

1934

TERRAPLANE

TECHNICAL INFORMATION HANDBOOK

- 1934 Terraplane -

General Chassis Data

Series	Model	Start Ser No.	Cyl.	Bore x Stroke	Disp.	NACC HP	WB
K	Special	373000	6	3 x 5	212	21.6	112
K	Commercial	373000	6	3 x 5	212	21.6	112
KU	Major	21500	6	3 x 5	212	21.6	116
KS	Challenger	296727	6	3 x 5	212	21.6	116

Starting motor number: 48000

General Body Data

BODY STYLE	K	KU	KS	K - Comm'cial	FP
2-Pass. Coupe	\$600	\$665	\$595	¾ Ton Chassis	\$405
5-Pass. Coach	615	680	574	¾ Ton Chassis w/cab	480
5-Pass. Compt. Victoria	655	720	N/A	Cab Pickup	515
5-Pass. Sedan	675	740	635	Utility Coach	530
4-Pass. Conv. Coupe	695	750	N/A	Utility Coupe	595
5-Pass. Compartment Sedan	715	780	N/A		

Electrical Equipment: Auto-Lite

Starter : MAD-4060 - 1934 Terra; 1935 Terra. to Eng. #143134; 1935 Hudson 6 to Eng. #76665
 Generator : GAM-4503 - 1934 Terra. KS; 1935 G Comm'cl; 1933 Hudson 6
 : GBK-4602 - 1933 E-T KU, KT; 1934 Terra. K, KU; 1934 Hudson
 Regulator : CBA-4002 - 1933 E-T KU, KT; 1934 Terra, K, KS; 1935 Terra. G to
 Eng. #143134; 1934 Hudson LL
 Distributor : IGB-4301A - 1934 Terra; 1935 Terra. to Eng. #128077; 1935 Hudson 6
 to eng, #73791
 Ignition Coil : IG-4311 - 1934 Terra; 1935 Terra commercial

Fuel System

Carburetor: Carter - W1-281S - 1934 Terraplane K, KU
 : Carter - W1-295S - 1934 Terraplane KS

Shipments

56,804 Passenger
 1901 Commercial

Notes

- 1) Introduction dates: K, KU - 1 Jan 1934; KS - 16 May 1934
- 2) Carburetor exchanges: W1-281S - use -329S (1936 Terraplane Model 62)
 : W1-295S - use -311S (1936 Terraplane Model 61)
- 3) Compartment models fitted with trunk at rear of body

1934 SERVICE INFORMATION AND ADJUSTMENTS

	Terraplane Six 112" W. B.	Terraplane Six 116" W. B.	Hudson Eight 116" W. B.	Hudson Eight 123" W. B.
<i>Starting Serial No. (U. S. Plant)</i>	373000	21500	950000	252000
<i>Starting Engine No. (All Plants)</i>	48000	48000	30000	30000
<i>Starting Serial No. (Canadian Plant)</i>	52000	76000	1300	8100

FRONT AXLE

Type	Elliot	Elliot	Elliot	Elliot
Caster (Actual on Car)	2-1/2 ⁰ to 3-1/2 ⁰			
Max. Variation Right and Left Ends.	1/2 deg.	1/2 deg.	1/2 deg.	1/2 deg.
Camber	1-3/4 ⁰ to 2-1/4 ⁰			
Toe-in	0-1/8"	0-1/8"	0-1/8"	0-1/8"
Spindle Pin Inclination (Angle with Spring Pad)				
Transverse	7 deg.	7 deg.	7 deg.	7 deg.
Forward	2 deg.	2 deg.	2 deg.	2 deg.
Steering Spindle Pin Diameter	3/4"	3/4"	3/4"	3/4"
Steering Spindle Thrust Bearing	Ball	Ball	Ball	Ball
Wheel Bearing Type	Taper Roller	Taper Roller	Taper Roller	Taper Roller
End Play	.001"-.003"	.001"-.003"	.001"-.003"	.001"-.003"
Tie Rod Joint - Type	Ball Bearings	Ball Bearings	Ball Bearings	Ball Bearings
Tie Rod Adjustment	Screw	Screw	Screw	Screw
To Adjust Tie Rod				
Turn Clockwise-To (As seen from right)	Lengthen	Lengthen	Lengthen	Lengthen
Turn Counter Clockwise To (As seen from right)	Shorten	Shorten	Shorten	Shorten

REAR AXLE

Type	Semi-Floating	Semi-Floating	Semi-Floating	Semi-Floating
Ratio	4.11	4.11	4.11	4.11
Pinion Bearings				
Type	Roller	Roller	Roller	Roller
Adjustment	Shim	Shim	Shim	Shim
End Play	.000"-.001"	.000"-.001"	.000"-.001"	.000"-.001"
Differential Bearings				
Type	Roller	Roller	Roller	Roller
Adjustment.	Screw	Screw	Screw	Screw
End Play	.009" Tension	.009" Tension	.009" Tension	.009" Tension
Wheel Bearings				
Type	Roller	Roller	Roller	Roller
Adjustment	Shim	Shim	Shim	Shim
End Play	.004"-.010"	.004"-.010"	.004"-.010"	.004"-.010"
Pinion and Gear				
Adjustment	Shim	Shim	Shim	Shim
Lash in Gears	.0005"-.003"	.0005"-.003"	.0005"-.003"	.0005"-.003"
Lubrication				
Quantity (Pints)	3	3	3	3

	Terraplane Six 112" W. B.	Terraplane Six 116" W. B.	Hudson Eight 116" W. B.	Hudson Eight 123" W. B.
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BRAKES

Location	4 Wheels	4 Wheels	4 Wheels	4 Wheels
Operation by	Cables	Cables	Cables	Cables
Drum Diameter	9"	9"	9"	9"
Lining - Type	Moulded	Moulded	Moulded	Moulded
Width	1-3/4"	2-3/4"	2-3/4"	1-3/4"
Thickness	3/16"	3/16"	3/16"	3/16"
Length per Wheel	19-3/16"	19-3/16"	19-3/16"	23-13/16"
Pieces per Wheel	2	2	2	2

Adjustments:

Anchor Pin Movable	Radially	Radially	Radially	Radially
Upper Shoe	Eccentric	Eccentric	Eccentric	Eccentric
Lower Shoe	Screw	Screw	Screw	Screw

<i>Clearance:</i> Anchor Pin End of Shoes	.010"	.010"	.010"	.010"
Adj. Screw End of Shoes	.010"	.010"	.010"	.010"

CLUTCH

Type - Single Disc in Oil	Yes	Yes	Yes	Yes
Facing	Cork	Cork	Cork	Cork
No. Inserts (Cork)	90	90	108	108
Pilot Bearing	Ball	Ball	Ball	Ball
Throwout Bearing	Ball	Ball	Ball	Ball

Lubrication:

Housing - Type	Hudsonite	Hudsonite	Hudsonite	Hudsonite
Quantity	1/3 Pint	1/3 Pint	1/3 Pint	1/3 Pint
Location of Filler	Front of Flywheel	Front of Flywheel	Front of Flywheel	Front of Flywheel
Throwout Bearing Quantity	1 Oz.	1 Oz.	1 Oz.	1 Oz.
Type of Fitting	Zerk	Zerk	Zerk	Zerk
Location of Fitting	Left Bell Housing	Left Bell Housing	Left Bell Housing	Left Bell Housing

ELECTRICAL EQUIPMENT

Coil (Ignition):

Make:	Autolite	Autolite	Autolite	Autolite
Location	Inst-Panel	Inst-Panel	Inst-Panel	Inst-Panel

Distributor (Ignition):

Make:	Autolite	Autolite	*	*
Drive	Camshaft	Camshaft	Camshaft	Camshaft
Advance	Automatic	Automatic	Automatic	Automatic
Breaker Point Gap.	.020"	.020"	.013"	.013"
Timing.	D. C.	D. C.	D. C.	D. C.
Firing Order	1-5-3-6-2-4	1-5-3-6-2-4	1-6-2-5-8-3-7-4	1-6-2-5-8-3-7-4
Lubrication	Lt. Motor Oil	Lt. Motor Oil	Lt. Motor Oil	Lt. Motor Oil
Quantity	Fill Cup	Fill Cup	Fill Cup	Fill Cup

* - IGP-4001A – 1934 Hudson exc. LT, LTS; TC-4102A – 1934 Hudson LT, LTS

Generator:

Make - Autolite				
Drive	V-Belt	V-Belt	V-Belt	V-Belt
Belt Adjustment	Swing Mtng.	Swing Mtng.	Swing Mtng.	Swing Mtng.
Regulation---Internal	Third Brush	Third Brush	Third Brush	Third Brush
External	Voltage Reg.	Voltage Reg.	Voltage Reg.	Voltage Reg.

	Terraplane Six 112" W. B.	Terraplane Six 116" W. B.	Hudson Eight 116" W. B.	Hudson Eight 123" W. B.
ELECTRICAL EQUIPMENT – Generator (Cont'd)				
Charging Rate	22 Amps.	22 Amps.	22 Amps.	22 Amps.
Lubrication	Motor Oil	Motor Oil	Motor Oil	Motor Oil
		Quantity -each Bearing		2 Drops 2 Drops 2 Drops 2 Drops
Lamps:				
Bulb Voltage	6-8	6-8	6-8	6-8
Candle Power and Bases (Contact Single-S; Double D)				
Head	21-32-D	21-32-D	21-32-D	21-32-D
Parking	3-S	3-S	3-S	3-S
Dash Signals	3-D	3-D	3-D	3-D
Instruments	3-S	3-S	3-S	3-S
Stop and Tail	2-21-D	2-21-D	2-21-D	2-21-D
Dome	15-S	15-S	15-S	15-S
Fuse--Headlamp Circuit	20 Amps.	20 Amps.	20 Amps.	20 Amps.
Tail Lamp Circuit	20 Amps.	20 Amps.	20 Amps.	20 Amps.
Windshield Wiper Circuit	7-1/2 Amps.	7-1/2 Amps.	7-1/2 Amps.	7-1/2 Amps.
Generator Regulator	7-1/2 Amps.	7-1/2 Amps.	7-1/2 Amps.	7-1/2 Amps.
Spark Plugs:				
Size	14 mm	14 mm	14 mm	14 mm
Gap	.022"	.022"	.022"	.022"
Starting Motor:				
Make - Autolite				
Drive	Bendix	Bendix	Bendix	Bendix
Control	Solenoid	Solenoid	Solenoid	Solenoid
Lubrication	Motor Oil	Motor Oil	Motor Oil	Motor Oil
Quantity (Each Bearing)	2 Drops	2 Drops	2 Drops	2 Drops
Battery:				
Make	National	National	Exide	Exide
No. Plates	17	17	19	19
Capacity	100 Amp. Hrs.	100 Amp. Hrs.	120 Amp. Hrs.	120 Amp. Hrs.
Dimensions ---Length	10-9/16"	10-9/16"	11-13/16"	11-13/16"
Width	6-3/4"	6-3/4"	6-3/4"	6-3/4"
Height (Overall)	7-13/16"	7-13/16"	7-13/16"	7-13/16"
Terminal Grounded	Pos.	Pos.	Pos.	Pos.
ENGINE				
Number of Cylinders	6	6	8	8
Arrangement	Vertical	Vertical	Vertical	Vertical
Bore	3"	3"	3"	3"
Stroke	5"	5"	4-1/2"	4 -1/2"
Piston Displacement	212	212	254	254
Taxable Horse Power	21.6	21.6	28.8	28.8
Actual Horse Power:				
Standard Compression	80 @ 3600	85 @ 3600	108 @ 3800	113 @ 3800
High Compression	89-1/2 @ 3600	89-1/2" @ 3600	121 @ 3800	121 @ 3800

	Terraplane Six 112" W. B.	Terraplane Six 116" W. B.	Hudson Eight 116" W. B.	Hudson Eight 123" W. B.
ENGINE (Cont'd)				
Compression Ratio:				
Standard	5.75	6.25	5.75	6.25
Optional	7	7	7	7
Firing Order	1-5-3-6-2-4	1-5-3-6-2-4	1-6-2-5-8-3-7-4	1-6-2-5-8-3-7-4
Engine Mounting	Rubber	Rubber	Rubber	Rubber
Camshaft:				
Drive	Gear	Gear	Gear	Gear
Number of Teeth -				
Camshaft Gear	56	56	56	56
Crankshaft Gear	28	28	28	28
Timing Indicated by Marks on	Gears	Gears	Gears	Gears
Camshaft Bearings:				
Diameter and Length				
No. 1	2x1-3/16"	2x1-3/16"	2x1-3/8"	2x1-3/38"
No. 2	1-31/32x1-16"	1-31/32x1-1/16"	2x1"	2x1"
No. 3	1-1/2x15/16"	1-1/2x15/16"	1-31/32x1x1/4"	1-31/32x1x1/4"
No. 4.			1-15/16x1"	1-15/16x1"
No. 5			1-1/2x1-1/2"	1-1/2x1-1/2"
Radial Clearance	.0015"	.0015"	.0015"	.0015"
End Play Prevented by	Spring	Spring	Spring	Spring
Connecting Rods:				
Material	D. F. Steel	D. F. Steel	D. F. Steel	D. F. Steel
Weight (Ounces)	29.4	29.4	29.4	29.4
Length (C to C) 8-3/16"	8-3/16"	8-3/16"	8-3/16"	
Lower End Bearing				
Diameter	1-15/16"	1-15/16"	1-15/16"	1-15/16"
Length	1-3/8"	1-3/8"	1-3/8"	1-3/8"
Clearance	.001"	.001"	.001"	.001"
End Play	.006"-.010"	.006"-.010"	.006"-.010"	.006"-.010"
Material	Spun Babbitt	Spun Babbitt	Spun Babbitt	Spun Babbitt
Upper End Bearing:				
Diameter	3/4"	3/4"	3/4"	3/4"
Length	15/16"	15/16"	15/16"	15/16"
Radial Clearance	.0003"	.0003"	.0003"	.0003"
Material	Bronze	Bronze	Bronze	Bronze
Cooling System:				
Circulation by	Pump	Pump	Pump	Pump
Capacity (Gallons)	4-1/2	4-1/2	5-3/4	5-3/4
Upper Radiator Hose - Length	9"	3-1/4"	7-5/8"	7-5/8"
- Diameter	1-9/16"	1-9/16"	1-9/16"	1-9/16"
Lower Rad. Hose - Length	9"	3-1/4"	3-1/4"	3-1/4"
- Diameter	1-9/16"	1-9/16"	1-1/2"	1-1/2"
Pump Drive	V-Belt	V-Belt	V-Belt	V-Belt
Fan Drive	Pump Shaft	Pump Shaft	Pump Shaft	Pump Shaft
Belt Adjustment	Generator Mtng.	Generator Mtng.	Generator Mtng.	Generator Mtng.
Pump Bearing Type	Bound Brook	Bound Brook	Bound Brook	Bound Brook
Diameter	3-5/64"	3-5/64"	3-5/64"	3-5/64"

Terraplane Six 112" W. B.	Terraplane Six 116" W. B.	Hudson Eight 116" W. B.	Hudson Eight 123" W. B.
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ENGINE (Cont'd)

Crankshaft:

Type	Fully Compensated	Fully Compensated	Fully Compensated	Fully Compensated
Number of Bearings	3	3	5	5
Bearing Material	Bronze Backed Babbitt	Bronze Backed Babbitt	Bronze Backed Babbitt	Bronze Backed Babbitt
Bearing Diameter and Length				
No. 1	2-11/32 x 1-5/8"	2-11/32" x 1-5/8"	2-9/32" x 1-5/8"	2-9/32 x 1-5/8"
No. 2	2-3/8" x 1-3/4"	2-3/8" x 1-3/4"	2-5/16" x 1-3/8"	2-5/16" x 1-3/8"
No. 3	2-13/32" x 2-3/8"	2-13/32" x 2-3/8"	2-11/16" x 1-7/8"	2-11/16" x 1-7/8"
No. 4			2 3/8" x 1-3/8"	2 3/8" x 1-3/8"
No. 5			2-13/32" x 2"	2-13/32" x 2"
End Play Taken by Bearing No.	2	2	3	3
Bearing End Play	.006--.012"	.006"--.012"	.006"--.012"	.006"--.012"
Bearing Clearance	.001"	.001"	.001"	.001"
Adjustment Type	Shim	Shim	Shim	Shim

Fuel System:

Carburetor - Make - Carter	W1-281S ¹	W1-295S ²	W 1 -299S ³	W2-282S
- Type	Down Draft	Down Draft	Down Draft	Down Draft
- Size	1-1/4"	1-1/4"	1-1/4"	1-1/4"
Super Type	Down Draft - Duplex	Down Draft - Duplex	Down Draft - Duplex	Down Draft - Duplex
Size	1"	1"	1"	1"
Heat Control	Automatic	Automatic	Automatic	Automatic
Choke Control	Automatic	Automatic	Automatic	Automatic
Fuel Delivered by	Pump	Pump	Pump	Pump
Pump Drive from Camshaft by	Cam	Cam	Cam	Cam
Air Cleaner and Silencer	A. C.	A. C.	A. C.	A. C.
Gasoline Tank Capacity (Gal.)	11-1/2	11-1/2	15-1/2	15-1/2

¹ W1-281S - TerraplaneK, KS; ² W1-295S - Terraplane KS; ³ W1-299S Hudson LTS Challenger

Lubrication System:

Type - Hudson Duoflo Automatic	Yes	Yes	Yes	Yes
Pump Type	Oscillating Plunger	Oscillating Plunger	Oscillating Plunger	Oscillating Plunger
Pump Drive	Camshaft	Camshaft	Camshaft	Camshaft
Oil Cooling	Baffles in Reservoir	Baffles in Reservoir	Baffles in Reservoir	Baffles in Reservoir
Oil Filter	Screen	Screen	Screen	Screen
Capacity - Total (Quarts)	7	7	9	9
- Reservoir (Quarts)	5	5	7	7

Pistons:

Type	Cam Ground	Cam Ground	Cam Ground	Cam Ground
Material	Lo-Ex Alum. Alloy	Lo-Ex Alum. Alloy	Lo-Ex. Alum Alloy	Lo-Ex. Alum. Alloy
Weight (Oz.)	9.6	9.6	9.6	9.6
Length	3-3/16"	3-3/16"	3-3/16"	3-3/16"
Pin Center to Top	1-11/16"	1-11/16"	1-11/16"	1-11/16"
Clearance - Top of Skirt	.001-.0015"	.001-.0015"	.001-.0015"	.001-.0015"

	Terraplane Six 112" W. B.	Terraplane Six 116" W. B.	Hudson Eight 116" W. B.	Hudson Eight 123" W. B.
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ENGINE – Piston (Cont'd):

Bottom of Skirt	.005-.001"	.005-.001"	.005-.001"	.005-.001"
Top of Piston	.016"	.016"	.016"	.016"
Depth of Grooves	5/32"	5/32"	5/32"	5/32"
Piston Pin Hole - Size	3/4"	3/4"	3/4"	3/4"
Finish	Diamond Bore	Diamond Bore	Diamond Bore	Diamond Bore

Piston Pin:

Type	Floating	Floating	Floating	Floating
Method of Locking	Snap Rings	Snap Rings	Snap Rings	Snap Rings
Diameter	3/4"	3/4"	3/4"	3/4"
Length	2-7/16"	2-7/16"	2-7/16"	2-7/16"
Fit in Piston (at 200° F.)	.0003"	.0003"	.0003"	.0003"
Fit in Rod	.0003"	.0003"	.0003"	.0003"

Piston Rings:

Material	Cast Iron	Cast Iron	Cast Iron	Cast Iron
Joint - Type	Straight Cut	Straight Cut	Straight Cut	Straight Cut
Compression Rings - No.	2	2	2	2
Width	3/32"	3/32"	3/32"	3/32"
Gap	.009-.011"	.009-.011"	.009-.011"	.009-.011"
Oil Rings - No.	2	2	2	2
Width - Upper	1/8"	1/8"	1/8"	1/8"
- Lower	3/16"	3/16"	3/16"	3/16"
Gap	.009-.011"	.009-.011"	.009-.011"	.009-.011"

Valves and Tappets:

Inlet Valve - Material	Silicon Steel	Silicon Steel	Silicon Steel	Silicon Steel
Head - Outside Diameter	1-3/8"	1-3/8" 1-1/2"	1-1/2"	1-3/8"
Opening	1- 1/4"	1-1-4"	1-3/8"	1-3/8"
Valve Lift	11/32"	11/32"	11/32"	11/32"
Stem Length	5-11/32"	5-11/32"	5-3/32"	5-3/32"
Stem Diameter	5/16"	5/16"	5/16"	5/16"
Exhaust Valve - Material	Silicon Chrome Steel	Silicon Chrome Steel	Silicon Chrome Steel	Silicon Chrome Steel
Head - Outside Diameter	1-3/8"	1-3/8"	1-3/8"	1-3/8"
Opening	1-1/4"	1-1/4"	1-1/4"	1-1/4"
Valve Lift	11/32"	11/32"	11/32"	11/32"
Stem Length	5-11/32"	5-11/32"	5-3/32"	5-3/32"
Stem Diameter	5/16"	5/16"	5/16"	5/16"
Valve Stem Guides	Removable	Removable	Removable	Removable
Valve Spring Pressure	53 lbs. @ 2" 104 lbs. @ 1-21/32"	53 lbs. 104 lbs.	53 lbs. 104 lbs.	53 lbs. 104 lbs.

SPRINGS

Front – Type	Semi-Elliptic	Semi-Elliptic	Semi-Elliptic	Semi-Elliptic
Material	Chrome Vanadium Steel	Chrome Vanadium Steel	Chrome Vanadium Steel	Chrome Vanadium Steel
Length	31"	31"	31"	31"
Width	1-3/4"	1-3/4"	1-3/4"	1-3/4"
No. of Leaves	8	8	8	8
Shackle Location	Front	Front	Front	Front
Shackle Type	Self Adjusting	Self Adjusting	Self Adjusting	Self Adjusting

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STEERING GEAR

Type	Worm & Sector	Worm & Sector	Worm & Sector	Worm & Roller
Ratio	15	15	15	16.4
Adjustments:				
Worm Shaft	Shims	Shims	Shims	Shims
Cross Shaft	Set Screw	Set Screw	Set Screw	Set Screw
Gear Mesh	Eccentric Cover Screw	Eccentric Cover Screw	Eccentric Cover Screw	Eccentric Cover Screw
Steering Wheel Height	Column Bracket	Column Bracket	Column Bracket	Column Bracket

TIRES

Size - Standard	17 x 5.50"	16 x 6.00"	16 x 6.25"	16 x 6.50"
- Optional	16 x 6.00"			
Air Pressure Minimum.- (Front/Rear)	28/30	22/28	22/28	22/26
Air Pressure 16x6.00 (Front/Rear)	22/28			

TRANSMISSION

Location	Unit	Unit	Unit	Unit
Speeds - Forward	3	3	3	3
Speeds - Reverse	1	1	1	1
Main Drive Gear Type	Helical	Helical	Helical	Helical
Countershaft Gear Type	Helical	Helical	Helical	Helical
Countershaft Second Type	Helical	Helical	Helical	Helical
Mainshaft Second Gear Type	Helical	Helical	Helical	Helical

1934

Hudson and Terraplane

Tune-up and Electrical
Specifications

1934 Hudson Eight Tune-up and Electrical

SERIAL NUMBER: - Stamped on plate on engine side of dash (under hood).

First number, Model LL - 252,000, Model LT - 950,000.

COMPRESSION: - Ratio - 5.75-1 standard cast-iron head; 6.25-1 standard aluminum composite head.

Pressure - 5.75-1 CI head 80 lbs. at 125 R.P.M., 116 lbs. at 219 R.P.M. At 6.25-1 head. All spark plugs must be removed and throttle wide open for readings.

VACUUM READING: - Gauge should show steady reading of 18-20" with engine idling.

IGNITION: - Coil Model CE-4304. Lock coil type. Resistor mounted on distributor.

Ignition Current - 2.5 amperes (running), 4.5 amperes (stopped).

Distributor Model IGP-4001-A. Single breaker, lobe cam, full automatic advance type. No synchronization required.

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

Breaker Arm Spring Tension - 18 ounces (minimum), 20 ounces (maximum).

Cam Angles - Closed 27.5°. Open 17.5° (distributor)

Automatic Advance

Distributor		Engine	
Degrees	R.P.M.	Degrees	R.P.M.
Start	400	0	800
4	760	8	1520
8	1120	16	2240
12	1500	24	3000
17.5	2000	35	4000

IGNITION TIMING: - Flywheel Degs. Piston Posit.
Initial Setting (all engines) at TDC .0000" TDC

Timing (Initial Setting): - With #1 piston on compression, turn engine over until piston reaches top dead center, stop when flywheel mark 'U.D.C.' registers with pointer in inspection hole (left hand front face of flywheel housing above starter), loosen hold-down screw in advance and rotate distributor clockwise to limit of advance arm slot, then rotate distributor slowly counter clockwise until contacts begin to open, tighten hold-down screw, check rotor position and spark plug connections (see diagram). This top dead center setting should be checked by road-testing car and spark advanced as much as operating conditions and fuel rating will allow (see below).

Timing (Final Setting): - With engine at normal operating temperature and running at 8 M.P. in high gear on level road, accelerate engine rapidly and note

performance from 10 to 15 M.P. With correct setting a slight spark knock should be noticed. If no knock is heard, loosen hold-down down screw in advance arm and rotate distributor one graduation counter-clockwise. If knock is too severe, rotate distributor one graduation clockwise. Final setting must not be beyond maximum advance mark on flywheel (3/4" before top dead center mark ('U.D.C.').

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

Spark Plugs: - -Champion, Type J-7. 14 MM. metric.

Spark Plug Gap - .022".

CARBURETION: - (Fuel System).

Carburetor: - Carter, Model 282-S (LL, LT, LU, LLU), 299-S (LTS) - 1-1/4" plain tube, downdraft type.

Automatic Choke - Carter Climatic Control (282-S).

Fuel Pump: - A.C., Type R.

Gasoline Gauge: - Motometer, electric type.

LUBRICATION: - Duo-flow (splash) system with positive pump feed to oil troughs and timing gears by oscillating plunger type pump. Pump mounted on right hand side of crankcase.

Normal Oil Pressure - 3 pounds.

Oil Pressure Relief Valve - Operates at 3 lbs. Located on right hand side of crankcase at rear (combined with oil pressure signal light switch).

Capacity and Oil - 9 quarts (dry), 7 quarts (refill). Use SAE #30 (above 40° F.), #20-W (40° to 0° F.).

VALVE TIMING: - To Check Timing - Set tappet clearance #1 Intake valve at .010". This valve should open with piston 10° 40' or .0494" before top dead center when a point on the flywheel approximately 3.97 teeth before the dead center mark 'U.D.C.' lines up with the indicator on the housing. Reset tappet clearance at .006" with engine hot.

Tappet Clearance: - .006" Intake, .008" Exhaust, engine hot.

Valve Spring Pressure: - 44 lbs. at 21, (valve closed), 102 lbs. at 1-21/32" (valve open).

LUBRICATION: - Normal Oil Pressure - 3 pounds.

BATTERY: - Exide, Type XTL-19-17F, 6 volt, 19 plate, 120 ampere hour capacity.

Starting Capacity - 106 amperes for 20 minutes.

Grounded Terminal - Positive (+) terminal.

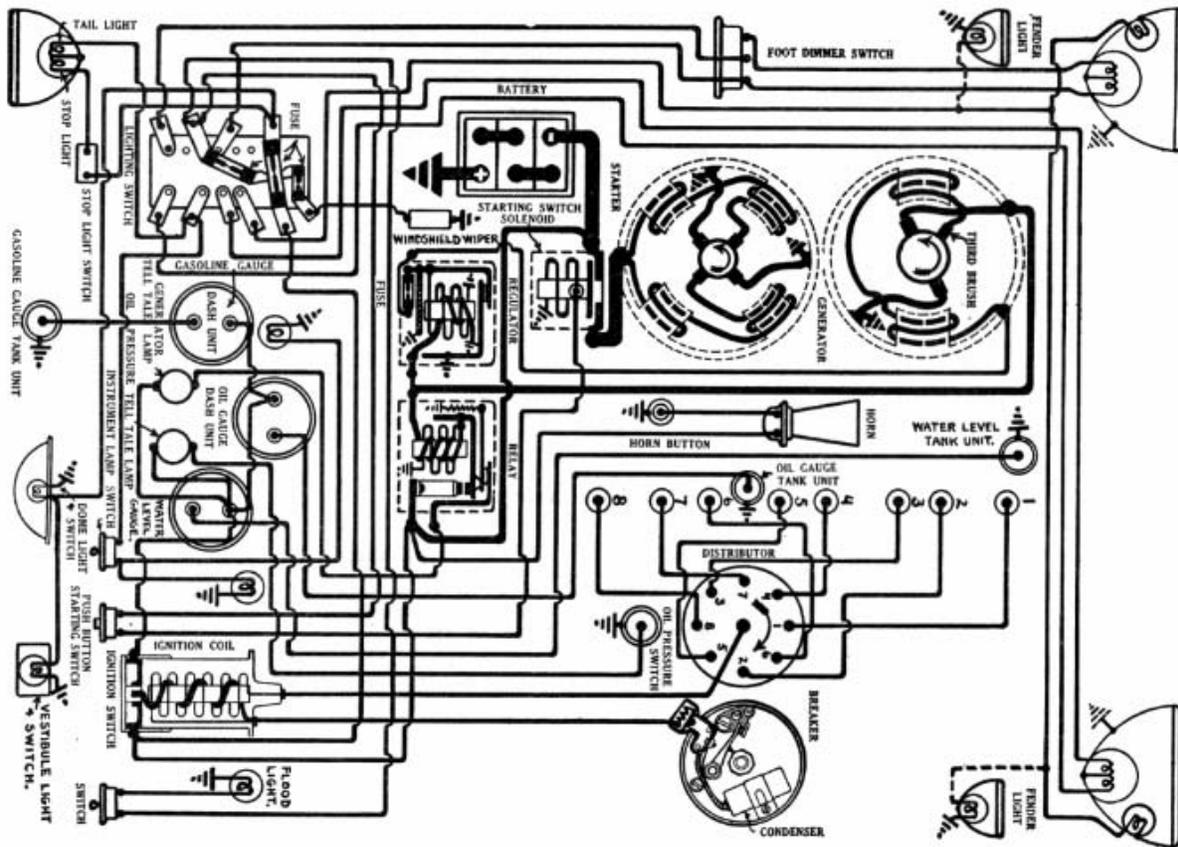
Location - Under front floor boards, left hand side.

STARTER: - Model MAB-4061. Armature No. MAB-2113. Starter drive - Inboard Bendix.

Rotation - Counter-Clockwise at commutator end.

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

Cranking Engine - 150 R.P.M., 120-125 amperes, 5 volts.



1934 Hudson 8 - All Models

Performance Data

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

NOTE: - Lock torque figures correct without switch.
Starting Switch: -Type SS-4001. Solenoid type switch mounted on starter field frame and controlled by pushbutton switch on instrument panel.

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

GENERATOR: - Model GBK-4602. Armature No. GBK-2055. Ventilated, third brush control type with external voltage regulator.

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

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

Performance Data

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

Generator (Cont'd)

Rotation-Counter - clockwise at commutator end.

Brush Spring Tension - 18-22 ounces.

Field Current - 3.75-4.15 amperes at 6.0 volts.

Motoring - 4.46-4.94 amperes at 6.0 volts.

Field Fuse - 7-1/2 ampere capacity in knurled cup under regulator case.

Mounting - Pivot mounted at left front of engine.

Driven by fan belt. To remove, take out two pivot bolts and one clamp bolt.

Belt Adjustment - Loosen pivot bolts and clamp bolt, swing generator out or away from engine until slight pull is felt on belt, tighten clamp bolt before slacking off on generator, tighten pivot bolts.

CUT-OUT RELAY - Model CBA-4002. Mounted on dash. Relay has extra set of contacts above armature for charge tell-tale light control.

Cuts in - 6.4 volts, 750 R.P.M. or 8 M.P.H. Limits, 6.5-7.25 volts.

Cuts out - .5-2.5 ampere discharge.

Contact Gap - .025-.035" with upper contacts closed.

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

VOLTAGE REGULATOR - Model TC-4102A. Two Charge Regulator mounted on engine side of dash.

Contacts Open - 7.86-8.27 volts at 70° F.

Contacts Close - 6.46-6.86 volts at 70° F.

Contact Gap - .005" minimum.

Core Gap - .030" plus or minus .001" with contacts closed.

LIGHTING - Soreng-Manegold Switch, Model 5640-A, C-5640-A (without windshield wiper fuse). Soreng Manegold Foot Control Switch. Foot control switch provides asymmetric 'meeting' beam (lower beam left hand headlight, upper beam right hand headlight). Operative only with lighting switch in 'Country Driving' position. Headlight bulbs are pre-focused type.

Bulb Specifications

Lamp	C.P.	Mazda No.
Headlights	32-21	2320-C
Parking, Instrument, Flood	3	63
Dome, Vestibule	15	87
Stop and Tail	21-2	1158
Signal	3	64 (DC.)

SIGNAL LIGHTS - Battery charge tell-tale and oil pressure tell-tale light mounted on instrument panel. Light bulbs are standard 3 cp. DC. bulbs, Mazda No. 64. To remove bulbs, turn light counter-clockwise slightly to release bayonet socket pin.

Battery Charge Tell-tale - At left of instrument cluster. Tell-tale should light with ignition turned on and should go out when generator begins to charge battery (relay contacts closed). If telltale does not burn when ignition turned on, check bulb by grounding tell-tale terminal on relay to generator field frame. If tell-tale does not light, replace bulb. If lamp lights, check auxiliary contact spring, contacts and ground resistor. See that auxiliary contacts are closed with main contacts open. If tell-tale lights at speeds above idling (8 M.P.H.), generator or relay is defective.

Oil Pressure Tell-tale - At right of instrument cluster. Tell-tale should light with ignition turned on but should go out when engine is operated (light should flash at idling speeds). Tell-tale should not light or flash at speeds above idling. If tell-tale does not light when ignition is turned on, check bulb by grounding terminal on oil pressure check valve (right side of crankcase) to engine. If tell-tale does not light, replace bulb. If tell-tale does not flash at idling speeds, disassemble check valve and clean out by-pass hole behind plunger, see that terminal pin is straight and clean, and that plunger is free.

FUSES - Lighting - Two 20 ampere capacity fuses on back of lighting switch.

Windshield Wiper - 7-1/2 ampere capacity fuse on lighting switch (not used on all cars).

Generator Field - 7-1/2 ampere capacity.

1934 TERRAPLANE

Standard Model K
Deluxe Model KU
Challenger Model KS

SERIAL NUMBER: - First number (K) 373,000, (KU) 21,500, (KS) 396,727. On plate on engine side of dash under hood.

COMPRESSION: - Ratio - Standard 5.75-1 head; Optional, 6.25-1 head.

Pressure - (Standard head) 80 lbs. at 125 R.P.M.

VACUUM READING: - Gauge should show steady reading of 18-191, with engine idling.

IGNITION: - Coil Model IG-4311. Lock coil type. Resistor mounted on distributor.

Ignition Current - 2.5 amperes (idling), 4.5 amperes (stopped).

Distributor Model IGB - 4301-A. Single breaker, 6 lobe cam, full automatic advance type.

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

Breaker Arm Spring Tension - 16-22 ounces.

Cam Angles - Closed 40°. Open 20° (distributor). Automatic Advance

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

IGNITION TIMING: - Flywheel Degs. Piston Position

Initial Setting (all engines) at TDC . .0000" TDC

Timing (Initial Setting): - With #1 piston on compression, turn engine over until piston reaches top dead center, stop when flywheel mark 'UDC.1-6/' registers with pointer in inspection hole (left hand front face of flywheel housing above starter), loosen hold-down screw in advance arm, rotate distributor clockwise to limit of advance arm slot, then rotate distributor slowly counter-clockwise until contacts begin to open, tighten hold-down screw, check rotor position and spark plug connections (see diagram). This top dead center setting should be checked by road-testing car and spark advanced as much as operating conditions and fuel rating will allow (see below).

Timing (Final Setting): - With engine at normal

operating temperature and running at 8 M.P.H. in high gear on level road, accelerate engine rapidly and note performance from 10 to 15 M.P.H. With correct setting a slight spark knock should be noted under these conditions. If no knock is heard, loosen hold-down screw in advance arm and rotate distributor one graduation counter-clockwise (advance). If knock is too severe, rotate distributor one graduation clockwise (retard). Repeat test until satisfactory setting is secured. Final setting must not be beyond maximum advance mark on flywheel (3/4" before top dead center mark 'UDC.1-6/1).

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

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

Spark Plug Gaps: - .022".

CARBURETION: - (Fuel System). See Carburetion Section for complete data on Carburetor, Automatic Choke (Climatic Control), Fuel Pump, and Gasoline and Oil Level Gauge.

Carburetor: - Carter, Model 281-S (K,KU), 295-S (KS), 1-1/4" plain tube, downdraft type.

Automatic Choke - Carter Climatic Control (281 only).

Fuel Pump: - A.C., Type R.

Gasoline Gauge: - Motometer, electric type.

VALVE TIMING: - To Check Timing-Set tappet clearance #1 intake valve at .010". This valve should open with piston 10° 40' or .0562" before top dead center when a point on the flywheel approximately 3.17 teeth before top dead center mark IUDC.1-6' lines up with indicator. Reset tappet clearance at .006" with engine warm and running.

Tappet Clearance: - .006" Intake, .008" Exhaust, engine hot and running.

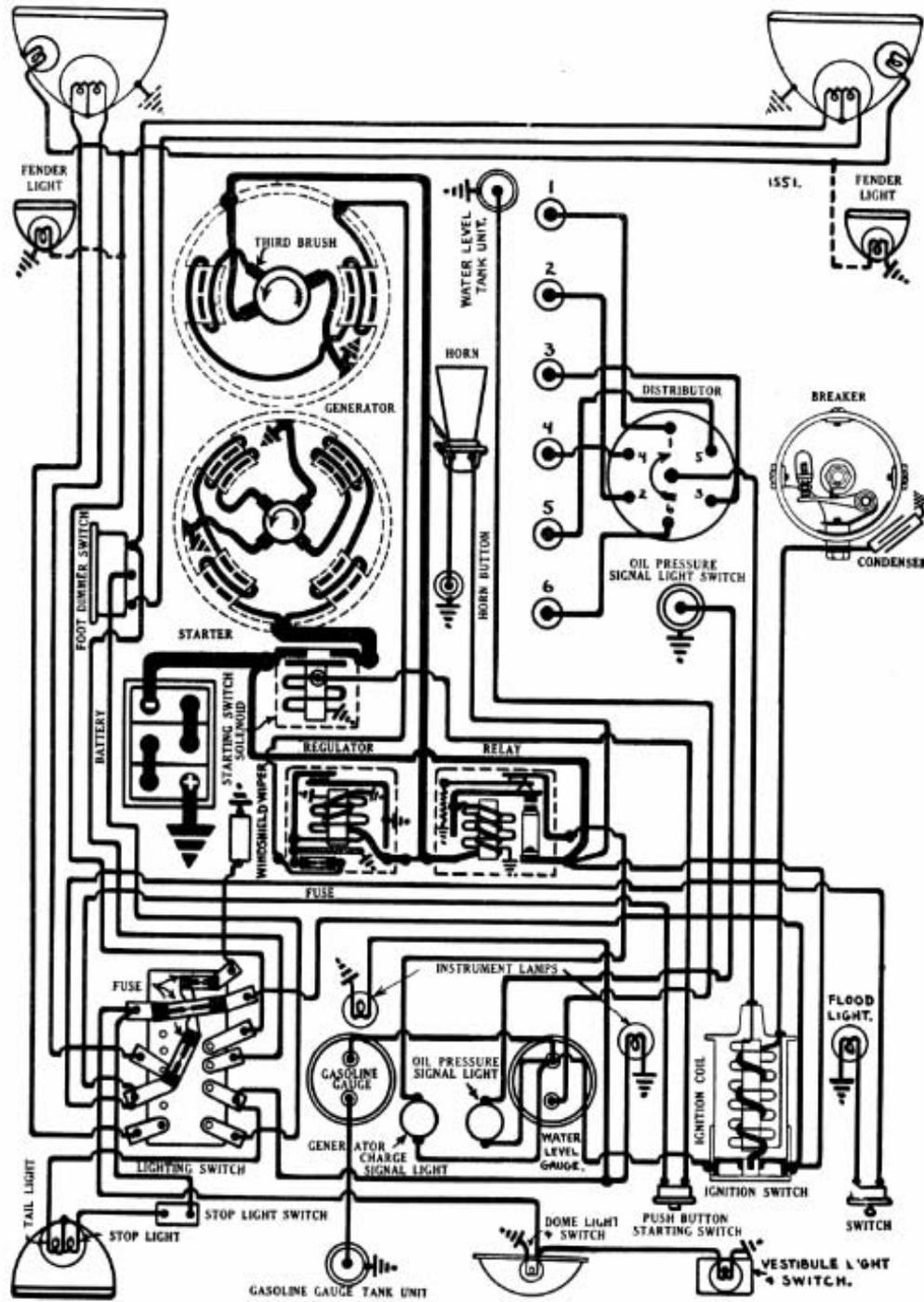
Valve Spring Pressure: - 44 lbs. at 2" (valve closed). 102 lbs. at 1-21/32" (valve open).

LUBRICATION: - Duo-flow (splash) system with positive pump feed to oil troughs and timing gears by oscillating plunger type pump. Pump mounted on right hand side of crankcase.

Normal Oil Pressure - 3 pounds.

Oil Pressure Relief Valve - Operates at 3 lbs. Located on right hand side of crankcase at rear (combined with oil pressure signal light switch).

Capacity and Oil - 7 quarts (dry), 6 quarts (refill). Use SAE #30 (above 40° F.), #20-W (40° to 0° F.).



1934 Terraplane - All Models

CARBURETION: - See Carburetion Section for data.

Carburetor: - Carter Model 311-S, 1-1/4" downdraft type.

Fuel Pump: - AC. Type R-1521540 diaphragm type.

Gasoline Gauge: - King-Seeley electric type.

VALVE TIMING: - To Check Timing-Set tappet clearance #1 intake valve at .010". This valve should open with piston 10° 40' or .0562" before top dead center when a point on the flywheel approximately 3.17 teeth before top dead center mark 'UTDC.1-6' lines up with indicator. Reset tappet clearance at .0061, with engine warm and running.

Tappet Clearance: - .006" Intake, .008" Exhaust, engine hot and running.

Valve Spring Pressure: - 44 lbs. at 2" (valve closed). 102 lbs. at 1-21/32" (valve open).

LUBRICATION: - Crankcase Capacity - 5 quarts (refill).

Normal Oil Pressure - 3 pounds.

BATTERY: - National, Type ST-3-17X. 6 volt 17 plate, 98 A.H. capacity (20 hour rate).

Starting Capacity - 122 amperes for 20 minutes.

Grounded Terminal - Positive (+) terminal.

Location - On left hand side under front floor.

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

Starter Drive - Inboard Bendix, Type A-1588.

Rotation - Counter-clockwise at commutator end.

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

Cranking Engine - 125-150 amperes at 5 volts.

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

NOTE: Lock torque figures correct without switch.

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

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

GENERATOR: - Model GBK-4602. Armature No. GBK-2055. Ventilated, third brush control type with external voltage regulator. See Equipment Section for complete data on Voltage Regulator.

Charging Rate Adjustment: - Use test meters to check generator output. Short out voltage regulator by

connecting short jumper wire from IF' terminal on generator to ground. Take off commutator cover band, shift third brush by hand counter-clockwise to increase, or clockwise to decrease charging rate. Remove jumper wire.

Maximum Charging Rate - 22 amperes (cold), 8.0 volts 2400 R.P.M.

Amperes	Performance Data				
	Cold - Regulator Inoperative			Hot	
	Volts	RPM	Amperes	Volts	RPM
0	6.4	800	0	6.4	840
4	6.7	980	4	6.8	1025
8	7.0	1110	8	7.15	1200
12	7.3	1300	12	7.5	1450
16	7.55	1500	16	7.85	1760
22	8.0	2200	18	8.0	2400

Rotation - Counter-clockwise at commutator end.

Brush Spring Tension - 18-22 ounces.

Field Current - 3.75-4.15 amperes at 6.0 volts.

Motoring - 4.46-4.94 amperes at 6.0 volts.

Field Fuse - 7-1/2 ampere capacity in knurled cup under regulator case.

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

Belt Adjustment - Loosen pivot bolts and clamp bolt, swing generator out or away from engine until slight pull is felt on belt, tighten clamp bolt before slacking off on generator, tighten pivot bolts.

CUT-OUT RELAY: - Model CBA-4002. Mounted on dash. Relay has extra set of contacts above armature for charge tell-tale light control.

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

Cuts out - .5-2.5 ampere discharge.

VOLTAGE REGULATOR: - Model TC-4102A. Two Charge Regulator mounted on engine side of dash. See article in Electrical Equipment Section for complete data.

Contacts Open - 7.86-8.27 volts at 70° F.

Contacts Close - 6.46-6.86 volts at 70° F.

Contact Gap-.005" minimum.

Core Gap-.030" plus or minus .001" with contacts closed.

LIGHTING: - Soreng-Manegold Switch, Model 5640-A, C-5640-A (without windshield wiper fuse). Soreng Manegold Foot Control Switch. Foot control switch provides asymmetric 'meeting' beam (lower beam right hand headlight, upper beam left hand headlight). Headlight beams are crossed (left hand headlight lights right side of road). Operative only with lighting switch in 'Country Driving' position. Headlight bulbs are pre-focused type.

Lighting (Cont'd)

Lamp	Bulb Specifications	
	Candlepower	Mazda No.
Headlights	32-21	2320-C
Parking, Instrument, Flood	3	63
Dome, Vestibule	15	87
Stop and Tail	21-2	1158
Signal	3	64 (DC)

SIGNAL LIGHTS: - Battery charge tell-tale and oil pressure tell-tale light mounted on instrument panel. Light bulbs are standard 3 cp. DC. bulbs.

Battery Charge Tell-tale - At left of instrument cluster. Tell-tale should light with ignition turned on and should go out when generator begins to charge battery (relay contacts closed). If telltale does not burn when ignition turned on, check bulb by grounding tell-tale terminal on relay to generator field frame. If tell-tale does not light, replace bulb. If lamp lights, check auxiliary contact

spring, contacts and ground resistor. See that auxiliary contacts are closed with main contacts open. If tell-tale lights at speeds above idling (8 M.P.H.), generator or relay is defective.

Oil Pressure Tell-tale - At right of instrument cluster. Tell-tale should light with ignition turned on but should go out when engine is operated (light should flash at idling speeds). Tell-tale should not light or flash at speeds above idling. If tell-tale does not light when ignition is turned on, check bulb by grounding terminal on oil pressure check valve (right side of crankcase) to engine. If tell-tale does not light, replace bulb. See special article on Hudson Signal Lights in Equipment Section for complete data.

FUSES: - Lighting - Two 20 ampere capacity fuses on back of lighting switch.

Windshield Wiper - 7-1/2 ampere capacity fuse on lighting switch (not used on all cars).

Generator Field - 7-1/2 ampere capacity.

CARTER DOWNDRAFT CARBURETOR

1934 Terraplane
All Models

Technical Information

Carter W-1 Downdraft Carburetors 1934 Terraplane Challenger, Model KS

NOTE: Terraplane Models. Carburetor fitted with Anti-Percolator and Throttle Cracker. See these sections below for adjustments.

TYPE: - Plain tube downdraft type with throttle operated accelerating pump and economizing device (metering rod). Main nozzle is located at an angle in the upper or primary venturi with a secondary and a main venturi directly below this point in the mixing chamber. Fuel for main nozzle is metered by metering jet and metering rod. Accelerating pump discharges through a pump jet against the wall of the secondary venturi. Idle adjustment and accelerating pump setting are the only points requiring attention.

IDLE ADJUSTMENT: - Needle valve type controlling fuel mixture. Engine must be thoroughly warmed up before adjustment is made. With engine warm and running, close throttle, adjust throttle stop screw if necessary to keep engine from stalling (do not set lower than 300 R.P.M. or approximately 5-6 M.P.H.). Turn idling adjusting screw in or clockwise until engine begins to miss (mixture too lean), then turn screw slowly out or counter-clockwise until engine fires smoothly. Idling screw controls fuel mixture and should be turned in to secure leaner mixture or out for richer mixture. See tune up data for each model on car model page. Approximate settings as follows:

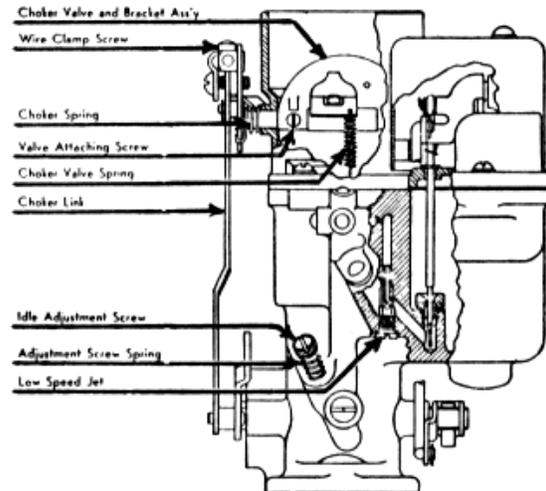
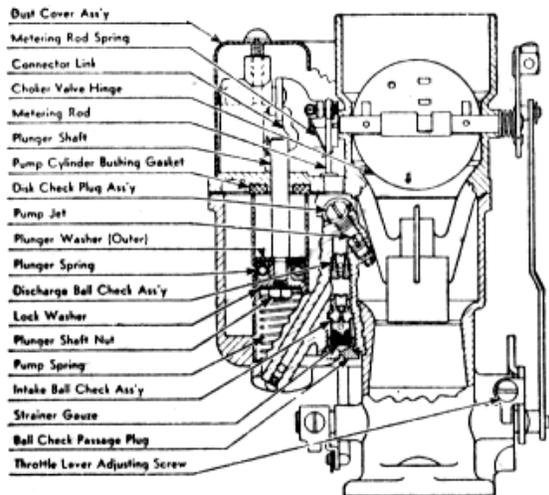
Car Model	Idle Screw Setting (Turn Open)	Idling Speed RPM @ MPH
Terraplane (all)	3/8-1	350 @ 7 MPH

METERING ROD (ECONOMIZER) : - Fuel is metered by a two or three step metering rod being raised in the metering jet as the throttle is opened, allowing an increased fuel flow through the jet. No adjustment is

provided but metering rods can be changed to secure leaner-than-standard fuel mixtures to compensate for special fuel or operating conditions, such as high altitudes. To change metering rod, take off dust cover, take off pin spring, turn rod one-quarter turn to left to disengage pump arm, lift rod out, being careful not to lose disc on rod. Insert new rod (with disc in place), holding rod vertically so that lower end of rod will enter jet in float chamber. Turn rod one-quarter turn to engage pin on pump arm (throttle must be closed).

NOTE: - Metering rod setting should be checked whenever carburetor is serviced or when rods are changed. This will require a special gauge (see table below for correct gauge for each carburetor model). To check rod setting, remove dust cover, disengage upper end of throttle connector rod, back off throttle lever adjusting screw so that throttle closes tight, remove metering rod (see above), insert gauge in place of rod so that beveled end is seated in metering rod jet and gauge is held in vertical position. See that metering rod pin rests on top of gauge with throttle closed and upper end of connecting rod centering freely in the hole in the pump arm. If setting is not correct, bend lower end of throttle connector rod so upper end centers freely in hole. Replace metering rod and dust cover (lubricate pump shaft - see Accelerating Pump Section). Readjust throttle stop-screw for correct idling speed.

Car Model	Carburetor Model No.	Gauge Part	Length
Terraplane	295-S	T-109-20	2.795"



ACCELERATING PUMP: - Low pressure type positively actuated by throttle lever. Fuel drawn into pump chamber through intake ball check valve and strainer on upstroke of plunger and discharged through outlet disc check valve to pump jet in carburetor wall on downstroke of plunger when throttle opened.

Adjustment - Pump arm on countershaft under dust cover on top of float bowl cover provided with three holes for engagement of pump plunger connecting link. Inner hole provides minimum stroke, outer hole medium stroke, and upper hole maximum stroke. See tune up data on car model page for recommended setting and seasonal changes.

NOTE - Pump countershaft should be lubricated at 5000 mile intervals by removing dust cover screw at top of carburetor and filling screw hole with good grade of graphite grease before replacing screw.

PERFORMANCE: - Should be satisfactory if Idle Setting and Accelerating Pump setting are correct. See Carter Jet Specification Table and tune up data on car model pages for any recommended changes.

ANTI-PERCOLATOR:-This device consists of a vent above the main jet well controlled by a cap linked to the accelerating pump rod so that the vent is opened with the throttle closed to prevent any 'percolating' discharge of fuel through the main jet with the carburetor hot. The setting of the Anti-percolating device should be checked as follows:

Adjustment - Anti-percolating cap must be off seat when throttle closed in idling position. Adjust by bending anti-percolating cap arm slightly to permit pump arm to depress bracket. Cap must be seated when throttle opened slightly beyond idling position. Check by opening throttle .030" (insert drill rod between throttle edge and carburetor wall on side

opposite port), adjust rocker arm so that clearance between rocker arm lip and pump arm is .005-.015" (with metering rod setting correct).

FLOAT LEVEL: - To check float level, take off float bowl cover, remove gasket, invert cover, measure distance from gasket seat (machined surface) on cover to nearest point on float (top when not inverted) at a point opposite the needle valve. Float level can be reset by bending lip of float lever. Correct float level setting should be 3/8" on all models.

CHOKE: - Choke valves on these models are in most instances fitted with a pressure relief device of the split-valve or poppet-valve type.

Models 295-S - Poppet type relief valve mounted on choke valve. Poppet valve is spring-controlled and opens to prevent over-choke when engine begins to fire.

Throttle Connector - 295-S. - Choke and throttle valves interconnected on these models so that throttle valve is opened slightly when carburetor is choked for starting, providing a 'fast idle' for as long as the choke valve is in use. Throttle returns to closed position when choke valve is opened. Correct throttle openings with choke valve closed are shown in table below:

Car Model	Carburetor	Throttle Opening
Terraplane	295-S	.036-.040"

TROUBLE SHOOTING: - Poor Idling Performance - If correct adjustment cannot be secured, engine stalls, or low speed performance is unsatisfactory, remove low speed idle tube, clean with compressed air, see that tube is tight in casting at top and bottom. Remove idle adjusting screw and clean idle passage with air.

Acceleration Unsatisfactory - Check pump setting, examine pump for damaged or worn plunger leather, bent pump arm or loose plunger, corrosion or sediment in pump cylinder. Use loading tool when replacing plunger in pump cylinder to avoid damage to plunger leather. If increased resistance felt on throttle lever, remove pump jet and clean with compressed air. Examine ball check valves and see that they are free and seat gasoline tight.

Carburetor 'Loads Up - If carburetor has been in use for some time, check float level and adjust if necessary.

SERVICING: - To Disassemble Carburetor - Take out screw and remove pump arm dust cover, disconnect choke and throttle interconnecting link (when used), take off pin spring on metering rod, lift out rod and disc (disc is loose on rod). Take off pin locks on throttle connector link and pump connector link, disengage links and remove. Take out float bowl cover screws, lift off cover being careful not to

damage float chamber gasket. Pull out pump plunger, remove plunger spring from pump cylinder. Remove idle adjusting screw and spring, nozzle plug and main nozzle, pump jet plug and pump jet being careful not to lose jet gasket, idle passage plug, low speed jet tube assembly, metering rod jet assembly, and other jets and plugs. Take out float lever pin, lift out float and lever assembly being careful not to drop float needle valve.

Servicing - Wash all parts and body castings in gasoline, blow out all passages in castings and jets with dry air. Replace all worn and damaged parts.

Reassembling Carburetor - Reverse disassembly directions above. Use new gaskets where necessary. Soak new metering rod jet gasket and needle seat gaskets in warm water for 15 minutes before installing. See that all jets and plugs tightened securely.

Adjusting - Check metering rod setting and float level. Adjust carburetor, when installed on engine, as directed in tune-up data on each car model page.

W- 1 WITH CLIMATIC CONTROL
(DOWNDRAFT TYPE)

281-S – 1934 Terraplane Standard Model K, Deluxe Model KU

NOTE: - All models fitted with Carter Climatic Control (automatic choke), Fast Idle, Unloader and Choke Valve Lock, and Anti-Percolator. See complete article in Carburetion Equipment Section for data on Climatic control. Fast Idle and Unloader. Anti-Percolator adjustment given below.

TYPE: - Plain tube downdraft type similar in design to other W1 models except for Climatic Control and Fast Idle which are mounted on carburetor.

IDLE ADJUSTMENT: - Needle valve type controlling fuel mixture. Adjusting screws should be turned in for leaner mixture or out for richer mixture. Do not adjust until engine warmed up so that choke valve wide open and idling at hot or slow idling speed with fast idle bar raised to clear throttle stopscrew. Adjust throttle stopscrew so that idling speed is approximately 350 R.P.M., turn idling screw in until engine begins to miss, then turn screw out slowly until engine fires evenly. Readjust throttle stopscrew if necessary. See tune up instructions on car model pages.

ACCELERATING PUMP: - Low pressure type positively actuated by throttle lever. Fuel drawn into pump cylinder through intake check valve and strainer on upstroke of plunger and discharged through outlet disc check valve to pump jet in carburetor wall on down-stroke of plunger when throttle opened.

Adjustment - Pump arm on countershaft under dust cover at top of cylinder provided with three holes for engagement of pump plunger connecting link. Inner hole provides minimum stroke, outer hole medium stroke and upper hole maximum stroke. See tune-up data on car model pages for recommended settings and seasonal changes.

NOTE - Pump countershaft should be lubricated at 5000 mile intervals by removing dust cover screw at top of carburetor and filling screw hole with good grade of graphite grease before replacing screw.

PERFORMANCE: - Should be satisfactory if idle setting and accelerating pump setting correct.

METERING ROD (ECONOMIZER): - All fuel for main nozzle metered by three-step metering rod linked to pump arm so that rod is raised permitting increased fuel flow through metering jet as throttle is opened. No adjustment provided but metering jet may be changed to secure leaner-than-standard fuel mixtures to compensate for special fuel or high altitude operation. Metering rod

setting should be checked whenever metering rods are removed.

To Remove Metering Rod - Take out dust cover screw, lift off dust cover, take off pin spring, turn metering rod one-quarter turn to left to disengage it from arm, lift rod out being careful not to lose disc on rod.

To Check Metering Rod - See that choke valve opened and fast-idle block raised to clear throttle stopscrew, back off stopscrew so that throttle closes tightly. Disconnect throttle connector at pump arm. Use special gauge (see table below for type for each model), insert gauge in place of metering rod so that beveled end seats in metering rod jet and gauge is held vertically. Rotate pump arm so that metering rod pin rests lightly in lower end of notch in gauge, bend lower end of throttle connector so that upper end centers freely in hole in pump arm. Remove gauge and re-connect throttle connector.

To Install Metering Rod - Insert rod (with disc in place) vertically so that lower end enters metering rod jet, turn rod one-quarter turn to engage pin on pump arm, replace pin spring. See that rod hangs freely, replace dust cover and cover screw.

ANTI-PERCOLATOR: - Consists of a vent above the main jet well controlled by cap linked to the accelerating pump rod so that the vent is opened with the throttle closed to prevent any percolating discharge of fuel through the main jet with the carburetor hot. The cap must close when the throttle is opened.

FLOAT LEVEL: - To check float level, take off float bowl cover, remove gasket, invert cover, measure distance from gasket seat to nearest point on float (top when not inverted and at free end). Float level can be corrected by bending lip of float lever. Settings should be as follows:

Car Model	Carburetor Model	Float Setting
Terraplane all models	281-S	3/8"

Adjustment - Hold fast idle cam in slow idle position, turn throttle stopscrew so that it is locked against first step of cam with throttle valve closed tight, use special tool No. T109-41, bend offset portion of fast idle link so that clearance between inside wall of air horn and lower tip of choke valve is exactly 5/8".

CHOKE: - All choke valves are offset type. See article in Carburetor Equipment Section for complete data on automatic choke (Climatic Control).

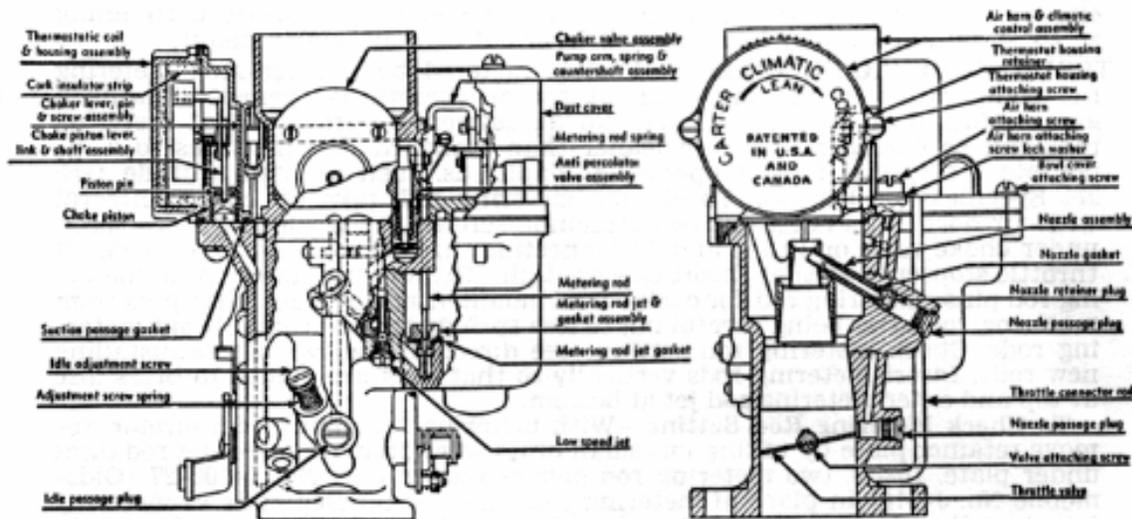
Unloader: - Consists of lip on fast idle block (1936), or cam on throttle lever (1937) which opens choke valve when throttle valve is opened wide.

Choke Valve Lock: - Prevents choke valve from closing when throttle valve is wide open. See article in Carburetion Equipment Section on Carter Climatic Control for adjustment directions.

TROUBLE SHOOTING: - Same as for other Carter models (see previous article).

SERVICING: - Disassembly. Remove dust cover, remove fast idle cam attaching screw and fast idle cam or take out two screws and remove fast idle drop-bar, remove nozzle plug, retainer plug, nozzle and gasket (do not take nozzle assemblies apart). Remove air horn attaching screws and lockwashers

(two above, one below), lift off air horn and Climatic Control assembly. Remove pin spring and connector link at top of accelerating pump stem, remove pin spring, unhook metering rod spring, take out metering rod and disc (do not lose disc which is free on metering rod). Remove spring retainers and connector rod springs, remove throttle connector. Remove bowl cover retaining screws and lockwashers, lift off bowl cover, lift off cover gasket. Remove pump arm and countershaft on cover by revolving one-half turn. Remove float and lever assembly, pin and pump cylinder bushing gasket, needle and seat from bowl cover. Remove



pump plunger and rod assembly and pump spring (remove nut on stem to disassemble pump plunger). Remove metering rod jet and gasket assembly. Use special 13/32" socket wrench No. 15451 to remove Anti-Percolator valve plug assembly. Remove pump jet passage plug, gasket, and pump jet, loosen screw and remove throttle shaft arm, remove low speed jet, ball check passage plug, strainer, and intake and outlet ball check plug assemblies, throttle valve screws, valves, throttle shaft assembly, idle port plug, and idle adjustment screw. Do not lose copper washers used on low speed jet, ball check assemblies.

Servicing. Wash all parts in gasoline (do not immerse cork gaskets). Replace worn parts (replace metering rod

and metering jet as an assembly). Blow out all passages in castings. Use all new gaskets when re-assembling.

Assembly. Reverse disassembly directions above. See that all jets and plugs tightened securely. When replacing throttle valves, install valve with trademark up, insert screws loosely, back off stopscrew so that valve closes tightly, tap valve lightly to centralize it in bore before tightening screws. Use loading tool to install pump plunger and lubricate plunger leather with castor oil. Check float level and metering rod setting as directed above and adjust carburetor when replaced on car.

KING-SEELEY ELECTRIC TYPE GAUGES

DESCRIPTION: - This is an electric type gauge of a new type using bi-metal arms on which heating coils are wound in both the tank or engine unit 'Sender' and the dash unit 'Receiver'. The two heating coils are connected in series and the gauge circuit is completed to ground through a set of contacts in the Sender unit (one of which is mounted on the bi-metal arm). The feed wire on the Receiver unit is connected to the accessory terminal of the ignition switch so that the gauge registers only with the ignition on.

Gasoline, Oil, Water Level - For this purpose the ground contact in the Sender is mounted on a movable arm (arm mounted through diaphragm forming lower cover of Sender unit and flexes diaphragm as it is moved). The lower end of the ground contact arm is actuated by a cam on the upper end of the float rod pivot. When the float moves up to follow the gasoline, oil, or water level, the cam moves the arm so that contact pressure and length of time contacts remain closed is increased.

OPERATION: - When the Sender contacts are closed a current flows through the heating coils of both the Sender and Receiver units. This causes the bi-metal arm in the Receiver to bend, moving the pointer, and indicating a reading on the gauge dial. At the same time the heating coil in the Sender unit causes its bi-metal arm to bend, opening the contacts and interrupting the current flow. When this occurs the heating action stops and the cooling of the bi-metal arm causes it to flex in the opposite direction and again close the contacts. In operation, this cycle takes place very rapidly (approximately once each second for the gasoline gauge with tank empty), and a steady reading is obtained on the Receiver dial.

TROUBLE SHOOTING: - Gasoline, Oil, Water Level Gauges - Manufacturer recommends use of extra or test Sender and Receiver to check operation of units which do not perform satisfactorily. Make tests as directed below:

Testing Sender: - Disconnect lead of Sender unit on car, connect this lead to test Sender and ground this Sender to the car frame. Turn on ignition, move Sender float up to 'full' position and note reading on Receiver. Receiver should read full or 'F' after 10-15 seconds time. If Receiver reading is correct, check following points before replacing Sender unit.

1. Ground. Sender is grounded through case. See that all paint and grease are removed under flange and both surfaces make good contact.

2. Radio By-pass Condenser Shorted. If by-pass condenser is connected at Sender on cars with radio, test for short-circuit by disconnecting condenser and noting gauge operation. If gauge is satisfactory, replace condenser. Use only condenser of .05 microfarad capacity (manufacturer recommends Cornell Dubiller Corp. Condenser No. 22-259).

If reading is secured with test Sender is same as that with Sender on car, check wire connecting Sender and Receiver and replace if found to be open-circuited or grounded.

Testing Receiver - Disconnect wires on Receiver on car and connect to same terminals on test Receiver. Turn on ignition switch and note reading on gauge. If test Receiver reading is correct, replace Receiver on car. If test Receiver reading is same as car Receiver, repeat tests on Sender and wiring.

SERVICING: - No service operations are required other than to see that wires are properly connected and terminals are tight. No repair operations are possible and defective Senders and Receivers should be replaced.

Mechanical Equipment
Hudson & Terraplane Models

BRAKES

Bendix Mechanical Type - Single Anchor

Used On:

Hudson Six (1933,1935).

Hudson Eight, Terraplane Six - (1932-1935).

Terraplane Eight, MODEL KT (1933).

DESCRIPTION AND OPERATION - Wheel Brakes, two shoes per wheel, connected together by turn buckle type adjusting screw at one end and bearing against single anchor pin at other end. Cable actuated lever concentric with anchor pin forces anchor end of primary shoe against drum when brakes applied. Primary shoe applies secondary. Shoes returned to off position by independent spring hooked to lever and brake shoe. Shoes held in position by coiled springs and clips hooked to backing plate. Adjustments consist of eccentric screw (brake shoe stop) to centralize shoes, and adjusting screw (between shoes) to control clearance between shoes and drum.

Brake Linkage: - Wheel brakes actuated by cables from single cross-shaft or rotary plate or equalizer mounted at center of frame 'X' member (1935 Hudson & Terraplane). Brake cables protected by flexible conduits between frame and wheel. Brake pedal linked to cross-shaft with Vacuum Power Cylinder Control Valve (when used) incorporated in pedal linkage.

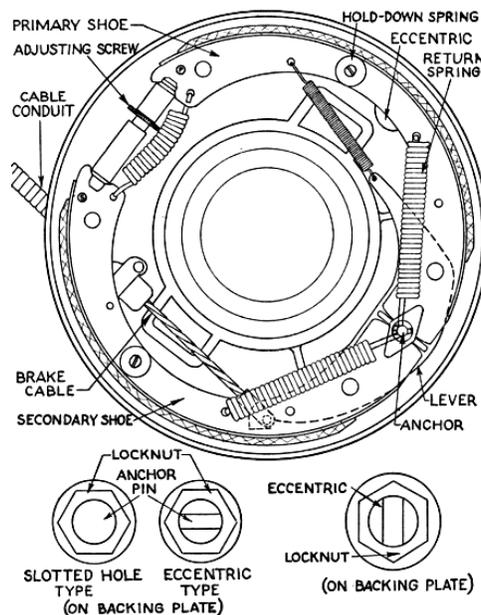
Hand Brake: - Hand Brake lever linked to cross-shaft or equalizer plate applies all four service brakes.

ADJUSTMENT: - Jack up all four wheels, disconnect cables at cross-shaft, remove adjusting screw hole covers on backing plates and inspection hole covers on drums (remove wheels if disc type). Check pedal position with cross-shaft levers against stops. Pedal

should clear underside of toeboard by 1/2". Adjust by disconnecting pedal link and changing length. Then proceed as follows:

Minor Adjustment (For Wear): -

- 1 - At each wheel loosen eccentric locknut, turn eccentric in direction of forward wheel rotation until .010" feeler is snug fit both ends of this shoe. Hold eccentric from turning, tighten locknut. Clearance at both ends must be the same within .003" with smaller clearance preferably at anchor end. If variation greater than .003", anchor pin must be relocated (see Major Adjustment below).
- 2 - At each wheel, insert tool or screwdriver in adjusting screw hole, turn notched adjusting screw toward backing plate rim (move outer end of tool up toward center of wheel) until shoes are expanded so that drum can just be turned, pull brake cables toward cross-shaft to remove all slack, adjust clevis position (loosen locknut, turn clevis, tighten locknut) until pins just enter clevises at cross-shaft lever freely, reconnect brake cables.
- 3 - Back off adjusting screws same number of notches at each wheel until wheels are free. Apply brakes with hand lever or use pedal jack until wheel with least drag can just be turned, equalize brakes by backing off adjusting screws on tight wheels not more than two or three notches. Do not tighten loose wheels.



- 4 - Check pedal reserve (distance from pedal to floorboard with brakes applied). This should be one half total travel (minimum). Recheck adjustment if less than this amount. Then check hand lever position (below).

Major Adjustment (New Shoes or Relined Brakes):

- 1 - At each wheel loosen anchor pin nut one turn, tap anchor pin out toward drum (slotted hole type with plain end) or turn anchor pin in direction of forward wheel rotation (eccentric type with slotted end). Loosen locknut, turn eccentric in direction of forward wheel rotation until .010" feeler snug at both ends of this shoe, hold anchor pin, tighten locknut securely with 16" wrench, hold eccentric from turning, tighten eccentric locknut. Then proceed with (2) and (3) under Wear Adjustment above.

RELINING BRAKES: - Manufacturer recommends use of replacement shoes furnished with new linings installed and ground concentrically. If shoes relined, use same type lining as fitted originally (see Car Model article). Lining on primary and secondary shoes may be of different types (woven on primary, moulded on secondary, etc.), or of different lengths.

Shoes may be identified by 'P' (primary) 'S' (secondary) stamped on rib at adjusting screw end.

SERVICING: - Brake Linkage-Whenever adjustment made, lubricate brake pedal hand lever, cross-shaft, overrunning linkage and all clevis pins. See that linkage operates freely and returns sharply to stops when pedal and hand lever released.

Cable Conduits: - Lubricate cable and conduit assemblies through fittings (when so equipped) or disconnect cable at both ends, clean thoroughly, pull cable out at wheel end to expose portion normally in conduit, clean and coat with Bendix Cable Lubricant, or graphite grease such as Gredag #2131/2, pull cable back and forth to spread lubricant in conduit. See that conduit is bottomed firmly in abutment brackets and that bracket bolts are tight.

Wheel Brakes: - With shoes removed, coat brake cam, anchor pin, cable ramps, eccentric, backing plate shoe edges and all other contact points with Bendix Lubriplate. Examine shoe return springs and see that heavier spring is attached to shoe which covers cable end of brake lever.

HUDSON CLUTCH

Used On:

1934 Hudson Eight, Models LL, LT, LTS
1934 Hudson Eight, Models HT, HH, HHU
1935-1936 Hudson Six, Models GH (1935); Model 63 (1936), Model 73 (1937)
1936-1937 Hudson Eight, Models 64, 65, 66, 67; Models 74, 75, 76, 77
1934-1938 Terraplane, Models K, KS, KU ;
MODELS G, GU (1935), Models 61,62 (1936), Models 70,71,72 (1937).

DESCRIPTION: - Single plate, cork insert type, operating in oil. Mounted on flywheel face by 16 capscrews in cover flange. Gasket used under cover flange to secure oil-tight joint and oil seal mounted on throwout collar to retain clutch lubricant. Clutch actuated by 3 clutch fingers pivoted on retainers bolted to cover and linked to pressure plate by pins at outer end.

SERVICING: - Clutch assembly need not be dismantled when replacing driven member unless springs are to be tested or replaced, pressure plate replaced, or other service work performed.

Dismantling: - Check punch marks near outer edge of pressure plate in line with mark on cover flange or make new marks to insure reassembly in same position. Place clutch assembly on special clutch fixture (#J-298-H) or in arbor press supporting pressure plate so that cover is free. Compress cover slightly, take off 3 nuts on clutch finger retainer bolts on cover, release pressure slowly, lift cover off.

Pressure Plate: - Examine plate, replace if scored. Check for warping (particularly if plate 'blued' due to overheating). Replace if warped more than .010".

Clutch Springs: - Twelve springs on Hudson models, nine large springs and six inner springs on Terraplanes. Replace springs if pressure plate 'blued' indicating overheating. Check springs and replace if pressure less than service limit shown below.

	Pressure (new)	Service Limit	Length
Large Springs	120 lbs	110 lbs	1-5/8"
Small (inner)	75 lbs	60 lbs	1-5/8"

Assembling: - Check clutch throw-out fingers, see that they are straight and do not show wear at tip or retainer lug. Replace retainer washers if necessary. Place pressure plate on fixture with face down. Assemble springs, clutch fingers, retainers and retainer washers on plate. Place cover on top of pressure plate assembly (lining up marks on cover and plate), compress cover slowly, guiding retainer bolts through holes in cover, install nuts on retainer bolts, tighten securely. Check clutch finger heights after clutch installed on flywheel.

INSTALLATION & ADJUSTMENT: - Shellac new gasket on face of cover flange, see that flywheel face smooth and clean, use clutch aligning arbor (#J384) inserted through clutch cover and driven plate to align driven plate, mount clutch assembly on flywheel (engaging two locating dowel pins on flywheel) install 16 cover screws, tighten screws evenly and securely (draw down screws diametrically opposite together to avoid distorting cover). Then align clutch fingers.

Clutch Finger Alignment: - Use special clutch finger adjusting gauge (#J-774) resting gauge on clutch cover so that pin is directly above clutch finger tip. Turn thumbscrew down until pin contacts finger. Repeat at other clutch fingers to secure final gauge setting equal to lowest finger. Turn gauge to higher finger, strike end of retainer bolt with soft hammer until gauge bar rests squarely on cover hub. With final setting, gauge bar should rest squarely on hub over all fingers and clearance between pin and end of thumbscrew must be less than .0051, (all fingers equal within this amount-check with feeler gauge).

Throw-out Bearing & Oil Seal: - Insert 1/3 pint Hudsonite through clutch hub before installing throwout collar assembly. Oil seal is pressed on collar behind throw-out bearing. When installing new oil seal, press firmly near inner diameter (pressure at point near rim may distort outer stamping and allow inner stamping and oil seal leather to revolve with shaft, this will cause noise similar to noisy throw-out bearing). Use arbor press to install throwout bearing (do not drive on). See that bearing revolves smoothly and that oil seal inner stamping is tight in outer stamping before installing collar in clutch cover.

DRIVEN PLATE: - Driven plate has spring-dampener type hub and facing consisting of cork inserts. Examine driven member, see that plate runs true and is not warped or distorted, and that springs in hub do not have appreciable free play. See that hub splines are not worn and are free from burrs. Corks must be in good condition. Black glaze indicates use of wrong lubricant. Soak driven plate in Hudsonite and clean corks, or replace driven member,

STEERING GEAR
GEMMER WORM-AND-SECTOR TYPES

Used On:

(1)1932-1936 - Hudson Eight
1932-1935 - Terraplane 6, (1932-33-34-35-36).
1933 - Terraplane 8 Model KT

(1) - Hudson Eight, Models LT (1934), HHU (1935) only, are equipped with Gemmer-Worm-and-Roller type.

DESCRIPTION: - Consists of 'hour glass' type worm mounted on steering shaft and carried on roller bearings at top and bottom. Bearings are provided with an automatic take-up under housing cover at upper end which eliminates necessity for adjustment except after considerable wear. The threetooth sector on the cross-shaft engages the worm. Cross-shaft is provided with endplay adjustment. Housing cover in which cross-shaft is mounted is provided with eccentric adjusting sleeve and eccentric rivet adjustments to adjust sector clearance in worm.

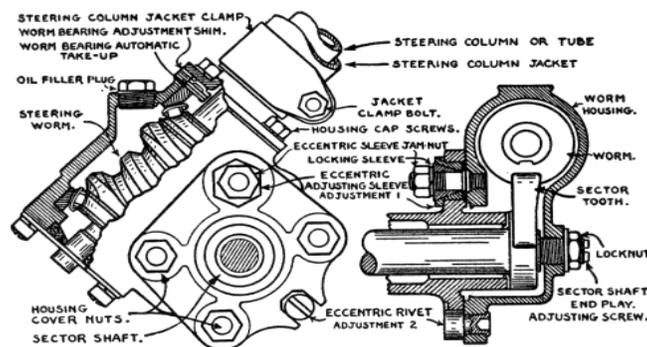
ADJUSTMENT: - Before making adjustments, jack up front wheels and disconnect drag link to free steering gear (front wheels should turn freely with not more than 10 lbs. pull on drag link in either direction). Align steering column by loosening frame bracket bolts to allow gear to shift in frame, tighten bolts, then loosen instrument board bracket bolts to allow bracket to shift in alignment with column, tighten bracket bolts. Make adjustments in order as follows:

Worm Bearing Endplay: - Evidenced as up and down movement of steering wheel. Adjust when this exceeds .010" (to check, turn wheel 1 turn off center, hold wheel, shake front wheels). To adjust, loosen jacket clamp bolt above housing upper cover, shift clamp up 3/8" above lower end of jacket, loosen instrument board bracket clamp, work jacket down until lower end is against housing arm, remove housing capscrews, work jacket up as far as possible. This will provide approximately 3/8" clearance between housing cap and housing. Clip and remove one shim, reassemble gear, locating jacket clamp as near bottom end of jacket as possible. Check adjustment. Wheel should turn freely without stiffness.

Cross-shaft Endplay: - See that housing cover nuts and jam nut are securely tightened. Turn steering wheel to extreme end position and then back 1/8 turn. Loosen locknut and turn adjusting screw in housing at inner end of cross-shaft until shaft rotates freely with no endplay, tighten locknut.

Sector Tooth Mesh in Worm: - Turn steering wheel to 'straight ahead position' midway between end points, loosen housing cover nuts 1/4 turn and eccentric sleeve jam nut 1/2 turn. Turn eccentric adjusting sleeve slowly clockwise until backlash can just be felt at ball end of steering arm. Check by turning steering wheel throughout full travel. If wheel is too tight in any position, turn eccentric sleeve counter-clockwise until wheel is free and then readjust. Sleeve must be turned clockwise to finish adjustment. Tighten eccentric sleeve jam nut, then tighten cover nuts. With correct adjustment sector should have minimum clearance at center position and gradually increased clearance toward ends.

Centralization of Tooth Contact: - Check clearance or backlash between sector teeth and worm at points 1/3 turn of steering wheel each side of center position. If clearance is not equal, note at which point (right or left) backlash is greatest, loosen cover nuts and eccentric sleeve jam nut, turn eccentric rivet in notch in edge of cover slightly clockwise (if greater clearance with wheel turned to right) or counter-clockwise (if greater clearance with wheel turned to left). Tighten cover nuts and jam nut securely, repeat test.



To Bend Pitman Arm - Wrap hardened pitman arm ball in wet rags, drip water on ball, heat arm 2" above ball with torch until color begins to show, bend arm with bending bar approximately 3/64" backward (if spoke to right of center) or forward (if spoke to left of center) to correct each 1" that spoke is off center. Drag link must be disconnected and ball protected as directed to prevent destroying hardened finish.

To Adjust Drag Link - See Car Pages for serial numbers of cars on which adjustable drag link used. Adjustment consists of shims placed at both ends of pitman arm ball seats at rear end of drag link. Transfer shims from one position to the other to throw pitman arm back (wheel spoke to right) or forward (wheel spoke to left).

Universal Joints Spicer Needle Bearing Type

Used on:

1934 thru 1937 Terraplane – All models

DESCRIPTION: - Needle bearing type. Universal has conventional cross or spider with individual bearings on cross ends. Bearings consist of loose needle rollers held in place in bearing cup by retainer and assembled with cork gasket and dustcap between bearing cup and shoulder on cross to retain lubricant. Bearing cups fit directly in holes in yoke ends and are retained by locking ring in yoke at outer end or by bearing cap held in place on yoke end over bearing cup by two capscrews. On some models, bearing cups are bolted directly to trunnions on companion flange by 'U' bolt passing completely through flange with nuts on opposite side.

DISCONNECTING UNIVERSAL: - Take out bolts in companion flange or remove nuts on U bolts mounting bearing cups on flange and remove U bolts. When disconnecting this type see that bearing cups do not fall off universal cross.

SERVICING: Disassembly - Remove locking rings or take out capscrews and remove bearing cups. Tap or press on outer end of one bearing cup until cup on opposite side has been forced out of yoke end. Turn universal joint over and press first bearing cup out (applying pressure on exposed end of universal cross). Bearing cups are light press fit in yoke lugs.

Servicing - Wash all parts in gasoline. Clean out lubricant holes in cross. Examine all parts for wear. Use new cork gasket when reassembling joint.

Assembly - Place cross in yoke, install needle rollers in bearing cups, assemble retainer, new cork gasket, and dustcap, pack bearing cup and lubricant passage in cross with SAE. #160 oil, insert bearing cup in yoke end on cross. Use special clamp to press bearing cups in and compress sufficiently so that locking rings can be installed. See that locking rings are firmly seated in recess in yoke. On types using bearing caps, use new lock plate under screw heads, turn up lock tang against capserew after screws have been securely tightened. On U bolt types, see that lockwashers installed under nuts.

NOTE - When installing drive shaft, see that arrows on shaft and universal joint yoke at sliding splined joint are lined up.