band. Then slide the generator from place.

**Oiling:**—Put 8 or 10 drops of light engine oil in the oiler at each end of the generator every two weeks or each 500 miles of operation.

**RELAY:**—Model 265-B. Relay is mounted on the generator field frame. Relay contacts close when the voltage of the generator reaches 6.75-7.5 volts and open with a discharge current of 0-3 amperes. Relay contact gap should be .015-.025 inch. Air gap should be .014-.020 inch with contacts closed.

**LIGHTING:**—Delco-Remy Lighting Switch, Model 486-D. Lighting switch is mounted at lower end of steering column and controlled by lever on steering wheel. Headlights dimmed by resistance mounted on dash and controlled by lighting switch.

**Lamp Sizes**

Position	Voltage	Candlepower	Base	Mazda Number
Headlights	6-8	32	SC	1133
Fender or cowl lights	6-8	3	SC	63
Dash and tail lights	6-8	3	SC	63
Stop and backing lights	6-8	21	SC	1129
Dome and corner lights	6-8	3	DC	64

**CIRCUIT BREAKER:**—Delco-Remy Model 5759. (Used on some cars.) This unit consists of a vibrating circuit breaker and a lock-out circuit breaker mounted on the dash. The vibrating circuit breaker (connected in the lighting circuits) begins to operate when the current reaches 25-30 amperes and continues limiting the current to 5-15 amperes. The lock-out circuit breaker (connected in the dash light and dome light circuits) begins to operate when the current reaches 25-30 amperes limiting the current to less than 1 ampere.

**FUSES:**—A 10 ampere fuse is mounted on the cigar lighter.



# DE SOTO

## SIX CYLINDER MODEL SC (1932)

SERIAL NUMBERS STANDARD—5,040,201 UP. CUSTOM—6,005,001 UP  
DELCO-REMY SYSTEM

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

**ENGINE NUMBER:**—Stamped on boss left side of cylinder block between No. 1 and 2 cylinders.

**BATTERY:**—Willard, Type WS-1-13, 6 volt, 13 plate, 80 ampere hour (20 hour rate). Positive (+) terminal grounded to transmission case. Battery mounted under driver's seat. Battery size, 7 1/16 inches wide, 9 1/16 inches long, 8 13/16 inches high.

**IGNITION:**—Coil Model 534-Z. Lock coil type with ignition switch in base. Coil mounted on back of instrument panel at extreme left. Ignition current, .5-2.5 amperes at 6 volts (engine running), 4.5 amperes at 6 volts (engine stopped).

**Distributor Model 632-L.** Single breaker arm type with semi-automatic advance (manual advance set in timing and not controllable by driver). Breaker gap set at .020 inch. Hold within limits of .018-.024 inch. To set gap, loosen lock screw on stationary contact mounting plate and turn eccentric adjusting screw. Breaker arm spring tension, 17-21 ounces (measured at tip of breaker arm with scale at right angles to contact surface). Maximum manual advance, 20 degrees (engine).

Engine	Degrees	Automatic Advance Distributor	R.P.M.	Engine
2	Start	400	800	
16	8	1300	2600	

**Mounting:**—Distributor mounted on left side of engine, driven by inclined shaft from camshaft. To remove, disconnect primary lead, take off distributor cap, take out hold-down screw in advance plate, lift distributor out.

**Oiling:**—500 Miles. Turn down grease cup on side of shaft housing one turn. Keep cup filled with medium grease.

2000 Miles. Take off distributor cap and rotor. Put 4-5 drops light oil in wick oiler in center of shaft. Apply thin film of vaseline to face of breaker cam.

**Timing:**—Standard setting 9° ('Silver Dome' Head), 7° (Red Head Engines) before top dead center with full manual advance. To set timing, remove inspection cover on left front face flywheel housing directly under starter. Turn engine over with No. 1 piston on compression until flywheel mark 'D/C' is opposite upper pointer on housing. Loosen advance plate clamping bolt, rotate distributor until contacts begin to open (use test lamp), tighten clamping bolt. Connect spark plugs as indicated on diagram (No. 1 terminal as designated).

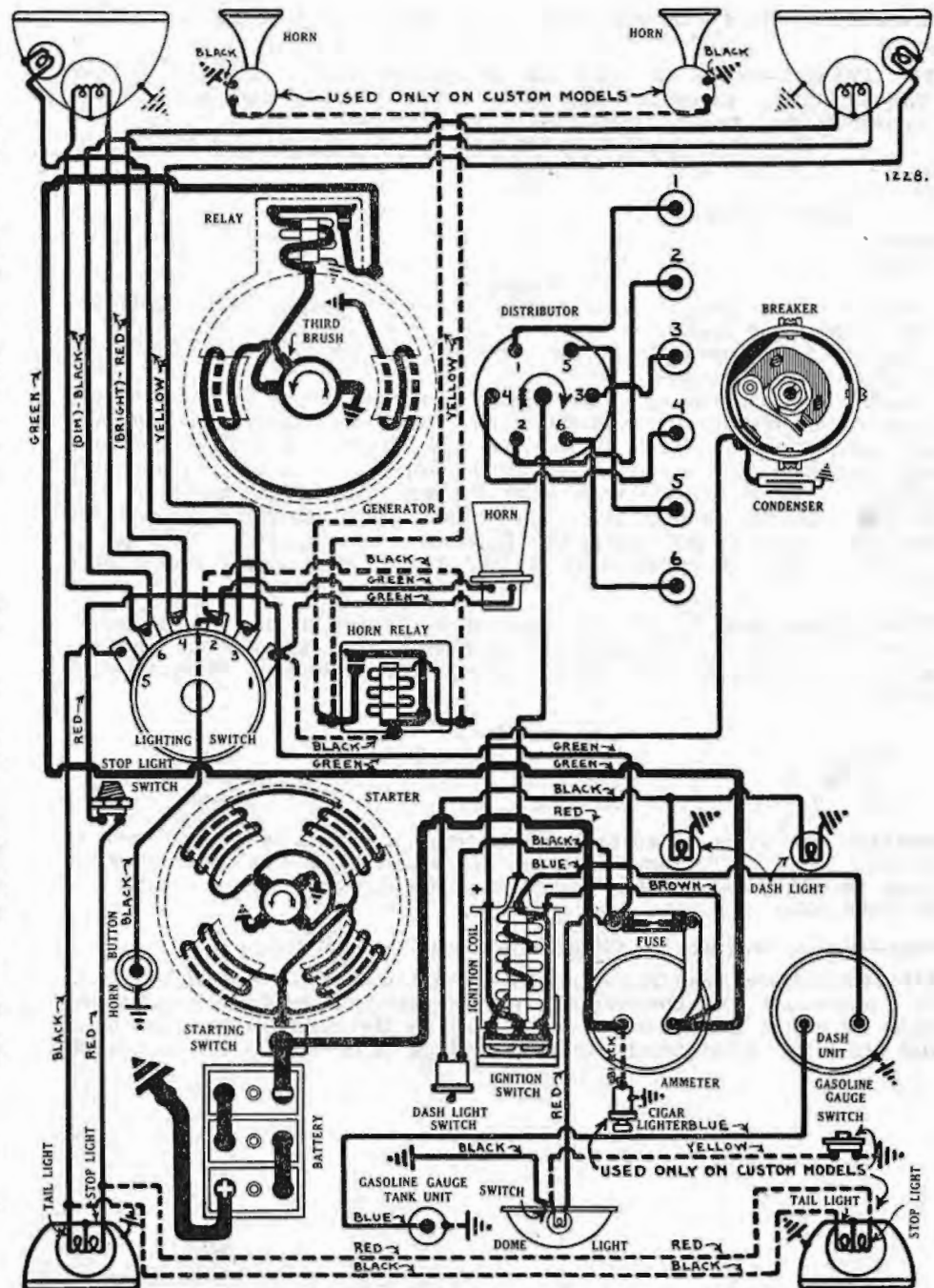
**Red Head Engines:**—No special directions necessary for timing engines with 'Red Heads'. On all cars equipped at the factory with Red Head Engines the ignition pointer is set for correct timing position. No provision is made for timing on engines where heads are changed in the field.

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

**Spark Plugs:**—14 MM. A.C. Type K-12. Set gap at .028 inch. Hold within limits of .025-.030 inch.

**VALVE TIMING:**—Valves on right side of engine. Camshaft driven by two-sprocket non-adjustable chain drive.

	Head Diameter	Stem Diameter	Valve Lgth.	Seat Angle	Lift
Intake	1.521" (13/16" clear)	.340-.341"	5 1/4"	45°	5/16"
Exhaust	1.459" (1 5/16" clear)	.340-.341"	5 1/4"	45°	5/16"



# DE SOTO

SIX CYLINDER MODEL SC (1932)  
 SERIAL NUMBERS STANDARD—5,040,201 UP. CUSTOM—6,005,001 UP  
 DELCO-REMY SYSTEM

## Tappet Clearance

	Operating	Timing
Inlet	.005" (hot)	.011" (cold)
Exhaust	.007" (hot)	.012" (cold)

## Spring Pressure

Closed	40-44 pounds (2 11/16")
Open	75-81 pounds (1 3/4")

**SPECIAL NOTE:**—Do not compress valve springs to over-all length of less than 1 5/8 inches to avoid damage through springs taking on permanent set. Valve stem clearance in guide, .001-.003" (inlet), .002-.004" (exhaust).

## Timing

Intake valves open 6° after top dead center. Piston .014" down on intake stroke. Close 46° after lower dead center.

Exhaust valves open 42° before lower dead center. Close 8° after top dead center. Piston .025" down on intake stroke.

**To Check Valve Timing.** Remove 1/8 inch pipe plug in cylinder head over No. 6 piston and install regular Chrysler timing gauge. Set gauge at '0' on top dead center. Set tappet clearance No. 1 inlet valve at .011", No. 1 exhaust valve at .012" (cold). Rotate crankshaft with No. 6 piston on compression until piston is .014" past top dead center. No. 1 inlet valve should be tight and about to open. Turn crankshaft 2° and stop with piston .025" past top dead center. No. 1 exhaust valve should be closing. Reset tappet clearance at .005" (inlet), .007" (exhaust) with engine hot.

**To Set Valve Timing.** Remove inspection cover on left front face flywheel housing directly under starter. Rotate crankshaft until flywheel mark 'D/C' is directly opposite lower pointer on housing (top dead center position Nos. 1 and 6 pistons). Rotate camshaft until mark between teeth on camshaft sprocket is directly opposite marked tooth on crankshaft sprocket with both marks in line with straightedge across shaft centers. Mesh chain. Camshaft sprocket mounting cap screws offset so that sprocket can only be mounted in one position.

**Valve Grinding.** Inlet valves chrome nickel steel. Exhaust valves silchrome. Manufacturer recommends that valves be refaced on valve grinder and then lapped in in cylinder block with compound.

**STARTER:**—Model 725-Q. Manual pinion shift connected with starter switch lever. Starter drives through overrunning clutch. Rotation counter-clockwise at commutator end. Brush spring tension 24-28 ounces.

## Starter Data

Torque	R.P.M.	Volts	Amperes
0 lb. ft.	6000	5	60
15 "	Lock	3	600

**Mounting:**—Flange mounted on left front face of flywheel housing. To remove, disconnect cable, take out cotter pin and clevis pin in switch linkage, take out two flange mounting cap screws, pull starter straight forward to clear housing, lift from place.

**Oiling:**—5000 Miles. Put 8-10 drops light engine oil in commutator end oiler.

**GENERATOR:**—Model 943-S. Third brush control. Adjust by loosening small round headed lock screw on commutator end plate, take off cover band, shift third brush by hand counter-clockwise to increase charging rate, clockwise to decrease charging rate, tighten locking screw. Manufacturer recommends that charging rate be set at 8 amperes maximum to battery (with all lights on—headlights bright) at 20 M.P.H. or 10 amperes maximum on cars equipped with radio. Rotation counter-clockwise at commutator end.

## Generator Data

Cold Test		R.P.M.	Hot Test		R.P.M.
Amperes	Volts		Amperes	Volts	
19-21	8-1-8.3	2300	13-15	7.7-8.0	2400

Brush spring tension 24-28 ounces. Shunt field current 3.5-4.5 amperes at 6 volts.

**Mounting:**—Generator mounted on swinging bracket at left front of engine. Driven by fan belt. To remove, disconnect lead, loosen adjustment clamp bolt and pivot mounting bolts, swing generator toward engine, slip off drive belt, take out mounting bolts forming bracket hinge, lift generator out.

**Belt Adjustment.** Loosen mounting bolts and adjustment clamp bolt. Attach spring scale by wire looped over generator field frame so that force of spring is tangent to top of generator and parallel to slot in adjustment clamp. Pull generator away from engine until scale reading is 45-50 pounds. Tighten adjustment clamp bolt and mounting bolts before slacking off on scale.

**Oiling:**—2000 Miles. Fill oiler at each end of generator with light oil.

**RELAY:**—Model 265-G. Mounted on generator field frame. Contacts close at 6.75-7.5 volts and open with 0-2.5 ampere discharge. Contact gap limits, .015-.025 inch. Air gap limits, .012-.017 inch (contacts closed).

**LIGHTING:**—Clum Switch, Model 9271. Mounted at lower end of steering column. Controlled by lower lever on steering wheel. Switch position:

1. Vertical—All lights off.
2. Right—Parking bulbs and tail lights on. Headlights off.
3. No. 1 Left—Bright headlights and tail lights on. Parking bulbs off.
4. No. 2 Left—Dim (depressed beam) headlights and tail lights on.

## Lamp Sizes

Position	Voltage	Candlepower	Base	Mazda No.
Headlights	6-8	32-32	D.C.	1000
Parking Lights	6-8	3	S.C.	63
Dash Lights	6-8	3	S.C.	63
Stop and Tail Light	6-8	21-2	D.C.	1158
Dome Light	6-8	15	S.C.	87

**NOTE:** Stop and tail light use combination bulb. Connect tail light wire to 2 cp. filament.

**FUSES:**—20 ampere capacity. Mounted on bracket under ammeter.

**GASOLINE GAUGE:**—Motometer Electric type (see Equipment Section).

**FUEL PUMP:**—A.C. Mechanical fuel pump (see Equipment Section).

**TEMPERATURE GAUGE:**—Motometer Vapor-tension type (see Equipment Section).

**HORN:**—Klaxon, Model K-14. Vibrator type mounted under hood. Twin horns (matched tone) optional equipment. Current draw, 7 amperes (each).

**Horn Relay, Type 266-T.** Used with twin horns. Pressing button completes horn relay circuit, energizing relay winding, closing relay contacts, completing horn circuit. Horn current does not pass through horn button. Relay requires .25 amperes to close contacts. Relay contact gap limits .015-.025 inch. Air gap .012-.017 inch (contacts closed).

# DE VAUX

MODEL 6-75 (1931), SERIAL NUMBERS 1001 UP  
MODEL 6-80 (1932)  
AUTO-LITE GENERATING, STARTING SYSTEM  
AUTO-LITE IGNITION

**CAR SERIAL NUMBER:**—On plate on right side upper toeboard in front compartment.

**ENGINE NUMBER:**—Stamped on right side of crankcase in front of carburetor.

**BATTERY:**—Prest-O-Lite, Type 615-J (1931), 615-B (1932), 6 volt, 15 plates, 100 ampere hour (5 ampere rate). Starting capacity 119 amperes for 20 minutes. Negative (—) terminal grounded. Battery mounted on left frame member under driver's seat. Battery size 7 inches wide, 10 5/16 inches long, 9 1/4 inches high.

**IGNITION:**—Coil Model IG-4303. The ignition switch is built in the base of the coil. Coil is mounted on the back of the instrument board with the ignition switch extending through to the face of the instrument panel. Ignition current is 1-3 amperes at 6 volts with engine running and 3-4.5 amperes at 6 volts with engine stopped. The gasoline gauge and stop light are connected to an auxiliary terminal on the side of the coil.

**Distributor Model IGB-4031-A.** Breaker contacts separate .018-.020 inch. Set contact gap by loosening lock nut on stationary contact mounting stud and turning up stud. Resurface contacts when necessary with a fine flat contact file or on a medium hard oilstone. Breaker arm spring tension is 16-20 ounces. Distributor is semi-automatic. Maximum manual advance is 20 degrees (engine).

Engine	Degrees	Automatic Advance Distributor	R.P.M.	Engine
0.....		Start.....	300.....	600
4.....	2.....		590.....	1180
8.....	4.....		880.....	1760
12.....	6.....		1180.....	2360
15.....	7 1/2.....		1400.....	2800

**Mounting:**—Distributor is mounted on the cylinder head. To remove distributor, disconnect manual spark control and primary lead and remove distributor head with cables intact. Then take off nut on hold-down stud in advance arm and lift distributor from place.

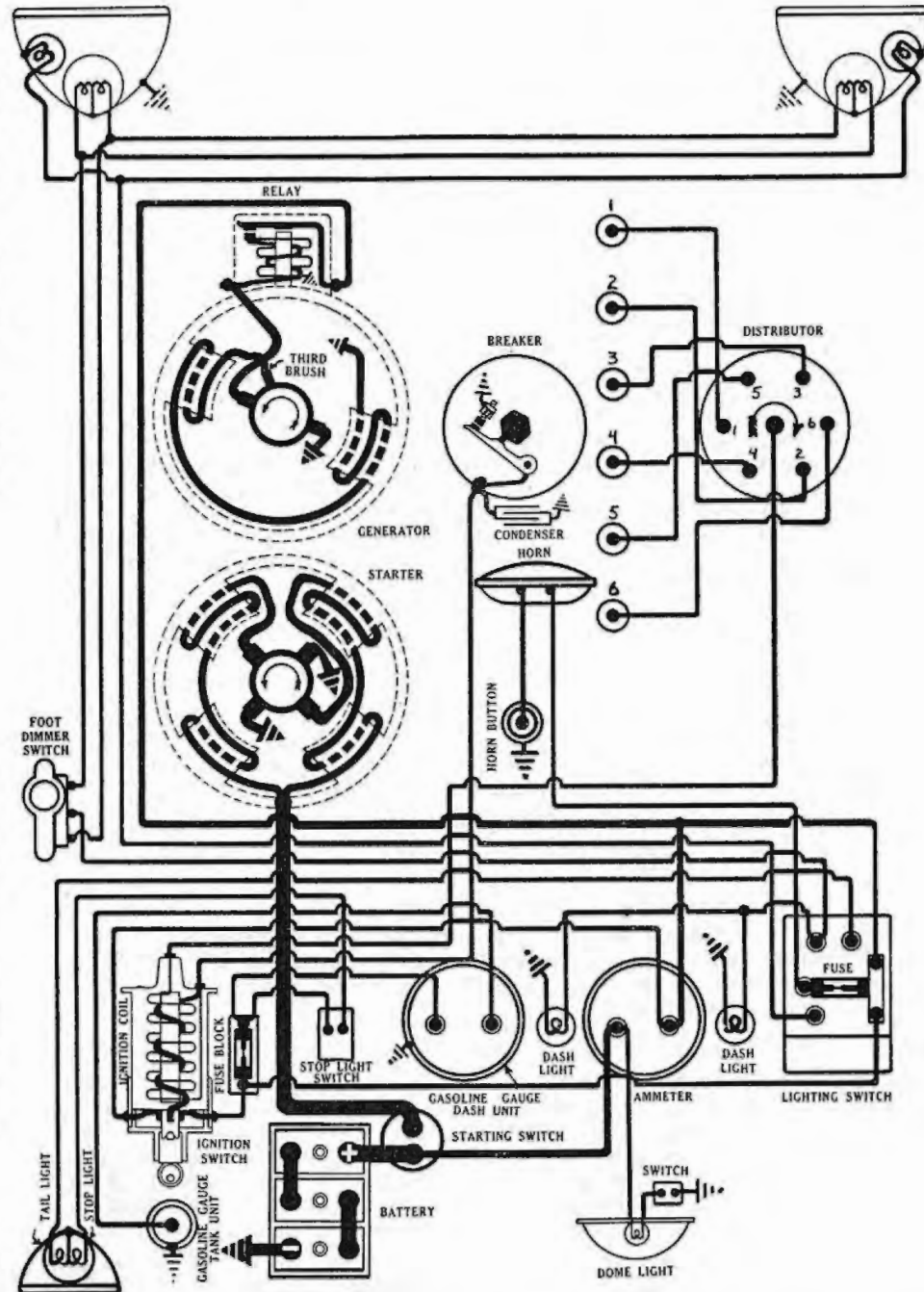
**Oiling:**—Put 4 or 5 drops of light engine oil in the oller on the side of the distributor head every two weeks or each 500 miles of operation. Every 1000 miles remove the distributor head and put one drop of oil on the breaker arm pivot pin and put a small bit of vaseline on the face of the breaker cam.

**Timing:**—Standard setting 6° or two teeth on flywheel before top dead center with manual spark control advanced. To set timing, advance spark control button (push button in toward dash) and see that distributor is rotated counter-clockwise to end of advance arm slot. With No. 1 piston on compression stroke, turn engine over until flywheel mark 'IGN.#1' (which is 6° or approximately 2 teeth before the top dead center position) is directly opposite indicator on housing. Loosen advance arm clamp bolt, rotate distributor until contacts begin to open, tighten clamp bolt, connect spark plugs as indicated on diagram (No. 1 terminal as designated).

**Firing Order:**—The firing order is 1-5-3-6-2-4.

**Spark Plugs:**—18 MM. Metric. Champion Type C-7. Set gaps at .025-.030 inch.

**VALVE TIMING:**—Valves at right of engine. Camshaft driven by two-sprocket non-adjustable chain drive.



# DE VAUX

MODEL 6-75 (1931), SERIAL NUMBERS 1001 UP  
MODEL 6-80 (1932)  
AUTO-LITE GENERATING, STARTING SYSTEM  
AUTO-LITE IGNITION

	Head Diameter	Stem Diameter	Stem Length	Seat Angle	Lift
Intake	1 45/64"	.33925	5 9/32"	45°	.344"
Exhaust	1.505-1.495"	.339"	5 1/4"	45°	.344"

	Tappet Clearance		Spring Pressure
	Operating	Timing	
Intake	.006" (hot)		43.6-47 pounds
Exhaust	.008" (hot)	.012 (cold)	

### Timing

Intake valves open 5° before top dead center. Intake valves close 40° after lower dead center.

Exhaust valves open 40° before lower dead center. Exhaust valves close 5° after top dead center. Flywheel is marked 'EX.#1' at point of exhaust closing for No. 1 cylinder

**To Check Valve Timing.** Turn engine over by hand until piston No. 1 is on top dead center entering power stroke. Set tappet clearance of No. 1 exhaust valve at .012 inch. Turn engine over one complete revolution and stop with piston slightly past top dead center when the flywheel mark 'EXC' is opposite the indicator on the housing. The No. 1 exhaust valve should close at this point. Reset all valve tappet clearances at .008 inch running clearance with engine hot.

**To Set Valve Timing.** Camshaft is driven by a non-adjustable two sprocket chain drive at the forward end of the engine. To set valve timing, turn crankshaft until No. 1 piston is on top dead center. Then mesh the chain so that there are exactly nine links or ten link pins between the marks on the camshaft sprocket and the crankshaft sprocket (including the pins in line with the marks on the sprockets).

**STARTER:—Model MAB-4037.** Starter is connected to the engine through a Bendix drive. The direction of rotation is counter-clockwise, viewed from the commutator end. Brush spring tension is 44-56 ounces. Starter switch is Model SW-4001.

### Starter Data

Torque	R.P.M.	Volts	Amperes
0 lb. ft.	4020	5.5	46
.6 "	1910	5.5	100
3.4 "	1100	5.0	200
6.6 "	695	4.5	300
10.15 "	420	4.0	400
24.0 "	Lock	4.0	720

**Mounting:—**Starter is flange mounted at left of engine on forward side of flywheel housing. To remove starter, disconnect cable and take off flange mounting screws. Then pull starter forward to clear drive and lift from place.

**Oiling:—**Put 5-6 drops light engine oil in oiler at each end of starter armature every 1000 miles. Outer bearing (in Bendix housing) is oilless.

**GENERATOR:—Model GAL-4330.** The direction of rotation is counter-clockwise, viewed from the commutator end. Generator current regulation is by third brush shunt field. To adjust generator output, remove the commutator cover band and shift the third brush by prying on the brush mounting stud with a screwdriver. Shift the third brush in a counter-clockwise direction to increase the charging rate and in the opposite direction to decrease the charging rate. The brush and mounting plate is held in position by friction between the mounting stud and the end plate. With standard car setting

the maximum charging rate is 16-17 amperes at 8 volts reached at 1900 R.P.M.

### Generator Data

Cold Test			Hot Test		
Amperes	Volts	R.P.M.	Amperes	Volts	R.P.M.
0	6.4	600	0	6.4	700
5	6.8	780	5	7.0	950
8	7.1	900	10	7.8	1340
12	7.4	1200	12.4	8.0	2150
17	8.0	1900	9.6	7.7	3200
12	7.4	3200			

Shunt field current is 4.08-4.52 amperes at 6 volts. Generator motoring draws 4.27-4.73 amperes at 6 volts. Brush spring tension is 8-13 ounces.

**Mounting:—**Generator is cradle mounted at left of engine and is driven by the fan belt. The water pump is driven by an extension of the generator shaft. To remove generator, disconnect lead and water pump drive coupling and slip off drive belt. Then loosen mounting clamp band and slip generator from place.

**Belt Adjustment.** To take up fan belt, loosen nut on rear of fan shaft stud and lift fan assembly, tighten nut. Belt should be just tight enough to drive fan and generator without slipping.

**Oiling:—**Put 4 or 5 drops of light engine oil in the oiler at each end of the generator every two weeks or each 500 miles of operation. Every 5000 miles remove the grease cup under the bearing retainer on the commutator end of the generator, wash out all old grease, dip wick in engine oil and fill cup with medium grease before replacing.

**RELAY:—Model CB-4014.** Relay is mounted on the generator. Relay contacts close at 675 R.P.M. when the generator voltage reaches 7-7.5 volts and open with a discharge current of .5-2.5 amperes. Charging current at closing of contacts is approximately 2 amperes. Relay contact gap is .025-.035 inch. Air gap is .010-.030 inch with contacts closed.

**LIGHTING:—Soreng-Manegold Switch, Model 5670-AA. Clum Dimmer Switch, Model 9126.** Lighting switch is mounted on the instrument board. Headlights are equipped with 'depressed beam' double filament bulbs controlled by the foot operated dimmer switch on the toeboard.

	Lamp Sizes			Mazda No.
	Position	Voltage	Candlepower	
Headlights	6-8	21-21	D.C.	1110
Parking Bulbs	6-8	3	S.C.	63
Dash and Dome Lights	6-8	3	S.C.	63
Stop and Tail Light	6-8	21-2	D.C.	1158

**NOTE:—**Stop and tail light is equipped with special double filament bulb. Tail light lead must be connected to the 2 cp. filament.

**FUSES:—**Lighting fuse mounted on switch is 20 ampere capacity. A separate 20 ampere fuse is mounted on the dash and connected in the auxiliary lead from the coil.

**GASOLINE GAUGE:—**Motometer electrical type (see Equipment Section).

**TEMPERATURE GAUGE:—**Motometer 'vapor tension' type (see Equipment Section).

**FUEL PUMP:—**Stewart Warner mechanical fuel pump mounted on right side of crankcase (see Equipment Section).

**HORNS:—**Motometer disc type vibrator horn.

# DODGE

SIX CYLINDER MODEL DL (1932)  
 SERIAL NUMBER 3,558,101 UP  
 DELCO-REMY SYSTEM

**CAR SERIAL NUMBER:**—On right front door hinge pillar post. This series 3,558,101 up.

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

**BATTERY:**—Willard Type WS-2-15, 6 volt, 100 ampere hour (20 hour rate). Positive (+) terminal grounded to transmission case. Battery mounted under driver's seat. Battery size 7 1/16 inches wide, 10 5/16 inches long, 8 13/16 inches high.

**IGNITION:**—Coil Model 534-Z. Lock coil type with ignition switch in base. Coil mounted on back of instrument panel at extreme left. Ignition current is .5-2.5 amperes at 6 volts (engine running), 4.5 amperes at 6 volts (engine stopped).

**Distributor Model 632-L.** Single breaker arm type with semi-automatic advance (manual advance set in timing and not controllable by driver). Breaker gap set at .020 inch. Hold within limits of .018-.024 inch. To set gap, loosen lock screw on stationary contact mounting plate and turn eccentric adjusting screw. Breaker arm spring tension 17-21 ounces (measured at tip of breaker arm with scale at right angles to contact surface). Maximum manual advance 20 degrees (engine).

Engine	Degrees	Automatic Advance	Distributor	R.P.M.	Engine
0	Start		400		800
16	8		1300		2600

**Mounting:**—Distributor mounted left side of engine driven by inclined shaft from camshaft. To remove, disconnect lead, take off distributor cap, take out hold-down screw in advance plate, lift distributor out.

**Oiling:**—500 Miles. Turn down grease cup on side of shaft housing one turn. Keep cup filled with medium cup grease.

2000 Miles. Take off distributor cap and rotor. Put 4-5 drops light oil in wick oiler in center of shaft. Apply thin film vaseline to face of breaker cam.

**Timing:**—Standard setting is 10° (flywheel) or .041" (piston travel) before top dead center with full manual advance. To set timing, remove inspection cover left front face flywheel housing directly under starter. Turn engine over with No. 1 piston on compression until mark 'D/C' is opposite upper pointer on housing. Loosen advance plate clamping bolt, rotate distributor cup until contacts begin to open (use test lamp), tighten clamp bolt. Connect spark plugs as indicated on diagram (No. 1 terminal as designated).

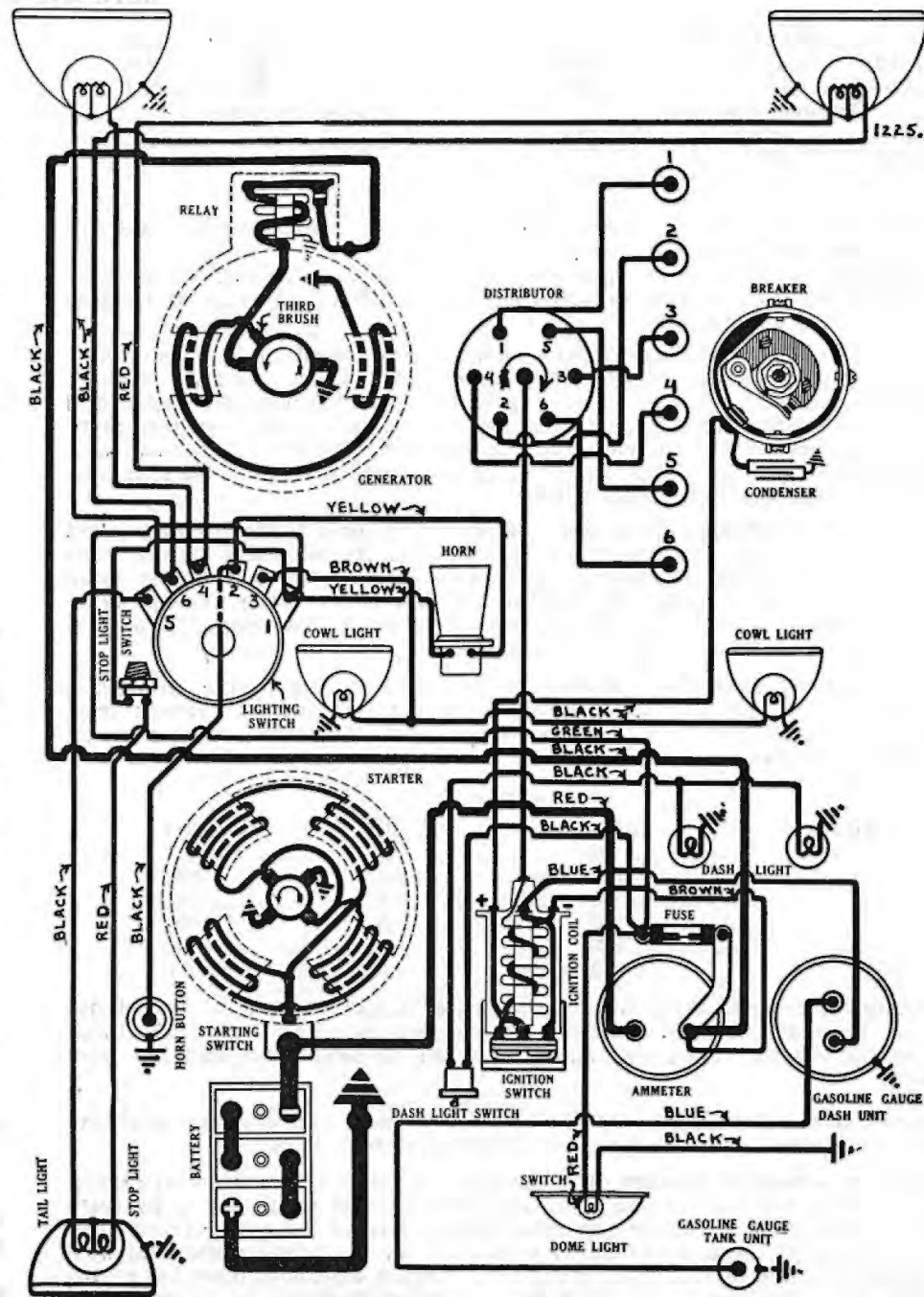
**Firing Order:**—1-5-3-6-2-4. No. 1 cylinder nearest radiator.

**Spark Plugs:**—14 MM. A.C. Type K-12. Set gap at .028 inch. Hold within limits of .025-.030 inch.

**VALVE TIMING:**—Valves on right side of engine with camshaft driven by two-sprocket non-adjustable chain drive.

	Head Diameter	Stem Diameter	Stem Length	Seat Angle	Lift
Inlet	1.521" (1 1/8" clear)	.340-.341"	5 1/4"	45°	5/16"
Exhaust	1.459" (1 5/16" clear)	.340-.341"	5 1/4"	45°	5/16"

	Tappet Clearance		Spring Pressure
	Operating	Timing	
Intake	.005" (hot)	.011" (cold)	Closed .....40-44 pounds (2 1/16")
Exhaust	.007" (hot)	.012" (cold)	Open .....75-81 pounds (1 3/4")



# DODGE

## SIX CYLINDER MODEL DL (1932)

### SERIAL NUMBER 3,558,101 UP

### DELCO-REMY SYSTEM

**NOTE:**—Do not compress springs to overall length of less than  $1\frac{1}{8}$  inches to avoid damage through springs taking on permanent set. Valve stem clearance in guide .001-.003" (intake) .002-.004" (exhaust).

#### Timing

Inlet valves open 6 degrees past top dead center, close 46 degrees past lower dead center.

Exhaust valves open 42 degrees before lower dead center and close 8 degrees past top dead center with piston .0265 inch down on intake stroke.

**To Check Valve Timing:**—Remove  $\frac{1}{8}$  inch pipe plug in cylinder head over No. 6 piston and use regular Chrysler timing gauge. Set tappet clearance No. 1 inlet valve at .011 inch. No. 1 exhaust valve at .012 inch (cold). Rotate crankshaft until No. 6 piston on compression stroke is .015 inch past top dead center. No. 1 inlet valve should be tight and about to open. Turn crankshaft 2 degrees and stop with piston .0265 inch past top dead center. No. 1 exhaust valve should be closing. Reset tappet clearance at .005 inch (inlet), .007 inch (exhaust) with engine hot.

**To Set Valve Timing:**—Remove inspection cover on left forward face of flywheel housing directly under starter. Rotate crankshaft until flywheel mark 'D/C' is directly opposite lower pointer on housing (top dead center position for pistons Nos. 1 and 6), rotate camshaft until mark between teeth on camshaft sprocket is directly opposite crankshaft mark with both marks in line with a straightedge across the shaft centers. Mesh chain. Camshaft sprocket mounting cap screws offset so that sprocket can only be mounted in one position.

**Valve Grinding.** Inlet valves chrome nickel steel. Exhaust valves sil-chrome. Manufacturer recommends that valves be refaced in valve grinder and then lapped in in cylinder block with compound.

**STARTER:**—Model 725-Q. Manual engagement hooked up with starting switch lever (switch mounted on field frame). Starter drives through overrunning clutch. Rotation counter-clockwise at commutator end. Brush spring tension 24-28 ounces.

#### Starter Data

Torque	R.P.M.	Volts	Amperes
0 lb. ft.	6000	5	60
15 "	Lock	3	600

**Mounting:**—Flange mounted on left front face of flywheel housing. To remove, disconnect cables, take out cotter pin and clevis pin in switch linkage, take out two flange mounting cap screws, pull starter straight forward to clear housing, lift from place.

**Oiling:**—5000 Miles. Put 8-10 drops light oil in oiler on commutator end.

**GENERATOR:**—Model 943-S. Third brush control. To adjust, loosen small round headed lock screw on commutator end plate, take off cover band, shift third brush counter-clockwise to increase output, clockwise to decrease output, tighten locking screw. Manufacturer recommends that charging rate be set at 8 amperes to battery (with all lights on—headlights bright), maximum

output at 20 M.P.H. or 10 amperes on cars equipped with radio. Rotation counter-clockwise at commutator end. Brush spring tension 24-28 ounces.

#### Generator Data

Cold Test			Hot Test		
Amperes	Volts	R.P.M.	Amperes	Volts	R.P.M.
19-21	8.1-8.3	2300	13-15	7.7-8.0	2400

Shunt field current 3.5-4.5 amperes at 6 volts.

**Mounting:**—Generator mounted on swinging bracket at left front of engine. Driven by fan belt. To remove, disconnect lead, loosen adjustment clamp bolt and mounting bolts, swing generator toward engine, slip off drive belt, take out mounting bolts forming bracket hinge and lift generator out.

**Belt Adjustment.** Loosen mounting bolts and adjustment clamp bolt. Attach spring scale by wire looped over generator field frame so that force of spring is tangent to top of generator and parallel to slot in adjustment clamp. Pull generator away from engine until scale reading is 45-50 pounds. Tighten adjustment clamp bolt and mounting bolts before slacking off on scale.

**Oiling:**—2000 Miles. Fill oiler at each end of generator with light oil.

**RELAY:**—Model 265-G. Mounted on generator field frame. Contacts close at 6.75-7.5 volts of generator and open with 0-2.5 ampere discharge. Contact gap limits .015-.025 inch. Air gap limits .012-.017 inch (contacts closed).

**LIGHTING:**—Cium Switch, Model 9271. Mounted at lower end of steering column controlled by lower lever on steering wheel. Switch positions:

1. Vertical—All lights off.
2. Right—Parking (cowl) and tail lights on. Headlights off.
3. No. 1 Left—Bright headlights and tail light on. Cowl lights off.
4. No. 2 Left—Dim (depressed beam) head and tail lights on.

#### Lamp Sizes

Position	Voltage	Candlepower	Base	Mazda No.
Headlights	6-8	32-32	D.C.	1000
Cowl Lights	6-8	3	S.C.	63
Dash Lights	6-8	3	S.C.	63
Stop and Tail Light	6-8	21-2	D.C.	1158
Dome Light	6-8	15	S.C.	87

**NOTE:**—Stop and tail light bulb is combination. Connect tail light to 2 cp. filament.

**FUSES:**—20 ampere capacity mounted on bracket under ammeter.

**GASOLINE GAUGE:**—Motometer electric type (see Equipment Section).

**FUEL PUMP:**—A.C. mechanical fuel pump (see Equipment Section).

**TEMPERATURE GAUGE:**—Motometer vapor tension type (see Equipment Section).

**HORN:**—Klaxon, Model K-14. Vibrator type mounted under engine hood. Current draw 7 amperes.

# DODGE

## EIGHT CYLINDER MODEL DK (1932)

### SERIAL NUMBERS 4,520,101 UP

### DELCO-REMY SYSTEM

**CAR SERIAL NUMBER:**—On right front door hinge pillar post. This series 4,520,101 up.

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

**BATTERY:**—Willard, Type WS-4-17, 6 volt, 17 plate, 115 ampere hour (20 hour rate). Positive (+) terminal grounded to transmission case. Battery mounted under driver's seat. Battery size, 7 1/16 inches wide, 11 11/16 inches long, 8 13/16 inches high.

**IGNITION:**—Coil Model 534-Z. Lock Coil type with ignition switch in base. Coil mounted on back of instrument panel at extreme left. Ignition current, .5-2.5 amperes at 6 volts (engine running), 4.5 amperes at 6 volts (engine stopped).

**Distributor Model 661-D.** Single breaker arm type with full automatic advance. No synchronization necessary. Set breaker gap at .020 inch. Hold within limits of .018-.024 inch. To set gap, loosen lock screw on stationary contact mounting plate and turn eccentric adjusting screw. Breaker arm spring tension 19-23 ounces (measured behind contacts with scale at right angles to back of breaker arm).

Engine	Degrees	Automatic Advance	Distributor	R.P.M.	Engine
0	Start	400	800		
17	8.5	1100	2200		

**Mounting:**—Distributor mounted on left side of engine. Driven by inclined shaft from the camshaft. To remove, disconnect primary lead, take off distributor cap, take out hold-down screw in advance plate, lift distributor out.

**Oiling:**—500 Miles. Turn down grease cup on side of shaft housing one turn. Keep cup filled with medium cup grease.

2000 Miles. Take off distributor cap and rotor. Put 4-5 drops light oil in wick oiler in center of shaft. Apply thin film of vaseline to face of breaker cam.

**Timing:**—Standard setting 10° before top dead center. To set timing, remove inspection cover on left front face of flywheel housing directly below starter. Turn engine over with No. 1 piston on compression until flywheel mark D/C' is opposite upper pointer on housing. Loosen hold-down screw in advance plate, rotate distributor cup until pointer is opposite '0' on scale (center of scale), tighten hold-down screw. Loosen advance plate clamp bolt, rotate distributor cup until contacts begin to open (use test light), tighten clamp bolt. Connect spark plugs as indicated on diagram (No. 1 terminal as designated).

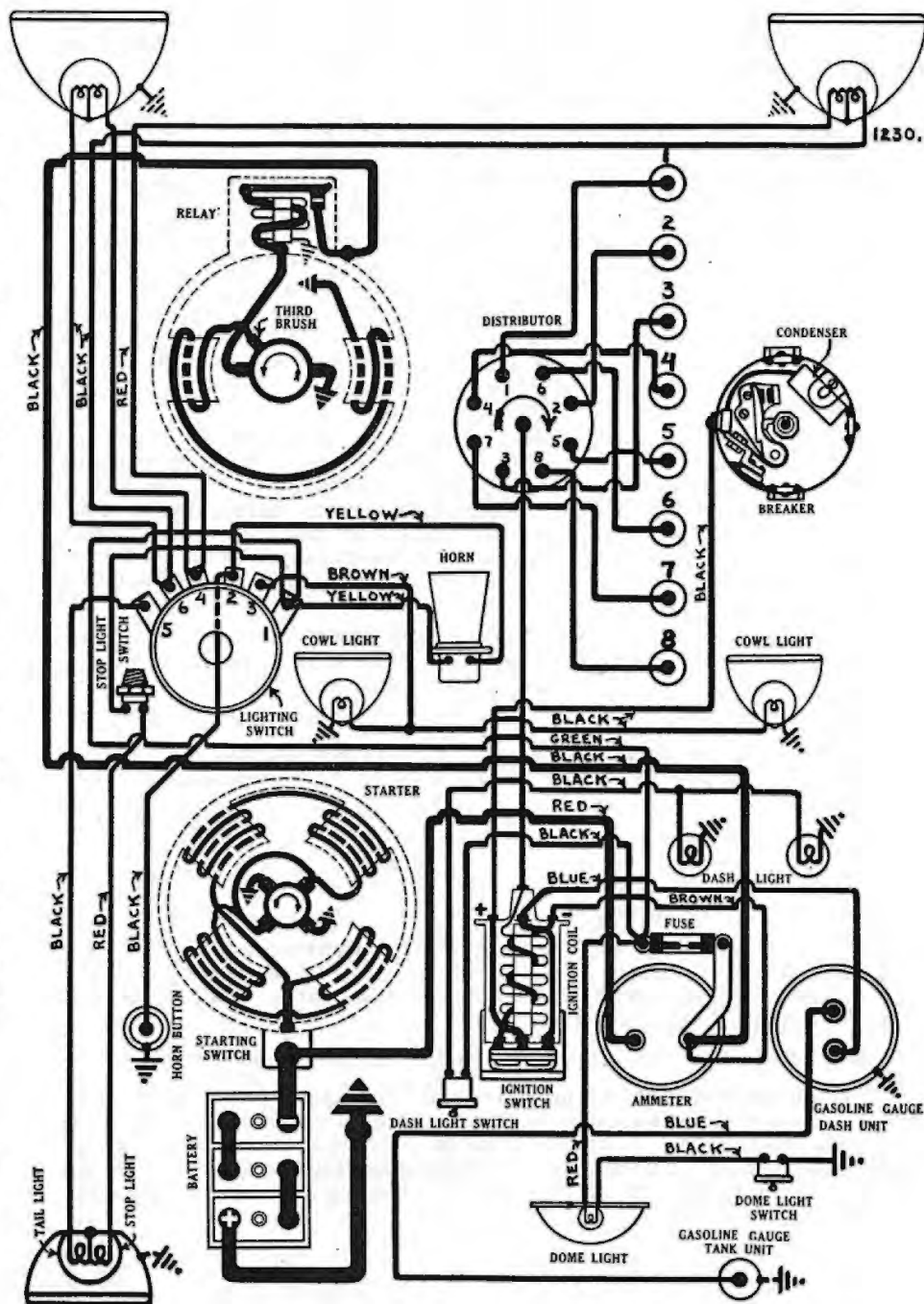
**Synchronization of Contacts.** No synchronization necessary.

**Firing Order:**—1-6-2-5-8-3-7-4. No. 1 cylinder nearest radiator.

**Spark Plugs:**—14 MM. A.C. Type K-12. Set gap at .028 inch. Hold within limits of .025-.030 inch.

**VALVE TIMING:**—Valves on right side of engine. Camshaft driven by two-sprocket non-adjustable chain drive.

	Head Diameter	Stem Diameter	Valve Lgth.	Seat Angle	Lift
Inlet	1 15/32" (1 5/16" clear)	340-341"	5 1/4"	45°	5/16"
Exhaust	1 13/32" (1 1/4" clear)	340-341"	5 1/4"	45°	5/16"



# DODGE

## EIGHT CYLINDER MODEL DK (1932)

### SERIAL NUMBERS 4,520,101 UP

### DELCO-REMY SYSTEM

**Tappet Clearance**

	Operating	Timing
Inlet	.005" (hot)	.011" (cold)
Exhaust	.007" (hot)	.012" (cold)

**Spring Pressure**

Closed	40-44 pounds (2 1/16")
Open	75-81 pounds (1 3/4")

**SPECIAL NOTE:**—Do not compress springs to over-all length of less than 1 5/8" to avoid damage through springs taking permanent set. Valve stem clearance in guide, .001-.003" (inlet), .002-.004" (exhaust).

**Timing**

Inlet opens 6° after top dead center with piston .014" down on intake stroke. Inlet closes 46° after lower dead center.

Exhaust opens 42° before lower dead center. Exhaust closes 8° after top dead center with piston .026" down on intake stroke.

**To Check Valve Timing:**—Remove 1/8 inch pipe plug in cylinder head over No. 8 piston and install regular Chrysler timing gauge. Set gauge dial at '0' with piston on top dead center. Set tappet clearance of No. 1 inlet valve at .011" (cold) and No. 1 exhaust valve at .012" (cold). Rotate crankshaft until No. 8 piston on compression stroke is .014" past top dead center. No. 1 inlet valve should be tight and about to open. Turn crankshaft 2 degrees until piston is .026" past top dead center. No. 1 exhaust valve should be closing. Reset tappet clearance at .005" (inlet) and .007" (exhaust) with engine hot.

**To Set Valve Timing:**—Remove inspection cover on left front face of flywheel housing below starter. Rotate crankshaft until flywheel mark 'D/C' is directly opposite lower pointer on housing (top dead center position for pistons 1 and 8). Rotate camshaft until mark on camshaft sprocket between teeth is directly opposite marked tooth on crankshaft sprocket with both marks in line with straightedge across the shaft centers. Mesh chain. Camshaft sprocket mounting cap screws are offset so that sprocket can only be assembled in one position.

**Valve Grinding:**—Inlet valves chrome nickel steel. Exhaust valves silchrome. Manufacturer recommends that valves be refaced on valve grinder and then lapped in in cylinder block with compound.

**STARTER:**—Model 728-K. Manual pinion shift connected to starting switch lever (switch mounted on field frame). Starter drives through reduction gears and overrunning clutch. Rotation clockwise (armature shaft) at commutator end. Brush spring tension 24-28 ounces.

**Starter Data**

Torque	R.P.M.	Volts	Amperes
0 lb. ft.	2500	5	70
28 "	Lock	3	600

**Mounting:**—Flange mounted on left front face of flywheel housing. To remove, disconnect cables, take out cotter pin and clevis pin in switch linkage, take out 2 flange mounting cap screws, pull starter forward to clear housing, lift from place.

**Oiling:**—5000 Miles. Put 8-10 drops light oil in oiler at each end of armature shaft.

10,000 Miles. Remove grease plug in reduction gear case. Repack gears with graphite grease.

**GENERATOR:**—Model 943-S. Third brush control. To adjust, loosen small round headed lock screw on commutator end plate, take off cover band, shift third brush (by hand) counter-clockwise to increase charging rate, clockwise to decrease charging rate, tighten lock screw. Manufacturer recommends that charging rate be set at 8 amperes maximum to battery at 20 M.P.H. with all lights on (headlights bright) or 10 amperes on cars equipped with radio. Rotation counter-clockwise at commutator end.

Cold Test		Hot Test	
Amperes	Volts	Amperes	Volts
19-21	8.1-8.3	13-15	7.7-8
R.P.M. 2300		R.P.M. 2400	

Brush spring tension 24-28 ounces. Shunt field current 3.5-4.5 amperes at 6 volts.

**Mounting:**—Generator mounted on swinging bracket at left front of engine. Driven by fan belt. To remove, disconnect lead, loosen adjustment clamp bolt and mounting bolts, swing generator toward engine, slip off drive belt, take out adjustment bolt and mounting pivot bolts, lift generator from place.

**Belt Adjustment.** Loosen mounting bolts and adjustment clamp bolt. Attach spring scale by wire looped over generator field frame so that force of scale is tangent to top of generator and parallel to slot in adjustment arm. Pull generator away from engine until scale reading is 45-50 pounds. Tighten adjustment clamp bolt and mounting bolts before slacking off on scale.

**Oiling:**—2000 Miles. Fill oiler at each end of generator with light oil.

**RELAY:**—Model 265-G. Mounted on generator field frame. Contacts close 6.75-7.5 volts of generator and open with 0-2.5 ampere discharge current. Contact gap limits .015-.025 inch. Air gap limits .014-.017 inch (contacts closed).

**LIGHTING:**—Clum Switch, Model 9271. Mounted at lower end of steering column. Controlled by lever on steering wheel. Switch positions:

1. Vertical—All lights off.
2. Right—Cowl lights and tail lights on. Headlights off.
3. No. 1 Left—Bright headlights and tail lights on. Cowl lights off.
4. No. 2 Left—Dim (depressed beam) headlights and tail lights on.

Position	Lamp Sizes			Mazda No.
	Voltage	Candlepower	Base	
Headlights	6-8	32-32	D.C.	1000
Cowl Lights	6-8	3	S.C.	63
Dash Lights	6-8	3	S.C.	63
Stop and Tail Lights	6-8	21-2	D.C.	1158
Dome Light	6-8	15	S.C.	87

**NOTE:**—Stop and tail lights use combination bulbs. Tail light wire must be connected to 2 cp. filament.

**FUSES:**—20 ampere capacity mounted on bracket under ammeter.

**GASOLINE GAUGE:**—Motometer electric type (see Equipment Section).

**TEMPERATURE GAUGE:**—Motometer vapor-tension type (see Equipment Section).

**HORNS:**—Klaxon Model K-18-C. Vibrator type mounted under engine hood. Current draw 5.5-6.5 amperes.



# DUESENBERG

## MODEL J (1932)

### DELCO-REMY GENERATING, STARTING SYSTEM DELCO-REMY IGNITION

**BATTERY:**—Exide, Type 3-LXRV-21-2G, 6 volt. The negative (—) terminal is grounded. Starting capacity (20 minute rate) is 164 amperes for 20 minutes. Lighting capacity (5 ampere rate) is 5 amperes for 30 hours. Battery is mounted on the right frame member under the dust shield.

**IGNITION:**—Coil Model 553-A, B (2 coil unit). The ignition switch is built in the base of the coils. Coil unit is mounted on the back of the instrument board with the ignition switch extending through to the face of the instrument panel.

**Distributor Model 4044 (SM-1064).** Two breaker arm, 4 lobe cam type with semi-automatic advance. Breaker contacts open alternately at 45 degree intervals corresponding to 90 degree firing interval of engine. Contacts must be synchronized—see Timing. Breaker gap set at .022 inch. Hold within limits of .018-.024 inch. To set gap, loosen lockscrew on stationary contact mounting plate, turn eccentric adjusting screw, tighten locking screw. Breaker arm spring tension 17-21 ounces (measured at tip of breaker arm with spring scale at right angles to contact surface). Maximum manual advance 20 degrees (engine).

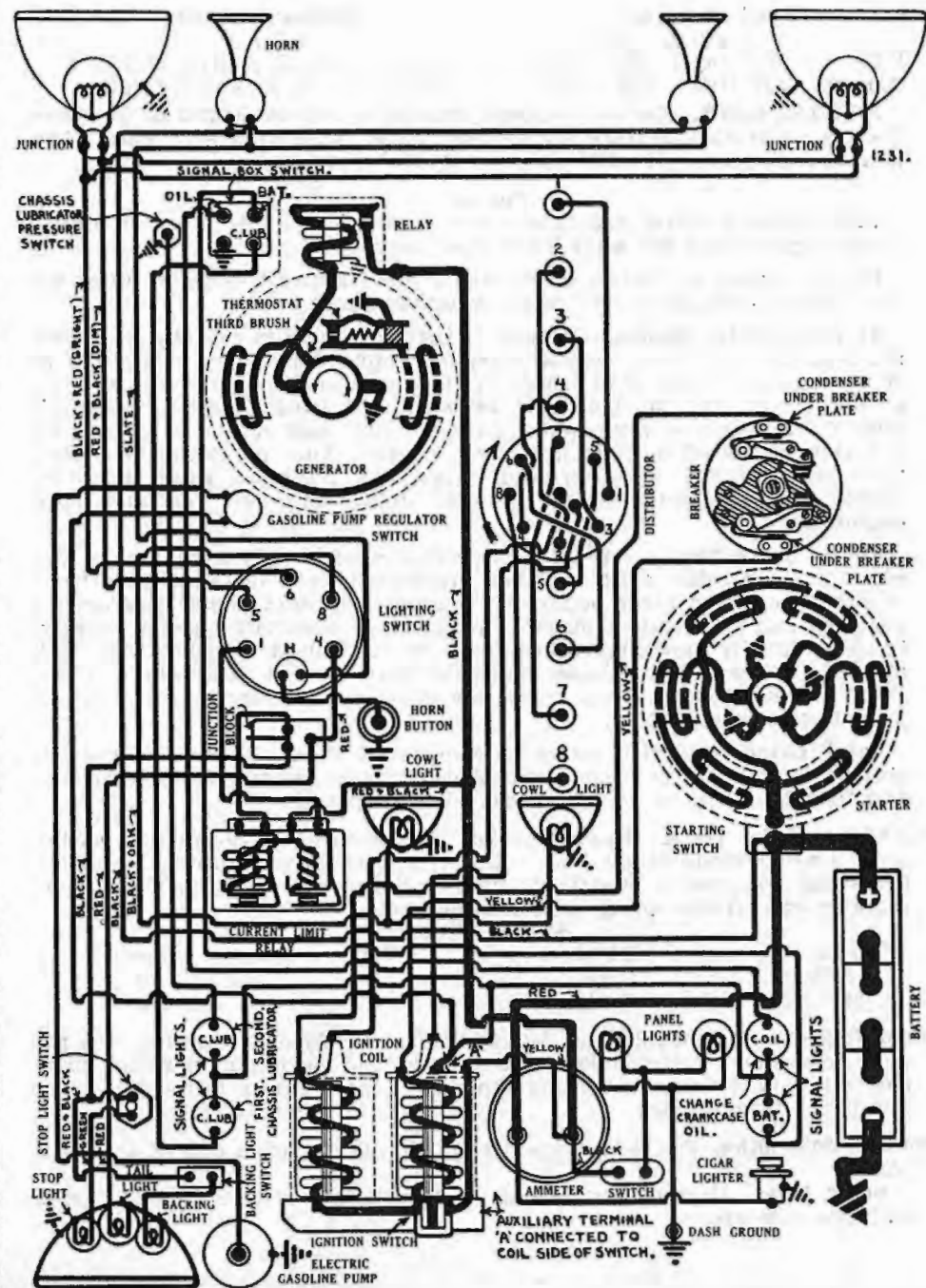
Engine	Degrees	Automatic Advance Distributor	R.P.M.	Engine
0	Start	350	700	
20	10	1000	2000	

**Mounting:**—Distributor is mounted on a bracket directly above the center of the left hand overhead camshaft on the top of the engine and is driven through spiral gears from the camshaft. The manual spark control operates through gears hidden in the base mounting flange. To remove distributor, disconnect primary leads and remove distributor head with cables intact. Then take out four mounting screws in distributor base mounting flange and lift distributor from place.

**Oiling:**—Put 8 or 10 drops of light engine oil in the oiler on the side of the distributor housing every 1000 miles of operation. At the same time remove the distributor head and rotor and put 4 or 5 drops of oil on top of the cam locking screw in the center of the shaft and 1 or 2 drops of oil on the breaker arm pivot pins. Put a small bit of vaseline on the face of the breaker cam.

**Timing:**—Synchronization of Contacts. The second set of contacts mounted on movable sub-plate begin to open exactly 45 degrees after the first set mounted directly on the breaker plate. Synchronize contacts on a rotary spark gap or turn engine over exactly 90 degrees from firing position of piston No. 1 after distributor has been timed to the engine when piston No. 6 will reach firing position (6 degrees after top dead center with manual spark control retarded). If the second set of contacts do not open at this point, loosen the two lock screws on the movable sub-plate and turn the eccentric adjusting screw until contacts open. Tighten the lock screws and check the contact gap. If outside limits of .018-.024 inch, reset at .022 inch and repeat synchronization.

**Timing Distributor to Engine.** Breaker contacts begin to open when the piston entering power stroke reaches a position 6 degrees on the flywheel after top dead center with the manual spark control fully retarded. To set timing, crank engine over until piston No. 1 enters compression stroke (the up stroke with both valves closed). Fully retard spark control lever and turn engine over until the ignition mark on the flywheel, which is 6 degrees after the top dead center mark '1/8' is directly opposite the reference line



# DUESENBERG

MODEL J (1932)

## DELCO-REMY GENERATING, STARTING SYSTEM DELCO-REMY IGNITION

on the flywheel housing. Then loosen lock screw in center of breaker cam and carefully locate cam so that the first set of contacts are beginning to open. Tighten the screw and see that the rotor is directly opposite the segment connected to the spark plug in cylinder No. 1.

**Firing Order:**—The firing order is 1-6-2-5-8-3-7-4.

**Spark Plugs:**—18 MM. Metric. Champion Type C-7. Set gaps at .025 inch.

**VALVE TIMING:**—Overhead valve type. Two intake and two exhaust valves per cylinder mounted in cylinder head and operated directly by overhead camshafts. Intake valves are mounted on left side directly under intake valve camshaft. Exhaust valves are mounted at right directly under exhaust valve camshaft. Both camshafts are chain driven from a transfer sprocket on the front of the cylinder block. Transfer sprocket is chain driven from the engine crankshaft.

	Head Diameter	Stem Diameter	Length	Seat Angle	Lift
Intake	1½"	11/32"	5½"	30°	350"
Exhaust	1 7/16"	11/32"	5½"	30°	360"

	Tappet Clearance		Spring Pressure
	Operating	Timing	
Intake	.015" (cold)	.025" (cold)	Closed..... 65 pounds
Exhaust	.015" (cold)	.025" (cold)	Open .....105 pounds

**Timing**

Intake valves open 6° before top dead center. Intake valves close 40 degrees lower after lower dead center.

Exhaust valves open 40° before lower dead center. Exhaust valves close 14° after top dead center. Valve stem guides are removable. Valves with oversize stems are not made.

**STARTER:**—Model 429. Starter is connected to the engine through a Bendix drive. The direction of rotation is counter-clockwise, viewed from the commutator end. Brush spring tension is 36-40 ounces. The starting switch is mounted on the starter field frame.

**Starter Data**

Torque	R.P.M.	Volts	Amperes
0 lb. ft.	3000	5	70
19 "	Lock	3	500

**Mounting:**—Starter is flange mounted at right of engine on forward side of flywheel housing. To remove starter, disconnect starting switch control wire and cables and take out three flange mounting bolts. Then pull starter forward to clear drive and lift from place.

**Oiling:**—Starter bearings are oilless. They require no attention.

**GENERATOR:**—Model 428. The direction of rotation is counter-clockwise, viewed from the commutator end. Generator current regulation is by third brush shunt field and thermostat. Thermostat contacts open at 165°F. cutting the resistance connected across the thermostat contacts in series with the shunt field and reducing the output approximately 40%. To adjust generator out-

put, loosen the commutator cover band and shift the third brush by hand in a counter-clockwise direction to increase the charging rate and in the opposite direction to decrease the charging rate. The brush is held in any position by friction.

**Generator Data**

Cold Test		R.P.M.	Hot Test		R.P.M.
Amperes	Volts		Amperes	Volts	
19-21	8.3-8.7	1200	11-13	7.5-7.8	1450

Shunt field current is 3.2-4.1 amperes at 6 volts. Brush spring tension is 20-24 ounces. Generator motoring draws 4.5 amperes at 6 volts.

**Mounting:**—Generator is cradle mounted at left of engine and is driven by the accessory drive shaft. To remove generator, disconnect lead and drive coupling and loosen mounting clamp band. Then slide generator from place.

**Oiling:**—Put 8 or 10 drops of light engine oil in the oiler at each end of the generator every 1000 miles of operation.

**RELAY:**—Model 265-B. Relay is mounted on the generator. Relay contacts close when the generator voltage reaches 7-7.5 volts and open with a discharge current of 0-2.5 amperes. Relay contact gap is .015-.025 inch. Air gap is .014-.020 inch with contacts closed.

**LIGHTING:**—Delco-Remy Switch Model 486-D. Lighting switch mounted at lower end of steering column and controlled by lever on steering wheel. Dimmer system 'depressed beam' double filament headlight bulbs controlled by lighting switch.

**Lamp Sizes**

Position	Voltage	Candlepower	Base	Mazda Number
Headlights	6-8	21-21	DC	1110
Side (cowl) lights	6-8	3	SC	63
Dash and tail lights	6-8	3	SC	63
Stop and backing lights	6-8	21	SC	1129

**CURRENT LIMIT RELAY:**—Model 5759. This device consists of a vibrating and lock-out circuit breaker mounted on the left side of the dash. The vibrating circuit breaker is connected in the lighting circuits to protect them from overload and short-circuits. It begins to vibrate when the current reaches 25-30 amperes and continues limiting the current to 5-15 amperes. The lock-out circuit breaker connected in the horn and stop light circuits begins to operate when the current reaches 25-30 amperes and continues limiting the current to less than 1 ampere. Circuit breaker contact gap is .012-.030 inch. Air gap is .015-.025 inch with contacts closed. Spring tension at plunger is 5 ounces (minimum).

**GASOLINE GAUGE:**—KS Telegauge hydrostatic type (see Equipment Section).

**FUEL PUMP:**—Stewart-Warner electric type fuel pump (see Equipment Section).

**HORNS:**—Klaxon Model K-22-B twin horns (matched tone) Type 1153 (low note) Type 1151 (high note). Current draw 6.0-8.0 amperes at 6 volts.

# DURANT

MODEL 6-19 (1931) SERIAL NUMBERS 1001 UP (AFTER JUNE 1, 1931)  
 MODEL 6-21, DeLUXE MODEL 6-22 (1932)  
 AUTO-LITE GENERATING, STARTING SYSTEM  
 AUTO-LITE IGNITION

**CAR SERIAL NUMBER:**—Stamped on name plate on right side upper toe-board.

**ENGINE NUMBER:**—Stamped on right side cylinder block front end of manifold.

**BATTERY:**—U.S.L. Type 3-CVX-6X-7A (Model 6-19) Type CW-13A (Model 6-21, 22), 6 volt, 105 ampere hour (5 ampere rate). Starting capacity 115 amperes for 20 minutes. Negative (—) terminal grounded. Battery mounted on right frame member under front compartment floor boards.

**IGNITION:**—Coil Model IG-4302. The ignition switch is built in the base of the coil. Coil is mounted on the back of the instrument board with the ignition switch extending through to the face of the instrument panel. Ignition current is 1-3 amperes at 6 volts with engine running and 3-4.5 amperes at 6 volts with engine stopped. The gasoline gauge and stop light are connected to an auxiliary terminal on the side of the coil. The ignition switch is a Chicago Lock.

**Distributor Model IGB-4031-A.** Breaker contacts separate .018-.020 inch. Set contact gap by loosening lock nut on stationary contact mounting stud and turning up stud. Resurface contacts when necessary with a fine flat contact file or on a medium hard oilstone. Breaker arm spring tension is 16-20 ounces. Distributor is semi-automatic. Maximum manual advance is 20 degrees (engine).

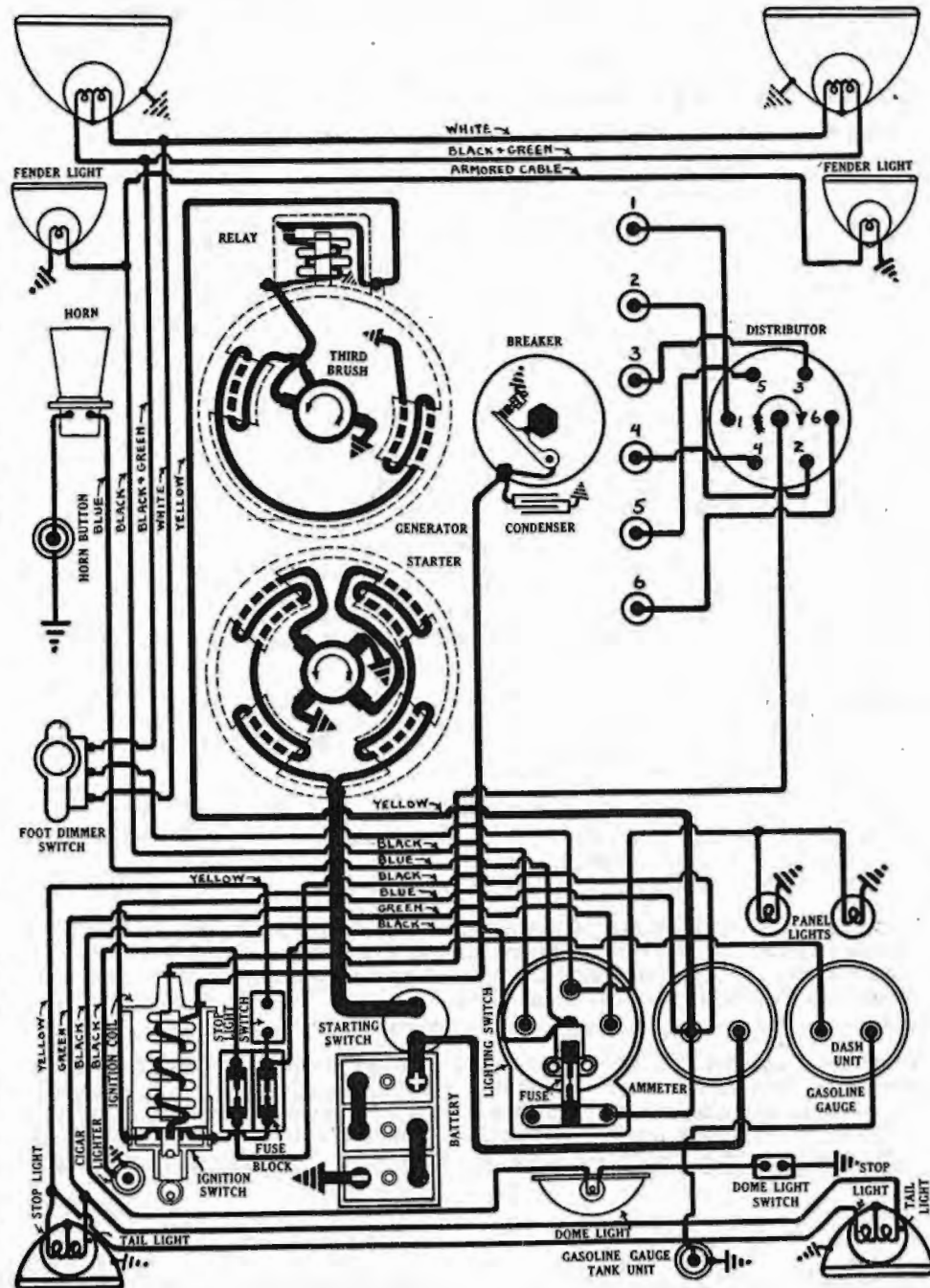
Degrees	Automatic Advance		R.P.M
Engine	Distributor	Distributor	Engine
0.....	Start	300.....	600
4.....	2	590.....	1180
8.....	4	880.....	1760
12.....	6	1180.....	2360
15.....	7½	1400.....	2800

**Note:**—Cars may be found equipped with Distributor Model IGB-4031. This distributor is identical with Model IGB-4031-A except for automatic advance characteristics. See data sheet on Durant Model 6-12 (1931).

**Mounting:**—Distributor is mounted on the cylinder head. To remove distributor, disconnect manual spark control and primary lead and remove distributor head with cables intact. Then take out 2 cap screws in cylinder head and lift distributor from place.

**Oiling:**—Put 4 or 5 drops of light engine oil in the oiler on the side of the distributor head every two weeks or each 500 miles of operation. Every 1000 miles remove the distributor head and put one drop of oil on the breaker arm pivot pin and put a small bit of vaseline on the face of the breaker cam.

**Timing:**—Breaker contacts begin to open when the piston entering power stroke reaches a position 6 degrees (on the flywheel) before top dead center with the spark control in the fully advanced position. To set timing, crank engine over until piston No. 1 enters compression stroke (the up stroke with both valves closed). Fully advance spark control and see that distributor is rotated counter-clockwise as far as possible. Turn engine over until flywheel mark 'IGN', which is 6 degrees before the top dead center mark 'DC', is directly opposite the indicator on the flywheel case. Then loosen advance arm clamp screw and rotate distributor until contacts begin to open. Tighten the clamp screw and see that the segment directly opposite the



# DURANT

MODEL 6-19 (1931) SERIAL NUMBERS 1001 UP (AFTER JUNE 1, 1931)  
 MODEL 6-21, DeLUXE MODEL 6-22 (1932)  
 AUTO-LITE GENERATING, STARTING SYSTEM  
 AUTO-LITE IGNITION

rotor in the distributor head is connected to the spark plug in cylinder No. 1. Spark plug connections are shown on the diagram.

**Firing Order:**—The firing order is 1-5-3-6-2-4.

**Spark Plugs:**—18 MM. Metric. A.C. Type PR-10. Set gaps at .025 inch.

**VALVE TIMING:**—Valves at right of engine. Camshaft driven by two-sprocket non-adjustable chain drive.

	Head Diameter	Stem Diameter	Valve Length	Seat Angle	Lift
Intake	1 9/16"	11/32"	5 9/32"	45°	11/32"
Exhaust	1 7/16"	11/32"	5 9/32"	45°	11/32"

**Note:**—Exhaust valves on Model 6-21, 22 are same as Model 6-19 above except Head Diameter, 1½" and Length, 5¼".

	Tappet Clearance	Spring Pressure
Operating	Timing	Closed .....45 pounds (2 3/32")
Intake .008" (hot)		6-19 Open.....80 pounds
Exhaust .008" (hot)-.012" (cold)		6-21,22 Open...104 pounds (1 27/32")

**Valve Timing**

**Model 6-19.** Intake valves open 5° after top dead center. Close 45° after lower dead center. **Model 6-21, 22.** Intake valves open 5° before top dead center. Close 45° after lower dead center.

Exhaust valves open 40° before lower dead center. Close 5° after top dead center.

**To Check Valve Timing.** Set tappet clearance No. 1 exhaust valve at .012" (cold). With No. 6 piston on compression stroke turn engine over until piston is slightly past top dead center with flywheel mark 'INLO/EX.CL.' (Model 6-19) or 'EXC.' (Model 6-21, 22) directly opposite the indicator on the flywheel housing. No. 1 exhaust valve should close at this point. Reset tappet clearance at .008 inch with engine hot.

**STARTER:**—Model MAJ-4001. Starter is connected to the engine through a Bendix drive. The direction of rotation is counter-clockwise, viewed from the commutator end. Starter cranks the engine at 160 R.P.M. drawing 175 amperes. Brush spring tension is 44-56 ounces. Starter switch is Model SW-4001.

**Starter Data**

Torque	R.P.M.	Volts	R.P.M.
0 lb. ft.	3000-5000	.6	50
.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
19.0 "	Lock	4.0	809

**Startix:**—Model 6-21 and 6-22 cars may be found equipped with Startix automatic starting switch. See complete article on Startix in Equipment Section.

**Mounting:**—Starter is flange mounted at left of engine on forward side of flywheel housing. To remove starter, disconnect cable and take off flange mounting screws. Then pull starter forward to clear drive and lift from place.

**Oiling:**—Put 5 or 6 drops of light engine oil in the oiler on the drive end of the starter every month or each 1000 miles of operation.

**GENERATOR:**—Model GAL-4330. The direction of rotation is counter-clockwise, viewed from the commutator end. Generator current regulation is by third brush shunt field. To adjust generator output, remove the commutator cover band and shift the third brush by prying on the brush mounting stud with

a screwdriver. Shift the third brush in a counter-clockwise direction to increase the charging rate and in the opposite direction to decrease the charging rate. The brush and mounting plate is held in position by friction between the mounting stud and the end plate. With standard car setting the maximum charging rate is 17 amperes at 8.0 volts reached at 1900 R.P.M. or 24-28 M.P.H. (Model 6-19) 22 M.P.H. (Model 6-21, 22).

**Generator Data**

Cold Test			Hot Test		
Amperes	Volts	R.P.M.	Amperes	Volts	R.P.M.
0	6.4	600	0	6.4	700
5	6.8	780	5	7.0	950
8	7.1	900	10	7.8	1340
12	7.4	1200	12.4	8.0	2150
17	8.0	1900	9.6	7.7	3200
12	7.4	3200			

Shunt field current is 4.08-4.52 amperes at 6 volts. Generator motoring draws 4.27-4.73 amperes at 6 volts. Brush spring tension is 8-13 ounces.

**Mounting:**—Generator is cradle mounted at left of engine and is driven by the fan belt. The water pump is driven by an extension of the generator shaft. To remove generator, disconnect lead and water pump drive coupling and slip off drive belt. Then loosen mounting clamp band and slip generator from place.

**Oiling:**—Put 4 or 5 drops of light engine oil in the oiler at each end of the generator every week or each 500 miles of operation. Every 5000 miles remove the grease cup under the bearing retainer on the commutator end and clean out all old grease. Dip wick in engine oil and fill cup with medium grease before replacing.

**RELAY:**—Model CB-4014. Relay is mounted on the generator. Relay contacts close at 675 R.P.M. when the generator voltage reaches 7-7.5 volts and open with a discharge current of .5-2.5 amperes. Charging current at closing of contacts is approximately 2 amperes. Relay contact gap is .025-.035 inch. Air gap is .010-.030 inch with contacts closed.

**LIGHTING:**—Clum Lighting Switch Model 5192. Dimmer Switch Model 9126. Lighting switch mounted on back of instrument board and controlled by push-pull button on instrument panel. Dimmer system 'depressed beam' double filament headlight bulbs controlled by foot operated dimmer switch mounted on toeboard. Parking bulbs (in headlights) are standard equipment on Models 6-19 and 6-21. Fender lights are standard equipment on Model 6-22 and optional on Model 6-19.

**Lamp Sizes**

Position	Voltage	Candlepower	Base	Mazda Number
Headlights	6-8	21-21	DC	1110
Parking, fender lights	6-8	3	SC	63
Dash lights	6-8	3	SC	63
Stop and tail lights	6-8	21- 2	DC	1158
Dome lights	6-8	3	SC	63

**Note:**—Stop and tail light is a special double filament bulb. Tail light lead must be connected to the 2 cp. filament.

**FUSES:**—Lighting fuse mounted on switch is 20 ampere capacity. Two 20 ampere fuses are mounted on the dash connected in the auxiliary lead from the coil and in the stop light circuit.

**GASOLINE GAUGE:**—Motometer electric type (see Equipment Section).

**TEMPERATURE GAUGE:**—Motometer Vapor tension type (see Equipment Section).

**FUEL PUMP:**—AC mechanical fuel pump (see Equipment Section).

# ESSEX

## PACEMAKER MODEL SUPER SIX (1932), SERIAL NUMBERS 1,281,685 UP STANDARD MODEL SUPER SIX (1932) AUTO-LITE SYSTEM

**CAR SERIAL NUMBER:**—Stamped on plate on dash under hood. This series 1,281,685 up.

**ENGINE NUMBER:**—Stamped on left side cylinder block opposite No. 3 cylinder.

**BATTERY:**—Exide, Type 3-VKA-15-1, 6 volt, 15 plate, 100 ampere hour (20 hour rate). Negative (—) terminal grounded. Battery mounted on left frame member under driver's seat. Battery size, 7¼ inches wide, 10¼ inches long, 9¼ inches high.

**IGNITION:**—Coil Model IG-4088. Coil mounted on left side cylinder head. Ignition current 1-3 amperes at 6 volts (engine running) 3-4.5 amperes at 6 volts (engine stopped). Ignition switch 'type 15-S Electrolock. See Equipment Section for complete description of Electrolock ignition switch. Switch positions left—ignition on—timing position, right—ignition on—Startix operative—running position.

**Distributor Model IGB-4052-A.** Single breaker arm, 6 lobe cam type with full automatic advance. Breaker contact .020 inch. Hold within limits of .018-.020 inch. To set gap, loosen locknut on stationary contact mounting stud, turn up stud, tighten locknut. Resurface contacts when necessary with fine flat contact file. Breaker arm spring tension 16-22 ounces measured at tip of breaker arm with spring scale in line with center of contacts and at right angles to arm).

Engine	Degrees	Automatic Advance	R.P.M.	Engine
0.....	Start	400.....	800	
8.....	4	825.....	1650	
16.....	8	1250.....	2500	
24.....	12	1675.....	3350	
30.....	15	2000.....	4000	

**Mounting:**—Distributor mounted on accessory bracket right front of engine. Electrolock must be removed as a unit with distributor when distributor is taken off car. See Equipment Section for details of Electrolock. To remove, disconnect ignition wires and free Electrolock at dash, take off distributor cap, take out hold-down screw in advance arm, lift distributor out.

**Oiling:**—2000 Miles. Fill distributor base to level of oiler under distributor head with line engine oil. Take off distributor cap and rotor, put one drop oil on breaker arm pivot pin, apply thin film vaseline to face of breaker cam.

**Timing:**—Engines regularly supplied with two types of cylinder heads 'Power Dome Head' and 'Super Power Dome Head'. Standard ignition settings as follows:

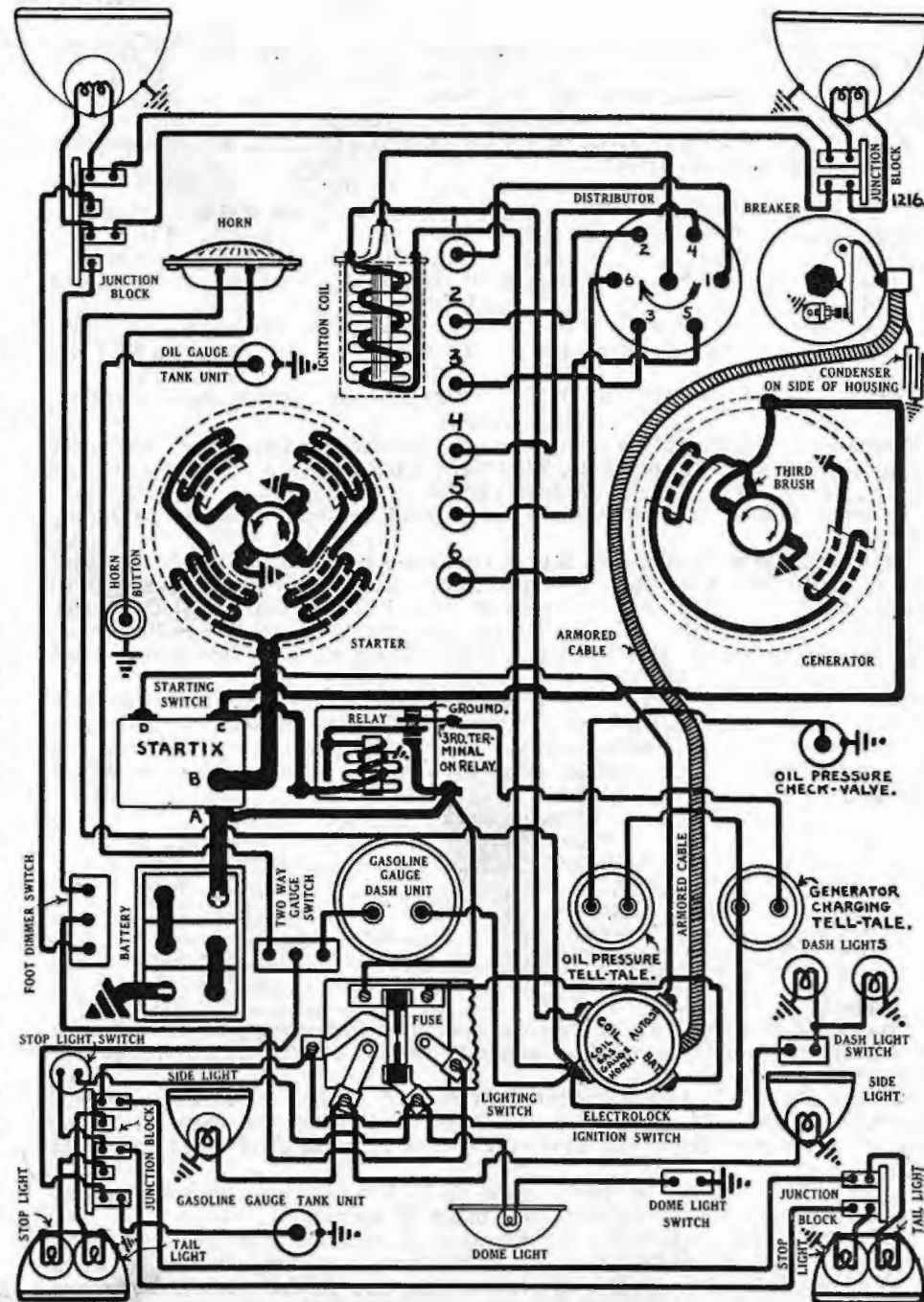
- Power Dome Head—using standard gasoline, Set at top dead center.
- Power Dome Head—using Ethyl fuel, Set ¼ inch before top dead center.
- Super Power Dome Head—use Ethyl fuel, Set at top dead center.

To set timing, first loosen hold-down screw in advance arm, rotate distributor until hold-down screw is in center of scale on advance arm, tighten screw. With No. 1 piston on compression stroke, turn engine over until flywheel mark 'DC.1-6' (top dead center mark for cylinder No. 1 and 6) is directly opposite pointer on edge of inspection hole in right front face of flywheel housing (engines with Power Dome Head using standard gasoline and Super Power Dome Head using Ethyl fuel) or stop with the mark ¼ inch ahead of indicator (engines with Power Dome Head using Ethyl fuel). Loosen advance arm clamp screw, rotate distributor until contacts begin to open (use test lamp), tighten clamp screw, connect spark plugs as indicated in diagram.

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

**Spark Plugs:**—Power Dome Head. 18 MM. AC. Type G-8. Set gap at .022 inch. Super Power Dome Head. 14MM. AC. Type K-12. Set gap at .022 inch.

**VALVE TIMING:**—Valves at right of engine. Camshaft driven by chain in tandem with accessory shaft sprocket. Chain adjusted manually—see below.



# ESSEX

## PACEMAKER MODEL SUPER SIX (1932), SERIAL NUMBERS 1,281,685 UP STANDARD MODEL SUPER SIX (1932) AUTO-LITE SYSTEM

	Head Diameter	Stem Diameter	Length	Seat Angle	Lift
Intake	1 3/8"	5/16"	5 3/32"	45°	11/32"
Exhaust	1 3/8"	5/16"	5 3/32"	45°	11/32"

Tappet Clearance  
Intake .....003-.005" (hot).  
Exhaust .....005-.007" (hot).  
Closed .....53 pounds (length—2").

**To Check Valve Timing.** Check tappet clearance No. 1 inlet valve. With No. 6 piston on compression stroke, turn engine over until 'IO' mark on flywheel which is slightly past top dead center mark 'DC.1-6/' is directly opposite pointer in edge of inspection hole in right front face flywheel housing. No. 1 inlet valve should open at this point.

**To Set Valve Timing.** Turn crankshaft and camshaft so there are 19 pins in timing chain between marks on sprockets when chain is meshed. Begin count with pin in line with tooth meshed opposite mark on camshaft sprocket and mesh tooth in line with nineteenth pin directly opposite mark on crankshaft sprocket.

**To Adjust Timing Chain.** Adjust chain at end of first 1500 miles and every 5000 miles throughout life of car or whenever play on circumference of generator drive coupling exceeds 1/8" (excluding slack of coupling bolts). To adjust chain, loosen three bolts in accessory bracket (the inside top bolt and bottom bolt pass through notches in eccentric and must be removed), insert special wrench on notched nut in front of bracket (between bracket and chain case), turn wrench clockwise until play on coupling is 1/8", tighten mounting bolts (slack off adjustment slightly if necessary to insert mounting bolts). If bracket has been taken off engine, take out plug directly above shaft, fill with 1/2 pint engine oil before engine is run.

**STARTER:—Model MAJ-4025.** Starter drives engine through inboard Bendix drive. Rotation counter-clockwise at commutator end. Brush spring tension 44-56 ounces.

### Starter Data

Torque	R.P.M.	Volts	Amperes
.3 lb. ft.	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
12.6 " "	Lock	3.0	575
19.0 " "	Lock	4.0	805

**Startix:—**Pacemaker Model equipped with Startix automatic starting switch mounted on left side engine block directly above starter. See Equipment Section for complete article on Startix. Not necessary to disconnect Startix to time engine. Startix not used on Standard Model.

**Mounting:—**Starter flange mounted left side of engine on front face flywheel housing. To remove, disconnect cable, take out 3 flange mounting cap-screws, pull starter straight forward to clear Bendix, lift out.

**Oiling:—1000 Miles.** Put 3-4 drops light engine oil (fill cups once) in oiler at each end of armature shaft.

**GENERATOR:—Model GAL-4344.** Third brush regulation. To adjust charging rate, 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. Rotation counter-clockwise at commutator end. Maximum charging rate 14-16 amperes (cold) at 8.0 volts reached at 1900 R.P.M. or 23 M.P.H.

### Generator Data

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

Brush spring tension 8-13 ounces. Shunt field current 4.08-4.52 amperes at 6.0 volts, Generator motoring draws 4.27-4.73 amperes at 6.0 volts.

**Note:—**Special charging tell-tale used instead of ammeter in charging circuit. Tell-tale light goes out when generator begins to charge battery. See paragraph on 'Signal Lights'. An ammeter must be connected in generator line at relay whenever charging rate is checked or adjusted.

**Mounting:—**Generator cradle mounted at right of engine and driven by shaft from accessory bracket. To remove, disconnect lead, disconnect generator drive coupling, loosen mounting clamp band, lift generator out.

**Oiling:—1000 Miles.** Put 3-4 drops light engine oil (fill cups once) in oiler at each end of generator.

**RELAY:—Model CBA-4001.** Relay mounted on left side engine block (beside Startix). Relay equipped with extra terminal and contact for Charge Tell-tale (see diagram). Contacts close at 675 R.P.M. or 10 M.P.H. when generator voltage reaches 7.0-8.0 volts with charging current of not more than 5 amperes and open with discharge current of 0-2.5 amperes. Relay contact gap limits .025-.035 inch (with upper contacts closed). Air gap limits .010-.030 inch (contacts closed).

**LIGHTING:—Soreng Manegold Switch, Model B-5670-A. Dimmer Switch Soreng Manegold, Model A-2100-A.** Lighting switch mounted on back of instrument board controlled by push-pull button on lower left center instrument panel. Dimmer system 'depressed beam' double filament headlight bulbs controlled by foot operated switch on toeboard. Cowl lights used only on Pacemaker Model. Lighting switch positions:

1. Button pushed in—All lights off.
2. Button one half out—Side lights on, tail light on.
3. Button pulled out—Headlights on, tail light on.

### Lamp Sizes

Position	Voltage	Candlepower	Base	Mazda Number
Headlights	6-8	32-32	DC	1000
Side lights	6-8	3	SC	63
Dash & tail lights	6-8	3	SC	63
Stop light	6-8	15	SC	87
Dome light	6-8	15	SC	87
Signal lights	6-8	3	DC	64

**FUSES:—**30 ampere capacity mounted on back of lighting switch.

**SIGNAL LIGHTS:—**Consist of battery charge tell-tale and oil pressure tell-tale lights mounted on instrument panel instead of ammeter and oil pressure gauge. Light bulbs used are standard 6-8 volt, 3 cp.DC. Mazda 64 and can be removed by turning light counter-clockwise slightly to release bayonet socket pin.

**Charging Tell-tale.**—Under ruby reflector on right center of instrument panel. Tell-tale should light with ignition turned 'on' with car stopped and continue to burn until generator begins to charge (relay contacts close). Closing of main relay contacts opens auxiliary contacts in tell-tale circuit causing tell-tale light to go out. If tell-tale light does not burn when ignition is turned on and at idling speeds below 10 M.P.H. check bulb by grounding left hand relay terminal to generator field frame (never short the two terminals). If tell-tale does not light replace bulb. If lamp lights when terminal is grounded, check auxiliary contact spring and contacts and ground strap, see that contacts are closed when main contacts are open.

**Oil Pressure Tell-tale.** Under ruby reflector on left center of instrument panel. Tell-tale should light with ignition turned on and engine stopped and should flash at idling speeds of engine. Tell-tale should not light at engine speeds above idling. If tell-tale does not light when ignition is turned on, short terminal on 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 in housing.

**GASOLINE GAUGE:—**Combination gasoline and oil gauge electrical type with selector switch under instrument board. Gasoline gauge in circuit and registers whenever ignition switch on. Oil reading obtained by pressing selector switch button. Motometer design—see Equipment Section.

**HORNS:—**EA disc type vibrator horn mounted under engine hood.

# FORD

## FOUR CYLINDER MODEL (1932)

### FORD-AUTO-LITE SYSTEM

**BATTERY:**—Ford Type, 6 volt, 13 plates, 80 ampere capacity. Starting capacity 98 amperes (to end voltage of 1.5 volts per cell). Lighting capacity 5 amperes for 18 hours (to end voltage of 1.75 volts per cell). Positive (+) terminal grounded. Battery mounted on cross member under front compartment floor boards on left side (accessible after removing special coverplate).

**IGNITION:**—Ford-Auto-Lite Coil. Coil is mounted on the dash. Ignition current .62 amperes at 6.2 volts (engine running at 1500 R.P.M.), 4 amperes at 6.2 volts (engine stopped). Ignition switch co-incidental with steering column lock (mounted on steering column at instrument board).

**Ford Auto-Lite Distributor.** Breaker contact gap set at .020 inch. Hold within limits of .016-.024 inch (in service) and .022-.028 inch with new breaker arm fiber rubbing block. To set gap, loosen lock screw on stationary contact mounting bracket, turn up contact stud, tighten locking screw. Breaker arm spring tension 14-20 ounces. Distributor is full automatic type.

Degrees	Automatic Advance	R.P.M.	
Engine	Distributor	Distributor	Engine
0	Start	350	700
14	7	1300	2600

**Mounting:**—Distributor mounted on right side of cylinder head at center of engine. To remove distributor, disconnect spark plug connectors, take off distributor cap and high tension cable, loosen lock nut and back off set screw in side of cylinder head opposite distributor, lift distributor out. The breaker plate may be taken out of the distributor housing by taking out the timing adjustment screw on the spark control arm and rotating the breaker plate until the projections on the plate line up with the notches in the housing.

**Oiling:**—500 Miles. Put a few drops of light engine oil in oiler on side of distributor housing.

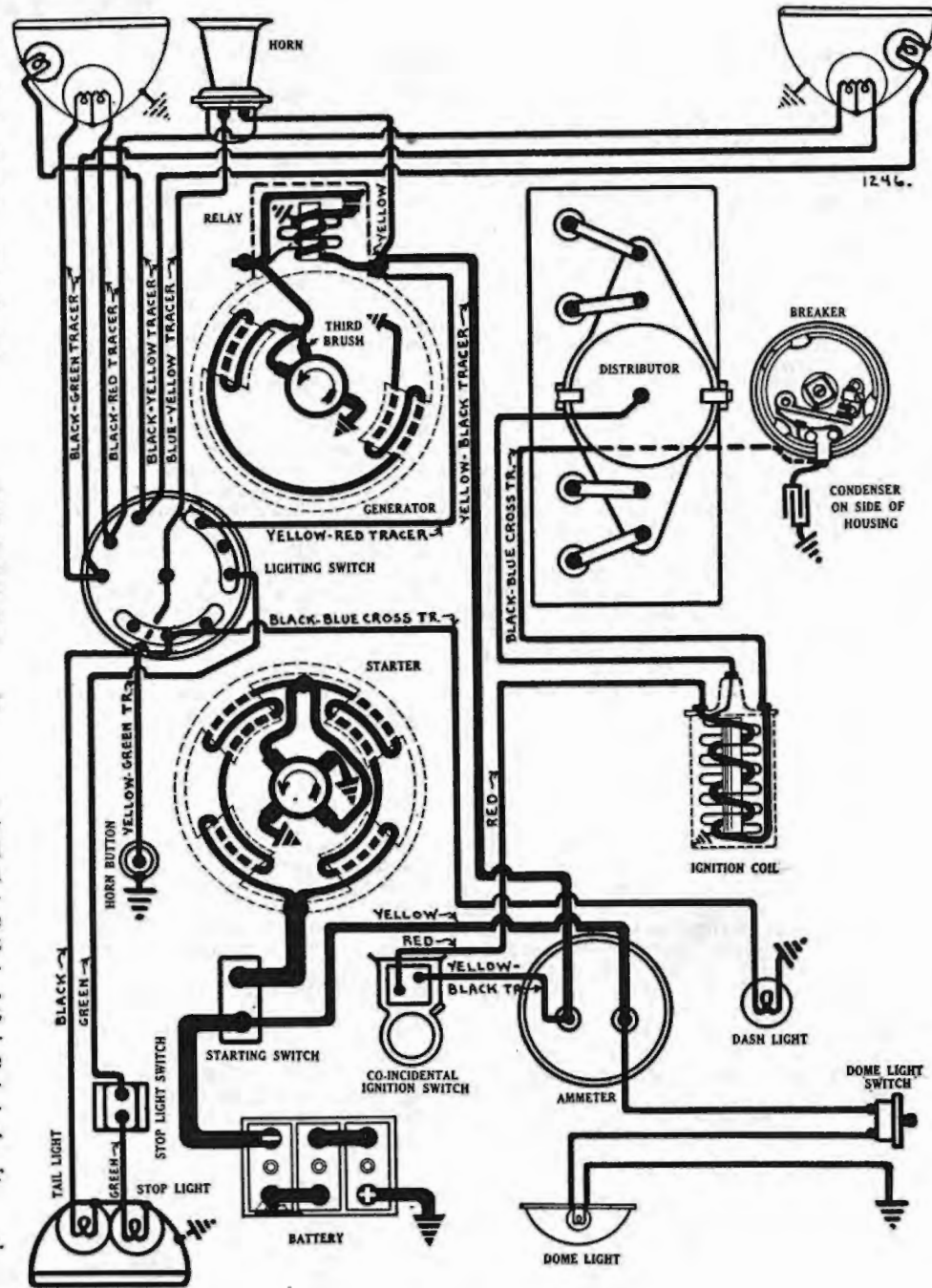
2000 Miles. Apply thin film of vaseline to face of breaker cam.

**Timing:**—Standard setting 15° (standard gasolines) or 23° (Ethyl gasolines) before top dead center. To set timing, first center spark control arm by loosening adjustment screw and moving arm so that center line on control arm scale is directly under center of adjustment screw, tighten screw. Then take out timing pin screwed in front face of timing gear case (over camshaft gear), reverse pin in hole. With No. 1 piston on compression stroke turn engine over slowly and press on pin until pin engages hole in front face of camshaft gear (this hole is 9½ degrees on the camshaft corresponding to 19 degrees on the crankshaft before the top dead center position). Loosen lock screw in center of breaker cam, carefully locate cam so that contacts are beginning to open, tighten locking screw. Then loosen adjustment screw on spark control arm, move arm 4 degrees to right (15 degree setting for cars using standard gasoline) or 4 degrees to left (23 degree setting for cars using Ethyl gasoline), tighten adjustment screw. **Remove timing pin and replace in running position before attempting to operate car.**

**Firing Order:**—1-2-4-3. No. 1 cylinder nearest the radiator. See diagram for spark plug connections.

**Spark Plugs:**—7/8-18 SAE. Champion Type 3X. Use Type C-4 for replacement. Set gaps at .030 inch. Hold within limits of .030-.035 inch.

**VALVE TIMING:**—Valves at right of engine. Camshaft gear driven from the crankshaft.



# FORD

## FOUR CYLINDER MODEL (1932)

### FORD-AUTO-LITE SYSTEM

Head Diameter	Stem Diameter	Length	Seat Angle	Lift
Exhaust .....1½"	.....5/16"	5.649-5.651" (O.A.L.)	45°	.287"
Intake .....1½"	.....5/16"	5.649-5.651" (O.A.L.)	45°	.314"

Tappet Clearance	Spring Pressure
Intake .....010-.013" (see note)	38 pounds.....2 15/16"
Exhaust .....020-.022" (see note)	

#### Timing

Intake valves open 8° before top dead center. Intake valves close 56° after lower dead center.

Exhaust valves open 56° before lower dead center. Exhaust valves close 8° after top dead center.

**Note on Tappet Clearance.** No tappet clearance adjustment is provided. Tappet clearance as given above represents limits in service. Valves should be replaced when tappet clearance becomes excessive. Valve stem guides are of the split type and are held in place by the valve spring. Guides can be removed after the spring retainer is taken out and the valve spring released.

**STARTER:—Ford Auto-Lite Type.** Starter drives engine through Bendix drive. Rotation is counter-clockwise at commutator end. Brush spring tension 2 pounds. Starter cranks engine at 1150 R.P.M. drawing 200 amperes at 6 volts (starting).

Starter Data			
Torque	R.P.M.	Volts	Amperes
4 lb. ft.....	1000.....	4.85.....	225
8 ".....	540.....	4.15.....	360
12 ".....	220.....	3.60.....	475

**Starter Switch:—Auto-Lite design.** Switch is mounted at left of engine and is operated by button between pedals (passenger cars) or at left of steering column (trucks).

**Mounting:—Starter flange mounted on forward face of flywheel housing at left of engine.** To remove, disconnect cable, take out 3 flange mounting bolts, pull starter forward to clear Bendix, lift out.

**Oiling:—Starter bearings oilless.** They require no attention.

**GENERATOR:—Ford Auto-Lite Type.** Generator current regulation by third brush system. To adjust generator output, take off commutator cover band, shift third brush by hand counter-clockwise to increase or clockwise to decrease charging rate. Third brush mounting plate held in position by

friction. Rotation counter-clockwise at commutator end. Maximum output should be set at 10-12 amperes. With standard setting, maximum charging rate is 10 amperes at 7 volts reached at 2000 R.P.M. or 22 M.P.H.

#### Generator Data

Amperes	Volts	R.P.M.
5.2.....	6.4.....	800
10.7.....	6.9.....	1600
4.8.....	6.75.....	4000

Brush spring tension is 20 ounces. Field current draw is 6.3 amperes at 7 volts. Generator motoring draws 5.75 amperes at 7 volts.

**Mounting:—Generator mounted on swinging bracket at left front of engine and driven by the fan belt.** To remove generator, disconnect leads, loosen mounting bolt, swing generator toward engine, slip off drive belt, take out mounting bolt forming bracket hinge, lift generator out.

**Belt Adjustment.** To take up fan belt, loosen generator mounting bolt, swing generator away from engine until belt tension is just sufficient to drive generator and fan without slipping, tighten mounting bolt.

**Oiling:—1000 Miles.** Put few drops light engine oil in oiler at each end of the generator.

**RELAY:—Ford Type.** Mounted on generator field frame. Relay contacts close at 650 R.P.M. of generator or 7.5 M.P.H. with generator voltage of 7.5 volts and charging current of approximately 2 amperes and open at 6.5 M.P.H. or 550 R.P.M. of generator with discharge current of 2.5 amperes. Relay contact gap limits .015-.020 inch. Air gap limits .010-.015 inch (contacts closed).

**LIGHTING:—Essex Wire Co. Switch.** Lighting switch mounted at lower end of steering column controlled by lever on steering wheel. Dimmer system 'depressed beam' double filament headlight bulbs controlled by lighting switch.

#### Lamp Sizes

Position	Voltage	Candlepower	Base	Mazda No.
Headlights .....	6-8.....	21-21.....	D.C.....	1110
Parking Bulbs .....	6-8.....	3.....	S.C.....	63
Dash and Tail Lights.....	6-8.....	3.....	S.C.....	63
Stop Light .....	6-8.....	21.....	S.C.....	1129
Dome Light (Passenger Cars).....	6-8.....	3.....	S.C.....	63
Dome Light (Commercial Cars).....	6-8.....	15.....	S.C.....	87

**GASOLINE GAUGE:—K-S Telegauge hydrostatic type** (see Equipment Section).



# FORD

## V-8 MODEL (1932)

### FORD GENERATING, STARTING SYSTEM FORD-MALLORY IGNITION

**BATTERY:**—Ford Type. 6 volt, 13 plate, 80 ampere hour. Starting capacity 98 amperes (to end voltage of 1.5 volts per cell). Lighting capacity 5 amperes for 18 hours (to end voltage of 1.75 volts per cell). Positive (+) terminal grounded. Battery mounted on left frame member under front compartment floor boards. Battery mounted crosswise, accesible after removing special cover plate.

**IGNITION:**—Mallory Large Type. Special coil (two section secondary). Coil mounted on top of ignition unit at front of engine. Ignition current 0.7 amperes at 6.2 volts (engine running at 1500 R.P.M.), 3 amperes at 6.2 volts (engine stopped). Ignition switch co-incident with steering post lock (mounted on steering column at instrument board).

**Distributor Ford-Mallory Type.** Two breaker arm, 8 lobe cam type. Right hand contacts (viewed from front of engine) used for timing, left hand contacts used to load coil (contacts close first and open first but spark does not occur until right hand contacts open). See article on Mallory distributors in Equipment Section. Breaker contact gap set at .014-.016 inch. To set contact gap (ignition unit must be off engine), loosen lock-screw on stationary contact mounting, turn up contact stud (insert screw-driver through hole in side of housing closed by rubber plug), tighten lock-screw. Breaker arm spring tension 14-18 ounces. Distributor is full automatic. There is an auxiliary vacuum spark control consisting of a brake controlled by a vacuum piston which bears on the governor plate—see article on Mallory Vacuum Spark Control in Equipment Section. Maximum automatic advance is 22 degrees at 1500 R.P.M.

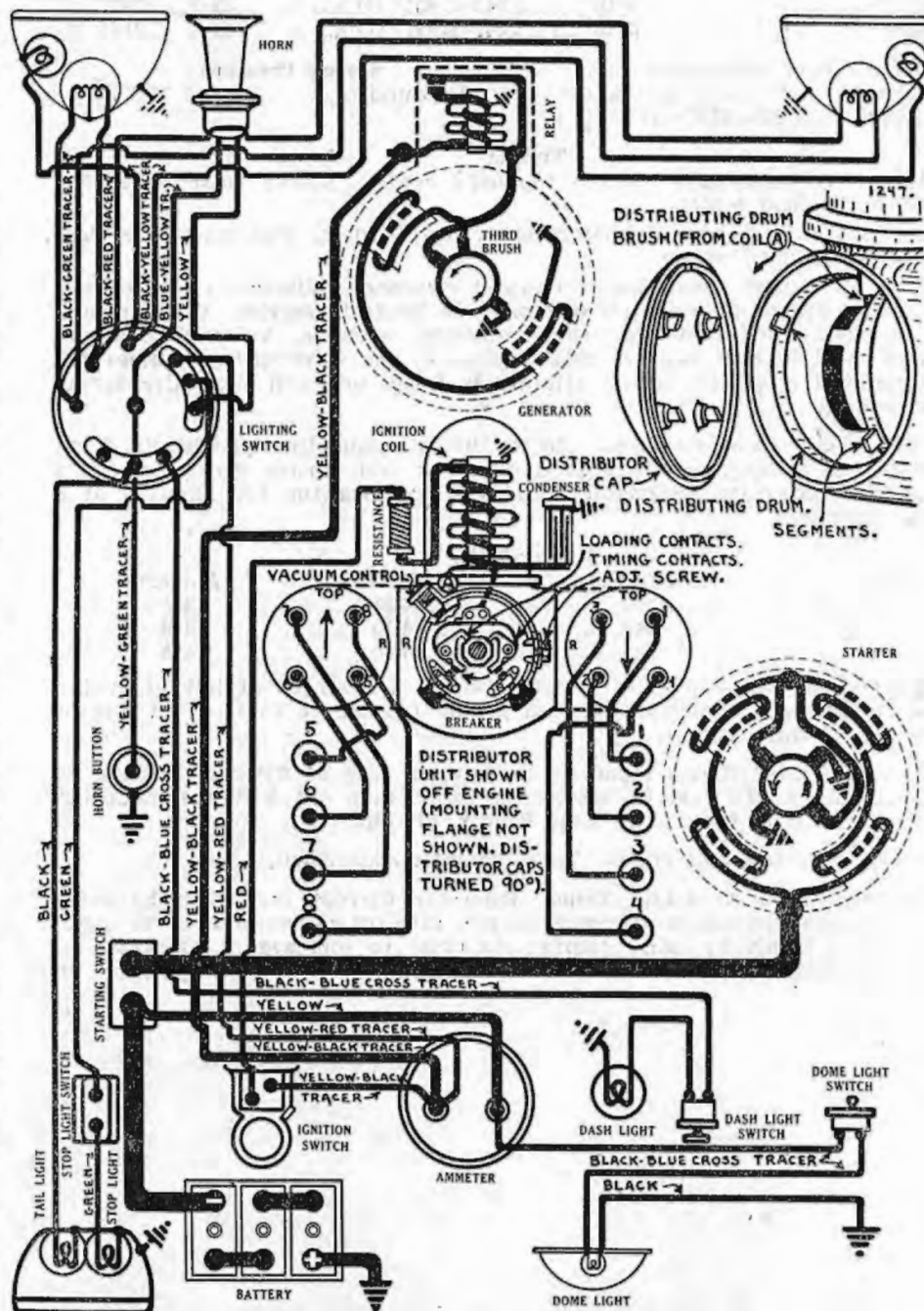
**Mounting:**—Complete ignition unit mounted on front of engine on gear case cover. Driven directly through offset tongue-and-slot coupling from forward end of camshaft. Coil mounted on top of distributor unit with condenser on left and primary ballast coil on right side (viewed from front of car). Distributor consists of distributing drum with jump spark segments rotating between two distributor caps containing four terminals each. Spark plugs in right hand bank connected to terminals on right hand distributor cap and spark plugs in left hand bank connected to terminals on left hand distributor cap (see illustration). To remove ignition unit, disconnect primary lead, take off two distributor caps (without disturbing the cable connections), take out four cap screws in mounting flange and lift unit out.

**Oiling:**—1000 Miles. Light engine oil in oiler on front of ignition unit.

**Timing:**—Standard setting top dead center with full retard. Ignition unit built to provide this setting when properly mounted on engine (drive through tongue-and-slot coupling) and ignition setting should not be required. An adjustment is provided (breaker plate locked to housing by means of lock-screw passing through slotted hole in housing—see illustration) which allows breaker plate to be rotated 5° both ways to take care of variations in dimension limits and contact gap. To check timing, turn crankshaft to firing position (piston on top dead center), check contact gap, loosen lock-screw and rotate plate until right hand contacts begin to open (use a test lamp).

**Firing Order:**—1-5-4-8-6-3-7-2 with cylinders numbered as indicated on diagram. This is 1R-1L-4R-4L-2L-3R-3L-2R with cylinder banks right (R) and left (L) as viewed from the driver's seat. No. 1 cylinder nearest the radiator.

**Spark Plugs:**—7/8-18 S.A.E. Champion Type C-4-X. Set gaps at .025 inch. Hold within limits of .022-.027 inch.



# F O R D

## V-8 MODEL (1932)

### FORD GENERATING, STARTING SYSTEM FORD-MALLORY IGNITION

**VALVE TIMING:**—Engine 'L' head type. Valves on inner side of cylinder block in 'valve alley' accessible after removing intake manifold. No tappet adjustment provided. Camshaft gear driven from crankshaft.

	Head Diameter	Stem Diameter	Length	Seat Angle	Lift
Intake	1½"	5/16"	4¾" (O.A.L.)	45°	300"
Exhaust	1½"	5/16"	4¾" (O.A.L.)	45°	300"
	Tappet Clearance		Spring Pressure		
	No adjustment provided or required		40-42 pounds.		
	Factory setting approximately .015"				

#### Timing

Intake valves open 9½ degrees before top dead center. Intake valves close 54½ degrees after lower dead center.

Exhaust valves open 57½ degrees before lower dead center. Exhaust valves close 6½ degrees after top dead center.

**To Set Valve Timing.** Camshaft gear and crankshaft gears are marked. Mesh gears so that the '0' mark on the crankshaft gear is directly opposite the '1' mark on the camshaft gear.

**Special Note:**—Valve stem guides are split. They must be removed in order to take valves out of engine (because of lifter on end of valve stem). Guides can be removed after taking out spring retainer and releasing valve springs. Valve stems have a mushroom end which rests on the valve lifter bearing on the cam face. First engines built had this lifter welded directly to the valve stem. Valves should be replaced if tappet clearance exceeds above limit.

**STARTER:**—Ford V8. Type. Starter drives through inboard Bendix drive. Rotation counter-clockwise at commutator end. Brush spring tension 2 pounds. Starter cranks engine at 1070 R.P.M. drawing 200 amperes at 6 volts (starting).

Starter Data			
Torque	R.P.M.	Volts	Amperes
4 lb. ft.	1070	4.6	200
8 " "	860	4.3	340
12 " "	300	3.65	465

**Mounting:**—Starter mounted on front of flywheel housing at right of engine. Bendix drive under cover at rear of housing. To remove starter, take out two bolts on starter end plate, pull starter out.

**Oiling:**—Starter bearings fitted with oilless bushings requiring no attention.

**GENERATOR:**—Ford-Auto-Lite Type. Generator current regulation by third brush system. To adjust generator output, take off commutator cover band, shift third brush by hand counter-clockwise to increase or clockwise to decrease charging rate. Third brush mounting plate held in posi-

tion by friction. Rotation counter-clockwise at commutator end. Maximum charging rate should not exceed 10-12 amperes. Standard setting 10 amperes at 7 volts reached at 2000 R.P.M. or 30 M.P.H.

Generator Data		
Amperes	Volts	R.P.M.
5.2	6.4	800
10.7	6.9	1600
4.8	6.75	4000

Brush spring tension 20 ounces. Shunt field draws 6.3 amperes at 7 volts. Motoring generator draws 5.75 amperes at 7 volts.

**Mounting:**—Generator mounted on bracket on top of cylinder block at front of engine and belt driven from crankshaft in tandem with two water pumps. Fan mounted on end of generator shaft. To remove generator, disconnect lead, loosen mounting stud clamp bolt, lower generator, slip off drive belt, lift generator out.

**Belt Adjustment.** Belt is adjusted by raising generator. To adjust belt tension, loosen mounting stud clamp bolt, lift generator until correct belt tension is secured, tighten clamp bolt. Generator stud is threaded and is adjusted for height by turning the adjusting nut on the generator mounting collar.

**Oiling:**—1000 Miles. Light oil in oiler at each end of generator. Commutator bearing oiled from wick oiler in oil well under bearing cap.

**RELAY:**—Ford Type. Mounted on generator field frame. Relay contacts close at 8.5 M.P.H. or 650 R.P.M. of generator when voltage reaches 7.5 volts and open at 7 M.P.H. or 550 R.P.M. of generator with discharge current of 2.5 amperes. Relay contact gap limits .015-.020 inch. Air gap limits .010-.015 inch (contacts closed).

**LIGHTING:**—Essex Wire Co. Switch, Ford V-8 Type. Lighting switch mounted at lower end of steering column and controlled by lever on steering wheel. Dimmer system 'depressed beam' double filament headlight bulbs controlled by lighting switch.

Position	Lamp Sizes		Base	Mazda No.
	Voltage	Candlepower		
Headlights	6-8	21-21	D.C.	1110
Parking Bulbs (in headlights)	6-8	3	S.C.	63
Cowl Lights (when used)	6-8	3	S.C.	63
Dash and Tail Lights	6-8	3	S.C.	63
Stop Light	6-8	21	S.C.	1129
Dome Light (passenger cars)	6-8	3	S.C.	63
Dome Light (commercial cars)	6-8	15	S.C.	87

**GASOLINE GAUGE:**—K-S Telegauge, hydrostatic type (see Equipment Section).

**FUEL PUMP:**—Ford Type, mounted between cylinder banks at rear of engine.

# FRANKLIN

## SUPERCHARGED AIRMAN, SERIES 16 (1932)

### DELCO-REMY SYSTEM

**CAR SERIAL NUMBER:**—Stamped on plate on dash under hood.

**ENGINE NUMBER:**—Stamped on left side crankcase directly back of fuel pump.

**BATTERY:**—National, Type H3-21M, 6 volt, 21 plates, 144 ampere hour capacity (20 hour rate). Positive (+) terminal grounded. Battery mounted on outside of right hand frame member under dust shield. Battery size, 5½ inches wide, 20⅝ long inches long, 8 13/16 inches high.

**IGNITION:**—Coil Model 532-C. Coil mounted on back of instrument board on left side. Ignition current 1.7-2 amperes at 6 volts (engine running), 4 amperes at 6 volts (engine stopped). Ignition switch mounted at extreme left of instrument panel—Clum Model 9193.

**Distributor Model 643-N.** Single breaker arm, 6-lobe cam type with semi-automatic advance. Manual advance controlled by button at lower right center of instrument panel. Ordinary running position with button pushed in, spark fully advanced. Pull out button to retard spark. Breaker contact gap set at .020 inch. Hold within limits of .018-.024 inch. To set gap, loosen lock screw on stationary contact mounting plate, turn eccentric adjusting screw, tighten lock screw. Breaker arm spring tension 17-21 ounces (measured at tip of breaker arm wish spring scale at right angles to contact surface). Maximum manual advance 25° (engine).

Engine	Degrees	Automatic Advance	R.P.M.	Engine
0	Start	Distributor	200	400
31	15½	Distributor	1200	2400

**Mounting:**—Distributor mounted on right side of crankcase. To remove, disconnect primary lead, take off distributor cap and cable conduit, loosen advance arm clamp bolt, lift distributor out.

**Oiling:**—500 Miles. Turn down grease cup on side of shaft housing one half turn. Keep cup filled with heat resistant grease such as Socony B-R-X2.

1000 Miles. Take off distributor cap and rotor. Fill wick oiler in center of shaft with light engine oil, put one drop on breaker arm pivot pin, apply thin film vaseline to face of breaker cam.

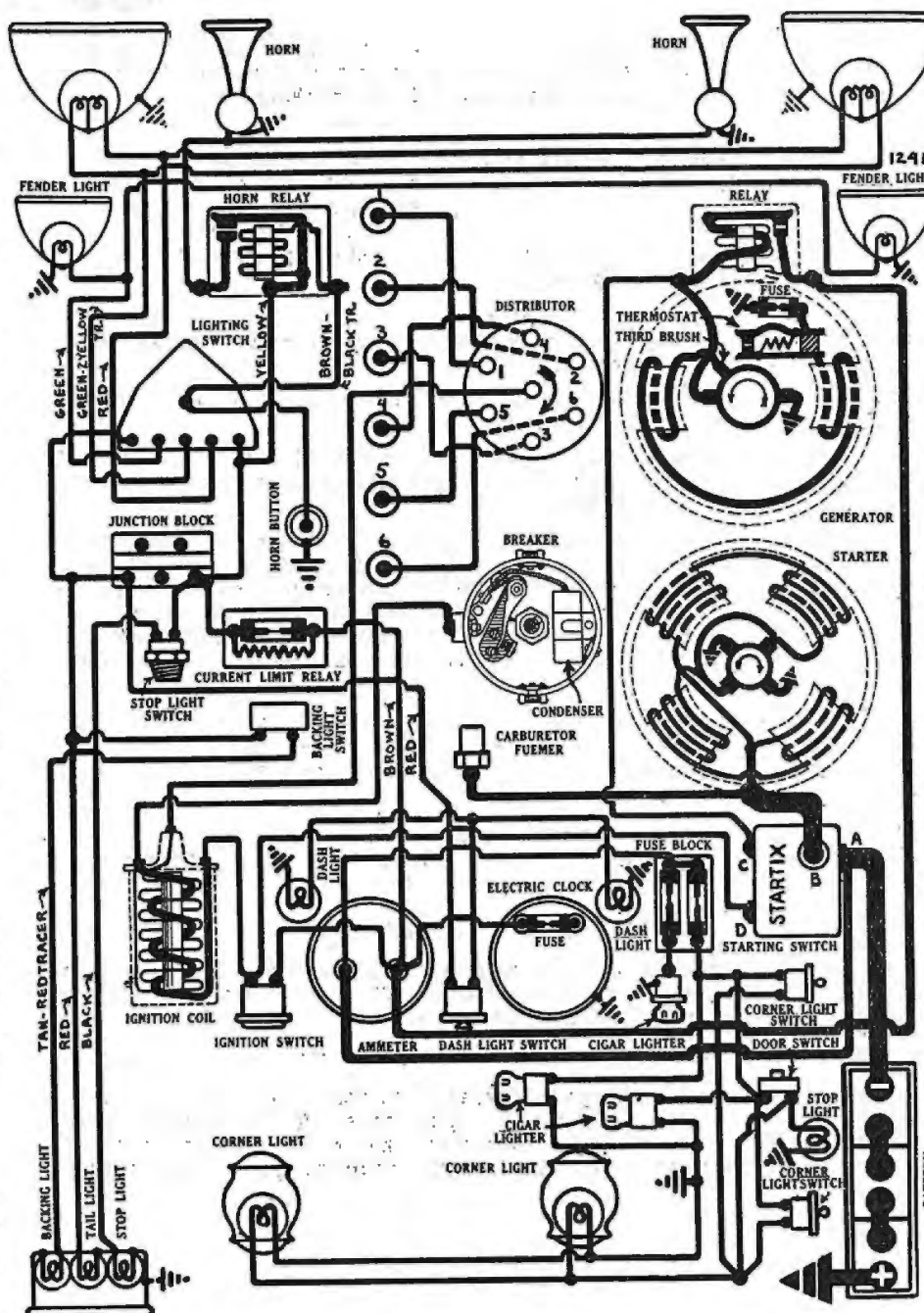
**Timing:**—Standard setting 1" (measured on fan wheel) before top dead center with manual spark control advanced. To set timing, advance manual spark control button (push button in toward dash), see that distributor is rotated counter-clockwise to end of advance arm slot, take off inspection hole cover in fan wheel housing at right of engine. With No. 1 piston on compression turn engine over until '0' mark on fanwheel (which is top dead center mark) is exactly 1" before or to the right of the indicator line on the housing, loosen advance arm clamp screw, rotate distributor until contacts begin to open, tighten clamp screw, connect spark plugs as indicated on diagram.

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

**Spark Plugs:**—18 MM. Metric. Champion Type C-7. Set gaps at .025 inch.

**VALVE TIMING:**—Valves in cylinder head operated by rocker arm and pushrods at right of engine. Valve tappet adjustment at upper end of pushrods on rocker arm. Camshaft at right of engine. Driven by chain from crankshaft in tandem with generator drive sprocket. Chain adjusted manually by shifting generator (see Generator Mounting).

	Head Diameter	Stem Diameter	Valve Length	Seat Angle	Lift
Intake	1 27/32"	3725/3715"	6.214/6.144"	30°	5/16"
Exhaust	1 21/32"	3725/3715"	5.256/5.276"	30°	5/16"



# FRANKLIN

## SUPERCHARGED AIRMAN, SERIES 16 (1932)

### DELCO-REMY SYSTEM

**Tappet Clearance**

Intake .....007" (hot—engine idling)  
Exhaust .007" (hot—engine idling)

**Spring Pressure**

48-52 pounds (total both springs  
with valve closed)

**Timing**

Intake valves open 28° after top dead center. Close 36° after lower dead center.

Exhaust valves open 52° before lower dead center. Close 8° before top dead center.

**To Check Valve Timing.** Set tappet clearance No. 1 intake valve at .036" with No. 1 piston on top dead center entering power stroke. Place .005" feeler between rocker arm and valve stem to determine opening point, crank engine over one complete revolution and stop when tension on feeler indicates that valve is about to open (feeler will be gripped between rocker arm and valve stem). The '0' mark on the fanwheel should be between 3 3/16" and 4 3/16" past the reference line on the fanwheel housing in the inspection hole at the right of the engine.

**To Set Valve Timing.** Assemble camshaft sprocket on camshaft flange so that '0' marks on flange and sprocket line up. Turn camshaft and crankshaft so that '2' marks on sprockets line up and assemble chain.

**STARTER:—Model 723-C.** Starter drives engine through reduction gears and an inboard Bendix drive. Starter gear reduction ratio 14 to 22. Rotation (armature shaft) clockwise at commutator end. Brush spring tension 24-28 ounces. Starter switch Model 408-A or 404-T. Starter cranks engine at 175 R.P.M. drawing 135 amperes at 5 volts.

**Starter Data**

Torque	R.P.M.	Volts	Amperes
0 lb. ft.	3500	5.0	70
2 "	2550	5.0	135
22 "	Lock	3.0	600

**Mounting:—**Starter flange mounted on right front face of flywheel housing. To remove, disconnect cable and fuemer lead, take out 3 flange mounting screws, pull starter forward to clear Bendix drive, lift out.

**Oiling:—1000 Miles.** Put 8-10 drops light machine oil in each of three starter bearing oilers.

**Yearly.** Remove plug in reduction gear case and repack gears with graphite grease.

**GENERATOR:—Model 957-E.** Third brush regulation, thermostat control. Thermostat operates at 190°F. (contacts open, cuts in resistance) reducing output approximately 40%. To adjust generator output, loosen small round headed lock screw on commutator end plate, take off cover band, shift third brush by hand counter-clockwise to increase or clockwise to decrease charging rate, tighten locking screw. Rotation counter-clockwise at commutator end. With standard setting maximum charging rate is 18 amperes (cold) at 8.6 volts reached at 1800 R.P.M. or 27 M.P.H.

**Generator Data**

Cold Test			Hot Test		
Amperes	Volts	R.P.M.	Amperes	Volts	R.P.M.
19-21	8.4-8.6	1800	11-14	7.5-7.6	1900-2100

Brush spring tension 14-18 ounces. Shunt field current 2.8-3.5 amperes at 6 volts. Motoring generator draws 4-5 amperes at 6 volts. Field fuse mounted in plug on commutator end plate 5 ampere capacity.

**Mounting:—**Generator flange mounted on rear face timing chain case at right

of engine. To remove, disconnect lead, take out two upper flange mounting screws, take off nut on rear end lower flange mounting bolt, pull generator to rear to disengage drive coupling, lift out. Generator sprocket mounted on journal between generator and chain case. Timing chain and camshaft setting will not be disturbed by removal of generator if nut on forward end of lower bolt is not loosened.

**Chain Adjustment.** To take up timing chain, loosen two upper flange mounting screws, loosen nut on forward end of lower flange mounting stud, turn adjustment set screw until play in chain between generator sprocket and camshaft sprocket is 3/8-1/2 inch (check by removing inspection plug in top of chain case and hooking wire under chain). Tighten mounting screws and stud nut. Chain should run noiselessly with proper adjustment. If chain hums, adjustment should be backed off slightly.

**Oiling:—1000 Miles.** Put 8-10 drops light machine oil in oiler on commutator end. Drive end bearing oiled from chain case.

**RELAY:—Model 265-B.** Relay mounted on generator. Relay contacts close at 680 R.P.M. of generator or 8-9 M.P.H. with generator voltage of 6.75-7.5 volts and open with discharge current of 0-2.5 amperes. Relay contact gap limits .015-.025 inch. Air gap limits .012-.017 inch (contacts closed).

**LIGHTING:—Delco-Remy Switch, Model 486-V.** Lighting switch mounted at lower end of steering column controlled by lower lever on steering wheel. Dimmer system 'depressed beam' double filament headlight bulbs controlled by lighting switch. Lighting switch positions:

1. Vertical—All lights off.
2. No. 1 Right—Parking lights on fenders on. Tail lights on.
3. No. 1 Left—Dim headlights on. Tail light on.
4. No. 2 Left—Bright headlights on. Tail lights on.

**Lamp Sizes**

Position	Voltage	Candlepower	Base	Mazda No.
Headlights	6-8	21-21	D.C.	1110
Fender Lights	6-8	3	S.C.	63
Dash and Tail Lights	6-8	3	S.C.	63
Stop and Backing Lights	6-8	15	S.C.	87
Corner and Step Lights	6-8	3	S.C.	63

**CURRENT LIMIT RELAY:—**Mounted on dash. Consists of 20 ampere fuse connected across a fixed resistance. Fuse blows when current in line reaches 20 amperes, fixed resistance then limits current to 30 amperes.

**FUSES:—**Lighting fuse on Current Limit Relay 20 ampere capacity. Lighting fuses on fuse block on dash (body circuits) 30 ampere capacity. Generator field fuse 5 ampere capacity. Fuse on back of clock 5 ampere capacity.

**GASOLINE GAUGE:—K-S** Telegauge hydrostatic type (see Equipment Section).

**FUEL PUMP:—A.C.** Mechanical fuel pump mounted at left of engine (see Equipment Section).

**HORNS:—Klaxon** horns, Model K-18-C or K-14. Horns operated by horn relay. Horn current 6 amperes each.

**Horn Relay, Model 266-T.** Pressing of horn button completes horn relay circuit, energizes horn relay winding which closes horn relay contacts. Closing of horn relay contacts completes horn circuit. Horn current does not pass through horn button. Relay requires .25 amperes to close contacts. Horn relay contact gap limits .015-.025 inch. Air gap limits .012-.017 inch.

## FRANKLIN 12 CYLINDER MODEL (1932) DELCO-REMY SYSTEM

**BATTERY:**—Willard, Type RH-5-19, 6 volt, 19 plates, 153 ampere hour capacity (20 hour rate). Starting capacity 180 amperes for 20 minutes. Positive (+) terminal grounded. Battery mounted on right frame member. Battery size 7 1/16 inches wide, 13 inches long, 9 3/4 inches high.

**IGNITION:**—Coil Model 532-C (2 used). Coils mounted on the dash. Ignition current 6 amperes at 6 volts (engine running), 10 amperes at 6 volts (engine stopped), maximum draw for both coils. Ignition switch Delco-Remy, Model 427-Z, mounted on instrument board.

**Distributor Model 667-A.** Two breaker arm, 6 lobe cam type with semi-automatic advance. Breaker contacts open alternately at 30 degree intervals corresponding to the 60 degree firing interval of the engine. Contacts must be synchronized (see Timing). Breaker contact gap set at .022 inch. Hold within limits of .018-.024 inch. To set gap, loosen lock screw on stationary contact mounting plate, turn eccentric adjusting screw, tighten lock screw. Breaker arm spring tension 17-21 ounces (measured at tip of breaker arm with spring scale at right angles to contact surface). Maximum manual advance 15 degrees (engine).

Engine Degrees	Automatic Advance Distributor	R.P.M. Distributor	Engine
2.0	Start	200	400
14	7	700	1400

**Mounting:**—Distributor mounted at rear of engine between cylinder banks. To remove, disconnect primary leads, disconnect manual spark control, take off distributor cap with cables intact, take out hold-down screw in advance arm, lift distributor out.

**Oiling:**—500 Miles. Turn down grease cup on side of shaft housing one half turn. Keep filled with heat resistant grease such as Socony B-R-X2.

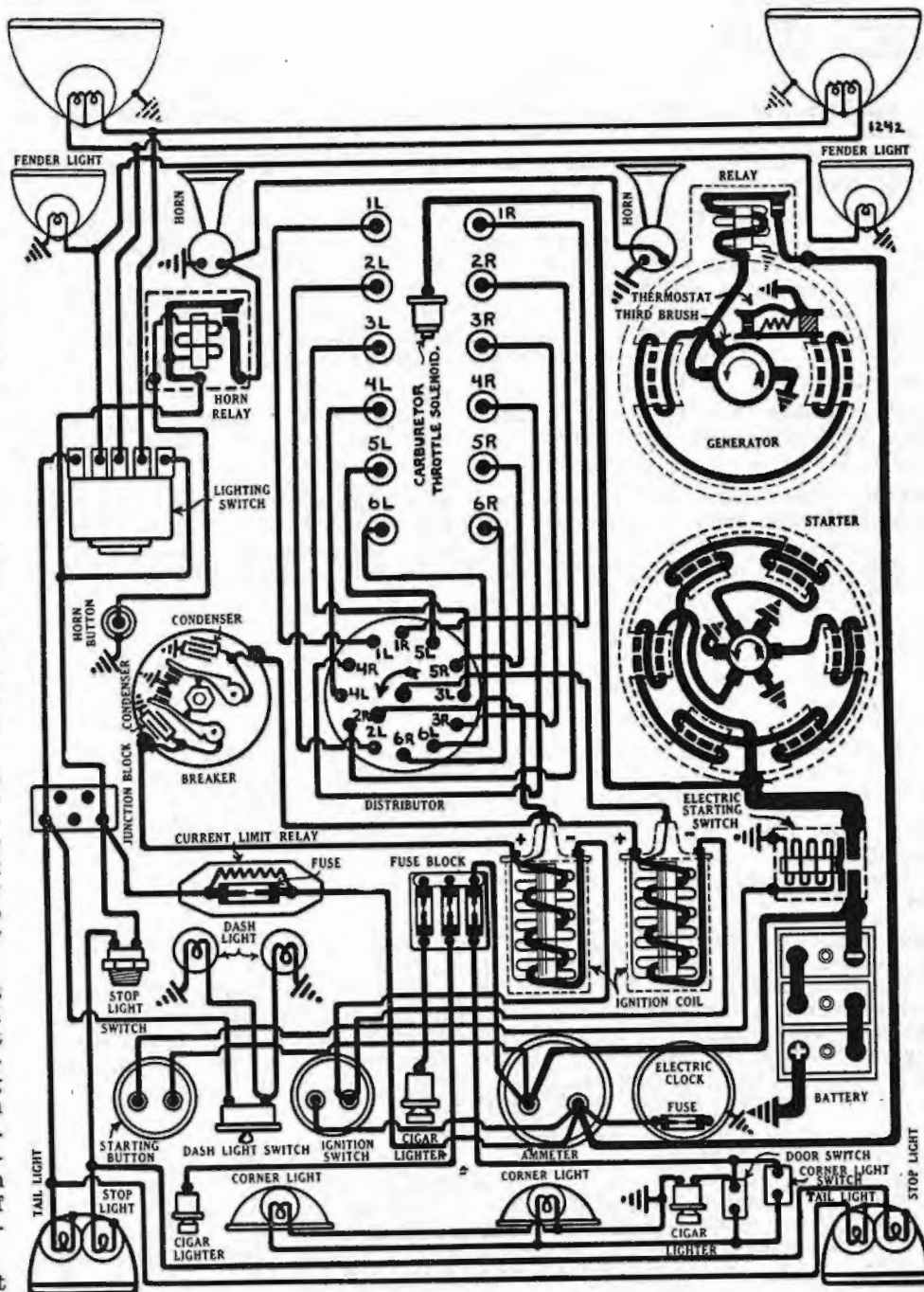
1000 Miles. Take off distributor cap and rotor, fill wick oiler in center of shaft with light engine oil, put one drop oil on breaker arm pivot pins, apply thin film vaseline to face of breaker cam.

**Timing:**—Standard setting 3/4" (on fanwheel) before top dead center with manual spark control advanced. To set timing, advance manual spark control, take off cover on inspection hole in fanwheel housing at front of engine. With No. 6 piston (left hand bank) on compression, turn engine over until second '0' mark on fanwheel is 3/4 inch before the center line mark on the fanwheel housing. Loosen advance arm clamp bolt, rotate distributor cup until first set of contacts (mounted directly on breaker plate) begin to open, tighten clamp bolt. Set timing for right hand bank of cylinders by synchronizing contacts.

**Synchronization of Contacts—first method.** After setting ignition for left hand cylinder bank (above) turn engine over two revolutions until No. 1 piston of the right bank enters compression stroke and stop with the first '0' mark on the fanwheel 3/4 inch before the center line mark on the fanwheel housing. Then loosen lock screws on movable sub-plate (carrying second set of contacts), turn eccentric adjusting screw until contacts begin to open, tighten locking screws. Contacts will then be correctly synchronized.

**Synchronization of Contacts—second method.** Contacts can be synchronized on a rotary spark gap by adjusting movable plate until contacts open at 30 degree intervals. After synchronizing contacts, check contact gap. If outside limits of .018-.024 inch, reset at .022 inch and repeat synchronization.

**Firing Order:**—1R-6L-4R-3L-2R-5L-6R-1L-3R-4L-5R-2L with cylinder banks right (R) and left (L) as viewed from the driver's seat and No. 1 cylinder nearest the radiator.



# FRANKLIN

## 12 CYLINDER MODEL (1932)

### DELCO-REMY SYSTEM

**Spark Plugs:**—18 MM. Metric. Champion Type C-7. Set gaps at .025 inch.

**VALVE TIMING:**—Overhead valve type engine. Valves in cylinder heads operated through rocker arms by pushrods on outside of each cylinder bank. Tappet adjustment on rocker arm at upper end of pushrod.

	Valve Dimensions			
	Head Diameter	Stem Diameter	Stem Length	Valve Lift
Intake	1 15/8"	.372"	6.555"	.120"
Exhaust	1 51/64"	.372"	6.555"	.120"

	Tappet Clearance		Spring Pressure
	Operating	Timing	
Intake	.007" (hot)	.031" (cold)	48-52 pounds
Exhaust	.007" (hot)	.031" (cold)	

#### Timing

Intake valves set to open with '0' mark (dead center mark) 2 1/2 inches past the indicator on the fanwheel with tappet clearance of .031 inch. To check timing, set tappet clearance intake valves No. 1 cylinder (right hand bank), No. 6 cylinder (left hand bank) at .031 inch, using a feeler gauge. Turn engine over one complete revolution past the firing position of No. 1R cylinder and stop with the first '0' mark on the fanwheel exactly 2 1/2 inches past the center line mark on the fanwheel housing. No. 1R intake valve should open at this point. Turn engine over 60 degrees and stop with sec-'0' mark on fanwheel exactly 2 1/2 inches past center mark on fanwheel housing. No. 6L intake valve should begin to open at this point. Set tappet clearance of all valves at .007 inch with engine hot and idling.

**STARTER:**—Model 545. Starter connected to engine through Bendix drive. Rotation counter-clockwise at commutator end. Brush spring tension 36-40 ounces.

Starter Data			
Torque	R.P.M.	Volts	Amperes
0 lb. ft.	3000	5.0	70
19 "	Lock	3.0	500

**Starter Switch:**—Delco-Remy Operating Solenoid No. 120. Starting switch is of the electro-magnetic type and consists of an operating solenoid controlled by a push button switch on the instrument panel.

**Carburetor Control:**—Delco-Remy Solenoid No. 1370. This solenoid is set to open the carburetor throttle to one third of the full open position for starting. It is connected to the starter terminal and operates for as long as the starter is cranking the engine.

**Mounting:**—Starter mounted on forward face of flywheel housing at right of engine. To remove, disconnect cables, take out flange mounting screws, pull starter forward to clear Bendix, lift out.

**Oiling:**—Starter bearings are oilless. They require no attention.

**GENERATOR:**—Model 931-G. Third brush regulation, thermostat control. Thermostat contacts open at 190° F. cutting resistance in field circuit and re-

ducing output approximately 40%. To adjust charging rate, loosen lock screw on commutator end plate, take off cover band, shift third brush by hand counter-clockwise to increase or clockwise to decrease charging rate, tighten locking screw.

#### Generator Data

Amperes	Cold Test		R.P.M.	Hot Test	
	Volts	Volts		Amperes	Volts
22-24	8.6-9.0	1400	13.5-16.5	7.7-8.1	1700

Brush spring tension 20-28 ounces. Shunt field current 3.5-4.0 amperes at 6 volts.

**Mounting:**—Generator flange mounted on rear face of timing chain case at right of engine. To remove generator, disconnect lead, take out flange mounting screws, pull generator to rear to disengage drive coupling, lift out. Do not disturb intermediate plate carrying generator sprocket.

**Oiling:**—1000 Miles. Put 8-10 drops light engine oil in oiler on commutator end. Drive end bearing oiled from chain case.

**RELAY:**—Model 265-B. Relay mounted on generator. Relay contacts close when generator voltage reaches 6.75-7.5 volts and open with 0-2.5 ampere discharge current. Relay contact gap limits .015-.025 inch. Air gap limits .012-.017 inch (contacts closed).

**LIGHTING:**—Delco-Remy Switch, Model 486-V. Lighting switch is mounted at lower end of steering column controlled by lever on steering wheel. Dimmer system 'depressed beam' double filament headlight bulbs controlled by lighting switch.

Position	Lamp Sizes			Mazda No.
	Voltage	Candlepower	Base	
Headlights	6-8	21-21	D.C.	1110
Fender Lights	6-8	3	S.C.	63
Dash and Tail Lights	6-8	3	S.C.	63
Stop Light	6-8	15	S.C.	87
Corner Lights	6-8	3	S.C.	63

**CURRENT LIMIT RELAY:**—Mounted on dash. Consists of a fixed resistance connected across a 20 ampere fuse. Fuse blows when current in line reaches 20 amperes and fixed resistance then limits current to 30 amperes.

**FUSES:**—Lighting fuse on Current Limit Relay 20 ampere capacity. Lighting fuses on fuse block on dash (body circuits) 30 ampere capacity.

**FUEL PUMP:**—A.C. mechanical fuel pump mounted on left side of crankcase (see Equipment Section).

**HORNS:**—Klaxon Horn, Model K-18-C and K-14. Horns controlled by horn relay. Current draw approximately 6 amperes each.

**Horn Relay:**—Model 266-T. Horn relay circuit is controlled by horn button on steering wheel. Pressing horn button completes horn relay circuit, energizes relay solenoid, closes horn relay contacts. This completes horn circuit. Horn current does not pass through horn button. Relay contact gap limits .015-.025 inch. Air gap limits .012-.017 inch.

# GRAHAM

PROSPERITY SIX (1931), GRAHAM SIX (1932)  
DELCO-REMY GENERATING, STARTING SYSTEM  
DELCO-REMY IGNITION

**CAR SERIAL NUMBER:**—Stamped on plate under floor mat near right rear door or under front seat cushion.

**ENGINE NUMBER:**—Stamped on plate on engine block.

**BATTERY:**—Willard, Type WS-1-13. 6 volt, 13 plate, 86 ampere hour capacity (20 hour rate). Starting capacity 105 amperes for 20 minutes. Positive (+) terminal grounded. Battery is mounted on right frame member under right front seat. Battery size 7 1/16 inches wide, 9 1/16 inches long, 8 13/16 inches high.

**IGNITION:**—Coil Model 528-C. Coil is mounted on the rear of the dash. Ignition current is 1.8 amperes at 6 volts with engine running and 4 amperes at 6 volts with engine stopped. The ignition switch is an Oakes 'Hershey' coincidental steering post and ignition switch lock.

**Distributor Model 632-F.** Breaker contacts separate .018-.024 inch. Set contact gap by loosening lock nut on crescent shaped stationary contact mounting plate and turning eccentric adjusting screw until gap is .020 inch with breaker arm on lobe of cam. Breaker arm spring tension is 17-21 ounces (measured at tip of breaker arm with spring scale at right angles to contact surface). Distributor is full automatic (manual advance not used).

Degrees	Automatic Advance		R.P.M.
Engine	Distributor	Distributor	Engine
0.....	Start	300.....	600
20.....	10	1400.....	2800

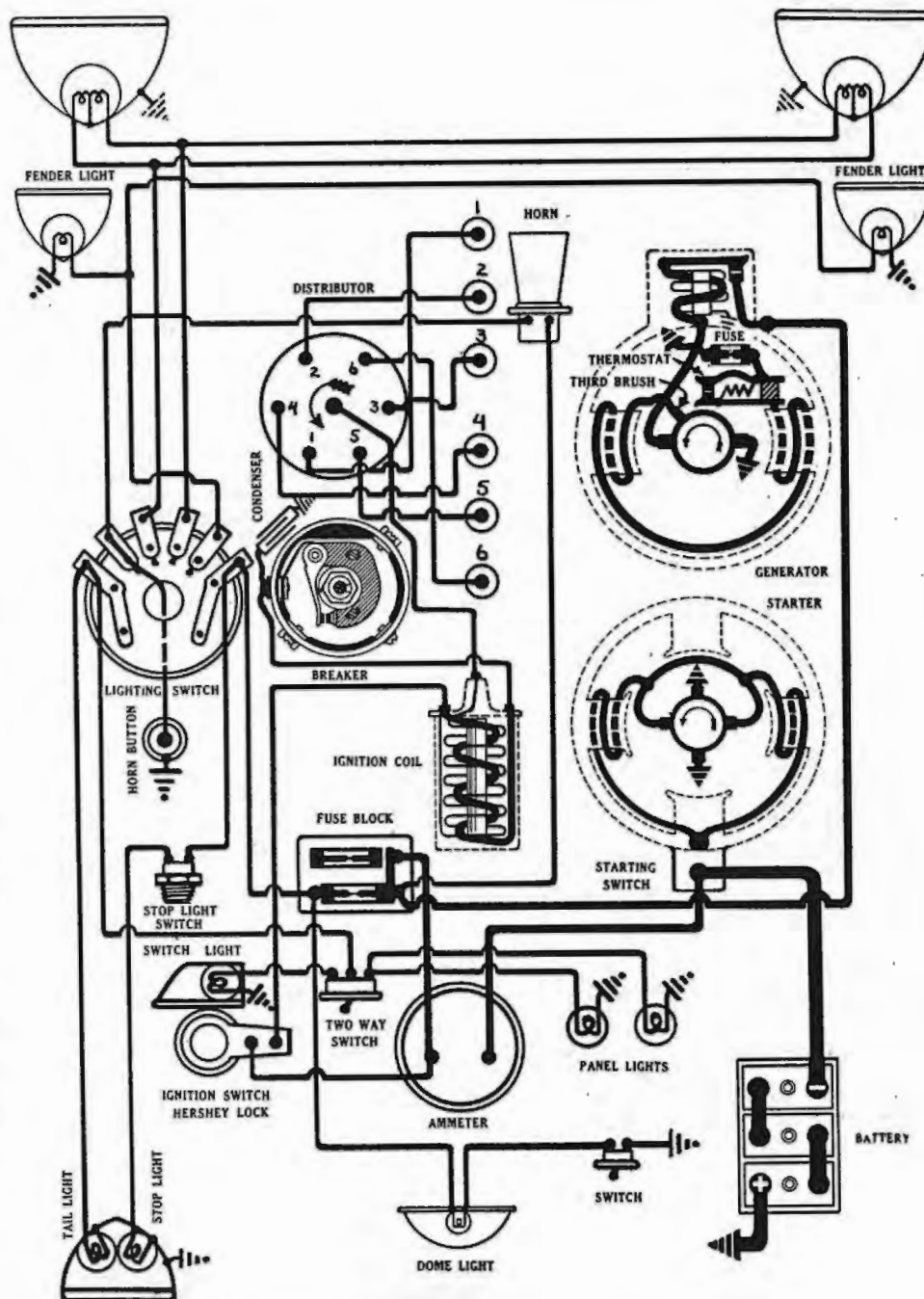
**Mounting:**—Distributor is mounted on the cylinder head. It may be removed from the left side. To remove distributor, disconnect primary lead and remove distributor head with cables intact. Then loosen advance arm clamp screw and lift distributor from place. The distributor may be removed without disturbing timing providing the advance arm is left in place. The hold-down screw should be removed and the distributor can then be lifted out. Distributor drive is through an offset tongue and slot coupling. In mounting distributor, make certain that the tongue enters the slot properly.

**Oiling:**—Fill the grease cup on the side of the shaft with medium cup grease and turn down one full turn every two weeks or each 500 miles of operation. Every 1000 miles remove the distributor head and rotor and saturate the wick in the center of the shaft with light engine oil and put a small bit of vaseline on the face of the breaker cam.

**Timing:**—Breaker contacts begin to open when the piston entering power stroke reaches a position 1 degree or 7/64 inch (on the flywheel) before top dead center with the spark control button in the fully advanced position. To set timing, crank engine over until piston No. 1 enters compression stroke (the up stroke with both valves closed) and stop when the flywheel mark 'SFADV-I' (which is 1 degree before the top dead center mark 'Top DC 1-6') is directly opposite the indicator on the flywheel housing. Loosen advance arm clamp screw and rotate distributor in a clockwise direction until the contacts begin to open. Tighten the clamp screw and check position of rotor to see that it is directly opposite segment connected to the spark plug in cylinder No. 1.

**Firing Order:**—The firing order is 1-5-3-6-2-4.

**Spark Plugs:**—7/8-18 S.A.E. Champion Type C-4. Set gaps at .025 inch.



# GRAHAM

## PROSPERITY SIX (1931), GRAHAM SIX (1932) DELCO-REMY GENERATING, STARTING SYSTEM DELCO-REMY IGNITION

**VALVE TIMING:**—Valves at left of engine. Camshaft chain driven in tandem with accessory drive sprocket. Chain adjusted manually by shifting accessory sprocket (see Adjustment below).

	Head Diameter	Stem Diameter	Length	Seat Angle	Lift
Intake	1.562"	.340"	5.5"	30°	.318"
Exhaust	1.499"	.340"	5.5"	45°	.327"

	Tappet Clearance		Spring Pressure	
	Operating	Timing	Closed	Open
Intake	.010" (hot).		50 pounds	
Exhaust	.010" (hot)-.012" (cold).		94 pounds	

### Timing

Intake valves open at top dead center. Close 40° after lower dead center (4 15/64 inches on 12 1/8 inch flywheel) with piston 13/32 inch up on compression stroke.

Exhaust valves open 40° before lower dead center (4 15/64 inches on 12 1/8 inch flywheel) with piston 13/32 inch from bottom of power stroke and close 10° after top dead center (1 1/16 inches on 12 1/8 inch flywheel) with piston 3/64 inch down on intake stroke.

**To Check Valve Timing.** Crank engine over until piston No. 6 is on top dead center entering power stroke. Set tappet clearance of No. 6 exhaust valve at .012 inch. Turn engine one complete revolution and stop when the flywheel mark 'EXCL.1-6' (which is 1 1/16 inches past the top dead center mark 'DC.1-6') is opposite the indicator. The No. 6 exhaust valve should close at this point.

**To Set Valve Timing.** Turn crankshaft until piston No. 1 is on top dead center. Rotate camshaft in direction of rotation until the mark on the camshaft sprocket is exactly 5 inches from the mark on the crankshaft sprocket. Mesh timing chain so there are 10 links or eleven link pins between the marks (inclusive of the tooth meshed directly opposite the mark on the sprockets).

**Timing Chain Adjustment.** Timing chain is adjusted by shifting accessory drive sprocket mounting (water pump bracket). To take up chain, loosen two flange mounting capscrews, back off lock screw on adjustment set screw, turn up adjustment screw until chain begins to hum, back off adjustment until chain runs noiselessly, tighten locknut and mounting screws. Adjustment should be made at six month intervals.

**STARTER:**—Model 714-V. Starter is connected to the engine through a manual pinion shift interconnected with the starting switch pedal. The direction of rotation is counter-clockwise, viewed from the commutator end. Starter cranks engine at 120 R.P.M. Brush spring tension is 24-28 ounces.

Starter Data			
Torque	R.P.M.	Volts	Amperes
0 lb. ft.	5000	5	65
12 "	Lock	3.63	475

**Mounting:**—Starter is flange mounted at right of engine on forward side of flywheel housing. To remove starter, disconnect cable and starting pedal linkage and remove nuts on three flange mounting studs. Then pull starter forward to clear drive and lift from place.

**Oiling:**—Put 8 or 10 drops of light engine oil in the oiler on the commutator

end of the starter every two weeks or each 500 miles of operation. The drive end bearing is oilless.

**GENERATOR:**—Model 957-B. The direction of rotation is counter-clockwise, viewed from the commutator end. Generator current regulation is by third brush shunt field and thermostat. Thermostat contacts open at 165°F. cutting the resistance across the thermostat contacts in series with the shunt field and reducing the output approximately 40%. To adjust the generator output, remove the commutator cover band and loosen the small round headed screw on the outside of the commutator end plate. Then shift the third brush by hand in a counter-clockwise direction to increase the charging rate and in the opposite direction to decrease the charging rate. Tighten the lock screw after making the adjustment. With standard car setting, the maximum charging rate is 10.8 amperes (hot) at 7.5 volts reached at 1500 R.P.M. or 32 M.P.H.

### Generator Data

Cold Test		R.P.M.	Hot Test		R.P.M.
Amperes	Volts		Amperes	Volts	
18-20	8.3-8.5	1300	9-12	7.3-7.6	1300-1500

There is a 6 ampere field fuse mounted under the fuse plug on the end plate. Generator brush spring tension is 14-18 ounces. Shunt field current is 4-6.1 amperes at 6 volts. Generator motoring draws 5.5 amperes at 6 volts.

**Mounting:**—Generator is cradle mounted at right of engine and is driven through a flexible hose coupling from an extension of the water pump shaft. To remove generator, disconnect lead and loosen mounting band. Disconnect hose coupling and slide generator from place.

**Oiling:**—Put 8 or 10 drops of light engine oil in the oiler at each end of the generator every two weeks or each 500 miles of operation.

**RELAY:**—Model 265-B. Relay is mounted on the generator. Relay closes at 700 R.P.M. or 12 M.P.H. when the generator voltage reaches 7-7.4 volts and opens with a discharge current of 0-2.5 amperes. Relay contact gap is .015-.025 inch. Air gap is .014-.020 inch with contacts closed.

**LIGHTING:**—(1931) B & S Switch, Model 50239. (1932) Clum Switch, Model 9218. Lighting switch mounted at lower end of steering column and controlled by lever on steering wheel. Dimmer system 'depressed beam' double filament headlight bulbs controlled by lighting switch.

### Lamp Sizes

Position	Voltage	Candlepower	Base	Mazda Number
Headlights	6-8	21-21	DC	1110
Fender lights	6-8	3	SC	63
Dash and tail lights	6-8	3	SC	63
Stop light	6-8	15	SC	87
Dome light	6-8	6	SC	81

**FUSES:**—Generator field fuse is 6 ampere capacity. Lighting fuse mounted on fuse block on the dash is 20 ampere capacity.

**GASOLINE GAUGE:**—K-S Telegauge hydrostatic type (see Equipment Section).

**FUEL PUMP:**—AC Type 'B' mechanical fuel pump (see Equipment Section).

**HORNS:**—Klaxon Model K-14. Vibrator type mounted under hood. Current draw 7 amperes.



# GRAHAM

## 'BLUE STREAK' EIGHT, MODEL 57 (1932)

### DELCO-REMY SYSTEM

**CAR SERIAL NUMBER:**—Stamped on plate under floor mat near right hand rear door or under front seat cushion.

**ENGINE NUMBER:**—Stamped on plate on right side of crankcase. This series 1015001 up.

**BATTERY:**—Willard, Type WS-2-15. 6 volt, 15 plate, 100 ampere hour (20 hour rate. Starting capacity 122 amperes for 20 minutes. Positive (+) terminal grounded. Battery mounted under right front seat. Battery size, 7 1/16 inches wide, 10 5/16 inches long, 8 13/16 inches high.

**IGNITION:**—Coil Model 528-C. Coil mounted on dash. Ignition current is 1.4 amperes at 6 volts (engine running), 4 amperes at 6 volts (engine stopped). Ignition switch is Oakes 'Hershey' type co-incidental ignition switch and steering column lock.

**Distributor Model 662-E.** Two breaker arm, four lobe cam type with semi-automatic advance. Must be synchronized—see Timing. Manual advance controlled by button on dash (ordinary running position with button pushed in—spark advanced, pull button out to retard for hand cranking). Set breaker gap at .020 inch. Hold within limits .018-.024 inch. Gap adjusted by loosening lock screw on stationary contact mounting plate and turning eccentric adjusting screw. Breaker arm spring tension 17-21 ounces (measured at tip of breaker arm with scale held at right angles to contact surface). Maximum manual advance 30° (engine).

Degrees	Automatic Advance		R.P.M.
Engine	Distributor	Distributor	Engine
0.....	Start .....	300.....	600
16.....	8 .....	1700.....	3400

**Mounting:**—Distributor mounted on cylinder head. To remove, disconnect primary lead and manual advance control, take off distributor cap, take out hold-down screw in advance arm, lift distributor out. Distributor is driven through offset coupling and can only be replaced in correct position.

**Oiling:**—500 Miles. Turn down grease cup on side of shaft housing one full turn. Keep cup filled with medium cup grease.

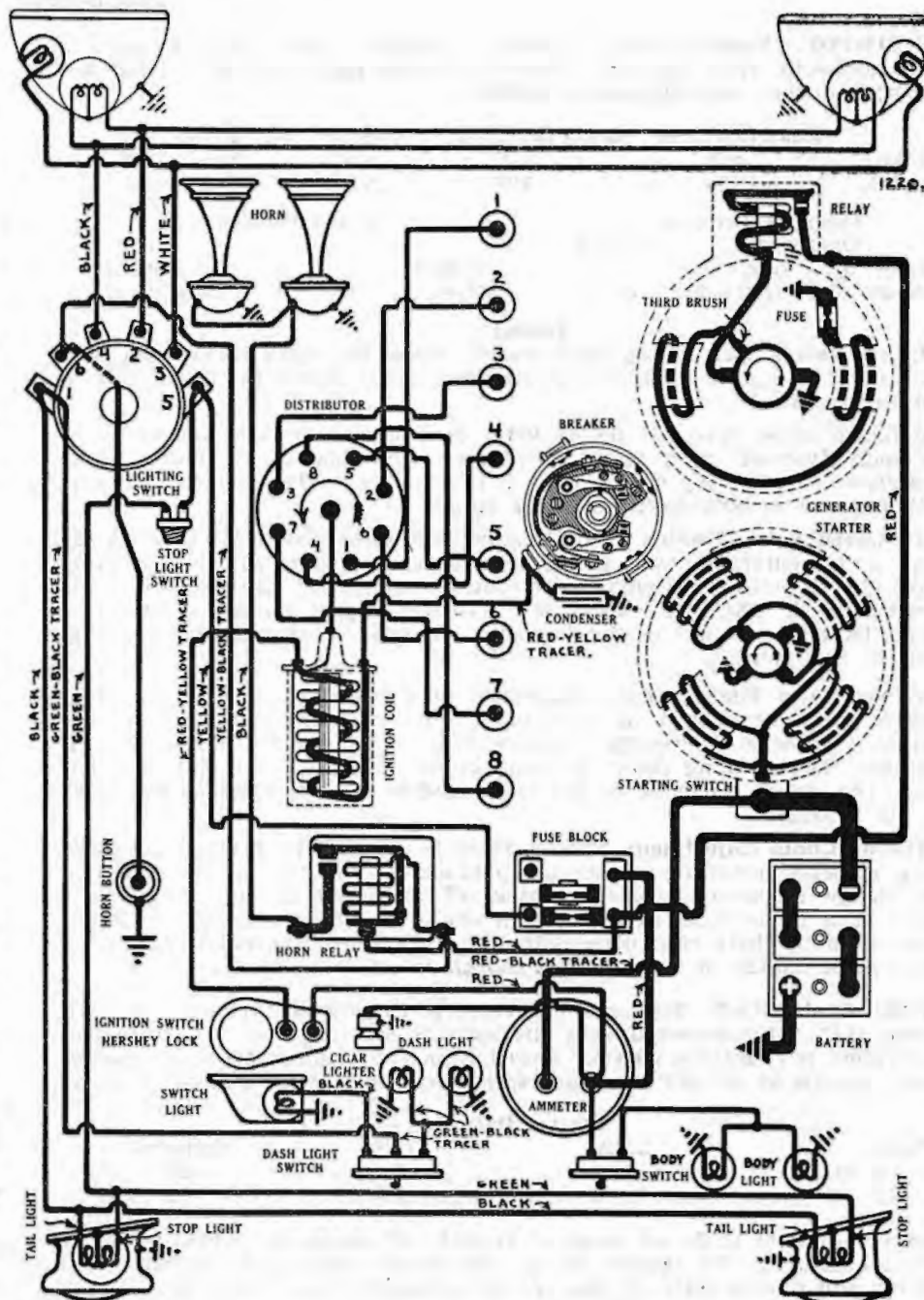
1000 Miles.—Take off distributor cap and rotor. Put light oil in wick oiler in center of shaft. Apply thin film of vaseline to face of breaker cam.

**Timing:**—Standard setting 3° or 5/16" on flywheel before top dead center with manual spark control advanced. To set timing, advance spark control button (push button in toward dash), check distributor to see that it is rotated clockwise as far as possible—to secure full manual advance, rotate crankshaft with No. 1 piston on compression stroke until flywheel mark 'SA-1' (which is 3° or 5/16" before top dead center mark 'DC-1') is opposite pointer on flywheel housing left side. Loosen advance arm clamp bolt, rotate distributor until first set of contacts (mounted directly on breaker plate) begin to open, tighten clamp bolt. Connect spark plugs as indicated on diagram.

**Synchronization of Contacts**—First method—as part of timing operation. After timing is completed, rotate crankshaft 90 degrees until No. 6 piston reaches firing position with flywheel mark 'SFAD-6' opposite pointer. Loosen two lock screws on movable breaker plate (carrying second set of contacts), turn eccentric adjusting screw until contacts begin to open, tighten locking screws. Check contact gap. If outside limits of .018-.024 inch, reset at .022 inch. repeat synchronization.

**Second Method:**—using synchronizing tool. Use Delco-Remy tool, Part No. 1838182, and follow complete directions in Equipment Section.

**VALVE TIMING:**—Valves at left of engine. Camshaft driven by three sprocket chain drive (in tandem with generator). Manual adjustment by shifting generator. First cars manufactured engine No. 1015001 to 1015031 used



# GRAHAM

## 'BLUE STREAK' EIGHT, MODEL 57 (1932)

### DELCO-REMY SYSTEM

same valves as Model 49 (1931). Specifications Engine No. 1015031 up as follows:

	Head Diameter	Stem Diameter	Length	Seat Angle	Lift
Intake	1.4325-1.4425"	3405-.341"	4 15/16"	45°	.3145"
Exhaust	1.3175-1.3075"	3405-.341"	4 15/16"	45°	.3195"

#### Tappet Clearance

Intake & Exhaust (operating).....010 (hot). Exhaust (timing) .012" (cold)

#### Spring Pressure

Engine No. 1015032 to 1016994	Engine No. 1016994 Up
Inner Spring 20-22 pounds (2 1/16")	47 1/2-52 1/2 pounds (2 3/16")
33-36 pounds (1 3/4")	103-109 pounds (1 7/8")
Outer Spring 30-34 pounds (2 3/16")	
71-74 pounds (1 7/8")	

**NOTE:**—Double springs used only on Engine Numbers 1015032 to 1016994. A single spring is used on all engines after No. 1016994. This new type single spring can be used for replacement on engines using the double valve spring.

#### Timing

Inlet opens at top dead center. Inlet valves close 40 degrees or 4.23" on 12 1/8" flywheel after lower dead center with piston .371" up on compression stroke.

Exhaust opens 40 degrees or 4.23" on 12 1/8" flywheel before lower dead center with piston .371" from bottom of power stroke. Exhaust valves close 10 degrees or 1.058" on 12 1/8" flywheel after top dead center with piston .0374" down on intake stroke.

**To Check Valve Timing.** Set tappet clearance No. 8 exhaust valve at .012". Turn engine over with No. 1 piston on compression until piston is 10° past top dead center with flywheel mark 'EC-1-8' directly opposite pointer on left of housing. No. 8 exhaust valve should close at this point. Allowable variation of closing point, 2 flywheel teeth. Reset tappet clearance at .010 inch (hot).

**To Set Valve Timing.** Rotate crankshaft until flywheel mark 'DC-1' is opposite pointer on left side of housing (top dead center position pistons No. 1 and 8). Mesh chain so that there are 10 links or eleven pins between marks on camshaft sprocket and crankshaft sprocket (begin count with chain pin opposite mark on camshaft sprocket and mesh the eleventh pin opposite mark on crankshaft sprocket). This is equivalent to 5" between marks.

**Timing Chain Adjustment.** Loosen two flange mounting nuts on water pump mounting flange, loosen lock nut on adjusting screw, turn up adjusting screw until chain begins to hum with engine running at equivalent of 25 M.P.H., back off adjusting screw until chain runs noiselessly, tighten locknut and mounting screws. Adjust chain every six months.

**STARTER:**—Model 725-K Manual pinion engagement connected to starting switch lever (switch mounted on starter field frame). Rotation counter-clockwise at commutator end. Brush spring tension 24-28 ounces.

Starter Data			
Torque	R.P.M.	Volts	Amperes
0 lb. ft. ....	6000.....	5.....	60
16 " " .....	Lock.....	3.....	600

**Mounting:**—Starter flange mounted on right front face flywheel housing. To remove, disconnect cable and starting pedal linkage, take off nuts on 3 flange mounting bolts, pull starter straight forward to clear housing, lift from place.

**Oiling:**—1000 Miles. Put 8-10 drops light oil in commutator end oiler. Drive end bearing oilless.

**GENERATOR:**—Model 957-B. Third brush control. To adjust charging rate, loosen small round headed lock screw on commutator end plate, remove cover band, shift third brush (by hand) counter-clockwise to increase charging rate, clockwise to decrease charging rate, tighten lock screw. Maximum charging rate 18 amperes (cold), 8.5 volts, at 1300 R.P.M.

#### Generator Data

Amperes	Cold Test Volts	R.P.M.
18-20 .....	8.3-8.5 .....	1300

**Note:**—This generator originally furnished with thermostat. Thermostat is removed at factory when generator is installed in car.

Brush spring tension 14-18 ounces. Shunt field current 4.0-6.1 amperes at 6 volts. A 6 ampere field fuse is mounted on the commutator end plate.

**Mounting:**—Generator cradle mounted at right of engine. Driven through flexible hose coupling by extension of water pump shaft. To remove, disconnect lead, disconnect drive coupling, loosen mounting clamp band, lift generator from place.

**Oiling:**—500 Miles. But 8-10 drops light oil in oiler at each end of generator.

**RELAY:**—Model 265-B. Mounted on generator. Contacts close at 550 R.P.M. (generator) when voltage reaches 7-7.4 volts and open with discharge current of 0-2.5 amperes. Relay contact gap limits .015-.025 inch. Air gap limits .012-.017 inch (contacts closed).

**LIGHTING:**—Clum Switch Model 9318. Switch mounted at lower end of steering column. Controlled by lever on steering wheel. Dimmer system 'depressed beam' double filament bulbs. Parking bulbs in headlights.

Lamp Sizes			
Position	Voltage	Candlepower	Base Mazda Number
Headlights .....	6-8.....	32-21.....	DC.....1116
Parking bulbs .....	6-8.....	3 .....	SC.....63
Dash lights .....	6-8.....	3 .....	SC.....63
Stop and tail lights .....	6-8.....	21-2 .....	DC.....1158
Body lights .....	6-8.....	3 .....	SC.....63

**Note:**—Stop and tail lights use double filament bulb. Tail light wire (black) must be connected to 2 cp. filament.

**FUSES:**—Lighting fuse mounted on fuse block on dash. 20 ampere capacity. Generator field fuse 6 ampere capacity.

**HORNS:**—Twin horns mounted under engine hood. Controlled by horn relay. Horns: Klaxon Model K-26-B (matched tone), Type 1407 low note, Type 1408 high note. Current draw 6.0-8.5 amperes at 6 volts (Type 1407) 5.0-6.5 amperes at 6.0 volts (Type 1408).

**Horn Relay Model 266-T:**—Pressing horn button completes horn relay circuit, energizing relay winding, closing relay contacts and completing horn circuit. Horn current does not pass through horn button. Horn relay requires .25 amperes to close contacts. Contact gap limits .015-.025 inch. Air gap limits .012-.017 inch (contacts closed).

**GASOLINE GAUGE:**—K-S Telegauge hydrostatic type (see Equipment Section).

**FUEL PUMP:**—AC mechanical type fuel pump mounted at left of engine (see Equipment Section).

# HUDSON

## GREATER EIGHT (1932) ENGINE NUMBERS, 50,000 UP AUTO-LITE SYSTEM

**CAR SERIAL NUMBER:**—Stamped on plate on dash under hood. This series Standard—119" W. B.—930,770 Up. Sterling—126" W. B.—62,884 Up. Major—132" W. B.—250,001 Up.

**ENGINE NUMBER:**—Stamped on left side cylinder block opposite No. 1 cylinder. This series 50,000 Up.

**BATTERY:**—Exide, Type 3-VXA-15-1, 6 volt, 15 plate, 100 ampere hour capacity (20 hour rate). Starting capacity 114 amperes for 20 minutes. Negative (—) terminal grounded. Mounted on left frame member under driver's seat. Battery size, 7¼ inches wide, 10¼ inches long, 9¼ inches high.

**IGNITION:**—Coil Model CE-4017. Coil mounted on left side cylinder head. Ignition current 2 amperes at 6 volts (engine running) 5 amperes at 6 volts (engine stopped). Ignition switch Type 'B' Electrolock. See Equipment Section for complete description of Electrolock. Switch positions: 1. Key vertical—ignition off. 2. Key turned left—ignition on, Startix inoperative—timing position. 3. Key turned right—ignition on, Startix operative—running position.

**Distributor Model IGH-4009-B.** Two breaker arm, 4 lobe cam type with full automatic advance. Contacts open alternately at 45° intervals (corresponding to 90° firing interval of engine), contacts must be synchronized—see Timing. Breaker gap .020 inch. Hold within limits of .020-.022 inch. To set gap, loosen lock screws on stationary contact mounting plate, turn eccentric adjusting screw (first set of contacts) or loosen locknut on stationary contact mounting stud, turn up stud (second set of contacts). Resurface contacts when necessary with fine flat contact file. Breaker arm spring tension 16-22 ounces (measured at tip of breaker arm with spring scale in line with center of contacts and at right angles to arm).

Engine	Degrees	Distributor Automatic Advance	Distributor R.P.M.	Engine
0	Start	400	800	
8	4	780	1560	
16	8	1140	2280	
24	12	1500	3000	
35	17½	2000	4000	

**Mounting:**—Distributor mounted on accessory bracket at right front of engine. Electrolock must be removed as unit with distributor when distributor is taken off. See Equipment Section for details of Electrolock. To remove, disconnect wires and free Electrolock at dash, take off distributor cap, take out hold-down screw in advance arm, lift distributor out.

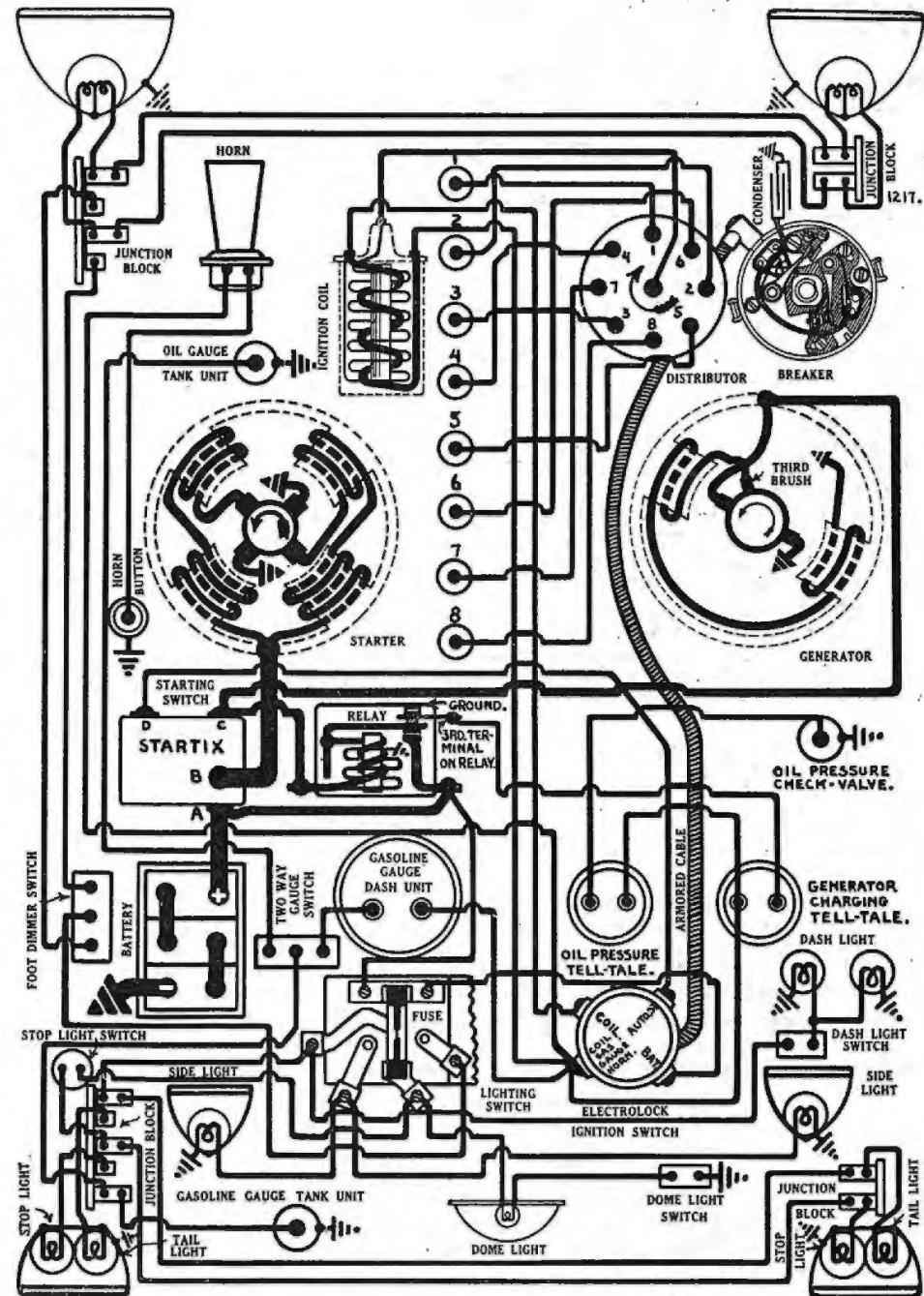
**Oiling:**—2000 Miles. Fill distributor base to level of oiler under distributor head with light engine oil. Take off distributor cap and rotor, put one drop oil on breaker arm pins and thin vaseline film on breaker cam face.

**Timing:**—Engines regularly supplied with two types of cylinder heads 'Power Dome Head' and 'Super Power Dome Head'. Standard ignition settings as follows: Power Dome Head—using standard fuel, set at top dead center. Power Dome Head—using Ethyl fuel, set 1¼" before top dead center. Super Power Dome Head—using Ethyl fuel only, set at top dead center. To set timing, first loosen hold-down screw in advance arm, center advance arm scale on screw, tighten hold-down screw. With No. 1 piston on compression stroke, turn engine over until flywheel mark 'DC.1-8' (top dead center mark for piston No. 1 and 8) is opposite pointer in inspection hole in right front face flywheel housing (engines with Power Dome Head using standard gasoline or Super Power Dome Head using Ethyl fuel) or stop with mark 1¼ inches before pointer (engines with Power Dome Head using Ethyl fuel). Loosen advance arm clamp screw, rotate distributor until first set of contacts (mounted directly on breaker plate) begin to open (use test lamp), tighten clamp screw, connect spark plugs as indicated on diagram.

**Synchronization of Contacts**—first method as part of timing operation. After timing distributor (above), turn engine over 90° to firing position of piston No. 6 with flywheel mark 'DC.3-6/' opposite pointer (Power Dome Head—standard gasoline and Super Power Dome Head—Ethyl fuel) or 1¼" before the pointer (Power Dome Head—Ethyl fuel), loosen lock screws on movable sub-plate (carrying second set of contacts), shift plate until contacts begin to open, tighten lock screws, check contact gap.

**Second Method**—using synchronizing tool. Use special Auto-Lite tool and follow complete directions in Equipment Section.

**Final Ignition Test:**—After setting ignition, car should be road tested for



# HUDSON

## GREATER EIGHT (1932) ENGINE NUMBERS, 50,000 UP AUTO-LITE SYSTEM

performance. With correct setting a slight spark knock should be heard when car is accelerated from 10 to 25 M.P.H. with wide open throttle on level road. If spark knock is not heard, loosen hold-down screw in advance arm and turn distributor one division at a time counter-clockwise until correct setting is obtained. If spark knock is too loud, rotate distributor clockwise.

**Firing Order:**—1-6-2-5-8-3-7-4. No. 1 cylinder nearest radiator.  
**Spark Plugs:**—Power Dome Head. 18 MM. AC. Type G-8. Set gap at .022 inch.  
 Super Power Dome Head. 14 MM. AC Type K-12. Set gap at .022 inch.

**VALVE TIMING:**—Valves at right of engine. Camshaft driven by chain in tandem with accessory shaft sprocket. Chain adjusted manually—see below.

	Head Diameter	Stem Diameter	Length	Seat Angle	Lift
Intake	1 1/2"	5/16"	5 1/32"	45°	11/32"
Exhaust	1 3/8"	5/16"	5 1/32"	45°	11/32"
	Tappet Clearance		Spring Pressure		
Intake	.003-.005" (hot).		Closed .....53 pounds (length 2")		
Exhaust	.005-.007" (hot).				

**To Check Valve Timing.** Check tappet clearance No. 1 intake valve. With No. 8 piston on compression turn engine over until piston is slightly past top dead center with flywheel mark 'L.O.' (which is 7° past the top dead center mark 'DC.1-8/') opposite pointer on edge of inspection hole in right front face flywheel housing. No. 1 intake valve should open at this point.

**To Set Flywheel Timing.** Turn crankshaft and camshaft so there are 19 pins in timing chain between marks on sprockets when chain is meshed. Begin count with pin in line with tooth meshed opposite mark on camshaft sprocket and mesh tooth in line with nineteenth pin directly opposite mark on crankshaft sprocket.

**To Adjust Timing Chain.** Adjust chain at end of first 1500 miles and at 5000 miles afterward or whenever play on circumference of generator drive coupling exceeds 1/8" (excluding slack of coupling bolts). To adjust, loosen 3 bolts in accessory bracket (the inner top and bottom bolts pass through notches in eccentric and must be removed), insert special wrench between bracket and chain case (on eccentric nut), turn wrench clockwise until play on coupling is 1/8", tighten mounting bolts (slack off adjustment slightly if necessary to insert bolts). If bracket has been taken off engine, take out plug directly above shaft and fill bracket with 1/2 pint engine oil.

**STARTER:**—Model MAB-4041. Starter drives engine through inboard Bendix drive. Rotation counter-clockwise at commutator end. Brush spring tension 44-56 ounces.

Starter Data				
Torque		R.P.M.	Volts	Amperes
0 lb. ft.		4000	5.5	46
.6 "		1910	5.5	100
3.4 "		1100	5.0	200
6.6 "		700	4.5	300
10.2 "		420	4.0	400
17.0 "		Lock	3.0	525
24.0 "		Lock	4.0	725

**Startix:**—This model equipped with Startix automatic starting switch mounted on left side engine block directly above starter. See Equipment Section for complete article on Startix. Not necessary to disconnect Startix to time engine—use left position of ignition switch.

**Mounting:**—Starter flange mounted left side of engine on front face flywheel housing. To remove, disconnect cable, take out 3 flange mounting cap-screws, pull starter straight forward to clear Bendix, lift out.

**Oiling:**—1000 Miles. Put 3-4 drops light engine oil (fill cups once) in oiler at each end of armature shaft.

**GENERATOR:**—Model GAL-4344. Third brush regulation. To adjust charging rate 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. Rotation counter-clockwise at commutator end. Maximum charging rate 14-16 amperes (cold) at 8.0 volts reached at 1900 R.P.M. or 23 M.P.H..

### Generator Data

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

Brush spring tension 8-13 ounces. Shunt field current 4.08-4.52 amperes at 6.0 volts, Generator motoring draws 4.27-4.73 amperes at 6.0 volts.

**Note:**—Special charging tell-tale used instead of ammeter in charging circuit. Tell-tale light goes out when generator begins to charge battery. See paragraph on 'Signal Lights'. An ammeter must be connected in generator line at relay whenever charging rate is checked or adjusted.

**Mounting:**—Generator cradle mounted at right of engine and driven by shaft from accessory bracket. To remove, disconnect lead, disconnect generator drive coupling, loosen mounting clamp band, lift generator out.

**Oiling:**—1000 Miles. Put 3-4 drops light engine oil (fill cups once) in oiler at each end of generator.

**RELAY:**—Model CBA-4001. Relay mounted on left side engine block (beside Startix). Relay equipped with extra terminal and contact for Charge Tell-tale (see diagram). Contacts close at 675 R.P.M. or 10 M.P.H. when generator voltage reaches 7.0-8.0 volts with charging current of not more than 5 amperes and open with discharge current of 0-2.5 amperes. Relay contact gap limits .025-.035 inch (with upper contacts closed. Air gap limits .010-.030 inch (contacts closed).

**LIGHTING:**—Soreng Manegold Switch, Model B-5670-A. Dimmer Switch Model A-2100-A. Lighting switch mounted on back of instrument board controlled by push-pull button on lower left center of instrument panel. Dimmer system 'depressed beam' double filament headlight bulbs controlled by foot operated switch on toeboard.

Position	Voltage	Lamp Sizes	
		Candlepower	Base Mazda Number
Headlights	6-8	32-32	DC.....1000
Side lights	6-8	3	SC.....63
Dash & tail lights	6-8	3	SC.....63
Stop light	6-8	15	SC.....87
Dome light	6-8	15	SC.....87
Signal lights	6-8	3	DC.....64

**FUSES:**—30 ampere capacity mounted on back of lighting switch.

**SIGNAL LIGHTS:**—Consist of battery charge tell-tale and oil pressure tell-tale lights mounted on instrument panel instead of ammeter and oil pressure gauge. Light bulbs used are standard 6-8 volt, 3 cp.DC Mazda 64 and can be removed by turning light counter-clockwise slightly to release bayonet socket pin.

**Charging Tell-tale.**—Under ruby reflector on right center of instrument panel. Tell-tale should light with ignition turned 'on' with car stopped and continue to burn until generator begins to charge (relay contacts close). Closing of main relay contacts opens auxiliary contacts in tell-tale circuit causing tell-tale light to go out. If tell tale light does not burn when ignition is turned on and at idling speeds below 10 M.P.H. check bulb by grounding left hand relay terminal to generator field frame (never short the two terminals). If tell-tale does not light replace bulb. If lamp lights when terminal is grounded, check auxiliary contact spring and contacts and ground strap, see that contacts are closed when main contacts are open.

**Oil Pressure Tell-tale.** Under ruby reflector on left center of instrument panel. Tell-tale should light with ignition turned on and engine stopped and should flash at idling speeds of engine. Tell-tale should not light at engine speeds above idling. If tell-tale does not light when ignition is turned on, short terminal on 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 in housing.

# HUPMOBILE

## SERIES 216, MODEL B (1932), SERIAL NUMBERS 5001 UP AUTO-LITE SYSTEM

**CAR SERIAL NUMBER:**—On right side of dash under hood.

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

**BATTERY:**—Willard, Type WH-2-15, 6 volt, 15 plate, 119 ampere hour capacity (20 hour rate). Battery mounted on left frame member under driver's seat. Positive (+) terminal is grounded. Battery size 7 1/16 inches wide, 10 5/16 inches long, 9 5/16 inches high.

**IGNITION:**—Coil Model IG-4080. Coil is mounted on dash. Ignition current 1-3 amperes at 6 volts (engine running), 3-4.5 amperes at 6 volts (engine stopped). Ignition switch is a Type 5-B Electrolock—see Equipment Section for complete data on this switch.

**Distributor Model IGC-4053.** Single breaker arm, 6-lobe cam type with semi-automatic advance. Manual spark advance controlled by button at extreme left of instrument panel. Ordinary running position, spark fully advanced, button pushed in. Pull button out to retard spark. Breaker gap set at .015-.018 inch. To set gap, loosen lock nut on stationary contact mounting stud, turn up stud, tighten lock nut. Resurface contacts when necessary with a fine flat contact file. Breaker arm spring tension 16-22 ounces (measured at tip of breaker arm with spring scale in line with center of contacts and at right angles to arm). Maximum manual advance 24 degrees (engine).

Engine	Degrees	Automatic Advance Distributor	Distributor	R.P.M.	Engine
0.....	Start.....	400.....	800		
4.....	2.....	650.....	1300		
8.....	4.....	900.....	1800		
12.....	6.....	1150.....	2300		
16.....	8.....	1400.....	2800		

Allowable variation plus or minus 1° (distributor) at any point.

**Mounting:**—Distributor mounted at left of engine, driven by inclined shaft from camshaft. Electrolock ignition switch must be removed as unit with distributor when distributor is taken off car (see Equipment Section for instructions on removing Electrolock from distributor). To remove distributor, disconnect manual advance control wire, free Electrolock at dash, take out hold-down screw in advance arm, lift distributor and Electrolock out.

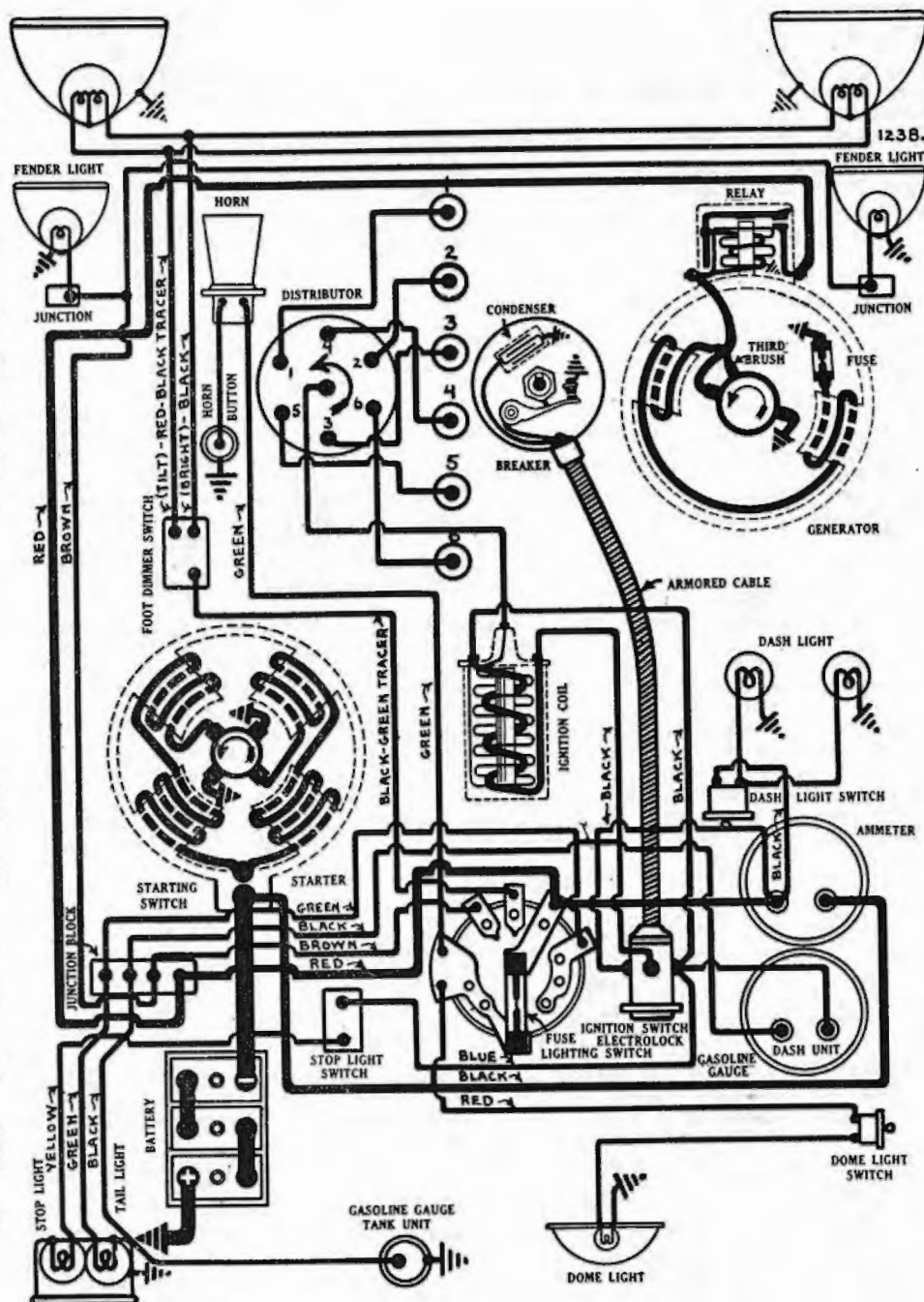
**Oiling:**—500 Miles. Put 4-5 drops light engine oil in oiler on side of distributor.

1000 Miles. Take off distributor cap and rotor. Put one drop oil on breaker arm pivot pin. Apply thin film vaseline to face of breaker cam.

**Timing:**—Standard setting 10° on flywheel before top dead center with full manual advance. To set timing, advance manual spark control (push button in toward dash), see that distributor is rotated clockwise to limit of advance arm slot. With No. 1 piston on compression, turn engine over until ignition mark on flywheel (which is 10° before the dead center mark 'DC/1-6') is directly in line with finished bosses on right front face of flywheel housing, loosen advance arm clamp bolt, rotate distributor until contacts begin to open (use test lamp), tighten clamp bolt, connect spark plugs as indicated on diagram (No. 1 terminal as designated).

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

**Spark Plugs:**—18 MM. Champion Type C-7. Set gap at .028 inch. Hold within limits of .025-.030 inch.



# HUPMOBILE

SERIES 216, MODEL B (1932), SERIAL NUMBERS 5001 UP  
AUTO-LITE SYSTEM

**VALVE TIMING:**—Valves at right of engine. Camshaft driven by chain from crankshaft in tandem with generator sprocket. Chain adjusted manually by shifting generator (see Generator Mounting).

	Head Diameter	Stem Diameter	Seat Angle	Lift
Intake	1.532"	.3675"	45°	.3125"
Exhaust	1.532"	.3675"	45°	.3125"

	Tappet Clearance		Spring Pressure	
	Operating	Timing	Closed	Open
Intake	.006" (hot)	.010"	42 pounds (2 3/16")	
Exhaust	.008" (hot)	.010"	71 pounds (1 7/8")	

**Timing**

Intake valves open 4 degrees after top dead center. Intake valves close 51 degrees after lower dead center.

Exhaust valves open 47 degrees before lower dead center. Exhaust valves close at top dead center.

**To Check Valve Timing.** Set tappet clearance No. 1 intake and exhaust valves at .010 inch. With No. 6 piston on compression stroke, turn engine over until piston is on top dead center with flywheel mark 'DC/1-6' in line with finished bosses on front face of clutch housing at right of engine. No. 1 exhaust valve should be closed and No. 1 intake valve about to open at this point. Reset tappet clearance at .006" (intake), .008" (exhaust) with engine hot.

**To Set Valve Timing.** Turn crankshaft until No. 6 piston is on top dead center. Turn camshaft until No. 1 intake valve is about to open. Mesh chain so that marks on camshaft sprocket and crankshaft sprocket are directly opposite and in line with a straightedge across the shaft centers.

**STARTER:**—Model MAJ-4003. Starter drives engine through inboard Bendix drive. Rotation counter-clockwise at commutator end. Brush spring tension 44-56 ounces.

**Starter Data**

Torque	R.P.M.	Volts	Amperes
0 lb. ft.	Free	6	50
.3 "	2500	5.5	100
2.25 "	1460	5.0	200
4.6 "	960	4.5	300
7.3 "	575	4.0	400
10.3 "	225	3.5	500
12.6 "	Lock	3.0	575
19.0 "	Lock	4.0	800

**Starting Switch:**—Model MU-2208-S. Switch mounted on starter field frame controlled through flexible wire by button at extreme left instrument panel. Force required to close switch must be not less than 7 1/2 pounds (measured at hole in switch arm with spring scale at right angles to arm).

**Mounting:**—Starter flange mounted at left side of engine on forward face of flywheel housing. To remove, disconnect cable, disconnect starting switch control wire, take out 2 flange mounting cap screws, pull starter straight forward to clear Bendix, lift from place.

**Oiling:**—500 Miles. Put 5-6 drops light engine oil in drive end oiler. Commutator end bearing oilless.

**GENERATOR:**—Model GAL-4324. Third brush regulation. To adjust charging rate, 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. Rotation counter-clockwise at commutator end. Maximum charging rate 16-17 amperes (cold) at 8.0 volts reached at 1900 R.P.M.

**Generator Data**

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

Brush spring tension 8-13 ounces. Shunt field current 4.08-4.52 amperes at 6.0 volts. Generator motoring 4.27-4.73 amperes at 6.0 volts. Field fuse mounted under cover on field frame 7 1/2 ampere capacity.

**Mounting:**—Generator flange mounted on rear face of timing chain case at right of engine. To remove, disconnect lead, back off chain adjustment set screw, take out 3 flange mounting cap screws, lift off timing chain, lift generator out. Tie up chain and do not crank engine with generator out.

**Timing Chain Adjustment.** Loosen 3 flange mounting screws, back off adjustment set screw locknut, run engine at equivalent of 25 M.P.H., turn up adjustment set screw until chain begins to hum, back off screw until chain runs noiselessly, tighten lock nut and mounting screws. Chain should be adjusted at end of first 1000 miles and at 5000-mile intervals afterward.

**Oiling:**—500 Miles. Put 5-6 drops light engine oil in commutator end oiler. Drive end bearing oiled from the chain case.

**5000 Miles.** Remove grease cup under bearing retainer on commutator end. Clean out old grease, dip wick in light oil, fill cup with medium grease and replace.

**RELAY:**—Model CB-4014. Relay mounted on generator. Contacts close at 675 R.P.M (generator) with generator voltage of 7-7.5 volts and charging current of approximately 2 amperes. Contacts open with discharge current of .5-2.5 amperes. Relay contact gap limits .025-.035 inch. Air gap limits .010-.030 inch (contacts closed).

**LIGHTING:**—Briggs & Stratton Switch, Model 40956. Lighting switch mounted behind instrument board controlled by push-pull button on lower left of instrument panel. Dimmer system 'depressed beam' double filament headlight bulbs controlled by foot operated switch on toeboard. Instrument lights controlled by button at upper center of instrument panel. Lighting switch positions:

1. Button pushed in—All lights off.
2. Button halfway out—Parking (fender) lights on, tail light on.
3. Button out 'on' position—Headlights on, tail light on.

**Lamp Sizes**

Position	Voltage	Candlepower	Base	Mazda No.
Headlights	6-8	32-32	D.C.	1000
Parking (fender) lights	6-8	3	S.C.	63
Dash and Tail Lights	6-8	3	S.C.	63
Stop Light	6-8	15	S.C.	87
Dome Light	6-8	6	S.C.	81

**FUSES:**—Lighting fuse on switch 20 ampere capacity. Spare fuse provided. Generator field fuse on generator field frame 7 1/2 ampere capacity.

**GASOLINE GAUGE:**—Motometer electric type (see Equipment Section).

**FUEL PUMP:**—Stewart Warner mechanical type (see Equipment Section).

**HORNS:**—Sparton vibrator type horn mounted under engine hood.

# HUPMOBILE

SERIES 222, MODEL F (1932), SERIAL NUMBERS 5001 UP  
AUTO-LITE SYSTEM

**CAR SERIAL NUMBER:**—Stamped on plate on right side of dash under hood.

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

**BATTERY:**—Willard, Type WH-2-15, 6 volt, 15 plate, 119 ampere hour capacity (20 hour rate). Starting capacity 140 amperes for 20 minutes. Positive (+) terminal grounded. Battery mounted on left frame member under driver's seat. Battery size 7 1/16 inches wide, 10 5/16 inches long, 9 5/16 high.

**IGNITION:**—Coil Model CE-4402. Coil mounted on left side of engine block. Ignition current 1-3 amperes at 6 volts (engine running), 3-4.5 amperes at 6 volts (engine stopped). Ignition switch Type 5-B Electrolock. See Equipment Section for complete details of this switch.

**Distributor Model IGH-4021.** Two breaker arm, 4 lobe cam type with semi-automatic advance. Controlled by button at lower right of instrument panel, normal running position with button pushed in—full manual advance, pull out button to retard spark. Breaker contacts open alternately at 45 degree intervals (corresponding to the engine firing interval of 90 degrees), contacts must be synchronized (see Timing). Breaker contact gap set at .020-.022 inch. To set gap, loosen lock screws on stationary contact mounting plate, turn eccentric adjusting screw (first set of contacts mounted directly on breaker plate) or loosen lock nut on stationary contact mounting stud, turn up stud, tighten lock nut (second set mounted on movable sub-plate). Resurface contacts when necessary with fine flat contact file. Breaker arm spring tension 16-20 ounces (measured by spring scale hooked under end of contact arm in direct line with center of contacts and at right angles to contact arm). Maximum manual advance 13 degrees (engine).

Engine Degrees	Automatic Advance Distributor	Distributor R.P.M.	Engine R.P.M.
0.....	Start.....	400.....	800
4.....	2.....	700.....	1400
8.....	4.....	1000.....	2000
12.....	6.....	1300.....	2600
16.....	8.....	1600.....	3200

Allowable variation 1° (distributor) at any point.

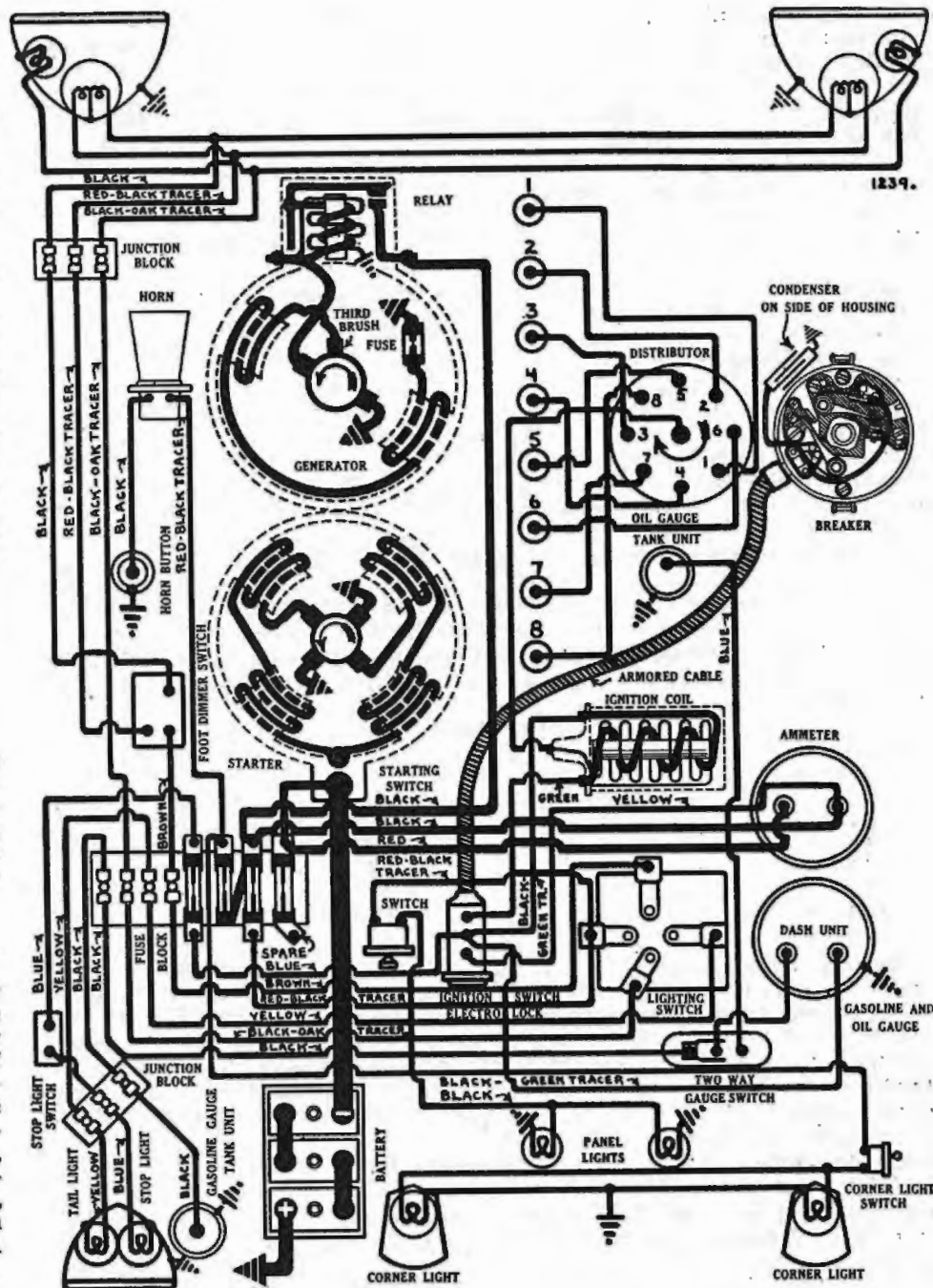
**Mounting:**—Distributor mounted on cylinder head at right (remove from right of car). Electrolock ignition switch must be removed as unit with distributor whenever distributor is taken off car (see Equipment Section for instructions on removing Electrolock from distributor). To remove distributor, disconnect manual advance control wire, disconnect ignition wires and free Electrolock at dash, take out hold-down screw in advance arm, lift distributor out.

**Oiling:**—500 Miles. Put 8-10 drops light engine oil in oiler under distributor.

1000 Miles. Take off distributor cap and rotor. Put one drop oil on breaker arm pivot pins, apply thin film vaseline to face of breaker cam.

**Timing:**—Standard setting 13° or 1 3/8" (on flywheel) before top dead center with manual spark control fully advanced. To set timing, fully advance spark control button (push button in toward dash) and see that distributor is rotated counter-clockwise to full extent of advance arm slot, take off cover plate over inspection hole in top of flywheel housing at right of engine. With No. 8 piston on compression stroke, turn engine over until the straight line mark on the flywheel (which is 1 3/8" before the top dead center mark '1° 8') is directly opposite the center line of the inspection hole, loosen the advance arm clamp bolt, rotate distributor until first set of contacts (mounted directly on breaker plate) begin to open (use test lamp), tighten the clamp bolt, see that rotor is directly opposite No. 8 segment in distributor head and connect spark plugs as indicated on diagram (No. 1 terminal as designated).

**Synchronization of Contacts**—first method as part of timing operation. After distributor has been timed to engine (above), crank engine over exactly 90 degrees to firing position of piston No. 5 (when a point on the flywheel 1 3/8 inches before the top dead center mark '4° 5' will be opposite



# HUPMOBILE

## SERIES 222, MODEL F (1932), SERIAL NUMBERS 5001 UP AUTO-LITE SYSTEM

the center line of the inspection hole)—the timing mark is not provided and it will be simpler to retard the spark (pull out button) and turn engine so that the dead center mark is opposite the indicator. Loosen lock screws on movable sub-plate (carrying second set of contacts), shift plate until contacts begin to open, tighten lock screws, check contact gap.

**Second Method**—using synchronizing tool. Use special Auto-Lite tool and follow complete directions in Equipment Section.

**Firing Order**:—1-4-7-3-8-5-2-6. No. 1 cylinder nearest radiator.

**Spark Plugs**:—18 MM. Champion Type C-7. Set gap at .028-.030 inch.

**VALVE TIMING**:—Valves at right of engine. Camshaft driven by two-sprocket non-adjustable chain drive.

	Head Diameter	Stem Diameter	Length	Seat Angle	Lift
Intake	1.437"	.341"	6 13/16"	45°	11/32"
Exhaust	1.343"	.341"		45°	11/32"

	Tappet Clearance		Spring Pressure	
	Operating	Timing	Free length	
Intake	.018" (hot)	.020" (cold)	18 pounds	2 17/32"
Exhaust	.018" (hot)	.026" (cold)	46 pounds	1 29/32"

### Timing

Intake valves open at top dead center. Close 40° after lower dead center. Exhaust valves open 40° before lower dead center. Close at top dead center.

**To Check Valve Timing.** Set tappet clearance of No. 1 intake valve at .020 inch, No. 1 exhaust valve at .026 inch. With No. 8 piston on compression stroke turn engine over until piston is on top dead center with flywheel mark '1 ° 8' directly opposite center line in inspection hole in flywheel housing at right of engine. No. 1 intake valve should open and No. 1 exhaust valve close at this point.

**To Set Valve Timing.** Turn crankshaft to top dead center position No. 1 and 8 piston with flywheel mark '1 ° 8' at indicator. Mesh chain so that there are nine links or ten pins between marks on camshaft sprocket and crankshaft sprocket (begin count with pin in tooth meshed opposite mark on camshaft sprocket and mesh tenth tooth opposite mark on crankshaft sprocket).

**STARTER**:—Model MAD-4118. Starter drives engine through outboard Bendix drive. Rotation counter-clockwise at commutator end. Brush spring tension 28-36 ounces.

### Starter Data

Torque	R.P.M.	Volts	Amperes
0 lb. ft.	3750	5.5	58
.7 "	2380	5.5	100
3.0 "	1280	5.0	200
5.7 "	770	4.5	300
8.8 "	425	4.0	400
13.0 "	Lock	3.0	500
20.2 "	Lock	4.0	730

**Starting Switch**:—Model SW-3731. Switch mounted on starter field frame controlled through flexible wire by button on lower left of the instrument panel. Force required to close switch must be not less than 23 pounds (measured at hole in switch arm with spring scale at right angles to arm).

**Mounting**:—Starter sleeve mounted in flywheel housing at left of engine. To remove, disconnect cable, disconnect starting switch control wire, take out large pilot mounting screw in housing, pull starter straight forward to clear Bendix housing, lift from place.

**Oiling**:—500 Miles. Put 5-6 drops light engine oil in drive end bearing oiler. Commutator end bearing and outer bearing (Bendix housing) are oilless.

**GENERATOR**:—Model GAR-4317. Third brush regulation. To adjust charging rate, take off commutator cover band, shift third brush (by prying on

mounting stud) counter-clockwise to increase or clockwise to decrease charging rate. Brush held in position by friction. Rotation counter-clockwise at commutator end. Maximum charging rate, 17 amperes (cold) at 8.0 volts reached at 1700 R.P.M.

### Generator Data

Cold Test			Hot Test		
Amperes	Volts	R.P.M.	Amperes	Volts	R.P.M.
0	6.4	675	0	6.4	740
4	6.8	820	4	6.9	925
8	7.0	950	8	7.3	1100
12	7.4	1120	12	7.7	1420
16	7.8	1400	13.4	8.0	1875
17	8.0	1700	8.5	7.4	3200
9	7.2	3200			

Brush spring tension 24-36 ounces. Shunt field current 4.75-5.25 amperes at 6.0 volts. Generator motoring draws 5.0-5.65 amperes at 6.0 volts. Field fuse mounted under cover on field frame 7½ ampere capacity.

**Mounting**:—Generator flange mounted on front motor support arm at left of engine. Driven by the fan belt. To remove, disconnect lead, loosen mounting bolts, back off generator, slip off drive belt, take out flange mounting bolts, lift generator out.

**Belt Adjustment.** Loosen clamp bolt and pivot bolts, swing generator away from engine, tighten mounting bolts. Belt should be just tight enough to drive generator and fan without slipping. Make adjustment every 1000 miles.

**Oiling**:—500 Miles. Put 5-6 drops light engine oil in oiler at each end of the generator.

**RELAY**:—Model CB-4011-A. Relay mounted on generator. Contacts close with generator voltage of 7-7.5 volts and charging current of approximately 2 amperes and open with discharge current of 0-2.5 amperes. Relay contact gap limits .025-.035 inch. Air gap limits .010-.030 inch (contacts closed).

**LIGHTING**:—Soreng Manegold Switch, Model A-5670-A. Dimmer Switch Soreng Manegold, Model B-2100-A. Lighting switch mounted behind instrument board controlled by push-pull button on lower right center of instrument panel. Dimmer system 'depressed beam' double filament headlight bulbs controlled by foot operated switch on toeboard. Instrument lights controlled by button at left center instrument panel. Lighting switch positions:

1. Button pushed in—All lights off.
2. Button halfway out—Parking lights (in headlights) on, tail light on.
3. Button out 'On' position—Headlights on, tail light on.

### Lamp Sizes

Position	Voltage	Candlepower	Base	Mazda No.
Headlights	6-8	32-32	D.C.	1000
Parking Lights	6-8	3	S.C.	63
Dash and Tail Lights	6-8	3	S.C.	63
Stop Light	6-8	15	S.C.	87
Pillar Lights	6-8	6	S.C.	81

**FUSES**:—Three 15 ampere capacity fuses and one spare mounted on fuse block left side of dash under hood. If cigar lighter is installed connect to extra terminal on fuse block and install 30 ampere capacity fuse. Generator field fuse mounted under cover on generator field frame 7½ ampere capacity.

**GASOLINE GAUGE**:—Motometer combination gasoline gauge and oil gauge. Oil gauge unit (on crankcase) cut into gauge circuit by pulling out button at center right of instrument panel. Gasoline gauge registers whenever ignition is turned 'On' (see Equipment Section).

**FUEL PUMP**:—Stewart Warner mechanical fuel pump mounted at right of engine driven by camshaft (see Equipment Section).

**HORNS**:—Sparton vibrator type horn mounted under engine hood.



# HUPMOBILE

## SERIES 226, MODEL 1 (1932), SERIAL NUMBERS 5001 UP AUTO-LITE SYSTEM

**CAR SERIAL NUMBER:**—Stamped on plate on right side of dash under hood.

**ENGINE NUMBER:**—Stamped on center left side of crankcase.

**BATTERY:**—Willard, Type WH-2-15, 6 volt, 15 plate, 119 ampere hour capacity (20 hour rate). Starting capacity 140 amperes for 20 minutes. Positive (+) terminal grounded. Battery mounted on left frame member under driver's seat. Battery size 7 1/16 inches wide, 10 5/16 inches long, 9 5/16 high.

**IGNITION:**—Coil Model CE-4402. Coil mounted on left side of engine block. Ignition current 1-3 amperes at 6 volts (engine running), 3-4.5 amperes at 6 volts (engine stopped). Ignition switch Type 5-B Electrolock. See Equipment Section for complete details of this switch.

**Distributor Model IGH-4021.** Two breaker arm, 4 lobe cam type with semi-automatic advance. Controlled by button at lower right of instrument panel, normal running position with button pushed in—full manual advance, pull out button to retard spark. Breaker contacts open alternately at 45 degree intervals (corresponding to the engine firing interval of 90 degrees), contacts must be synchronized (see Timing). Breaker contact gap set at .020-.022 inch. To set gap, loosen lock screws on stationary contact mounting plate, turn eccentric adjusting screw (first set of contacts mounted directly on breaker plate) or loosen lock nut on stationary contact mounting stud, turn up stud, tighten lock nut (second set mounted on movable sub-plate). Resurface contacts when necessary with a fine flat contact file. Breaker arm spring tension 16-20 ounces (measured by spring scale hooked under end of contact arm). Maximum manual advance 13 degrees (engine).

Engine	Degrees	Automatic Advance	Distributor	R.P.M.	Engine
0.....			Start.....	400.....	800
4.....	2		.....	700.....	1400
8.....	4		.....	1000.....	2000
12.....	6		.....	1300.....	2600
16.....	8		.....	1600.....	3200

Allowable variation 1° (distributor) at any point.

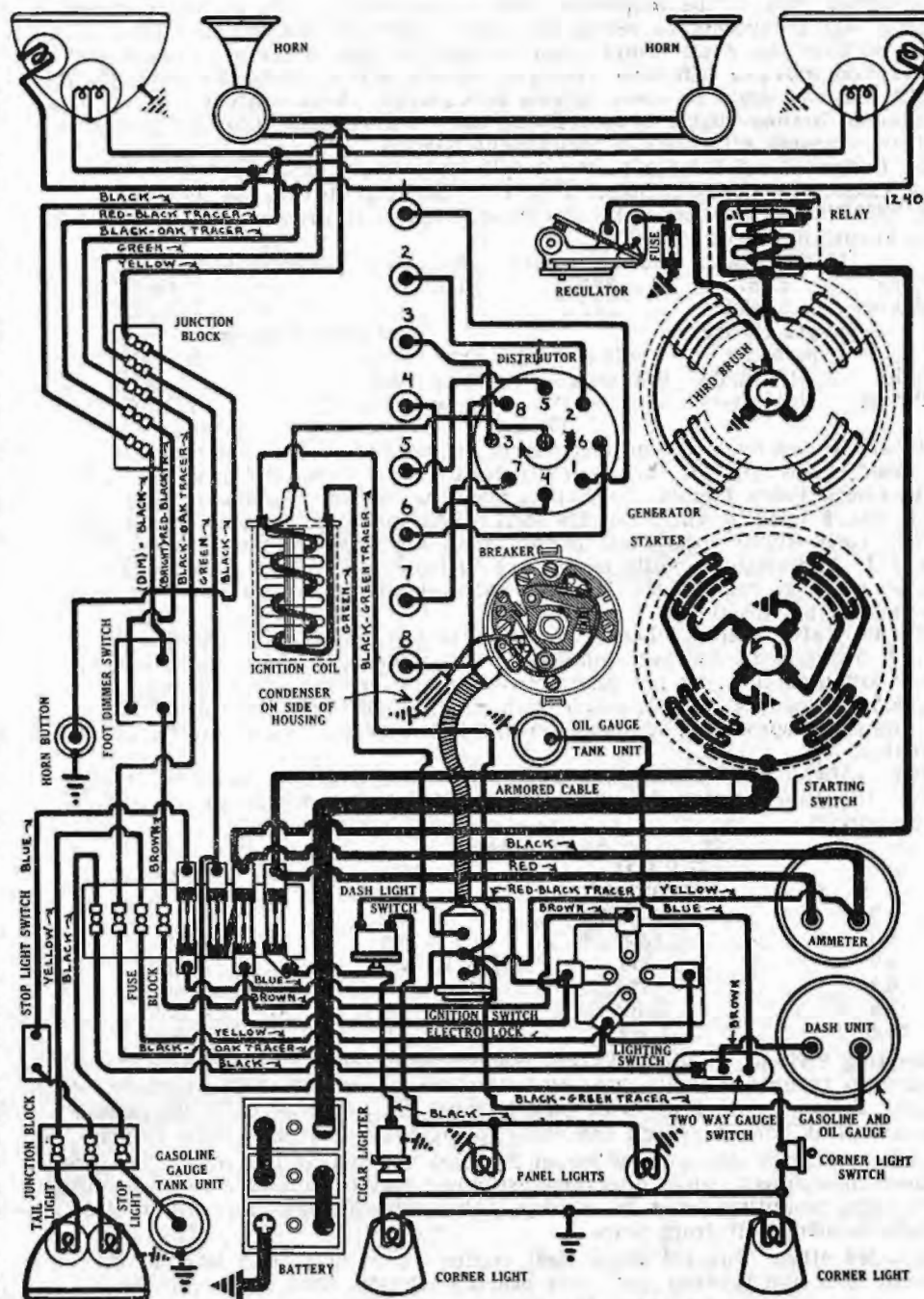
**Mounting:**—Distributor mounted on cylinder head at right (remove from right of car). Electrolock ignition switch must be removed as unit with distributor whenever distributor is taken off car (see Equipment Section for instructions on removing Electrolock from distributor). To remove distributor, disconnect manual advance control wire, disconnect ignition wires and free Electrolock at dash, take out hold-down screw in advance arm, lift distributor out.

**Oiling:**—500 Miles. Put 8-10 drops light engine oil in oiler under distributor.

1000 Miles. Take off distributor cap and rotor. Put one drop of oil on breaker pivot pins, apply thin film vaseline to face of breaker cam.

**Timing:**—Standard setting 9° or 1" (on flywheel) before top dead center with manual spark control fully advanced. To set timing, fully advance spark control button (push button in toward dash) and see that distributor is rotated counter-clockwise to full extent of advance arm slot, take off cover plate over inspection hole in top of flywheel housing at right of engine. With No. 8 piston on compression stroke, turn engine over until the straight line mark on the flywheel (which is 1" before the top dead center mark '1° 8') is directly opposite the center line of the inspection hole, loosen the advance arm clamp bolt, rotate distributor until first set of contacts (mounted directly on breaker plate) begin to open (use test lamp), tighten the clamp bolt, see that rotor is directly opposite No. 8 segment on diagram (No. 1 terminal as designated).

**Synchronization of Contacts**—first method as part of timing operation. After distributor has been timed to engine (as above) crank engine over exactly 90 degrees to firing position of piston No. 5 (when a point on the flywheel 1 inch before the top dead center mark '4-5' will be directly opposite the center line of the inspection hole of the housing), loosen lock screws on movable sub-plate (carrying second set of contacts), shift plate



# HUPMOBILE

SERIES 226, MODEL I (1932), SERIAL NUMBERS 5001 UP  
AUTO-LITE SYSTEM

until contacts begin to open, tighten locking screws, check contact gap.

**Second Method**—using synchronizing tool. Use special Auto-Lite tool and follow complete directions in Equipment Section.

**Firing Order**:—1-4-7-3-8-5-2-6. No. 1 cylinder nearest radiator.

**Spark Plugs**:—18 MM. Champion Type C-7. Set gap at .028-.030 inch.

**VALVE TIMING**:—Valves at right of engine. Camshaft driven by timing chain in tandem with generator sprocket. Chain adjusted manually by shifting generator (see Generator Mounting).

	Head Diameter	Stem Diameter	Length	Seat Angle	Lift
Intake	1.530"	.3410"	7 5/16"	45°	
Exhaust	1.406"	.3310"		45°	

	Tappet Clearance	Operating Timing	Free length	Spring Pressure
Intake	.007" (hot)	.010"	2 23/32"	18 pounds
Exhaust	.015" (hot)	.020"	2 3/32"	44 pounds

### Timing

Intake valves open 1 degree after top dead center. Intake valves close 51 degrees after lower dead center.

Exhaust valves open 47 degrees before lower dead center. Exhaust valves close 3 degrees after top dead center.

**To Check Valve Timing**. Set tappet clearance of No. 1 intake valve at .010 inch, No. 1 exhaust valve at .020 inch. With No. 3 piston on compression stroke turn engine over until piston reaches top dead center with flywheel mark '1-8' directly opposite center line of inspection hole in flywheel housing at right of engine. No. 1 exhaust valve should close and No. 1 intake valve open at this point.

**To Set Valve Timing**. Turn crankshaft to top dead center position pistons Nos. 1 and 8 with flywheel mark '1-8' in center of inspection hole in housing. Mesh chain so that there are 11 links or 12 pins between marks on camshaft sprocket and crankshaft sprocket (begin count with pin in tooth meshed opposite mark on camshaft sprocket and mesh the twelfth tooth in chain opposite mark on crankshaft sprocket).

**STARTER**:—Model MAB-4042. Starter drives engine through outboard Bendix drive. Rotation counter-clockwise at commutator end. Brush spring tension 44-56 ounces.

### Starter Data

Torque	R.P.M.	Volts	Amperes
0 lb. ft.	4000	5.5	46
.6 "	1910	5.5	100
3.4 "	1100	5.0	200
6.6 "	700	4.5	300
10.2 "	420	4.0	400
17.0 "	Lock	3.0	525
24.0 "	Lock	4.0	725

**Starter Switch**:—Model SW-3752. Mounted on starter field frame controlled through flexible cable by button at lower left of instrument panel. Force required to close switch not less than 5½ pounds (measured at hole in extreme end of switch lever with spring scale at right angles to arm).

**Mounting**:—Starter sleeve mounted in flywheel housing at right of engine. To remove, disconnect cable, disconnect starting switch control wire, take out large pilot mounting screw in housing, pull starter straight forward to clear housing, lift out.

**Oiling**:—500 Miles. Put 5-6 drops light engine oil in drive end bearing oiler. Commutator end bearing and outer bearing (Bendix housing) are oilless.

**GENERATOR**:—Model GAG-4138. Third brush regulation combined with Owen-Dyneto Battery Charge Regulator. To adjust charging rate, 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. Rotation counter-clockwise at commutator end. Maximum charging rate 10 amperes (cold) at 8.0 volts reached at 1500 R.P.M.

Cold Test		Generator Data		Hot Test	
Amperes	Volts	R.P.M.	Amperes	Volts	R.P.M.
0	6.4	550	0	6.4	640
4	6.7	660	4	6.9	800
8	7.0	760	8	7.3	980
12	7.4	900	10	7.6	1110
16	7.8	1120	12	7.8	1280
19	8.0	1540	14.2	8.0	1680
13	7.4	2400	11.5	7.7	2400

Brush spring tension 22-27 ounces. Shunt field current 3.9-4.41 amperes at 6.0 volts. Generator motoring draws 5.13-5.67 amperes at 6.0 volts. Field fuse mounted in plug in relay housing 7½ ampere capacity.

**Mounting**:—Generator flange mounted on rear face of timing chain case at right of engine. To remove, disconnect lead, slack off chain adjustment set screw, take out flange mounting screws, lift off timing chain, pull generator out. Tie up timing chain and do not crank engine with generator out.

**Chain Adjustment**. Loosen 3 flange mounting screws, back off adjustment set screw lock nut, run engine at equivalent of 25 M.P.H., turn up adjustment screw until chain begins to hum, back off until chain runs noiselessly, tighten lock nut and mounting screws. Adjust chain at end of first 1000 miles and at 5000 mile intervals afterward.

**Oiling**:—500 Miles. Put 5-6 drops light engine oil in commutator end oiler. Drive end bearing oiled from chain case.

**RELAY**:—Battery Charge Regulator Auto-Lite, Model XA-407-B. Owen-Dyneto Model No. 21611. Combination relay and thermostatically operated regulator mounted on generator field frame. See complete article on Battery Charge Regulator in Equipment Section. Regulator adjusted to operate at 7.6-8.0 volts reducing charging rate approximately one half. Regulator adjusted by turning adjusting screw under lower thermostatic arm to left to increase operating voltage or to right to decrease operating voltage. Screw accessible by taking out field fuse and fuse holder and taking off regulator cover. Relay contacts close with generator voltage of 6.2-6.4 volts and open with discharge current of 0-2 amperes. Relay contact gap .015 inch. Air gap .010 inch (contacts closed).

**LIGHTING**:—Soreng Manegold Switch, Model A-5670-A. Dimmer Switch Model B-2100-A. Lighting switch mounted behind instrument board controlled by push-pull button at lower right center of instrument panel. Dimmer system 'depressed beam' double filament headlight bulbs controlled by foot operated switch on toeboard. Instrument lights controlled by button at left center of instrument panel. Lighting switch positions:

1. Button pushed in—All lights off.
2. Button halfway out—Parking lights (in headlights) and tail light on.
3. Button pulled out 'On' position—Headlights and tail light on.

### Lamp Sizes

Position	Voltage	Candlepower	Base	Mazda No.
Headlights	6-8	32-32	D.C.	1000
Parking Lights	6-8	3	S.C.	63
Dash and Tail Lights	6-8	3	S.C.	63
Stop Lights	6-8	15	S.C.	87
Pillar Lights	6-8	6	S.C.	81

**FUSES**:—Four 15 ampere capacity fuses mounted on fuse block left side of dash under hood. Generator field fuse mounted in fuse holder plug in regulator cover 7½ ampere capacity.

**GASOLINE GAUGE**:—Motometer combination gasoline and oil gauge. Oil gauge tank unit (on crankcase) cut into gauge circuit by pulling out button at right center of instrument panel. Gasoline gauge registers whenever ignition is turned 'on' (see Equipment Section).

**FUEL PUMP**:—Stewart Warner mechanical fuel pump mounted at right of engine driven by camshaft (see Equipment Section).

**HORNS**:—Sparton twin horns vibrator type mounted under headlights.

# LA SALLE

MODEL 345-B (1932), SERIAL NUMBERS 1,100,001 UP  
 PRODUCTION STARTED JANUARY, 1932  
 DELCO-REMY SYSTEM

**CAR SERIAL NUMBER:**—Same as engine number.

**ENGINE NUMBER:**—Stamped on right hand side of crankcase below water inlet.

**BATTERY:**—Delco, Type 17-BW, 6 volt, 17 plate, 130 ampere hour (20 hour rate). The positive (+) terminal is grounded. Battery is mounted under the right front fender (accessible by removing four screws and lifting up portion of fender which serves as battery box cover).

**IGNITION:**—Coil Model 528-G. Coil is mounted on rear of dash under cowl in front compartment. Ignition current 2.5 amperes (engine running), 2.0 amperes (engine stopped). Ignition switch Delco-Remy Dual-lock, Model 426-T coincidental ignition switch and transmission lock.

**Distributor Model 660-Y or 662-Y.** Two breaker arm, 4 lobe cam type with full automatic advance. Must be synchronized (see Timing). Breaker gap .018-.022 inch (breaker arm on lobe of cam). To set gap, loosen lock screw on stationary contact mounting plate and turn eccentric adjusting screw. Resurface contacts when necessary with a fine flat contact file. Breaker arm spring tension 17-21 ounces (measured at tip of breaker arm with spring scale at right angles to contact surface).

Engine	Degrees	Automatic Advance Distributor	R.P.M. Distributor	Engine
660-Y	0	Start	250	500
660-Y	20	10	1475	2950
662-Y	11	5.5	900	1800

**Mounting:**—Distributor is mounted at front of engine between cylinder banks. Driven by gears from the camshaft. To remove, disconnect primary lead, take off distributor cap, take out two cap screws in distributor bracket, lift distributor out.

**Oiling:**—1000 Miles. Use Alemite grease and gun on Alemite fitting under distributor until grease appears at relief hole above fitting. Take off distributor cap and rotor. Put light oil on breaker arm pivot pins and fill wick oiler in center of shaft. Apply thin film of vaseline to face of breaker cam.

**Timing:**—Standard setting 1 3/16 inches (on flywheel) before top dead center. To set timing, remove inspection cover on flywheel housing. Center distributor pointer on quadrant scale by loosening hold-down screw in pointer arm and rotating distributor cup, tighten hold-down screw. With No. 1 piston (right hand block) on compression stroke rotate crankshaft until flywheel mark 'IG/A-1' is directly opposite indicator on flywheel housing. Loosen advance arm clamp bolt, rotate distributor cup until first set of contacts (mounted directly on breaker plate) begin to open (use test lamp). Tighten clamp bolt, connect spark plugs as indicated on diagram.

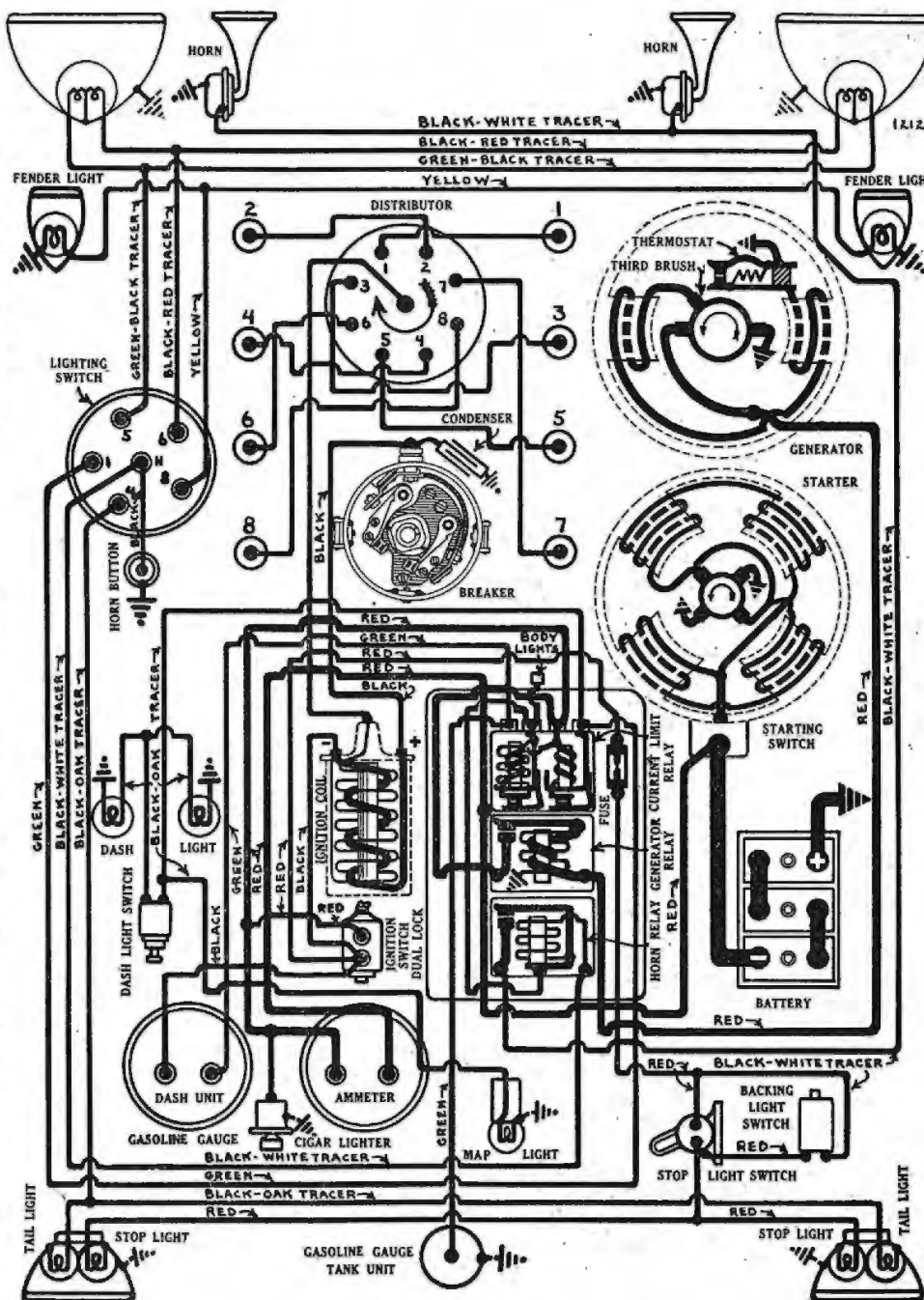
**Synchronization of Contacts**—first method as part of timing operation. After timing has been completed (as above), turn crankshaft 90 degrees to firing position of piston No. 2 when flywheel mark 'IG/A-2' should be opposite indicator. Loosen two lock screws on movable sub-plate (carrying second set of contacts), turn eccentric adjusting screw until contacts begin to open, tighten lock screws. Check contact gap; if outside limits of .018-.022 inch, reset at .020 inch and repeat synchronization.

**Second Method**—using synchronizing tool. Use Delco-Remy tool, Part No. 1338182, and follow complete directions in Equipment Section.

**Firing Order:**—1-2-7-8-4-5-6-3 with cylinders numbered as shown on diagram, or 1R-1L-4R-4L-2L-3R-3L-2R with cylinder banks right (R) and left (L) as viewed from the driver's seat. No. 1 cylinder nearest radiator in each case.

**Spark Plugs:**—18 MM. A.C. Type D-8. Hold gap within limits of .025-.028 inch.

**VALVE TIMING:**—Camshaft mounted directly above crankshaft driven by two-sprocket non-adjustable chain drive. Valves adjustable at center of engine



# LA SALLE

MODEL 345-B (1932), SERIAL NUMBERS 1,100,001 UP

PRODUCTION STARTED JANUARY, 1932

DELCO-REMY SYSTEM

between cylinder banks. New manifolding on 345-B engine requires new location of valves. With valves numbered 1 to 8, beginning at radiator, valves are #1—exhaust, #2—intake, #3—exhaust, #4 and #5—intake, #6—exhaust, #7—intake, #8—exhaust. Both cylinder blocks are identical.

	Head Diameter	Stem Diameter	Length	Seat Angle	Lift
Intake	1.660-1.666"	3/8"	6 17/32"	30°	23/64"
Exhaust	1.634-1.640"	3/8"	6 1/2 "	45°	23/64"

	Tappet Clearance	Spring Pressure
Intake	.004" (hot)	Closed 79 pounds (2 1/2" )
Exhaust	.006" (hot)	Open 160 pounds (2.148")

### Timing

Intake valves open 6 degrees before top dead center. Intake valves close 42 degrees after lower dead center. This applies with .004" tappet clearance.

Exhaust valves open 38 degrees before lower dead center. Exhaust valves close 2 degrees after top dead center. This applies with .006" tappet clearance.

To Set Valve Timing:—Camshaft sprocket and crankshaft sprocket are marked. Chain should be assembled with crankshaft and camshaft turned so that sprocket marks are directly opposite and in line with a straightedge across the shaft centers.

**STARTER:—Model 728-P.** Manual pinion engagement connected to starting switch lever (not adjustable). Starter drives through reduction gears and an overrunning clutch. Rotation (armature shaft) counter-clockwise at commutator end. Brush spring tension 24-28 ounces. Starter cranks engine at 80-90 R.P.M.

### Starter Data

Torque	R.P.M.	Volts	Amperes
0 lb. ft.	2500	5	70
28 "	Lock	3.0	600

**Mounting:—**Starter flange mounted on rear face of flywheel housing at right of transmission. To remove, disconnect cable, disconnect starting pedal linkage, take out 3 flange mounting cap screws, pull starter to rear to clear housing, lift from place.

**Oiling:—1000 Miles.** Put 8-10 drops light oil in oiler at each end of armature shaft. Outer bearing in pinion housing is oilless.

**Six Months.** Take out grease plug in reduction gear case. Repack gears with graphite grease.

**GENERATOR:—Model 927-S.** Third brush regulation thermostat control. Thermostat operates at 165°F. (contacts open—cuts in resistance), reducing output approximately 40%. To adjust charging rate, loosen hexagonal lock screw on commutator end plate, take off cover band, shift third brush (by hand) counter-clockwise to increase or clockwise to decrease charging rate, tighten the lock screw. With standard setting, charging rate is 13 1/2-16 1/2 amperes at 8.6-9.0 volts reached at 1450-1650 R.P.M. or 22 M.P.H. Generator is air cooled and may be set at 24 amperes maximum output without damage.

### Generator Data

Amperes	Cold Test		Amperes	Hot Test	
	Volts	R.P.M.		Volts	R.P.M.
22-24	8.6-9.0	1450-1650	14-15	7.8-8.2	1800-2000

Shunt field current 4.25-4.65 amperes at 6 volts. Brush spring tension 20-28 ounces.

**Mounting:—**Generator flange mounted at right of engine on rear of accessory drive chain case. Water pump mounted on front of chain case. Driven by special chain from crankshaft. To remove, drop mud pan at right of engine, disconnect lead, take off nuts on two upper flange mounting bolts, take out

lower flange mounting cap screw, pull generator to rear to disengage drive coupling, take out from underneath car.

**Chain Adjustment.** Loosen nuts on flange mounting bolts, loosen two pivot screws (second screw on front of chain case), pull generator away from engine until chain is tight, slack off 1/8 inch, tighten bolts and screws.

**Oiling:—1000 Miles.** Put 8-10 drops light engine oil in oiler at each end of generator.

**RELAY:—**See paragraph on 'Apparatus Box'.

**LIGHTING:—Delco-Remy Switch, Model 486-H.** Lighting switch is mounted at lower end of steering column controlled by lever on steering wheel. Dimmer system 'depressed beam' double filament headlight bulbs controlled by lighting switch.

Position	Voltage	Candlepower	Base	Mazda No.
Headlights	6-8	32-32	D.C.	1000
Fender Lights	6-8	3	S.C.	63
Dash and Tail Lights	6-8	3	S.C.	63
Backing and Stop Light	6-8	15	S.C.	87
Map Reading Lights	6-8	3	S.C.	63
Dome and Corner Light	6-8	6	S.C.	81

**Switches:—**Stop light switch is Delco-Remy, Model 474-Z. Backing light switch is Model 440-E.

**NOTE:—**The map reading light in the center of the instrument panel has a switch built in the socket. Switch is operated by pulling the light out against the stop. To remove map reading light bulb, pull lamp out part way until the end of the threaded shaft on the lamp plunger is flush with the end of the cylinder (behind the instrument panel), turn bulb shield until the hole in the plunger lines up with the hole in the cylinder, insert a nail to prevent plunger turning, unscrew bulb shield (right hand thread).

**APPARATUS BOX:—Delco-Remy, Model 480-Z.** Mounted on rear of dash under cowl. Consists of current limit relay (vibrating and lock-out circuit breaker), generator cut-out relay, horn relay, and a 10-ampere capacity fuse (in circuit to backing and stop lights).

**Current Limit Relay:—**Vibrating circuit breaker begins to operate with current load of 35-40 amperes limiting current to 5-20 amperes maximum with direct short-circuit. Lock-out circuit breaker begins to operate with current load of 25-30 amperes limiting current to less than 1 ampere with direct short-circuit. Circuit breaker contact gap limits .012-.030 inch. Air gap limits .015-.025 inch (contacts closed). Spring tension 5 ounces minimum (measured at brass button with spring scale at right angles to contact arm).

**Cut-out Relay:—**Contacts close at 8-9 M.P.H. or 420 R.P.M. (generator) with a generator voltage of 6.75-7.5 volts and open with a discharge current of 0-2 amperes. Contact gap limits, .015-.025 inch. Air gap limits, .012-.017 inch (contacts closed).

**Horn Relay:—Model 266-T.** Pressing horn button energizes horn relay winding, closing horn relay contacts and completing horn circuit. Horn current does not pass through horn button. Horn relay requires .25 amperes to close contacts. Horn relay contact gap limits, .015-.025 inch. Air gap limits, .012-.017 inch (contacts closed).

**FUSES:—**Stop and backing light fuse in Apparatus Box 10 ampere capacity.

**GASOLINE GAUGE:—**A.C. Electric Type (see Equipment Section).

**HORNS:—**Klaxon vibrator type matched set with blended tone, Model K-26-C Type 1379 (low note) and Model K-26-C Type 1380 (high note). Horns draw 6.0-8.5 amperes at 6 volts (Type 1379), and 5.0-6.5 amperes at 6 volts (Type 1380).

# LINCOLN

## EIGHT CYLINDER MODEL V-8 (1932)

### AUTO-LITE SYSTEM

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

**ENGINE NUMBER:**—Stamped on left side of crankcase between Nos. 1 and 2 cylinders.

**BATTERY:**—Exide, Type 3-LXV-15-1RD, 6 volt, 135 ampere hour (5 ampere rate). Starting capacity 150 amperes for 20 minutes. Negative (—) terminal is grounded. Battery mounted under left front fender. Battery size, 7 inches wide, 15½ inches long, 8¾ inches high.

**IGNITION:**—Coil Model CE-4001-L (2 used). Coils are mounted on dash under cowl. Ignition current is 1.45-4 amperes at 6 volts (engine running), 3-4.5 amperes at 6 volts (engine stopped) for each coil. Ignition switch is a Cutler-Hammer push-pull switch built in the co-incidental ignition switch and steering post lock.

**Distributor Model IGL-4001.** Two breaker arm, 4 lobe cam type with semi-automatic advance. Breaker contacts open alternately at 30 and 60 degree intervals corresponding to the engine firing intervals of 60 and 120 degrees. Contacts must be synchronized (see Timing). Breaker gap set at .020 inch. To set gap (first set mounted on breaker plate), loosen lock screws on stationary contact mounting plate, turn eccentric adjusting screw, tighten locking screws or (second set mounted on movable sub-plate), loosen lock nut on stationary contact mounting stud, turn up stud, tighten lock nut. Breaker arm spring tension 24 ounces. Maximum manual advance 20 degrees (engine).

Engine	Degrees	Automatic Advance	Distributor	R.P.M.	Engine
0		Start	400		800
4		2	600		1200
12		6	950		1900
20		10	1365		2730
26		13	1650		3300

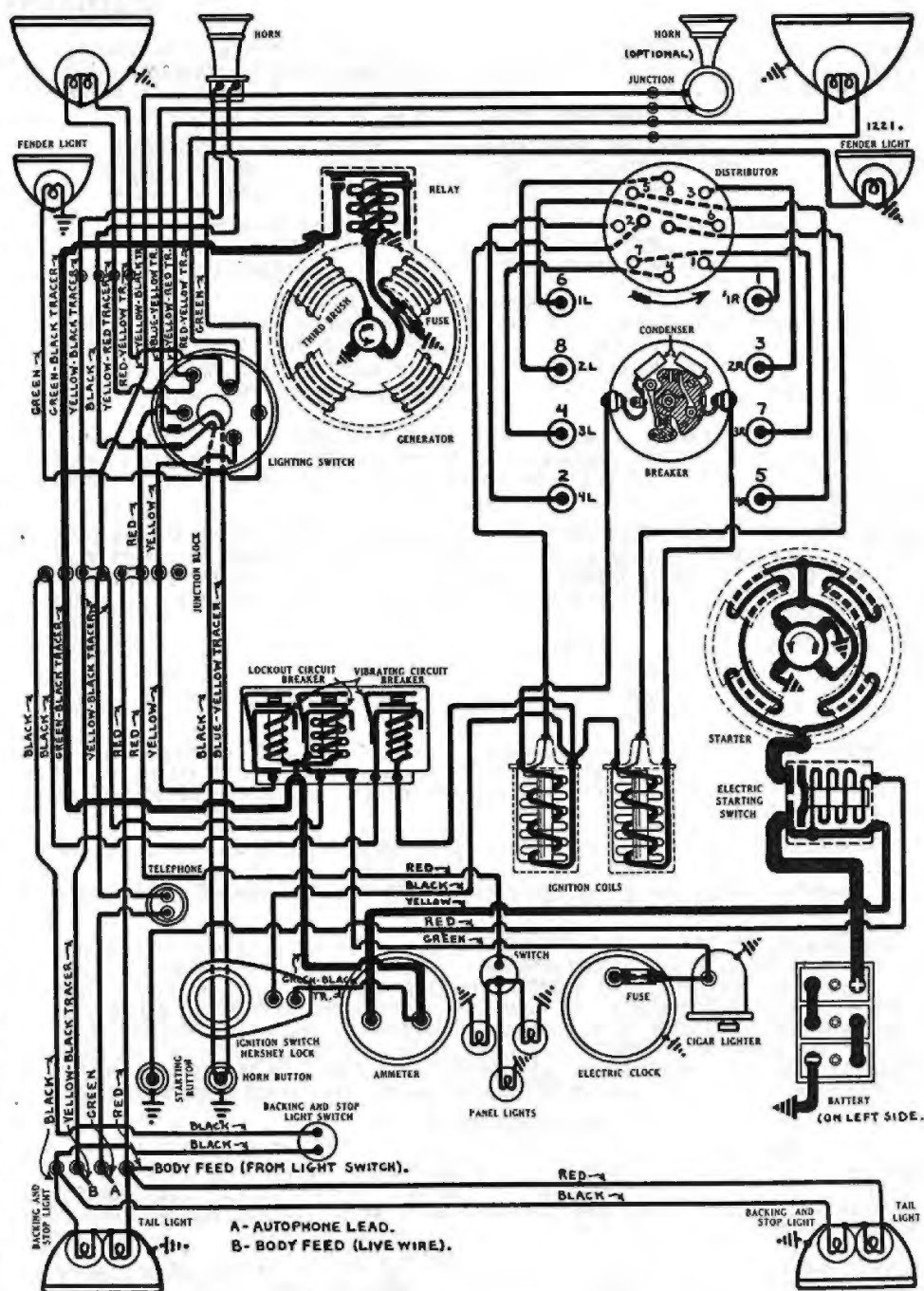
**Mounting:**—Distributor mounted at forward end of engine between cylinder banks. To remove, disconnect primary leads, disconnect manual spark control, take off distributor cap and cable assembly, take out two hold-down screws in advance arm and lift distributor out.

**Oiling:**—1000 Miles. Put 5-6 drops light engine oil in each of two oilers on side of distributor housing.

5000 Miles. Take off distributor cap and rotor. Put one drop oil on breaker arm pivot pins and apply thin film of vaseline to face of breaker cam.

**Timing:**—To set timing, first check contact gaps, fully advance manual spark control, see that distributor is rotated clockwise to end of advance arm slot, take off cover plate over inspection hole in flywheel housing. With piston No. 2 (No. 4 left hand bank—see diagram) on compression, turn engine over until flywheel mark 'A/2' (which is slightly before top dead center mark 'DC/2-6') is directly under pointer on flywheel housing. Then loosen lock screw in center of breaker cam, carefully locate cam so that left hand breaker contacts (mounted directly on breaker plate) are beginning to open, tighten locking screw, connect spark plugs as indicated on diagram.

**Synchronization of Contacts:**—Turn engine over 300° or slightly more than ¼ turn to firing position of piston No. 5 (No. 4 on right hand block—see diagram) when the flywheel mark 'A/1' (which is slightly before the top dead center mark 'DC/1-5') should be directly under pointer on flywheel housing. Then loosen three lock screws on movable sub-plate (carrying



# LINCOLN

## EIGHT CYLINDER MODEL V-8 (1932)

### AUTO-LITE SYSTEM

second set of contacts), turn eccentric adjusting screw until contacts open, tighten lock screws. This will establish the proper alternate 30 and 60 degree firing interval between contact openings. It is important that the contact gap on each set of contacts be kept exactly the same.

**Firing Order:**—1-2-3-4-5-6-7-8 with cylinders numbered as shown on diagram, or 1R-4L-2R-3L-4R-1L-3R-2L with cylinder banks right (R) and left (L) as viewed from the driver's seat and No. 1 cylinder nearest the radiator.

**Spark Plugs:**— $\frac{7}{8}$ -18 S.A.E. Champion Type C-4. Set gaps at .022-.024 inch.

**VALVE TIMING:**—Valves on inner side of each cylinder bank and adjustable in valve alley at center of engine. Camshaft directly above crankshaft and chain driven. Timing chain adjusted manually by shifting accessory drive sprocket (see Adjustment paragraph below).

	Head Diameter	Stem Diameter	Length	Seat Angle	Lift
Intake	2"	$\frac{3}{8}$ "	$6\frac{3}{4}$ "	45°	11/32"
Exhaust	1 $\frac{7}{8}$ "	$\frac{3}{8}$ "	$6\frac{3}{4}$ "	45°	11/32"

	Tappet Clearance	Spring Pressure
Intake	.005" (cold)	Valve open.....160 pounds
Exhaust	.005" (cold)	

#### Timing

Intake valves open 22 $\frac{1}{2}$ ° before top dead center. Intake valves close 66° after lower dead center.

Exhaust valves open 48 $\frac{1}{2}$ ° before lower dead center. Exhaust valves close at top dead center. Flywheel is marked 'DC/1-5' at point of exhaust closing for cylinders Nos. 1 and 5 and also 'DC/2-6' at point of exhaust closing for cylinders Nos. 2 and 6. Valve stem guides are removable. Valves with over-size stems are not made.

**Timing Chain Adjustment.** Timing chain is adjusted by shifting accessory drive sprocket. To take up timing chain, loosen flange mounting screws on water pump bracket, back off lock nut and turn up adjusting set screw until correct chain tension is secured, tighten lock nut and mounting screws. With correct adjustment, chain will operate noiselessly. If chain hums, adjustment must be backed off slightly.

**STARTER:**—Model MAL-4001 (Domestic), MAL-4002 (Export). Starter drives engine through an outboard Bendix drive. Rotation counter-clockwise at commutator end. Brush spring tension 44-56 ounces. Starter switch electromagnetic type mounted on starter field frame and controlled by starting push button on instrument panel.

Starter Data			
Torque	R.P.M.	Volts	Amperes
1 lb. ft.	2000	5.5	100
4.5 "	1000	5.0	200
8.25 "	640	4.5	300
12.75 "	375	4.0	400
22.0 "	Lock	3.0	600
32.0 "	Lock	4.0	825

**Mounting:**—Starter flange mounted on front face of flywheel housing at right (domestic models) or left (export models) of engine. To remove, disconnect cable and switch control wires or take off starting switch, take out three flange mounting screws, pull starter forward to clear Bendix housing.

**Oiling:**—1000 Miles. Put 5-6 drops light engine oil in oiler at each end of the armature shaft. Outboard bearing (outer end of Bendix housing) is oilless.

**GENERATOR:**—Model GAU-4001. Third brush regulation. To adjust generator

output, take off commutator cover band, shift third brush mounting plate by hand counter-clockwise to increase or clockwise to decrease charging rate. The third brush plate is held in position by friction. With standard car setting maximum charging rate is 17 amperes (cold) at 8.0 volts reached at 1600 R.P.M.

#### Generator Data

Cold Test			Hot Test		
Amperes	Volts	R.P.M.	Amperes	Volts	R.P.M.
0	8.4	415	0	6.4	590
4	6.9	620	4	6.9	740
8	7.1	730	8	7.4	930
12	7.5	890	12	7.9	1280
15	7.8	1100	13.2	8.0	1800
17	8.0	1600	9.6	7.5	2800
11.2	7.4	2800			

Shunt field current is 2.0-2.2 amperes at 6 volts. Motoring generator draws 3.0-3.3 amperes at 6.0 volts. Field fuse mounted in plug in commutator end plate is 7 $\frac{1}{2}$  ampere capacity.

**Mounting:**—Generator mounted at left front of engine on swinging bracket mounting and is belt driven from crankshaft. To remove, disconnect lead, loosen adjustment clamp bolt, swing generator toward engine, slip off drive belt, take out two bolts under generator forming bracket hinge, lift generator out.

**Oiling:**—500 Miles. Put 5-6 drops light engine oil in oiler at each end.

**RELAY:**—Model CB-4014-B. Relay mounted on generator field frame. Relay contacts close at 450-525 R.P.M. of generator or 7 M.P.H. when generator voltage reaches 6.4 volts and open with discharge current of 1-2.5 amperes. Relay contact gap limits .025-.035 inch. Air gap limits .010-.030 inch (contacts closed).

**LIGHTING:**—Essex Switch. Lighting switch mounted at lower end of steering column and controlled by lever on steering wheel. Dimmer system 'depressed beam' double filament headlight bulbs controlled by lighting switch.

#### Lamp Sizes

Position	Voltage	Candlepower	Base	Mazda No.
Headlights	6-8	32-32	D.C.	1000
Fender Lights	6-8	6	S.C.	81
Instrument Lights	6-8	3	S.C.	63
Tail Lights	6-8	3	S.C.	63
Stop and Backing Lights	6-8	21	S.C.	1129
Dome and Corner Lights	6-8	6	S.C.	81

**CURRENT LIMIT RELAY:**—Delco-Remy Model. Mounted on dash, consists of two vibrating circuit breakers and one lock-out circuit breaker (mounted in center).

**Vibrating Circuit Breaker:**—Begins to operate with current load of 35-40 amperes limiting current to 5-20 amperes with direct short-circuit.

**Lock-out Circuit Breaker:**—Begins to operate with current load of 28-31.3 amperes limiting current to less than 1 ampere with direct short-circuit.

Circuit Breaker contact gap limits .012-.030 inch. Air gap limits .015-.025 inch (contacts closed). Spring tension 5 ounces minimum (measured by spring scale hooked under arm at brass button and at right angles to arm).

**GASOLINE GAUGE:**—K-S Telegauge hydrostatic type (see Equipment Section).

**FUEL PUMP:**—A.C. mechanical fuel pump mounted on left side of crankcase (see Equipment Section).

# LINCOLN

## TWELVE CYLINDER MODEL V-12 (1932)

### AUTO-LITE SYSTEM

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

**ENGINE NUMBER:**—Stamped on left side of crankcase below first cylinder.

**BATTERY:**—Exide, Type 3-LXV-15-1RD, 6 volt, 135 ampere hour capacity (5 ampere rate). Starting capacity 150 amperes for 20 minutes. Negative (—) terminal grounded. Battery mounted on right frame member under front compartment floor boards. Battery size, 7 inches wide, 15½ inches long, 8¾ inches high.

**IGNITION:**—Coil Model CE-4001-L (2 used). Coils mounted on dash. Ignition current 1.45-4 amperes at 6 volts per coil (engine running), 3-4.5 amperes at 6 volts per coil (engine stopped). Ignition switch is an Oakes 'Hershey' type co-incidental ignition switch and steering post lock.

**Distributor Model IGM-4001.** Two breaker arm, 6 lobe cam type with semi-automatic advance. Breaker contacts open at 27½ and 32½ degree intervals corresponding to 55 and 65 degree firing intervals of engine (cylinder banks set at 65 degree angle resulting in uneven firing intervals). Contacts must be synchronized (see Timing). Manual advance controlled by lever on steering wheel. Breaker gap set at .020 inch. To set gap, loosen lock screws on stationary contact mounting plate, turn eccentric adjusting screw (first set of contacts called fixed points mounted directly on breaker plate), or loosen lock nut on stationary contact mounting stud, turn up stud (second set of contacts called movable points mounted on movable sub-plate). Maximum manual advance 20 degrees (engine).

Engine	Degrees	Automatic Advance	R.P.M.	Engine
0	Start	300	600	
4	2	600	1200	
8	4	900	1800	
12	6	1200	2400	
16	8	1500	3000	
20	10	1800	3600	
23	11½	2000	4000	

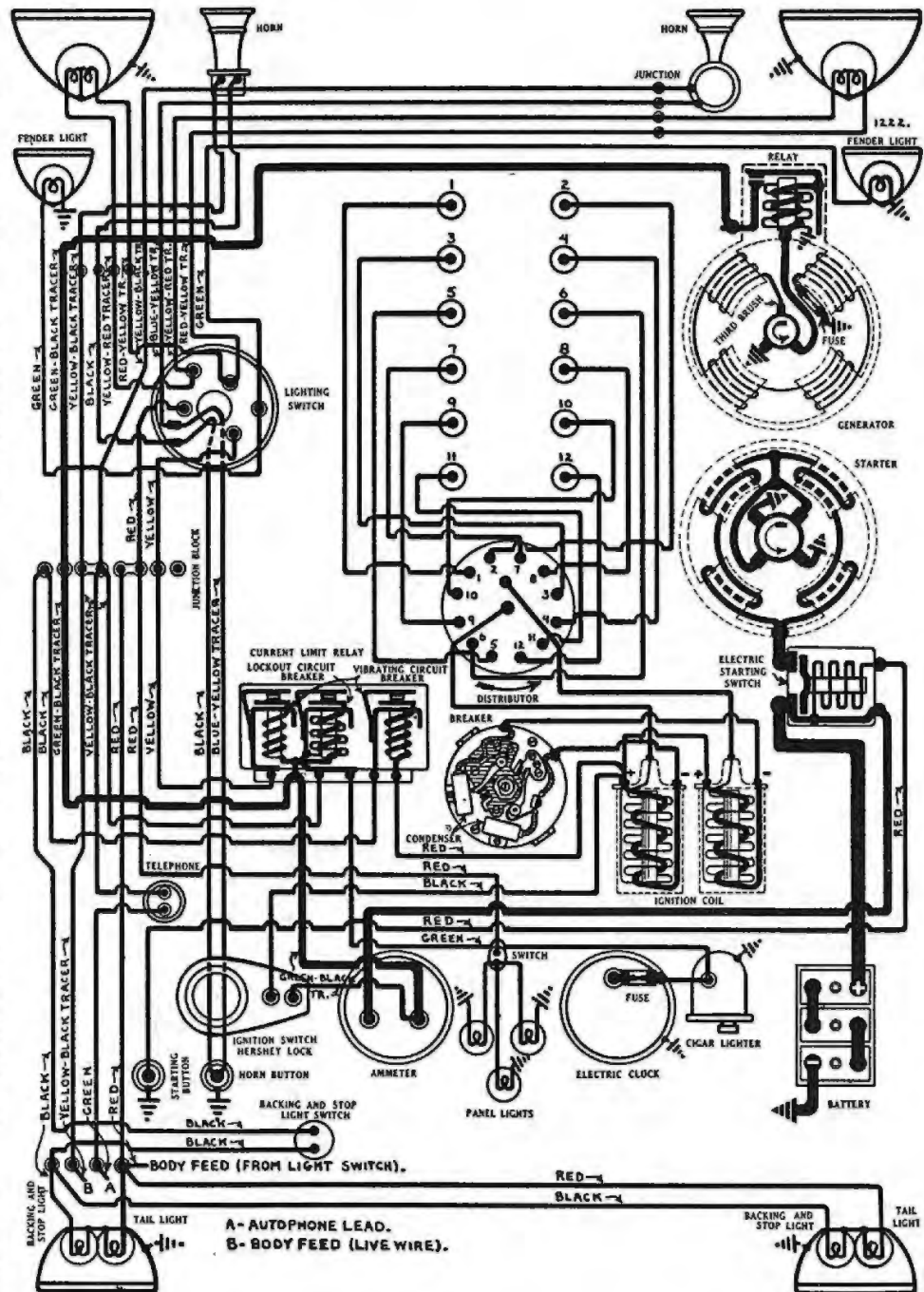
**Mounting:**—Distributor mounted between cylinder banks at extreme rear of engine. To remove, disconnect primary leads, disconnect manual spark control, take off cable conduits and distributor cap, take out two hold-down screws in advance arm, lift distributor out.

**Oiling:**—1000 Miles. Few drops medium engine oil in two oilers on side of distributor cup.

5000 Miles. Take off distributor cap and rotor. Put one drop castor oil on breaker arm pivot pins. Apply thin film of grease to face of breaker cam.

**Timing:**—To set timing, advance manual spark control, see that distributor is rotated clockwise to end of advance arm slot, take off cover plate on inspection hole in top of flywheel housing at right of engine. With piston No. 2 (No. 1 of the right hand block) on compression, turn engine over until flywheel mark 'A/2' (which is before the top dead center mark 'D2/12C') is directly under pointer on the housing, take off distributor cap and rotor, loosen locking screw in center of breaker cam, carefully locate cam so that first set of contacts (mounted directly on breaker plate) are beginning to open, tighten locking screw, connect spark plugs as indicated on diagram (No. 1 terminal as designated).

**Synchronization of Contacts.** After timing distributor (above) crank engine over 65 degrees to firing position of piston No. 11 (or if desired, turn engine over 1 revolution plus 65 degrees to firing position of piston No. 1) with flywheel mark 'A/1' (which is before the top dead center mark 'D1/11C') directly opposite pointer on housing. Loosen three lock screws on movable sub-plate carrying second set of contacts, turn eccentric adjusting screw until contacts begin to open, tighten lock screws. The first set or fixed contacts should open again after an interval of 27½ degrees (distributor) or 55 degrees of crankshaft rotation.



# LINCOLN

## TWELVE CYLINDER MODEL V-12 (1932)

### AUTO-LITE SYSTEM

**Firing Order:**—1-4-9-8-5-2-11-10-3-6-7-12 with cylinders numbered as shown on diagram, or 1L-2R-5L-4R-3L-1R-6L-5R-2L-3R-4L-6R with cylinder banks right (R) and left (L) as viewed from driver's seat. No. 1 cylinder nearest radiator in each case. See diagram for proper connection of spark plug cables on distributor cap.

**Spark Plugs:**— $\frac{7}{8}$ -18 S.A.E. Champion Type C-4. Set gaps at .025-.030 inch.

**VALVE TIMING:**—Valves on inner side of each cylinder bank operated by single camshaft mounted directly above crankshaft. Camshaft driven in tandem with generator sprocket by chain drive with automatic chain adjustment.

	Head Diameter	Stem Diameter	Length	Seat Angle	Lift
Intake	2"	$\frac{3}{8}$ "	$7\frac{1}{8}$ "	45°	11/32"
Exhaust	2"	$\frac{3}{8}$ "	$7\frac{1}{8}$ "	45°	11/32"

	Tappet Clearance	Spring Pressure
Intake	.003 (cold)	Closed .... 75- 80 pounds (2 15/16")
Exhaust	.005" cold)	Open .... 175-180 pounds (2 19/32")

#### Timing

Intake valves open 21° before top dead center. Close 47° after lower dead center.

Exhaust valves open 57° before lower dead center. Close 11° after top dead center.

**STARTER:**—Model MAO-4001. Starter drives engine through an outboard Bendix drive. Rotation counter-clockwise at commutator end. Electric starting switch mounted on starter field frame controlled by button on instrument board.

Starter Data			
Torque	R.P.M.	Volts	Amperes
0 lb. ft.	2800	5.8	50
1.5 "	1380	5.5	100
5.75 "	750	5.0	200
11.2 "	500	4.5	300
17.0 "	325	4.0	400
22.4 "	180	3.5	500
28.0 "	60	3.0	600
35.0 "	Lock	3.0	725
52.0 "	Lock	4.0	1025

**Mounting:**—Starter flange mounted on front face of flywheel housing at right of engine. To remove, disconnect cable and switch lead or take off starting switch, take out 3 flange mounting screws, pull starter straight forward to clear Bendix housing, lift out.

**Oiling:**—1000 Miles. Few drops medium engine oil in oiler at each end of armature shaft. Outboard bearing (Bendix housing) is oilless.

**GENERATOR:**—Model GBC-4001. Third brush regulation. To adjust charging rate, take off commutator cover band, shift third brush by prying on brush mounting stud. Shift third brush counter-clockwise to increase or clockwise to decrease charging rate. Rotation counter-clockwise at commutator end. Brush held in position by friction. Maximum charging rate 20 amperes at 8.0 volts reached at 1250 R.P.M. or 25 M.P.H.

Generator Data					
Cold Test			Hot Test		
Amperes	Volts	R.P.M.	Amperes	Volts	R.P.M.
0	6.4	400	0	6.4	460
4	6.9	460	4	6.7	550
8	7.0	525	8	7.1	650
12	7.3	600	12	7.4	790
16	7.5	725	16	7.8	1075
20	7.8	940	17.2	8.0	1400
21.6	8.0	1250	12.4	7.5	2800
13	7.3	2800			

Shunt field current 2.75-3.05 amperes at 6.0 volts. Generator motoring draws 5.32-5.88 amperes at 6.0 volts. A  $7\frac{1}{2}$  ampere field fuse is mounted under fuse plug on commutator end plate.

**Mounting:**—Generator flange mounted on rear face of timing chain case at right of engine. Water pump mounted on crankcase and driven by extension of generator shaft. To remove, disconnect lead, take off cover and disconnect water pump drive shaft, take out 3 flange mounting screws, pull generator to rear to disengage drive coupling (do not disturb intermediate plate carrying drive sprocket), lift out.

**Oiling:**—1000 Miles. Few drops medium engine oil in oiler at each end of generator.

**RELAY:**—Model CB-4014-L. Relay mounted on generator field frame. Contacts close with generator voltage of 7-7.5 volts and open with discharge current of .5-2.5 amperes. Contact gap limits .025-.035 inch. Air gap limits .010-.030 inch (contacts closed).

**LIGHTING:**—Essex Switch. Lighting switch mounted at lower end of steering column controlled by lever on steering wheel. Dimmer system 'depressed beam' double filament headlight bulbs controlled by lighting switch.

Position	Lamp Sizes		Base	Mazda No.
	Voltage	Candlepower		
Headlights	6-8	32-32	D.C.	1000
Fender Lights	6-8	6	S.C.	81
Instrument Lights	6-8	3	S.C.	63
Tail Lights	6-8	3	S.C.	63
Stop and Backing Lights	6-8	21	S.C.	1129
Dome and Corner Lights	6-8	6	S.C.	81

**CURRENT LIMIT RELAY:**—Delco-Remy Model. Mounted on dash consists of two vibrating circuit breakers and one lock-out circuit breaker (in center).

**Vibrating Circuit Breaker:**—Begins to operate with current load of 35-40 amperes limiting load to 5-20 amperes with direct short-circuit.

**Lock-out Circuit Breaker:**—Begins to operate with current load of 28-31.3 amperes limiting load to less than 1 ampere with direct short-circuit.

Circuit breaker contact gap limits .012-.030 inch. Air gap limits .015-.025 inch (contacts closed). Spring tension 5 ounces minimum (measured by spring scale hooked under contact arm and at right angles to arm).

**GASOLINE GAUGE:**—K-S Telegauge hydrostatic type (see Equipment Section).

**FUEL PUMP:**—A.C. mechanical fuel pump mounted at right front of engine (see Equipment Section).

**CLOCK:**—Waltham Electric type. Five ampere capacity fuse mounted on back of clock.



# MARMON

## MODEL 8-125 (1932)

### DELCO-REMY SYSTEM

**CAR SERIAL NUMBER:**—Stamped on plate on left side of front compartment under carpet.

**ENGINE NUMBER:**—Stamped on boss on right side of engine near No. 1 exhaust port.

**BATTERY:**—National, Type K-3-19XR, 6 volt, 19 plates, 153 ampere hour capacity (20 hour rate). Positive (+) terminal grounded. Battery mounted on left frame member under front compartment floor boards. Battery size, 7½ inches wide, 13 3/16 inches long, 9 5/16 inches high.

**IGNITION:**—Coil Model 528-K. Coil lock type with ignition switch in base. Coil mounted on back of instrument board. Ignition current 2.5 amperes at 6 volts (engine running), 4.7 amperes at 6 volts (engine stopped).

**Distributor Model 652-D.** Two breaker 4-lobe cam type with semi-automatic advance. Contacts open alternately at 45 degree intervals corresponding to 90 degree firing interval of engine. Contacts must be synchronized (see Timing). Manual advance controlled by button on dash. Ordinary running position with button pushed in, spark fully advanced. Pull out button to retard spark. Breaker gap set at .022 inch. Hold within limits of .018-.024 inch. To set gap, loosen lock screw on stationary contact mounting plate, turn eccentric adjusting screw, tighten lock screw. Breaker arm spring tension 17-21 ounces (measured at tip of breaker arm with spring scale at right angles to contact surface). Maximum manual advance 25 degrees (engine).

Engine	Degrees	Automatic Advance	R.P.M.	Engine
0	Start	450	900	
17	8½	2400	4800	
20	10	2550	5100	

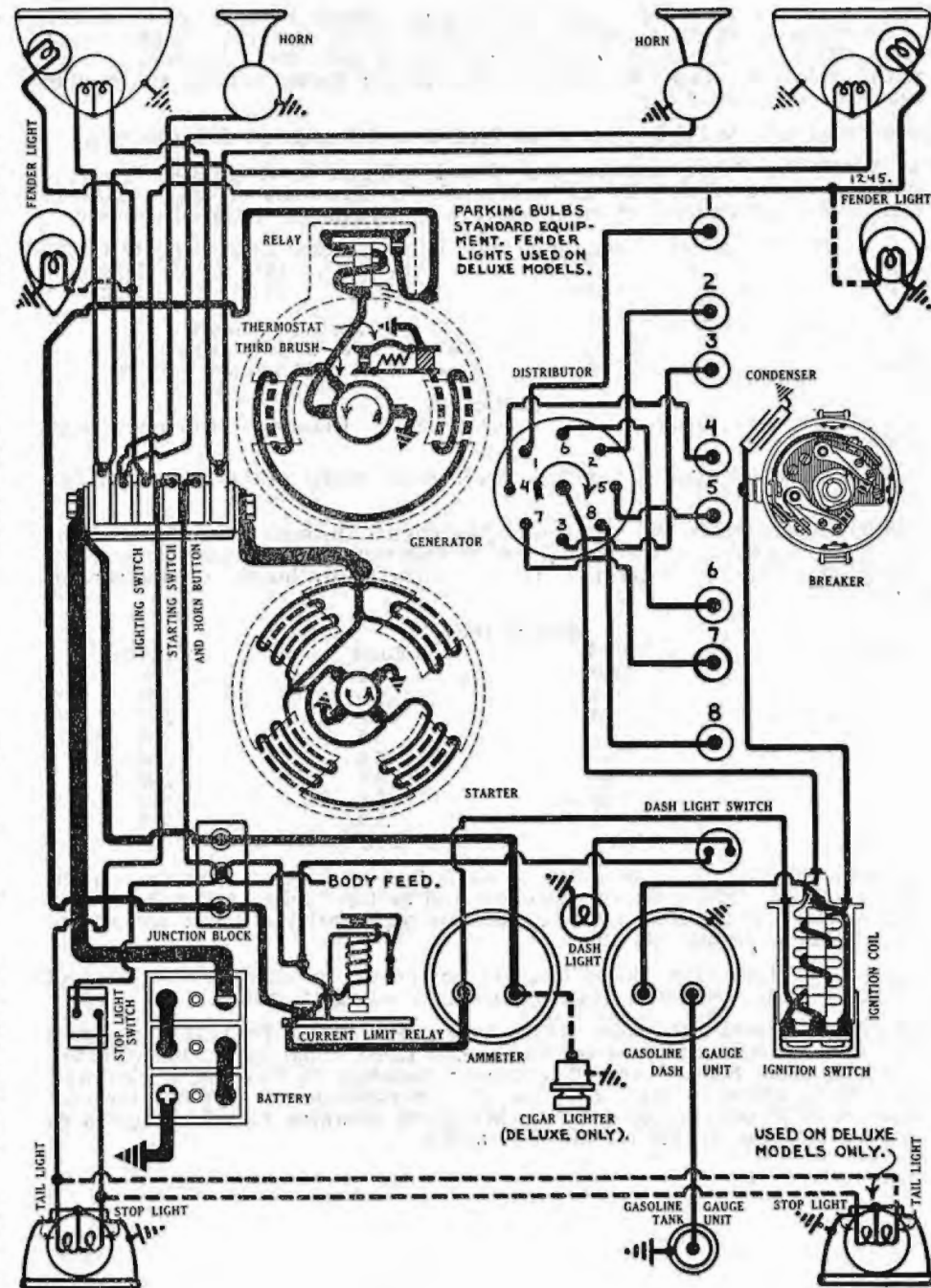
**Mounting:**—Distributor mounted on cylinder head at left side. To remove, disconnect primary lead, take off distributor cap, loosen clamp bolt in advance arm, lift distributor out.

**Oiling:**—750 Miles. Turn down grease cup on side of shaft housing one full turn. Keep cup filled with medium cup grease.

1000 Miles. Take off distributor cap and rotor. Saturate wick oiler in center of shaft with light engine oil, put one drop oil on breaker arm pivot pins, apply thin film vaseline to face of breaker cam.

**Timing:**—Standard setting 5° 40' or two teeth on flywheel before top dead center with full manual advance. To set timing, first advance manual spark control button (push button in toward dash), see that distributor is rotated counter-clockwise as far as possible, take off cover plate on inspection hole in flywheel housing. With No. 1 piston on compression, turn engine over until a point on the flywheel two teeth before the top dead center mark 'D/C' is directly opposite indicator on housing. Loosen advance arm clamp bolt, rotate distributor until first set of contacts (mounted directly on breaker plate) begin to open (use test lamp), tighten clamp bolt, connect spark plugs as indicated on diagram.

**Synchronization of Contacts.** Synchronize contacts on rotary spark gap or use Delco-Remy tool, Part No. 820738, and follow complete directions in Equipment Section. It is possible to synchronize contacts as part of timing operation by cranking engine over 90 degrees or 27 flywheel teeth from No. 1 firing position to No. 6 firing position (no flywheel mark provided, so it will be necessary to count teeth). Then loosen lock screws, turn eccentric adjusting screw until second set of contacts (mounted on movable sub-plate) begin to open, tighten lock screws, check contact gap. If outside limits of .018-.024 inch, reset at .022 inch and repeat synchronization.



# MAR MON

MODEL 8-125 (1932)  
DELCO-REMY SYSTEM

**Firing Order:**—1-6-2-5-8-3-7-4. No. 1 cylinder nearest radiator.

**Spark Plugs:**—18 MM. Metric. Champion C-7. Set gaps at .025 inch.

**VALVE TIMING:**—Valves at right of engine. Camshaft driven by two sprocket non-adjustable chain drive.

	Head Diameter	Stem Diameter	Length	Seat Angles	Lift
Intake	1 11/16"	.3417"	6 1/64"	45°	11/32"
Exhaust	1 9/16"	.3407"	6 1/64"	45°	11/32"

	Tappet Clearance		Spring Pressure
	Operating	Timing	
Intake	.008" (hot)		Open—100 pounds
Exhaust	.008" (hot)	.010" (cold)	

**Timing**

Intake valves open at top dead center. Close 50° after lower dead center.  
Exhaust valves open 50° before lower dead center. Close 10° after top dead center.

**To Check Valve Timing.** Check tappet clearance No. 1 exhaust valve with engine hot or set at .010 inch with engine cold. With No. 8 piston on compression stroke turn engine over until piston is 10° past top dead center with flywheel mark 'EX/CL' opposite indicator on flywheel housing. No. 1 exhaust valve should close at this point. No. 1 intake valve should open with piston No. 1 on top dead center and flywheel mark 'D/C' at indicator.

**STARTER:**—Model 718-M. Starter drives through Bendix drive. Rotation counter-clockwise at commutator end. Brush spring tension 24-28 ounces. Starter cranks engine at 125 R.P.M. Starter switch is combined with lighting switch at lower end of steering column.

Starter Data			
Torque	R.P.M.	Volts	Amperes
0 lb. ft.	8000	5.0	65
15 "	Lock	3.15	570

**Mounting:**—Starter flange mounted on left front face of flywheel housing. To remove, disconnect cable, take out 2 flange mounting cap screws, pull starter forward to clear drive housing, lift out.

**Oiling:**—750 Miles. Put 4-5 drops light engine oil in commutator end oiler. Drive end bearing is oilless.

**GENERATOR:**—Model 949-F. Third brush regulation, thermostat control. Thermostat operates at 162°F. (contacts open—cuts in resistance) reducing the charging rate approximately 40%. To adjust charging rate, loosen small round headed lock screw on commutator end plate, take off cover band, shift third brush by hand counter-clockwise to increase or clockwise to decrease charging rate, tighten locking screw. With standard setting maximum charging rate is 12 amperes (hot) at 7.5 volts reached at 2000 R.P.M. or 38 M.P.H.

**Generator Data**

Cold Test		R.P.M.	Hot Test		R.P.M.
Amperes	Volts		Amperes	Volts	
19-21	8.3-8.5	1450	9-12	7.3-7.6	1800-2000

Generator Model 965-L. Used on cars with free-wheeling. Construction and adjustment same as Model 949-F (above).

**Model 965-L Generator Data**

Cold Test		R.P.M.	Hot Test		R.P.M.
Amperes	Volts		Amperes	Volts	
18-20	8.3-8.5	1300	9-12	7.35-7.65	1300-1500

Brush spring tension 14-18 ounces. Shunt field current 4.0-6.1 amperes. Motoring generator draws 6 amperes at 6 volts.

**Mounting:**—Generator cradle mounted at left front of engine. Driven by fan belt. To remove, disconnect lead, slack off belt adjustment (at fan), slip off drive belt, loosen one bolt in mounting clamp band, lift generator out.

**Oiling:**—750 Miles. Put 4-5 drops light engine oil in oiler at each end.

**RELAY:**—Model 265-B. Relay mounted on generator field frame. Relay contacts close at 600 R.P.M. when generator voltage reaches 6.75-7.5 volts and open with discharge current of 0-2.5 amperes. Contact gap limits .015-.025 inch. Air gap limits .012-.017 inch (contacts closed).

**LIGHTING:**—Pines Finger Tip Control Switch, Model A-808. Switch is combination lighting and starting switch and horn control mounted at lower end of steering column controlled by button on steering wheel. Dimmer system 'depressed beam' double filament headlight bulbs controlled by lighting switch. See Equipment Section for complete article on Finger Tip Control.

Position	Lamp Sizes		Base	Mazda No.
	Voltage	Candlepower		
Headlights	6-8	21-21	D.C.	1110
Fender & Parking Lights	6-8	3	S.C.	63
Dash and Dome Lights	6-8	3	S.C.	63
Stop and Tail Light	6-8	21-2	D.C.	1158

NOTE:—Stop and tail lights are equipped with double filament bulb. Tail light lead must be connected to 2 cp. filament.

**CURRENT LIMIT RELAY:**—Model 410-C. Vibrating circuit breaker mounted on dash. Begins to operate with current load of 25-30 amperes limiting load to 2-15 amperes with direct short circuit. Contact gap limits .012-.030 inch. Air gap limits .015-.025 inch (contacts closed). Spring tension 5 ounces minimum (measured at brass button with spring scale at right angles to contact arm).

**GASOLINE GAUGE:**—A.C. Electric type (see Equipment Section).

**FUEL PUMP:**—A.C. mechanical fuel pump mounted at right of engine (see Equipment Section).

**HORNS:**—Sparton vibrator type matched tone twin horns. Current draw 6 amperes each.

# MARMON

## SIXTEEN CYLINDER MODEL (1931-32)

### DELCO-REMY GENERATING, STARTING SYSTEM DELCO-REMY IGNITION

**BATTERY:**—Exide, 3-XCH-21-1, 6 volt, 21 plate, 167 ampere hour capacity (20 hour rate). Starting capacity is 190 amperes for 20 minutes. Positive (+) terminal is grounded. Battery mounted on left frame member under front compartment floor boards. Battery size, 7 inches wide, 13 9/16 inches long, 9 5/16 inches high.

**IGNITION:**—Coil Models 528-A and 533-S. Coil Model 533-S (see 'A' on diagram) has an ignition switch built in the base. The Model 528-A coil (see 'B' on the diagram) is a standard ignition coil and is controlled by the ignition switch built in the 'A' coil. The primary lead for the 'B' coil is taken from the accessory terminal on the 'A' coil. Coils are mounted on the back of the instrument board.

**Distributor Model 4084.** Breaker contacts separate .015-.020 inch. Set contact gap by loosening lock screw on stationary contact mounting plate and turning up adjusting screw. Resurface contacts when necessary with a fine flat contact file or medium hard oilstone. Breaker arm spring tension 17-21 ounces. Breaker has two sets of contacts operating on an eight sided cam. Contacts open alternately at intervals of 22½ degrees corresponding to the 45 degree firing interval of the engine. Each set of contacts controls one ignition coil and fires one half the total number of spark plugs. Contacts must be synchronized as part of the timing operation to secure satisfactory engine performance (see Timing). Distributor is semi-automatic. Maximum manual advance is 15 degrees (engine).

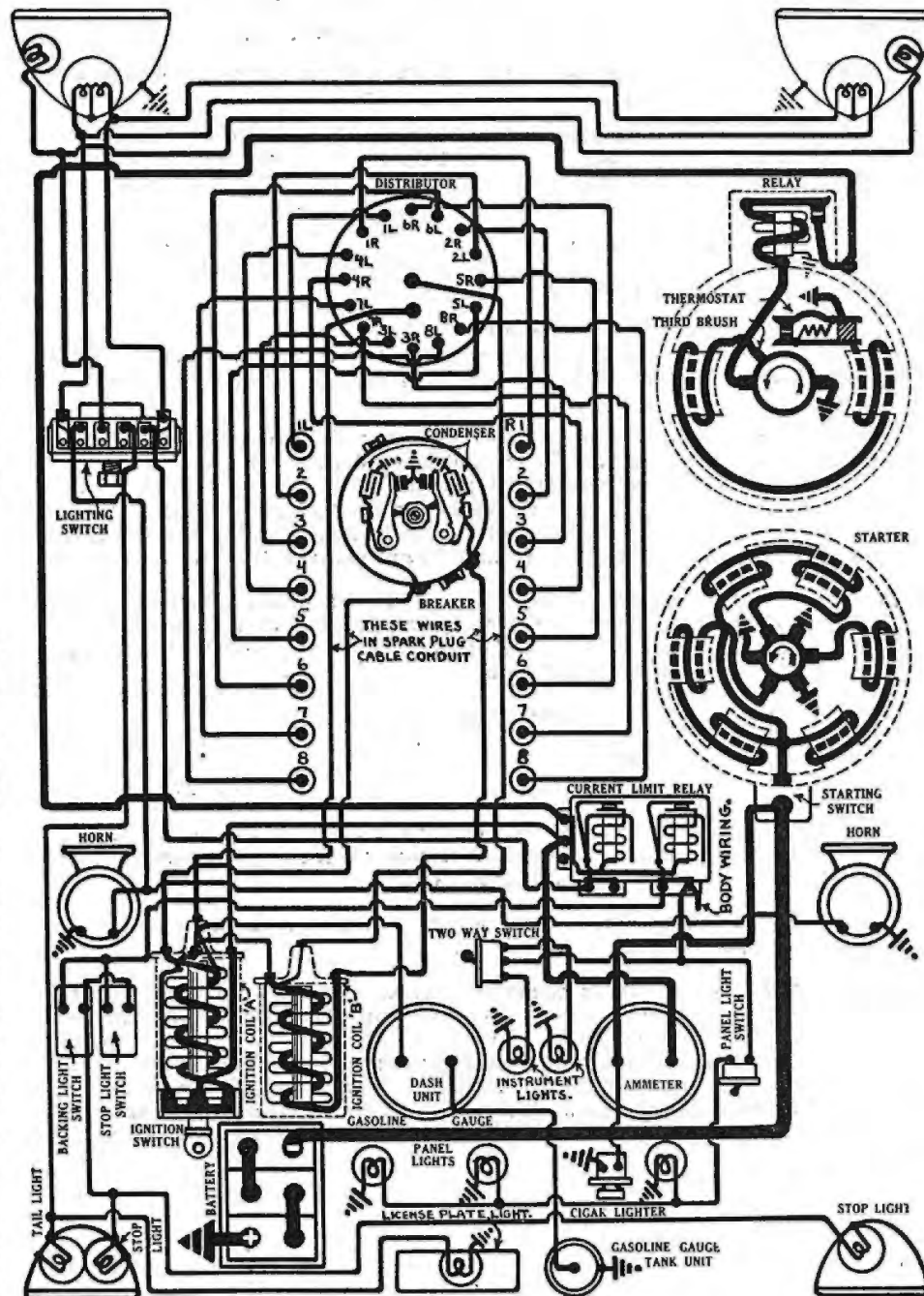
Engine	Degrees	Automatic Advance	R.P.M.	Engine
0.....	Start.....	Distributor	Distributor	600
32.....	16 .....	1900.....	3800	

**Mounting:**—Distributor is mounted between the cylinder banks at the front of the engine. To remove distributor, disconnect primary leads and manual advance control and take off cable conduits and distributor cap. Then take out hold-down screw in advance arm and lift distributor from place.

**Oiling:**—Fill the grease cup on the side of the distributor shaft with medium cup grease and turn down one turn every month or each 1000 miles. Every 1000 miles put 8-10 drops of light engine oil in the upper oiler and remove the distributor cap and rotor and oil the breaker arm pivot and put a small bit of vaseline on the face of the breaker cam.

**Timing:**—Standard setting 6° 12' or two teeth on the flywheel before top dead center with manual spark control fully advanced. To set timing, advance manual spark control and see that distributor is rotated counter-clockwise to end of advance arm slot, take off cover over inspection hole in flywheel housing at right of engine, turn engine over (using starter) until No. 1L piston (No. 1 of the left hand bank) is approaching top dead center on compression stroke. Then turn engine over slowly (using a large screwdriver to pry wheel around) until flywheel mark 'IGN/L1' (which is two teeth before the top dead center mark 'TDC/L1') is directly under the pointer in the inspection hole. Then loosen taper lock screw in center of breaker cam and carefully locate cam so that left hand breaker contacts (stationary set mounted directly on breaker plate) are beginning to open, tighten locking screw. Use a test lamp to determine contact opening. The left hand contacts control coil 'A' and fire spark plugs in left hand cylinder block. Ignition is set for right hand block by synchronizing contacts.

**Synchronization of Contacts.** After setting left hand contacts (above), turn engine over 315 degrees or 7/8 revolution to firing position of No. 1R cylinder (No. 1 of the right hand bank) with the flywheel mark 'IGN/R1' (which is two teeth before the top dead center mark 'TDC/R1') directly under the pointer in the inspection hole. Then loosen lock screws on movable breaker sub-plate (on which right hand contacts are mounted) and



# MARMON

## SIXTEEN CYLINDER MODEL (1931-32)

### DELCO-REMY GENERATING, STARTING SYSTEM DELCO-REMY IGNITION

turn eccentric adjusting screw until contacts begin to open, tighten lock screws. Use a test lamp to determine contact opening. The right hand contacts control coil 'B' and fire spark plugs in right hand cylinder block. Check contact gap after synchronizing contacts. If outside limits of .015-.020 inch, reset at .018 inch and repeat synchronization.

**Firing Order:**—Cylinder banks are designated right (R) and left (L) as viewed from the driver's seat. No. 1 cylinder of each bank is nearest the radiator. Firing order is 1L-3R-6L-7R-2L-4R-5L-1R-8L-6R-3L-2R-7L-5R-4L-8R.

**Spark Plugs:**—18 MM. Metric. Champion Type 8-S. Use Type C-7 for replacement. Set gaps at .021-.022 inch.

**VALVE TIMING:**—Valve-in-head type engine. Valves in cylinder head operated by rocker arms and pushrods on inner side of each cylinder bank. Tappet adjustment on rocker arm above pushrod. Tappet adjustments should be made with engine hot and idling. Camshaft is directly above crankshaft and is chain driven from the crankshaft in tandem with the generator. Chain is adjusted by shifting generator drive sprocket (see Generator Mounting).

	Head Diameter	Stem Diameter	Length	Seat Angle	Lift
Intake	1.562"	3095"	5 23/32"	45°	21/64"
Exhaust	1.375"	3085"	5 23/32"	45°	21/64"

	Tappet Clearance		Spring Pressure	
	Operating	Timing	Closed	Open
Intake	.008" (hot)		35 pounds (outer spring)	30 pounds (inner spring)
Exhaust	.008" (hot)	.014 (cold)	120 pounds	

**NOTE:**—Double valve springs are used. Coils of inner springs are wrapped in an opposite direction. Cylinder head is counter-bored for valve spring seat and a steel washer used to protect the aluminum head.

#### Timing

Intake valves open 6° before top dead center. Intake valves close 40° after lower dead center.

Exhaust valves open 40° before lower dead center. Exhaust valves close 6° after top dead center.

**To Check Valve Timing.** The exhaust opening point of cylinders Nos. 1R and 1L are marked on the flywheel and should be used for checking the valves. The flywheel mark 'EX.OP./1R', which is the exhaust opening point for cylinder No. 1R, is 140 degrees after the top dead center mark 'T.D.C./R1'. The exhaust opening mark for cylinder No. 1L, 'EX.OP./1L', is 140 degrees after the top dead center mark 'T.D.C./L1', or 45 degrees after the exhaust opening mark for No. 1R. To check valve timing, set tappet clearance No. 1R exhaust valve at .014 inch, turn engine over to approximately firing position of No. 3L cylinder and stop with flywheel mark 'EX.OP/1-R' directly under pointer in inspection hole in right side of flywheel housing. No. 1R exhaust valve should open at this point.

**To Set Valve Timing.** Turn crankshaft so that No. 3L piston is approximately on top dead center with flywheel mark 'EX.OP/1-R' at indicator in inspection hole. With tappet clearance of .014 inch, turn camshaft in direction of rotation until No. 1R exhaust valve is about to open. With camshaft and crankshaft in this position, the marks '0/0' on the camshaft and crankshaft sprockets should be directly opposite and in line with a straight-edge laid across the shaft centers. Whenever the chain case cover is removed care should be taken not to lose the spring and thrust button which holds the generator drive coupling in place.

**STARTER:**—Model 489. Starter is connected to the engine through a manual pinion shift interconnected with the starting switch pedal. Rotation is clockwise at commutator end. Brush spring tension should be 2¼-2½ pounds.

#### Starter Data

Torque	R.P.M.	Volts	Amperes
0 lb. ft.	3000	5	70
19 "	Lock	3	500

**Mounting:**—Starter is flange mounted on the rear face of the flywheel housing at right of the engine. To remove starter, take up front floor boards disconnect cable and starting pedal linkage and remove three flange mounting screws. Pull starter to the rear to clear drive pinion and lift from place.

**Oiling:**—Starter bearings are oilless. They require no attention.

**GENERATOR:**—Model 927-N. Third brush regulation. To adjust charging rate, loosen lock screw on commutator endplate, take off cover band, shift third brush counter-clockwise to increase or clockwise to decrease charging rate, tighten locking screw. Rotation counter-clockwise at commutator end. Maximum charging rate 10-13 amperes (hot) at 7.3-7.7 volts reached at 1600 R.P.M. or 38 M.P.H.

#### Generator Data

Cold Test			Hot Test		
Amperes	Volts	R.P.M.	Amperes	Volts	R.P.M.
19-21	8.2-8.62	1400	10-13	7.3-7.7	1600

Shunt field current is 1.8-2.3 amperes at 6 volts. Generator motoring draws 5-6 amperes at 6 volts. Brush spring tension should be 20-28 ounces.

**Mounting:**—Generator is flange mounted at right of engine on rear face of timing chain case. The water pump is driven by an extension of the generator shaft. To remove the generator, disconnect lead and water pump drive coupling and take out flange mounting cap screws. Then pull generator to the rear to disengage drive coupling and lift from place.

**Chain Adjustment.** Timing chain is adjusted by shifting the plate between the generator and the front motor support housing. To tighten the chain, loosen the three generator mounting nuts and move the plate away from the engine at the top. Hold in this position and tighten the mounting nuts.

**Oiling:**—Put 8 or 10 drops of light engine oil in the oiler at each end of the generator every 1000 miles of operation.

**RELAY:**—Model 265-B. Relay is mounted on the generator. Relay contacts close when the voltage of the generator reaches 6.75-7.5 volts and open with a discharge current of 0-2.5 amperes. Relay contacts separate .015-.025 inch. Air gap is .014-.020 inch with contacts closed.

**LIGHTING:**—Pines Switch, Model A-808. Lighting switch is 'Finger Tip Control' (the starting switch feature is not used) type mounted at lower end of steering column. Dimmer system 'depressed beam' double filament headlight bulbs controlled by lighting switch.

#### Lamp Sizes

Position	Voltage	Candlepower	Base	Mazda No.
Headlights	6-8	32-32	D.C.	1000
Parking Bulbs	6-8	3	S.C.	63
Dash Lights	6-8	15	S.C.	87
Tail Lights (1931)	6-8	15	D.C.	88
Tail Lights (1932)	6-8	21-2	D.C.	1158
Stop & Backing Lights (1931)	6-8	15	D.C.	88
Stop & Backing Lights (1932)	6-8	15	S.C.	87
Dome & Corner Lights	6-8	3	S.C.	63
License Plate Light	6-8	3	S.C.	63

**CURRENT LIMIT RELAY:**—Model 410-E. This device consists of two vibrating circuit breakers mounted on the dash. Circuit breakers begin to vibrate when the current reaches 25-30 amperes and continue limiting the current to 2-15 amperes. Circuit breaker contact gap is .012-.030 inch. Air gap is .015-.025 inch. Plunger spring tension must be 5 ounces minimum.

# NASH

## BIG SIX SERIES 9-60 (EARLY 1932)

### SERIES 10-60 (1932), SERIAL NUMBERS R-267690 UP

#### AUTO-LITE GENERATING, STARTING SYSTEM AUTO-LITE IGNITION

**CAR SERIAL NUMBER:**—On plate on top left frame member near steering gear housing (under engine hood).

**ENGINE NUMBER:**—On plate on left side of crankcase directly above generator.

**BATTERY:**—U.S.L., Type HW-11R-KAW, 6 volt, 11 plate, 92 ampere hour capacity (5 ampere rate). Starting capacity, 106 amperes for 20 minutes. Negative (—) terminal grounded. Battery mounted under the left front seat. Battery size, 7½ inches wide, 9 1/16 inches long, 9½ inches high.

**IGNITION:**—Coil Model CE-4001. Coil is mounted on the engine side of the dash. Ignition current is 2 amperes at 6 volts with engine running and 4 amperes at 6 volts with engine stopped. Ignition switch is an Oakes 'Hershey' type co-incidental ignition switch and steering post lock.

Distributor Model IGB-4071. Breaker contact gap set at .020-.024 inch. Set contact gap by loosening lock nut on stationary contact mounting stud and turning up stud until correct gap is secured with breaker arm on lobe of cam. Resurface contacts when necessary with a fine flat contact file or on a medium hard oilstone. Breaker arm spring tension is 16-20 ounces. Distributor is full automatic.

Engine	Degrees	Automatic Advance	R.P.M.	Engine
		Distributor	Distributor	
0	Start	300	300	600
6	3	600	600	1200
12	6	900	900	1800
18	9	1200	1200	2400
24	12	1500	1500	3000
28	14	1700	1700	3400

**Mounting:**—Distributor is mounted on the cylinder head and is driven through a spiral gear from the center of the camshaft. To remove distributor, disconnect primary lead and remove distributor head with cables intact. Then take out set screw and lock nut in side of cylinder head and lift distributor from place.

**Oiling:**—Fill the oiler on the side of the shaft with light engine oil every 500 miles of operation. Every 1000 miles remove the distributor head and rotor and put one drop of oil on the breaker arm pivot pin and 2 or 3 drops of oil in the oiler in the center of the shaft. At the same time put a small bit of vaseline on the face of the breaker cam.

**Timing:**—To set timing with No. 1 piston on compression stroke, turn engine over until the first notch on the vibration dampener at the front of the engine (which is marked 'IGN') is directly opposite the timing pointer on the chain case, then loosen advance arm clamp bolt, rotate distributor until contacts begin to open, tighten clamp bolt, connect spark plugs as indicated on diagram (No. 1 terminal as designated). Use a test lamp to determine contact opening point.

**Firing Order:**—The firing order is 1-5-3-6-2-4.

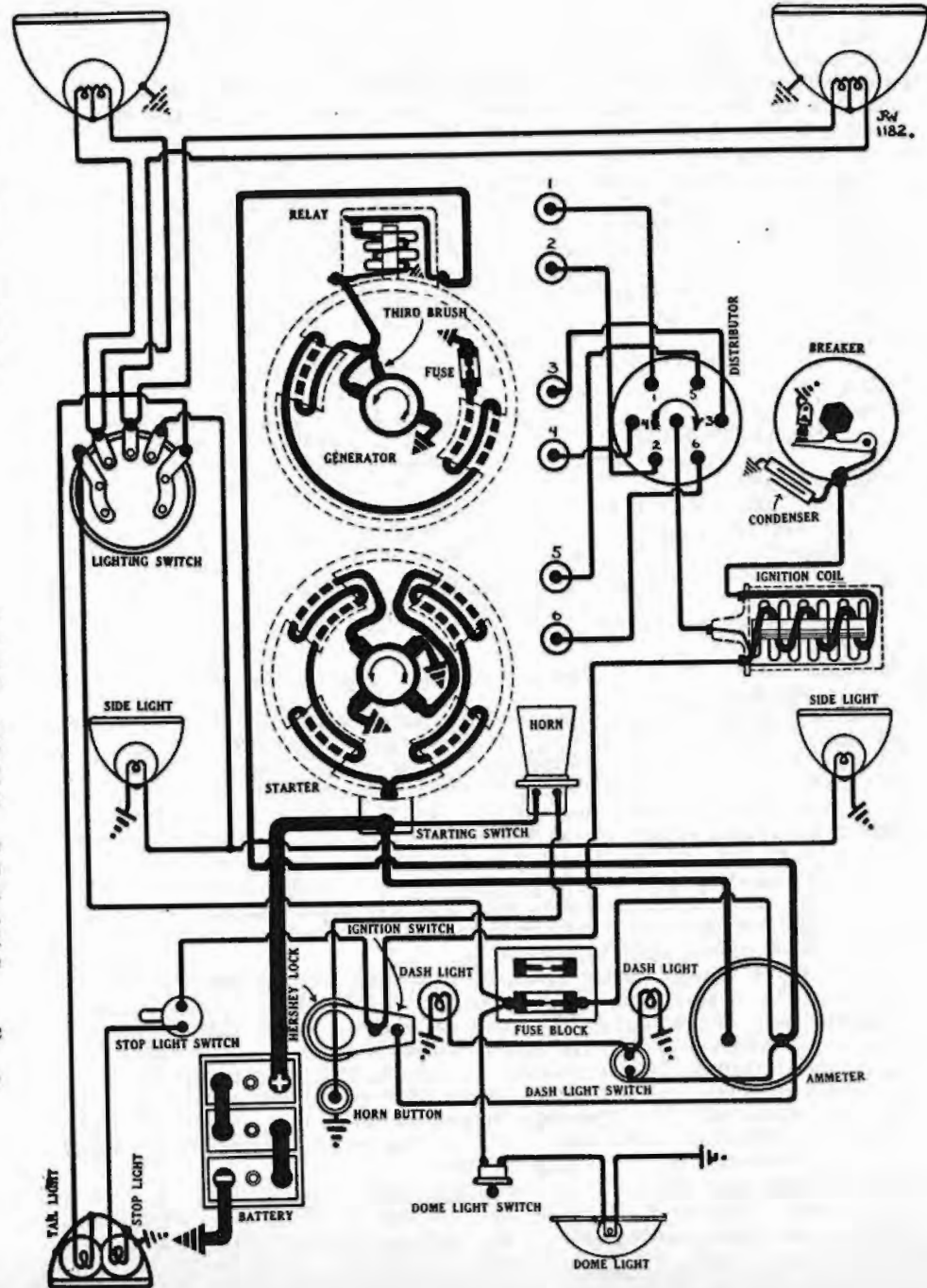
**Spark Plugs:**—(9-60) 18 MM. Metric A.C. Type G-14. (10-60) 18 MM. Metric A.C. Type G-10. Set gaps at .020 inch.

**VALVE TIMING:**—Valves at right of engine. Camshaft driven by gears (9-60) or by two sprocket non-adjustable roller chain drive (10-60).

#### Valve Dimensions—9-60

	Head Diameter	Stem Diameter	Length	Seat Angle	Lift
Intake	1 17/32"	.3095"	5 9/16"	45°	5/16"
Exhaust	1 13/32"	.3095"	5 9/16"	45°	5/16"

	Tappet Clearance	Spring Pressure
Intake	.008 (hot)	Closed 45 pounds
Exhaust	.008" (hot)	Open 76 pounds



# NASH

## BIG SIX SERIES 9-60 (EARLY 1932) SERIES 10-60 (1932), SERIAL NUMBERS R-267690 UP AUTO-LITE GENERATING, STARTING SYSTEM AUTO-LITE IGNITION

### Timing—Series 9-60

Intake valves open 5° after top dead center. Intake valves close 45° after lower dead center. Exhaust valves open 45° before lower dead center. Exhaust valves close 5° after top dead center.

To Set Valve Timing (9-60 and 10-60). Timing gears and sprockets are marked. Mesh gears or mesh sprockets in chain so that marks are directly opposite and in line with a straight edge through the shaft centers (both marks should be between the shaft centers). Chain should be removed and installed endless.

**STARTER:—Model MAB-4026.** Starter is connected to the engine through a Bendix drive. The direction of rotation is counter-clockwise, viewed from the commutator end. Starter switch is Model MAB-3080. Switch is mounted on the starter and is operated through a flexible control from a button on the dash. Starter cranks the engine at 200 R.P.M. drawing 150 amperes at 6 volts. Brush spring tension is 44-56 ounces.

Starter Data			
Torque	R.P.M.	Volts	Amperes
0 lb. ft.	4020	5.5	46
.6 "	1900	5.5	100
3.4 "	1100	5.0	200
6.6 "	700	4.5	300
10.2 "	410	4.0	400
24 "	Lock	4.0	720

**Startix:—**Startix automatic starting switch is optional equipment on these models. In installing Startix or in servicing cars equipped with Startix, refer to complete article in Equipment Section on Startix. On cars with Startix the original starting switch is modified by disconnecting the control cable and blocking the switch lever so that switch contacts are permanently closed. The 'GEN' terminal on the Startix is connected to a terminal underneath the relay on 9-60 cars and to a special terminal on the outside of the relay case on Series 10-60 cars.

**Mounting:—**Starter is flange mounted at left of engine on forward side of flywheel housing. To remove starter, disconnect starting cable and switch control and take out flange mounting screws. Then pull starter forward to clear drive and lift from place.

**Oiling:—**Put 5 or 6 drops of engine oil in the oiler at each end of the starter every month or each 1000 miles of operation.

**GENERATOR:—Model GAL-4329.** The direction of rotation is counter-clockwise, viewed from the commutator end. Generator current regulation is by third brush shunt field. To adjust generator output, remove the commutator cover band and shift the third brush and mounting plate by tapping on the mounting stud with a screwdriver. Shift the third brush in a counter-clockwise direction to increase the charging rate and in the opposite direction to decrease the charging rate. The brush is held in position by friction between the mounting stud and the end plate. With standard car setting, the maximum charging rate is 17-18 amperes at 8 volts reached at 1800 R.P.M. or 24 miles per hour.

### Generator Data

Amperes	Volts	R.P.M.
0	6.4	600
4	6.7	740
8	7.1	900
12	7.4	1120
17	8.0	1900
12	7.4	3200

Brush spring tension is 8-13 ounces. Shunt field current is 4.08-4.52 amperes at 6.0 volts. Generator motoring draws 4.27-4.73 amperes at 6.0 volts. Field fuse mounted on brush ring is 7½ ampere capacity.

**Mounting:—**Generator is flange mounted at left of engine on rear face of front engine cross member. Generator is belt driven from the crankshaft. To remove generator, disconnect lead and take off drive pulley and belt. Free brace strap at rear of generator. Then take out flange mounting bolts and lift generator from place.

**Belt Adjustment.** Fan belt is adjusted by shifting generator. To take up belt, loosen generator flange mounting bolts, pull generator away from engine until correct belt tension is secured, tighten mounting bolts. Belt should be just tight enough to drive fan and generator without slipping.

**Oiling:—**Put 4 or 5 drops of engine oil in each of the generator bearing oilers every two weeks or each 500 miles of operation.

**RELAY:—Model CB-4014.** Relay is mounted on the generator. Relay contacts close at 675 R.P.M. or 9-9.5 M.P.H. when the generator voltage reaches 7-7.5 volts and open with a discharge current of .5-2.5 amperes. Charging current at closing of contacts is approximately 2 amperes. Relay contacts separate .025-.035 inch. Air gap between relay armature and coil core is .010-.030 inch with contacts closed.

**LIGHTING:—Soreng Manegold Switch, Model 4210-A.** Lighting switch is mounted at lower end of steering column and is controlled by a lever on steering Dimmer system 'depressed beam' double filament headlight bulbs controlled by lighting switch.

Position	Lamp Sizes		Base	Mazda No.
	Voltage	Candlepower		
Headlights	6-8	21-21	D.C.	1110
Fender Lights	6-8	3	S.C.	63
Instrument Lights	6-8	3	S.C.	63
Tail Light (9-60)	6-8	3	S.C.	63
Stop Light (9-60)	6-8	15	S.C.	87
Stop and Tail Light (10-60)	6-8	21-2	D.C.	1158
Dome Light	6-8	4	D.C.	

NOTE:—Stop and tail light on Series 10-60 is fitted with special double filament bulb. In installing lights follow mark on bulb 'This Side Up' to insure tail light lead being connected to 2 cp. filament.

**FUSES:—**Lighting fuse mounted on fuse block on the dash is 20 ampere capacity. Generator field fuse is 7½ ampere capacity.

**GASOLINE GAUGE:—**K-S Telegauge hydrostatic type (see Equipment Section).

**FUEL PUMP:—**A.C. mechanical fuel pump mounted on right side of crankcase (see Equipment Section).

# NASH

STANDARD EIGHT SERIES 9-70 (EARLY 1932)  
SERIES 10-70 (1932), SERIAL NUMBERS X-21318 UP  
AUTO-LITE GENERATING, STARTING SYSTEM  
AUTO-LITE IGNITION

**CAR SERIAL NUMBER:**—On plate on left frame member directly forward of car body (under engine hood).

**ENGINE NUMBER:**—On plate on left side of crankcase directly back of generator.

**BATTERY:**—U.S.L., Type HW-13A-BV, 6 volt, 13 plates, 117 ampere hour capacity (5 ampere rate). Starting capacity 127 amperes for 20 minutes. Negative (—) terminal is grounded. Battery mounted under left front seat. Battery size, 7 $\frac{1}{8}$  inches wide, 10  $\frac{7}{32}$  inches long, 9 $\frac{1}{8}$  inches high.

**IGNITION:**—Coil Model IG-4065 (1931), CE-4001 (1932). The coil is mounted on the engine side of the dash under the hood. Ignition current is 2 amperes at 6 volts with engine running and 4 amperes at 6 volts with engine stopped. The ignition switch is an Oakes 'Hershey' type co-incidental ignition switch and steering post lock.

**Distributor Model IGH-4017.** Breaker contacts separate .020-.024 inch. Set contact gap by loosening lock screws on stationary contact mounting plate and turning eccentric adjusting screw (first set of contacts mounted on breaker plate) or loosening the lock nut on the stationary contact mounting stud and turning up the stud (second set of contacts mounted on movable sub-plate). Resurface contacts with a fine flat contact file or on a medium hard oilstone. Breaker has two sets of contacts operating on a four lobe cam. Breaker has two sets of contacts operating on a single four sided cam. Contacts open alternately at intervals of 45 degrees corresponding to the 90 degree firing interval of the engine. Contacts must be synchronized to secure this firing interval for satisfactory engine performance (see Timing). Breaker arm spring tension is 16-20 ounces. Distributor is full automatic.

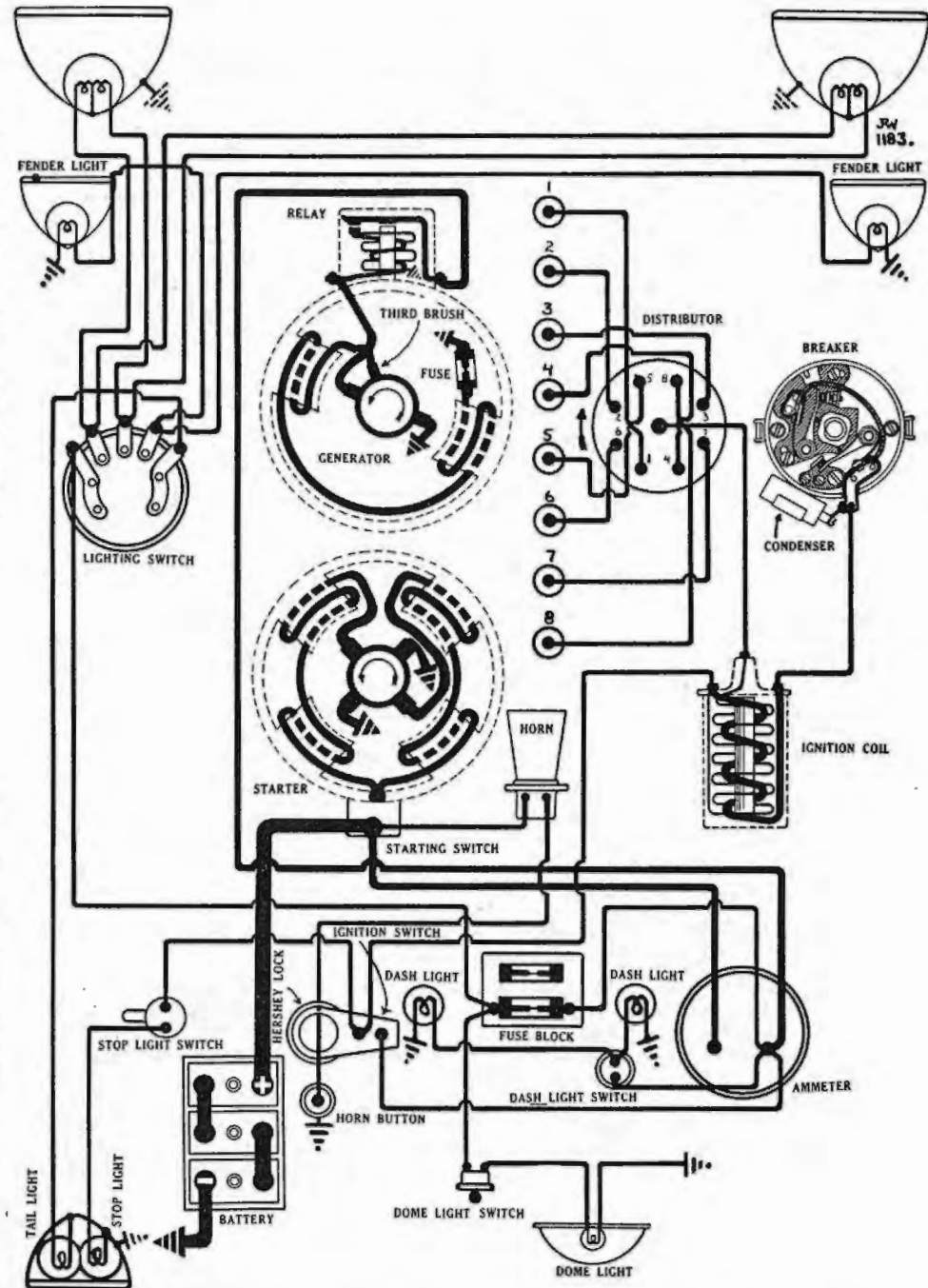
Engine	Degrees	Automatic Advance	Distributor	R.P.M.	Engine
0	Start	300	600	600	
6	3	600	1200	1200	
12	6	900	1800	1800	
18	9	1200	2400	2400	
24	12	1500	3000	3000	
28	14	1700	3400	3400	

**Mounting:**—Distributor is mounted on top of the cylinder head and is driven through a bevel gear from the center of the camshaft. To remove distributor, disconnect primary lead and remove distributor head with cables intact. Then loosen set screw in side of cylinder head and lift distributor from place.

**Oiling:**—Put 8 or 10 drops of light engine oil in the oiler on the side of the shaft every 500 miles of operation. Remove the distributor head and rotor and put one drop of oil on the breaker pivot pins and 2 or 3 drops in the oiler in the center of the shaft. Every 5000 miles put a small bit of vaseline on the face of the breaker cam.

**Timing:**—**Synchronization of Contacts.** Synchronize contacts on a rotary spark gap or use special Auto-Lite Indicator and follow complete directions in Equipment Section. Synchronization should be checked whenever contacts are resurfaced or when ignition timing is checked. This is very important as it affects the timing of four cylinders.

**Timing Distributor to Engine.** To set timing, turn engine over with No. 1 piston on compression stroke until the first notch, (marked 'IGN') on the vibration dampener at the front of the engine is directly opposite the indicator on the chain case, then loosen advance arm clamp bolt, rotate distributor until first set of contacts (mounted on movable breaker sub-plate) begin to open, tighten clamp bolt. Use a test lamp to determine contact opening. Connect spart plugs as indicated on diagram (No. 1 terminal as designated).



# NASH

## STANDARD EIGHT SERIES 9-70 (EARLY 1932) SERIES 10-70 (1932), SERIAL NUMBERS X-21318 UP AUTO-LITE GENERATING, STARTING SYSTEM AUTO-LITE IGNITION

**Firing Order:**—The firing order is 1-6-2-5-8-3-7-4.

**Spark Plugs:**—(9-70) 18 MM. Metric A.C. Type G-14. (10-70) 18 MM. Metric A.C. Type G-10. Set gaps at .020 inch.

**VALVE TIMING:**—Valves at right of engine. Camshaft driven from crankshaft by two sprocket non-adjustable roller chain drive.

### Valve Dimensions—Series 9-70

	Head Diameter	Stem Diameter	Stem Length	Seat Angle	Lift
Intake	1 13/32"	3095"	4 49/64"	45°	5/16"
Exhaust	1 11/32"	3095"	4 49/64"	45°	5/16"

### Tappet Clearance

	Intake	Exhaust	Spring Pressure
Intake	.008" (hot)	Closed	45 pounds
Exhaust	.008" (hot)	Open	75 pounds

### Timing—Series 9-70

Intake valves open 5° after top dead center. Intake valves close 45° after lower dead center. Exhaust valves open 45° before lower dead center. Exhaust valves close 5° after top dead center.

**To Set Valve Timing (9-70 and 10-70).** The timing chain should be removed and installed endless. Mesh sprockets in chain so that a straightedge laid across the camshaft sprocket in line with the center of the keyway and the punch mark on the rim of the sprocket (through sprocket center) will be in line with the punch mark on the crankshaft sprocket with both marks adjacent or between the shaft centers.

**STARTER:**—Model MAB-4026. Starter is connected to the engine through a Bendix drive. The direction of rotation is counter-clockwise, viewed from the commutator end. Starter switch is Model MAB-3080. Switch is mounted on the starter and is operated through a flexible control from a button on the dash. Starter cranks engine at 200 R.P.M. drawing 150 amperes at 6 volts. Brush spring tension is 44-56 ounces.

### Starter Data

Torque	R.P.M.	Volts	Amperes
0 lb. ft.	4020	5.5	46
.6 "	1900	5.5	100
3.4 "	1100	5.0	200
6.6 "	700	4.5	300
10.2 "	410	4.0	400
24 "	Lock	4.0	720

**Startix:**—Startix automatic starting switch is optional equipment on these models. In installing Startix or in servicing cars equipped with Startix, refer to complete article on Startix in Equipment Section. On cars with Startix the original starting motor switch is modified by disconnecting the control cable and blocking the switch lever so that switch contacts are permanently closed. The 'GEN' terminal on the Startix is connected to a terminal under the relay on the Series 9-70 and to a special terminal on the outside of the relay on Series 10-70 cars.

**Mounting:**—Starter is flange mounted at left of engine on forward side of flywheel housing. To remove starter, disconnect starting cable and switch control and take out flange mounting screws. Then pull starter forward to clear drive and lift from place.

**Oiling:**—Put 5 or 6 drops of engine oil in the oiler at each end of the starter every month or each 1000 miles of operation.

**GENERATOR:**—Model GAL-4329. The direction of rotation is counter-clockwise, viewed from the commutator end. Generator current regulation is by third brush shunt field. To adjust generator output, remove the commutator cover band and shift the third brush and mounting plate by tapping on the mounting stud with a screwdriver. Shift the third brush in a counter-clockwise direction to increase the charging rate and in the opposite direc-

tion to decrease the charging rate. The brush is held in position by friction between the mounting stud and the end plate. With standard car setting, the maximum charging rate is 17-18 amperes at 8 volts reached at 1800 R.P.M. or 24 miles per hour.

### Generator Data

Amperes	Volts	R.P.M.
0	6.4	600
4	6.7	740
8	7.1	900
12	7.4	1120
17	8.0	1900

Brush spring tension 8-13 ounces. Shunt field current 4.08-4.52 amperes at 6 volts. Generator motoring draws 4.27-4.73 amperes at 6.0 volts. Field fuse mounted on brush ring is 7½ ampere capacity.

**Mounting:**—Generator is flange mounted at left of engine on rear face of front engine cross member. Generator is belt driven from the crankshaft. To remove generator, disconnect lead and take off drive pulley and belt. Free brace strap at rear of generator. Then take out flange mounting bolts and lift generator from place.

**Belt Adjustment.** Fan belt is adjusted by shifting generator. To take up fan belt, loosen generator flange mounting bolts, pull generator away from engine until correct belt tension is secured, tighten mounting bolts. Fan belt should be just tight enough to drive fan and generator without slipping.

**Oiling:**—Put 4 or 5 drops of engine oil in each of the generator bearing oilers every two weeks or each 500 miles of operation.

**RELAY:**—Model CB-4014. Relay is mounted on the generator. Relay contacts close at 675 R.P.M. or 9-9.5 M.P.H. when the generator voltage reaches 7-7.5 volts and open with a discharge current of .5-2.5 amperes. Charging current at closing of contacts is approximately 2 amperes. Relay contacts separate .025-.035 inch. Air gap between relay armature and coil core is .010-.030 inch with contacts closed.

**LIGHTING:**—Soreng Manegold Switch, Model 4210-A. Lighting switch is mounted at lower end of steering column and controlled by lever on steering wheel. Dimmer system 'depressed beam' double filament headlight bulbs controlled by lighting switch.

### Lamp Sizes

Position	Voltage	Candlepower	Base	Mazda No.
Headlights	6-8	21-21	D.C.	1110
Fender Lights	6-8	3	S.C.	63
Instrument Lights	6-8	3	S.C.	63
Tail Light (9-70)	6-8	3	S.C.	63
Stop Light (9-70)	6-8	15	S.C.	87
Stop and Tail Light (10-70)	6-8	21-2	D.C.	1158
Dome Light	6-8	4	D.C.	

**NOTE:**—Stop and tail light on Series 10-70 is fitted with special double filament bulb. In installing bulbs follow mark on bulb 'This Side Up' so that the tail light lead will be connected to the 2 cp. filament.

**FUSES:**—Lighting fuse mounted on fuse block on the dash is 20 ampere capacity. Generator field fuse is 7½ ampere capacity.

**GASOLINE GAUGE:**—K-S Telegauge hydrostatic type gauge (see Equipment Section).

**FUEL PUMP:**—A.C. mechanical fuel pump mounted on right side of crankcase (see Equipment Section).

**IGNITION:**—Coil Model CE-4001. Coil is mounted on engine side of dash under engine hood. Ignition current is 2 amperes at 6 volts (engine running), 4 amperes at 6 volts (engine stopped). The ignition switch is an Oakes 'Hershey' type co-incidental ignition switch and steering post lock.



# NASH

## TWIN IGNITION SERIES 9-80 (EARLY 1932) SPECIAL EIGHT SERIES 10-80 (1932), SERIAL NUMBERS B-66800 UP AUTO-LITE GENERATING, STARTING SYSTEM AUTO-LITE IGNITION

**CAR SERIAL NUMBER:**—On plate on top of right frame member near starter (under engine hood).

**ENGINE NUMBER:**—On plate on right side flywheel housing directly behind starter.

**BATTERY:**—U.S.L., Type HW-13A-BV, 6 volt, 13 plates, 117 ampere hour capacity (5 ampere rate). Starting capacity 127 amperes for 20 minutes. Positive (+) terminal grounded. Battery mounted under right front seat. Battery size 7 $\frac{1}{8}$  inches wide, 10  $\frac{7}{32}$  inches long, 9 $\frac{1}{8}$  inches high.

**IGNITION:**—Coils Model CE-4402 (2 used). Ignition coils are mounted on the engine side of the dash at the right of the engine under the hood. Ignition current of each coil is 1-3 amperes at 6 volts with engine running and 3.4-5 amperes at 6 volts with engine stopped. The ammeter will indicate the current drawn by both coils and should indicate an 8-10 ampere discharge with the ignition turned on whenever the engine is stopped with the breaker contacts closed. Ignition switch is Oakes 'Hershey' type co-incident ignition switch and steering post lock.

**Distributor Model IKG-4004.** Breaker contact gap set at .020-.024 inch (when new) and .018-.020 inch (after 1000 miles of operation). To set gap, loosen lock nut on stationary contact mounting stud, turn up stud, tighten lock nut. Resurface contacts when necessary with a fine flat contact file or on a medium hard oilstone. Breaker arm spring tension 20 ounces. Breaker has two sets of contacts operating on an eight lobe cam. Each set of contacts controls one ignition coil and fires one of the spark plugs in each cylinder. Contacts open simultaneously and this simultaneous opening must be maintained by synchronizing contacts to secure full advantage of 'Twin Ignition' (see Timing). Distributor is semi-automatic. Maximum manual advance is 20 degrees (engine).

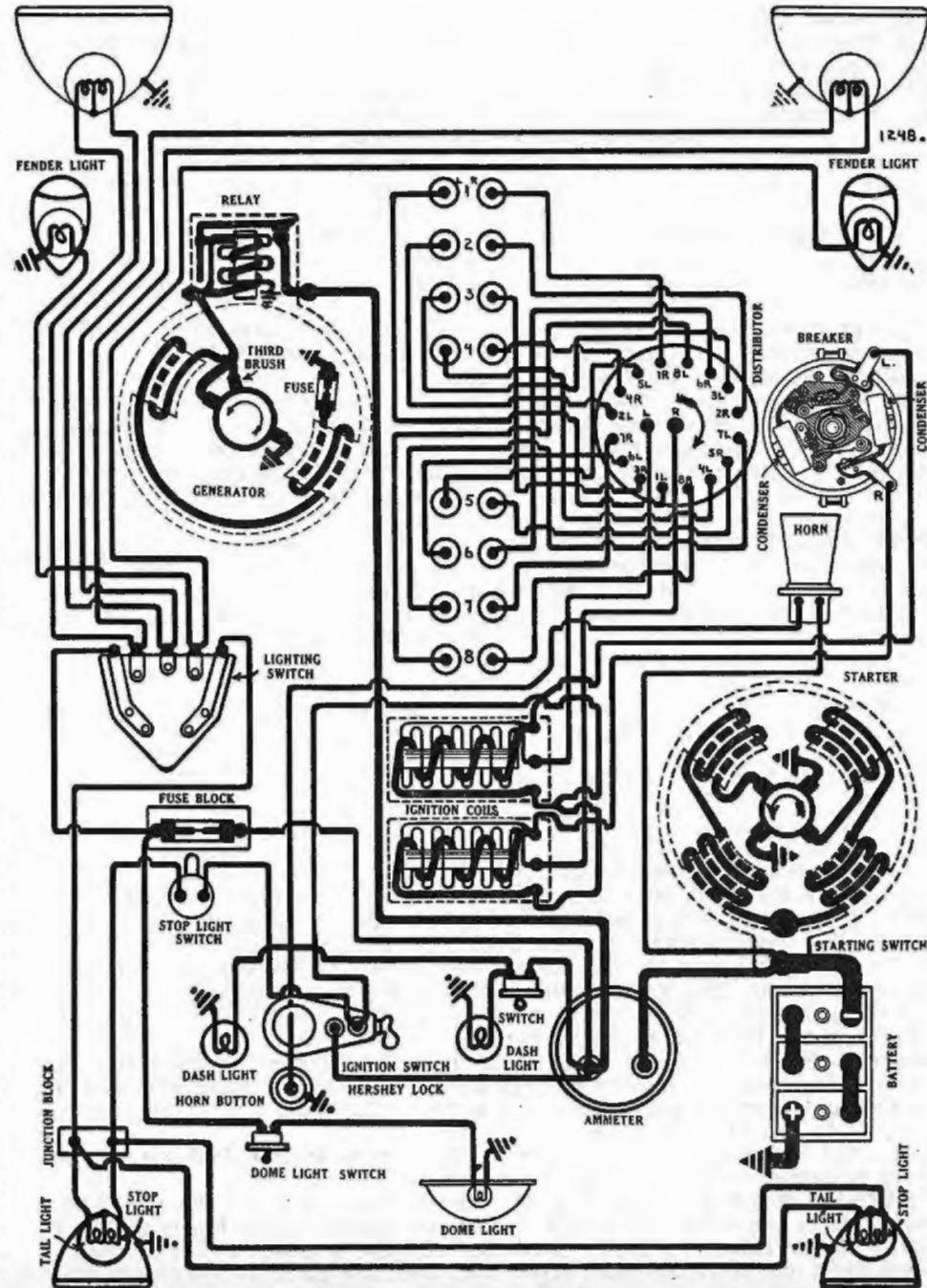
Engine	Degrees	Automatic Advance	Distributor	R.P.M.	Distributor	Engine
0.....	Start.....	215.....	430			
4.....	2.....	410.....	820			
8.....	4.....	605.....	1210			
12.....	6.....	800.....	1600			
16.....	8.....	1000.....	2000			

**Mounting:**—Distributor is mounted at the right of the engine and is driven through a spiral gear from the camshaft. To remove distributor, disconnect primary leads and manual spark control and remove distributor head with cables intact. Then take out two cap screws in distributor bracket and lift distributor from place.

**Oiling:**—Put 8 or 10 drops of light engine oil in the oiler on the side of the distributor every 500 miles of operation. At the same time remove the distributor head and rotor and put one drop of oil on the breaker arm pivot pins and oil the wick oiler in the center of the shaft. Put a small bit of vaseline on the face of the breaker cam.

**Timing:**—Synchronization of Contacts. Contacts must be synchronized to secure simultaneous opening of both sets. Full directions on synchronization of IKG distributors will be found in the Equipment Section. Contacts may be synchronized as part of the timing operation. See next paragraph.

**Timing Distributor to Engine.** Breaker contacts begin to open when the piston entering power stroke reaches a position 15 degrees (crankshaft) before top dead center with the manual spark control fully advanced. To set timing, crank engine over until piston No. 1 enters compression stroke (the up stroke with both valves closed). Fully advance the manual spark control lever. Connect a six volt test lamp in series with each primary circuit to accurately determine when contacts open. Turn on ignition and continue to turn engine over until the mark 'IGN' on the front flywheel (which is 15



# NASH

## TWIN IGNITION SERIES 9-80 (EARLY 1932) SPECIAL EIGHT SERIES 10-80 (1932), SERIAL NUMBERS B-66800 UP AUTO-LITE GENERATING, STARTING SYSTEM AUTO-LITE IGNITION

degrees before top dead center) is directly opposite the indicator on the crankcase. Then loosen the advance arm clamp screw and rotate distributor housing until the lamp goes out indicating that the first set of contacts has opened. Tighten the clamp screw. If both lamps go out at the same instant, the contacts are properly synchronized. However if one lamp goes out first, it will be necessary to loosen the lockscrews on the movable sub-plate and shift the plate until the second set of contacts (mounted on the sub-plate) open at the same instant. Connect the spark plugs as shown on the diagram.

**Firing Order:**—The firing order is 1-6-2-5-8-3-7-4.

**Spark Plugs:**—(9-80) 18 MM. Metric A.C. Type J-9. (10-80) 14 MM. Metric A.C. Type K-12. Set gaps at .020 inch.

**VALVE TIMING:**—Overhead valve type engine. Valves in cylinder head operated by rocker arms and pushrods at right of engine. Valve tappet adjustment in end of rocker arm directly over pushrods. Camshaft driven from crankshaft by Diamond roller chain (two sprocket drive—no adjustment necessary).

### Valve Dimensions—Series 9-80

	Head Diameter	Stem Diameter	Length	Seat Angle	Lift
Intake	1 21/32"	.372"	5 1/2"	45°	.348"
Exhaust	1 15/32"	.372"	5 1/2"	45°	.348"

### Tappet Clearance

Intake .....012" (hot)—see note      Exhaust .....012" (hot)—see note

### Timing—Series 9-80

Intake valves open 15° after top dead center. Intake valves close 38° after lower dead center. Exhaust valves open 45° before lower dead center. Exhaust valves close 10° after top dead center.

**To Set Tappet Clearance.** All tappet clearance adjustments should be made with the engine hot and idling. To set tappet clearance, see that engine is at normal running temperature (car should be driven for 20 minutes or longer), remove cylinder head valve cover, run engine at idling speed and set tappet clearance by turning adjustment screw up or down after loosening lock nut until a slight pull is necessary to remove feeler gauge.

**To Set Valve Timing (9-80 and 10-80).** The chain should be installed endless. Both sprockets must be pulled and installed at the same time with the chain in place. Care must be taken not to move one sprocket on its shaft faster than the other. Special pullers must be used for both sprockets. To set timing, mesh sprockets in chain so that a straightedge laid across the camshaft sprocket in line with the center of the keyway and the punch mark on the sprocket is in line with the punch mark on the crankshaft sprocket (both punch marks must be adjacent or between the shaft centers). The punch mark on the crankshaft gear is approximately 4 teeth counter-clockwise from the keyway on the sprocket.

**STARTER:**—Model MAB-4033. Starter is connected to the engine through a Bendix drive. The direction of rotation is counter-clockwise, viewed from the commutator end. The starting switch is mounted on the starter field frame and is operated through a flexible control by a button on the dash. Brush spring tension is 44-56 ounces.

### Starter Data

Torque	R.P.M.	Volts	Amperes
0 lb. ft.	4020	5.5	46
3.4 "	1100	5.0	200
6.6 "	695	4.5	300
10.2 "	420	4.0	400
24 "	Lock	4.0	725

**Startix:**—Startix automatic starting switch is optional equipment on these models. In installing Startix or in servicing cars equipped with Startix, follow complete article in Equipment Section on Startix switch. On cars

with Startix the original starting motor switch is modified by disconnecting the control cable and blocking the switch lever so that the switch contacts are permanently closed.

**Mounting:**—Starter is flange mounted at the right of the engine on the forward side of the flywheel housing. To remove starter, disconnect cables and starting switch control and take out flange mounting cap screws. Then pull starter forward to clear drive and lift from place.

**Oiling:**—1000 Miles. Put 8-10 drops light oil in oiler at each end.

**GENERATOR:**—Model GAR-4205. Rotation counter-clockwise at commutator end. Current regulation by third brush shunt field. To adjust generator output, loosen the commutator cover band and shift the third brush mounting plate by prying on the mounting stud with a screwdriver. Shift the third brush in a counter-clockwise direction to increase the charging rate and in the opposite direction to decrease the charging rate. The mounting plate is held in position by friction between the mounting stud and the end plate. With standard car setting, the maximum charging rate is 12-14 amperes (hot) at 8 volts reached at 1700 R.P.M.

### Generator Data

Amperes	Volts	R.P.M.
2	6.4	750
6	6.9	885
14	7.65	1230
17	8.0	1700

Brush spring tension is 24-36 ounces. Generator motoring draws 3.5 amperes at 6 volts. Shunt field current is 2.5 amperes at 6 volts. A 7 1/2 ampere field fuse is connected in the field circuit.

**Mounting:**—Generator is cradle mounted at the left of the engine and is belt driven from the crankshaft. The water pump is driven by an extension of the generator shaft. To remove generator, disconnect lead and water pump drive coupling and loosen mounting clamp band. Slip off drive belt and lift generator from place.

**Belt Adjustment.** Fan belt should be adjusted whenever sideplay at a point midway between the generator and fan pulleys is more than 1 1/2 inches. To take up belt, loosen two cap screws on fan bracket, raise bracket, tighten cap screws.

**Oiling:**—500 Miles. Put 8-10 drops light oil in oiler at each end.

**RELAY:**—Model CB-4014. Relay is mounted on the generator. Relay contacts close at 725-750 R.P.M. when the voltage of the generator reaches 7-7.5 volts and open with a discharge current of .5-2.5 amperes. Charging current at closing of contacts is 2 amperes. Relay contact gap is .025-.035 inch. Air gap is .010-.030 inch with contacts closed.

**LIGHTING:**—Delco-Remy Switch, Model 486-C. Lighting switch mounted at lower end of steering column and controlled by lever on steering wheel. Dimmer system 'depressed beam' double filament headlight bulbs controlled by lighting switch.

Position	Lamp Sizes		Base	Mazda No.
	Voltage	Candlepower		
Headlights	6-8	21-21	D.C.	1110
Fender Lights	6-8	3	S.C.	63
Instrument Lights	6-8	3	S.C.	63
Tail Lights (9-80)	6-8	3	S.C.	63
Stop Lights (9-80)	6-8	15	S.C.	87
Stop and Tail Lights (10-80)	6-8	21-2	D.C.	1158

**FUSES:**—Generator field fuse is 7 1/2 ampere capacity. Lighting fuse on fuse block on the engine side of the dash is 20 ampere capacity.

**GASOLINE GAUGE:**—K-S Telegauge hydrostatic type (see Equipment Section).

**FUEL PUMP:**—A.C. mechanical fuel pump mounted on right side of crankcase (see Equipment Section).

# NASH

## TWIN IGNITION SERIES 9-90 (EARLY 1932) AMBASSADOR & ADVANCED EIGHT SERIES 10-90, SERIAL NOS. 519,300 UP AUTO-LITE GENERATING, STARTING SYSTEM AUTO-LITE IGNITION

**CAR SERIAL NUMBER:**—On plate on top of right frame member near starter (under engine hood).

**ENGINE NUMBER:**—On plate on right side of flywheel housing directly behind starter.

**BATTERY:**—Exide, Type 3-MXC-17-1N, 6 volt, 17 plates, 133 ampere hour capacity (20 hour rate). Starting capacity 152 amperes for 20 minutes. Positive (+) terminal grounded. Battery mounted under right front seat. Battery size, 7 1/8 inches wide, 11 1/8 inches long, 9 9/32 inches high.

**IGNITION:**—Coils Model CE-4402 (2 used). Coils are mounted on the engine side of the dash at the right of the engine under the hood. Ignition current is 1-3 amperes at 6 volts with engine running and 3.4-5 amperes at 6 volts with engine stopped (for each coil). The ammeter will indicate the current drawn by both coils and should show an 8-10 ampere discharge whenever the engine is stopped with the contacts closed with ignition turned on. The ignition switch is a Delco-Remy Dual-lock, Model 425-S.

**Distributor Model IGK-4001.** Breaker contact gap set at .020-.024 inch (when new) and .018-.020 inch (after 1000 miles of operation). Set contact gap by loosening lock nut on stationary contact mounting stud and turning up stud. Resurface contacts when necessary with a fine flat contact file or on a medium hard oilstone. Breaker arm spring tension 20 ounces. Breaker has two sets of contacts on an eight lobe cam. Each set of contacts controls one ignition coil and fires one of the spark plugs in each cylinder. Contacts open simultaneously and this simultaneous opening must be maintained by synchronizing contacts to secure full advantage of 'Twin Ignition' (see Timing). Distributor is semi-automatic. Maximum manual advance is 38 degrees (engine).

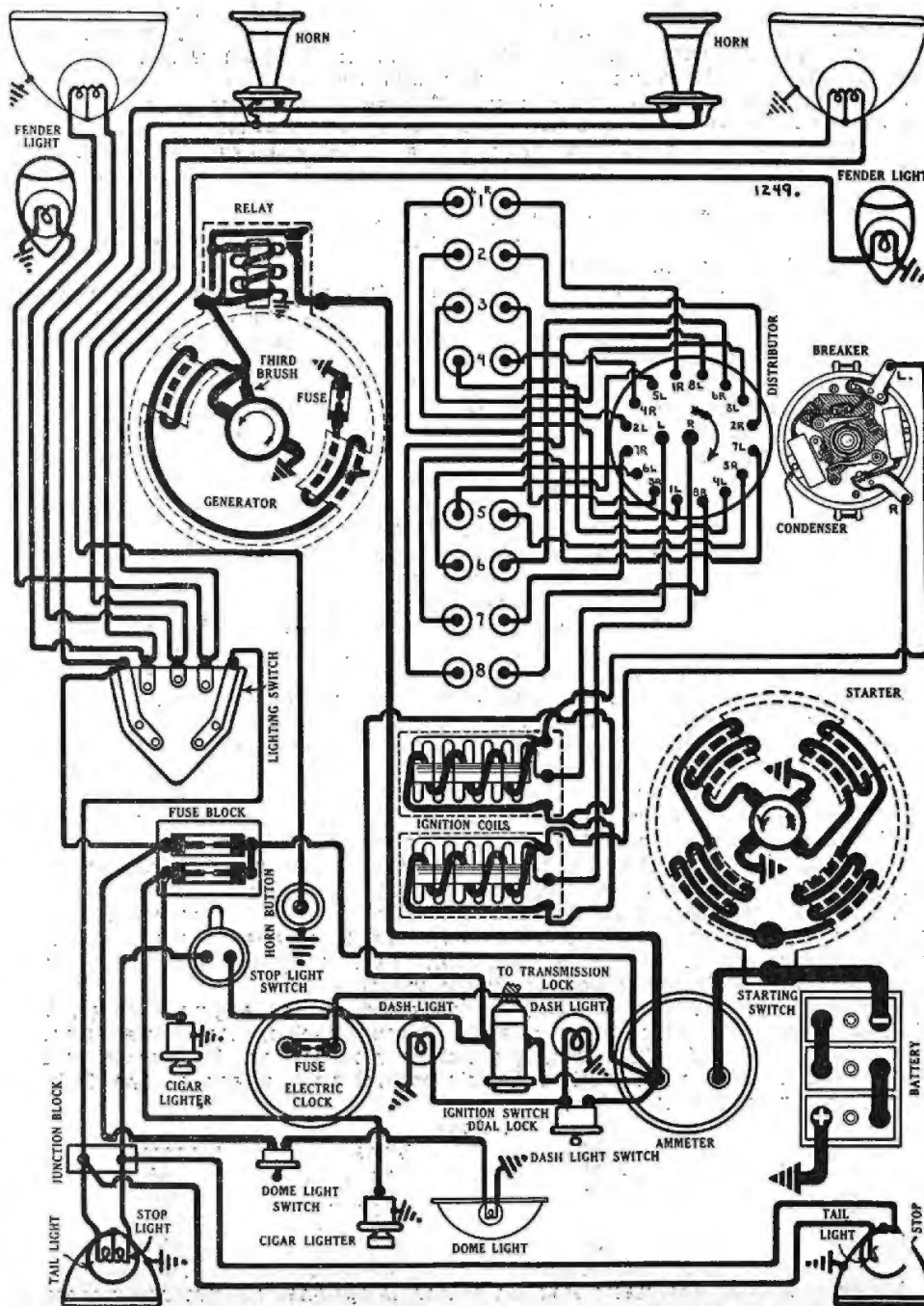
Engine	Automatic Advance		R.P.M.	Engine
	Degrees	Distributor		
0	Start	200	400	400
4	2	400	800	800
8	4	600	1200	1200
12	6	800	1600	1600
16	8	1000	2000	2000

**Mounting:**—Distributor is mounted at the right of the engine and is driven through spiral gears from the camshaft. To remove distributor, disconnect primary leads and manual spark control and remove distributor head with cables intact. Then take out two cap screws in distributor bracket and lift distributor from place.

**Oiling:**—Put 8 or 10 drops of light engine oil in the oiler on the side of the distributor every 500 miles of operation. At the same time remove the distributor head and rotor and put one drop of oil on the breaker arm pivot pins and oil the wick oiler in the center of the shaft. Put a small bit of vaseline on the face of the breaker cam.

**Timing:**—Synchronization of Contacts. Contacts must be synchronized to secure simultaneous opening of both sets. Full directions on synchronization of IGK distributors will be found in the Equipment Section. Contacts may be synchronized as part of the timing operation. See next paragraph.

**Timing Distributor to Engine.** Breaker contacts begin to open when the piston entering power stroke reaches a position 15 degrees (crankshaft) before top dead center with the manual spark control fully advanced. To set timing, crank engine over until piston No. 1 enters compression stroke (he up stroke with both valves closed). Fully advance the manual spark control lever. Connect a six volt test lamp in series with each primary circuit to accurately determine when contacts open. Turn on ignition and continue to turn engine over until the mark 'IGN' on the front flywheel (which is 15 degrees before top dead center) is directly opposite the indicator on the



# NASH

## TWIN IGNITION SERIES 9-90 (EARLY 1932) AMBASSADOR & ADVANCED EIGHT SERIES 10-90, SERIAL NOS. 519,300 UP AUTO-LITE GENERATING, STARTING SYSTEM AUTO-LITE IGNITION

crankcase. Then loosen the advance arm clamp screw and rotate distributor housing until the lamp goes out, indicating that the first set of contacts has opened. Tighten the clamp screw. If both lamps go out at the same instant, the contacts are properly synchronized. However if one lamp goes out first, it will be necessary to loosen the lock screws on the movable sub-plate and shift the plate until the second set of contacts (mounted on the sub-plate) begin to open. Tighten lock screws.

**Firing Order:**—The firing order is 1-6-2-5-8-3-7-4.

**Spark Plugs:**—(9-90 14 MM. Metric A.C. Type K-12. Special Part No. 841608.

10-90) 18 MM. Metric A.C. Type J-9. Set gaps at .020 inch.

**VALVE TIMING:**—Overhead valve type engine. Valves in cylinder head operated by rocker arm and pushrods at right of engine. Valve tappet adjustment in end of rocker arm directly over pushrods. Camshaft driven from crankshaft by Diamond roller chain (two sprocket drive—no adjustment necessary).

### Valve Dimensions—Series 9-90

	Head Diameter	Stem Diameter	Length	Seat Angle	Lift
Intake	1 11/16"	3/8"	5 17/32"	45°	11 32"
Exhaust	1 17/32"	3/8"	5 17/32"	45°	11 32"

	Tappet Clearance	Spring Pressure
Intake	.012" (hot). See note	Closed ..... 55-65 pounds
Exhaust	.012" (hot). See note	Open ..... 139-149 pounds

### Timing—Series 9-90

Intake valves open 15° after top dead center. Intake valves close 38° after lower dead center. Exhaust valves open 45° before lower dead center and close 10° after top dead center.

**To Set Tappet Clearance.** All tappet clearance adjustments should be made with the engine hot and idling. To set tappet clearance, see that the engine is at normal running temperature (car should be driven for 20 minutes or longer), remove cylinder head valve cover, run engine at idling speed, use .012 inch feeler and set clearance by turning adjustment screw up or down after loosening lock nut until a slight pull is necessary to remove feeler.

**To Set Valve Timing (9-90 and 10-90).** The chain should be installed end-less. Both sprockets must be pulled and installed at the same time with the chain in place. Care must be taken not to remove one sprocket ahead of the other. Special pullers must be used on both sprockets and special tools used to install sprockets. To set timing, mesh sprockets in chain so that a straightedge laid across the camshaft sprocket in line with the center of the keyway and the punch mark on the sprocket is in line with the punch mark on the crankshaft sprocket (both punch marks adjacent or between the shaft centers). The punch mark on the crankshaft sprocket is approximately 4 teeth counter-clockwise from the keyway on the sprocket.

**STARTER:**—Model MAB-4024. Starter is connected to the engine through a Bendix drive. The direction of rotation is counter-clockwise, viewed from the commutator end. The starting switch is mounted on the starter field frame and is operated through a flexible control by a button on the dash. Brush spring tension is 44-56 ounces.

### Starter Data

Torque	R.P.M.	Volts	Amperes
0 lb. ft.	4020	5.5	46
3.4 "	1100	5.0	200
6.6 "	695	4.5	300
10.2 "	410	4.0	400
24 "	Lock	4.0	725

**Startix:**—Startix automatic starting switch is optional equipment on these models. To install Startix or to service cars equipped with Startix, see complete article in Equipment Section on Startix switch. The starting motor

switch is modified by disconnecting the control cable and blocking switch lever so that switch contacts are permanently closed.

**Mounting:**—Starter is sleeve mounted at the right of the engine on the forward side of the flywheel housing. To remove starter, disconnect cables and starting switch control and take out large pilot mounting screw in housing directly above starter sleeve. Then pull starter forward to clear drive and lift from place.

**Oiling:**—Put 8 or 10 drops of light engine oil in the oiler at each end of the starter every 1000 miles of operation.

**GENERATOR:**—Model GAR-4205. Rotation counter-clockwise at commutator end. Current regulation by third brush shunt field. To adjust generator output, loosen the commutator cover band and shift the third brush mounting plate by prying on the mounting stud with a screwdriver. Shift the third brush in a counter-clockwise direction to increase the charging rate and in the opposite direction to decrease the charging rate. The mounting plate is held in position by friction between the mounting stud and the end plate. With standard car setting, the maximum charging rate is 12-14 amperes (hot) at 8 volts reached at 1700 R.P.M.

Generator Data		
Amperes	Volts	R.P.M.
2	6.4	750
10	7.3	1030
14	7.65	1230
17	8.0	1700

Brush spring tension is 24-36 ounces. Generator motoring draws 3.5 amperes at 6 volts. Shunt field current is 2.5 amperes at 6 volts. A 7.5 ampere field fuse is connected in the field circuit.

**Mounting:**—Generator is cradle mounted at the left of the engine and is belt driven from the crankshaft. The water pump is driven by an extension of the generator shaft. To remove generator, disconnect lead and water pump drive coupling and loosen mounting clamp band. Slip off drive belt and lift generator from place.

**Belt Adjustment.** Adjust fan belt whenever sideplay at a point midway between the generator and fan pulleys is greater than 1½ inches. To take up fan belt, loosen two cap screws on fan bracket and raise fan until belt tension is correct, tighten cap screws. Belt should be just tight enough to drive generator and fan without slipping.

**Oiling:**—Put 8 or 10 drops of light engine oil in the oiler at each end of the generator every 500 miles of operation.

**RELAY:**—Model CB-4014. Relay is mounted on the generator. Relay contacts close at 725-750 R.P.M. when the voltage of the generator reaches 7-7.5 volts and open with a discharge current of .5-2.5 amperes. Charging current at closing of contacts is 2 amperes. Relay contact gap is .025-.035 inch. Air gap is .010-.030 inch with contacts closed.

**LIGHTING:**—Delco-Remy Switch, Model 486-K. Lighting switch is mounted at lower end of steering column controlled by lever on steering wheel. Dimmer system 'depressed beam' double filament headlight bulbs controlled by lighting switch.

Position	Lamp Sizes		Base	Mazda No.
	Voltage	Candlepower		
Headlights	6-8	21-21	D.C.	1110
Fender Lights	6-8	3	S.C.	63
Instrument Lights	6-8	3	S.C.	63
Tail Lights 9-90	6-8	3	S.C.	63
Stop Lights 9-90	6-8	15	S.C.	87
Stop and Tail Lights (10-90)	6-8	21-2	D.C.	1158

**FUSES:**—Generator field fuse is 7.5 ampere capacity. Lighting fuse on fuse block on the engine side of the dash is 20 ampere capacity.

# OLDSMOBILE

**SIX MODEL F-32 (1932), SERIAL NUMBERS 10,001 UP  
PRODUCTION STARTED DECEMBER, 1931  
DELCO-REMY SYSTEM**

**CAR SERIAL NUMBER:**—Stamped on plate on right door sill under floor mat.

**ENGINE NUMBER:**—On car serial number plate. This series F-302,001 up.

**BATTERY:**—Delco, Type 13-C, 6 volt, 13 plate, 86 ampere hour capacity (20 hour rate). Negative (—) terminal grounded. Battery mounted on left frame member under front compartment floor boards.

**IGNITION:**—Coil Model 534-W. Lock coil type with ignition switch in base. Coil mounted on back of instrument board with ignition switch at lower center of instrument panel. Ignition current .5-2.5 amperes (engine running), 4.5 amperes (engine stopped).

**Distributor Model 632-P.** Single breaker arm, 6-lobe cam type with full automatic advance. Breaker gap set at .022 inch. Hold within limits of .018-.024 inch. To set gap, loosen lock screw on crescent shaped stationary contact plate, turn eccentric adjusting screw, tighten lock screw. Breaker arm spring tension, 17-21 ounces (measured at tip of breaker arm with spring scale at right angles to contact surface).

Engine	Degrees	Automatic Advance	Distributor	R.P.M.	Engine
0	Start		300		600
28	14		1500		3000

**Mounting:**—Distributor mounted on cylinder head. Remove from right side. To remove, disconnect primary lead, take off distributor cap, take out hold-down screw in advance arm, lift distributor out.

**Oiling:**—500 Miles. Turn down grease cup under distributor one full turn. Keep cup filled with No. 2½ cup grease.

1000 Miles. Take of distributor cap and rotor. Fill wick oiler in center of shaft with light engine oil. Put one drop of oil on breaker arm pivot pin, apply thin film of vaseline to face of breaker cam.

**Timing:**—Standard setting 7° (on flywheel) or .020" (piston travel) before top dead center. To set timing, with No. 1 piston on compression turn engine over until the first mark on the rim of the vibration dampener at the front of the engine is directly opposite the pointer on the chain case, loosen advance arm clamp screw, rotate distributor until contacts begin to open, tighten clamp screw, connect spark plugs as indicated on diagram (No. 1 terminal as designated). The second mark on the vibration dampener is the top dead center mark for pistons Nos. 1 and 6.

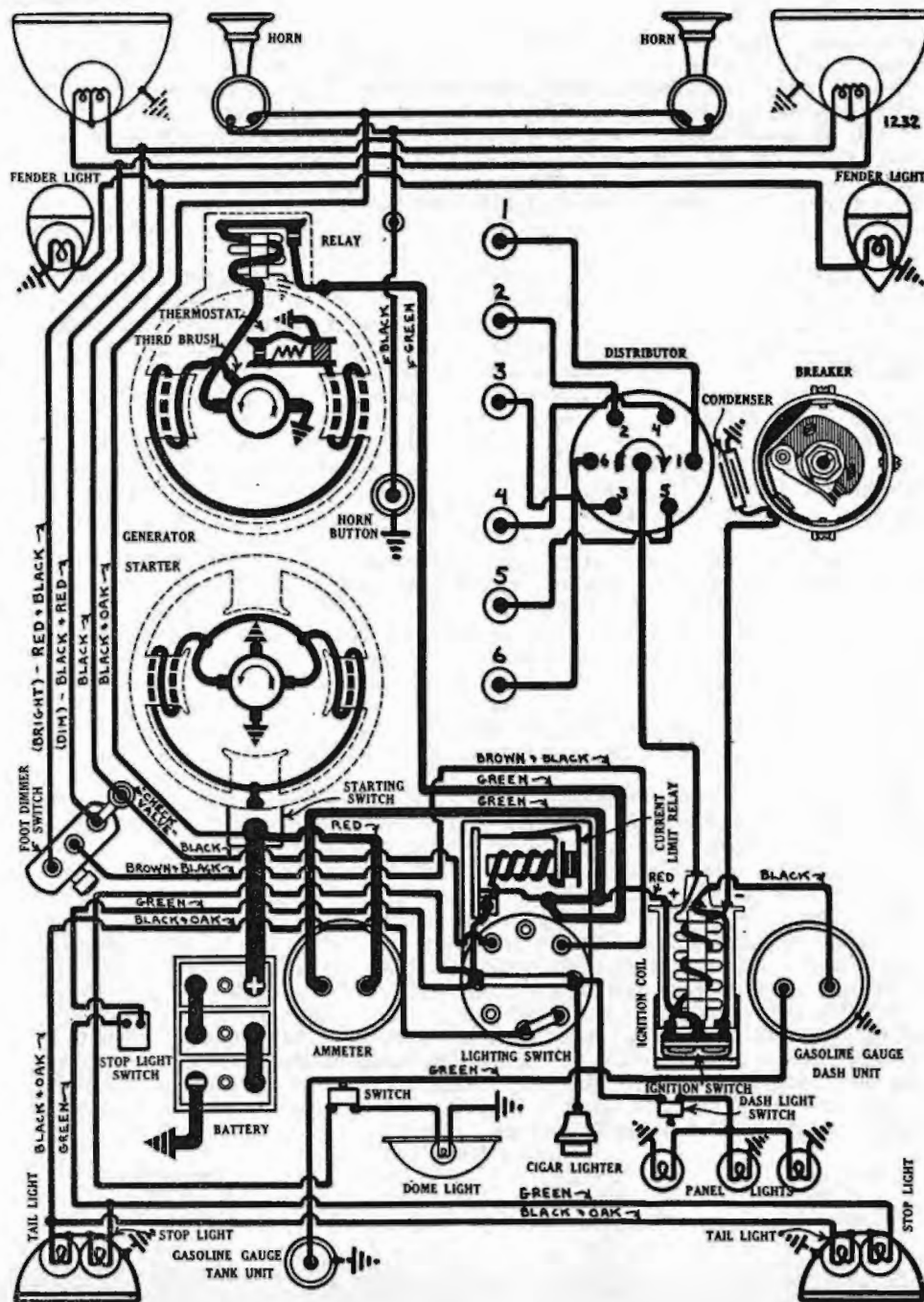
**Firing Order:**—1-5-3-6-2-4. No. 1 cylinder nearest radiator.

**Spark Plugs:**—18 MM. Metric. A.C. Type G-9. Set gap at .025 inch.

**VALVE TIMING:**—Valves at right of engine. Camshaft driven by two-sprocket non-adjustable chain drive.

Head Diameter	Stem Diameter	Stem Length	Seat Angle	Lift
Intake .....1⅝"	.....11/32"	.....5⅜"	.....30°	......320"
Exhaust .....1½"	.....⅞"	.....5⅜"	.....30°	......320"

Tappet Clearance		Timing	Spring Pressure	
Operating	Timing		Closed	Hot
Intake .....007-.009" (hot)	.010"	.010"	Closed.....43 pounds (2¼")	
Exhaust .....009-.011" (hot)				



# OLDSMOBILE

## EIGHT MODEL L-32 (1932), SERIAL NUMBERS 1,001 UP DELCO-REMY SYSTEM

**CAR SERIAL NUMBER:**—Stamped on plate on right door sill under floor mat.

**ENGINE NUMBER:**—Stamped on car serial number plate. This series 1,001 up.

**BATTERY:**—Delco, Type 13-E, 6 volt, 13 plate, 100 ampere hour capacity (20 hour rate). Negative (—) terminal grounded. Battery mounted on left frame member under front compartment floor boards.

**IGNITION:**—Coil Model 534-W. Lock coil type with ignition switch in base. Coil mounted on back of instrument board with ignition switch at lower center of instrument panel. Ignition current .5-2.5 amperes at 6 volts (engine running), 4.5 amperes at 6 volts (engine stopped).

**Distributor Model 660-T.** Two-breaker arm, 4-lobe cam type with full automatic advance. Contacts open alternately at 45 degree intervals corresponding to 90 degree firing interval of engine. Contacts must be synchronized (see Timing). Breaker gap set at .022 inch. Hold within limits of .018-.024 inch. To set gap, loosen lock screw on stationary contact plate, turn eccentric adjusting screw, tighten lock screw. Breaker arm spring tension 17-21 ounces (measured at tip of breaker arm with spring scale at right angles to contact surface).

Engine	Degrees	Automatic Advance	R.P.M.	Engine
		Distributor	Distributor	
0.....		Start.....	300.....	600
26.....	13		1400.....	2800

**Mounting:**—Distributor mounted on cylinder head. Remove from right side. To remove, disconnect primary lead, take off distributor cap, take out hold-down screw in advance arm, lift distributor out.

**Oiling:**—500 Miles. Turn down grease cup on side of shaft housing one full turn. Keep filled with No. 2½ cup grease.

1000 Miles. Take off distributor cap and rotor. Fill wick oiler in center of shaft with light engine oil, put one drop oil on breaker arm pivot pins, apply thin film vaseline to face of breaker cam.

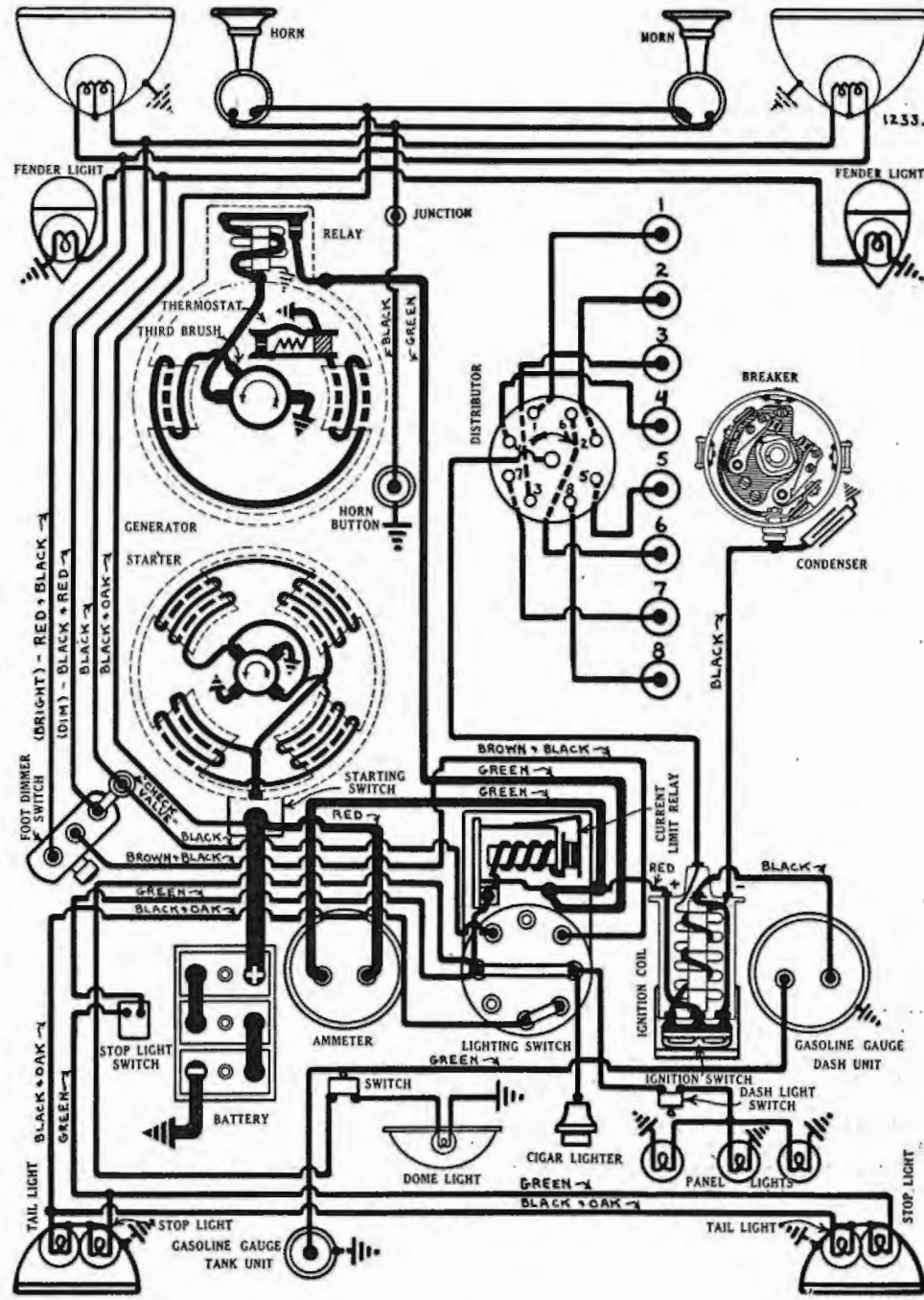
**Timing:**—Standard setting 7° (on flywheel) or .020" (piston travel) before top dead center. To set timing, with No. 1 piston on compression stroke, turn engine over until the first mark on the rim of the vibration dampener at the front of the engine is directly opposite the pointer on the chain case, loosen hold-down screw in advance arm, center pointer on quadrant, tighten hold-down screw, loosen advance arm clamp screw, rotate distributor until first set of contacts (mounted directly on breaker plate) begin to open, tighten clamp screw, connect spark plugs as indicated on diagram (No. 1 terminal as designated).

**Synchronization of Contacts.** No marks provided on flywheel for synchronization of contacts on engine. Use special tool, Oldsmobile Part No. HMJ-185, and follow complete directions in Equipment Section. Contacts can also be synchronized on a rotary spark gap or with a timing gauge if adaptors are available so that timing gauge can be mounted in No. 6 cylinder. In this case turn crankshaft to firing position of No. 6 piston (.020" before top dead center), loosen lock screws on movable sub-plate, turn eccentric adjusting screw until second set of contacts open, tighten lock screws.

**Firing Order:**—1-6-2-5-8-3-7-4. No. 1 cylinder nearest radiator.

**Spark Plugs:**—18 MM. Metric. A.C. Type G-9. Set gaps at .025 inch.

**VALVE TIMING:**—Valves at right of engine. Camshaft driven by two-sprocket non-adjustable chain drive.



# OLDSMOBILE

SIX MODEL F-32 (1932), SERIAL NUMBERS 10,001 UP  
PRODUCTION STARTED DECEMBER, 1931  
DELCO-REMY SYSTEM

**Timing**

Intake valves open at top dead center. Close 50° after lower dead center. Exhaust valves open 40° before lower dead center and close 10° after top dead center. These figures are correct with .010" tappet clearance or lash.

**To Set Valve Timing.** Camshaft sprocket and crankshaft sprocket are With No. 6 piston on compression, turn engine over until piston reaches top dead center with the second (or last) mark on the vibration dampener on the front of the crankshaft directly opposite pointer on chain case. No. 1 intake valve should begin to open at this point.

**To Set Valve Timing.** Camshaft sprocket and crankshaft sprocket are marked. To set timing, turn crankshaft and camshaft until marks are directly opposite and in line with straightedge across shaft centers. Mesh chain.

**STARTER:—Model 734-B.** Manual pinion engagement connected to the starting switch pedal (switch mounted on starter field frame). Starter drives through overrunning clutch. Rotation counter-clockwise at commutator end. Brush spring tension, 24-28 ounces.

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

**Mounting:—**Starter flange mounted on left front face of flywheel housing. To remove, disconnect cable, disconnect starting pedal linkage, take out 2 flange mounting bolts, pull starter forward to clear housing, lift out.

**Oiling:—1000 Miles.** Put 8-10 drops light engine oil in commutator end oiler. Drive end bearing is oilless.

**GENERATOR:—Model 953-H.** Third brush regulation, thermostat control. Thermostat operates at 200°F. (contacts open—cuts in resistance) reducing output approximately 40%. To adjust charging rate, loosen small round headed lock screw on commutator end plate, take off cover band, shift third brush by hand counter-clockwise to increase or clockwise to decrease charging rate, tighten lock screw. Rotation counter-clockwise at commutator end. Maximum charging rate, 19-21 amperes (cold) at 8.3-8.5 volts reached at 1450 R.P.M.

Generator Data					
Cold Test			Hot Test		
Amperes	Volts	R.P.M.	Amperes	Volts	R.P.M.
19-21	8.35-8.5	1450	9-12	7.35-7.65	1800-2000

Brush spring tension, 14-18 ounces. Shunt field current, 4.0-6.1 amperes at 6 volts. Motoring generator draws 5.5 amperes at 6 volts.

**Mounting:—**Generator cradle mounted at left front of engine. Driven by fan belt. Water pump driven by extension of generator shaft. To remove, disconnect lead, disconnect water pump drive coupling, take out two bolts in mounting clamp band, lift generator out.

**Oiling:—1000 Miles.** Put 8-10 drops light engine oil in oiler at each end of generator.

**RELAY:—Model 265-G.** Relay mounted on generator. Relay contacts close at 825 R.P.M. of generator or 10 M.P.H. with generator voltage of 6.75-7.5 volts and open with discharge current of 0-2.5 amperes. Relay contact gap limits .015-.025 inch. Air gap limits .012-.017 inch (contacts closed).

**LIGHTING:—Delco-Remy Switch, Model 478-J** (with current limit relay). Lighting switch mounted on back of instrument panel. Dimmer system 'depressed beam' double filament headlight bulbs controlled by foot operated switch on toeboard. Instrument panel lights controlled by switch under instrument board. Lighting switch positions:

1. Button pushed in—all lights off.
2. Button halfway out—Parking (fender) lights on. Tail lights on.
3. Button pulled out—Headlights on. Tail lights on. Fender lights are on when headlights 'dimmed' by foot switch.

Position	Lamp Sizes		Base	Mazda No.
	Voltage	Candlepower		
Headlights	6-8	21-21	D.C.	1110
Parking (fender) Lights	6-8	3	S.C.	63
Dash and Tail Lights	6-8	3	S.C.	63
Stop Light	6-8	15	S.C.	87
Dome Light	6-8	3	S.C.	63

**Dimmer Switch:—Model 465-K.** Dimmer switch incorporates special 'check valve' in fender light circuit. Valve consists of special alloy washer under terminal on fender light lead on busbar connected to 'dim' terminal of dimmer switch. Fender lamps are lighted whenever headlights are 'dim'. Fender light terminal also connected to terminal on lighting switch. Fender lamps are lighted whenever lighting switch button is in 'park' position. The valve prevents headlight 'dim' bulbs being lighted with the switch in this position. Stop light switch is Model 474-W.

**CURRENT LIMIT RELAY:—**Mounted as part of lighting switch assembly. Consists of vibrating circuit breaker. Circuit breaker begins to operate when current load reaches 25-30 amperes, limiting load to 15 amperes with direct short-circuit. Contact gap limits, .012-.030 inch. Air gap limits, .015-.025 inch (contacts closed). Spring tension, 5 ounces minimum (measured at brass button with spring scale at right angles to arm).

**GASOLINE GAUGE:—A.C.** Electric type (see Equipment Section).

**FUEL PUMP:—A.C.** Type 'B' mechanical fuel pump mounted at right of engine (see Equipment Section).

**HORNS:—Klaxon Model K-26-B** twin horns (matched tone), Type 1385 (low note), Type 1386 (high note). Current draw (Type 1385), 6.0-8.5 amperes at 6 volts; (Type 1386), 5.0-6.5 amperes at 6 volts.

# OLDSMOBILE

## EIGHT MODEL L-32 (1932), SERIAL NUMBERS 1,001 UP DELCO-REMY SYSTEM

**CAR SERIAL NUMBER:**—Stamped on plate on right door sill under floor mat.

**ENGINE NUMBER:**—Stamped on car serial number plate. This series 1,001 up.

**BATTERY:**—Delco, Type 13-E, 6 volt, 13 plate, 100 ampere hour capacity (20 hour rate). Negative (—) terminal grounded. Battery mounted on left frame member under front compartment floor boards.

**IGNITION:**—Coil Model 534-W. Lock coil type with ignition switch in base. Coil mounted on back of instrument board with ignition switch at lower center of instrument panel. Ignition current .5-2.5 amperes at 6 volts (engine running), 4.5 amperes at 6 volts (engine stopped).

**Distributor Model 660-T.** Two-breaker arm, 4-lobe cam type with full automatic advance. Contacts open alternately at 45 degree intervals corresponding to 90 degree firing interval of engine. Contacts must be synchronized (see Timing). Breaker gap set at .022 inch. Hold within limits of .018-.024 inch. To set gap, loosen lock screw on stationary contact plate, turn eccentric adjusting screw, tighten lock screw. Breaker arm spring tension 17-21 ounces (measured at tip of breaker arm with spring scale at right angles to contact surface).

Engine	Degrees	Automatic Advance	R.P.M.	Engine
		Distributor	Distributor	
0.....		Start.....	300.....	600
26.....	13		1400.....	2800

**Mounting:**—Distributor mounted on cylinder head. Remove from right side. To remove, disconnect primary lead, take off distributor cap, take out hold-down screw in advance arm, lift distributor out.

**Oiling:**—500 Miles. Turn down grease cup on side of shaft housing one full turn. Keep filled with No. 2½ cup grease.

1000 Miles. Take off distributor cap and rotor. Fill wick oiler in center of shaft with light engine oil, put one drop oil on breaker arm pivot pins, apply thin film vaseline to face of breaker cam.

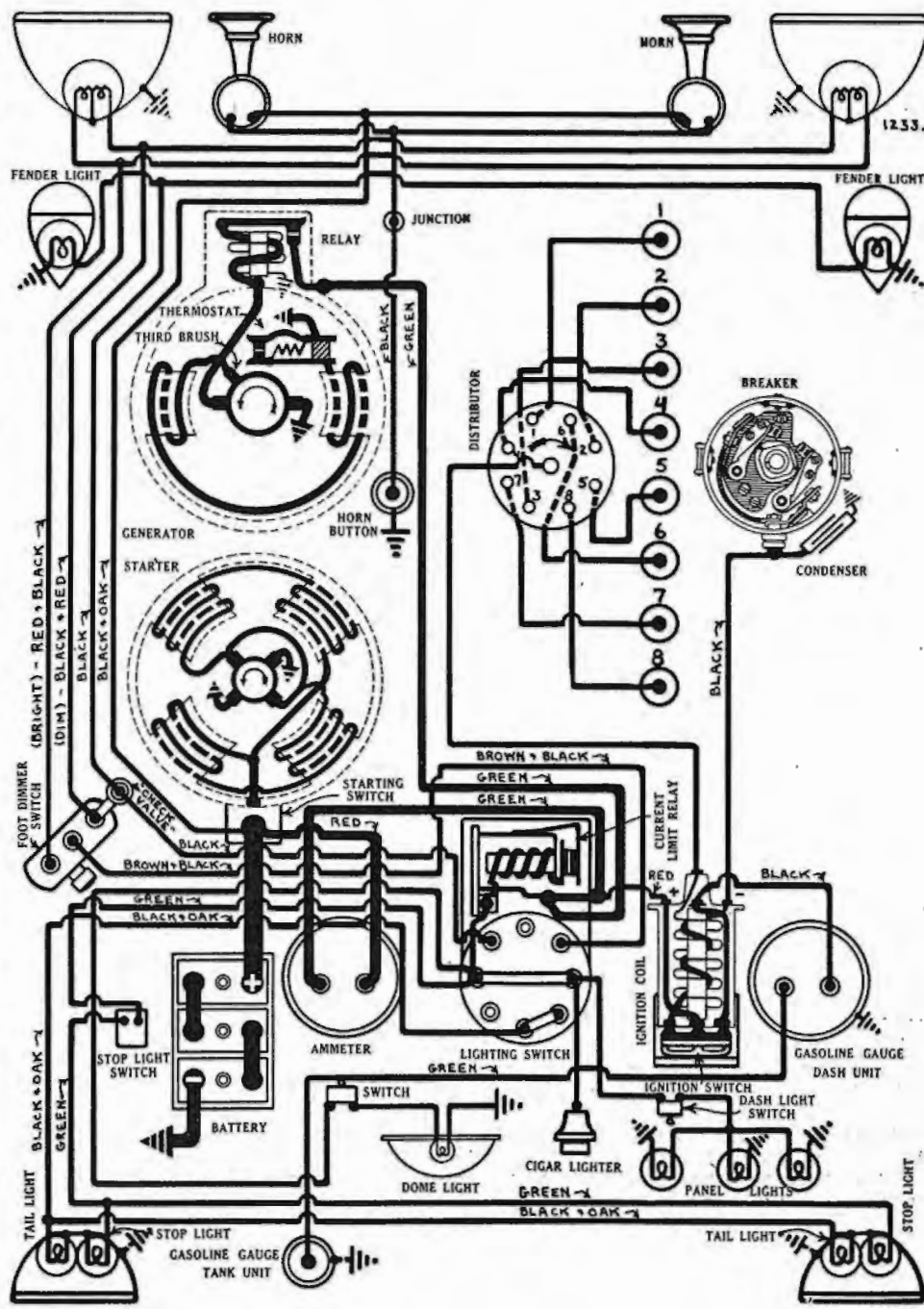
**Timing:**—Standard setting 7° (on flywheel) or .020" (piston travel) before top dead center. To set timing, with No. 1 piston on compression stroke, turn engine over until the first mark on the rim of the vibration dampener at the front of the engine is directly opposite the pointer on the chain case, loosen hold-down screw in advance arm, center pointer on quadrant, tighten hold-down screw, loosen advance arm clamp screw, rotate distributor until first set of contacts (mounted directly on breaker plate) begin to open, tighten clamp screw, connect spark plugs as indicated on diagram (No. 1 terminal as designated).

**Synchronization of Contacts.** No marks provided on flywheel for synchronization of contacts on engine. Use special tool, Oldsmobile Part No. HMJ-185, and follow complete directions in Equipment Section. Contacts can also be synchronized on a rotary spark gap or with a timing gauge if adaptors are available so that timing gauge can be mounted in No. 6 cylinder. In this case turn crankshaft to firing position of No. 6 piston (.020" before top dead center), loosen lock screws on movable sub-plate, turn eccentric adjusting screw until second set of contacts open, tighten lock screws.

**Firing Order:**—1-6-2-5-8-3-7-4. No. 1 cylinder nearest radiator.

**Spark Plugs:**—18 MM. Metric. A.C. Type G-9. Set gaps at .025 inch.

**VALVE TIMING:**—Valves at right of engine. Camshaft driven by two-sprocket non-adjustable chain drive.





# OLDSMOBILE

## EIGHT MODEL L-32 (1932), SERIAL NUMBERS 1,001 UP DELCO-REMY SYSTEM

	Head Diameter	Stem Diameter	Length	Seat Angle	Lift
Intake	1 9/16"	1 1/32"	5 9/32"	30°	.300"
Exhaust	1 7/16"	3/8"	5 9/32"	30°	.300"

	Tappet Clearance		Spring Pressure
	Operating	Timing	
Intake	.007-.009" (hot)	.010"	Closed .....43 pounds (2 1/4 inches)
Exhaust	.009-.011" (hot)		

### Timing

Intake valves open at top dead center. Close 42° after lower dead center. Exhaust valves open 40° before lower dead center. Close 10° after top dead center. These figures are correct with tappet clearance or lash of .010".

**To Check Valve Timing.** Set tappet clearance of No. 1 intake valve at .010 inch. With No. 6 piston on compression stroke, turn engine over until piston No. 6 reaches top dead center with the second or top dead center mark on the vibration dampener at the front of the engine directly opposite the pointer on the chain case. No. 1 intake valve should begin to open at this point.

**To Set Valve Timing.** Camshaft sprocket and crankshaft sprocket are marked. To set timing, turn crankshaft and camshaft until marks are directly opposite and in line with straightedge across shaft centers. Mesh chain.

**STARTER:—Model 725-R.** Manual pinion engagement connected to starting switch pedal (switch mounted on starter field frame). Starter drives through overrunning clutch. Rotation counter-clockwise at commutator end. Brush spring tension 24-28 ounces.

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

**Mounting:—**Starter flange mounted on left front face of flywheel housing. To remove, disconnect cable, disconnect starting pedal linkage, take out 2 flange mounting bolts, pull starter forward to clear housing, lift out.

**Oiling:—1000 Miles.** Put 8-10 drops light engine oil in commutator end oiler. Drive end bearing is oilless.

**GENERATOR:—Model 953-H.** Third brush regulation, thermostat control. Thermostat operates at 200°F. (contacts open—cuts in resistance) reducing output approximately 40%. To adjust charging rate, loosen small round headed lock screw on commutator end plate, take off cover band, shift third brush by hand counter-clockwise to increase or clockwise to decrease charging rate, tighten lock screw. Rotation counter-clockwise at commutator end. Maximum charging rate, 19-21 amperes (cold) at 8.3-8.5 volts reached at 1450 R.P.M.

Generator Data					
Amperes	Cold Test		Amperes	Hot Test	
	Volts	R.P.M.		Volts	R.P.M.
19-21	8.35-8.5	1450	9-12	7.35-7.65	1800-2000

Brush spring tension, 14-18 ounces. Shunt field current, 4.0-6.1 amperes at 6 volts. Motoring generator draws 5.5 amperes at 6 volts.

**Mounting:—**Generator cradle mounted at left front of engine. Driven by fan belt. Water pump driven by extension of generator shaft. To remove, disconnect lead, disconnect water pump drive coupling, take out two bolts in mounting clamp band, lift generator out.

**Oiling:—1000 Miles.** Put 8-10 drops light engine oil in oiler at each end of generator.

**RELAY:—Model 265-G.** Relay mounted on generator. Relay contacts close at 825 R.P.M. of generator or 10 M.P.H. with generator voltage of 6.75-7.5 volts and open with discharge current of 0-2.5 amperes. Relay contact gap limits .015-.025 inch. Air gap limits .012-.017 inch (contacts closed).

**LIGHTING:—Delco-Remy Switch, Model 478-J** (with current limit relay). Lighting switch mounted on back of instrument panel. Dimmer system 'depressed beam' double filament headlight bulbs controlled by foot operated switch on toeboard. Instrument panel lights controlled by switch under instrument board. Lighting switch positions:

1. Button pushed in—All lights off.
2. Button halfway out—Parking (fender) lights on. Tail lights on.
3. Button pulled out—Headlights on. Tail light on. Fender lights are on when headlights 'dimmed' by foot switch.

Position	Lamp Sizes			Mazda No.
	Voltage	Candlepower	Base	
Headlights	6-8	21-21	D.C.	1110
Parking (fender) Lights	6-8	3	S.C.	63
Dash and Tail Lights	6-8	3	S.C.	63
Stop Light	8-8	15	S.C.	87
Dome Light	6-8	3	S.C.	63

**Dimmer Switch:—Model 465-K.** Dimmer switch incorporates special 'check valve' in fender light circuit. Valve consists of special alloy washer under terminal on fender light lead on busbar connected to 'Dim' terminal of dimmer switch. Fender lamps are lighted whenever headlights are 'dim'. Fender light terminal also connected to terminal on lighting switch. Fender lamps are lighted whenever lighting switch button is in 'park' position. The valve prevents headlight 'dim' bulbs being lighted with the switch in this position. Stop light switch is Model 474-W.

**CURRENT LIMIT RELAY:—**Mounted as part of lighting switch assembly. Consists of vibrating circuit breaker. Circuit breaker begins to operate when current load reaches 25-30 amperes, limiting load to 15 amperes with direct short-circuit. Contact gap limits, .012-.030 inch. Air gap limits, .015-.025 inch (contacts closed). Spring tension, 5 ounces minimum (measured at brass button with spring scale at right angles to arm).

**GASOLINE GAUGE:—A.C. Electric type** (see Equipment Section).

**FUEL PUMP:—A.C. Type 'B'** mechanical fuel pump mounted at right of engine (see Equipment Section).

**HORNS:—Klaxon Model K-26-B** twin horns (matched tone), Type 1385 (low note), Type 1386 (high note). Current draw (Type 1385), 6.0-8.5 amperes at 6 volts; (Type 1386), 5.0-6.5 amperes at 6 volts.

# PACKARD

## LIGHT EIGHT SERIES 900 (1932) SERIAL NUMBERS 360,001 UP OWEN-DYNETO GENERATING, STARTING SYSTEM NORTH EAST IGNITION

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

**ENGINE NUMBER:**—On top of left front motor arm.

**BATTERY:**—Prest-O-Lite, Type 619-ST. 6 volt, 19 plates. Capacity 170 amperes for 20 minutes. Positive (+) terminal is grounded. Battery mounted under left front seat. Battery size, 7 inches wide, 13 inches long, 9 $\frac{1}{8}$  inches high.

**IGNITION:**—Coil Type 5027936. Lock coil type with ignition switch in base. Coil mounted on back of instrument board with ignition switch at right of instrument panel. Ignition current 2.2 amperes at 6 volts (800 R.P.M. of engine) or 1.2 amperes at 6 volts (2800 R.P.M. of engine). Stalled current at room temperature 4.8 amperes at 6 volts.

**Distributor Type 5031262 (first cars) 5028025 (later cars).** Two breaker arm, 8 lobe cam type with full automatic advance. Contacts must be synchronized to secure satisfactory engine performance—see Timing. Breaker contact gap set at .020 inch. Hold within limits of .015-.020 inch. To set gap, loosen lock screw on stationary contact plate, shift plate (insert screwdriver in notch in plate), tighten locking screw. Breaker arm spring tension 14-15 ounces.

Engine	Degrees	Automatic Advance	R.P.M.	Engine
		Distributor		
0.....		Start	300.....	600
15.....	7 $\frac{1}{2}$	1400.....		2800

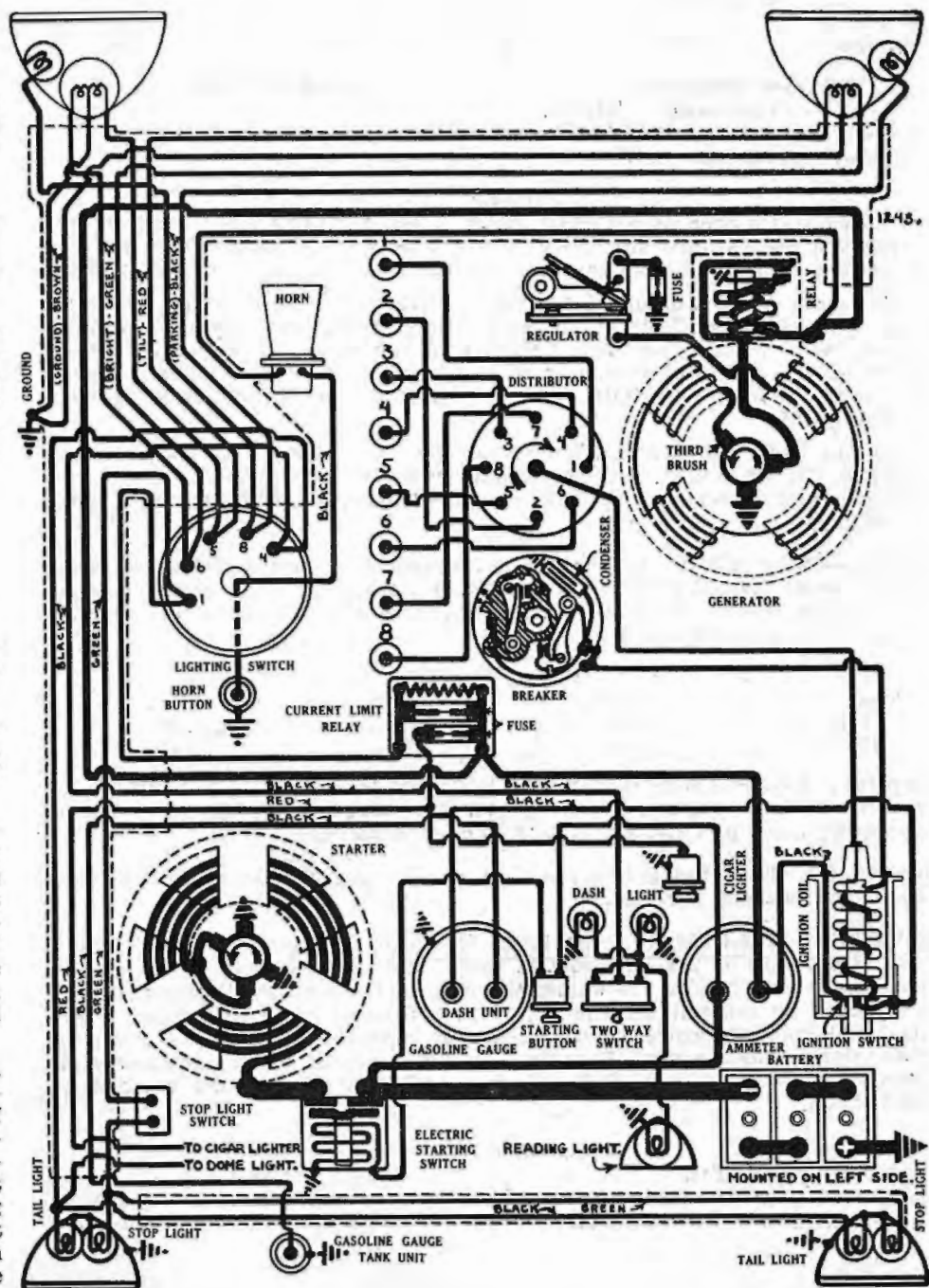
Distributor advances approximately 1.5° for each 100 R.P.M.

**Mounting:**—Distributor mounted on cylinder head. Remove from right side. To remove distributor, disconnect primary lead, take off distributor cap, take out hold-down screw in mounting and lift out.

**Oiling:**—1000 Miles. Turn down grease cup under distributor head one turn. Keep cup filled with No. 3 cup grease. Take off distributor cap and rotor, put one drop of oil on breaker arm pivot pins, oil cam felt oiler under condenser.

**Timing:**—Standard setting 9° (on flywheel) before top dead center. Flywheels on first cars and vibration dampener (at front of engine) on later cars marked for top dead center 'D/C' with fifteen one degree graduations on rim before the dead center mark. To set timing, remove starter so that flywheel marks can be seen (first cars only), with No. 1 piston on compression stroke turn engine over until the ninth mark (indicating 9°) before the dead center mark 'D/C' is opposite the indicator, loosen advance arm clamp screw, rotate distributor until contacts begin to open, tighten clamp screw, connect spark plugs as indicated on diagram (No. 1 terminal as designated).

**Synchronization of Contacts.** Contacts must open at the same instant. See complete article in Equipment Section. A simple method of synchronization is to block open the second set of contacts with a small piece of cardboard (the set mounted on the movable sub-plate) when the distributor is being timed. Then shift the insulator to the first set of contacts, loosen lock screws on movable sub-plate, shift plate until second set of contacts begin to open, tighten lock screws. Check timing by turning engine over one complete revolution (with insulator still in place in first set of contacts). The second set of contacts should open when the ignition mark on the flywheel or vibration dampener (ninth degree mark before 'D/C' mark) is directly opposite the indicator.



# PACKARD

## LIGHT EIGHT SERIES 900 (1932) SERIAL NUMBERS 360,001 UP OWEN-DYNETO GENERATING, STARTING SYSTEM NORTH EAST IGNITION

**Firing Order:**—1-6-2-5-8-3-7-4. No. 1 cylinder nearest radiator.

**Spark Plugs:**—14 MM. Metric. AC Type K-9 Set gaps at .025 inch.

**VALVE TIMING:**—Valves at right of engine. Camshaft driven by timing chain from crankshaft in tandem with generator. Chain adjusted manually by shifting generator. See Generator Mounting.

	Head Diameter	Stem Diameter	Length	Seat Angle	Lift
Intake.	1 23/32"	3405"	7 <sup>3</sup> / <sub>8</sub> "	45°	358"
Exhaust	1 15/32"	3405"	7 <sup>3</sup> / <sub>8</sub> "	45°	358"

	Tappet Clearance	Spring Pressure
Intake	.004" (hot)	Closed .....73 pounds (3 1/16")
Exhaust	.004" (hot)	

**Timing**

Intake valves open 20° before top dead center. Close 65° after lower dead center.

Exhaust valves open 65° before lower dead center. Close 20° after top dead center.

**STARTER:**—Model DI-955. Starter drives engine through a Bendix drive. Rotation counter-clockwise at commutator end. Brush spring tension 26-28 ounces. Starter is a six pole, series wound motor with a single field coil which is so shaped as to wind around three sides of each field pole. There are four main brushes (two field lead brushes and two ground brushes, each connected in parallel).

Starter Data			
Torque	R.P.M	Volts	Amperes
0 lb. ft.	3500-4000	6.0	60
27 " "	Lock	3.5	650

**Starter Switch:**—Model 21518. Switch is of electro-magnetic type and consists of an operating solenoid and main switch contacts mounted in a case on the starter field frame. Solenoid circuit is controlled by a starting push button on the instrument panel.

**Mounting:**—Starter sleeve mounted at left of engine on forward face of fly-wheel housing. To remove, disconnect cable and switch lead, take out large pilot mounting screw in housing directly above starter sleeve, pull starter straight forward to clear Bendix, lift out.

**Oiling:**—Oilless bronze bearings used. Require no attention.

**GENERATOR:**—Model CL-1005. Generator current regulation by third brush and Battery Charge Regulator'. To adjust generator output, take off commutator cover band, shift third brush by turning slotted adjustment screw on end plate. Turn screw clockwise to increase or counter-clockwise to decrease charging rate. See Relay-Regulator paragraph for data on Battery Charge Regulator.

Generator Data		
Amperes	Volts	R.P.M.
0	6.2	480
8	7.0	680
18	8.1	1300
12	7.4	4000

Shunt field grounded through 5 ampere capacity field fuse mounted under relay-regulator cover.

**Mounting:**—Generator flange mounted on rear face timing chain case at right of engine. To remove, disconnect lead, take out three flange mounting capscrews, slide generator to rear to disengage drive coupling, lift out. Do not disturb intermediate flange carrying drive sprocket. Drive end bearing is in the engine. Generator can not be driven on test bench without special test bearing being used on drive end. This is Owen-Dyneto Part No. 22196.

**Chain Adjustment:**—To take up timing chain, loosen generator flange mounting screws, pull generator away from engine (pivoting on lower screw), tighten mounting screws. With correct adjustment chain should operate noiselessly. If chain hums adjustment is too tight and generator must be backed off slightly.

**Oiling:**—1000 Miles. Put 4-5 drops light engine oil in commutator end oiler. Drive end bearing is oiled from chain case.

**RELAY-REGULATOR:**—Model 20530. Relay cut-out and Battery Charge Regulator mounted in a case on the generator field frame. Relay contacts close at 480 R.P.M. with generator voltage of 6.2 volts and open with discharge current of 0-2 amperes. Relay contact gap .015 inch. Air gap .010 inch (contacts closed). Battery Charge Regulator consists of a fixed field resistance connected across a set of contacts controlled by an electrically operated thermostatic arm. Thermostat is set to operate with generator voltage of 8.0 volts (cold) or 7.6 volts (hot) cutting the resistance in the field circuit and reducing the output. See Equipment Section for complete data on Battery Charge Regulator.

**LIGHTING:**—Clum Switch Model 9170. Lighting switch mounted at lower end of steering column controlled by lever on steering wheel. Dimmer system 'depressed beam' double filament headlight bulbs controlled by lighting switch.

Position	Lamp Sizes		Base	Mazda No.
	Voltage	Candlepower		
Headlights	6-8	32-32	D.C.	1000
Parking bulbs	6-8	3	S.C.	63
Dash and tail lights	6-8	3	S.C.	63
Stop lights	6-8	21	S.C.	1129
Dome lights	6-8	6	S.C.	81

**CURRENT LIMIT RELAY:**—Consists of a fixed resistance connected across 2 20 ampere fuses. Mounted on front of dash. Resistance limits current after fuses burn out with 20 ampere load.

**GASOLINE GAUGE:**—Electric type (see Equipment Section).

**FUEL PUMP:**—Stewart-Warner mechanical fuel pump (see Equipment Section).

**HORNS:**—Sparton horn mounted under engine hood.

# PACKARD

STANDARD EIGHT SERIES 901 AND 902 (1932)  
DeLUXE EIGHT SERIES 903 AND 904 (1932)  
OWEN-DYNETO GENERATING, STARTING SYSTEM  
NORTH EAST IGNITION

**BATTERY:**—Prest-O-Lite, Type SH-6175-G (Hi-Level Type), 6 volt, 170 hour. The positive (+) terminal is grounded. Lighting capacity (5 ampere rate) is 5 amperes for 32 hours. Battery is mounted in a battery box built in the right hand dust shield.

**IGNITION:**—Coil Type 5025430. The ignition switch is built in the base of the coil. Coil is mounted on the back of the instrument board with the switch extending through to the face of the instrument panel. Ignition current is 2.75 amperes at 6 volts with engine running at 400 R.P.M., decreasing to .8 ampere at 4000 R.P.M. Current with engine stopped is 4.75 amperes at 6 volts. Ignition switch is Type No. 25472.

**Distributor Type 5028025 (901, 2), 5028269 (903, 4).** Breaker contact gap should be set at .020 inch. Set gap by loosening lock screw on stationary contact mounting plate and shifting plate. Resurface contacts when necessary with a fine flat contact file or on a medium hard oilstone. Breaker arms spring tension is 16 ounces. Breaker has two sets of contacts on an eight lobe cam. Contacts must be synchronized so as to open simultaneously for satisfactory engine performance. See Timing. Distributor is full automatic type.

Type Engine	Degrees Distributor	Automatic Advance Distributor	R.P.M. Engine
Both	0	Start	300
5028025	11	5½	1400
5028269	20	10	1800
			2800
			3600

**Mounting:**—Distributor is mounted on the cylinder head. To remove distributor, disconnect primary lead and remove distributor head with cables intact. Then take out two hold-down screws in the distributor mounting and lift the distributor from place.

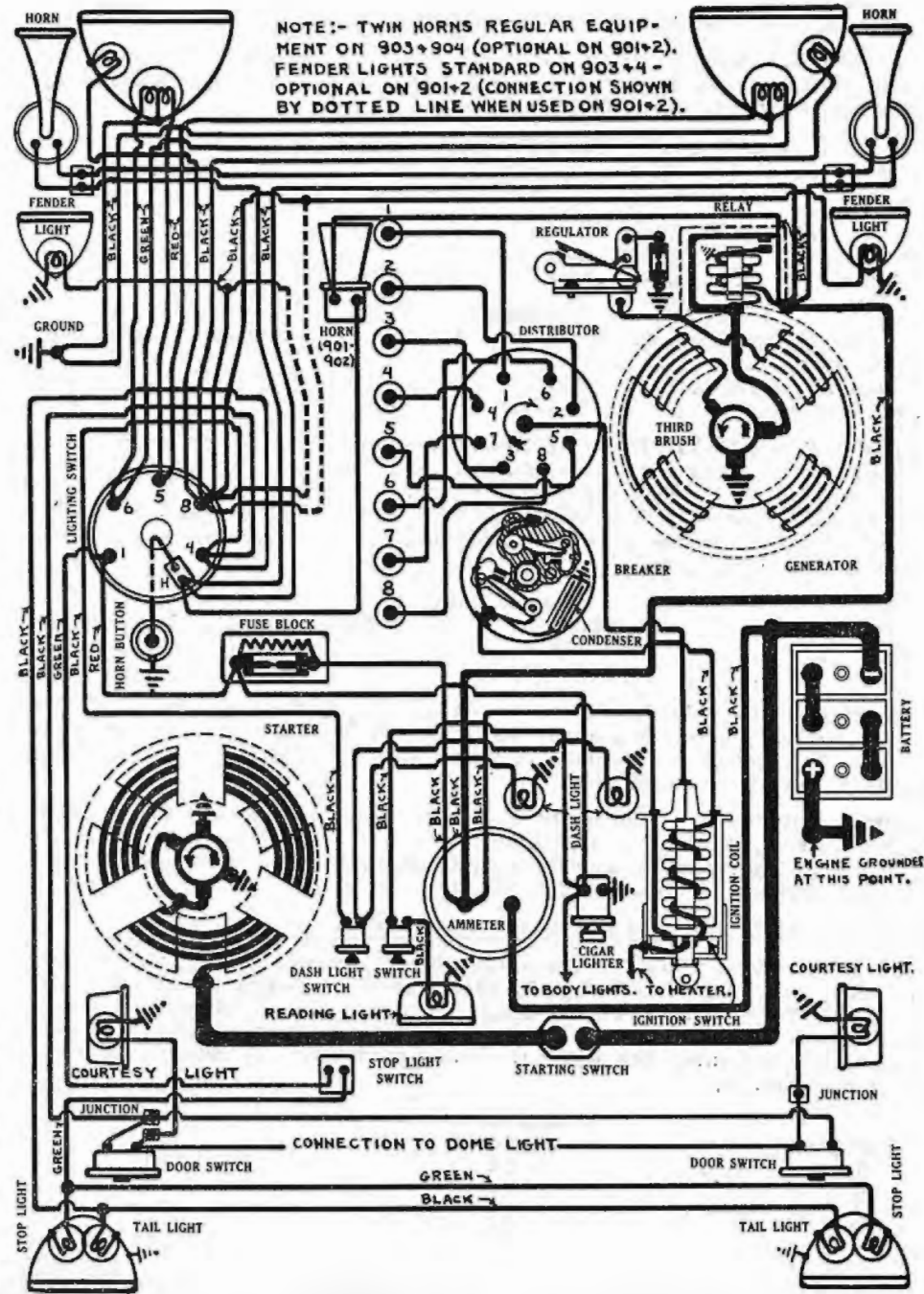
**Oiling:**—Fill the grease cup under the distributor head with medium cup grease and turn down one turn every month or each 1000 miles of operation. At the same time remove the distributor head and rotor and put a drop of oil on the breaker arm pivot pins. There is a cam oiler pad under the condenser.

**Timing:**—Engines are built with three compression ratios and each engine has a specific ignition setting. The standard engine is of medium compression while a low compression head and high compression head engine are also built. Ignition settings are as follows:

Engine Type	Ignition Setting
901, 2 Low Compression Head	12 degrees before T.D.C.
901, 2 Std. Compression Head	9 degrees before T.D.C.
901, 2 High Compression Head	4 degrees before T.D.C.
903, 4 Low Compression Head	12 degrees before T.D.C.
903, 4 Std. Compression Head	9 degrees before T.D.C.
903, 4 High Compression Head	1 degree before T.D.C.

To set ignition, crank engine over until piston No. 1 is approaching top dead center on compression stroke. Remove starter so that flywheel marks can be viewed through starter mounting hole. The flywheel marks can be viewed through starter mounting hole. The flywheel is marked 'D.C.1-8' and is marked by straight lines placed one degree apart for 15 degrees before the top dead center point. Each 5 degree interval is marked by a slightly longer line. Crank engine over until the proper flywheel mark (see above table) is opposite the indicator. Then loosen advance arm clamp screw and rotate distributor until contacts begin to open. Tighten the clamp screw and connect the spark plugs as indicated on the diagram.

**Synchronization of Contacts.** Contacts must be synchronized so as to open at the same instant. A simple method of checking synchronization is to block open the second set of contacts (mounted on movable plate) with a piece of cardboard or fibre insulator when the ignition is being set. Then shift the insulator to the first set of contacts, loosen the lock screws on the



# PACKARD

STANDARD EIGHT SERIES 901 AND 902 (1932)  
 DeLUXE EIGHT SERIES 903 AND 904 (1932)  
 OWEN-DYNETO GENERATING, STARTING SYSTEM  
 NORTH EAST IGNITION

mounting plate and shift the plate until the second set of contacts begin to open. Timing can be checked by cranking the engine over one complete revolution (with the first set of contacts still blocked open) and stopping at the instant the second set of contacts begin to open. The same mark on the flywheel used in setting the ignition should be opposite the indicator on the housing.

**Firing Order:**—The firing order is 1-6-2-5-8-3-7-4.

**Spark Plugs:**—14 MM. Metric. AC Type K-9. Set gaps at .025-.030 inch.

**VALVE TIMING, 901, 902:**—INLET VALVES. Head diameter, 1 21/32 inches. Stem diameter, .3405 inch. Stem length, 7 3/8 inches. Valve lift, .358 inch. Spring pressure, 73 pounds (spring length, 3 1/16 inches). Tappet clearance, .004 inch (hot). Inlet valves open 20 degrees before top dead center and close 65 degrees after lower dead center. The inlet opening point is approximately 9 teeth on the flywheel before top dead center.

EXHAUST VALVES. Head diameter, 1 15/32 inches. Stem diameter, .3405 inch. Stem length, 7 3/8 inches. Valve lift, .358 inch. Spring pressure, 73 pounds (spring length, 3 1/16 inches). Tappet clearance, .004 inch (hot). Exhaust valves open 65 degrees before lower dead center and close 20 degrees after top dead center. Valve stem guides are removable. Valves with oversize stems are not made.

**VALVE TIMING, 903, 904:**—INLET VALVES. Head diameter, 1 13/16 inches. Stem diameter, .3405 inch. Stem length, 7 3/8 inches. Valve lift, .358 inch. Spring pressure, 73 pounds (spring length, 3 1/16 inches). Tappet clearance, .004 inch (hot). Inlet valves open 20 degrees before top dead center and close 65 degrees after lower dead center. The inlet opening point is approximately 9 teeth on the flywheel before top dead center.

EXHAUST VALVES. Head diameter, 1 11/16 inches. Stem diameter, .3405 inch. Stem length, 7 3/8 inches. Valve lift, .358 inch. Spring pressure, 73 pounds (spring length, 3 1/16 inches). Tappet clearance, .004 inch (hot). Exhaust valves open 65 degrees before lower dead center and close 20 degrees after top dead center. Valve stem guides are removable. Valves with oversize stems are not made.

**STARTER:**—Model DI-955 (901, 2), DN-952 (903, 4). Starter is connected to the engine through a Bendix drive. The direction of rotation is counter-clockwise, viewed from the commutator end. Brush spring tension is 26-28 ounces. Starter cranks engine at 125 R.P.M.

Model DI-955 Starter Data			
Torque	R.P.M.	Volts	Amperes
0 lb. ft.	3500-4000	6	60
27 "	Lock	3.5	650
Model DN-952 Starter Data			
0 lb. ft.	3000	6	50
35 "	Lock	3.5	650

**Starting Switch Model 21110:**—Starting switch is electro-magnetic type mounted on starter field frame and controlled by starting button on instrument panel. Main starting switch contacts are operated by switch solenoid. Solenoid circuit completed through starting button.

**Mounting:**—Starter is sleeve mounted at the left of the engine on the forward side of the flywheel housing. To remove starter, disconnect cable and take out large pilot mounting screw in flywheel case directly above the starter sleeve. Pull starter forward to clear Bendix and lift from place.

**Oiling:**—Starter is equipped with oilless bronze bearings.

**GENERATOR:**—Model CL-1005. The direction of rotation is counter-clockwise, viewed from the commutator end. Generator current regulation is by third brush shunt field in conjunction with a 'Battery Charge Regulator'. To adjust the charging rate, remove the commutator cover and turn the slotted adjustment screw on the end plate. This shifts the third brush through a

rack and pinion engagement. Turn the adjustment screw in a clockwise direction to increase the charging rate and in the opposite direction to decrease the charging rate. See Relay-Regulator paragraph and article in Equipment Section on Battery Charge Regulator.

Generator Data		
Amperes	Volts	R.P.M.
0	6.2	480
8	7.0	680
18	8.1	1300
12	7.4	4000

A five ampere field fuse is mounted under the regulator cover on the generator. The shunt field is grounded through this fuse.

**Mounting:**—Generator is flange mounted at the right of the engine on the rear of the timing chain case. To remove generator, disconnect lead and take out three flange mounting cap screws. Then pull the generator to the rear without disturbing the intermediate flange which carries the generator bearing and drive sprocket. The drive end bearing is mounted in the engine and the generator can not be driven on the test bench unless a special test bearing is bolted in place. This is furnished by the Owen-Dyneto Corporation and is their part No. 22196. Do not attempt to crank the engine with the generator out.

**Oiling:**—Put 4 or 5 drops of light engine oil in the oiler on the commutator end of the generator every month or each 1000 miles of operation. The drive end bearing is oiled from the chain case.

**BATTERY CHARGE REGULATOR AND RELAY:**—Model 20530. The Battery Charge Regulator and relay cut-out are mounted on the generator field frame in a single case. The relay contacts close at 480 R.P.M. when the generator voltage reaches 6.4 volts and open with a discharge current of 0-2 amperes. Relay contact gap is .015 inch. Air gap should be .010 inch with contacts closed. The regulator consists of a fixed field resistance connected across the contacts of the thermostat blade. This resistance is cut in series with the shunt field when the thermostat contacts open. The thermostat is set to operate at 8.0 volts (cold), or 7.6 volts (hot). Thermostat is compensated for temperature changes.

**Note:**—Battery Charge Regulator Model 21262 supersedes Model 20530. The two types are identical except that an extra terminal is provided on the Model 21262 connected to the main generator brush lead which is used when automatic starting (optional) is installed on the car.

**LIGHTING:**—Clum Switch Model 9170. Lighting switch mounted at lower end of steering column and controlled by lever on steering wheel. Dimmer system 'depressed beam' double filament headlight bulbs controlled by lighting switch.

Lamp Sizes			
Position	Voltage	Candlepower	Base Mazda Number
Headlights	6-8	32-32	DC.....1000
Fender and parking lights	6-8	3	SC.....63
Dash and tail lights	6-8	3	SC.....63
Stop and backing lights	6-8	21	SC.....1129

Fender lights are standard equipment on the Model 903 and 904 and optional equipment on the Model 901 and 902. A spot light is supplied on open cars.

**FUSES:**—Generator field fuse is 5 ampere capacity. Lighting fuse mounted on the fuse block on the dash is 20 ampere capacity.

**GASOLINE GAUGE:**—K-S Telegauge hydrostatic type (see Equipment Section).  
**FUEL PUMP:**—Stewart-Warner mechanical pump (see Equipment Section).

**HORNS:**—The Model 901 and 902 is regularly equipped with one Sparton 'S.O.S.' horn. The Model 903 and 904 is equipped with twin Sparton 'Trumpets', Type L. These horns are optional equipment on the Model 901 and 902.

# PACKARD

## TWIN SIX SERIES 905 AND 906 (1932), SERIAL NUMBERS 900,001 UP OWEN-DYNETO GENERATING, STARTING SYSTEM AUTO-LITE IGNITION

**CAR SERIAL NUMBER:**—On plate on left front side of dash. This series 900,001 up.

**ENGINE NUMBER:**—On left hand cylinder block under cylinder head.

**BATTERY:**—Prest-O-Lite, Type AH-6175G Special, 6 volt, 160 ampere hour capacity (5 ampere rate). Starting capacity 170 amperes for 20 minutes. Positive (+) terminal grounded. Battery mounted in right hand front fender. Battery size, 7 inches wide, 13 inches long, 9½ inches high.

**IGNITION:**—Coil Model CE-4001 (2 used). Coils mounted on the dash. Ignition current 6 amperes at 6 volts (engine running), 10 amperes at 6 volts (engine stopped), maximum draw for both coils.

**Distributor Model IGO-4001.** Two breaker arm, 6 lobe cam type with full automatic advance. Contacts open alternately at 33½ and 26½ firing intervals corresponding to the engine firing intervals of 67 and 53 degrees. Cylinder blocks are set at 67 degrees angle resulting in this unequal firing interval. Contacts must be synchronized for satisfactory engine performance (see Timing). Breaker contact gap set at .020 inch. Hold within limits of .015-.020 inch. To set gap, loosen lock screws on stationary contact mounting plate, turn eccentric adjusting screw, tighten lock screws (first set mounted directly on breaker plate), or loosen lock nut on stationary contact mounting stud, turn up stud, tighten lock nut (second set mounted on moveable sub-plate).

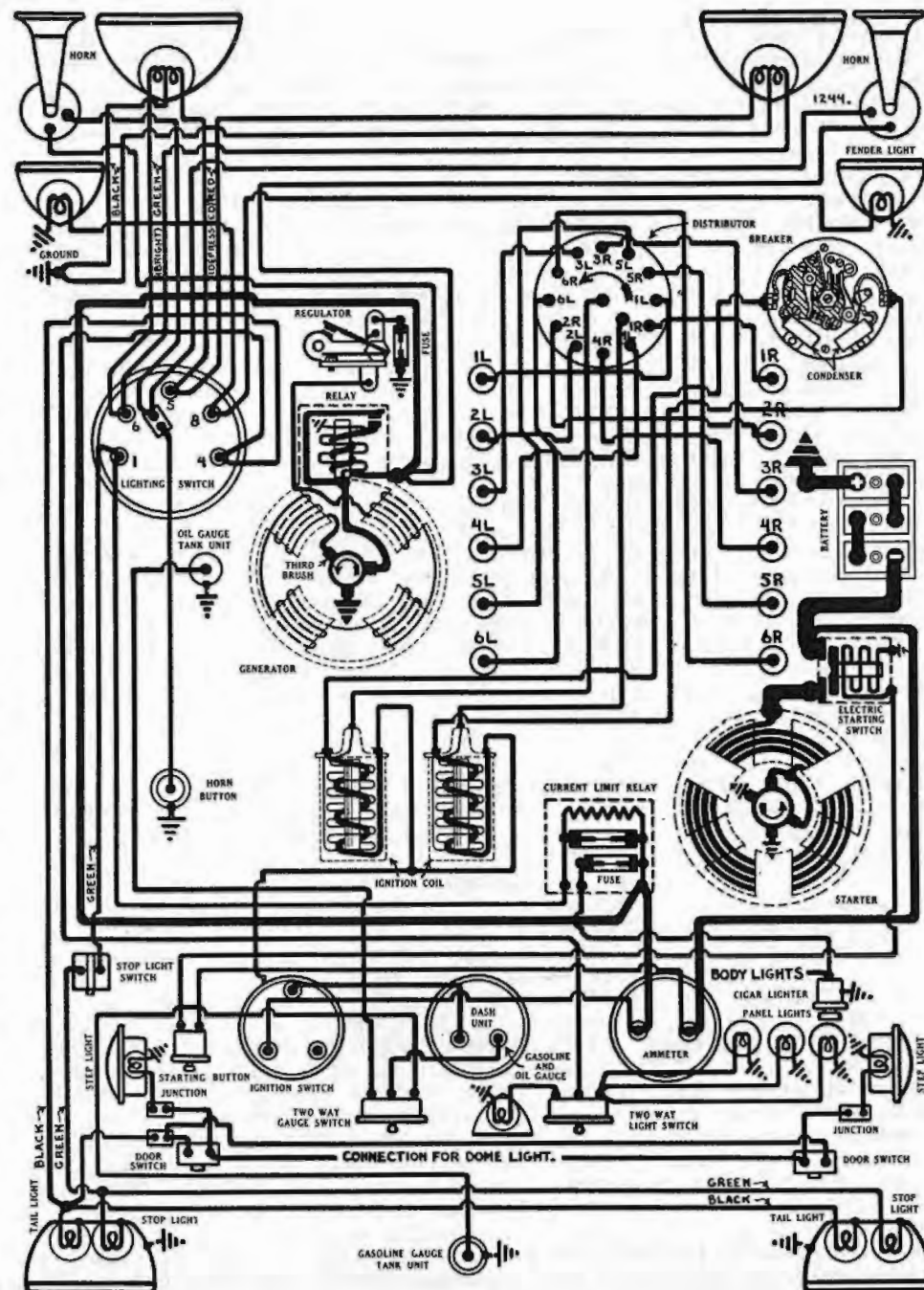
Engine	Degrees	Automatic Advance Distributor	R.P.M.	Engine
0.....	Start.....	300.....	600	
6.....	3.....	450.....	900	
10.....	5.....	700.....	1400	
12.....	6.....	850.....	1700	
14.....	7.....	1050.....	2100	
16.....	8.....	1400.....	2800	

**Mounting:**—Distributor mounted at front of engine between cylinder banks. Driven from camshaft through tongue-and-slot coupling (offset so that it can be replaced only in correct position). To remove distributor, disconnect primary leads, take off distributor cap and spark plug cable conduits, take out mounting screws in mounting bracket, lift distributor out.

**Oiling:**—1000 Miles. Put few drops medium engine oil in each of two oilers on side of distributor housing. Breaker cam face oiled by wick oiler assembled on breaker plate. Check wick every 10,000 miles and replace if dry.

**Timing:**—Standard setting 7° (on vibration dampener at front of engine) before top dead center. To set timing, turn engine over until No. 1R piston (No. 1 of right hand bank) enters compression stroke and stop with the seventh mark from the 'UDC' reference line on the vibration dampener at the front of the engine directly opposite the timing pointer on the chain case (vibration dampener is marked '1R-UDC' at top dead center point with fifteen one-degree graduations before this point—the seventh reference line from the 'UDC' mark is the timing point). Then loosen clamp screw on distributor mounting bracket, rotate distributor until right hand breaker contacts (fixed set mounted on breaker plate) begin to open, tighten locking screw. Use a test lamp to determine opening point. The timing for the left hand bank of cylinders is set by synchronizing contacts (see next paragraph).

**Synchronization of Contacts**—first method as part of timing operation. After setting timing of right hand cylinder bank (above), crank engine over exactly 67 degrees to firing position of piston No. 6L (No. 6 of the left hand bank) with the seventh graduation from the '6L-UDC' reference line directly opposite the timing pointer. Then loosen lock screws on movable breaker sub-plate, turn eccentric adjusting screw until left hand contacts begin to open, tighten lock screws. Use a test lamp to determine opening point.



# PACKARD

## TWIN SIX SERIES 905 AND 906 (1932), SERIAL NUMBERS 900,001 UP OWEN-DYNETO GENERATING, STARTING SYSTEM AUTO-LITE IGNITION

**Synchronization of Contacts**—second method. Synchronize contacts on a rotary spark gap and adjust movable breaker plate until left hand (movable contacts open exactly  $33\frac{1}{2}$  degrees after fixed set, and right hand (fixed) contacts open exactly  $26\frac{1}{2}$  degrees after this point. This will secure the correct alternate  $33\frac{1}{2}$  and  $26\frac{1}{2}$  degree firing interval (corresponding to 67 and 53 degrees of crankshaft rotation).

**Firing Order**:—1R-6L-5R-2L-3R-4L-6R-1L-2R-5L-4R-3L with cylinder banks right (R) and left (L) as viewed from the driver's seat. No. 1 cylinder nearest the radiator. See diagram for connections on distributor head.

**Spark Plugs**:—18 MM. Metric A.C. Type G-10. Set gaps at .025 inch. Hold within limits of .025-.030 inch.

**VALVE TIMING**:—Valves mounted horizontally ( $20^\circ$  angle) in valve alley between cylinder banks and are operated by rocker arms directly from the camshaft. An automatic valve tappet takeup is used so that rocker arms bear directly on valve stem without appreciable tappet clearance in service. Camshaft is mounted directly above crankshaft and is chain driven.

	Head Diameter	Stem Diameter	Stem Length	Seat Angle	Lift
Intake	1 21/32"	3/405"	6 35/64"	45°	5/16"
Exhaust	1 21/32"	3/38"	6 35/64"	45°	5/16"

### Tappet Clearance

Automatic valve tappet takeup used. Closed .....55-65 pounds (2 9/32")  
No clearance in service.

### Timing

Intake valves open at top dead center. Intake valves close  $45^\circ$  after lower dead center.

Exhaust valves open  $35^\circ$  before lower dead center. Exhaust valves close  $10^\circ$  after top dead center.

**To Check Valve Timing.** Turn engine over until piston No. 6R is on top dead center of compression stroke. No. 1R intake valve should open at this point. Vibration dampener is marked '1R-UDC' (first set of marks) at this point; the mark should be directly opposite the pointer on the chain case.

**STARTER**:—Model DN-1072. Starter drives engine through outboard Bendix drive. Rotation counter-clockwise at commutator end. Brush spring tension 26-28 ounces. Starter is a six pole, series wound motor with a single field coil which is so shaped as to wind around three sides of each field pole. There are four main brushes, two field lead brushes and two ground brushes each connected in parallel. Starter cranks engine at 125 R.P.M.

### Starter Data

Torque	R.P.M.	Volts	Amperes
0 lb. ft.	3000	6.0	50
35 "	Lock	3.5	650

**Starter Switch**:—Model 21518. Starter switch is electro-magnetic type mounted on starter field frame and controlled by starting button on instrument panel. Main switch contacts are closed by switch solenoid controlled by the starting button.

**Mounting**:—Starter sleeve mounted on forward side of flywheel housing (right rear motor support) at right of engine. To remove starter, disconnect cable and switch leads or take off switch, loosen lock nut and back out large pilot mounting screw in housing directly above starter sleeve, pull starter straight forward to clear Bendix housing, lift out.

**Oiling**:—Starter bearings are oilless. They require no attention.

**GENERATOR**:—Model CL-1033. Generator current regulation is by third brush system and 'Battery Charge Regulator'. Generator output controlled by shifting third brush through rack and pinion engagement by turning slotted adjustment screw on end plate. To adjust generator output, take off commutator cover, turn adjustment screw clockwise (right hand) to increase or

counter-clockwise (left hand) to decrease charging rate. Generator rotation counter-clockwise at commutator end. See Relay Regulator paragraph for details on Battery Charge Regulator operation.

### Generator Data

Amperes	Volts	R.P.M.
0	6.5	600
12	7.5	1000
18	8.0	1500
9	7.5	5000

Shunt field grounded through 5 ampere field fuse mounted under relay-regulator cover.

**Mounting**:—Generator mounted on special sliding bracket at front of engine and driven by the fan belt. To remove, disconnect lead, loosen nuts on two studs in generator mounting slide on front face of crankcase, slide generator toward engine and slip off drive belt, take off nuts and lift generator out.

**Belt Adjustment.** Attach spring scale by wire looped around generator field frame at mounting slide. Loosen nuts on two mounting studs on front of mounting slide. Pull generator away from engine until scale reading is 180 pounds and tighten mounting nuts before slacking off on scale.

**Oiling**:—2500 Miles. Medium engine oil in oiler at each end of generator.

**RELAY-REGULATOR**:—Model 21732. Consists of relay cut-out and Battery Charge Regulator assembled in a single case mounted on generator field frame. Relay contacts close at 600 R.P.M. of generator with generator voltage of 6.5 volts and open with discharge current of 0-2 amperes. Relay contact gap .015 inch. Air gap .010 inch (contacts closed). Battery Charge Regulator consists of a fixed field resistance connected across a set of contacts controlled by an electrically operated thermostatic arm. Thermostat is set to operate with generator voltage of 8.0 volts (cold) or 7.6 volts (hot) cutting the resistance in the field circuit and reducing the output. Thermostat is compensated for temperature changes. See Equipment Section for complete details on construction and adjustment of Battery Charge Regulator.

**NOTE**:—Extra terminal on Battery Charge Regulator is used only when Automatic Starting (optional equipment) is installed. See article in Owen-Dyneto Automatic Starting in Equipment Section.

**LIGHTING**:—Clum Switch, Model 9170. Lighting switch mounted at lower end of steering column and controlled by lever on steering wheel. Dimmer system 'depressed beam' double filament headlight bulbs controlled by lighting switch.

Position	Lamp Sizes		Base	Mazda No.
	Voltage	Candlepower		
Headlights	6-8	32-32	D.C.	1000
Fender Lights	6-8	3	S.C.	63
Dash and Tail Lights	6-8	3	S.C.	63
Stop Lights	6-8	21	S.C.	1129
Dome Lights	6-8	6	S.C.	81

**CURRENT LIMIT RELAY**:—Consists of a fixed resistance connected across two 20 ampere capacity fuses on fuse block on front of dash. Resistance limits current after fuse burns out with 20 ampere load.

**FUSES**:—Generator field fuse mounted under plug in Battery Charge Regulator case is 5 ampere capacity. Lighting fuses on block on dash are 20 ampere capacity.

**GASOLINE GAUGE**:—Motometer electric combination gasoline and oil level gauge (see Equipment Section).

**FUEL PUMP**:—Stewart-Warner mechanical fuel pump mounted at right front of crankcase (see Equipment Section).

# PEERLESS

DELUXE MASTER EIGHT (1932)  
DELUXE CUSTOM EIGHT (1932)  
AUTO-LITE GENERATING, STARTING SYSTEM  
AUTO-LITE IGNITION

**CAR SERIAL NUMBER:**—Stamped on brass plate on right front body sill.  
**ENGINE NUMBER:**—Stamped on brass plate on left side crankcase wall at rear.  
**BATTERY:**—Willard, Type WSB-19, 6 volt, 19 plate, 129 ampere hour capacity (20 hour rate). Starting capacity 158 amperes for 20 minutes. Positive (+) terminal grounded. Battery mounted on left frame member under front compartment floor boards. Battery size 7 1/16 inches wide, 13 inches long, 9 1/4 inches high.

**IGNITION:**—Coil Model CE-4013. The ignition switch is built in the base of the coil. Coil is mounted on the back of the instrument board with the ignition switch extending through to the face of the instrument panel. Ignition current is 1.5 amperes at 6 volts with engine running and 4.5 amperes at 6 volts with engine stopped.

**Distributor Model IGH-4010.** Breaker contacts separate .018-.020 inch. Set contact gap by loosening two lock screws on stationary contact mounting plate (first set mounted on breaker plate) and turning eccentric adjusting screw until gap is .020 inch with breaker arm on lobe of cam. The second set (mounted on movable sub-plate) is adjusted by loosening the lock nut on the stationary contact mounting stud and turning up the stud. Resurface contacts when necessary with a fine flat contact file or on a medium hard oilstone. Breaker arm spring tension is 16-20 ounces. Distributor is semi-automatic. Engine is designed to operate with manual spark fully advanced (with the button pushed all the way in toward the dash). Pulling out the button provides an auxiliary retard. Breaker has two sets of contacts operating on a single four lobe cam. Contacts open alternately at intervals of 45 degrees corresponding to the 90 degree firing interval of the engine. This firing interval must be accurately set by synchronizing contacts for satisfactory engine performance (see Timing). Maximum manual advance 15 degrees (engine).

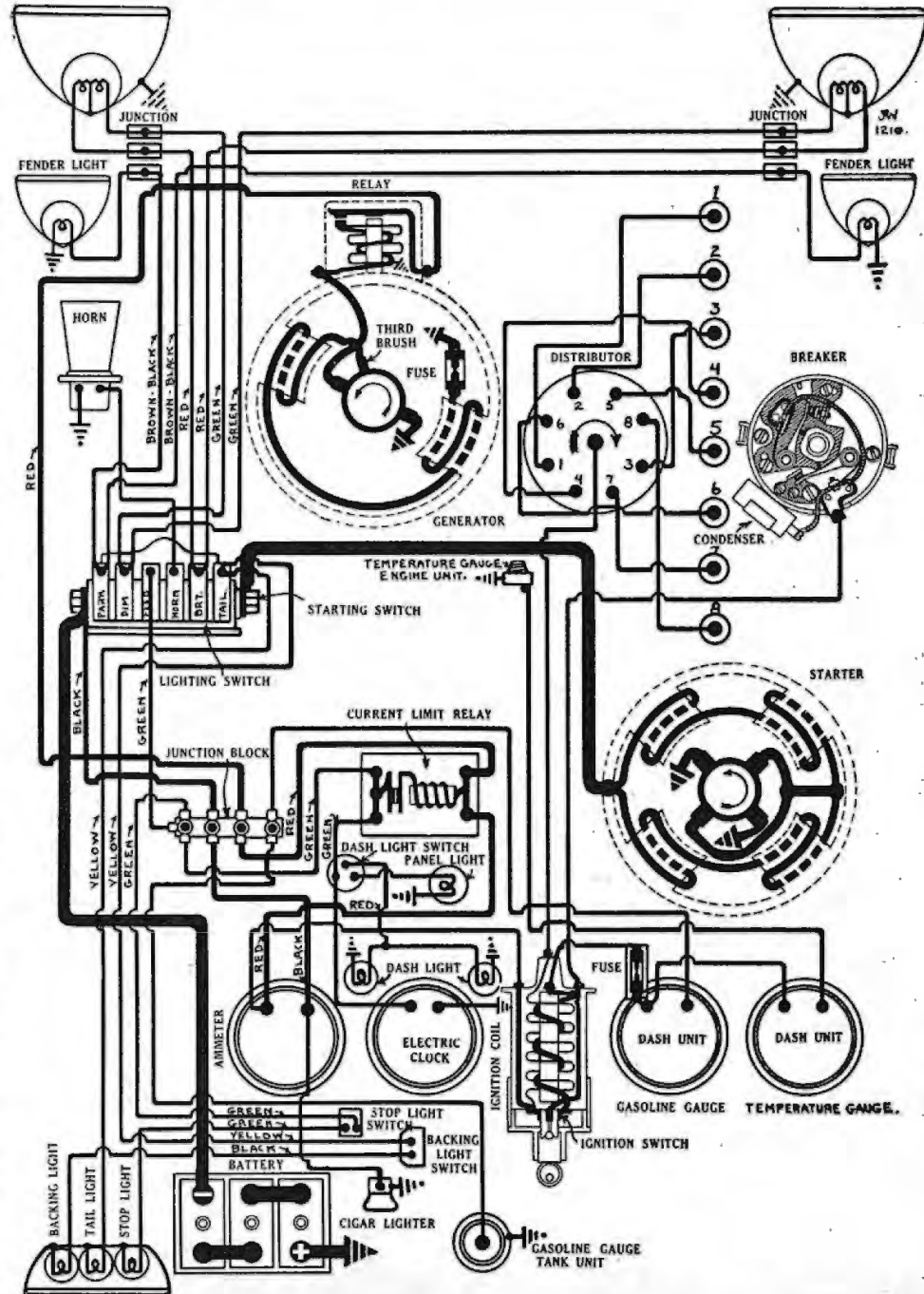
Engine	Degrees	Automatic Advance Distributor	R.P.M.	Engine
0.....	Start.....	200.....	400	
4.....	2.....	340.....	680	
8.....	4.....	480.....	960	
12.....	6.....	625.....	1250	
15.....	7 1/2.....	725.....	1450	

**Mounting:**—Distributor is mounted on the cylinder head and may be removed from the right side. To remove distributor, disconnect manual spark control and primary lead and remove distributor head with cables intact. Then take out mounting screw in advance arm and lift distributor from place.

**Oiling:**—Put 6 or 8 drops of light engine oil in the oiler on the side of the distributor head and rotor and put 3 or 4 drops of oil in the oiler in the center of the shaft and put one drop of oil on the breaker arm pivot pins. Every 5000 miles put a small bit of grease on the face of the breaker cam.

**Timing:**—Synchronization of Contacts. Synchronize contacts on a rotary spark gap or use special Auto-Lite tool and follow complete directions given in Equipment Section. Contacts can be synchronized without special equipment after distributor has been timed to engine by cranking engine over exactly 90 degrees when piston No. 6 will reach firing position (3/4 inch on the flywheel before top dead center with the manual spark control fully advanced). If the second set of contacts (mounted on movable sub-plate) do not open at this point, loosen the two lock screws and turn the eccentric adjusting screw until the contacts begin to open. Tighten the lock screws.

**Timing Distributor to Engine.** Breaker contacts begin to open when the piston entering power stroke reaches a position 3/4 inch (on the flywheel)





# PEERLESS

DELUXE MASTER EIGHT (1932)  
 DELUXE CUSTOM EIGHT (1932)  
 AUTO-LITE GENERATING, STARTING SYSTEM  
 AUTO-LITE IGNITION

before top dead center with the spark control button fully advanced. To set timing, crank engine over until piston No. 1 enters compression stroke (the up stroke with both valves closed). See that spark control button is pushed all the way in toward the dash and remove inspection hole cover in left front of flywheel housing. Turn engine over until the ignition mark 'IGN' on the flywheel is directly opposite the indicator on the edge of the inspection hole. Then loosen advance arm clamp screw and rotate distributor until the first set of contacts (mounted directly on the breaker plate) begin to open. Tighten the clamp screw and see that the rotor is directly opposite the segment in the distributor head connected to the spark plug in cylinder No. 1. Connect the remaining spark plugs as shown on the diagram.

**Firing Order:**—The firing order is 1-6-2-5-8-3-7-4.

**Spark Plugs:**—Spark plugs are 18MM. Metric. Champion Type 9-S. Gaps are .027 inch.

**VALVE TIMING:**—Valves at right of engine. Camshaft driven by two-sprocket non-adjustable chain drive.

	Head Diameter	Stem Diameter	Stem Length	Seat Angle	Lift
Intake	1 1/8"	3710-.3715"	4 13/16"	30°	5/16"
Exhaust	1 9/16"	3710-.3715"	4 13/16"	45°	5/16"
	<b>Tappet Clearance</b>			<b>Spring Pressure</b>	
Intake	.006" (hot)		105 pounds		
Exhaust	.010" (hot)				

### Timing

Intake valves open 2° after top dead center. Intake valves close 47° after lower dead center.

Exhaust valves open 43° before lower dead center. Exhaust valves close 2° after top dead center. Flywheel is marked 'No.1 EX.CL.' at point of exhaust closing for cylinders Nos. 1 and 8. Valve stem guides are removable. Valves with oversize stems are made for replacement.

**To Check Valve Timing:** Set tappet clearance of No. 1 exhaust valve at .007 inch (cold). With No. 8 piston on compression stroke, turn engine over until piston is 2° after top dead center with flywheel mark 'No.1 EX.CL.' at indicator on flywheel housing. No. 1 exhaust valve should close at this point.

**To Set Valve Timing:**—Crank engine over until piston No. 1 reaches top dead center when the flywheel mark 'DC 1&8' will be directly opposite the indicator in the inspection hole in the left front of the flywheel housing. Then turn camshaft so that there will be 10 links between the small 'o' stamped on the crankshaft sprocket and the camshaft sprocket when the chain is installed. To check timing, set No. 1 exhaust tappet clearance at .007 inch and crank engine over until No. 1 exhaust valve has just closed. The flywheel mark 'No.1 EX.CL.' should be directly opposite the indicator.

**STARTER:**—Model ML-4146. Starter is connected to the engine through a Bendix drive. The direction of rotation is counter-clockwise, viewed from the commutator end. Starter brush tension is 24-32 ounces. The starting switch is mounted at the lower end of the steering column.

Starter Data			
Torque	R.P.M.	Volts	Amperes
0 lb. ft.	3288	5.5	44
1.15 "	1940	5.5	100
4.2 "	1050	5.0	200
7.85 "	650	4.5	300
11.45 "	350	3.5	400
22.4 "	Lock	4.0	730

**Mounting:**—Starter is flange mounted at right of engine on forward side of flywheel housing. To remove starter, disconnect cable and take out flange

mounting screws. Then pull starter forward to clear drive and lift from place.

**Oiling:**—Put 5 or 6 drops of light engine oil in the oiler at each end of the armature every 1000 miles of operation.

**GENERATOR:**—Model GAR-4111. The direction of rotation is counter-clockwise, viewed from the commutator end. Generator current regulation is by third brush shunt field. To adjust generator output, remove the commutator cover band and shift third brush (by prying on brush mounting stud with a screwdriver) counter-clockwise to increase or clockwise to decrease charging rate. Maximum charging rate 17 amperes at 1700 R.P.M. or 25-30 M.P.H.

Generator 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

Shunt field current is 4.75-5.25 amperes at 6 volts. Brush spring tension is 22-25 ounces (main brushes), 31-34 ounces (third brush). Generator motoring draws 5.0-5.65 amperes at 6 volts. A 7.5 amperes field fuse is mounted on the end plate.

**Mounting:**—Generator is mounted by special flange mounting at left of engine and is driven by the fan belt. To remove generator, disconnect lead and water pump drive coupling (water pump driven by generator shaft extension), take out flange mounting bolts under generator, slip off drive belt, lift generator out.

**Belt Adjustment.** To take up fan belt, loosen two lock nuts at rear of fan bracket fork, raise fan assembly until correct belt tension is secured, tighten nuts. Tension should be just sufficient to drive fan and generator without slipping.

**Oiling:**—Put 5 or 6 drops of light engine oil in the oiler at each end of the generator every 500 miles of operation. Every 5000 miles remove the grease cup under the bearing retainer on the commutator end of the generator and fill with light grease.

**RELAY:**—Model CB-4014. Relay is mounted on the generator. Relay contacts close at 675 R.P.M. or 10-11 M.P.H. when the generator voltage reaches 7-7.5 volts and open with a discharge current of 1-2.5 amperes. Charging current at closing of contacts is approximately 2 amperes. Relay contact gap is .025-.035 inch. Air gap is .010-.030 inch with contacts closed.

**LIGHTING:**—Pines Lighting Switch, Model A-808. 'Finger Tip Control' type incorporating lighting switch, starting switch and horn button in a single unit mounted at lower end of steering column. Headlights are equipped with double filament headlight bulbs controlled by the lighting switch. See Equipment Section for complete data on Finger Tip Control.

Lamp Sizes				
Position	Voltage	Candlepower	Base	Mazda No.
Headlights	6-8	21-21	D.C.	1110
Fender Lights	6-8	3	S.C.	63
Dash, Dome, Tail Lights	6-8	3	S.C.	63
Stop and Backing Lights	6-8	15	S.C.	87

**FUSES:**—Generator field fuse 7½ ampere capacity. Fuse mounted on back of gasoline gauge (in gauge circuit) is 20 ampere capacity.

**CURRENT LIMIT RELAY:**—Vibrating circuit breaker mounted on dash and connected in lighting circuits. Circuit breaker begins to operate with current load of 25-30 amperes and limits current to 15 amperes maximum with direct short-circuit. Circuit breaker contact gap limits .012-.030 inch. Air gap limits .015-.025 inch (contacts closed).

# PIERCE ARROW

MODEL 51 (1932) 147" W. B. MODEL 52 (1932) 142", 147" W. B.

MODEL 53 (1932) 137", 142" W. B.

**CAR SERIAL NUMBER:**—Stamped on plate on right frame member near rear end right front spring. This series Model 52—142" W.B.—3,075,001 up, Model 52—147" W.B.—3,500,001 Up, Model 53—137" W.B.—2,050,001 Up, Model 53—142" W.B.—2,550,001 Up.

**ENGINE NUMBER:**—Stamped on upper right rear side of crankcase.

**BATTERY:**—Willard, Type WH-5-19. 6 volt, 19 plate, 153 ampere hour capacity (20 hour rate). Starting capacity 180 amperes for 20 minutes. Positive (+) terminal grounded. Battery mounted on left frame member under front compartment floor boards. Battery size 7 1/16 inches wide, 13 inches long, 9 3/4 inches high.

**IGNITION:**—Coil Model 528-E (2 used). Coils are mounted on the dash. Ignition current 3.6 amperes at 6 volts (engine running) 8 amperes at 6 volts (engine stopped) for both coils. Ignition switch Oakes 'Hershey' type coincidental ignition switch and steering post lock.

**Distributor Model 4096.** Two breaker arm, 6 lobe cam type with semi-automatic advance. Breaker contacts open alternately at 20 and 40 degree intervals corresponding to engine firing intervals of 40 and 80 degrees—engine has cylinder banks set at 80 degree angle and has uneven firing interval. Contacts must be synchronized (see Timing). Manual advance controlled by button on lower right of instrument panel. Ordinary running position with button pushed in—spark fully advanced, to retard spark pull out button. Breaker gap .018 inch. Hold within limits of .018-.024 inch. To set gap, loosen lock screw on stationary contact plate (directly behind breaker arm), turn eccentric adjusting screw. Breaker arm spring tension 17-21 ounces (measured at tip of breaker arm with spring scale at right angles to contact surface). Maximum manual advance 33° (engine).

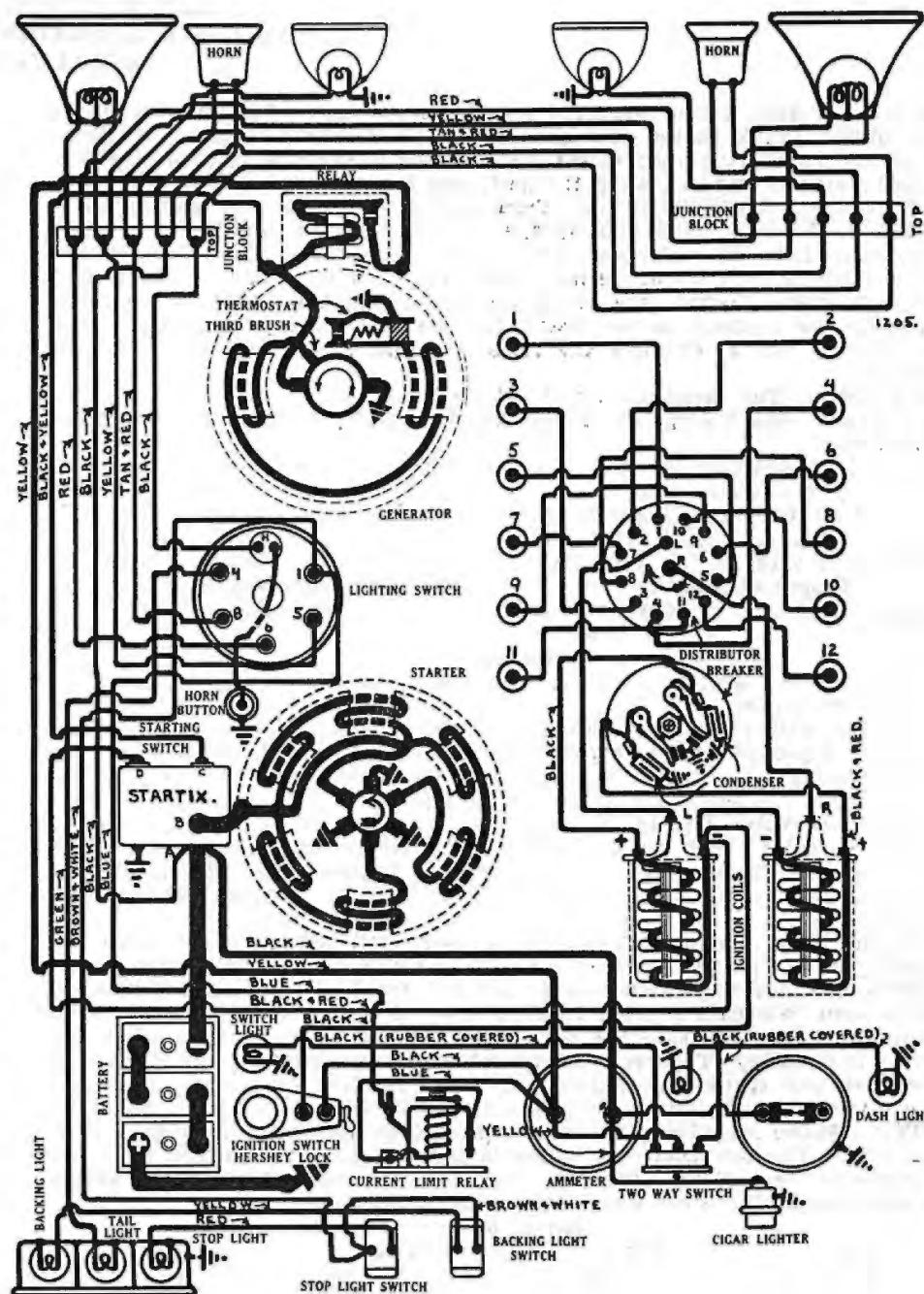
Degrees Engine	Automatic Advance Distributor	Distributor	R.P.M. Engine
2	Start	300	600
14	7	1500	3000

**Mounting:**—Distributor mounted at extreme rear of engine between cylinder banks. To remove, disconnect primary leads, take off distributor cap, disconnect manual spark control cable, take out distributor bracket mounting screws, lift distributor out.

**Oiling:**—2500 Miles. Turn down grease cup on side of shaft housing two turns. Keep cup filled with light cup grease. Put 8-10 drops light engine oil in distributor oiler. Take off distributor cap and rotor. Put 8-10 drops oil in breaker cam oiler.

**Timing:**—Standard setting 8° 26' (on flywheel) before top dead center with manual spark control fully advanced. To set timing, first advance manual spark control (push button in toward dash) and see that distributor is rotated counter-clockwise as far as possible, disconnect wire on 'IGN' terminal of Startix to prevent automatic cranking of engine, take off cover on inspection hole in flywheel housing. With No. 1 piston (No. 1 left hand bank) on compression stroke, turn engine over until flywheel mark 'IGN/NO.1' (which is 8° 26' before top dead center mark 'UDC/NO.1') is directly opposite indicator on housing. Take off distributor cap and rotor, loosen locking screw in center of breaker cam, carefully locate cam so that first set of contacts (mounted directly on breaker plate) are beginning to open, (use test lamp), tighten locking screw, connect spark plugs as shown on diagram (No. 1 terminal as designated).

**Synchronization of Contacts.**—First method as part of timing operation.



# PIERCE ARROW

MODEL 51 (1932) 147" W. B. MODEL 52 (1932) 142", 147" W. B.  
MODEL 53 (1932) 137", 142" W. B.

After distributor has been timed (above), turn engine over 40° to firing position of piston No. 4 (second cylinder right hand bank) when flywheel mark 'IGN/NO.4' (which is 8° 26' before top dead center mark 'UDC/NO.4') will be directly opposite indicator on housing. Loosen lockscrews on movable sub-plate (carrying second set of contacts), shift plate until contacts begin to open, tighten lockscrews, check contact gap.

**Second Method.** Synchronize contacts on rotary spark gap and shift movable sub-plate until interval between opening of contacts is alternately 20 and 40 degrees.

**Firing Order:**—1-4-9-8-5-2-11-10-3-6-7-12 with cylinders numbered as shown on diagram or 1L-2R-5L-4R-3L-1R-6L-5R-2L-3R-4L-6R with cylinder banks right (R) and left (L) as viewed from driver's seat, No. 1 cylinder nearest radiator in each case.

**Spark Plugs:**—14 MM. AC Type K-10. Set gap at .025-.030 inch.

**VALVE TIMING:**—Valves are located on inner side of each cylinder bank and are operated by a single camshaft mounted directly above crankshaft. Camshaft driven by two-sprocket non-adjustable chain drive from crankshaft.

	Head Diameter	Stem Diameter	Seat Angle	Lift
Intake	1 21/32" (overall)	.3725"	45°	.312"
Exhaust	1 9/16" (overall)	.3715"	45°	.312"
Tappet Clearance		Spring Pressure		
Intake	.004" (hot)	Closed .....50-55 pounds		
Exhaust	.006" (hot)			

### Timing

Intake valves open 4° before top dead center. Close 52° after lower dead center.

Exhaust valves open 40° before lower dead center. Close 16° after top dead center.

**To Check Valve Timing.** Check tappet clearance No. 1 intake valve (left hand bank). With No. 11 piston on compression stroke, turn engine over until flywheel mark 'IN.OP/NO.1' (which is 4° before top dead center mark 'UDC/NO.1') is directly opposite indicator on flywheel housing. No. 1 intake valve should begin to open at this point. An additional mark 'IN.OP./NO.4' which is 4° before the top dead center mark 'UDC/NO.4' is placed on the flywheel to indicate the intake opening point for cylinder No. 4.

**STARTER:**—Model 498. Starter drives engine through Bendix drive. Rotation counter-clockwise at commutator end. Brush spring tension 36-40 ounces.

### Starter Data

Torque	R.P.M.	Volts	Amperes
0 lb. ft.	3000	5.0	70
19 " "	Lock	3.0	500

**Startix:**—This model equipped with Startix automatic starting switch—see Equipment Section for complete article on Startix. When ignition setting is checked Startix should be disconnected (disconnect wire on 'IGN' terminal) to prevent automatic cranking of engine.

**Mounting:**—Starter flange mounted on front face flywheel housing at right of engine. To remove, disconnect cable, take out flange mounting screws, pull starter straight forward to clear Bendix housing.

**Oiling:**—Starter bearings oilless.

**GENERATOR:**—Model 927-U. Third brush regulation, thermostat control. Thermostat operates at 165°F. (contacts open, cuts in resistance) reducing output approximately 40%. To adjust charging rate, loosen lockscrew on commutator end plate, take off cover band, shift third brush by hand counter-clockwise to increase or clockwise to decrease charging rate, tighten locking screw. Maximum charging rate is 20 amperes (cold) at 8.5 volts reached at 1600 R.P.M.. Rotation counter-clockwise at commutator end.

### Generator Data

Cold Test		R.P.M.	Hot Test		R.P.M.
Amperes	Volts		Amperes	Volts	
20-22	8.5-8.7	1600	12-14	7.5-7.9	1800
Brush spring tension 20-28 ounces. Shunt field current 1.8-2.3 amperes at 6 volts.					

**Mounting:**—Generator cradle mounted left front of engine driven by fan belt (double Vee belt). Water pump driven by extension of generator shaft. To remove, disconnect water pump drive coupling, disconnect lead, slack off fan belt adjustment, loosen mounting clamp band, lift generator out.

**Belt Adjustment.** To adjust belt, loosen clamp bolt on fan bracket, turn eccentric shaft spindle, tighten clamp bolt. Additional adjustment secured by taking off fan bracket, moving bracket up on engine block so that mounting bolts engage lower holes in bracket, and making final adjustment by means of eccentric shaft spindle.

**Oiling:**—2500 Miles: Put 8-10 drops light engine oil in oiler at each end of generator.

**RELAY:**—Model 265-G. Mounted on generator. Relay contacts close with generator voltage of 6.75-7.5 volts and open with discharge current of 0-2.5 amperes. Relay contact limits .015-.025 inch. Air gap limits .012-.017 inch. (contacts closed).

**LIGHTING:**—Delco-Remy Switch, Model 486-U. Lighting switch mounted at lower end of steering column controlled by left hand lever on steering wheel. Dimmer system 'depressed beam' double filament headlight bulbs controlled by lighting switch. Switch positions:

1. Upper position—Auxiliary lights on, tail light on.
2. Lever pulled down one notch—all lights off.
3. Lever pulled down two notches—Dim 'depressed beam' headlights and tail lights on.
4. Lever pulled down—Bright headlights on, tail light on.

**Note:**—Instrument lights and switch lock light controlled by push-pull button at extreme left instrument board. First position (button halfway out)—instrument lights on, second position (button entirely out)—instrument lights and switch lock light on.

### Lamp Sizes

Position	Voltage	Candlepower	Base	Mazda Number
Headlights	6-8	32-32	DC	1000
Auxiliary lights	6-8	6	SC	81
Dash lights	6-8	3	SC	63
Tail and Tonneau lights	6-8	6	SC	81
Stop and backing lights	6-8	21	SC	1129
Dome light	6-8	15	SC	87

**CURRENT LIMIT RELAY:**—Model 410-F. Vibrating circuit breaker in lighting circuits starts with current load of 30-35 amperes limiting current to 5-18 amperes with direct short-circuit. Contact gap limits .012-.030 inch. Air gap limits .015-.025 inch (contacts closed). Spring pressure 5 ounces minimum (measured at brass button on contact arm with spring scale at right angles to arm).

**GASOLINE GAUGE:**—K-S Telegauge hydrostatic type—see Equipment Section.

**FUEL PUMP:**—Stewart-Warner mechanical fuel pump mounted at left of engine—see Equipment Section

**HORNS:**—Klaxon Type K-26-E matched set Type 1475 (low note) Type 1476 (high note) Current draw 6.0-8.5 amperes at 6 volts (Type 1475) 5.0-6.5 amperes at 6.0 volts (Type 1476).

**ELECTRIC CLOCK:**—Mounted left center instrument panel. 5 ampere capacity fuse mounted on back of clock.

# PIERCE ARROW

## MODEL 54 (1932) 137" AND 142" W. B. DELCO-REMY SYSTEM

**CAR SERIAL NUMBER:**—Stamped on plate on right frame member near rear end right front spring. This series Model 54—137" WB.—1,050,001 Up, Model 54—142" WB.—1,525,001 Up.

**ENGINE NUMBER:**—Stamped on upper right rear side of crankcase.

**BATTERY:**—Willard, Type WH-4-17. 6 volt, 17 plate, 136 ampere hour capacity 20 hour rate). Starting capacity 160 amperes for 20 minutes. Positive (+) terminal grounded. Battery mounted on left frame member under front compartment floor boards. Battery size 7 1/16 inches wide, 11 11/16 inches long, 9 5/16 inches high.

**IGNITION:**—Coil Model 528-E. Coil mounted on dash. Ignition current 1.8 amperes at 6 volts (engine running) 4 amperes at 6 volts (engine stopped). Ignition switch Oakes 'Hershey' type co-incidental ignition switch and steering post lock.

**Distributor Model 660-P.** Two breaker arm, 4 lobe cam type with semi-automatic advance. Breaker contacts open alternately at 45 degree intervals corresponding to 90 degree firing interval of engine. Contacts must be synchronized—see Timing. Manual advance controlled by button on dash, normal running position with button pushed in—spark fully advanced, pull button out to retard spark. Set contact gap at .018 inch. Hold within limits of .018-.024 inch. To set gap, loosen lock screw on stationary contact plate (directly behind contact arm), turn eccentric adjusting screw. Breaker arm spring tension 17-21 ounces (measured at tip of breaker arm with spring scale at right angles to contact surface. Maximum manual advance 33° (engine).

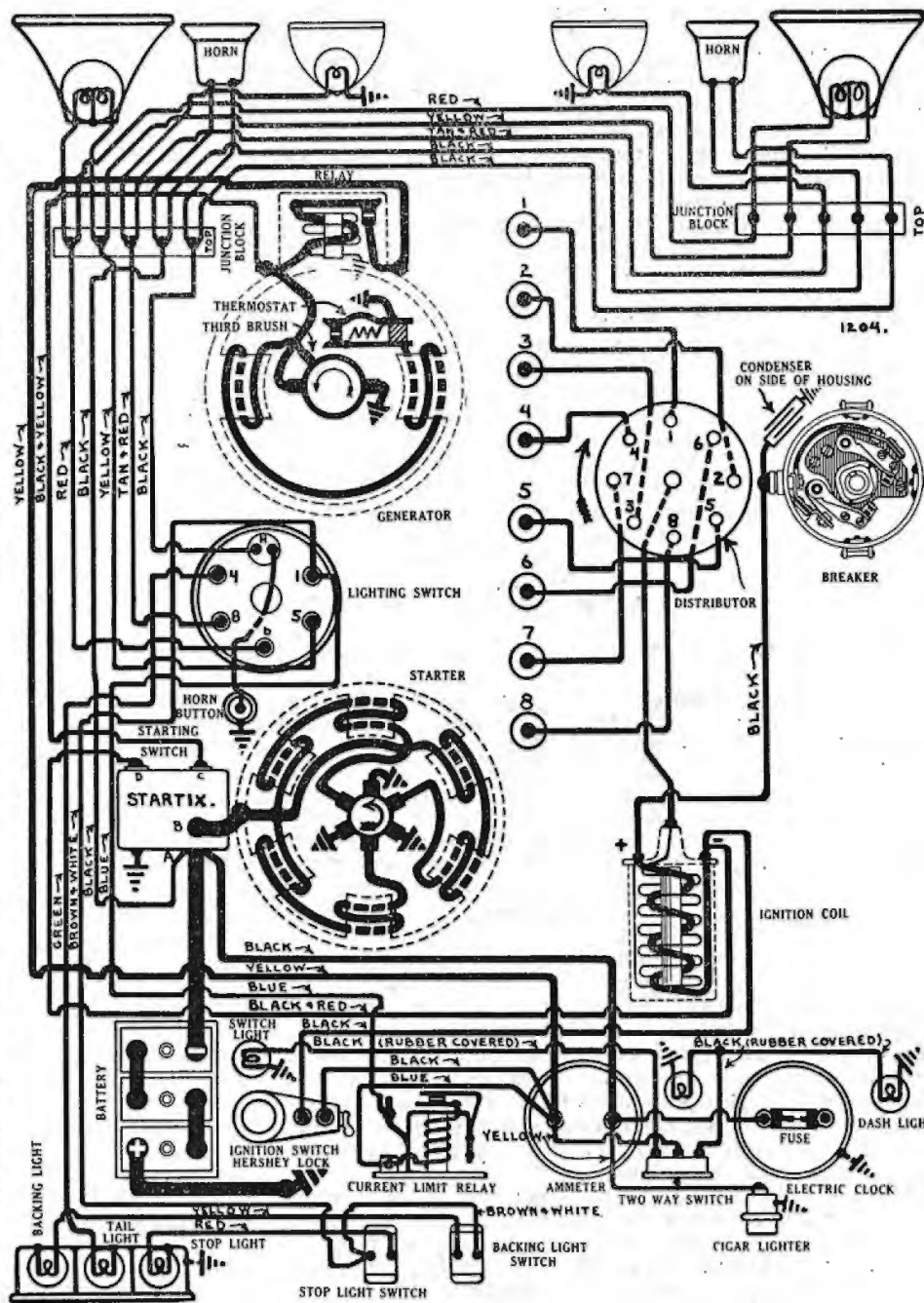
Engine	Degrees	Automatic Advance Distributor	Distributor	R.P.M.	Engine		
3	Start	300	600	19.5	9.75	1600	3200

**Mounting:**—Distributor mounted on cylinder head at right. To remove, disconnect primary lead, disconnect manual advance control wire, take off distributor cap, take out hold-down screw in advance arm, lift distributor out.

**Oiling:**—2500 Miles. Turn down grease cup on side of shaft housing two turns. Keep cup filled with light cup grease. Take off distributor cap and rotor, put 8-10 drops light engine oil in wick oiler in center of shaft, apply thin film vaseline to face of breaker arm.

**Timing:** Standard setting 8° 26' (on flywheel) before top dead center with full manual advance. To set timing, first advance spark control button (push button in toward dash) and see that distributor is rotated counter-clockwise as far as possible, disconnect wire on 'IGN' terminal on Startix to prevent automatic cranking of engine, take off cover plate on inspection hole in flywheel housing. With No. 1 piston on compression turn engine over until flywheel mark 'IGN/1-8' (which is 8° 26' before top dead center mark 'UDC/1-8') is directly opposite indicator on housing. Loosen advance arm clamp bolt, rotate distributor until first set breaker contacts (mounted directly on breaker plate) begin to open (use test lamp), tighten clamp bolt, connect spark plugs as shown on diagram.

**Synchronization of Contacts**—First method as part of timing operation. After timing distributor (above) turn crankshaft 270° or 3/4 revolution to firing position of piston No. 5 with flywheel mark 'IGN/5-4' which is 8° 26' before the top dead center mark 'UDC/5-4' directly opposite indicator on housing, loosen lock screws on movable plate (carrying second set of contacts), turn eccentric adjusting screw until contacts open, tighten locking



# PIERCE ARROW

## MODEL 54 (1932) 137" AND 142" W. B.

### DELCO-REMY SYSTEM

screws, check contact gap, if outside limits of .018-.024 inch, reset at .022 inch, repeat synchronization.

**Second Method**—Using synchronizing tool. Use Delco-Remy tool, Part No. 1838182, follow complete instructions in Equipment Section.

**Firing Order**:—1-6-2-5-8-3-7-4. No. 1 cylinder nearest radiator.

**Spark Plugs**:— $\frac{7}{8}$ -18 S.A.E. Champion Type C-4. Set gaps at .025-.030 inch.

**VALVE TIMING**:—Valves at right of engine. Camshaft driven by two-sprocket non-adjustable chain drive.

	Head Diameter	Stem Diameter	Seat Angle	Lift
Intake	1 21/32" (overall)	.3725"	45°	.359"
Exhaust	1 9/16" (overall)	.3715"	45°	.359"

Tappet Clearance		Spring Pressure	
Intake	.004" (hot)	Closed	50-55 pounds
Exhaust	.006" (hot)		

#### Timing

Intake valves open 5° before top dead center. Close 45° after lower dead center.

Exhaust valves open 40° before lower dead center. Exhaust valves close 12° after top dead center.

**To Check Valve Timing**. Check tappet clearance No. 1 intake valve. With piston No. 8 on compression turn engine over until flywheel mark 'IN.OP/1-8' (which is 5° before top dead center mark 'UDC/1-8') is directly opposite indicator on flywheel housing. No. 1 intake valve should begin to open at this point. An additional mark 'IN.OP/5-4' is placed 5° before the top dead center mark 'UDC/5-4'.

**STARTER**:—Model 497. Starter drives engine through outboard Bendix drive. Rotation counter-clockwise at commutator end. Brush spring tension 36-40 ounces.

#### Starter Data

Torque	R.P.M.	Volts	Amperes
0 lb. ft.	3000	5.0	70
19 " "	Lock	3.0	500

**Startix**:—This model equipped with Startix automatic starting switch mounted on engine block—see Equipment Section for complete article on Startix. When checking ignition disconnect wire on 'IGN' terminal of Startix to prevent automatic cranking of engine.

**Mounting**:—Starter flange mounted on front face flywheel housing at left of engine. To remove, disconnect cable, take out 3 flange mounting screws, pull starter forward to clear Bendix housing, lift out.

**Oiling**:—Starter bearings oilless.

**GENERATOR**:—Model 927-U. Third brush regulation, thermostat control. Thermostat operates at 165°F. (contacts open, cuts in resistance) reducing output approximately 40%. To adjust charging rate, loosen lock-screw on commutator end plate, take off cover band, shift third brush by hand counter-clockwise to increase or clockwise to decrease charging rate, tighten lock-screw. Maximum charging rate is 20 amperes (cold) at 8.5 volts reached at 1600 R.P.M. Rotation counter-clockwise at commutator end.

#### Generator Data

Cold Test			Hot Test		
Amperes	Volts	R.P.M.	Amperes	Volts	R.P.M.
20-22	8.5-8.7	1600	12-14	7.6-7.9	1800

Brush spring tension 20-28 ounces. Shunt field current 1.8-2.3 amperes at 6 volts.

**Mounting**:—Generator cradle mounted left front of engine driven by fan belt (double Vee belt). Water pump driven by extension of generator shaft. To remove, disconnect water pump drive coupling, disconnect lead, slack off fan belt adjustment, loosen mounting clamp band, lift generator out.

**Belt Adjustment**. To adjust belt, loosen clamp bolt on fan bracket, turn eccentric shaft spindle, tighten clamp bolt. Additional adjustment secured by taking off fan bracket, moving bracket up on engine block so that mounting bolts engage lower holes in bracket, and making final adjustment by means of eccentric shaft spindle.

**Oiling**:—2500 miles. Put 8-10 drops light engine oil in oiler at each end of generator.

**RELAY**:—Model 265-G. Mounted on generator. Relay contacts close with generator voltage of 6.75-7.5 volts and open with discharge current of 0-2.5 amperes. Relay contact limits .015-.025 inch. Air gap limits .012-.017 inch (contacts closed).

**LIGHTING**:—Delco-Remy Switch Model 486-U. Lighting switch mounted at lower end of steering column controlled by left hand lever on steering wheel. Dimmer system 'depressed beam' double filament headlight bulbs controlled by lighting switch. Switch positions:

1. Upper position—Auxiliary lights on, tail light on.
2. Lever pulled down one notch—all lights off.
3. Lever pulled down two notches—Dim 'depressed beam' headlights and tail lights on.
4. Lever pulled down—Bright headlights on, tail light on.

**Note**:—Instrument lights and switch lock light controlled by push-pull button at extreme left instrument board. First position (button halfway out)—instrument lights on, second position (button entirely out)—instrument lights and switch lock light on.

#### Lamp Sizes

Position	Voltage	Candlepower	Base	Mazda Number
Headlights	6-8	32-32	DC	1000
Auxiliary lights	6-8	6	SC	81
Dash lights	6-8	3	SC	63
Tail and Tonneau lights	6-8	6	SC	81
Stop and backing lights	6-8	21	SC	1129
Dome light	6-8	15	SC	87

**CURRENT LIMIT RELAY**:—Model 410-F. Vibrating circuit breaker in lighting circuits starts with current load of 30-35 amperes limiting current to 5-18 amperes with direct short-circuit. Contact gap limits .012-.030 inch. Air gap limits .015-.025 inch (contacts closed). Spring pressure 5 ounces minimum (measured at brass button on contact arm with spring scale at right angles to arm).

**GASOLINE GAUGE**:—K-S Telegauge hydrostatic type—see Equipment Section.

**FUEL PUMP**:—Stewart-Warner mechanical fuel pump mounted at left of engine—see Equipment Section

**HORNS**:—Klaxon Type K-26-E matched set Type 1475 (low note) Type 1476 (high note) Current draw 6.0-8.5 amperes at 6 volts (Type 1475) 5.0-6.5 amperes at 6.0 volts (Type 1476).

**ELECTRIC CLOCK**:—Mounted left center instrument panel. 5 ampere capacity fuse mounted on back of clock.

# PLYMOUTH

## FLOATING POWER MODEL PA (1931-32) NEW MODEL PB (1932), SERIAL NUMBERS 1,680,001 UP DELCO-REMY GENERATING, STARTING SYSTEM DELCO-REMY IGNITION

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

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

**BATTERY:**—Willard, Type WS-1-13, 6 volt, 13 plates, 86 ampere hour capacity (20 hour rate). Starting capacity 105 amperes for 20 minutes. Positive (+) terminal grounded to transmission. Battery mounted on left frame member under front compartment floor boards (PA) or under driver's seat (PB). Battery size, 7 1/16 inches wide, 9 1/16 inches long, 8 13/16 inches high.

**IGNITION:**—Coil Model 526-T. The ignition switch is built in the base of the coil. Coil is mounted on the back of the instrument board with the ignition switch extending through to the face of the instrument panel. Ignition current is 1-3 amperes at 6 volts with engine running and 3.4-5 amperes with engine stopped.

**Distributor Model 629-H (PA), 629-M (PB).** Single breaker arm, 4 lobe cam type with full automatic advance. Distributor fitted with vacuum controlled spark retard (see Note). Breaker contact gap set at .020 inch. Hold within limits of .018-.024 inch. To set gap, loosen lock screw on crescent shaped stationary contact mounting plate, turn eccentric adjusting screw, tighten lock screw. Breaker arm spring tension, 17-21 ounces (measured at tip of breaker arm with spring scale at right angles to contact surface).

Engine	Degrees	Automatic Advance	Distributor	R.P.M.	Engine
0	Start	400	800		
629-H-14	7	1275	2550		
629-M-14	7	1460	2920		

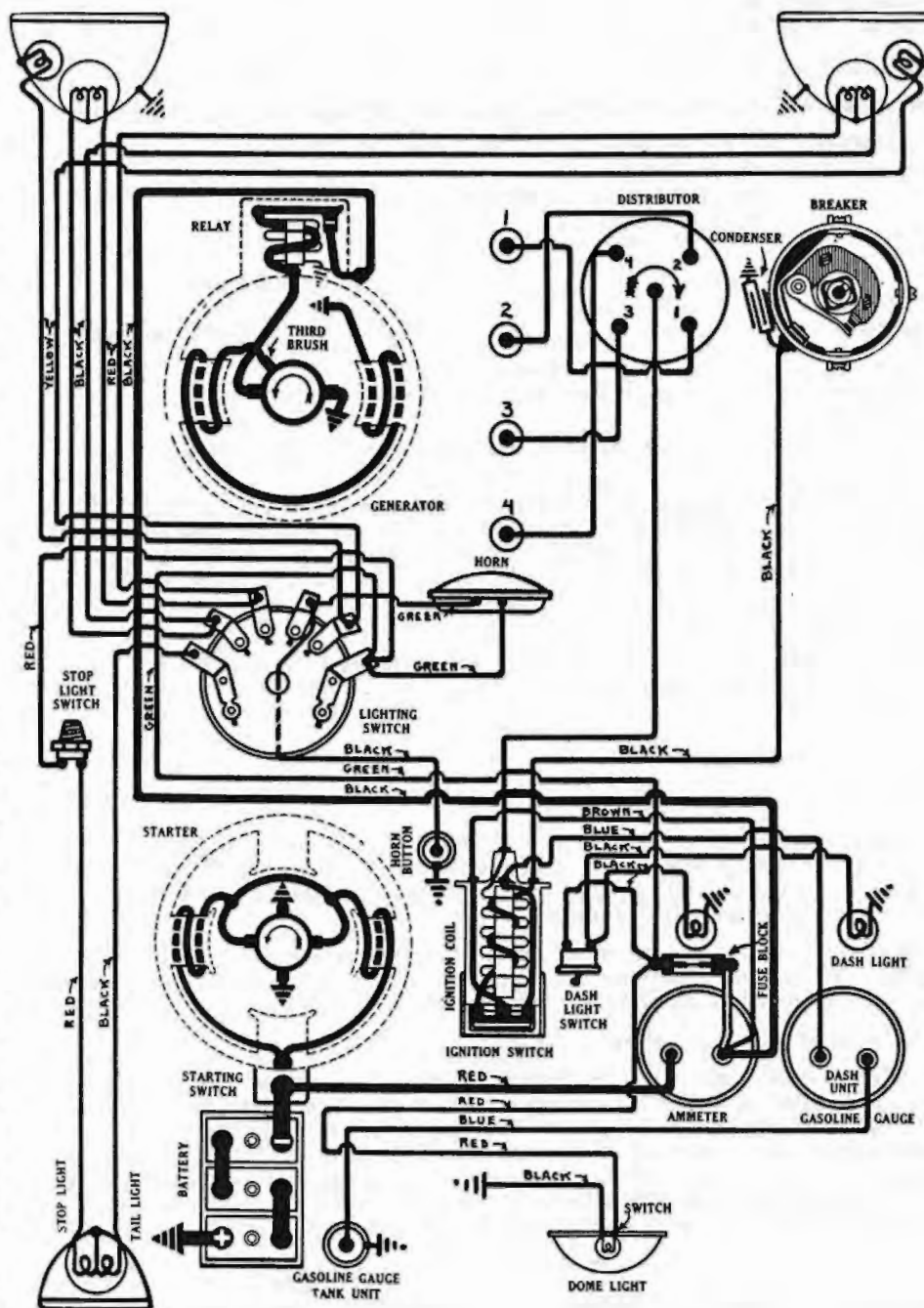
**Vacuum Spark Control:**—Model 680-E. The vacuum control is mounted on a bracket bolted to the timing gear case (right front of engine) and is coupled to the distributor advance plate. At idling speeds or when the throttle is closed the spark is automatically retarded. When the throttle is opened the spark is automatically advanced. The Vacuum Control requires no attention.

**Mounting:**—Distributor is mounted at the front of the engine and is driven from the forward end of the camshaft. To remove distributor, disconnect primary lead and take off distributor cap with cables intact. Disconnect vacuum spark control. Take out hold-down screw in advance arm and lift distributor from place.

**Oiling:**—Fill the grease cup in the side of the distributor shaft housing and turn down two turns every month or each 1000 miles of operation. Every 2000 miles put a small bit of vaseline on the face of the distributor cam.

**Timing:**—(PA and First PB). Standard setting .046 inch before top dead center. To set timing, remove the 1/8 inch pipe plug in the cylinder head directly over No. 4 piston. Install regular Chrysler timing gauge (see Equipment Section). Set gauge dial at '0' with piston on top dead center. Check breaker contact gap (set at .020 inch) and connect test lamp in primary circuit at distributor, turn on ignition. With No. 1 piston on compression stroke, turn engine over until gauge reading is .046 inch before top dead center, loosen advance arm clamp screw, rotate distributor until contacts begin to open (test lamp will go out), tighten clamp screw and connect spark plugs as indicated on diagram (No. 1 terminal as designated). Check ignition setting by turning engine over several times and stop with No. 1 piston on compression at the point where the test lamp goes out, indicating that contacts are beginning to open. Gauge reading must be within limits of .043-.049 inch before top dead center.

(PB). Standard setting 10° (on flywheel) before top dead center. To set timing, first check breaker contact gap (set at .020 inch), take off timing inspection hole cover on left front face of flywheel housing directly below starter, connect test lamp in primary circuit at distributor, turn on ignition.



# PLYMOUTH

## FLOATING POWER MODEL PA (1931-32) NEW MODEL PB (1932), SERIAL NUMBERS 1,680,001 UP DELCO-REMY GENERATING, STARTING SYSTEM DELCO-REMY IGNITION

With No. 1 piston on compression stroke, turn engine over until flywheel mark 'D/C' is directly opposite upper pointer in inspection hole. Loosen advance arm clamp screw, rotate distributor until contacts begin to open (test lamp will go out), tighten clamp screw and connect spark plugs as indicated on diagram (No. 1 terminal as designated).

**Firing Order:**—The firing order is 1-3-4-2.

**Spark Plugs:**—(PA) 18 MM. Metric A.C. Type G-12. Set gaps at .022 inch. (PB) 14 MM. Metric. A.C. Type K-12. Set gaps at .028 inch.

**VALVE TIMING:**—Valves at right of engine. Camshaft gear driven from crankshaft. Gears marked for correct timing (see paragraph below).

### Valve Dimensions (PA)

	Head Diameter	Stem Diameter	Stem Length	Seat Angle	Lift
Intake	1 27/32"	.372"	5 1/16"	45°	.3125"
Exhaust	1 9/32"	.372"	5 1/16"	45°	.3125"

### Valve Dimensions (PB)

Intake	1 27/32"	.372"	5 1/8" (overall)	45°	.3125"
Exhaust	1 27/32"	.372"	5 1/8" (overall)	45°	.3125"

### Tappet Clearance

	Operating	Timing	Spring Pressure
Intake	.005" (hot)	.008" (cold)	(PA) Open...85 pounds (1 9/16") (PB) Open...66-72 pounds (1 9/16")
Exhaust	.007" (hot)	.009" (cold)	

### Timing

Intake valves open 6° after top dead center with piston .0166" down on intake stroke. Intake valves close 46° after lower dead center.

Exhaust valves open 42° before lower dead center. Exhaust valves close 8° after top dead center with piston .0295" down on intake stroke.

**To Check Valve Timing.** Take out the 1/8 inch pipe plug in the cylinder head over No. 4 cylinder and screw the special timing gauge in place. Crank engine over until No. 4 piston is on top dead center and set gauge dial at zero. Turn engine over until No. 1 piston is on top dead center entering power stroke. Set tappet clearance of No. 1 inlet valve at .008 inch and No. 1 exhaust valve at .009 inch. Crank engine over one complete revolution and stop when gauge indicates No. 1 piston is .0166 inch past top dead center. No. 1 inlet valve should begin to open at this point. Turn engine over 2 degrees until gauge reading is .0295 inch past top dead center. No. 1 exhaust valve should close at this point. Reset tappet clearance with engine hot to .005 inch (inlet) and .007 inch (exhaust).

**To Set Valve Timing.** Camshaft is driven by spiral gears from the crankshaft at the front of the engine. To set valve timing, turn crankshaft over until piston No. 1 is on top dead center (use timing gauge in opening over No. 4 piston). Then mesh gears so that the marked tooth on the crankshaft gear is opposite the space which is similarly marked on the camshaft gear. Both marks should be in line with a straightedge laid across the two shaft centers.

**STARTER:**—Model 714-Q. Starter is connected to the engine through a manual pinion shift interconnected with the starting switch pedal. The direction of rotation is counter-clockwise, viewed from the commutator end. Brush spring tension should be 24-28 ounces.

### Starter Data

Torque	R.P.M.	Volts	R.P.M.
0 lb. ft.	5000	5.0	65
3.0 "	1500	5.0	200
6.0 "	800	4.5	300
9.4 "	350	4.0	400
12.0 "	Lock	3.63	475

**Mounting:**—Starter is flange mounted at left of engine on forward face of flywheel housing. To remove starter, disconnect cable and starting pedal linkage and take out two flange mounting cap screws. Pull starter forward

to clear drive pinion and lift from place.

**Oiling:**—Put 8 or 10 drops of light engine oil in the oiler on the commutator end of the starter every 5000 miles of operation. The drive end bearing is oilless.

**GENERATOR:**—Model 943-R (PA), 943-S (PB). Rotation is counter-clockwise viewed from the commutator end. Generator current regulation is by third brush shunt field. To adjust the generator output, loosen the small round headed lock screw on the commutator end plate and remove the commutator cover band. Then shift the third brush by hand in a counter clockwise direction to increase the charging rate and in the opposite direction to decrease the charging rate. Tighten the lock screw after making the adjustment. With standard car setting the maximum charging rate is 16-18 amperes (cold) reached at 2300 R.P.M. or 20-22 miles per hour.

### Model 943-R Generator Data

Cold Test			Hot Test		
Amperes	Volts	R.P.M.	Amperes	Volts	R.P.M.
0	6.4	800	0	6.4	875
4	6.8	920	4	6.8	1075
8	7.2	1075	8	7.2	1400
18	8.3	2300	12.2	7.7	2400

### Model 943-S Generator Data

19-21	8.1-8.3	2300	13-15	7.7-8.0	2400
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Shunt field current is 3.5-4.5 amperes at 6 volts. Generator motoring draws 3 amperes at 6 volts. Brush spring tension is 24-28 ounces.

**Mounting:**—Generator is mounted on special hinge bracket at left of engine and is driven by the fan belt. To remove generator, disconnect lead and loosen adjustment clamp bolt. Swing generator toward the engine and slip off drive belt. Then remove the two bolts forming the bracket hinge and life generator from place.

**Belt Adjustment.** To take up fan belt, loosen mounting bolts and adjustment clamp bolt, attach spring scale by wire looped over top of generator field frame so that force of spring is tangent to top of generator and parallel to slot in adjustment arm. Pull generator away from engine until scale reading is 45-50 pounds and tighten adjustment bolt and mounting bolts before slacking off on scale.

**Oiling:**—Fill oiler at each end with light engine oil every 2000 miles.

**RELAY:**—Model 265-G. Relay is mounted on the generator. Relay closes at 8-10 M.P.H. or 800 R.P.M. when the generator voltage reaches 6.4-7 volts and opens with a discharge current of 0-2.5 amperes. Relay contact gap is .015-.025 inch. Air gap is .014-.020 inch with contacts closed.

**LIGHTING:**—Clum Switch, Model 9150 (PA), 9271 (PB). Lighting switch mounted at lower end of steering column controlled by lower lever on steering wheel. Dimmer system 'depressed beam' double filament headlight bulbs controlled by lighting switch.

### Lamp Sizes

Position	Voltage	Candlepower	Base	Mazda No.
Headlights	6-8	21-21	D.C.	1110
Parking Bulbs	6-8	3	S.C.	63
Instrument Lights	6-8	3	S.C.	63
Stop and Tail Light	6-8	21-2	D.C.	1158
Dome Light	6-8	15	S.C.	87

**FUSES:**—Lighting fuse mounted on the back of the ammeter is 20 ampere capacity.

**HORN:**—Klaxon Model K-16. Vibrator type mounted under engine hood. Current draw, 4.0-6.5 amperes at 6 volts.

**GASOLINE GAUGE:**—Motometer electric type (see Equipment Section).

**FUEL PUMP:**—A.C. mechanical fuel pump mounted on right side of crankcase (see Equipment Section).

# PONTIAC

## SIX MODEL 402 (1932), SERIAL NUMBERS 729,001 UP DELCO-REMY SYSTEM

**CAR SERIAL NUMBER:**—Stamped on plate on left frame member under left front fender.

**ENGINE NUMBER:**—Stamped on left side cylinder block above generator.

**BATTERY:**—Delco, Type 13-D, 6 volt, 13 plate, 86 ampere hour (5 ampere rate). Starting capacity 102 amperes for 20 minutes. Negative (—) terminal grounded. Battery mounted on left frame member under front compartment floor boards.

**IGNITION:**—Coil Model 534-W. Coil lock type with ignition switch in base. Coil mounted on back of instrument board with ignition switch at center of instrument panel. Ignition current 2 amperes at 6 volts (engine running), 4.5 amperes at 6 volts (engine stopped).

**Distributor Model 639-U.** Single breaker arm, 6-lobe cam type with full automatic advance. Breaker gap set at .022 inch. Hold within limits of .018-.024 inch. To set gap, loosen lock screw on crescent shaped stationary contact plate, turn eccentric adjusting screw, tighten lock screw. Breaker arm spring tension 17-21 ounces (measured at tip of breaker arm with spring scale at right angles to contact surface).

Engine..	Degrees	Automatic Advance	R.P.M.	Engine
	Distributor	Distributor		
2.5 .....	Start.....	300.....	600	
16½ .....	8¼ .....	1000.....	2000	
24 .....	12 .....	1600.....	3200	

**Mounting:**—Distributor mounted on cylinder head. To remove, disconnect primary lead, take off distributor cap, loosen lock nut and set screw on left side of engine block, take out hold-down screw in advance arm, lift distributor out.

**Oiling:**—1000 Miles. Turn down grease cup under distributor head one full turn. Keep cup filled with No. 3 cup grease. Take off distributor cap and rotor, oil wick oiler in center of shaft, put one drop oil on breaker arm pivot pin, apply thin film vaseline to face of breaker cam.

**Timing:**—Standard setting 8° on flywheel before top dead center. To set timing, with No. 1 piston on compression stroke, turn engine over until first line of ignition mark on flywheel 'IGN.1 & 6' (which is 8° before top dead center mark 'IN.OP.UDC/1 & 6') is directly opposite indicator on housing at left front of flywheel housing, loosen advance clamp screw, rotate distributor until contacts begin to open, tighten clamp screw, connect spark plugs as indicated on diagram (No. 1 terminal as designated). The second line of the ignition mark which is 4° before top dead center indicates the allowable variation in timing. Manufacturer recommends that timing always be set on first mark.

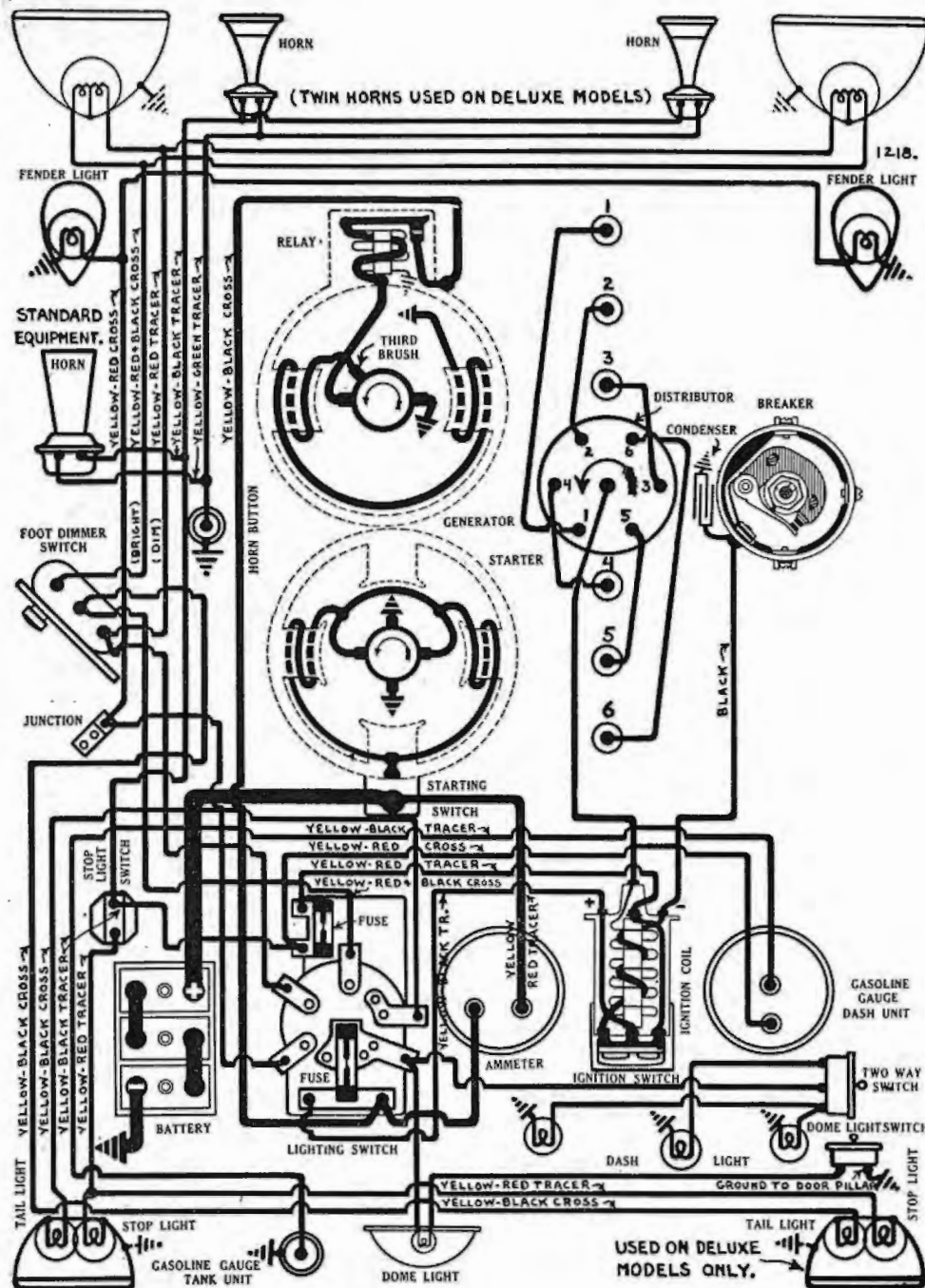
**Firing Order:**—1-5-3-6-2-4. No. 1 cylinder nearest radiator.

**Spark Plugs:**—14 MM. Metric. A.C. Type K-12. Set gaps at .022 inch.

**VALVE TIMING:**—Valves at right of engine. Camshaft driven by two-sprocket non-adjustable chain drive.

	Head Diameter	Stem Diameter	Length	Seat Angle	Lift
Intake .....	1.406"	.310"	3⅞"	30°	5/16"
Exhaust .....	1.344"	.310"	3⅞"	45°	5/16"

	Tapet Clearance	Spring Pressure
Intake .....	.009-.011" (hot)	Closed .....35 pounds
Exhaust .....	.009-.011" (hot)	Open .....55 pounds





# PONTIAC

SIX MODEL 402 (1932), SERIAL NUMBERS 729,001 UP  
 DELCO-REMY SYSTEM

### Timing

Intake valves open at top dead center. Close 42° after lower dead center. Exhaust valves open 40° before lower dead center. Close 10° after top dead center.

**To Check Valve Timing.** Check tappet clearance No. 1 intake valve (.009-.011"). With No. 6 piston on compression turn engine over until piston is at top dead center with flywheel mark 'IN.OP.UDC/1 & 6' at indicator in inspection hole left front face flywheel housing. No. 1 intake valve should begin to open at this point.

**To Set Valve Timing.** Turn crankshaft and camshaft until marks on sprockets are directly opposite and in line with straightedge across shaft centers. Mesh chain.

**STARTER:—Model 734-A.** Manual pinion engagement connected to starting switch pedal (switch mounted on starter field frame). Rotation counter-clockwise at commutator end. Brush spring tension 24-28 ounces. Starter switch Part No. 820005.

### Starter Data

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

**Mounting:—**Starter flange mounted on left front face flywheel housing. To remove, disconnect cable, disconnect starting pedal linkage, take out flange mounting cap screws, pull starter forward to clear drive, lift out.

**Oiling:—1000 Miles.** Put 8-10 drops engine oil in commutator end oiler.

**GENERATOR:—Model 943-Y.** Third brush regulation. To adjust charging rate, loosen small round headed lock screw on commutator end plate, take off cover band, shift third brush by hand counter-clockwise to increase or clockwise to decrease charging rate, tighten locking screw. Rotation counter-clockwise at commutator end. Maximum charging rate 16-18 amperes (cold) at 8.2 volts reached at 1700 R.P.M.

### Generator Data

Amperes	Cold Test		Amperes	Hot Test	
	Volts	R.P.M.		Volts	R.P.M.
16-18	8.2	1700	11-13	7.5-7.8	1750-1850

Brush spring tension 14-18 ounces. Shunt field current 3.5-4.5 amperes at 6 volts. Motoring generator draws 5.5 amperes at 6 volts.

**Mounting:—**Generator mounted on swinging bracket at left front of engine driven by fan belt. To remove, disconnect lead, loosen mounting bolts and adjustment clamp bolt, swing generator toward engine, slip off drive belt, take out clamp bolt and two bolts forming bracket hinge, lift generator out.

**Belt Adjustment.** To tighten drive belt, loosen mounting bolts and adjustment bolt, pull generator away from engine, tighten bolts.

**Oiling:—1000 Miles.** Put 8-10 drops light engine oil in oiler at each end of generator.

**RELAY:—Model 265-G.** Relay mounted on generator. Contacts close with generator voltage of 6.75-7.5 volts and open with discharge current of 0-2.5 amperes. Contact gap limits .015-.025 inch. Air gap limits .012-.017 inch (contacts closed).

**LIGHTING:—Clum Switch, Model 9191. Delco-Remy Dimmer Switch, Model 465-J.** Lighting switch mounted on back of instrument board controlled by push-pull button on instrument panel. Dimmer system 'depressed beam' double filament headlight bulbs controlled by foot operated switch on toeboard.

### Lamp Sizes

Position	Voltage	Candlepower	Base	Mazda No.
Headlights	6-8	32-21	D.C.	1116
Fender Lights	6-8	3	S.C.	63
Dash and Tail Lights	6-8	3	S.C.	63
Stop Light	6-8	15	S.C.	87
Dome and Corner Lights	6-8	6	S.C.	81

**FUSES:—20 ampere capacity lighting fuse** mounted on back of switch. 20 ampere capacity accessory fuse mounted on switch bracket. Spare fuse also mounted on switch bracket.

**GASOLINE GAUGE:—A.C. Electric type** (see Equipment Section).

**FUEL PUMP:—A.C. Type 'B' mechanical pump** mounted at right of engine—see Equipment Section.

**HORNS:—Klaxon Model K-18-C vibrator type.** Current draw 5.5-6.5 amperes. Model K-26-B (matched set), Low note Type 1401, High note Type 1402 furnished as optional equipment. Current draw (Type 1401) 6.0-8.5 amperes, (Type 1402) 5.0-6.5 amperes.

# PONTIAC

## EIGHT MODEL 302 (1932), SERIAL NUMBERS 310,001 UP DELCO-REMY SYSTEM

**CAR SERIAL NUMBER:**—Stamped on plate on left frame member under left front fender.

**ENGINE NUMBER:**—Stamped on top of cylinder block in front of left front intake manifold.

**BATTERY:**—Delco, Type 15-A, 6 volt, 15 plate, 100 ampere hour (5 ampere rate). Starting capacity 137 amperes for 20 minutes. Negative (—) terminal grounded. Battery mounted on right frame member under front compartment floor boards.

**IGNITION:**—Coil Model 534-W. Lock coil type with ignition switch in base. Coil mounted on back of instrument board with ignition switch in center of instrument panel. Ignition current 2 amperes at 6 volts (engine running), 4.5 amperes at 6 volts (engine stopped).

**Distributor Model 661-C.** Single breaker arm, 8 lobe cam type with full automatic advance. No synchronization necessary. Breaker gap set at .016 inch. Hold within limits of .0125-.0175 inch. To set gap, loosen lock screw on stationary contact plate (directly behind breaker arm), turn eccentric adjusting screw, tighten lock screw. Breaker arm spring tension 19-23 ounces (measured directly behind breaker contacts with spring scale at right angles to back of breaker arm).

Engine..	Degrees	Automatic Advance	R.P.M.	Engine
4½	Start.....	Distributor	300.....	000
16	8	Distributor	700.....	1400
27	13½	Distributor	1300.....	2600

**Mounting:**—Distributor mounted between cylinder banks at rear of engine. To remove, disconnect primary lead, take off distributor cap, loosen advance arm clamp screw, lift distributor out.

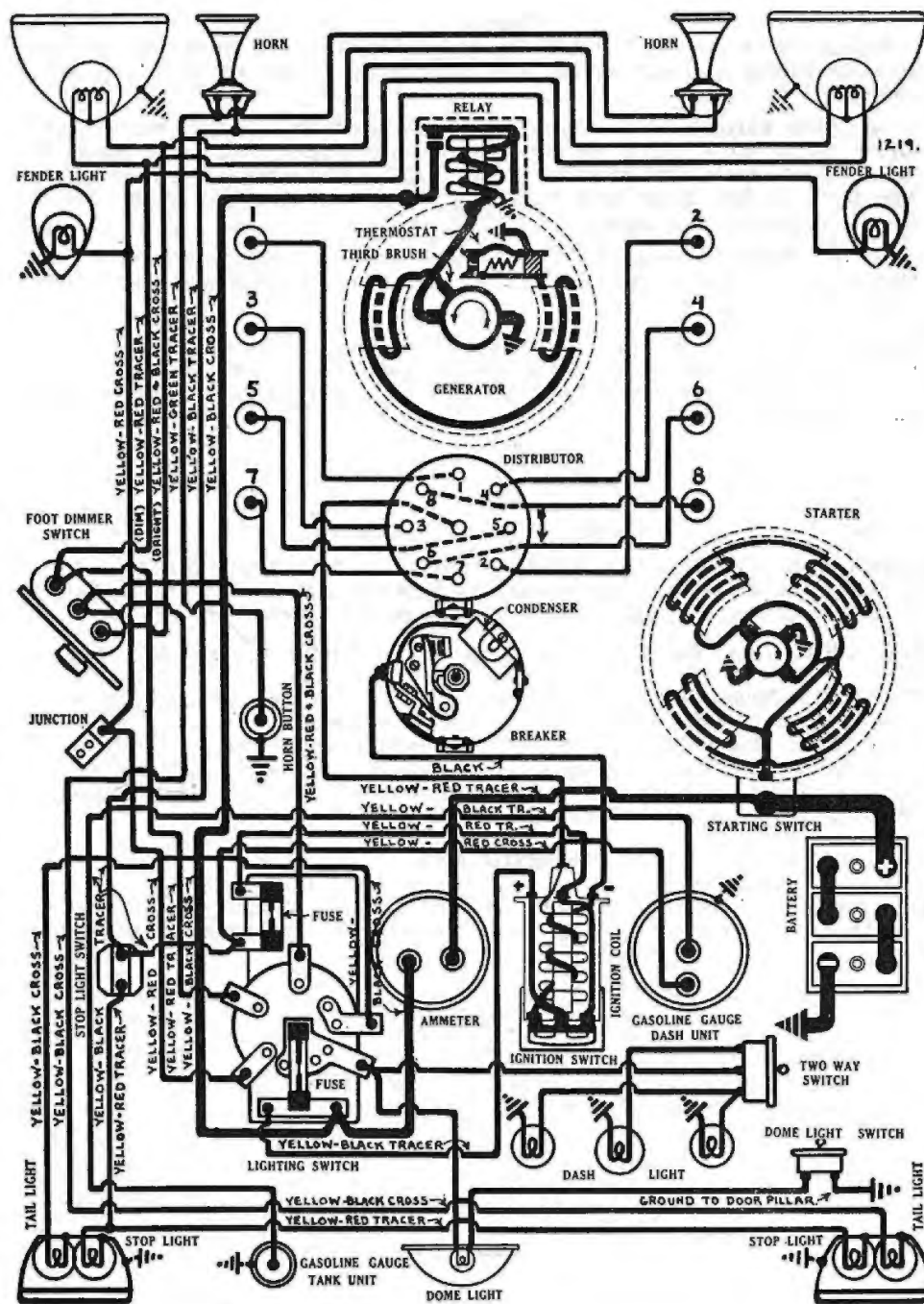
**Oiling:**—1000 Miles. Turn down grease cup under distributor head one full turn. Keep cup filled with No. 3 grease. Take off distributor cap and rotor, oil wick oiler in center of shaft, apply thin film vaseline to face of breaker cam.

**Timing:**—Standard setting 11° before top dead center. To set timing, with No. 1 piston (left hand bank) on compression, turn engine over until first line of ignition mark on flywheel 'IGN.1 & 7' (which is 11° before the top dead center mark 'IN.OP./1 & 7') is directly opposite indicator in inspection hole in left side flywheel housing, loosen advance arm clamp screw, rotate distributor until contacts begin to open (use test lamp), tighten clamping screw, connect spark plugs as indicated on diagram (No. 1 terminal as designated). The second line of the ignition mark, which is 7° before top dead center indicates allowable variation in timing. When setting ignition the first mark should be used.

**Firing Order:**—1-4-5-2-7-6-3-8 with cylinders numbered as indicated on diagram, or 1L-2R-3L-1R-4L-3R-2L-4R with cylinder banks numbered right (R) and left (L) as viewed from driver's seat. No. 1 cylinder nearest radiator in each case.

**Spark Plugs:**—14 MM. Metric. A.C. Type K-12. Set gaps at .022 inch.

**VALVE TIMING:**—Valves mounted horizontally between cylinder banks operated by vertical rocker arms from single camshaft mounted directly above crankshaft. Camshaft driven from crankshaft by two-sprocket non-adjustable chain drive.



# PONTIAC

EIGHT MODEL 302 (1932), SERIAL NUMBERS 310,001 UP  
DELCO-REMY SYSTEM

	Head Diameter	Stem Diameter	Length	Seat Angle ..	Lift
Intake	1.500"	.341"	5 13/16"	45°	5/16"
Exhaust	1.375"	.341"	5 13/16"	45°	5/16"

	Tappet Clearance	Spring Pressure
Intake	.012" (hot)	Closed ..... 71 pounds
Exhaust	.012" (hot)	Open ..... 105 pounds

### Timing

Intake valves open at top dead center. Close 40° after lower dead center. Exhaust valves open 45° before lower dead center. Close 15° after top dead center.

**To Check Valve Timing.** Check tappet clearance No. 1 intake valve (.012 inch hot). With piston No. 7 (rear cylinder left hand block) on compression, turn engine over until piston reaches top dead center with flywheel mark 'IN.OP./1 & 7' directly opposite indicator in inspection hole in left side flywheel housing. No. 1 intake valve should begin to open at this point.

**To Set Valve Timing.** Turn crankshaft and camshaft until sprocket marks are directly opposite and in line with straightedge across shaft centers. Mesh chain.

**STARTER:—Model 726-K.** Manual pinion engagement connected to starting switch pedal (switch mounted on starter field frame). Rotation counter-clockwise at commutator end. Brush spring tension 24-28 ounces. Starter switch Part No. 820005.

Starter Data			
Torque	R.P.M.	Volts	Amperes
0 lb. ft.	6000	5.0	60
16 "	Lock	3.0	600

**Mounting:—**Starter flange mounted on right front face flywheel housing. To remove, disconnect cable, disconnect starting pedal linkage, take out 2 flange mounting screws, take off nut on flange mounting bolt, pull starter forward to clear drive, lift out.

**Oiling:—1000 Miles.** Put 8-10 drops light engine oil in one oiler.

**GENERATOR:—Model 959-Z.** Third brush regulation, thermostat control. Thermostat operates at 165°F. (contacts open, cuts in resistance) reducing charging rate by approximately 40%. To adjust charging rate, loosen small round headed lock screw on commutator end plate, take off cover band, shift third brush by hand counter-clockwise to increase, or clockwise to decrease charging rate, tighten locking screw. Rotation counter-clockwise at commutator end. Maximum charging rate 19-21 amperes (cold) at 8.35-8.5 volts reached 1450 R.P.M.

### Generator Data

Cold Test		R.P.M.	Hot Test		R.P.M.
Amperes	Volts		Amperes	Volts	
19-21	8.35-8.5	1450	9-12	7.3-7.6	1800-2000

Brush spring tension 14-18 ounces. Shunt field current 4.0-6.1 amperes at 6 volts. Motoring generator draws 5.5-6 amperes at 6 volts.

**Mounting:—**Generator flange mounted between cylinder banks at front of engine, driven by the fan belt (fan mounted on forward end of generator shaft). To remove, disconnect lead, take out 3 flange mounting screws, lower generator, slip off drive belt, lift out generator and fan.

**Belt Adjustment.** Loosen mounting screws, rotate generator to left (around left hand mounting screw as a pivot) until belt tension is sufficient to drive generator and fan without slipping, tighten mounting screws.

**Oiling:—1000 Miles.** Put 8-10 drops light engine oil in oiler at each end of generator.

**RELAY:—Model 265-G.** Relay mounted on generator field frame. Contacts close with generator voltage of 6.75-7.5 volts and open with discharge current of 0-2.5 amperes. Relay contact gap limits .015-.025 inch. Air gap limits .012-.017 inch (contacts closed).

**LIGHTING:—Clum Switch, Model 9191. Delco-Remy Dimmer Switch, Model 465-J.** Lighting switch mounted on back of instrument board controlled by push-pull button at right of instrument panel. Dimmer system 'depressed beam' double filament headlight bulbs controlled by foot operated switch on toe-board.

Position	Lamp Sizes		Base	Mazda No.
	Voltage	Candlepower		
Headlights	6-8	32-21	D.C.	1116
Fender Lights	6-8	3	S.C.	63
Dash and Tail Lights	6-8	3	S.C.	63
Stop Light	6-8	15	S.C.	87
Dome and Corner Lights	6-8	6	S.C.	81

**FUSES:—**20 ampere capacity lighting fuse mounted on back of switch. 20 ampere capacity accessory fuse mounted on switch bracket. Spare fuse also mounted on switch bracket.

**GASOLINE GAUGE:—**A.C. Electric type (see Equipment Section).

**FUEL PUMP:—**A.C. Type 'B' mechanical pump mounted on flywheel housing—see Equipment Section.

**HORNS:—**Klaxon Model K-26-B (matched set), Low Note Type 1401, High Note Type 1402. Current draw (Type 1401) 6.0-8.5 amperes, (Type 1402) 5.0-6.5 amperes.

# R E O

## NEW FLYING CLOUD SIX, MODEL S (1932)

### DELCO-REMY SYSTEM

**ENGINE NUMBER:**—Stamped on boss on left side of engine block under water header.

**BATTERY:**—Willard, Type WH-1-13, 6 volt, 13 plates, 102 ampere hour capacity (20 hour rate). Starting capacity 120 amperes for 20 minutes. Negative (—) terminal grounded. Battery mounted on left frame member under front compartment floor boards. Battery size 7 1/16 inches wide, 9 1/16 inches long, 9 5/16 inches high.

**IGNITION:**—Coil Model 528-E. Coil mounted through dash with terminals on engine side (under engine hood). Ignition current 1-3 amperes at 6 volts (engine running), 3.4-5 amperes at 6 volts (engine stopped). Ignition switch is a Type 15-S Electrolock. See Equipment Section for complete data on this type Electrolock.

**Distributor Model 641-H.** Single breaker arm, 6 lobe cam type with semi-automatic advance. Breaker contact gap set at .020 inch. Hold within limits of .018-.024 inch. To set gap, loosen lock screw on stationary contact mounting plate, turn eccentric adjusting screw, tighten lock screw. Breaker arm spring tension 17-21 ounces (measured at tip of breaker arm with spring scale at right angles to contact surface). Manual advance controlled by button on dash. Ordinary running position with button pushed in—full advance, pull out button to retard spark. Distributor is semi-automatic.

**Mounting:**—Distributor mounted on cylinder head and driven by vertical shaft from the camshaft. Electrolock must be removed as a unit with the distributor whenever the distributor is taken off the car. To remove distributor, disconnect ignition wiring on Electrolock, free Electrolock at dash, disconnect manual spark control, take off distributor cap, take out hold-down screw in advance arm, lift distributor out.

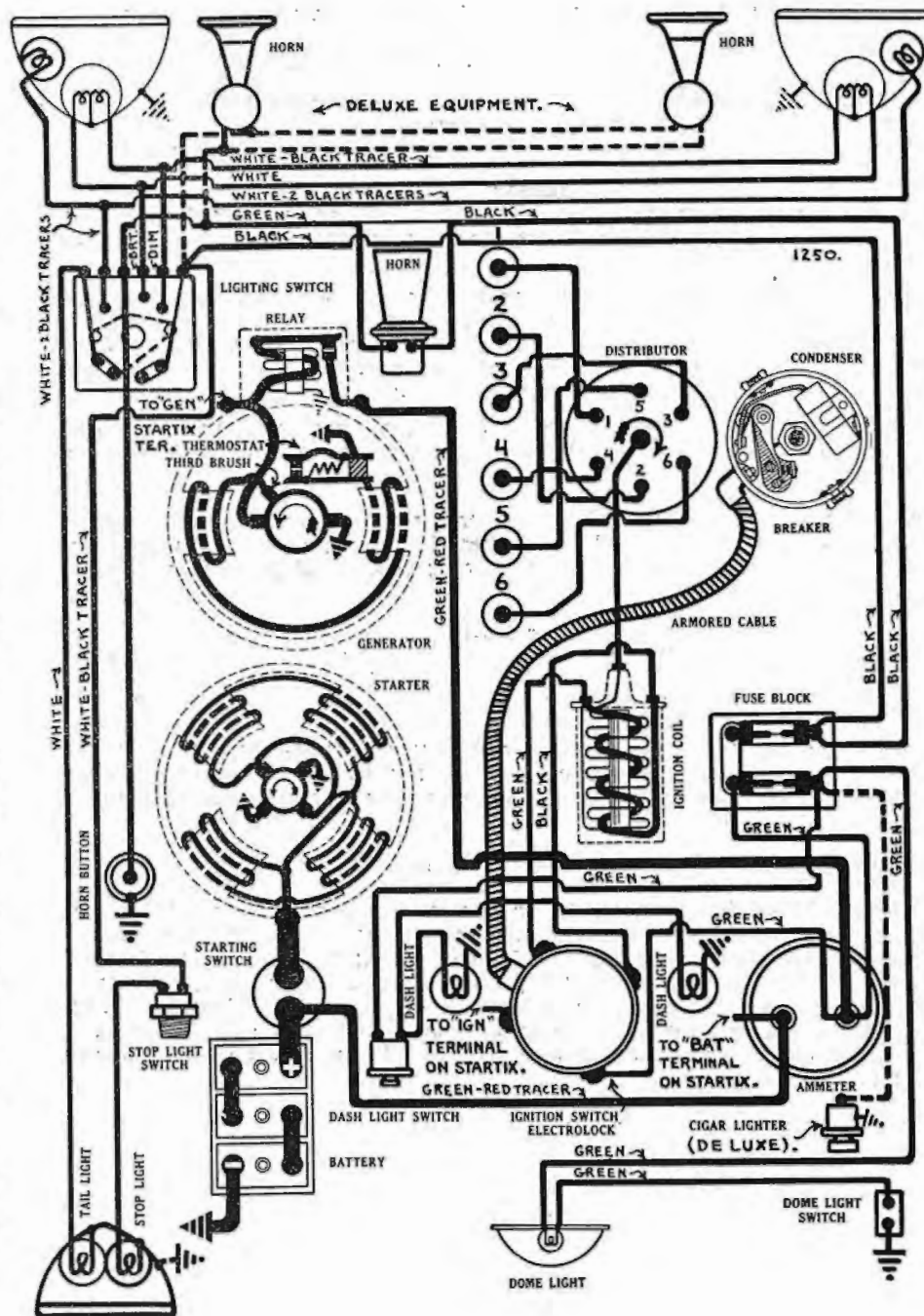
**Oiling:**—1000 Miles. Turn down grease cup on side of shaft housing two turns. Keep cup filled with medium cup grease. Take off distributor cap and rotor, oil wick oiler in center of shaft, put one drop oil on breaker arm pivot pin, apply thin film vaseline to face of breaker cam.

**Timing:**—Standard setting 1" or 2 teeth on flywheel or .012" piston travel before top dead center with manual spark control advanced. To set timing, fully advance manual spark control, see that distributor is rotated counter-clockwise to end of advance arm slot, take off cover plate on flywheel housing. With No. 1 piston on compression stroke, turn engine over until a point on the flywheel 2 teeth before the top dead center mark 'UDC.#1' is directly opposite the indicator on the flywheel housing. Loosen advance arm clamp bolt, rotate distributor until contacts begin to open, tighten clamp bolt, connect spark plugs as indicated on diagram (No. 1 terminal as designated). Use a test lamp to determine contact opening or turn on ignition (on cars with Startix use special position of ignition switch with key turned to left to avoid automatic cranking).

Manufacturer recommends that ignition setting be varied if necessary to avoid detonation or spark knock with various gasolines. The setting should be barely under the detonating point and the setting may be varied from the standard setting above to an advance limit of not more than 3 teeth (on flywheel), or .031 inch (actual piston travel) before top dead center.

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

**Spark Plugs:**—18 MM. Metric. Champion Type C-7. Set gaps at .025 inch.



# REO

## NEW FLYING CLOUD SIX, MODEL S (1932) DELCO-REMY SYSTEM

**VALVE TIMING:**—Valves at right of engine. Camshaft driven by two-sprocket non-adjustable chain drive.

	Head Diameter	Stem Diameter	Stem Length	Lift
Intake	1 13/16"	3/4"	5 3/4"	5/16"
Exhaust	1 13/16"	3/4"	5 3/4"	5/16"

	Tappet Clearance	Spring Pressure
Intake	Operating .007" (hot) .012" (cold)	Valves closed.....58-60 pounds
Exhaust	.007" (hot)	

### Timing

Intake valves open at top dead center. Intake valves close 50° after lower dead center.

Exhaust valves open 48° before lower dead center. Exhaust valves close 2° after top dead center.

**To Check Valve Timing.** Set tappet clearance of No. 1 intake valve at .012 inch. With No. 6 piston on compression stroke turn engine over until piston reaches top dead center with flywheel mark 'UDC.#1' directly opposite indicator on housing. No. 1 intake valve should begin to open at this point. Reset tappet clearance at .007 inch.

**To Set Valve Timing.** Turn crankshaft to top dead center position for piston No. 1 with flywheel mark 'UDC.#1' at indicator. With tappet clearance of .012 inch rotate camshaft in direction of rotation until No. 1 intake valve is about to open. Mesh camshaft sprocket in chain so that '0' marks on camshaft sprocket and crankshaft sprocket are adjacent and in line with a straightedge laid across the shaft centers. Mount camshaft sprocket on camshaft flange. One of the camshaft sprocket cap screws is offset so that sprocket can only be mounted in correct position. This cap screw is used as a dowel to locate camshaft sprocket and must be installed first. The plunger on the camshaft sprocket (which controls camshaft and play) must be in place before the chain case cover is installed.

**STARTER:**—Model 718-H. Starter drives engine through Bendix drive. Rotation is counter-clockwise at commutator end. Brush spring tension 24-28 ounces.

### Starter Data

Torque	R.P.M.	Volts	Amperes
•0 lb. ft.....	6000.....	5.0 .....	65
15 " .....	Lock.....	3.15.....	570

**Startix:**—Startix automatic starting switch is optional equipment on these cars. For complete details on Startix and wiring, see article in Equipment Section. It will not be necessary to disconnect Startix in setting ignition timing if special timing position of the ignition switch (key turned left) is used.

**Mounting:**—Starter flange mounted on front face of flywheel housing at left of engine. To remove, disconnect cable, take out 3 flange mounting screws, pull starter straight forward to clear Bendix, lift out.

**Oiling:**—1000 Miles. Put 8-10 drops light engine oil in commutator end oiler.

**GENERATOR:**—Model 955-R. Third brush regulation, thermostat control. Thermostat operates at 165°F. (contacts open cutting resistance in field circuit)

reducing output approximately 40%. To adjust generator charging rate, loosen small round headed lock screw on commutator end plate, take off cover band, shift third brush counter-clockwise to increase or clockwise to decrease charging rate, tighten locking screw. Rotation counter-clockwise at commutator end. With standard setting maximum charging rate is 20 amperes (cold) at 8.3-8.5 volts reached at 1450 R.P.M.

### Generator Data

Cold Test		Hot Test			
Amperes	Volts	R.P.M.	Amperes	Volts	R.P.M.
19-21.....	8.3-8.5.....	1450	9-12.....	7.3-7.6.....	1800-2000

Brush spring tension 14-18 ounces. Shunt field current 4.0-6.1 amperes at 6.0 volts. Motoring generator draws 5 amperes at 6 volts.

**Mounting:**—Generator mounted on swinging bracket at left front of engine and driven by the fan belt. To remove generator, disconnect lead, loosen adjustment clamp bolt, swing generator toward engine, slip off drive belt, take out 2 bolts forming bracket hinge under generator, lift generator out.

**Belt Adjustment.** To take up fan belt, loosen generator hinge mounting bolts and adjustment clamp bolt, pull generator away from engine to secure correct belt tension, tighten adjustment bolt and mounting bolts. Belt tension should be just sufficient to drive fan and generator without slipping.

**Oiling:**—1000 Miles. Put 8-10 drops light engine oil in oiler at each end of generator.

**RELAY:**—Model 265-B. Relay mounted on generator field frame. Relay contacts close with generator voltage of 6.75-7.5 volts and open with 0-2.5 ampere discharge current. Relay contact gap limits .015-.025 inch. Air gap limits .012-.017 inch (contacts closed).

**LIGHTING:**—Delco-Remy Switch, Model 486-X. Lighting switch mounted at lower end of steering column controlled by lever on steering wheel. Dimmer system 'depressed beam' double filament headlight bulbs controlled by lighting switch. Instrument panel lights controlled by push-pull button at lower left of instrument panel.

Position	Lamp Sizes		Base	Mazda No.
	Voltage	Candlepower		
Headlights	6-8.....	21-21.....	D.C.....	1110
Parking Bulbs	6-8.....	3 .....	S.C.....	63
Dash and Tail Lights	6-8.....	3 .....	S.C.....	63
Stop Light	6-8.....	15 .....	S.C.....	87
Body Lights	6-8.....	3 .....	S.C.....	63

**FUSES:**—Lighting fuse mounted on fuse block on dash 20 ampere capacity.

**GASOLINE GAUGE:**—K-S Telegauge hydrostatic type (see Equipment Section).

**FUEL PUMP:**—A.C. mechanical fuel pump mounted on right side of crankcase (see Equipment Section).

**HORN:**—E.A. Model 'S' horn standard equipment. Twin horns optional equipment.

# REO

## FLYING CLOUD SIX MODEL 6-21 (1931-32) DELCO-REY GENERATING, STARTING SYSTEM DELCO-REMY IGNITION

**CAR SERIAL NUMBER:**—Stamped on left frame member near steering gear housing.

**ENGINE NUMBER:**—Stamped on nameplate on left side of crankcase behind oil filler.

**BATTERY:**—Willard, Type WH-2-15, 6 volt, 15 plate, 119 ampere hour capacity (20 hour rate). Starting capacity 140 amperes for 20 minutes. Negative (—)terminal grounded. Battery mounted on left frame member under driver's seat. Battery size 7 1/6 inches wide, 10 5/16 inches long, 9 5/16 inches high.

**IGNITION:**—Coil Model 533-R. The ignition switch is built in the base of the coil. Coil is mounted on the dash with the ignition switch extending through to the face of the instrument panel. Ignition current is 2.5 amperes at 6 volts with engine running and 4.5-5 amperes at 6 volts with engine stopped.

**Distributor Model 640-S.** Breaker contacts separate .018-.024 inch. Set the contact gap by loosening lock screw on stationary contact mounting plate and turning up eccentric adjusting screw until gap is .020 inch with breaker arm on lobe of cam. Resurface contacts when necessary with a flat contact file or on a medium hard oilstone. Breaker arm spring tension 17-21 ounces (measured at tip of breaker arm with spring scale at right angles to contact surface). Distributor is semi-automatic. Maximum manual advance 25 degrees (engine).

Engine	Degrees	Automatic Advance	Distributor	Distributor	R.P.M.	Engine
0.....		Start		200.....		400
19.....	9 1/2			1200.....		2400

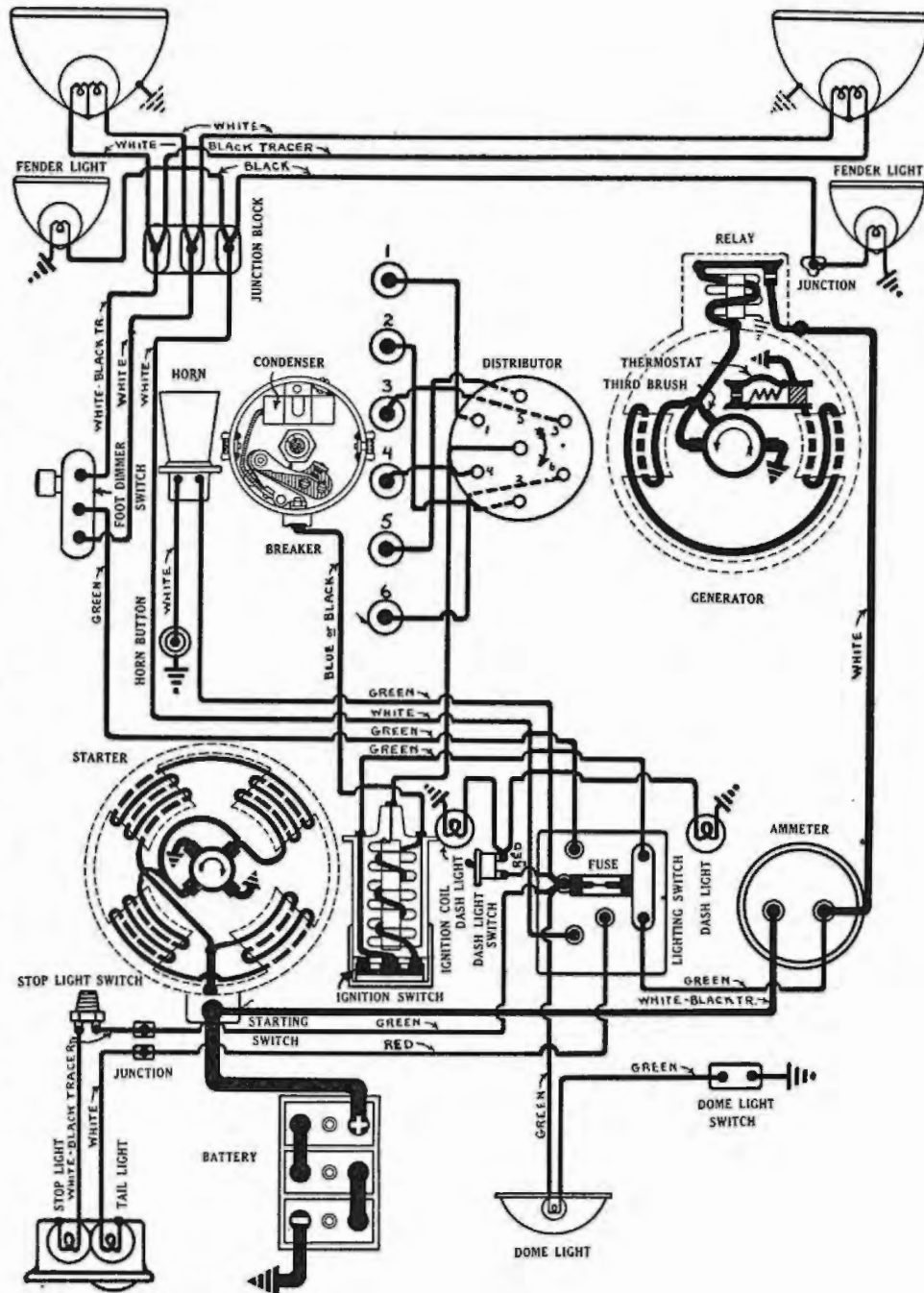
**Mounting:**—Distributor is mounted on the cylinder head. To remove distributor, disconnect primary lead and manual advance rod and remove distributor head with cables intact. Then take out hold-down screw in advance arm and lift distributor from place.

**Oiling:**—Fill the grease cup under the distributor head with medium cup grease and turn down two turns every month or each 1000 miles of operation. Remove the distributor head and rotor and oil the wick oiler in the center of the shaft with light engine oil. Put one drop of oil on the breaker arm pivot pin and place a small bit of vaseline on the face of the breaker cam.

**Timing:**—Breaker contacts begin to open when the piston entering power stroke reaches a position 1 1/4 inches (measured on the flywheel) before top dead center with the manual spark control in the fully advanced position. To set timing, crank engine over until piston No. 1 enters compression stroke (the up stroke with both valves closed). Fully advance the manual spark control (push the button in toward the dash) and remove the timing inspection cover over the inspection hole in the flywheel case. Then turn engine over until a point on the flywheel 1 1/4 inches before the top dead center mark 'UDC #1' is opposite the indicator on the housing. Loosen the advance arm clamp screw and rotate the distributor until the contacts begin to open. Tighten the clamp screw and see that the segment in the distributor head opposite the rotor is connected to the spark plug in cylinder No. 1.

**Firing Order:**—The firing order is 1-5-3-6-2-4.

**Spark Plugs:**—Spark plugs are 18 MM. Metric. Champion Type C-7. Gaps are .025 inch.



# R E O

## FLYING CLOUD SIX MODEL 6-21 (1931-32) DELCO-REY GENERATING, STARTING SYSTEM DELCO-REMY IGNITION

**VALVE TIMING:**—Valves at right of engine. Camshaft chain driven in tandem with generator sprocket. Chain adjusted manually—see Generator mounting.

	Head Diameter	Stem Diameter	Length	Seat Angle	Lift
Intake	1 13/16"	.3437"	5 3/4"	45°	5/16"
Exhaust	1 13/16"	.3437"	5 3/4"	45°	5/16"

	Tappet Clearance	Spring Pressure
Intake	.007" (hot)	Closed 58-60 pounds (2 3/8" )
Exhaust	.007" (hot)	Open 90 pounds (2 1/16")

### Timing

Intake valves open at top dead center. Close 50° after lower dead center. Flywheel marked 'UDC.#1' at point of inlet opening of No. 1 cylinder. Exhaust valves open 45° before lower dead center. Close 2° after top dead center. Valve stem guides are removable. Valves with oversize stems are not made.

**To Check Valve Timing.** Check tappet clearance No. 1 intake valve (set at .007 inch). With No. 6 piston on compression stroke turn engine over until piston reaches top dead center with flywheel mark 'UDC.#1' opposite indicator on flywheel housing. No. 1 intake valve should begin to open at this point.

**STARTER:**—Model 722-J. Starter is connected to the engine through a set of reduction gears and a Bendix drive. The direction of rotation is clockwise (armature shaft), viewed from the commutator end. Starter cranks the engine at 150 R.P.M. Brush spring tension is 24-28 ounces.

Starter Data			
Torque	R.P.M.	Volts	R.P.M.
0 lb. ft.	3500	5	70
22 "	Lock	3	600

**Mounting:**—Starter is flange mounted at left of engine on forward face of the flywheel housing. To remove starter, disconnect cable and starting switch control and take out three flange mounting cap screws. Then pull starter forward to clear Bendix drive and lift from place.

**Oiling:**—Put 8 or 10 drops of light engine oil in each of the starter oilers every month or each 1000 miles of operation. Every six months or each 5000 miles remove the grease plug in the reduction gear case and repack gears with graphite grease.

**GENERATOR:**—Model 955-G. The direction of rotation is counter-clockwise, viewed from the commutator end. Generator current regulation is by third brush shunt field and thermostat. Thermostat contacts open at 165°F. cutting the resistance connected across the thermostat contacts in series with the shunt field and reducing the output approximately 40%. To adjust the generator output, remove the commutator cover band and loosen the small round headed lock screw on the outside of the end plate. Then shift the third brush by hand in a counter-clockwise direction to increase the charging rate and in the opposite direction to decrease the charging rate. With standard car setting, the maximum charging rate is 18-19 amperes reached at 1450 R.P.M. or 25-26 M.P.H.

### Generator Data

Cold Test		Hot Test	
Amperes	Volts	R.P.M.	Amperes
19-21	8.3-8.5	1450	9-12
			7.3-7.5
			1300-2000

Generator motoring draws 5 amperes at 6 volts. Shunt field current is 4-6.1 amperes at 6 volts. Brush spring tension is 14-18 ounces.

**Mounting:**—Generator is flange mounted at right of engine on the rear face of the timing chain case. To remove generator, disconnect lead and take out flange mounting cap screws. Then slide generator to the rear to disengage drive coupling and lift from place. Generator is driven through a slotted tongue coupling by the accessory sprocket which is mounted independently in the chain case.

**Chain Adjustment.** The timing chain tension is adjusted by shifting the generator. To take up timing chain, loosen the three mounting screws and shift the generator away from the engine. Tighten the mounting screws and operate the engine. If the chain hums, the adjustment is too tight and the generator must be backed off slightly. With proper adjustment the chain should run noiselessly. Do not operate the engine unless the generator mounting screws are tight.

**Oiling:**—Put 8 or 10 drops of light engine oil in each of the generator bearing oilers every month or each 1000 miles of operation.

**RELAY:**—Model 265-B. Relay is mounted on the generator field frame. Relay contacts close at 575 R.P.M. when the generator voltage reaches 6.75-7.5 volts and open with a discharge current of 0-2.5 amperes. Relay contact gap is .015-.025 inch. Air gap should be .014-.020 inch with contacts closed.

**LIGHTING:**—Soreng-Manegold Switch, Model 5670-AA. Delco-Remy Dimmer Switch, Model 465-H. Lighting switch is mounted on the instrument panel. Dimmer system 'depressed beam' double filament headlight bulbs controlled by foot operated dimmer switch on toeboard.

Position	Lamp Sizes		
	Voltage	Candlepower	Base Mazda Number
Headlights	6-8	21-21	DC.....1110
Fender lights	6-8	3	SC.....63
Dash and tail lights	6-8	3	SC.....63
Stop and backing lights	6-8	15	SC.....87
Dome light	6-8	3	DC.....64

**FUSES:**—Lighting fuse mounted on the back of the lighting switch is 20 ampere capacity.

**GASOLINE GAUGE:**—K-S Telegauge hydrostatic type (see Equipment Section).

**FUEL PUMP:**—Van Sicklen mechanical fuel pump mounted on left side of crankcase.

**HORNS:**—Klaxon Model K-18-C vibrator type. Current draw 5.5-6.5 amperes at 6 volts.

## REO

FLYING CLOUD EIGHT MODEL 8-21 AND 8-25 (1931-32)  
 DELCO-REMY GENERATING, STARTING SYSTEM  
 DELCO-REMY IGNITION

**CAR SERIAL NUMBER:**—Stamped on left frame member near steering gear housing.

**ENGINE NUMBER:**—Stamped on nameplate on left side crankcase behind oil filler.

**BATTERY:**—Willard, Type WH-2-15. 6 volt, 15 plate, 119 ampere hour capacity (20 hour rate). Starting capacity 140 amperes for 20 minutes. Negative (—) terminal grounded. Battery mounted on left frame member under driver's seat. Battery size 7 1/16 inches wide, 10 5/16 inches long, 9 5/16 inches high.

**IGNITION:**—Coil Model 533-R. The ignition switch is built in the base of the coil. Coil is mounted on the back of the instrument board with the switch extending through to the face of the instrument panel. Ignition current is 2.5 amperes at 6 volts with engine running and 4.5-5 amperes at 6 volts with engine stopped.

**Distributor Model 660-S.** Breaker contacts separate .018-.024 inch. Set contacts by loosening lock screw on stationary contact mounting plate and turning eccentric adjusting screw until gap is .020 inch. Breaker arm spring tension 17-21 ounces (measured at tip of breaker arm with spring scale at right angles to contact surface). Breaker has two sets of contacts on a four lobe cam. Contacts open alternately at 45 degree intervals corresponding to the 90 degree firing interval of the engine. Contacts must be synchronized—see Timing. Distributor is semi-automatic. Maximum manual advance is 25 degrees (engine).

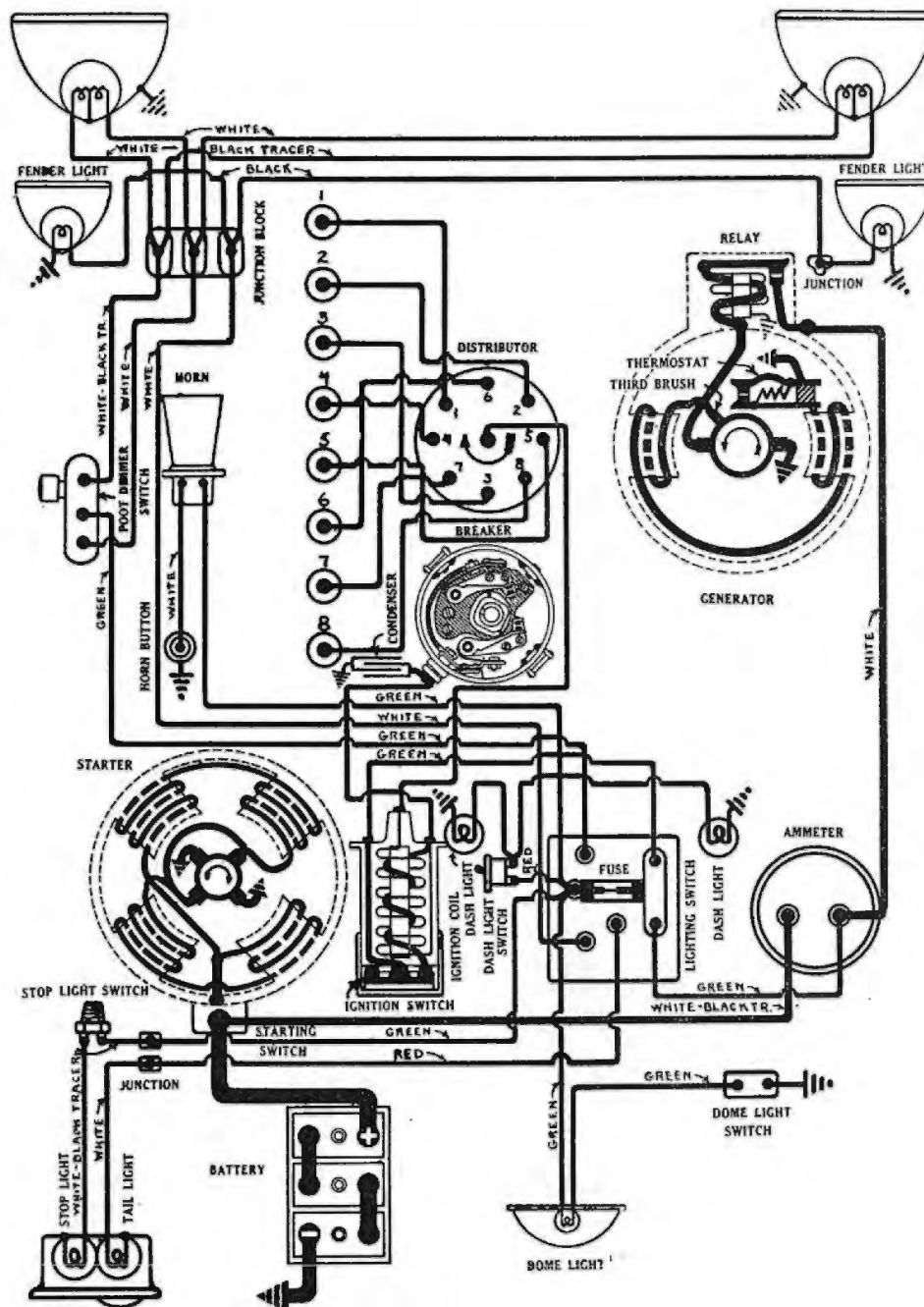
Degrees	Automatic Advance		R.P.M.
Engine	Distributor	Distributor	Engine
0.....	Start	400.....	800
22.....	11	1600.....	3200

**Mounting:**—Distributor is mounted on the generator at the right of the engine. To remove distributor, disconnect primary lead and manual spark control and take off distributor cap with cables intact. Then take out mounting screw in advance arm and lift distributor from place.

**Oiling:**—Fill the grease cup under the distributor cup with medium cup grease and turn down two turns every 1000 miles of operation. Once each month remove the distributor head and rotor and oil the wick oiler in the center of the shaft, put one drop of oil on the breaker pivot posts and place a small bit of vaseline on the face of the breaker cam.

**Timing:**—**Synchronization of Contacts.** Synchronize contacts on a rotary spark gap or use special Delco-Remy tool, Part No. 1838182, and follow complete directions in Equipment Section. Contacts can be synchronized directly after distributor has been timed to the engine by cranking engine over 90 degrees to firing position of piston No. 6. Then loosen the lock screws on the movable sub-plate (on which the second set of contacts are mounted) and turn the eccentric adjusting screw until contacts begin to open. Tighten the lock screws and check the contact gap. If outside limits of .018-.024 inch, reset at .022 inch and repeat synchronization.

**Timing Distributor to Engine.** Breaker contacts begin to open when the piston entering power stroke reaches a position 5 degrees before top dead center with the manual spark control fully advanced. To set timing, crank engine over until No. 1 piston enters compression stroke (the up stroke with both valves close). Remove the cover over the flywheel inspection hole and fully advance manual spark control (push spark button all the way in toward the dash). Turn engine over until the flywheel mark 'Intake Opens' (which is 5 degrees before the top dead center mark 'UDC.1-8') is opposite





# REO

## FLYING CLOUD EIGHT MODEL 8-21 AND 8-25 (1931-32) DELCO-REMY GENERATING, STARTING SYSTEM DELCO-REMY IGNITION

the indicator. Then loosen the advance arm clamp screw and rotate the distributor until the first set of contacts (mounted on the base plate) begin to open. Tighten the clamp screw and connect the spark plugs as indicated on the diagram. The second set of contacts (mounted on the movable sub-plate) begin to open 45 degrees after this point when piston No. 6 reaches firing position.

**Firing Order:**—The firing order is 1-6-2-5-8-3-7-4.

**Spark Plugs:**—18MM. Metric. Champion Type C-7. Set gaps at .025 inch.

**VALVE TIMING:**—Valves at right of engine. Camshaft chain driven from crankshaft in tandem with generator drive sprocket. Chain adjusted manually (see Generator Mounting).

	Head Diameter	Stem Diameter	Length	Seat Angle	Lift
Intake	1 33/64"	5/16"	5 59/64"	45°	.344"
Exhaust	1 1/8"	5/16"	5 57/64"	45°	.344"

Tappet Clearance		Spring Pressure	
Operating	Timing	Closed	Open
Intake .007" (hot) -.012" (cold)		45.6 pounds (2 1/4")	
Exhaust .007" (hot) -.012" (cold)		108 pounds (1 29/32")	

### Timing

Intake valves open 5° before top dead center. Close 40° after lower dead center. Flywheel marked 'Intake Opens' at point of intake opening for cylinder No. 1.

Exhaust valves open 50° before lower dead center. Close 5° after top dead center. Valve stem guides removable. Valves are made with oversize stems.

**To Check Valve Timing.** Turn engine over until piston No. 1 is on top dead center entering power stroke. Set tappet clearance of No. 1 inlet valve at .012 inch. Turn engine over one complete revolution and stop with the piston 5 degrees before top dead center when the flywheel mark 'Intake Opens' (which is 5 degrees before the top dead center mark 'UDC.1-8') is opposite the indicator on the flywheel housing. The No. 1 inlet valve should begin to open at this point. Reset tappet clearance at .007 inch running clearance with engine hot.

**To Set Valve Timing.** It is necessary to lift the engine from the chassis in order to get at the timing chain. To remove the chain, first crank engine over until No. 1 piston is at firing position. Then loosen generator mounting bolts and back off generator toward the engine. The chain can then be lifted off the generator sprocket and removed endless. When the chain is reinstalled, the distributor rotor should be turned to position opposite No. 1 segment and it will not be necessary to retime the engine.

To assemble timing chain, turn crankshaft until No. 1 piston is on top dead center. Mesh timing chain so that there are thirteen links or fourteen pins between the marks on the camshaft sprocket and crankshaft sprocket (inclusive of the chain teeth meshed opposite the marks). Timing chain is adjusted by shifting generator. See Generator Mounting.

**STARTER:**—Model 722-K. Starter is connected to the engine through a set of reduction gears and a Bendix drive. The direction of rotation (armature shaft) is clockwise, viewed from the commutator end. Starter cranks the engine at 80 R.P.M. Brush spring tension should be 24-28 ounces.

Starter Data			
Torque	R.P.M.	Volts	R.P.M.
0 lb. ft.	3500	5	70
22 "	Lock	3	600

**Mounting:**—Starter is flange mounted at the left of the engine on the forward face of the flywheel housing. To remove starter, disconnect cable and starting switch control and take out three flange mounting cap screws. Pull starter forward to clear Bendix drive and lift from place.

**Oiling:**—Put 8 or 10 drops of light engine oil in the oiler at each end of the armature shaft every 1000 miles of operation. Every six months or each

5000 miles remove the grease plug in the reduction gear case and repack gears with graphite grease.

**GENERATOR:**—Model 940-X. The direction of rotation is counter-clockwise, viewed from the commutator end. Generator current regulation is by third brush shunt field and thermostat. Thermostat contacts open at 165°F. cutting the resistance connected across the thermostat contacts in series with the shunt field and reducing the output approximately 40%. To adjust the generator output, remove the commutator cover band and loosen the small round headed lock screw on the outside of the end plate. Then shift the third brush by hand in a counter-clockwise direction to increase the charging rate and in the opposite direction to decrease the charging rate. Tighten the lock screw after making the adjustment. With standard car setting the maximum charging rate is 18-19 amperes reached at 1450 R.P.M. or 25-26 M.P.H.

Generator Data					
Cold Test		Hot Test		R.P.M.	
Amperes	Volts	Amperes	Volts	Amperes	Volts
19-21	8.5	9-12	7.5	1450	2000

Generator motoring draws 5 amperes at 6 volts. Shunt field current is 4-6.1 amperes at 6 volts. Brush spring tension is 14-18 ounces.

**Mounting:**—Generator is flange mounted at right of engine on the rear face of the timing chain case. To remove generator, disconnect all ignition wiring or remove distributor. Loosen generator adjusting screw and remove cover plate on front face of chain case. Then take out two generator flange mounting bolts. Shift generator toward engine and lift off timing chain. The generator can then be lifted out. Tie up the chain and do not crank engine over with the generator out.

**Timing Chain Adjustment.** Timing chain is adjusted by shifting the generator. To take up timing chain, loosen the two flange mounting bolts and turn up the adjusting screw until there is 1/2 inch up and down play in the chain between the generator sprocket and the camshaft sprocket. Tighten the mounting bolts. If the chain hums the adjustment is too tight. Do not make this adjustment with the engine running and do not run engine until generator bolts have been tightened.

**Oiling:**—Put 8 or 10 drops of light engine oil in the generator bearing oilers on the commutator end every month or each 1000 miles of operation. Fill distributor drive gear compartment with fibre grease.

**RELAY:**—Model 265-B. Relay is mounted on the generator field frame. Relay contacts close at 575 R.P.M. when the generator voltage reaches 6.75-7.5 volts and open with a discharge current of 0-2.5 amperes. Relay contact gap is .015-.025 inch. Air gap should be .014-.020 inch with contacts closed.

**LIGHTING:**—Soreng-Manegold Switch, Model 5670-AA. Delco-Remy Dimmer Switch, Model 465-H. Lighting switch is mounted on the instrument panel. Dimmer system 'depressed beam' double filament headlight bulbs controlled by foot operated dimmer switch on toeboard.

Lamp Sizes			
Position	Voltage	Candlepower	Base Mazda Number
Headlights	6-8	21-21	DC 1110
Fender lights	6-8	3	SC 63
Dash and tail lights	6-8	3	SC 63
Stop and backing light	6-8	15	SC 87
Dome lights	6-8	3	DC 64

**FUSES:**—Lighting fuse mounted on the back of the switch is 20 ampere capacity.

**GASOLINE GAUGE:**—K-S Telegauge hydrostatic type (see Equipment Section).  
**FUEL PUMP:**—AC Type 'B' mechanical fuel pump mounted on right side of crankcase (see Equipment Section).

**HORNS:**—Klaxon Model K-18-C vibrator type. Current draw 5.5-6.5 amperes at 6 volts.

# REO

## ROYALE EIGHT, MODELS 8-31, 8-35, 8-52 (1932) DELCO-REMY GENERATING, STARTING SYSTEM DELCO-REMY IGNITION

**CAR SERIAL NUMBER:**—Stamped on left frame member near steering gear housing.

**ENGINE NUMBER:**—Stamped on plate on left side of crankcase.

**BATTERY:**—Willard, Type RJ-4-15. 6 volt, 15 plate, 128 ampere hour capacity (20 hour rate). Negative (—) terminal grounded. Battery mounted on right frame member under right front fender (accessible after taking out 4 screws and removing battery box cover in fender). Battery size 7 1/16 inches wide, 11 11/16 inches long, 9 3/4 inches high.

**IGNITION:**—Coil Model 528-E. Coil is mounted on the dash. Ignition current is 2.5 amperes at 6 volts with engine running and 4.5-5 amperes at 6 volts with engine stopped. The ignition switch is a Delco-Remy Dual-lock, Model 425-R or 425-T (four speed transmission).

**Distributor Model 660-K.** Breaker contacts separate .020 inch. Set contact gap by loosening lock screw on stationary contact mounting plate and turning up eccentric adjusting screw. Resurface contact when necessary with a fine flat contact file or on a medium hard oilstone. Breaker arm spring tension is 17-21 ounces (measured at tip of breaker arm with spring scale at right angles to contact surface). Breaker has two sets of contacts operating on a four lobe cam. Contacts open alternately at 45 degree intervals corresponding to the 90 degree firing interval of the engine. Contacts must be synchronized (see Timing). Distributor is semi-automatic. Maximum manual advance is 25 degrees (engine).

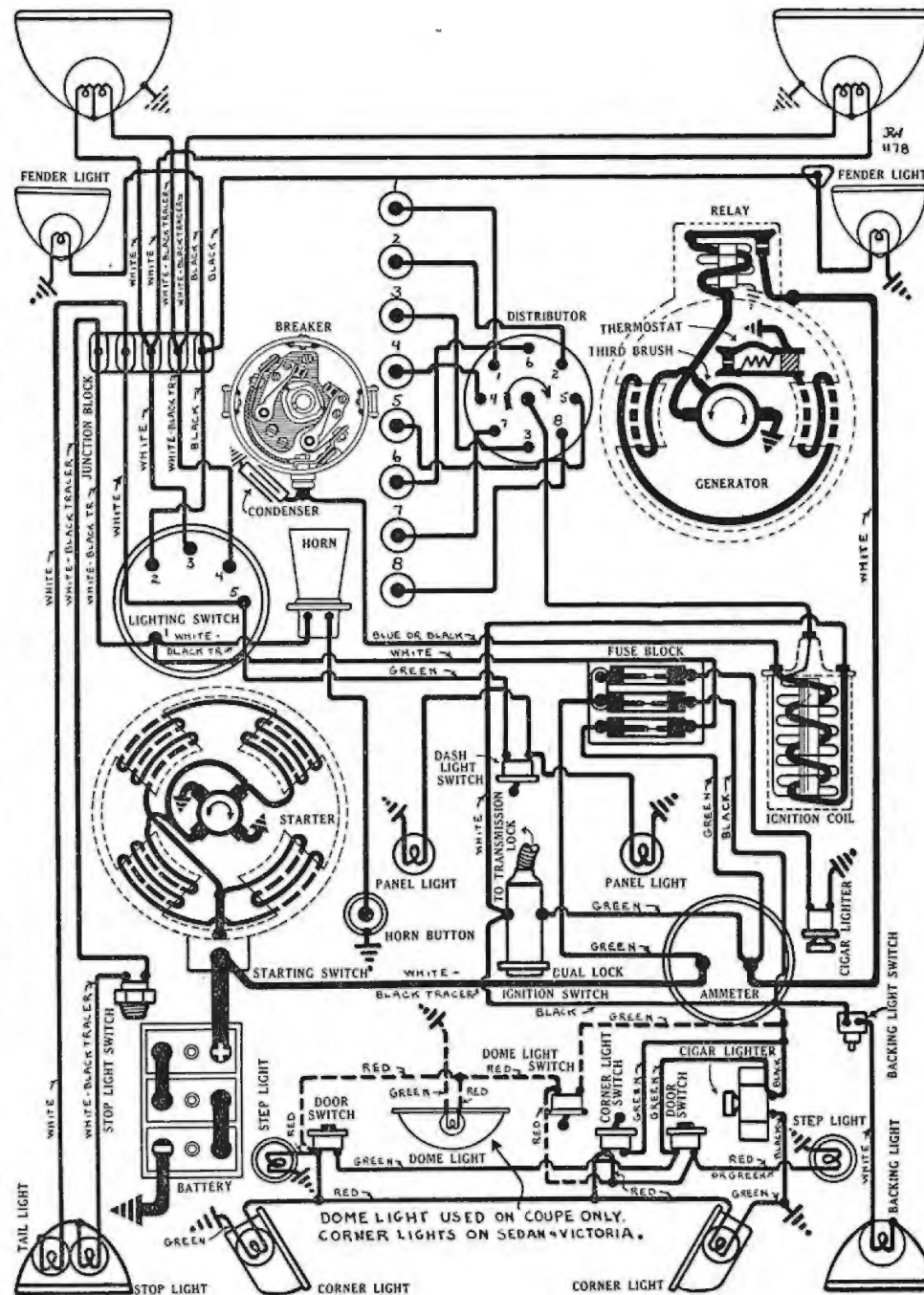
Degrees	Automatic Advance		R.P.M.
Engine	Distributor	Distributor	Engine
0.....	Start .....	400.....	800
22.....	11 .....	1600.....	3200

**Mounting:**—Distributor is mounted on the cylinder head and can be removed from the left side. To remove distributor, disconnect primary lead and manual spark control and remove distributor head with cables intact. Then take out hold-down screw in advance arm and lift distributor from place.

**Oiling:**—Fill the grease cup under the distributor head with medium cup grease and turn down two turns every month or each 1000 miles of operation. Once each month remove the distributor head and rotor and oil the wick oiler in the center of the shaft with light engine oil. Put one drop of oil on the breaker arm pivot pins and place a small bit of vaseline on the face of the breaker cam.

**Timing:**—Synchronization of Contacts. Synchronize contacts on a rotary spark gap or use special Delco-Remy tool, Part No. 1838182, and follow complete directions in Equipment Section. Contacts can be synchronized without special equipment after distributor has been timed to the engine by cranking engine over exactly 90 degrees when piston No. 6 will reach firing position (10 degrees before top dead center with manual spark control fully advanced). If the second set of contacts (mounted on the movable sub-plate) do not begin to open at this point, loosen the lock screws and turn the eccentric adjusting screw until contacts begin to open. Tighten the lock screws and check the contact gap. If outside limits of .018-.024 inch. reset at .022 and repeat synchronization.

**Timing Distributor to Engine.** Breaker contacts begin to open when the piston entering power stroke reaches a position 10 degrees before top dead center (measured on the flywheel) with the manual spark control in the fully advanced position. To set timing, crank engine over until piston No. 1 enters compression stroke (the up stroke with both valves closed). Fully advance the manual spark control (push the spark button all the way in toward the dash) and remove the timing inspection cover plate over the inspection hole in the flywheel housing. Turn engine over until



# REO

## ROYALE EIGHT, MODELS 8-31, 8-35, 8-52 (1932) DELCO-REMY GENERATING, STARTING SYSTEM DELCO-REMY IGNITION

a point 10 degrees before the top dead center mark for cylinders No. 1 and 8 is directly opposite the indicator on the flywheel housing. Then loosen the advance arm clamp screw and rotate the distributor until the first set of contacts (mounted directly on the breaker plate) begin to open. Tighten the clamp screw and see that the distributor head segment opposite the rotor is connected to the spark plug in cylinder No. 1. The second set of contacts open 45 degrees after this point when piston No. 6 reaches firing position.

The engine can also be timed when piston No. 1 reaches a position 15 degrees after top dead center if the manual spark control is retarded by pulling out the spark button on the dash.

**Firing Order:**—The firing order is 1-6-2-5-8-3-7-4.

**Spark Plugs:**—Spark plugs are 18 MM. Metric. Champion Type C-7. Gaps are .025 inch.

**VALVE TIMING:**—Valves at right of engine. Camshaft chain driven from crankshaft in tandem with generator drive sprocket. Chain adjusted manually by shifting generator—see Generator Mounting.

	Head Diameter	Stem Diameter	Length	Seat Angle	Lift
Intake	1 13/16"	3/4"	5 3/4"	45°	11/32"
Exhaust	1 11/16"	3/4"	5 3/4"	45°	11/32"

Tappet Clearance		Spring Pressure	
Operating	Timing		
Intake .008" (hot)–.012" (cold)		Closed	90 pounds (2 3/8")
Exhaust .008" (hot)–.012" (cold)		Open	85 pounds (2 1/32")

### Timing

Intake valves open at top dead center. Close 50° after lower dead center. Exhaust valves open 48° before lower dead center. Close 2° after top dead center. Valve stem guides are removable. Valves with oversize stems not made.

**To Check Valve Timing:**—Set tappet clearance No. 1 intake valve at .012 inch. With No. 8 piston on compression stroke turn engine over until piston is on top dead center with dead center mark on flywheel at indicator on flywheel housing. No. 1 intake valve should open at this point. Reset tappet clearance at .008 inch with engine hot.

**STARTER:**—Model 728-M. Starter is connected to the engine through a mechanical pinion shift and a set of reduction gears. Pinion shift is interconnected with the starting switch pedal. The direction of rotation is clockwise (armature shaft), viewed from the commutator end. Brush spring tension is 24-28 ounces. Starter cranks the engine at 80 R.P.M. drawing 200 amperes.

Starter Data			
Torque	R.P.M.	Volts	Amperes
0 lb. ft.	2500	5	70
28 "	Lock	3.25	550

**Mounting:**—Starter is flange mounted at the left of the engine on the forward face of the flywheel housing. To remove starter, disconnect cable and starting pedal linkage and take out three flange mounting cap screws. Then pull starter forward to clear drive and lift from place.

**Oiling:**—Put 8 or 10 drops of light engine oil in each of the starter bearing oilers every month or each 1000 miles of operation. Every six months or each 5000 miles remove the grease plug in the reduction gear case and repack gears with medium cup grease.

**GENERATOR:**—Model 955-G. The direction of rotation is counter-clockwise, viewed from the commutator end. Generator current regulation is by third brush shunt field and thermostat. Thermostat contacts open at 165°F. cutting the resistance connected across the thermostat contacts in series with the shunt field and reducing the output approximately 40%. To adjust the generator output, remove the commutator cover band and loosen the small round lock screw on the outside of the commutator end plate. Then shift the third brush by hand in a counter-clockwise direction to increase the charging rate and in the opposite direction to decrease the charging rate. Tighten the lock screw after making the adjustment. With standard car setting the maximum charging rate is 19-21 amperes at 8.4 volts reached at 1600-1800 R.P.M. or 38-42 M.P.H.

### Generator Data

Cold Test		R.P.M.	Hot Test		R.P.M.
Amperes	Volts		Amperes	Volts	
19-21	8.5	1450	9-12	7.5	2000

Generator, motoring, draws 5 amperes at 6 volts. Shunt field current is 4-6.1 amperes at 6 volts. Brush spring tension is 14-18 ounces.

**Mounting:**—Generator is flange mounted at right of engine on the rear face of the timing chain case. To remove generator, disconnect lead and take out flange mounting cap screws. Then slide generator to the rear to disengage drive coupling and lift from place. Generator is driven through a slotted tongue coupling by the accessory sprocket which is mounted independently in the chain case. The timing chain tension is adjusted by shifting the generator. To take up timing chain, loosen the three mounting screws and turn up the adjusting set screw until the chain begins to hum with the engine running. Then back off the set screw until the chain runs noiselessly and tighten the mounting screws.

**Oiling:**—Put 8 or 10 drops of light engine oil in each of the generator bearing oilers every month or each 1000 miles of operation.

**RELAY:**—Model 265-B. Relay is mounted on the generator field frame. Relay contacts close at 575 R.P.M. when the generator voltage reaches 6.75-7.5 volts and open with a discharge current of 0-2.5 amperes. Relay contact gap is .015-.025 inch. Air gap should be .014-.020 inch with contacts closed.

**LIGHTING:**—Delco-Remy Switch Model 482-F. Lighting switch mounted at lower end of steering column and controlled by lever on steering wheel. Dimmer system 'depressed beam' double filament headlight bulbs controlled by lighting switch.

### Lamp Sizes

Position	Voltage	Candlepower	Base	Mazda Number
Headlights	6-8	21-21	DC	1110
Fender lights	6-8	3	SC	63
Dash and tail lights	6-8	3	SC	63
Stop and backing lights	6-8	15	SC	87
Dome and corner lights	6-8	3	DC	64

**FUSES:**—Light fuses on fuse block on the dash are 20 ampere capacity.

**GASOLINE GAUGE:**—K-S Telegauge hydrostatic type (see Equipment Section).

**FUEL PUMP:**—AC mechanical fuel pump mounted at right of engine (see Equipment Section).

**HORN:**—Klaxon Model K-18-C. Vibrator type mounted under engine hood. Current draw 5.5-6.5 amperes at 6 volts.

# ROCKNE

**MODEL 65 (1932), SERIAL NUMBERS 00001 UP  
PRODUCTION STARTED FEBRUARY 15, 1932  
AUTO-LITE SYSTEM**

**CAR SERIAL NUMBER:**—On plate riveted to frame under left front fender.

**ENGINE NUMBER:**—Stamped on left center cylinder block above distributor.

**BATTERY:**—Willard, Type WH-1-13, 6 volt, 13 plate, 102 ampere hour capacity (20 hour rate). Positive (+) terminal grounded. Battery mounted on left frame member under front compartment floor boards. Battery size, 7 1/16 inches wide, 9 1/16 inches long, 9 5/16 inches high.

**IGNITION:**—Coil Model IG-4307. Lock coil type with ignition switch in base. Coil mounted on back of instrument board at lower right center of instrument panel. Ignition current .5-2.5 amperes (engine running), 4-5 amperes (engine stopped). Ignition switch has 3 positions, No. 1 vertical—off; No. 2 right—ignition on and Startix on—regular running position; No. 3 left—ignition on but Startix not operative—this position used for timing engine when automatic cranking feature not desired.

**Distributor Model IGB-4070.** Single breaker arm, 6-lobe cam type with full automatic advance. Breaker contact gap set at .020 inch. Hold within limits of .018-.020 inch. To set gap, loosen lock nut on stationary contact mounting stud, turn up stud, tighten lock nut. Resurface contacts when necessary with fine flat contact file. Breaker arm spring tension 16-22 ounces.

Engine	Degrees	Automatic Advance	Distributor	R.P.M.	Engine
0.....	Start.....		300.....	600	
8.....	4 .....		720.....	1440	
16.....	8 .....		1140.....	2280	
23.....	11 1/2.....		1500.....	3000	

Allowable variation is 1° (distributor) at any point in advance curve.

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

**Oiling:**—1000 Miles. Put few drops light oil in oiler on side of distributor housing. Take off distributor cap and rotor. Put few drops oil in oiler in center of shaft, put one drop oil on breaker arm pivot pin, apply thin film vaseline to face of breaker cam.

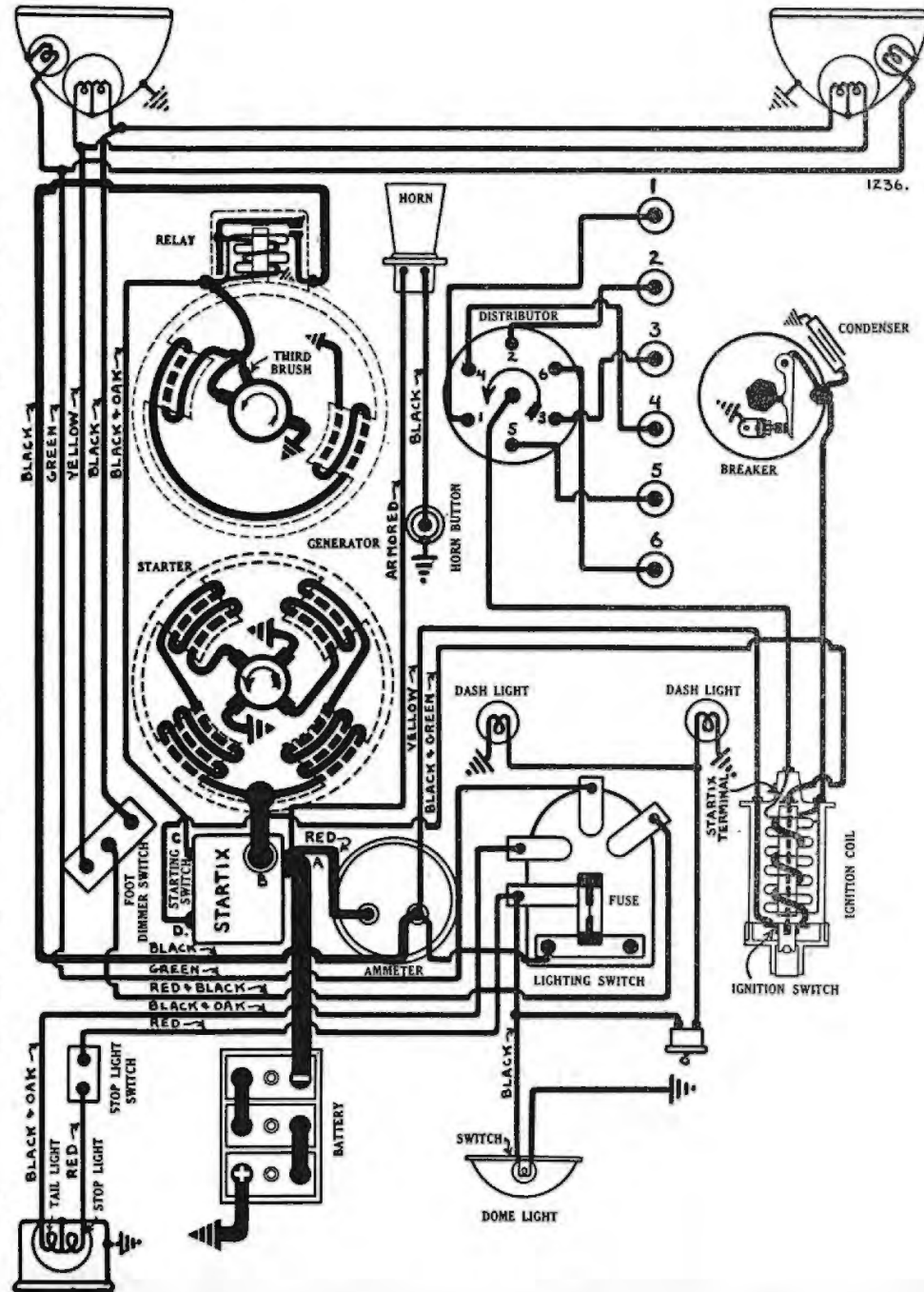
**Timing:**—Standard setting 5° before top dead center. To set timing, with No. 1 piston on compression stroke, turn engine over until flywheel mark 'IN.O/ No. 1' (which is 5° before top dead center mark 'UDC/1-6') is directly opposite indicator in inspection hole in right front face of flywheel housing. Loosen advance arm clamp screw, rotate distributor until contacts begin to open, tighten clamp screw, connect spark plugs as indicated on diagram. If ignition is turned on to check contact opening, turn key to left (this will cut out Startix operation).

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

**Spark Plugs:**—7/8-18 S.A.E. Champion #2. Set gap at .025 inch.

**VALVE TIMING:**—Valves at right of engine. Camshaft driven by two-sprocket non-adjustable chain drive.

	Head Diameter	Stem Diameter	Length	Seat Angle	Lift
Intake	1 15/32"	341-342"	4 11/16"	45°	5/16"
Exhaust	1 9/32"	341-342"	4 11/16"	45°	5/16"



# ROCKNE

MODEL 65 (1932), SERIAL NUMBERS 00001 UP  
PRODUCTION STARTED FEBRUARY 15, 1932  
AUTO-LITE SYSTEM

<b>Tappet Clearance</b>		<b>Spring Pressure</b>	
Operating	Timing		
Intake .....004 (hot).....010" (cold)		Closed ...48-53 pounds (2 1/23")	
Exhaust .....006" (hot)		Open .....71-76 pounds (1 23/32")	

**Timing**

Intake valves open 5 degrees before top dead center. Intake valves close 40 degrees after lower dead center.

Exhaust valves open 40 degrees before lower dead center. Exhaust valves close 5 degrees after top dead center.

**To Check Valve Timing.** Set tappet clearance No. 1 intake valve at .010 inch (cold). With No. 6 piston on compression stroke crank engine over until flywheel mark 'IN.O/No. 1' (which is 5° before the top dead center mark 'UDC/1-6') is directly opposite the indicator in the inspection hole in the right front face of the flywheel housing. No. 1 intake valve should open at this point. Reset tappet clearance at .004 inch with engine hot.

**To Set Valve Timing.** Camshaft sprocket and crankshaft sprocket are marked. Mesh chain with camshaft and crankshaft turned so that marks are directly opposite each other and in line with a straightedge across the two shaft centers.

**STARTER:—Model MAJ-4026.** Starter drives engine through outboard Bendix drive. Rotation counter-clockwise at commutator end. Brush spring tension 44-56 ounces.

Starter Data			
Torque	R.P.M.	Volts	Amperes
0 lb. ft.....	3000-5000.....	6.0.....	50
.3 ".....	2500.....	5.5.....	100
2.25 ".....	1460.....	5.0.....	200
4.6 ".....	960.....	4.5.....	300
7.3 ".....	575.....	4.0.....	400
10.3 ".....	225.....	3.5.....	500
12.6 ".....	Lock.....	3.0.....	575
19.0 ".....	Lock.....	4.0.....	800

**Startix:—**This model equipped with Startix automatic starting switch. Not necessary to disconnect Startix when setting ignition—use special position of ignition switch (key turned to left). For complete article on Startix see Equipment Section.

**Mounting:—**Starter flange mounted at left of engine on forward face of flywheel housing. To remove, disconnect cable, take out 2 flange mounting screws, pull starter straight forward to clear Bendix housing, lift from place.

**Oiling:—1000 Miles.** Put few drops light oil in oiler at each end of armature. Outboard bearing (outer end of Bendix housing) is oilless.

**GENERATOR:—Model GAM-4401.** Third brush regulation. To adjust charging rate, 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 is 12.8 amperes (hot) at 7.9 volts reached at 2500 R.P.M. or 18 M.P.H.

Cold Test			Generator Data			Hot Test		
Amperes	Volts	R.P.M.	Amperes	Volts	R.P.M.	Amperes	Volts	R.P.M.
0 .....	6.4.....	700	0 .....	6.4.....	760	0 .....	6.4.....	760
4 .....	6.9.....	880	4 .....	6.9.....	1040	4 .....	6.9.....	1040
7 .....	7.0.....	1000	8 .....	7.3.....	1400	8 .....	7.3.....	1400
10 .....	7.2.....	1180	10 .....	7.5.....	1600	10 .....	7.5.....	1600
14 .....	7.8.....	1520	12.8.....	7.9.....	2550	12.8.....	7.9.....	2550
17 .....	8.0.....	2400	12.2.....	7.8.....	3200	12.2.....	7.8.....	3200
15.2.....	7.9.....	3200						

Brush spring tension 17-20 ounces. Shunt field current 4.08-4.52 amperes at 6 volts. Generator motoring draws 4.94-5.46 amperes at 6.0 volts.

**Mounting:—**Generator mounted on swinging bracket at left front of engine, driven by fan belt. To remove, disconnect lead, loosen adjustment clamp bolt and mounting bolts, swing generator toward engine, slip off drive belt, take out adjustment clamp bolt and two mounting bolts (forming bracket hinge), lift generator out.

**Belt Adjustment.** Loosen mounting bolts and adjustment clamp bolt, swing generator away from engine until fan can just be turned with belt held stationary, tighten clamp bolt and mounting bolts.

**Oiling:—1000 Miles.** Put few drops light engine oil in oiler at each end of generator.

**RELAY:—Model CB-4022.** Relay mounted on generator. Relay contacts close at 6.5 M.P.H. or 725 R.P.M. (generator) with generator voltage of 7-7.5 volts and open with discharge current of 0-2.5 amperes. Relay contact gap limits .025-.035 inch. Air gap limits .010-.030 inch (contacts closed).

**LIGHTING:—Clum Switch, Model 9236. Dimmer Switch Clum Model 9126.** Lighting switch mounted behind instrument board at lower left of instrument panel, operated by push-pull button on instrument panel. Dimmer system 'depressed beam' double filament headlight bulbs controlled by foot-operated switch on toeboard. Switch positions:

1. Button pushed in—All lights off.
2. Button pulled out one half—Headlights and tail light on.
3. Button pulled out—Parking bulbs (in headlights) and tail light on.

Lamp Sizes				
Position	Voltage	Candlepower	Base	Mazda No.
Headlights .....	6-8.....	21-21.....	D.C.....	1110
Parking Bulbs (Headlights) .....	6-8.....	6.....	S.C.....	81
Instrument Lights .....	6-8.....	3.....	S.C.....	63
Stop and Tail Lights.....	6-8.....	21-2.....	D.C.....	1158
Dome Light .....	6-8.....	6.....	S.C.....	81

**NOTE:—**Stop and tail light equipped with double filament bulb. Connect tail light wire (black and oak wire) to 2 cp. filament.

**FUSE:—**20 ampere capacity mounted on lighting switch.

**FUEL PUMP:—**A.C. mechanical fuel pump (see Equipment Section).

**GASOLINE GAUGE:—**K-S gasoline gauge (see Equipment Section).

**HORN:—**Sparton motor driven type mounted under engine hood. Current draw, 6 amperes at 6 volts.

## ROCKNE

MODEL 75 (1932), SERIAL NUMBERS 1,500,001 UP  
PRODUCTION STARTED DECEMBER 15, 1931  
AUTO-LITE SYSTEM

**CAR SERIAL NUMBER:**—On plate riveted to left frame member under left front fender.

**ENGINE NUMBER:**—Stamped on left front of engine block back of water pump.

**BATTERY:**—Willard, Type WJ-1-13, 6 volt, 13 plate, 102 ampere hour capacity (20 hour rate). Positive (+) terminal grounded. Battery mounted on left frame member under front compartment floor boards. Battery size, 7 1/16 inches wide, 9 1/16 inches long, 9 5/16 inches high.

**IGNITION:**—Coil Model IG-4306. Lock coil type with ignition switch at base of coil, equipped with terminal for Startix. Ignition switch has three positions, No. 1 Key vertical—ignition off—key can be removed; No. 2, right—ignition on and Startix on—regular running position; No. 3, left—ignition on but Startix not operative—this position used for cranking engine when automatic cranking not desired. Ignition current .5-1.5 amperes (engine running), 4-5 amperes (engine stopped).

**Distributor Model IGB-4062.** Single breaker arm, 6-lobe cam type with semi-automatic advance. Manual advance controlled by button on dash. Ordinary operating position, button pushed in toward instrument board, fully advanced spark, pull button out to retard spark. Breaker contact gap set at .020 inch. Hold within limits of .018-.020 inch. To set gap, loosen lock nut on stationary contact mounting stud, turn up stud, tighten lock nut. Resurface contacts when necessary with fine flat contact file. Breaker arm spring tension 16-22 ounces (measured at tip of breaker arm with spring scale in line with center of contacts and at right angles to arm). Maximum manual advance 15 degrees (engine).

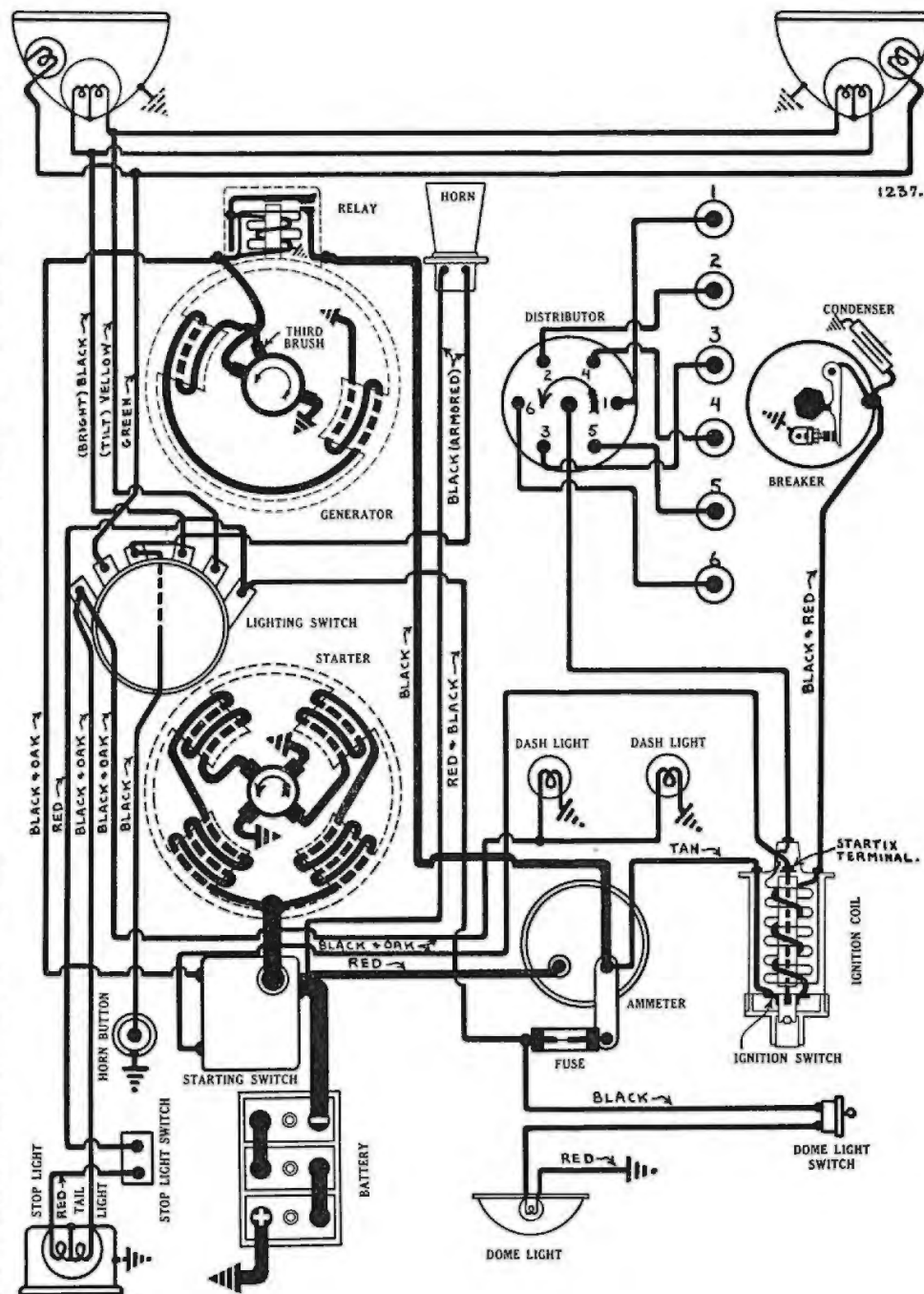
Engine	Degrees	Automatic Advance	R.P.M.	Engine
0.....	Start.....	300.....	600	
4.....	2.....	500.....	1000	
8.....	4.....	720.....	1440	
16.....	8.....	1138.....	2275	
23.....	11½.....	1500.....	3000	

Allowable variation plus or minus 1° (distributor).

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

**Oiling:**—1000 Miles. Put a few drops light oil in oiler on side of distributor housing. Take off distributor cap and rotor. Put few drops of oil in oiler in center of shaft, put one drop oil on breaker arm pivot pin, apply thin film vaseline to face of breaker cam.

**Timing:**—Standard setting 5° or 35/64" (on flywheel) before top dead center with full manual advance. To set timing, take off cover plate on inspection hole in top of flywheel housing at right of engine, fully advance manual spark control (push button in toward dash) and see that distributor is rotated clockwise to full extent of advance arm slot, turn ignition key to left (if ignition turned on to check contact opening). With No. 1 piston on compression stroke, turn engine over until punch marks on rim of flywheel (which are 35/64 inch before the top dead center mark 'UDC/1-6' are directly opposite indicator in inspection hole on housing. Loosen advance arm clamp bolt, rotate distributor until contacts begin to open (use test lamp), tighten clamp bolt, connect spark plugs as indicated on diagram.



# ROCKNE

MODEL 75 (1932), SERIAL NUMBERS 1,500,001 UP  
PRODUCTION STARTED DECEMBER 15, 1931  
AUTO-LITE SYSTEM

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

**Spark Plugs:**— $\frac{7}{8}$ -18 S.A.E. Champion #2. Set gaps at .025 inch.

**VALVE TIMING:**—Valves at right of engine. Camshaft driven by two-sprocket non-adjustable chain drive.

	Head Diameter	Stem Diameter	Length	Seat Angle	Lift
Intake	1 $\frac{5}{8}$ "	.341-.342"	5 $\frac{3}{8}$ "	45°	5/16"
Exhaust	1 $\frac{1}{2}$ "	.341-.342"	5 $\frac{3}{8}$ "	45°	5/16"

	Tappet Clearance		Spring Pressure
	Operating	Timing	
Intake	.004" (hot)	.010" (cold)	Closed .....48-53 pounds (2 1/32") Open .....71-76 pounds (1 23/32")
Exhaust	.006" (hot)		

### Timing

Intake valves open 5 degrees after top dead center. Intake valves close 53 degrees after lower dead center.

Exhaust valves open 38 degrees before lower dead center. Exhaust valves close 10 degrees after top dead center.

**To Check Valve Timing.** Set tappet clearance No. 1 intake valve at .010 inch (cold). With No. 6 piston on compression stroke, turn engine over until piston is slightly past top dead center and stop when flywheel mark 'IN.O/No.1' (which is 5° or 35/64" past the top dead center mark 'UDC/1-6') is directly opposite indicator in inspection hole in flywheel housing at right of engine. No. 1 intake valve should begin to open at this point. Reset tappet clearance .004 inch with engine hot.

**To Set Valve Timing.** Camshaft sprocket and crankshaft sprocket are marked. Mesh chain so that marks are directly opposite each other and in line with a straightedge across the shaft centers (center the two crankshaft sprocket marks).

**STARTER:**—Model MAN-4001. Starter drives engine through outboard Bendix drive. Rotation counter-clockwise at commutator end. Brush spring tension 44-56 ounces.

### Starter Data

Torque	R.P.M.	Volts	Amperes
0 lb. ft.	Free	5.6	50
.5 "	2425	5.5	100
3.0 "	1300	5.0	200
6.0 "	790	4.5	300
9.4 "	475	4.0	400
12.5 "	200	3.5	500
14.5 "	Lock	3.0	560
21.0 "	Lock	4.0	775

**Startix:**—This model equipped with Startix automatic starting switch. Not necessary to disconnect Startix when timing engine if special position of ignition switch is used (turn key to left). For complete article on Startix see Equipment Section.

**Mounting:**—Starter flange mounted at left of engine on forward face of flywheel housing. To remove, disconnect cable, take out 3 flange mounting cap screws, pull starter straight forward to clear Bendix housing, lift from place.

**Oiling:**—1000 Miles. Put few drops light engine oil in oiler at each end of starter armature shaft. Outboard bearing (outer end of Bendix housing) is oilless.

**GENERATOR:**—Model GAM-4401. Third brush regulation. To adjust charging

rate, 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 is 12.8 amperes (hot) at 7.9 volts, reached at 2500 R.P.M. or 18.4 M.P.H.

### Generator Data

Cold Test			Hot Test		
Amperes	Volts	R.P.M.	Amperes	Volts	R.P.M.
0	6.4	700	0	6.4	760
4	6.9	880	4	6.9	1040
7	7.0	1000	8	7.3	1400
10	7.2	1180	10	7.5	1600
14	7.8	1520	12.8	7.9	2550
17	8.0	2400	12.2	7.8	3200
15.2	7.9	3200			

Brush spring tension 17-20 ounces. Shunt field current 4.02-4.52 amperes at 6.0 volts. Generator motoring draws 4.94-5.46 amperes at 6.0 volts.

**Mounting:**—Generator mounted on swinging bracket at left front of engine, driven by fan belt. To remove, disconnect lead, loosen adjustment clamp bolt, swing generator toward engine, slip off drive belt, take out clamp bolt and two mounting bolts forming bracket hinge, lift generator from place.

**Belt Adjustment.** Loosen mounting bolts and adjustment clamp bolt, swing generator away from engine until fan can just be turned with belt held stationary, tighten clamp bolt and mounting bolts.

**Oiling:**—1000 Miles. Put few drops light engine oil in oiler at each end of generator.

**RELAY:**—Model CB-4022. Mounted on generator. Relay contacts close at 6.5 M.P.H. or 725 R.P.M. (generator) with generator voltage of 7-7.5 volts and open with discharge current of 0-2.5 amperes. Relay contact gap limits .025-.035 inch. Air gap limits .010-.030 inch (contacts closed).

**LIGHTING:**—Clum Switch, Model 9115. Lighting switch mounted at lower end of steering column, controlled by lower lever on steering wheel. Dimmer system 'depressed beam' double filament headlight bulbs controlled by lighting switch. Switch positions:

1. Vertical—All lights off.
2. Left—Parking bulbs (in headlights), tail light, instrument lights on.
3. No. 1 Right—Headlights (depressed beam), tail light, instrument lights on.
4. No. 2 Right—Headlights (bright), tail light, instrument lights on.

### Lamp Sizes

Position	Voltage	Candlepower	Base	Mazda No.
Headlights	6-8	21-21	D.C.	1110
Parking Lights	6-8	6	S.C.	81
Instrument Lights	6-8	3	S.C.	63
Stop and Tail Light	6-8	21-2	D.C.	1158
Dome Light	6-8	6	S.C.	81

**NOTE:**—Stop and tail light equipped with double filament bulb. Connect tail light wire (black and oak) to 2 cp. filament.

**FUSE:**—20 ampere capacity mounted on ammeter.

**GASOLINE GAUGE:**—K-S gasoline gauge (see Equipment Section).

**FUEL PUMP:**—A.C. mechanical fuel pump mounted at right of engine (see Equipment Section).

**HORN:**—Sparton motor-driven type mounted under engine hood. Current draw, 6 amperes at 6 volts.

# STUDEBAKER

## SIX MODEL 55 (1932), SERIAL NUMBERS 5,120,001 UP DELCO-REMY SYSTEM

**CAR SERIAL NUMBER:**—On plate riveted to frame under left front fender.

**ENGINE NUMBER:**—Stamped on front center of engine block back of water pump.

**BATTERY:**—Willard, Type WH-1-13, 6 volt, 13 plate, 102 ampere hour (5 ampere rate). Positive (+) terminal is grounded. Battery mounted on left frame member under driver's seat. Battery size, 7 1/16 inches wide, 9 1/16 inches long, 8 7/8 inches high.

**IGNITION:**—Coil Model 534-X. Lock coil type with ignition switch in base. Coil mounted on back of instrument board at right of instrument panel. Ignition current 5-1.5 amperes (engine running), 4-5 amperes (engine stopped).

**Distributor Model 632-M.** Single breaker arm, 6-lobe cam type with semi-automatic advance and 'Spark Modifier' (see Note). Manual advance controlled by button on dash. Ordinary driving position with button pushed in toward dash (spark advanced), pull out button to retard spark. Breaker contact gap set at .020 inch. Hold within limits of .018-.024 inch. To set gap, loosen lock screw on stationary contact mounting plate, turn eccentric adjusting screw (mounting plate moves concentrically and does not change parallel relation between contact surfaces), tighten locking screw. Breaker arm spring tension, 17-21 ounces (measured at tip of breaker arm with spring scale at right angles to contact surface). Maximum manual advance, 15 degrees (engine).

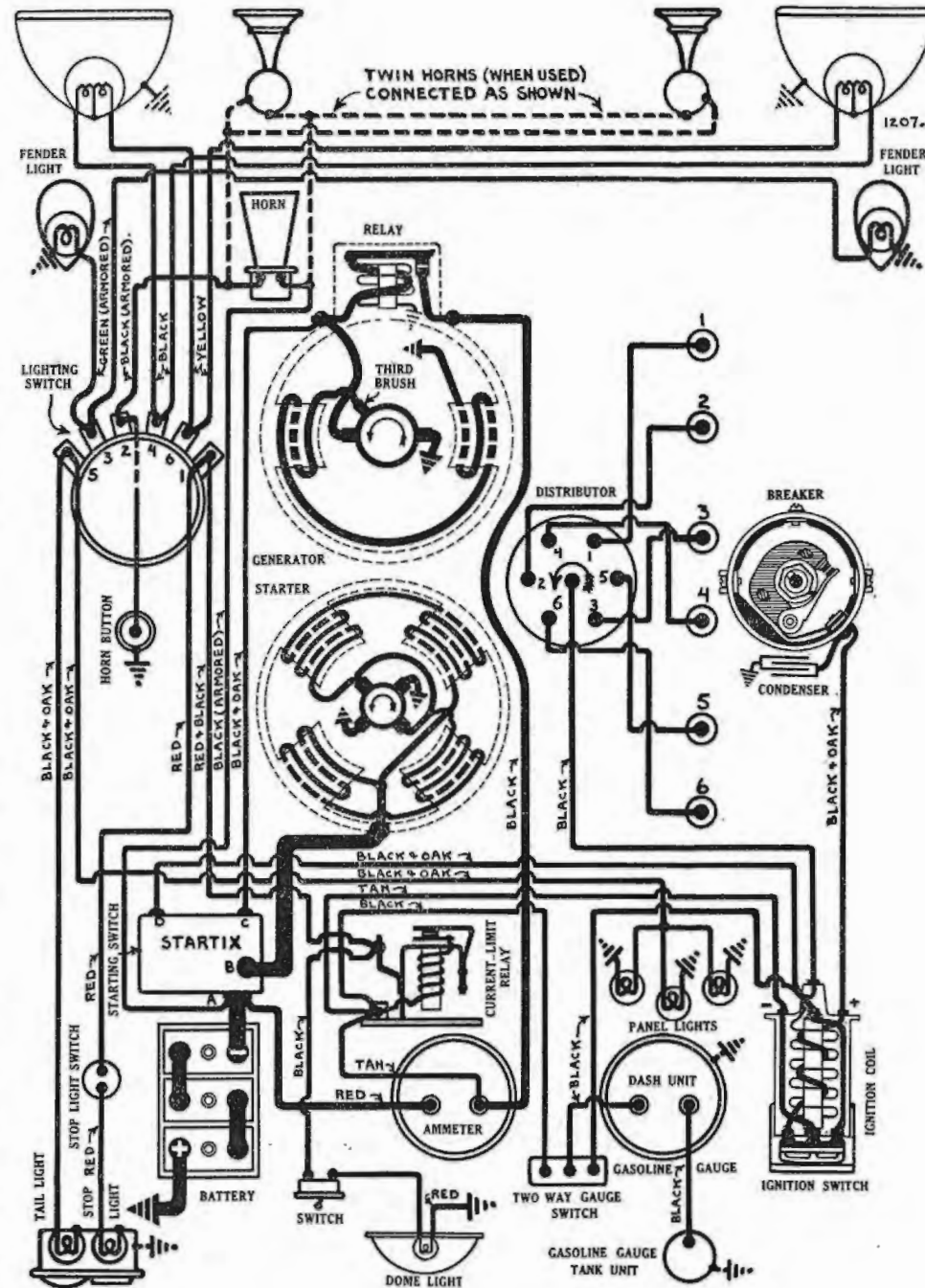
Engine..	Degrees		R.P.M.
	Distributor	Distributor	
4.5.....	Start.....	400.....	800
18.....	9.....	1100.....	2200
25 1/2.....	12 3/4.....	1500.....	3000

**Spark Modifier:**—Model 680-D. The 'Vacuum Spark Advance Modifier' consists of a spring-loaded vacuum-operated piston mounted on the spark advance plate and connected to a secondary plate directly underneath. It is designed to momentarily retard the spark (up to 6°) whenever the engine is quickly accelerated to eliminate spark knock. Spark Modifier requires no attention in service but must be locked out when setting ignition timing. See Timing.

**Mounting:**—Distributor mounted at left center of engine, driven by inclined shaft from the camshaft. To remove, disconnect primary lead, take off distributor cap, loosen clamp bolt in advance arm, lift distributor out.

**Oiling:**—1000 Miles. Turn down grease cup under distributor head two turns. Keep cup filled with medium cup grease. Take off distributor cap and rotor. Put 2-4 drops S.A.E. No. 20 oil in wick oiler in center of shaft. Apply thin film vaseline to face of breaker cam.

**Timing:**—Standard setting, 5° or 1/2" (on flywheel) before top dead center with full manual advance. To set timing, first remove inspection cover plate over inspection hole in top of flywheel housing, fully advance manual spark control (push button in toward dash), check distributor to see that it is rotated clockwise to full extent of advance arm slot, disconnect and tape wire marked 'IGN' on Startix to prevent automatic cranking of engine with ignition turned on, lock out Vacuum Spark Advance Modifier by inserting 1/2" diameter pin through hole in advance arm and slot in secondary arm. With No. 1 piston on compression turn engine over until the punch marks on the flywheel (which are 5° or 1/2" before top dead center mark 'UDC.1-6') are directly opposite the pointer on the housing. Loosen advance arm clamp bolt, rotate distributor cup until contacts begin to open (use test lamp),





# STUDEBAKER

SIX MODEL 55 (1932), SERIAL NUMBERS 5,120,001 UP  
DELCO-REMY SYSTEM

tighten clamp bolt. Connect spark plugs as indicated on diagram.

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

**Spark Plugs:**— $\frac{7}{8}$ -18 S.A.E. Champion #2. Set gap at .025 inch.

**VALVE TIMING:**—Valves at right of engine. Camshaft driven by two-sprocket non-adjustable chain drive.

	Head Diameter	Stem Diameter	Length	Seat Angle	Lift
Intake	1 $\frac{5}{8}$ "	.341/.342"	5 $\frac{3}{8}$ "	45°	5/16"
Exhaust	1 $\frac{1}{2}$ "	.341/.342"	5 $\frac{3}{8}$ "	45°	5/16"

	Tappet Clearance		Spring Pressure
	Operating	Timing	
Intake	.004" (hot)	.010" (cold)	Closed.....63-68 pounds (1 23/32")
Exhaust	.006" (hot)		

Intake valves open 5 degrees after top dead center. Intake valves close 53 degrees after lower dead center.

Exhaust valves open 38 degrees before lower dead center. Exhaust valves close 10 degrees after top dead center.

**To Check Valve Timing.** Set tappet clearance No. 1 intake valve at .010 inch (cold). With No. 6 piston on compression crank engine over until flywheel mark 'IN-OP/1-6' (which is 5 degrees or  $\frac{1}{2}$  inch past top dead center mark 'UDC/1-6') is directly opposite pointer on housing in inspection hole in flywheel housing at right of engine. No. 1 intake valve should begin to open at this point. Reset tappet clearance at .004 inch with engine hot.

**To Set Valve Timing.** Camshaft sprocket has one tooth marked. Crankshaft sprocket has two teeth marked. Turn crankshaft and camshaft so that mark on camshaft sprocket is directly opposite and between the marks on the crankshaft sprocket (use straightedge across shaft centers to center marks). Assemble chain.

**STARTER:**—Model 718-Z. Starter drives through outboard Bendix drive. Rotation counter-clockwise at commutator end. Brush spring tension, 24-28 ounces. Starter cranks engine at 100 R.P.M. drawing 180 amperes.

Starter Data			
Torque	R.P.M.	Volts	Amperes
0 lb. ft.	6000	5	65
15 "	Lock	3.15	570

**Startix:**—This model equipped with Startix automatic starting switch. See complete article on Startix in Equipment Section.

**Mounting:**—Starter flange mounted on forward face of flywheel housing at left of engine. To remove, disconnect cable, take out 3 flange mounting screws, pull starter straight forward to clear Bendix housing, lift from place.

**Oiling:**—1000 Miles. Put 2-4 drops S.A.E. No. 20 engine oil in commutator end oiler. Drive end bearing (outer end of Bendix housing) is oilless.

**GENERATOR:**—Model 943-V. Third brush regulation. To adjust charging rate, loosen small round headed lock screw on commutator end plate, take off cover band, shift third brush (by hand) counter-clockwise to increase or clockwise to decrease charging rate, tighten locking screw. Rotation coun-

ter-clockwise at commutator end. With standard setting, maximum charging rate is 12 $\frac{1}{2}$  amperes at 7.8 volts (hot) reached at 2200 R.P.M. (generator) or 23.13 M.P.H.

Generator Data					
Cold Test		R.P.M.	Hot Test		R.P.M.
Amperes	Volts		Amperes	Volts	
16-18	8.2	1700	11-13	7.5-7.8	1750-1850

Brush spring tension, 14-18 ounces. Shunt field current, 3.5-4.5 amperes at 6 volts. Generator motoring draws 5.5 amperes at 6 volts.

**Mounting:**—Generator mounted on swinging bracket at left front of engine, driven by fan belt. To remove, loosen adjustment clamp bolt, swing generator toward engine, slip off drive belt, take out adjustment bolt and two bolts forming bracket hinge, lift generator out.

**Belt Adjustment:**—Loosen bracket hinge bolts and adjustment clamp bolt, pull generator away from engine until fan can just be rotated with belt held stationary, tighten adjustment bolt and mounting bolts.

**Oiling:**—1000 Miles. Put 2-4 drops S.A.E. No. 20 engine oil in oiler at each end of generator.

**RELAY:**—Model 265-G. Mounted on generator. Relay contacts close at 8.2 M.P.H. or 780 R.P.M. (generator) when generator voltage reaches 6.4 volts with charging current of approximately 1 ampere and open with discharge current of 0-2.5 amperes. Relay contact gap limits, .015-.025 inch. Air gap limits, .012-.017 inch (contacts closed).

**LIGHTING:**—Clum Switch, Model 9115. Lighting switch mounted at lower end of steering column, controlled by lower lever on steering wheel. Dimmer system 'depressed beam' double filament headlight bulbs controlled by lighting switch.

Position	Lamp Sizes		Base	Mazda No.
	Voltage	Candlepower		
Headlights	6-8	21-21	D.C.	1110
Parking Lights	6-8	3	S.C.	63
Dash and Tail Lights	6-8	3	S.C.	63
Stop Light	6-8	15	S.C.	87
Dome Light	6-8	6	S.C.	81

**CURRENT LIMIT RELAY:**—Model 410-L. Vibrating circuit breaker mounted on dash. Starts with current load of 30-35 amperes, limits current to 5-18 amperes with direct short-circuit. Contacts gap limits, .012-.030 inch. Air gap limits, .015-.025 inch (contacts closed). Spring tension, 5 ounces minimum (measured at brass button on contact arm with spring scale at right angles to contact arm).

**GASOLINE GAUGE:**—A.C. Electric type (see Equipment Section). Selector switch in gauge circuit so that reading may be obtained with ignition 'off' by pressing switch button (gauge always 'on' with ignition turned 'on').

**FUEL PUMP:**—Stewart-Warner mechanical fuel pump at right of engine driven from camshaft. See Equipment Section.

**HORN:**—Sparton motor-driven type mounted under engine hood. Twin horns optional equipment. Current draw, 6 amperes at 6 volts.

# STUDEBAKER

DICTATOR EIGHT MODEL 62 (1932), SERIAL NUMBERS 9,015,001 UP  
 COMMANDER EIGHT MODEL 71 (1932), SERIAL NUMBERS 8,036,001 UP  
 DELCO-REMY SYSTEM

**CAR SERIAL NUMBER:**—On plate riveted to frame under left front fender.

**ENGINE NUMBER:**—Stamped on left center engine block directly above water jacket cover.

**BATTERY:**—(Dictator 62). Willard, Type WH-1-13, 6 volt, 13 plate, 102 ampere hour capacity (20 hour rate). Positive (+) terminal grounded. Battery is mounted on left frame member under driver's seat. Battery size, 7 1/16 inches wide, 9 1/16 inches long, 9 5/16 inches high.

(Commander 71). Willard, Type WH-4-17, 6 volt, 17 plate, 136 ampere hour capacity (20 hour rate). Positive (+) terminal grounded. Battery is mounted on left frame member under front compartment floor boards. Battery size, 7 1/16 inches wide, 11 11/16 inches long, 9 5/16 inches high.

**IGNITION:**—Coil Model 534-X. Lock coil type with ignition switch in base. Mounted on back of instrument board at right of instrument panel. Ignition current, 2.25 amperes (engine idling), 4.5 amperes (engine stopped).

Distributor Model 660-M. Two-breaker arm, 4-lobe cam type with semi-automatic advance and 'Spark Modifier' (see Note). Manual advance controlled by button on instrument panel. Ordinary driving position with button pushed in toward dash (spark advanced), pull out button to retard spark. Breaker contacts open alternately at 45 degree intervals (corresponding to engine firing interval of 90 degrees), contacts must be synchronized (see Timing). Breaker gap set at .020 inch. Hold gap within limits of .018-.024 inch. To set gap, loosen lock screw on stationary contact mounting plate (directly behind breaker arm), turn eccentric adjusting screw. Breaker arm spring tension, 17-21 ounces (measured at tip of breaker arm with spring scale at right angles to contact surface). Maximum manual advance, 25 degrees (engine).

Engine	Degrees	Automatic Advance Distributor	R.P.M.	Engine
0	Start	300	600	
29	14.5	1800	3600	

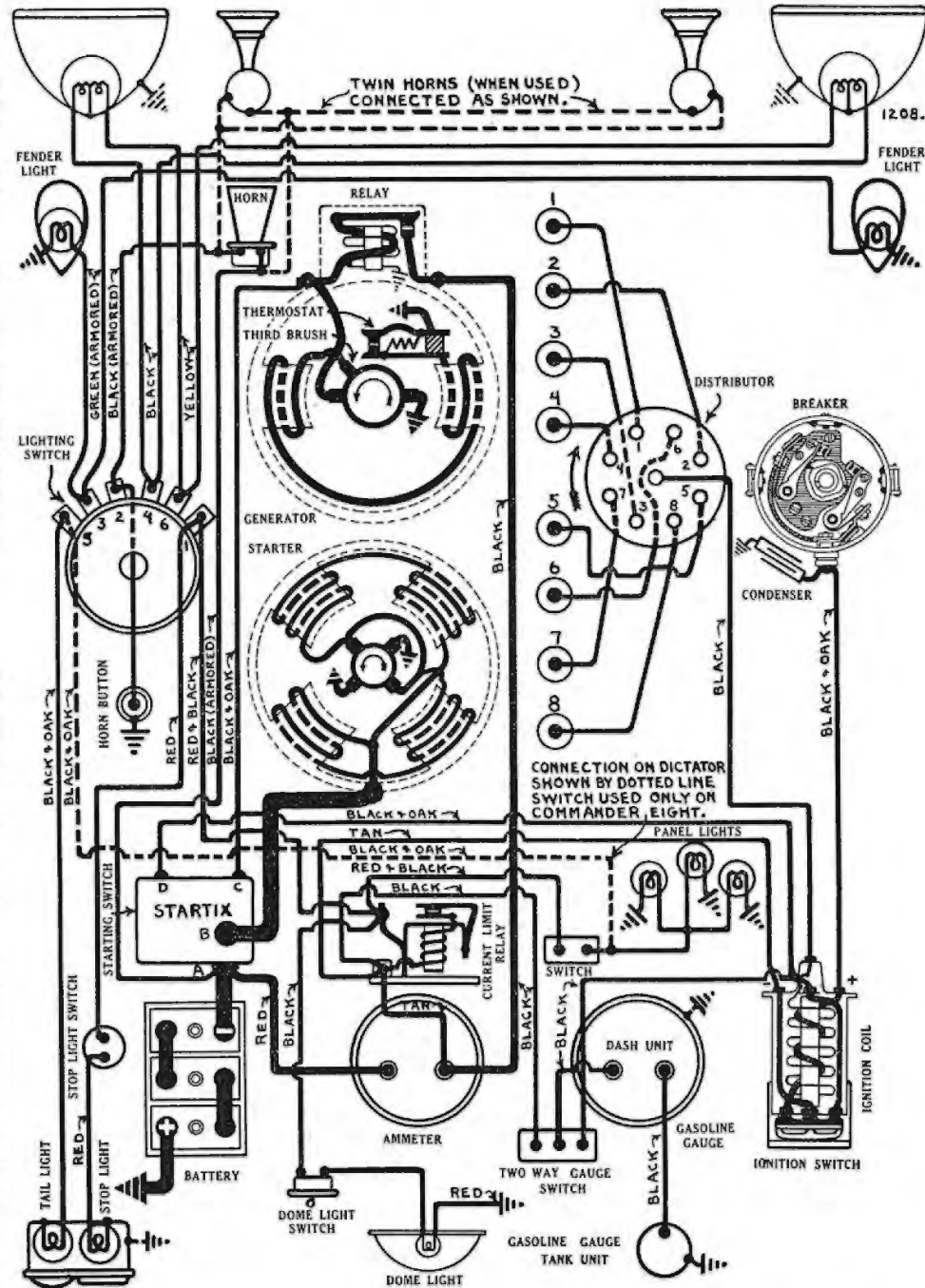
**Spark Modifier:**—The 'Vacuum Spark Advance Modifier' consists of a spring loaded vacuum operated piston, mounted on the spark advance plate and connected to a secondary plate directly underneath. It is designed to momentarily retard the spark (up to 6°) whenever the engine is quickly accelerated to eliminate spark knock. Spark Modifier requires no attention in service but must be locked out when setting ignition timing (see Timing).

**Mounting:**—Distributor mounted on cylinder head, driven from the camshaft. Remove from right side of car. To remove, disconnect primary lead, take off distributor cap, loosen clamp bolt in advance arm, lift distributor out.

**Oiling:**—1000 Miles. Turn down grease cup under distributor head two turns. Keep cup filled with medium cup grease. Take off distributor cap and rotor. Put 2-4 drops S.A.E. No. 20 engine oil in wick oiler in center of shaft. Apply thin film of vaseline to face of breaker cam.

**Timing:**—Standard setting 9° or 3/4" (on the flywheel) before top dead center with full manual advance. To set timing, remove inspection cover plate over inspection hole in top face of flywheel housing at right of engine, fully advance manual spark control (push button in toward the dash), see that distributor is rotated counter-clockwise to full limit of advance arm slot, disconnect and tape wire on terminal marked 'IGN' on Startix to prevent automatic cranking of engine with ignition turned on, lock out Vacuum Spark Advance Modifier by inserting 1/8" diameter pin through hole in advance arm and slot in secondary arm. With No. 1 piston on compression stroke, turn engine over until punch marks on flywheel (which are 9° or 3/4" before the top dead center mark 'UDC/1-8') are directly opposite pointer on housing in inspection hole. Loosen advance arm clamp bolt, rotate distributor until first set of contacts (mounted directly on breaker plate) begin to open (use test lamp), tighten clamp bolt, connect spark plugs as indicated on diagram.

**Synchronization**—first method as part of timing operation. After distributor has been timed to engine (above), crank engine over 90 degrees to firing position of piston No. 6 and stop with punch marks on flywheel (9° or 3/4" before top dead center mark 'UDC/3-6') opposite the indicator on the



# STUDEBAKER

**DICTATOR EIGHT MODEL 62 (1932), SERIAL NUMBERS 9,015,001 UP**  
**COMMANDER EIGHT MODEL 71 (1932), SERIAL NUMBERS 8,036,001 UP**  
**DELCO-REMY SYSTEM**

housing. Loosen lock screws on movable sub-plate (carrying second set of contacts), turn eccentric adjusting screw until contacts begin to open, tighten lock screws, check contact gap. It outside limits of .018-.024 inch, reset at .022 inch, repeat synchronization.

**Second Method**—using synchronizing tool. Use special synchronizing tool, Delco-Remy Part No. 1838182 and follow complete directions in Equipment Section.

**Firing Order**:—1-6-2-5-8-3-7-4. No. 1 cylinder nearest radiator.

**Spark Plugs**:— $\frac{7}{8}$ -18 S.A.E. Champion #2. Set gap t .025 inch.

**VALVE TIMING**:—Valves at right of engine. Camshaft gear driven from crankshaft. Crankshaft gear is castiron. Camshaft gear celoron.

**Specifications—Dictator Model 62**

	Head Diameter	Stem Diameter	Length	Seat Angle	Lift
Intake	1 13/32"	.341/.342"	5 7/32"	45°	9/32"
Exhaust	1 9/32"	.341/.342"	5 7/32"	45°	9/32"

**Commander Model 71**

	Head Diameter	Stem Diameter	Length	Seat Angle	Lift
Intake	1 13/32"	.341/.342"	5 7/32"	45°	11/32"
Exhaust	1 9/32"	.341/.342"	5 7/32"	45°	11/32"

**Tappet Clearance**

	Operating	Timing	Spring Pressure
Intake	.004" (hot)	.010" cold)	Closed 48-53 pounds (2 1/32")
Exhaust	.006" (hot)		Open 63-68 pounds (1 23/32")

**Timing—Dictator Model 62**

Intake valves open at top dead center. Intake valves close 40 degrees after lower dead center.

Exhaust valves open 45 degrees before lower dead center. Exhaust valves close 11 degrees after top dead center.

**To Check Valve Timing.** Set tappet clearance No. 1 intake valve at .010 inch (cold). With No. 8 piston on compression stroke crank engine over until piston reaches top dead center with flywheel mark 'UDC/IN-OP-1-8' directly opposite pointer in inspection hole in flywheel housing. No. 1 intake valve should begin to open at this point. Reset tappet clearance at .004 inch with engine hot.

**Timing—Commander Model 71**

Intake valves open 15 degrees before top dead center. Intake valves close 43 degrees after lower dead center.

Exhaust valves open 48 degrees before lower dead center. Exhaust valves close 10 degrees after top dead center.

**To Check Valve Timing.** Set tappet clearance No. 1 intake valve at .010 inch (cold). With No. 8 piston on compression, crank engine over until flywheel mark 'IN-OP/1-8' (which is 15 degrees or approximately 1 1/4 inches before the top dead center mark 'UDC/1-8') is directly opposite pointer in inspection hole in flywheel housing. No. 1 intake valve should begin to open at this point. Reset tappet clearance at .004 inch with engine hot.

**To Set Valve Timing.** One tooth on crankshaft gear marked. Two adjacent teeth on camshaft gear similarly marked. Mesh gears so that marked tooth on crankshaft gear is between two marked teeth on camshaft gear.

**STARTER**:—Model 718-Y. Starter drives to engine through outboard Bendix drive. Rotation counter-clockwise at commutator end. Brush spring tension 24-28 ounces. Starter cranks engine at 90 R.P.M. (armature speed 1050 R.P.M.) drawing 180 amperes.

**Starter Data**

Torque	R.P.M.	Volts	Amperes
0 lb. ft.	6000	5.0	65
2.2 "	1050	—	180
15 "	Lock	3.15	570

**Startix**:—This model equipped with Startix automatic switch—see complete article on Startix in Equipment Section.

plete article on Startix in Equipment Section.

**Mounting**:—Starter flange mounted on forward face of flywheel housing left of engine. To remove, disconnect cable, take out 3 flange mounting cap screws, pull starter straight forward to clear Bendix housing, lift from place.

**Oiling**:—1000 Miles. Put 2-4 drops S.A.E. No. 20 engine oil in commutator end oiler. Drive end bearing (outer end of Bendix housing) is oilless.

**GENERATOR**:—Model 955-C. Third brush regulation, thermostat control. Thermostat operates at 200°F. (contacts open—cuts in resistance) reducing the output approximately 40%. To adjust charging rate, loosen small round headed lock screw on commutator end plate, take off cover band, shift third brush (by hand) counter-clockwise to increase or clockwise to decrease the charging rate, tighten locking screw. With standard car setting maximum charging rate is 11 amperes (hot) at 7.4 volts, reached at 2100 R.P.M. or 23.5 M.P.H. (62), 23 M.P.H. (71).

**Generator Data**

Cold Test		Generator Data		Hot Test	
Amperes	Volts	R.P.M.	Amperes	Volts	R.P.M.
19-21	8.3-8.5	1450	9-12	7.3-7.6	1800-2000

Brush spring tension, 14-18 ounces. Shunt field current, 4.0-6.1 amperes at 6 volts. Generator motoring draws 5.5 amperes at 6 volts.

**Mounting**:—Generator cradle mounted at left front of engine, driven by fan belt. Drives water pump through extension shaft and flexible coupling. To remove, disconnect lead, disconnect water pump drive coupling, slack off belt adjustment, loosen mounting clamp band, lift generator out.

**Belt Adjustment.** Loosen nut in back of fan bracket, lift up fan assembly until fan can just be turned with belt held stationary, tighten nut.

**Oiling**:—1000 Miles. Put 2-4 drops S.A.E. No. 20 engine oil in oiler at each end of generator.

**RELAY**:—Model 265-B. Mounted on generator. Relay contacts close at 6.2 M.P.H. or 550 R.P.M. (generator) with generator voltage of 6.4 volts and open with discharge current not to exceed 1 ampere. Charging current at closing of contacts approximately 1 ampere. Contact gap limits, .015-.025 inch. Air gap limits, .012-.017 inch (contacts closed).

**LIGHTING**:—Clum Switch, Model 9115. Lighting switch mounted at lower end of steering column controlled by lower lever on steering wheel. Dimmer system 'depressed beam' double filament headlight bulbs controlled by lighting switch.

**Lamp Sizes**

Position	Voltage	Candlepower	Base	Mazda No.
Headlights	6-8	21-21	D.C.	1110
Parking (Fender) Lights	6-8	3	S.C.	63
Dash and Tail Lights	6-8	3	S.C.	63
Stop Light	6-8	15	S.C.	87
Dome Light	6-8	6	S.C.	81

**CURRENT LIMIT RELAY**:—Model 410-L. Vibrating circuit breaker mounted on dash. Starts with current load of 30-35 amperes, limits current to 5-18 amperes with direct short-circuit. Contact gap limits, .012-.030 inch. Air gap limits, .015-.025 inch (contacts closed). Spring tension, 5 ounces minimum (measured at brass button with spring scale hooked under contact arm at right angles to arm).

**GASOLINE GAUGE**:—A.C. Electric type (see Equipment Section). Selector switch in gauge circuit permits reading to be obtained with ignition 'off' by pressing switch button (gauge always registers with ignition turned 'on').

**FUEL PUMP**:—Stewart Warner Mechanical fuel pump mounted at right rear of engine. Driven from camshaft (see Equipment Section).

**HORNS**:—Sparton horn mounted under engine hood (standard equipment) or twin horns mounted under headlights (optional equipment), current draw approximately 6 amperes each.

# STUDEBAKER

PRESIDENT EIGHT MODEL 91 (1932), SERIAL NUMBERS 6,025,001 UP  
DELCO-REMY SYSTEM

**CAR SERIAL NUMBER:**—On plate riveted to frame under left front fender.

**ENGINE NUMBER:**—Stamped on surface of fan bracket boss.

**BATTERY:**—Willard, Type WH-4-17, 6 volt, 17 plate, 136 ampere hour capacity (20 hour rate). Positive (+) terminal is grounded. Battery mounted on right frame member under floor boards of front compartment. Battery size, 7 1/16 inches wide, 11 11/16 inches long, 9 5/16 inches high.

**IGNITION:**—Coil Model 534-X. Lock coil type with ignition switch in base of coil. Coil mounted on back of instrument board at right of instrument panel. Ignition current 2.25 amperes (engine idling), 4.5 amperes (engine stopped).

**Distributor Model 662-A.** Two-breaker arm, 4-lobe cam type with semi-automatic advance and 'Spark Modifier' (see Special Note). Manual spark advance controlled by button on left of instrument panel. Ordinary running position with spark advanced (button pushed in toward dash), pull button out to retard spark. Breaker contacts open alternately at 45 degree intervals (corresponding to 90 degree firing interval of engine). Contacts must be synchronized (see Timing). Breaker gap set at .020 inch. Hold gap within limits of .018-.024 inch. To set gap, loosen lock screw on stationary contact mounting plate (directly behind breaker arm), turn eccentric adjusting screw. Breaker arm spring tension 17-21 ounces (measured at tip of breaker arm with spring scale at right angles to contact surface). Maximum manual advance 25 degrees (engine).

Engine	Degrees	Automatic Advance	R.P.M.	Engine
0	Start	Distributor	300	600
23	11 1/2	Distributor	1900	3800

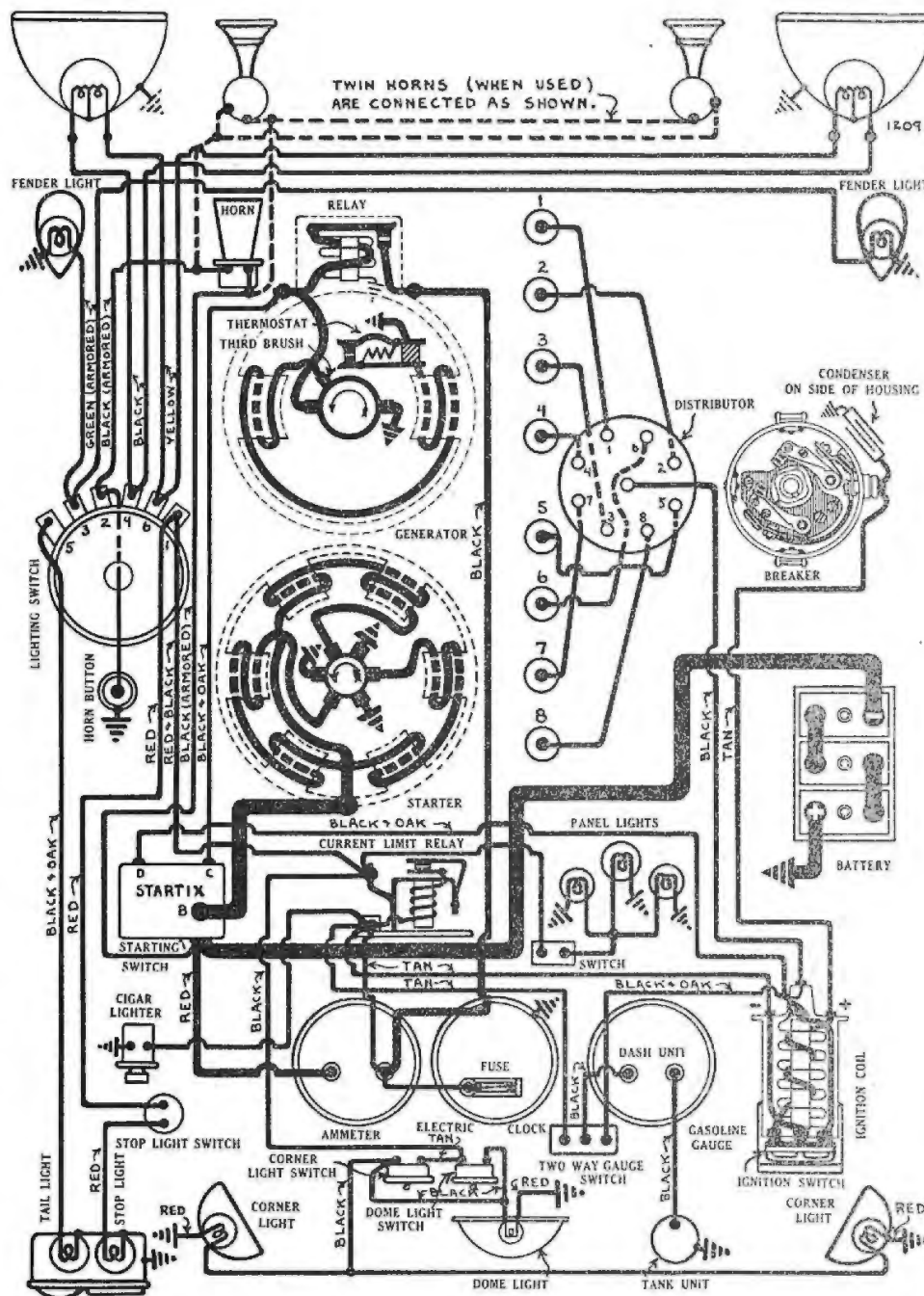
**Spark Modifier:**—Model 680-D. The 'Vacuum Spark Advance Modifier' consists of a spring loaded vacuum operated piston mounted on the advance plate and connected to a secondary plate directly underneath. It is designed to momentarily retard the spark (up to 6°) whenever the engine is quickly accelerated to eliminate spark knock. The Spark Modifier requires no attention in service but must be locked out when ignition timing is being set—see Timing.

**Mounting:**—Distributor mounted on cylinder head, driven from camshaft. Remove from right side of car. To remove, disconnect primary lead, take off distributor cap, loosen clamp bolt in advance arm, lift distributor out.

**Oiling:**—1000 Miles. Turn down grease cup under distributor cup two turns. Keep cup filled with medium cup grease. Take off distributor cap and rotor. Apply thin film vaseline to face of breaker cam.

**Timing:**—Standard setting 8° 20' or 3/4" (on flywheel) before top dead center with manual spark control fully advanced. To set timing, first remove cover plate over inspection hole in top face of flywheel housing at right of engine, fully advance manual spark control (push button in toward instrument panel), see that distributor is turned counter-clockwise to full extent of advance arm slot, disconnect and tape wire on terminal marked 'IGN' of Startix to prevent automatic cranking of engine with ignition turned on, lock out Vacuum Spark Advance Modifier by inserting 1/8 inch diameter pin through hole in advance arm and slot in secondary arm. With No. 1 piston on compression stroke, turn engine over until punch marks on flywheel (which are 8° 20' or 3/4" before the top dead center mark 'UDC/1-8') are directly opposite pointer in inspection hole in flywheel housing. Loosen advance arm clamp bolt, rotate distributor until first set of contacts (mounted directly on breaker plate) begin to open (use test lamp), tighten clamp bolt, connect spark plugs as indicated on diagram.

**Synchronization of Contacts**—first method as part of timing operation. After distributor has been timed to engine (above), turn engine over 90 degrees to firing position of piston No. 6 when punch marks on flywheel which



# STUDEBAKER

PRESIDENT EIGHT MODEL 91 (1932), SERIAL NUMBERS 6,025,001 UP  
DELCO-REMY SYSTEM

are 8° 20' or 3/4" before the dead center mark 'UDC/3-6' should be directly opposite pointer on housing in inspection hole. Loosen lock screws on movable sub-plate (carrying second set of contacts), turn eccentric adjusting screw until contacts begin to open, tighten lock screws, check contact gap. If outside limits of .018-.024 inch, reset at .022 inch and repeat synchronization.

**Second Method**—using synchronizing tool. Use Delco-Remy tool, Part No. 1838182, and follow complete directions in Equipment Section.

**Firing Order**:—1-6-2-5-8-3-7-4. No. 1 cylinder nearest radiator.

**Spark Plugs**:—7/8-18 S.A.E. Champion #4. Set gap at .025 inch.

**VALVE TIMING**:—Valves at right of engine. Camshaft gear driven from camshaft. Crankshaft gear castiron. Camshaft gear celoron.

	Head Diameter	Stem Diameter	Length	Seat Angle	Lift
Intake	1 21/32"	.3725-.3735"	5 19/32"	45°	11/32"
Exhaust	1 9/16"	.3715-.3725"	5 19/32"	45°	11/32"

Tappet Clearance		Spring Pressure
Operating	Timing	
Intake	.004" (hot)	98-108 pounds—length 1 3/4 inches
Exhaust	.006" (hot)	

### Timing

Intake valves open 5 degrees after top dead center. Intake valves close 45 degrees after lower dead center.

Exhaust valves open 40 degrees before lower dead center. Exhaust valves close 12 degrees after top dead center.

**To Check Valve Timing.** Set tappet clearance No. 1 intake valve at .010 inch (cold). With No. 8 piston on compression turn engine over until piston is slightly past top dead center with flywheel mark 'IN-OP/1-8' (which is 12° past the top dead center mark 'UDC/1-8') directly opposite pointer in inspection hole on housing. No. 1 intake valve should begin to open at this point. Reset tappet clearance at .004 inch with engine hot.

**To Set Valve Timing.** One tooth on crankshaft gear marked. Two adjacent teeth on camshaft gear marked. Mesh gears so that marked tooth on crankshaft gear is between two marked camshaft gear teeth.

**STARTER**:—Model 497. Starter drives engine through outboard Bendix drive. Rotation counter-clockwise at commutator end. Brush spring tension, 36-40 ounces. Starter cranks engine at 90 R.P.M. (armature speed 1008 R.P.M.) drawing 180 amperes.

Starter Data			
Torque	R.P.M.	Volts	Amperes
0 lb. ft.	3000	5	70
3.6 "	1008		180
19 "	Lock	3.0	500
24 "	Lock	3.05	550

**Startix**:—This model equipped with Startix automatic starting switch—see complete article on Startix in Equipment Section.

**Mounting**:—Starter flange mounted on forward face flywheel housing at left of engine. To remove, disconnect cable, take out 3 flange mounting cap screws, pull starter straight forward to clear housing, lift from place.

**Oiling**:—Starter bearings are oilless.

**GENERATOR**:—Model 927-J. Third brush regulation, thermostat control. Therput approximately 40%. To adjust charging rate, loosen small round headed lock screw on commutator end plate, take off cover band, shift third brush (by hand) counter-clockwise to increase or clockwise to decrease charging rate, tighten lock screw. With standard car setting maximum charging rate is 13 amperes (hot) at 7.7 volts reached at 1800 R.P.M. or 22 M.P.H.

Generator Data					
Cold Test			Hot Test		
Amperes	Volts	R.P.M.	Amperes	Volts	R.P.M.
20-22	8.5-8.7	1600	12-14	7.6-7.9	1800
Brush spring tension, 20-28 ounces. Shunt field current, 1.8-2.3 amperes at 6 volts. Generator motoring draws 3.5 amperes at 6 volts.					

**Mounting**:—Generator cradle mounted at left front of engine, driven by fan belt. Drives water pump through shaft extension and flexible coupling. To remove, disconnect lead, disconnect water pump drive coupling, slack off belt adjustment, loosen mounting clamp band, lift generator out.

**Belt Adjustment.** Loosen nut on back of fan bracket, lift up fan assembly until fan can just be turned with belt held stationary, tighten nut.

**Oiling**:—1000 Miles. Put 2-4 drops S.A.E. No. 20 engine oil in oiler at each end of generator.

**RELAY**:—Model 265-B. Mounted on generator. Relay contacts close at 10 M.P.H. or 650 R.P.M. (generator) when generator voltage reaches 6.4 volts. Contacts open with discharge current of 1-2.5 amperes. Charging current at closing of contacts approximately 1 ampere. Relay contact gap limits, .015-.025 inch. Air gap limits .012-.017 inch (contacts closed).

**LIGHTING**:—Clum Switch, Model 9115. Lighting switch mounted at lower end of steering column controlled by lower lever on steering wheel. Dimmer system 'depressed beam' double filament headlight bulbs controlled by lighting switch.

Position	Lamp Sizes		Base	Mazda No.
	Voltage	Candlepower		
Headlights	6-8	21-21	D.C.	1110
Parking (Fender) Lights	6-8	3	S.C.	63
Dash and Tail Lights	6-8	3	S.C.	63
Stop Light	6-8	15	S.C.	87
Dome and Corner Lights	6-8	6	S.C.	81

**NOTE**:—Stop light switch is Delco-Remy, Model 466-Q.

**CURRENT LIMIT RELAY**:—Model 410-L. Vibrating circuit breaker mounted on dash. Starts to operate with current load of 30-35 amperes, limits current to 5-18 amperes with direct short-circuit. Contact gap limits, .012-.030 inch. Air gap limits, .015-.025 inch. Spring tension, 5 ounces minimum (measured at brass button with spring scale hooked under contact arm and at right angles to arm).

**CLOCK**:—Borg electric type. Equipped with 5 ampere fuse on back of clock.

**GASOLINE GAUGE**:—A.C. Electric type (see Equipment Section). Selector switch in gauge circuit permits readings to be obtained with ignition turned 'off' by pressing switch button (gauge always registers with ignition turned 'on').

**FUEL PUMP**:—Stewart Warner Mechanical type (see Equipment Section). Fuel pump mounted at right of engine, driven from camshaft.

**HORNS**:—Sparton horn mounted under engine hood (standard) or twin horns mounted under headlights (optional). Current draw approximately 6 amperes each.

# STUTZ

## SIX CYLINDER MODEL LAA (1932)

### DELCO-REMY GENERATING, STARTING SYSTEM DELCO-REMY IGNITION

**CAR SERIAL NUMBER:**—Stamped on plate on right front side of dash and on right top side of front frame cross member (forward engine support).

**ENGINE NUMBER:**—Stamped on plate on right side of cylinder cover and on right crankcase wall back of distributor.

**BATTERY:**—Prest-O-Lite, Type A-617-SP, 6 volt, 17 plate, 160 ampere hour capacity (5 ampere rate). Starting capacity 170 amperes for 20 minutes. Negative (—) terminal grounded. Battery mounted under driver's seat. Battery size 7 inches wide, 13 inches long, 9 $\frac{5}{8}$  inches high.

**IGNITION:**—Coil Model 528-C (two used). Coils are mounted under the hood on the right side. Ignition current is 10 amperes at 6 volts with engine stopped and 6 amperes at 6 volts with engine running. The ignition switch is a Delco-Remy Dual-lock Model 426-K.

**Distributor Model 4043.** Breaker contact gap .018-.024 inch. Set contact gap by loosening lock nut on stationary contact mounting stud and turning up stud until correct gap is obtained with breaker arm on lobe of cam. Re-surface contacts when necessary with a fine flat contact file or on a medium hard oilstone. Breaker arm spring tension 17-21 ounces (measured at tip of breaker arm with spring scale at right angles to contact surface). There are two sets of contacts operating on a six lobe cam. Contacts open simultaneously to fire both spark plugs in each cylinder. Contacts must be synchronized (see Timing). Distributor is semi-automatic. Maximum manual advance is 38° (engine).

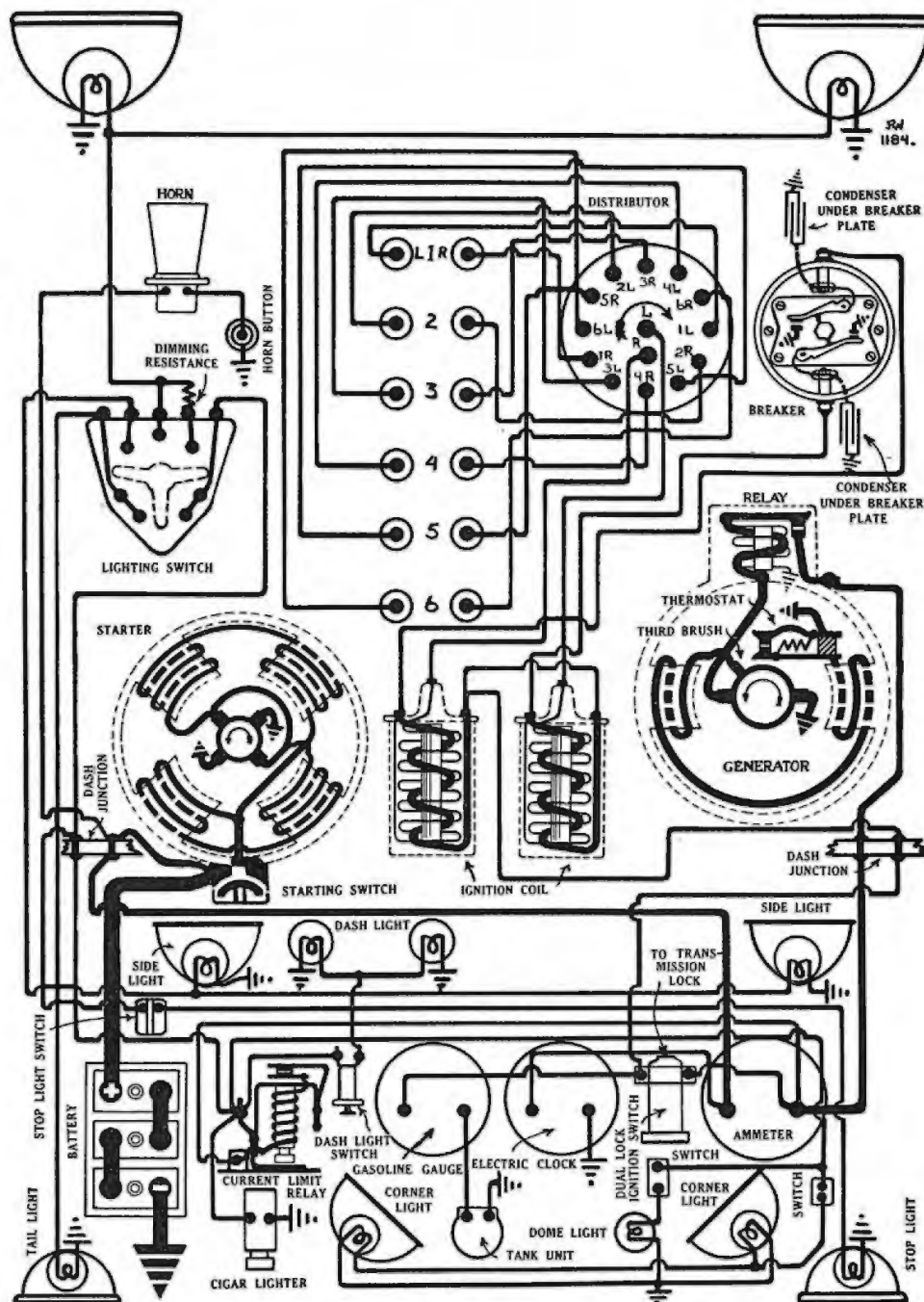
Engine	Degrees	Automatic Advance	Distributor	R.P.M.	Engine
0.....		Start.....	300.....		600
22.....	11	.....	1400.....		2800

**Mounting:**—Distributor is mounted on accessory bracket at right of engine. To remove distributor, disconnect manual advance rod and primary leads and remove distributor head with cables intact. Then remove manual advance stop screw and lift distributor from place.

**Oiling:**—Put 8 or 10 drops of light engine oil in the oiler on the side of the distributor every 750 miles. Every 1000 miles remove the distributor head and rotor and put a small amount of vaseline on the face of the breaker cam and oil the breaker arm pivot pins with light engine oil.

**Timing:**—**Synchronization of Contacts.** Contacts must be synchronized so that they open at the same instant firing both spark plugs in each cylinder simultaneously. Connect a six volt lamp in each primary circuit. Turn ignition on and crank engine over slowly. The lamps will go out as each set of contacts open. If both lamps go out at the same instant the contacts are synchronized. If they do not, loosen the four lock screws on the breaker plate and shift the plate causing one set of contacts to open earlier or later until synchronization is effected. Then tighten lock screws and check contact gap with breaker arm on lobe of cam. If outside limits of .018-.024 inch, reset at .022 inch and repeat synchronization.

**Timing Distributor to Engine.** Standard setting 15 degrees (on flywheel) before top dead center with manual spark control fully advanced. To set timing, fully advance manual spark control, see that distributor is rotated counter-clockwise as far as possible, take off cover over inspection hole in flywheel housing. With No. 1 piston on compression stroke turn engine over until flywheel mark 'AD.SP.K.1 & 8' is directly opposite indicator in inspection hole in housing. Loosen lock screw in center of breaker cam, carefully locate cam so that contacts are beginning to open, tighten locking screw. Connect spark plugs as indicated on diagram.



# STUTZ

## SIX CYLINDER MODEL LAA (1932)

### DELCO-REMY GENERATING, STARTING SYSTEM

### DELCO-REMY IGNITION

**Firing Order:**—The firing order is 1-5-3-6-2-4. Spark plugs are connected 1R-6L-5R-2L-3R-4L-6R-1L-2R-5L-4R-3L clockwise around the distributor head. Spark plugs are right (R) and left (L) in the cylinder head as viewed from the driver's seat and No. 1 cylinder is nearest the radiator.

**Spark Plugs:**—18 MM. Metric Champion No. 7. Set gaps at .022 inch.

**VALVE TIMING:**—Valves in cylinder head operated directly by overhead camshaft. Camshaft driven from transfer sprocket on front of engine block by silent timing chain. Transfer sprocket driven from crankshaft by silent timing chain. Automatic idler take-up sprockets are used on both chains.

	Head Diameter	Stem Diameter	Length	Seat Angle	Lift
Intake and Exhaust	1 21/32"	3/8"	6 11/32"	45°	11/32"
	<b>Tappet Clearance</b>		<b>Spring Pressure</b>		
Intake	.028" (see Note)		56 pounds (length 2 27/64")		
Exhaust	.028" (see Note)		102 pounds (length 2 5/64")		

#### Timing

Intake valves open 1 degree before top dead center. Intake valves close 55 degrees after lower dead center.

Exhaust valves open 49 degrees before lower dead center. Exhaust valves close 7 degrees after top dead center.

**Note on Tappet Clearance or Lash.** Valves equipped with conventional removable valve stem guide (inner guide) and piston guide (outer guide) screwed on end of valve stem. Valve cap (which bears against cam face) screwed on end of valve stem against valve piston. To set tappet clearance or lash, turn camshaft until nose of cam points up at 45° angle with heel of cam at one side of metering pin directly over valve cap. Insert bar in hole in valve piston (piston guide cut away on left side) to hold valve piston from turning and turn valve cap by bar inserted in hole. Adjust lash to .028 inch by screwing valve cap and piston up or down on valve stem.

**To Set Valve Timing.** Cam shaft sprocket should be taken off cam shaft and automatic adjusting sprocket must be off engine. Crank engine over until piston No. 1 reaches a position 7 degrees past top dead center when the flywheel mark 'EX.CL.1 & 6' should be in the exact center of the inspection hole in the upper flywheel housing. Then turn cam shaft until the heel of the first cam at the front of the engine is directly above No. 1 valve (exhaust valve in cylinder No. 1). Set lash or clearance between valve cap and cam at .028 inch (this is very important). Then turn cam shaft in direction of rotation (clockwise) until the valve has opened and just closed. This may be determined by inserting pin in hole in valve cap and oscillating valve. The added drag when the valve seats will be perceptible. Then mesh cam shaft sprocket in upper chain and rotate sprocket counter-clockwise to take up all the slack in the driving side of the chain. Line up holes in sprocket and cam shaft flange by slipping chain one tooth at a time on the transfer sprocket. Insert four cap screws mounting sprocket on cam shaft. Mesh automatic adjusting sprocket in chain and insert eccentric adjusting hub. Wind up spiral spring one and one half turns to provide proper chain tension and insert spring tongue in nearest slot. Assemble plain washer on sprocket shaft and insert cotter.

**STARTER:**—Model 726-C. Starter is connected to the engine through a clutch and manual pinion shift connected to the starting switch. The direction of rotation is counter-clockwise, viewed from the commutator end. Brush spring tension is 24-28 ounces.

Starter Data			
Torque	R.P.M.	Volts	Amperes
0 lb. ft.	8000	5	65
15 "	Lock	3.15	570

**Mounting:**—Starter is flange mounted at left of engine on forward side of flywheel housing. To remove starter, disconnect cable and starting pedal linkage and remove three flange mounting cap screws. Then pull starter forward and lift from place.

**Oiling:**—Put 8 or 10 drops of light engine oil in the oiler on the commutator end of the starter every 750 miles. The drive end bearing is oilless.

**GENERATOR:**—Model 391. The direction of rotation is counter-clockwise, viewed from the commutator end. Generator current regulation is by third brush shunt field and thermostat. Thermostat contacts open at 165°F. cutting the resistance across the thermostat contacts in series with the shunt field and reducing the output approximately 40%. To adjust generator output, take off commutator cover band and shift third brush using a screw-driver inserted in the notch in the third brush plate to shift the plate. Shift third brush counter-clockwise to increase or clockwise to decrease the charging rate. Third brush mounting plate held in position by friction. With standard car setting maximum charging rate is 12 amperes (hot) at 7.6 volts reached at 1600 R.P.M. or 32 M.P.H.

#### Generator Data

Cold Test		Hot Test			
Amperes	Volts	R.P.M.	Amperes	Volts	R.P.M.
22-24	8.2-8.62	1400	10-12	7.35-7.65	1600

Shunt field current is 1.8-2.3 amperes at 6 volts. Brush spring tension is 20-28 ounces.

**Mounting:**—Generator is flange mounted at right of engine on rear of accessory bracket. To remove generator, disconnect water pump drive coupling and generator lead and remove three flange mounting cap screws. Then pull generator to rear and lift from place.

**Oiling:**—Put 8 or 10 drops of light engine oil in the oiler at each end of the generator every 750 miles.

**RELAY:**—Model 266-N. Relay is mounted on the generator. Relay contacts close at 575 R.P.M. or 8 M.P.H. when the generator voltage reaches 7-7.5 volts and open with a discharge current of 0-2.5 amperes. Contacts separate .015-.020 inch. Air gap is .014-.021 inch with contacts closed.

**LIGHTING:**—Delco-Remy Switch Model 486-G. Lighting switch is mounted at lower end of steering column. Headlights are dimmed by resistance on lighting switch. Lighting switch positions:

1. Lever vertical—All lights off.
2. No. 1 right—Headlights dimmed through resistance, tail light on.
3. No. 2 right—Headlights on bright, tail light on.
4. No. 1 left—Cowl lights on, tail light on.

#### Lamp Sizes

Position	Voltage	Candlepower	Base	Mazda No.
Headlights	6-8	32	S.C.	1133
Parking Lights	6-8	3	S.C.	63
Dash and Tail Lights	6-8	3	S.C.	63
Stop Light	6-8	15	S.C.	87
Dome and Corner Lights	6-8	15	S.C.	87

**CURRENT LIMIT RELAY:**—Model 410-C. This device is a vibrating circuit breaker mounted on the dash and connected in the lighting circuits. It begins to vibrate when the current flow reaches 20-30 amperes and continues limiting the current to 2-15 amperes. Contacts separate .012-.030 inch. Air gap is .019-.025 inch with contacts closed.

# STUTZ

## MODEL SV-16 (1931-32)

### DELCO-REMY SYSTEM

**CAR SERIAL NUMBER:**—Stamped on plate on right front side of engine dash and on right top side of front frame cross member (forward engine support).

**ENGINE NUMBER:**—Stamped on plate on right side cylinder cover and on right crankcase wall back of distributor.

**BATTERY:**—Prest-O-Lite, Type A-617-SP, 6 volt, 17 plate, 160 ampere hour capacity (5 ampere rate). Starting capacity 170 amperes for 20 minutes. Negative (—) terminal grounded. Battery mounted under driver's seat. Battery size 7 inches wide, 13 inches long, 9 $\frac{5}{8}$  inches high.

**IGNITION:**—Coil Model 531-C (2 used). Coils mounted at right of engine. Ignition current 6 amperes at 6 volts (engine running), 10 amperes at 6 volts (engine stopped), both coils. Ignition switch Oakes 'Hershey' type co-incident steering post and ignition switch lock.

**Distributor Model 4028.** Two breaker arm, 8-lobe cam type with semi-automatic advance. Breaker contacts open simultaneously to fire both spark plugs in each cylinder. Contacts must be synchronized—(see Timing). Manual advance controlled by left hand lever on steering wheel. Breaker gap set at .020 inch. Hold within limits of .018-.024 inch. To set gap, loosen lock nut on stationary contact stud, turn up stud, tighten lock nut. Breaker arm spring tension 17-21 ounces (measured at tip of breaker arm with spring scale at right angles to contact surface). Manual advance 38 degrees (engine).

Engine	Degrees	Automatic Advance Distributor	Distributor	R.P.M.	Engine
0		Start	300		600
22		11	1400		2800

**Mounting:**—Distributor mounted on accessory bracket at right front of engine. To remove, disconnect manual spark control, take off distributor cap, take out hold-down screw in advance arm, lift distributor out.

**Oiling:**—750 Miles. Put 8-10 drops light engine oil in oiler on side of distributor cup.

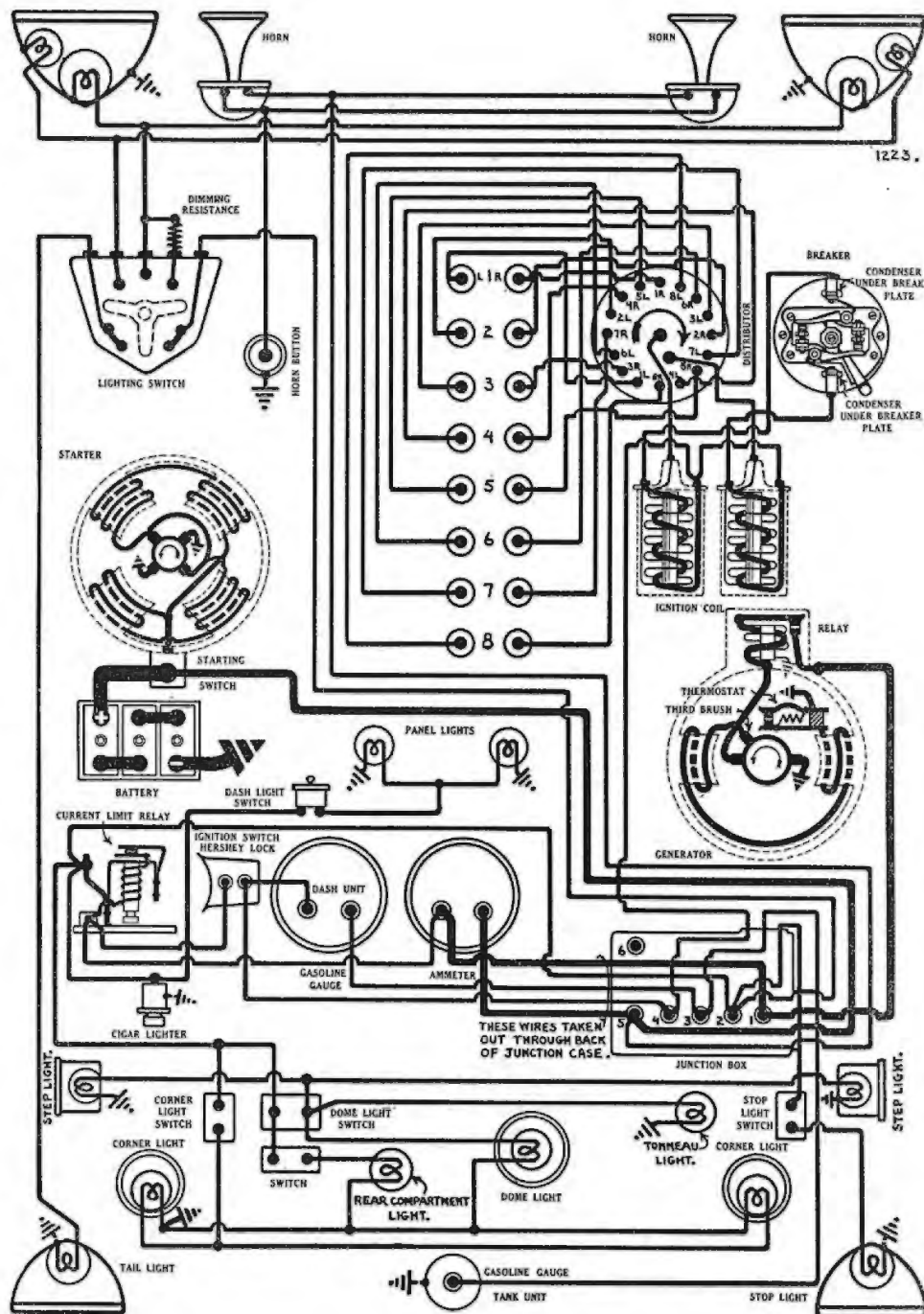
1000 Miles. Take off distributor cap and rotor. Put one drop oil on breaker arm pivot pins, apply thin film vaseline to face of breaker cam.

**Timing:**—Standard setting 15° (on flywheel) before top dead center with manual spark control fully advanced. To set timing, first advance manual spark control (pull lever down), see that distributor is rotated counter-clockwise to end of advance arm slot, take off cover over inspection hole in top of flywheel housing. With No. 1 piston on compression turn engine over until piston is slightly before top dead center with flywheel mark AD.SP.K. 1 & 8' directly opposite indicator on housing, loosen taper lock screw in center of breaker cam, carefully locate cam so that contacts are beginning to open (use test lamp), tighten locking screw, connect spark plugs as indicated on diagram.

**Synchronization of Contacts.** To synchronize contacts, connect test lamp in each primary circuit, loosen four lock screws on movable breaker sub-plate, shift plate until both sets of contacts open at the same instant. Synchronization should be checked whenever contacts are adjusted or ignition is set.

**Firing Order:**—1-6-2-5-8-3-7-4. No. 1 cylinder nearest radiator. See diagram for order in which spark plug cables are connected around distributor head.

**Spark Plugs:**—18 MM. Metric. Champion No. 7. Set gaps at .022 inch.





# STUTZ

## MODEL SV-16 (1931-32)

### DELCO-REMY SYSTEM

**VALVE TIMING:**—Valves in cylinder head operated directly from overhead camshaft. Camshaft driven from transfer sprocket on front of engine by silent timing chain. Transfer sprocket driven from crankshaft in tandem with accessory sprocket by silent timing chain. Automatic idler sprockets on both chains.

	Head Diameter	Stem Diameter	Length	Seat Angle	Lift
Intake and Exhaust	1 21/32"	3/8"	6 11/32"	45°	11/32"

	Tappet Clearance	Spring Pressure
Intake	.028" (see note)	Closed ..... 56 pounds (2 27/64")
Exhaust	.028" (see note)	Opone ..... 102 pounds ( 2 5/64")

#### Timing

Intake valves open 1 degree before top dead center. Intake valves close 55 degrees after lower dead center.

Exhaust valves open 49 degrees before lower dead center. Exhaust valves close 7 degrees after top dead center.

**Note on Tappet Clearance or Lash:**—Valves equipped with conventional removable valve stem guide (inner guide) and piston guide (outer guide) screwed on end of valve stem. Valve caps (which bears against cam face) are screwed on valve stem against valve piston. To set tappet clearance or lash, turn camshaft until nose of cam points up at 45° angle with heel of cam at one side of metering pin directly over valve cap. Insert bar in hole of valve piston (piston guide cut away on left side), hold valve piston from turning, turn valve cap with bar inserted in hole to loosen. Adjust lash to .028" by screwing valve cap and piston up or down on valve stem.

**To Check Valve Timing.** Set tappet clearance or lash of No. 1 exhaust valve at .028" (see above). With No. 3 piston on compression turn engine over until No. 1 exhaust valve begins to close (insert valve adjusting rod in hole in valve cap and oscillate valve until added drag indicates that valve has begun to seat). Flywheel mark 'EX.CL.1 & 8' should be directly opposite indicator on housing (inspection hole at top or side of flywheel housing).

**To Set Valve Timing**—with upper chain and idler sprocket off engine and camshaft sprocket off camshaft. Turn crankshaft until flywheel mark 'EX. CL.1 & 8' is directly opposite indicator on housing. Turn camshaft in direction of rotation until No. 1 exhaust valve has begun to close (see paragraph above). Mesh camshaft sprocket in chain, turn sprocket counter-clockwise to take up all slack in driving side of chain, slip chain on transfer sprocket one tooth at a time until cap screws can be inserted without disturbing position of camshaft (a closer adjustment can be obtained by rotating camshaft sprocket one quarter turn which changes the timing 1/4 tooth). After mounting camshaft sprocket, mesh automatic sprocket, turn eccentric hub clockwise to take up all slack in chain, wind up spring 1 1/2 turns to secure proper spring tension, insert end of spring in nearest slot in stud, assemble plain washer and cotter pin. Wire camshaft sprocket cap screws. Check setting and set tappet clearance or lash of all valves at .028 inch.

**STARTER:**—Model 726-C. Manual pinion engagement type. Starting pedal operates pinion engagement and starting switch (switch mounted on starter field frame). Starter drives through overrunning clutch. Rotation counter-clockwise at commutator end. Brush spring tension 24-28 ounces.

Starter Data			
Torque	R.P.M.	Volts	Amperes
0 lb. ft.	6000	5.0	65
15 "	Lock	3.15	570

**Mounting:**—Starter flange mounted left front face flywheel housing. To re-

move, disconnect cable, disconnect starting pedal linkage, take out 3 flange mounting screws, pull starter forward to clear pinion housing, lift out.

**Oiling:**—750 Miles. Put 8-10 drops light engine oil in commutator end oiler. Intermediate bearing and drive end bearing are graphite bronze oilless.

**GENERATOR:**—Model 391. Third brush regulation, thermostat control. Thermostat operates at 160°F. (contacts open, cuts in resistance) reducing output approximately 40%. To adjust charging rate, take off commutator cover band, shift third brush by prying on brush mounting plate with screwdriver inserted in slot in plate. Shift third brush counter-clockwise to increase or clockwise to decrease charging rate. Brush mounting plate held in position by friction. Rotation counter-clockwise at commutator end. Maximum charging rate 12 amperes (hot) at 7.3 volts reached at 1600 R.P.M. or 32 M.P.H.

Generator Data					
		Cold Test		Hot Test	
Amperes	Volts	R.P.M.	Amperes	Volts	R.P.M.
22-24	8.2-8.6	1400	10-12	7.3-7.6	1600
Brush spring tension 20-28 ounces. Shunt field current 1.8-2.3 amperes at 6.0 volts.					

**Mounting:**—Generator flange mounted on rear face of accessory bracket at right of engine. To remove, disconnect water pump drive coupling, disconnect lead, take out 3 flange mounting screws, pull generator to rear to disengage drive coupling, lift out.

**Oiling:**—750 Miles. Put 8-10 drops light engine oil in oiler at each end.

**RELAY:**—Model 266-N. Relay mounted on generator. Contacts close at 600 R.P.M. of generator or 7 M.P.H. with generator voltage of 7-7.5 volts and open with discharge current of 0-2.5 amperes. Relay contact gap limits .015-.025 inch. Air gap limits .012-.017 inch (contacts closed).

**LIGHTING:**—Delco-Remy Switch, Model 486-G. Lighting switch mounted at lower end of steering column controlled by lower lever on steering wheel. Dimmer system resistance on lighting switch reduces headlights to approximately 21 cp. Instrument lights controlled by button on lower right hand corner of instrument panel. Lighting switch positions:

1. Lever vertical—All lights off.
2. No. 1 right—Headlights dimmed (through resistance), tail light on.
3. No. 2 right—Headlights on bright, tail light on.
4. No. 1 left—Parking bulbs (in headlights) on, tail light on.

Lamp Sizes				
Position	Voltage	Candlepower	Base	Mazda No.
Headlights	6-8	32	S.C.	1133
Parking Lights	6-8	3	S.C.	63
Dash and Tail Lights	6-8	3	S.C.	63
Stop Light	6-8	15	S.C.	87
Dome and Corner Lights	6-8	15	S.C.	87

**CURRENT LIMIT RELAY:**—Model 410-C. Vibrating circuit breaker mounted on back of instrument panel at extreme left. Circuit breaker begins to vibrate with current load of 25-30 amperes limiting load to 2-15 amperes with direct short-circuit. Contact gap limits .012-.030 inch. Air gap limits .015-.025 inch (contacts closed). Spring tension measured at brass button 5 ounces (measure with spring scale hooked under contact spring arm and at right angles to arm).

**GASOLINE GAUGE:**—Motometer electric type (see Equipment Section).

# STUTZ

## MODEL DV-32 (1931-32)

### DELCO-REMY SYSTEM

**CAR SERIAL NUMBER:**—Stamped on plate on right front side of engine dash and on right top side of frame front cross member (front engine support).

**ENGINE NUMBER:**—Stamped on plate on right side cylinder head cover and on right crankcase wall back of distributor.

**BATTERY:**—Prest-O-Lite, Type A-617-SP, 6 volt, 17 plate, 160 ampere hour capacity (5 ampere rate). Starting capacity 170 amperes for 20 minutes. Negative (—) terminal grounded. Battery mounted under driver's seat. Battery mounted under driver's seat. Battery size 7 inches wide, 13 inches long, 9 $\frac{5}{8}$  inches high.

**IGNITION:**—Coil Model 531-C. Coil mounted on bracket at right front of engine beside generator. Ignition current 3 amperes at 6 volts (engine running) 5 amperes at 6 volts (engine stopped). Ignition switch is Oakes 'Hershey' type co-incidental ignition switch and steering post lock.

Distributor Model 660-W. Two breaker arm, 4 lobe cam type with semi-automatic advance. Breaker contacts open alternately at 45° intervals corresponding to 90° firing interval of engine. Contacts must be synchronized—see Timing. Breaker gap set at .020 inch. Hold within limits of .018-.024 inch. To set gap, loosen lock screw on stationary contact mounting plate behind breaker arm, turn eccentric adjusting screw, tighten lock screw. Breaker arm spring tension 17-21 ounces (measured at tip of breaker arm with spring scale at right angles to contact surface). Maximum manual advance 40 degrees (engine).

Degrees		Automatic Advance Data		R.P.M.	Engine
Engine	Distributor	Distributor			
0	Start	300			600
37	18 $\frac{1}{2}$	2100			4200

**Mounting:**—Distributor mounted on accessory bracket at right front of engine. To remove, disconnect lead, disconnect manual spark control, take off distributor cap, take out hold-down screw in advance arm, lift distributor out.

**Oiling:**—750 Miles. Turn down grease cup on side of shaft housing one full turn. Keep cup filled with medium cup grease.

**1000 Miles:**—Take off distributor cap and rotor. Oil wick oiler in center of shaft with light engine oil, apply thin film vaseline to face of breaker cam.

**Timing:**—Standard setting 20° (on flywheel) before top dead center with manual spark control fully advanced. To set timing, first advance manual spark control (pull lever down), see that distributor is rotated counter-clockwise to end of advance arm slot, take off cover plate over inspection hole in top of flywheel housing. With No. 1 piston on compression stroke, turn engine over until flywheel mark 'AD.SP.K.1&8' (which is 20° before top dead center mark 'TOP C.1 & 8') is directly opposite indicator in inspection hole, loosen advance arm clampscrew, rotate distributor until first set of contacts mounted directly on breaker plate begin to open (use test lamp), tighten clamp screw, connect spark plugs as indicated on diagram.

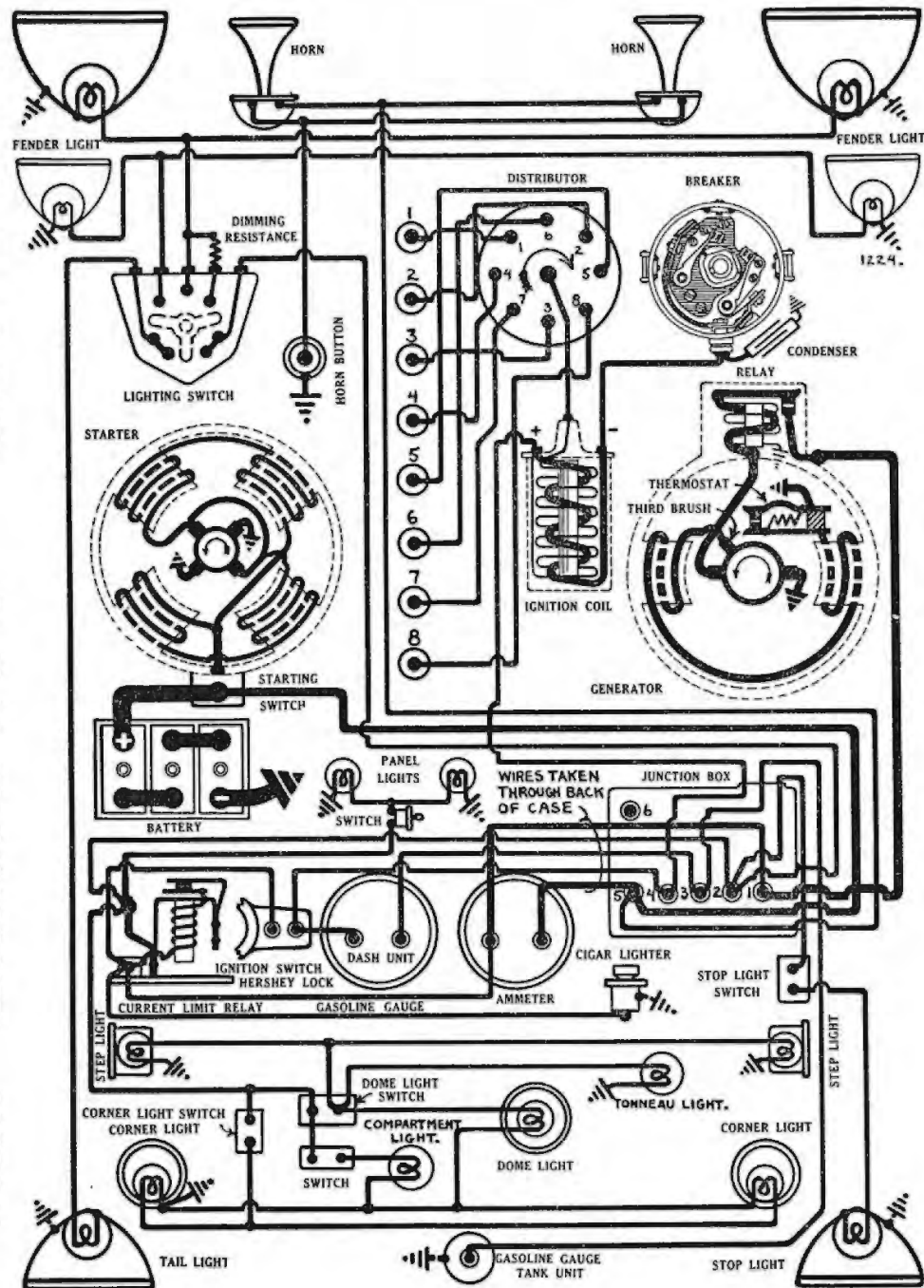
**Synchronization of Contacts.** Use special Delco-Remy tool, Part No. 1838182 and follow complete directions in Equipment Section. No flywheel marks provided to check synchronization by timing distributor using second set of contacts.

**Firing Order:**—1-6-2-5-8-3-7-4. No. 1 cylinder nearest radiator.

**Spark Plugs:**—18 MM. Metric. Champion No. 7. Set gaps at .022 inch.

**VALVE TIMING:**—Exhaust valves (two per cylinder) in cylinder head at right of engine operated by overhead exhaust camshaft. Intake valves (two per cylinder) in cylinder head at left of engine operated by overhead intake camshaft. Both camshafts driven in tandem by silent timing chain from transfer sprocket on front of engine block. Transfer sprocket driven in tandem with accessory sprocket by silent timing chain from crankshaft. Both chains equipped with automatic take-up idler sprockets, no adjustment necessary in service.

	Head Diameter	Stem Diameter	Stem Length (Straight Stem)	Seat Angle	Lift
Intake and Exhaust	19/32"	3/8"	5 21/32"	45°	11/32"
			Spring Pressure		
Intake	.028" or .046" see note		Closed 53 pounds (2 9/32")		
Exhaust	.028" or .046" see note		Open 115 pounds (1 15/16")		



# STUTZ

## MODEL DV-32 (1931-32)

### DELCO-REMY SYSTEM

#### Timing

Intake valves open 5° before top dead center. Intake valves close 41° after lower dead center.

Exhaust valves open 46° before lower dead center. Exhaust valves close 10° after top dead center.

**Note on Tappet Clearance or Lash:**—Tappet clearance on various engines set at either .028" or .046". Correct tappet clearance for each engine is stamped on name plate on engine and should be consulted when tappet clearance is being set. Valves are fitted with conventional removable valve stem guide (inner guide) and piston guide screwed on end of valve stem (outer guide). Valve cap (which bears on cam face) is screwed on valve stem against valve piston. To set tappet clearance or lash, turn camshaft until nose of cam is perpendicular (at right angles to face of valve cap), with metering pin turned off valve cap. Insert adjusting bar in hole in valve piston (piston guide cut away on inside), hold valve piston from turning, insert second bar in hole in valve cap and turn cap to loosen. Adjust lash to .028" or .046" by screwing valve cap and piston up or down on valve stem. All turning must be done on valve cap to avoid formation of burrs on valve piston.

**To Check Valve Timing Intake Camshaft:**—Set tappet clearance No. 1 intake and exhaust valves at .028" or .046" (see name plate on engine), take off cover plate over inspection hole in top or side of flywheel housing. Turn engine over until No. 1 intake cam is about to touch valve cap (tappet clearance taken up—valve about to open), insert adjusting bar in valve cap hole so that bar is pointed across engine and loop rubber band over bar fastening other end of band to engine so that band tension is slightly less than amount necessary to rotate valve. Turn engine over slightly until band begins to rotate valve indicating that valve has left its seat. Flywheel mark 'IN.OP.1 & 8' (which is 5° before top dead center mark "TOP. C. 1 & 8") should be directly opposite indicator on housing. If setting is not exact, turn crankshaft over two revolutions and stop with flywheel mark at indicator. Then loosen camshaft sprocket mounting cap-screws slightly, rotate camshaft until intake valve begins to open, tighten cap-screws (cap-screw holes are slotted). Check setting.

**To Check Exhaust Camshaft:**—After checking intake camshaft setting (above) insert adjusting rod in hole of No. 1 exhaust valve cap, turn engine over slowly until added drag on rod when valve is oscillated indicates that valve is beginning to seat. Flywheel mark 'EX.CL.1 & 8' (which is 10° after top dead center mark "TOP.C. 1 & 8") should be directly opposite indicator on housing. If setting is not correct, turn crankshaft two revolutions and stop with flywheel mark at indicator. Then loosen camshaft sprocket mounting cap-screws slightly, turn camshaft until valve closes, tighten mounting screws (cap-screw holes are slotted). Check setting.

**To Set Valve Timing:**—With intake and exhaust camshaft sprockets and automatic idler take-up sprocket off engine. Turn crankshaft until flywheel mark '0' (which is 2½° after top dead center mark "TOP.C.18") is directly opposite indicator on housing with distributor rotor pointed toward rear of car (if rotor points toward front of car turn engine over one complete revolution). Turn intake camshaft until No. 1 intake valve is about to open and turn exhaust camshaft until No. 1 exhaust valve is about to close. Mesh intake camshaft sprocket in chain, turn sprocket counter-clockwise to take up all slack in driving side of chain (between sprocket and transfer sprocket), see if lines indicating center of slotted holes in sprocket line up with lines on camshaft flange indicating center of cap-screw holes without disturbing position of camshaft. If they do not, slip sprocket on chain one tooth at a time to left until sprocket can be mounted on flange with marks in line without disturbing camshaft. This is necessary to provide for later adjustment. Insert cap-screws mounting sprocket on flange. Mesh exhaust camshaft sprocket in chain, turn to left to take up slack in driving side of chain between camshaft sprockets, slip sprocket on chain one tooth at a time until sprocket can be mounted on camshaft flange with marks indicating center of slots in sprocket and center of holes in flange in line without disturbing position of camshaft. Mesh automatic take-up idler sprocket in chain, turn eccentric hub to left to take up all slack in chain, wind up eccentric spring one and one half turns, insert end of spring in nearest slot, assemble washer and cotter. Check valve timing as directed above for both camshafts and make any

adjustment necessary by shifting sprockets on camshafts until exact settings are secured.

**STARTER:**—Model 726-C. Manual pinion engagement type. Starting pedal operates pinion engagement and starting switch (switch mounted on starter field frame). Starter drives through overrunning clutch. Rotation counter-clockwise at commutator end. Brush spring tension 24-28 ounces.

#### Starter Data

Torque	R.P.M.	Volts	Amperes
0 lb ft.	6000	5.0	65
15 " "	Lock	3.15	570

**Mounting:**—Starter flange mounted left front face flywheel housing. To remove, disconnect cable, disconnect starting pedal linkage, take out 3 flange mounting screws, pull starter forward to clear pinion housing, lift out.

**Oiling:**—750 Miles. Put 8-10 drops light engine oil in commutator end oiler. Intermediate bearing and drive end bearing are graphite bronze oilless.

**GENERATOR:**—Model 391. Third brush regulation, thermostat control. Thermostat operates at 160° F. (contacts open, cuts in resistance) reducing output approximately 40%. To adjust charging rate, take off commutator cover band, shift third brush by prying on brush mounting plate with screwdriver inserted in slot in plate. Shift third brush counter-clockwise to increase or clockwise to decrease charging rate. Brush mounting plate held in position by friction. Rotation counter-clockwise at commutator end. Maximum charging rate 12 amperes (hot) at 7.3 volts reached at 1600 R.P.M. or 32 M. P.H.

#### Generator Data

Cold Test		Hot Test			
Amperes	Volts	R.P.M.	Amperes	Volts	R.P.M.
22-24	8.2-8.6	1400	10-12	7.3-7.6	1600

Brush spring tension 20-88 ounces. Shunt field current 1.8-2.3 amperes at 6.0 volts.

**Mounting:**—Generator flange mounted on rear face of accessory bracket at right of engine. To remove, disconnect water pump drive coupling, disconnect lead, take out 3 flange screws, pull generator to rear to disengage drive coupling, lift out.

**Oiling:**—750 Miles. Put 8-10 drops light engine oil in oiler at each end.

**RELAY:**—Model 266-N. Relay mounted on generator. Contacts close at 600 R.P.M. of generator, or 7 M.P.H with generator voltage of 7-7.5 volts and open with discharge current of 0-2.5 amperes. Relay contact gap limits .012-.017 inch (contacts closed).

**LIGHTING:**—Delco-Remy Switch, Model 486-G. Lighting switch mounted at the lower end of steering column controlled by lower lever on steering wheel. Dimmer system resistance on lighting switch reduces headlights to approximately 21 cp. Instrument lights controlled by button on lower right hand corner of instrument panel. Lighting switch positions:

1. Lever vertical—All lights off.
2. No. 1 right—Headlights dimmed (through resistance), tail light on.
3. No. 2 right—Headlights on bright, tail light on.
4. No. 1 left—Fender lights on, tail light on.

#### Lamp Sizes

Position	Voltage	Candlepower	Base No.	Mazda
Headlights	6-8	32	S.C.	1133
Parking Lights	6-8	3	S.C.	63
Dash and Tail Lights	6-8	3	S.C.	63
Stop Lights	6-8	15	S.C.	87
Dome and Corner Lights	6-8	15	S.C.	87

**CURRENT LIMIT RELAY:**—Model 410-C. Vibrating circuit breaker mounted on back of instrument panel at extreme left. Circuit breaker begins to vibrate with current load of 25-30 amperes, limiting load to 2-15 amperes with direct short-circuit. Contact gap limits .012-.030 inch. Air gap limits .015-.025 inch (contacts closed). Spring tension measured at brass button 5 ounces measured with spring scale hooked under contact spring arm and at right angles to arm).

**GASOLINE GAUGE:**—Motometer electric type (see Equipment Section).

**FUEL PUMP:**—Stewart Warner mechanical fuel pump mounted on valve cover at left rear of engine (see Equipment Section).

# WILLYS KNIGHT

## MODEL 95 (1931-32), SERIAL NUMBERS 1001 UP

### PRODUCTION STARTED JUNE 6, 1931

#### AUTO-LITE SYSTEM

**CAR SERIAL NUMBER:**—Stamped on plate on right frame member in front of right front spring rear hanger and on body sill under driver's seat cushion.

**ENGINE NUMBER:**—Stamped on plate on right side of crankcase.

**BATTERY:**—U.S.L., Type 3-HVX-6X-6A, 6 volt, 117 ampere hour capacity (5 ampere rate). Starting capacity, 127 amperes for 20 minutes. Negative (—) terminal grounded. Battery mounted on right frame member under front compartment floor boards. Battery size, 7 7/16 inches wide, 10 7/16 inches long, 9 3/4 inches high.

**IGNITION:**—Coil Model IGC-4303. Lock coil type with ignition switch in base. Coil mounted on back of instrument board with ignition switch at right of instrument panel. Ignition current 1-3 amperes at 6 volts (engine running), 3.4-5 amperes at 6 volts (engine stopped).

**Distributor Model IGC-4045-A.** Single breaker arm, 6-lobe cam type with semi-automatic advance. Manual spark controlled by button at lower right of instrument panel. Normal running position with spark advanced—button pushed in, pull out button to retard spark. Breaker contact gap set at .018 inch. Hold within limits of .018-.020 inch. To set gap, loosen lock nut on stationary contact stud, turn up stud. Breaker arm spring tension, 16-22 ounces (measured at tip of breaker arm with spring scale in line with center of contacts and at right angles to arm). Maximum manual advance, 20 degrees (engine).

Engine	Degrees	Automatic Advance Distributor	Distributor	R.P.M.	Engine
0	Start	Start	300	600	
4	2	2	520	1040	
8	4	4	725	1450	
12	6	6	930	1860	
15	7 1/2	7 1/2	1100	2200	

**Mounting:**—Mounted on accessory drive housing at right of engine. To remove, disconnect manual advance control, disconnect primary lead, take off distributor cap, take out hold-down screw in advance arm, lift unit out.

**Oiling:**—250 Miles. Fill oiler under distributor cup with light engine oil.

500 Miles. Take off distributor cap and rotor, oil wick oiler in center of shaft, put one drop of oil on breaker arm pivot pin.

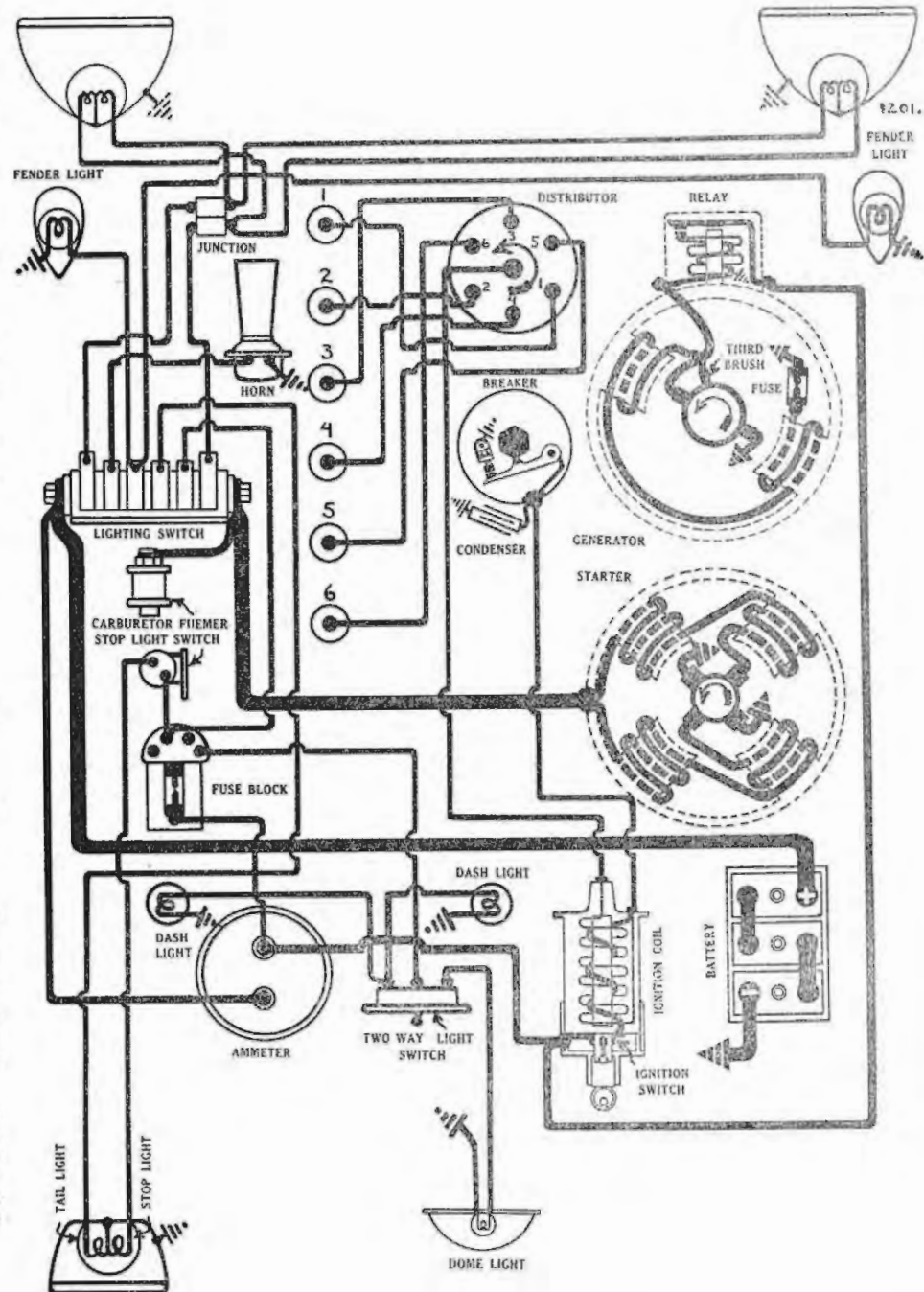
5000 Miles. Take off distributor cap and rotor, apply thin film vaseline to face of breaker cam.

**Timing:**—Standard setting 12° (on flywheel) or .058" (piston travel) before top dead center with manual spark control fully advanced. To set timing, advance manual spark control (push button in toward dash), take off cover over inspection hole in left front of flywheel housing. With No. 1 piston on compression turn engine over until flywheel mark 'IGN/' (which is 12° before top dead center mark 'TC/EC') is directly opposite pointed indicator pin in inspection hole, loosen advance arm clamp screw, rotate distributor until contacts begin to open (use test lamp), tighten clamp screw, connect spark plugs as indicated on diagram (No. 1 terminal as designated).

**NOTE:**—Flywheel is stamped with two sets of marks for right hand drive cars and left hand drive cars. Inspection hole on right hand drive cars is at right of housing and no confusion should result in setting timing if care is taken that No. 1 piston is approaching top dead center on compression when flywheel mark is checked. To determine compression stroke, take out No. 1 spark plug, close opening by placing thumb in port and turn engine over until air compressed in cylinder is felt escaping.

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

**Spark Plugs:**—7/8-18 S.A.E. Champion Type C-1. Set gaps at .020 inch.



# WILLYS KNIGHT

**MODEL 95 (1931-32), SERIAL NUMBERS 1001 UP**  
**PRODUCTION STARTED JUNE 6, 1931**  
**AUTO-LITE SYSTEM**

**VALVE TIMING:**—Sleeve valve type with double sleeves driven by eccentric shaft at left of engine. Eccentric shaft driven by chain from crankshaft. Chain adjustment by automatic idler sprocket.

### Valve Timing

Inlet port opens—10° or 1 9/64" on flywheel before top dead center.  
 Inlet port closes—35° or 3 31/32" on flywheel after lower dead center.  
 Exhaust port opens—45° or 5 7/64" on flywheel before lower dead center.  
 Exhaust port closes—at top dead center with flywheel mark 'TC/EC' at indicator on flywheel housing.

**To Check Valve Timing.** Take off exhaust manifold, take off cover plate on inspection hole in left front of flywheel housing. Scrape carbon from edges of exhaust port cylinder No. 1, turn engine over until port just closes when upper edge of port in outer sleeve passes lower edge of port in cylinder block (use .0015" feeler inserted in port or take out No. 1 spark plug and insert test light in spark plug port to check closing—closing of port will be indicated by sleeve gripping feeler or ray of light from test light being cut off). Flywheel mark 'TC/EC' should be directly opposite pointed indicator screw on housing. Retime sleeves when flywheel mark is more than 3/8" from indicator when port closes.

**To Set Valve Timing**—with chain and automatic idler sprocket dismantled. Turn crankshaft until No. 1 piston is on top dead center with flywheel mark 'TC/EC' at indicator on housing. Turn eccentric shaft clockwise until No. 6 exhaust port just closes (see paragraph above). Assemble chain on crankshaft sprocket, eccentric shaft sprocket, accessory sprocket. Mesh idler sprocket, take up all slack by turning eccentric bushing spring, turn spring 1 1/4 additional turn, insert end in nearest slot of idler sprocket stud. Rotor in distributor should be opposite No. 1 terminal in distributor cap.

**STARTER:**—Model MAD-4115. Starter drives through outboard Bendix drive. Rotation counter-clockwise at commutator end. Brush spring tension 44-56 ounces. Starter switch Pines 'Finger Tip Control' mounted at lower end of steering column (see Equipment Section).

### Starter Data

Torque	R.P.M.	Volts	Amperes
0 lb. ft.	3750	5.5	58.2
.7 "	2355	5.5	100
3.0 "	1260	5.0	200
5.7 "	770	4.5	300
8.85 "	425	4.0	400
13.0 "	Lock	3.0	505
20.2 "	Lock	4.0	730

**Mounting:**—Starter flange mounted on front face of flywheel housing at right of engine. To remove, disconnect cable, take out 2 flange mounting bolts, pull starter straight forward to clear Bendix housing, lift out.

**Oiling:**—500 Miles. Put 4-5 drops light engine oil in oiler at each end of armature shaft. Outboard bearing (Bendix housing) is oilless.

**GENERATOR:**—Model GAL-4103 (cars without free wheeling). Third brush regulation. To adjust charging rate, 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, 17-18 amperes (cold) at 8.0 volts reached at 1900 R.P.M.

### Model GAL-4103—Generator Data

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

Brush spring tension, 22-25 ounces (main brushes), 31-34 ounces (third brush)—manufacturers' recommendation. Shunt field current, 4.94-5.46 amperes at 7.2 volts. Generator field fuse, 7 1/2 ampere capacity.

**Model GAG-4134** (cars with free wheeling). Third brush regulation. Adjustment same as Model GAL-4103 (above). Maximum charging rate, 17 amperes (cold) at 8.0 volts reached at 1500 R.P.M.

### Model GAG-4134—Generator Data

Cold Test			Hot Test		
Amperes	Volts	R.P.M.	Amperes	Volts	R.P.M.
0	6.4	550	0	6.4	640
4	6.7	660	4	6.9	800
8	7.0	760	8	7.3	980
12	7.4	900	10	7.6	1110
16	7.8	1120	12	7.8	1280
19	8.0	1540	14.2	8.0	1680
13	7.4	2400	11.5	7.7	2400

Brush spring tension, 22-27 ounces. Shunt field current, 3.99-4.41 amperes at 6.0 volts. Generator motoring draws 5.13-5.67 amperes at 6.0 volts. Generator field fuse, 7 1/2 ampere capacity.

**Mounting:**—Generator cradle mounted at right of engine. Driven through flexible coupling from accessory sprocket. To remove, disconnect lead, disconnect drive coupling, loosen mounting clamp band, lift generator out.

**Oiling:**—250 Miles. Put 4-6 drops light engine oil in oiler at each end.

**RELAY:**—Model CB-4014. Mounted on generator. Relay contacts close with generator voltage of 7-7.5 volts and open with discharge current of .5-2.5 amperes. Contact gap limits, .025-.035 inch. Air gap limits, .010-.030 inch (contacts closed).

**LIGHTING:**—Pines Switch, Model A-805. Lighting switch 'Finger Tip Control' type mounted at lower end of steering column controlled by button on steering wheel (see Equipment Section). Dimmer system 'depressed beam' double filament headlight bulbs controlled by lighting switch.

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

NOTE:—Stop and tail light is a combination double filament bulb. Connect tail light lead to 2 cp. filament.

**FUSES:**—20 ampere capacity fuse mounted on fuse block left front of dash. Generator field fuse 7 1/2 ampere capacity mounted on brush ring.

**GASOLINE GAUGE:**—K-S Telegauge, hydrostatic type (see Equipment Section).

**FUEL PUMP:**—A.C. Type 'B' mechanical fuel pump mounted at left of engine (see Equipment Section).

# WILLYS KNIGHT

MODEL 66-D (1932), SERIAL NUMBERS 6701 UP  
 PRODUCTION STARTED DECEMBER 8, 1931  
 AUTO-LITE GENERATING, STARTING SYSTEM  
 AUTO-LITE IGNITION

**CAR SERIAL NUMBER:**—On plate on right frame member above front spring rear hanger and under driver's seat cushion.

**ENGINE NUMBER:**—On plate on left side of crankcase.

**BATTERY:**—U. S. L. Type HW-17A. 6 volt, 17 plate, 166 ampere hour capacity (5 ampere rate). Starting capacity 170 amperes for 20 minutes. Negative (—) terminal grounded. Battery mounted on left frame member under front compartment floor boards. Battery size 7 inches wide, 13 1/16 inches long, 9 1/8 inches high.

**IGNITION:**—Coil Model IG-4303. The ignition switch is built in the base of the coil. Coil is mounted on the back of the instrument board with the switch extending through to the face of the instrument panel. Ignition current is 1-1 1/2 amperes at 6 volts with engine running and 3.4-5 amperes at 6 volts with engine stopped.

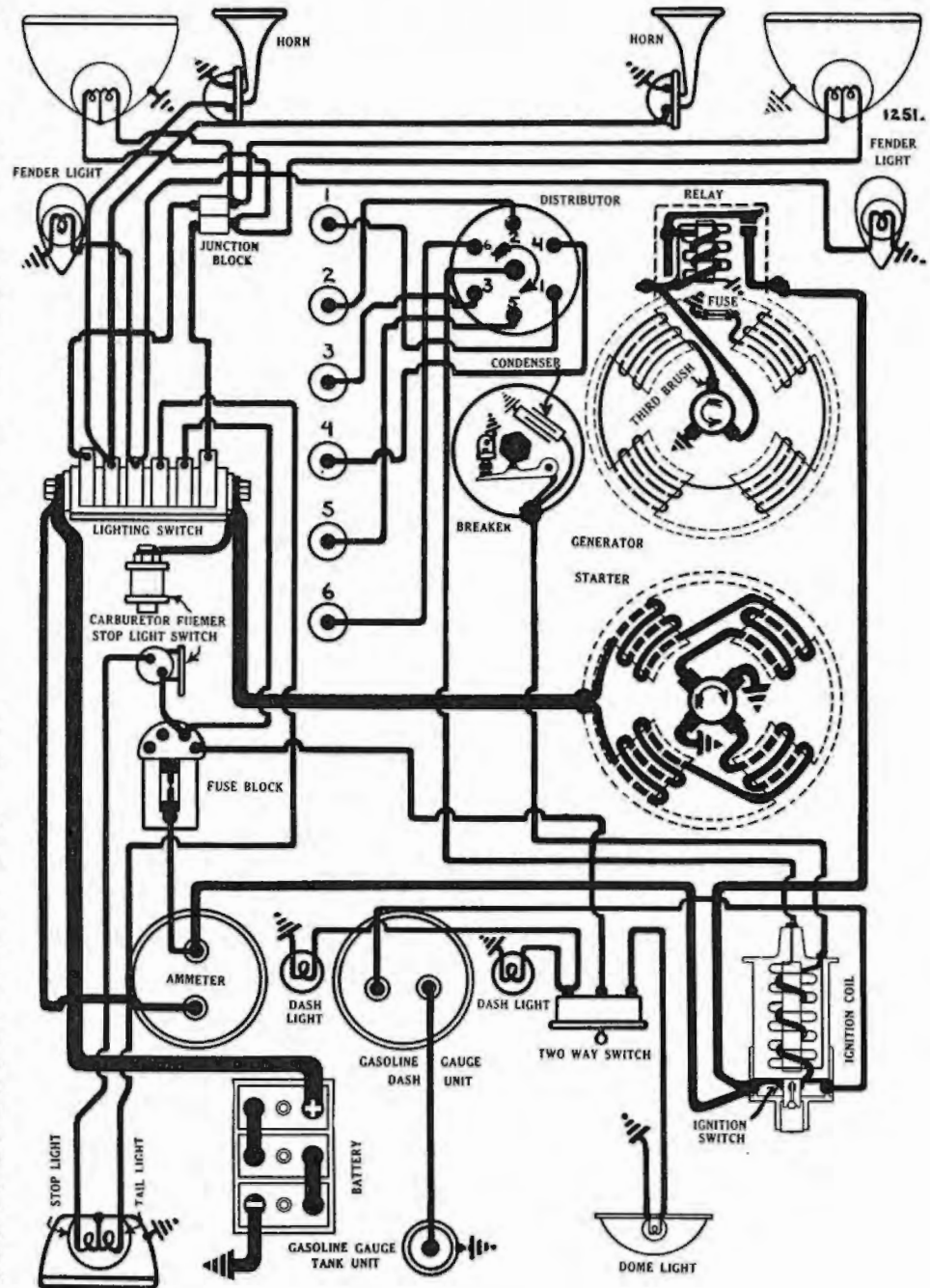
**Distributor Model IGC-4052.** Breaker contacts separate .018-.020 inch. Set contact gap by loosening lock nut on stationary contact mounting stud and turning up stud until gap is .020 inch with breaker arm on lobe of cam. Resurface contacts when necessary with a fine flat contact file or on a medium hard oilstone. Breaker arm spring tension is 18-22 ounces. Distributor is semi-automatic. Maximum manual advance is 20 degrees (engine).

Degrees	Automatic Advance		R.P.M.
Engine	Distributor	Distributor	Engine
0.....	Start .....	200.....	400
5.....	2 1/2 .....	575.....	1150
10.....	5 .....	920.....	1840
15.....	7 1/2 .....	1275.....	2550
21.....	10 1/2 .....	1700.....	3400

**Mounting:**—Distributor is mounted on top of oil pump housing at right of engine. To remove distributor, disconnect primary lead and manual advance control and remove distributor head with cables intact. Then take out hold-down screw in advance arm and lift distributor from place.

**Oiling:**—Fill the oiler on the side of the distributor shaft housing with light engine oil every week or each 250 miles. Every 1000 miles remove the distributor head and rotor and put several drops of oil in the wick oiler in the center of the shaft and one drop of oil on the breaker arm pivot pin. Every 5000 miles put a small bit of vaseline on the face of the breaker cam.

**Timing:**—Breaker contacts begin to open when the piston entering power stroke reaches a position .112 inch (actual piston travel) or 16 degrees (on the flywheel) before top dead center with the manual spark control fully advanced. To set timing, crank engine over until piston No. 1 enters compression stroke. This can be determined by taking out No. 1 spark plug and turning the engine over until the air compressed in the cylinder is felt escaping through the spark plug part. Fully advance the manual spark control (push the spark button all the way in toward the dash) and see that the distributor is turned counter-clockwise as far as possible. Turn engine over until the ignition mark on the flywheel 'IGN' which is 16 degrees before the top dead center mark 'T.C.' is directly opposite the indicator in the inspection hole in the flywheel housing. Take up all backlash in distributor gears by turning distributor shaft counter-clockwise. Then loosen advance arm clamp screw and rotate distributor until contacts begin to open. Tighten the clamp screw and connect spark plugs as shown on the diagram.



# WILLYS KNIGHT

MODEL 66-D (1932), SERIAL NUMBERS 6701 UP  
 PRODUCTION STARTED DECEMBER 8, 1931  
 AUTO-LITE GENERATING, STARTING SYSTEM  
 AUTO-LITE IGNITION

**Firing Order:**—The firing order is 1-5-3-6-2-4.

**Spark Plugs:**—Spark plugs are 7/8-18 S.A.E. Champion Type C-4. Gaps are .020 inch.

**VALVE TIMING:**—The Willys Knight engine is of the sleeve valve type. To time sleeve valves with eccentric shaft sprocket removed, remove pipe plug in exhaust manifold directly opposite No. 1 exhaust port and scrape carbon from edges of sleeve ports so that closing of ports can be checked. Remove inspection hole cover in flywheel housing and turn engine over until piston No. 1 reaches top dead center with the flywheel mark 'T.C.' directly opposite the indicator. Remove the spark plug in cylinder No. 1 and place a test lamp in the spark plug port so that the light can be seen through the exhaust port. Then turn eccentric shaft in direction of rotation until the upper edge of the port in the outer sleeve just passes the lower edge of the port in the cylinder block when the light will be cut off. Assemble eccentric shaft sprocket and timing chain, being careful not to disturb relative positions of eccentric shaft and crankshaft.

**Valve Timing Specifications:**—Intake ports open 10 degrees before top dead center and close 36 degrees after lower dead center. Exhaust ports open 45 degrees before lower dead center and close at top dead center. The exhaust closing point for cylinders No. 1 and 6 is marked on the flywheel by 'T.C./E.C.'

**STARTER:**—Model MAB-4018. Starter is connected to the engine through a Bendix drive. The direction of rotation is clockwise, viewed from the commutator end. Brush spring tension is 44-56 ounces. The starting switch is mounted at the lower end of the steering column and is operated by pulling up on the knob on the steering wheel.

Starter Data			
Torque	R.P.M.	Volts	Amperes
.6 lb. ft.	1910	5.5	100
3.4 "	1100	5.0	200
6.6 "	695	4.5	300
10.15 "	420	4.0	400
24 "	Lock	4.0	725

**Mounting:**—Starter is sleeve mounted at the right of the transmission on the rear face of the flywheel housing. To remove starter, disconnect cable and take out two dowel screws in flywheel housing directly above starter sleeve. Then pull starter to the rear to clear drive and lift from place.

**Oiling:**—Put 4 to 6 drops of light engine oil in the oiler at each end of the starter every two weeks or each 500 miles of operation.

**GENERATOR:**—Model GAG-4134. The direction of rotation is counter-clockwise, viewed from the commutator end. Generator current regulation is by third brush shunt field. To adjust generator output, remove the commutator cover band and shift the third brush by prying on the brush mounting stud with a screwdriver. Shift the third brush in a counter-clockwise direction to increase the charging rate and in the opposite direction to

decrease the charging rate. The brush is held in position by friction between the mounting stud and the end plate. With standard car setting, the maximum charging rate is 17 amperes at 8 volts reached at 1400 R.P.M. (cold).

Generator Data					
Cold Test			Hot Test		
Amperes	Volts	R.P.M.	Amperes	Volts	R.P.M.
0	6.4	550	0	6.4	640
4	6.7	660	4	6.9	800
8	7.0	760	8	7.3	980
12	7.4	900	10	7.6	1110
16	7.8	1120	12	7.8	1280
19	8.0	1500	14.2	8.0	1680
13	7.4	2400	11.5	7.7	2400

Brush spring tension 22-27 ounces. Shunt field current 3.99-4.41 amperes at 6.0 volts. Generator motoring draws 5.13-5.67 amperes at 6.0 volts. Generator field fuse mounted on brush ring 7 1/2 ampere capacity.

**Mounting:**—Generator is cradle mounted at the right of the engine and is driven through a flexible coupling from the chain case. To remove generator, disconnect lead and drive coupling. Then loosen mounting strap and slide generator from place.

**Oiling:**—Put 4 or 5 drops of light engine oil in the oiler at each end of the generator every two weeks or each 500 miles of operation.

**RELAY:**—Model CB-4014. Relay is mounted on the generator field frame. Relay contacts close at 575 R.P.M. when the voltage of the generator reaches 7-7.5 volts and open with a discharge current of .5-2.5 amperes. Charging current at closing of contacts is approximately 2 amperes. Relay contact gap is .025-.035 inch. Air gap is .010-.030 inch with contacts closed.

**LIGHTING:**—Finger Tip Control Switch Model A-805. Switch is mounted at the lower end of the steering column and is controlled by a button on the steering wheel. The starting switch, lighting switch and horn button are all incorporated in the single unit. Dimmer system 'depressed beam' double filament headlight bulbs controlled by lighting switch. See Equipment Section for complete article on Finger Tip Control.

Lamp Sizes				
Position	Voltage	Candlepower	Base	Mazda Number
Headlights	6-8	21-21	DC	1110
Fender lights	6-8	3	SC	63
Dash lights	6-8	3	SC	63
Stop and tail light	6-8	21-2	DC	1158
Dome and corner lights	6-8	3	SC	63

**Note:**—Stop and tail light is fitted with a special double filament bulb. Tail light lead must be connected to the 2 cp. filament.

**FUSES:**—Generator field fuse is 7.5 ampere capacity. Lighting fuse mounted on fuse block on lower left front side of dash is 20 ampere capacity.

**GASOLINE GAUGE:**—Motometer electric type (see Equipment Section).

# WILLYS OVERLAND

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

### PRODUCTION STARTED DECEMBER 1, 1931

#### AUTO-LITE SYSTEM

**CAR SERIAL NUMBER:**—Stamped on plate on left frame member in front of rear hanger left front spring, also on plate under driver's seat cushion.

**ENGINE NUMBER:**—Stamped on front upper corner cylinder block, left side.

**BATTERY:**—U.S.L., Type XY-13-X-7A, 6 volt, 13 plate, 87.5 ampere hour capacity (5 ampere rate). Starting capacity 102 amperes for 20 minutes. Negative (—) terminal grounded. Battery mounted under front compartment floor boards on left side. Battery size, 7¼ inches wide, 9 1/16 inches long, 8⅝ inches high.

**IGNITION:**—Coil Model IG-4305. Lock coil type with ignition switch in base. Coil mounted behind instrument board with ignition switch at extreme right of instrument panel. Ignition current 1-1½ amperes at 6 volts (engine running), 3.4-5 amperes at 6 volts (engine stopped).

**Distributor Model IGB-4032.** Single breaker arm, 6 lobe cam type with semi-automatic advance. Manual spark control by button on dash. Ordinary running position with button pushed in—spark advanced, pull out button to retard spark. Breaker gap set at .018 inch. Hold within limits of .018-.020 inch. To set gap, loosen lock nut on stationary contact stud, turn up stud, tighten lock nut. Resurface contacts when necessary with fine flat contact file. Breaker arm spring tension, 16-22 ounces (measured at tip of breaker arm with spring scale in line with center of contacts and at right angles to arm. Maximum manual advance, 20 degrees (engine).

Engine	Degrees Distributor	Automatic Advance Distributor	R.P.M.	Engine
0.....	Start.....	200.....	400	
6.....	3.....	600.....	1200	
12.....	6.....	1000.....	2000	
16.....	8.....	1240.....	2480	
20.....	10.....	1500.....	3000	

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

**Oiling:**—250 Miles. Put 6 drops S.A.E. No. 20 engine oil in oiler on side of shaft. Take off distributor cap and rotor, put 6 drops oil in wick oiler in center of shaft.

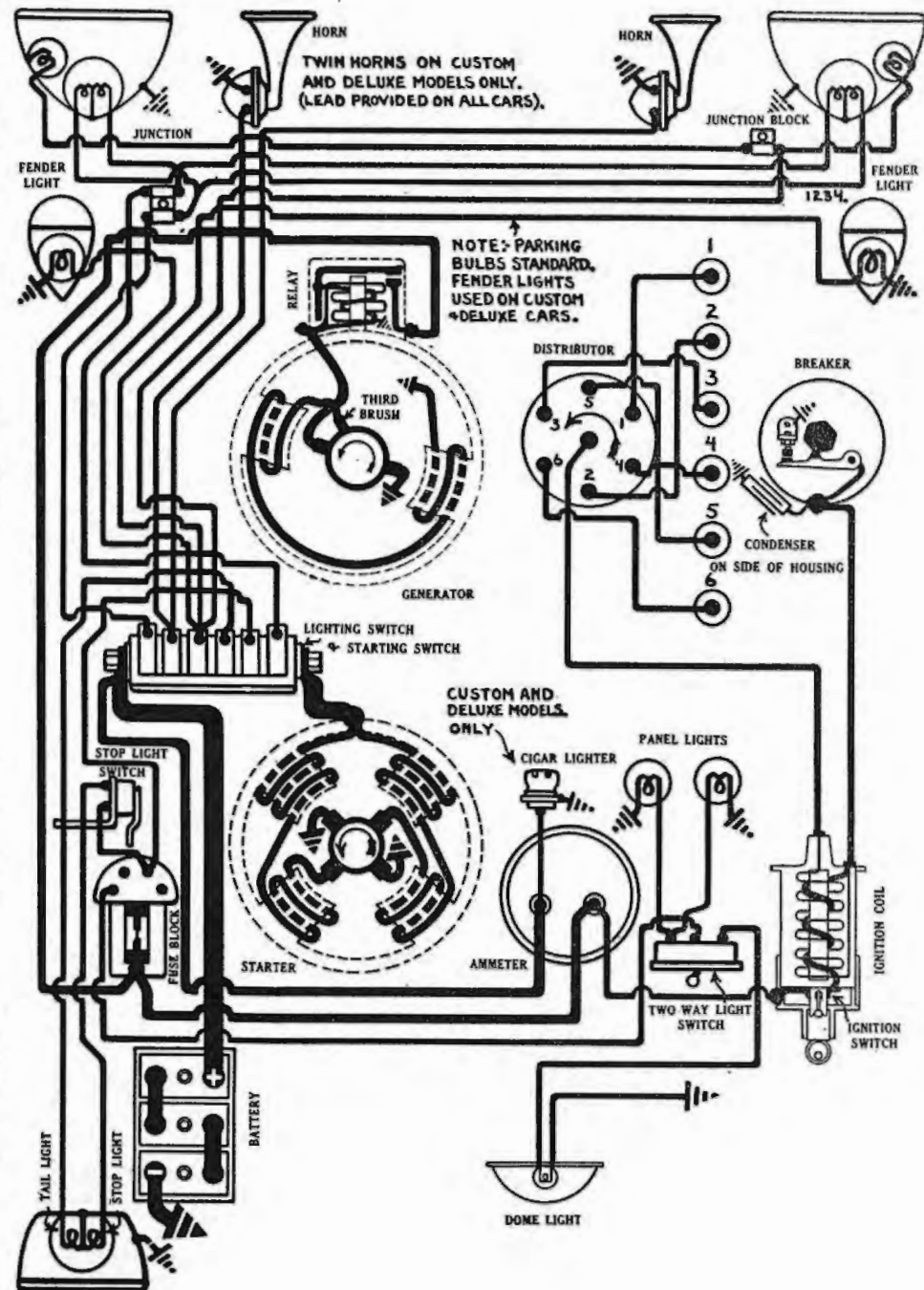
5000 Miles. Apply thin film vaseline to face of breaker cam.

**Timing:**—Standard setting top dead center with manual spark control advanced. To set timing, advance spark control button, see that distributor is rotated clockwise to limit of advance arm slot, take off cover plate over inspection hole in left front face flywheel housing. With No. 1 piston on compression turn engine over until flywheel mark 'IGN.TC/CYL.NO.1-6' is directly opposite indicator on housing (top dead center position). Loosen advance arm clamp screw, rotate distributor until contacts begin to open, tighten clamp screw, connect spark plugs as indicated on diagram (No. 1 terminal as designated).

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

**Spark Plugs:**—18 MM. Champion Type C-7. Set gaps at .027 inch.

**VALVE TIMING:**—Valves at right of engine. Camshaft driven by two-sprocket non-adjustable chain drive.





# WILLYS OVERLAND

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

### PRODUCTION STARTED DECEMBER 1, 1931

#### AUTO-LITE SYSTEM

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

	Tappet Clearance		Spring Pressure
	Operating	Timing	
Intake	.004" (hot)	.008" (cold)	85 1/2 pounds (length 1 15/16")
Exhaust	.006" (hot)	.009" (cold)	

#### Timing

Intake valves open 7° before top dead center. Close 39° after lower dead center.

Exhaust valves open 49° before lower dead center. Close 2° before top dead center.

**To Check Valve Timing.** Set tappet clearance No. 1 intake valve at .008 inch (cold), No. 1 exhaust valve at .009 inch (cold). With No. 6 piston on compression stroke, turn engine over until flywheel mark 'I.O.' (which is 7° before top dead center mark 'IGN.TC/CYL.1-6') is directly opposite pointed screw on edge of housing in inspection hole left front face of flywheel housing. No. 1 intake valve should open at this point. Turn crankshaft to position 2° before top dead center with flywheel mark 'E.C.' opposite indicator. No. 1 exhaust valve should close at this point. Reset tappet clearance at .004 inch (intake), .006 inch (exhaust) with engine hot.

**To Set Valve Timing.** Turn crankshaft and camshaft so that marks on sprocket are directly opposite and in line with straightedge across shaft centers. Mesh chain. With correct setting, mark on rim of camshaft sprocket should be in line with mark on edge of front engine support with piston No. 1 on top dead center and flywheel mark 'IGN.TC/CYL.1-6' directly opposite indicator on housing.

**STARTER:—Model MZ-4024.** Starter drives engine through inboard Bendix drive. Rotation counter-clockwise at commutator end. Brush spring tension 44-56 ounces. Starter switch, Pines 'Finger Tip Control' (see Equipment Section).

Torque	Starter Data		
	R.P.M.	Volts	Amperes
0 lb. ft.	4020	5.5	47 (with Bendix)
.65 "	2500	5.5	100
2.55 "	1325	5.0	200
4.95 "	750	4.5	300
7.65 "	220	4.0	400
10.1 "	Lock	3.5	470
12.25 "	Lock	4.0	545

**Mounting:—**Starter flange mounted on front face of flywheel housing at left of engine. To remove, disconnect cable, take out 3 flange mounting bolts, pull starter forward to clear Bendix, lift out.

**Oiling:—500 Miles.** Put 6 drops S.A.E. No. 20 engine oil in oiler at each end.

**GENERATOR:—Model GAL-4331.** Third brush regulation. To adjust charging rate, take off commutator cover band, shift third brush (by prying on brush mounting stud) counter-clockwise to increase or clockwise to decrease the charging rate. Brush held in position by friction. Rotation counter-clock-

wise at commutator end. With standard setting maximum charging rate is 17.2 amperes (cold) at 8.0 volts reached at 1900 R.P.M.

#### Generator Data

Amperes	Cold Test		R.P.M.	Amperes	Hot Test	
	Volts	R.P.M.			Volts	R.P.M.
0	8.3	600	0	6.4	700	
4	6.7	740	4	6.9	900	
8	7.1	900	8	7.4	1150	
12	7.4	1120	10	7.7	1340	
17	8.0	1900	12.4	8.0	2150	
12	7.4	3200	9.5	7.7	3200	

Brush spring tension, 24-32 ounces (factory recommendation). Shunt field current, 4.08-4.52 amperes at 6.0 volts. Generator motoring draws 4.27-4.73 amperes at 6.0 volts.

**Mounting:—**Generator mounted on swinging bracket at left front of engine driven by fan belt. To remove generator, disconnect lead, loosen adjustment clamp bolt, swing generator toward engine, slip off drive belt, take out clamp bolt and two bolts forming hinge under generator, lift generator out.

**Belt Adjustment.** Loosen adjustment clamp bolt and mounting bolts, swing generator away from engine to secure correct belt tension, tighten clamp bolt and mounting bolts. Belt should be just tight enough to drive fan and generator without slipping.

**Oiling:—250 Miles.** Put 6 drops S.A.E. No. 20 engine oil in oiler at each end.  
**1000 Miles.** Remove grease cup under bearing retainer on commutator end. Clean out old grease, dip wick in light oil, fill cup with vaseline.

**RELAY:—Model CB-4014.** Relay mounted on generator. Contacts close at 675 R.P.M. of generator with generator voltage of 7-7.5 volts and charging current of approximately 2 amperes and open with discharge current of .5-2.5 amperes. Contact gap limits .025-.035 inch. Air gap limits .010-.030 inch (contacts closed).

**LIGHTING:—Pines Switch, Model A-805.** Lighting switch 'Finger Tip Control' type mounted at lower end of steering column controlled by knob on steering wheel (see Equipment Section). Dimmer system 'depressed beam' double filament headlight bulbs controlled by lighting switch. Parking bulbs in headlights used on standard models or fender lights used on De Luxe and Custom models.

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

**NOTE:—**Stop and tail light is a combination double filament bulb. Connect tail light lead to 2 cp. filament.

**FUSES:—**20 ampere capacity fuse mounted on left front side of dash under hood.

**GASOLINE GAUGE:—**K-S Telegauge, hydrostatic type (see Equipment Section).

**FUEL PUMP:—**A.C. Type B mechanical fuel pump mounted on right side of engine (see Equipment Section).

# WILLYS OVERLAND

## EIGHT CYLINDER MODEL 8-88 (1932), SERIAL NUMBERS 1001 UP PRODUCTION STARTED DECEMBER 3, 1931 AUTO-LITE SYSTEM

**CAR SERIAL NUMBER:**—Stamped on plate on right frame member above rear hanger right front spring, also under driver's seat cushion.

**ENGINE NUMBER:**—Stamped on left side cylinder block opposite No. 1 cylinder.

**BATTERY:**—U.S.L., Type 3-HVX-7X-6A, 6 volt, 15 plate, 142 ampere hour capacity (5 ampere rate). Starting capacity, 148.5 amperes for 20 minutes. Negative (—) terminal grounded. Battery mounted under front compartment floor boards on left side. Battery size, 7 7/16 inches wide, 11 3/4 inches long, 9 3/4 inches high.

**IGNITION:**—Coil Model IG-4303. Lock coil type with ignition switch in base. Coil mounted on back of instrument board with ignition switch at extreme right of instrument panel. Ignition current, 1-3 amperes at 6 volts (engine running), 3.4-5 amperes at 6 volts (engine stopped).

**Distributor Model IGH-4013.** Two breaker arm, 4 lobe cam type with semi-automatic advance. Contacts open alternately at 45° intervals corresponding to 90° firing interval of engine. Contacts must be synchronized (see Timing). Manual advance controlled by button on dash. Ordinary running position with button pushed in—spark fully advanced, pull button out to retard spark. Breaker contact gap .018 inch. Hold within limits of .018-.020 inch. To set gap, loosen lock screws on stationary contact plate, turn eccentric adjusting screw (first set of contacts), or loosen lock nut on stationary contact stud, turn up stud (second set of contacts). Breaker arm spring tension, 16-22 ounces (measured at tip of breaker arm with spring scale in line with center of contacts and at right angles to arm). Maximum manual advance 20° (engine).

Engine..	Degrees	Automatic Advance	R.P.M.	Engine
0.....	Start.....	200.....	400	400
4.....	2.....	400.....	800	800
8.....	4.....	740.....	1480	1480
12.....	6.....	1000.....	2000	2000
16.....	8.....	1300.....	2600	2600
22.....	11.....	1700.....	3400	3400

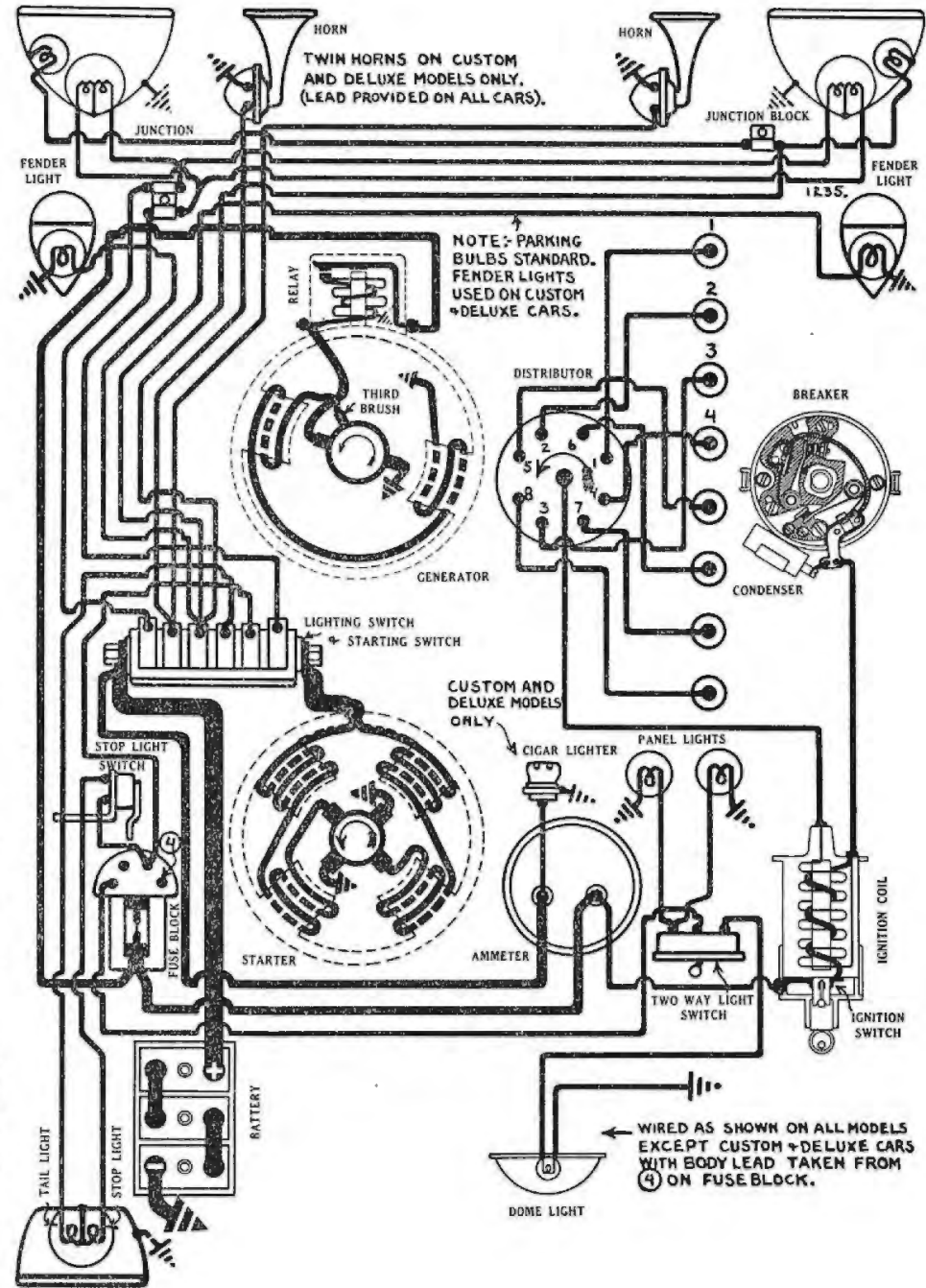
**Mounting:**—Distributor mounted left center of engine driven by inclined shaft from camshaft. To remove, disconnect primary lead, disconnect manual advance control wire, take off distributor cap, take out hold-down screw in advance arm and lift distributor out.

**Oiling:**—250 Miles. Put 6 drops S.A.E. No. 20 engine oil in oiler under distributor cup. Take off distributor cap and rotor. Put 6 drops oil in wick oiler in center of shaft.

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

**Timing:**—Standard setting 6° (flywheel), or .0136" (piston travel) before top dead center with manual spark control fully advanced. To set timing, first advance spark control button, see that distributor is rotated clockwise to full extent of advance arm slot, take off cover plate on inspection hole in left front face of flywheel housing. With No. 1 piston on compression turn engine over until flywheel mark 'IGN/' (which is 6° before top dead center mark '1-8 T.C./I.O') is directly opposite pointed end of inspection plate screw. Loosen advance arm clamp screw, rotate distributor until first set of contacts (mounted directly on breaker plate) begin to open (use test lamp), tighten clamp screw, connect spark plugs as indicated on diagram (No. 1 terminal as designated).

**Synchronization of Contacts.** No flywheel marks placed for synchroniza-



# WILLYS OVERLAND

## EIGHT CYLINDER MODEL 8-88 (1932), SERIAL NUMBERS 1001 UP

### PRODUCTION STARTED DECEMBER 3, 1931

#### AUTO-LITE SYSTEM

tion on engine. Contacts must be synchronized on rotary spark gap or by using special Auto-Lite synchronizing tool (see Equipment Section).

**Firing Order:**—1-6-2-5-8-3-7-4. No. 1 cylinder nearest radiator.

**Spark Plugs:**—18 MM. Champion No. 8. Set gaps at .027 inch.

**VALVE TIMING:**—Valves at right of engine. Camshaft driven by two-sprocket non-adjustable chain drive.

	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		Spring Pressure
Operating	Timing	
Intake	.006" (hot) .010" (cold)	92-100 pounds—length 1 15/16"
Exhaust	.008" (hot) .010" (cold)	

#### Timing

Intake valves open at top dead center. Close 38° after lower dead center. Exhaust valves open 34° before lower dead center. Close 4° after top dead center.

**To Check Valve Timing.** Set tappet clearance of No. 1 intake and exhaust valves at .010 inch (cold). With No. 8 piston on compression turn engine over until flywheel mark '1-8 T.C./I.O.' is directly opposite indicator on housing (top dead center position of piston). No. 1 intake valve should open at this point. Turn crankshaft 4° with flywheel mark 'E.C./' opposite indicator. No. 1 exhaust valve should close at this point. Reset tappet clearance at .006 inch (intake), .008 inch (exhaust) with engine hot.

**To Set Valve Timing.** Turn crankshaft and camshaft so that punch marks on sprockets are directly opposite each other and in line with straightedge across shaft centers. Mesh chain. With correct setting, mark on rim of camshaft sprocket should be opposite mark on edge of front engine support with piston No. 1 on top dead center and flywheel mark '1-8 T.C./I.O.' at indicator on housing.

**STARTER:**—Model MAB-4035. Starter drives engine through inboard Bendix drive. Rotation counter-clockwise at commutator end. Brush spring tension 44-56 ounces. Starter switch Pines 'Finger Tip Control' (see Equipment Section).

Starter Data			
Torque	R.P.M.	Volts	Amperes
0 lb. ft.	4020	5.5	46
.6 "	1910	5.5	100
3.4 "	1100	5.0	200
6.6 "	695	4.5	300
10.15 "	420	4.0	400
17.0 "	Lock	3.0	525
24.0 "	Lock	4.0	720

**Mounting:**—Starter flange mounted on front face of flywheel housing at left of engine. To remove, disconnect cable, take out 3 flange mounting bolts, pull starter forward to clear Bendix, lift out.

**Oiling:**—500 Miles. Put 6 drops S.A.E. No. 20 engine oil in oiler at each end.

**GENERATOR:**—Model GAL-4331. Third brush regulation. To adjust charging rate, 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. Rotation counter-clockwise at commutator end. With standard setting, maximum charging rate 17.2 amperes at 8.0 volts, reached at 1900 R.P.M.

Generator Data					
Cold Test			Hot Test		
Amperes	Volts	R.P.M.	Amperes	Volts	R.P.M.
0	6.3	600	0	6.4	700
4	6.7	740	4	6.9	900
8	7.1	900	8	7.4	1150
12	7.4	1120	10	7.7	1340
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Brush spring tension 24-32 ounces (factory recommendation). Shunt field current 4.08-4.52 amperes at 6.0 volts. Generator motoring draws 4.27-4.73 amperes at 6.0 volts.

**Mounting:**—Generator mounted on swinging bracket at left front of engine driven by fan belt. To remove generator, disconnect lead, loosen adjustment clamp bolt, swing generator toward engine, slip off drive belt, take out clamp bolt and two bolts forming bracket hinge under generator, lift generator out.

**Belt Adjustment.** Loosen adjustment clamp bolt and mounting bolts, swing generator away from engine to secure correct belt tension, tighten clamp bolt and mounting bolts. Belt should be just tight enough to drive fan and generator without slipping.

**Oiling:**—250 Miles. Put 6 drops S.A.E. No. 20 engine oil in oiler at each end. 1000 Miles. Remove grease cup under bearing retainer on commutator end. Clean out old grease, dip wick in light oil, fill cup with vaseline.

**RELAY:**—Model CB-4014. Relay mounted on generator. Contacts close at 675 R.P.M. of generator with generator voltage of 7-7.5 volts and charging current of approximately 2 amperes and open with discharge current of .5-2.5 amperes. Contact gap limits .025-.035 inch. Air gap limits .010-.030 inch (contacts closed).

**LIGHTING:**—Pines Switch, Model A-805. Lighting switch 'Finger Tip Control' type mounted at lower end of steering column controlled by knob on steering wheel (see Equipment Section). Dimmer system 'depressed beam' double filament headlight bulbs controlled by lighting switch. Parking bulbs in headlights used on standard models or fender lights used on DeLuxe and Custom models.

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

NOTE:—Stop and tail light is a combination double filament bulb. Connect tail light lead to 2 cp. filament.

**FUSES:**—20 ampere capacity fuse mounted on left front side of dash under hood.

**GASOLINE GAUGE:**—K-S Telegauge, hydrostatic type (see Equipment Section).

**FUEL PUMP:**—A.C. Type B mechanical fuel pump mounted on right side of engine (see Equipment Section).