

PRINTED IN U.S.A.

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HUDSON

SERVICE - REPAIRS

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Hudson Front Axle

Front Axle Group



Hudson Front Axle

Ref. No. Name of Part

- 1. Front wheel outer bearing
- 2. Spindle washer
- 3. Spindle nut
- 4. Spindle-left hand
- 5. Front wheel inner bearing
- 6. Front wheel dust washer retainer-outer
- 7. Front wheel dust washer
- 8. Front wheel dust washer retainer-inner
- 9. Spindle shim
- 10. Spindle pivot pin lower bushing
- 11. Lower bushing pipe plug
- 12. Tie rod pivot pin lock
- 13. Spindle pivot pin oiler
- 14. Steering arm nut
- 15. Pivot pin oiler elbow
- 16. Pivot pin dust shield
- 17. Pivot pin dust washer
- 18. Spindle pivot pin upper bushing
- 19. Spindle pivot pin
- 20. Thrust bearing shield

Ref. No. Name of Part

- 21. Thrust bearing
- 22. Spindle pivot pin lock
- 23. Tie rod pivot pin lower bushing
- 24. Tie rod pivot pin washer
- 25. Tie rod pivot pin nut
- 26. Tie rod pivot pin shield
- 27. Tie rod pivot pin upper bushing
- 28. Tie rod pivot pin
- 29. Steering arm ball
- 30. Steering arm-left hand
- 31. Steering arm ball nut
- 32. Axle center
- 33. Tie rod yoke clamp bolt nut
- 34. Tie rod yoke
- 35. Tie rod
- 36. Tie rod clamp bolt
- 37. Spindle-right hand
- 38. Steering arm stop screw
- 39. Steering arm stop screw nut
- 40. Steering arm-right hand

(A) Renew Spindle Pivot Pin Bushings and Pins

1. Jack up or block up front end of car.

2. Remove front hub caps and spindle nuts (3); take off wheels.

3. Remove drag link front end boot, cotter pin and front end adjusting plug, then disconnect drag link from steering arm ball (29).

4. Remove cotter pins, nuts (25) and washers from bottom of tie rod pivot pins (28).

5. Drive out flat side lock pins (12) from steering arms, remove tie rod pivot pins and tie rod assembly.

6. Remove oil cup elbows (15), dust caps (16), and dust washers (17) from top of spindle pivot pins and pipe plugs (11) from lower bushings.

7. Drive out flat side lock pins (22) from spindles and drive out spindle pivot pins (19) with drift inserted through pipe plug holes in lower bushings, allowing spindles (4), thrust bearings (21), and shims (9) to be removed. Note: If spindle pivot pins are rusted or frozen in spindle, it will be necessary to force them out with the spindle pivot pin remover shown on page 32, service tool section.

8. Remove old bushings (10, 18) and insert new ones, using pivot pin bushing press shown on page 3, service tool section, which will prevent damage to the parts and insure proper alignment of the bushings so that the pivot pins will operate freely.

9. To reassemble, reverse above operations, making sure that pivot pins turn freely, without shake, and that the proper number of shims are inserted between bottom of spindle and top of lower bushing to eliminate up and down play.

(B) Renew Tie Rod Pivot Pin Bushings and Pins

1. Remove cotter pins, nuts (25) and washers from bottom of tie rod pivot pins (28).

2. Drive out tie rod pivot pin locks (12) from steering arms; take out pivot pins (2 8) and remove, tie rod assembly.

Front Axle Group

3. Remove old bushings (23, 27) from tie rod yokes and press in new ones, using bushing press shown on page 12, service tool section.

4. Reassemble parts to axle, by reversing the above operations.

(C) Straighten* or Replace Front Axle Center

*This procedure we do not recommend unless the axle center is only slightly bent and the proper equipment available to straighten it cold. Heating the axle to straighten it should be avoided, as this destroys the original heat treatment, with the result that the part is weakened and a satisfactory or lasting job is seldom obtained.

1. Raise front end of car with chain hoist or by jacks or blocking under frame side members, directly back of front springs.

2. Remove front hub caps, cotter pins and spindle nuts (3); take off front wheels.

3. Remove drag link front end boot, cotter pin and front end adjusting plug, then disconnect drag link from steering arm ball (29)..

4. Remove cotter pins, nuts (25) and washers from bottom of tie rod pivot pins (28).

5. Drive out tie rod pivot pin locks (12); take out pivot pins and tie rod assembly.

6. Remove oil cup elbows (15), dust caps (16), and dust washers (17), from top of spindle pivot pins, also pipe plugs (11) from bottom of lower bushings.

7. Drive out flat sided lock pins (22) from spindles and drive out spindle pivot pins (19) with drift inserted through pipe plug holes in lower bushings, allowing spindles, thrust bearings (21) and shims (9) to be removed. If the spindle pivot pin is rusted or frozen in the spindle, it should be removed with the spindle pivot pin remover shown on page 32, service tool section.

8. Remove front spring clip nuts, clips and rubber bumpers. This will release the front axle center (32), which may be removed and straightened or replaced with a new part. (See note above.) If the axle center is straightened, care must be exercised to have the pivot pins parallel to each other in all directions and perpendicular to the spring seats. It is very important that these points be observed, as they materially affect the steering of the car and tire wear.

9. To reassemble axle, reverse the above operations.

(D) Renew Front Wheel Bearings, Washers, or Retainers

1. Remove front hub caps, cotter pins and spindle nuts (3); take off front wheels.

2. Remove inner bearing cone and rolls from spindle, using bearing cone and roll puller shown on page 26 service tool section, if necessary; this will allow the removal of the felt washer retainers (6) and felt washers (7).

3. The bearing cups are best removed from the wheel hubs by the use of the bearing outer cup puller shown on page 14, service tool section, inserting the lugs of the puller through the openings in the inside flanges of the hubs, against which the cups seat. They may, however, be removed by inserting a drift through these openings and tapping on opposite sides lightly with a hammer. The new bearing cups should be fitted into position with the puller or by means of a soft hammer.

4. The parts may be reassembled by reversing the above operations, using care to make sure that the bearings are properly adjusted as outlined in Article "E."

(E) Adjust Front Wheel Bearings

1. Jack up car under front axle.

2. Remove front hub caps, and spindle nut cotter pins.

3. Adjust spindle nuts (3), so that when the wheel is grasped at the top and bottom, all perceptible play or looseness will be taken up. If the wheels do not turn freely after the cotter pins have been replaced, the spindle nuts should be backed off and the cotter pins inserted in the next notch, otherwise destruction of the bearings may result.

4. Add grease if necessary, and replace hub caps.

(F) Align Front Wheels

One of the most important factors governing the life of the front tires and ease of steering, is the alignment of the front wheels. In view of this, it is advisable to check the alignment of the wheels after front axle repairs have been made, or whenever there is a possibility of the parts having been damaged by skidding or accident.

The operation of checking wheel alignment is greatly simplified and the time reduced by the use of a wheel aligning gauge, similar to that shown in the equipment section. This instrument is used by telescoping it and inserting it between the tires, ahead of the front axle, so that the ends of the chains just touch the floor. The pointer should then be set to zero, and the car moved forward until the gauge is to the rear of the front axle, with the ends of the chains just touching the floor. The difference between the measurements taken between the inside of the tires ahead of and behind the axle, or the amount of toe-in, will then be immediately apparent by merely reading the scale on the gauge.

The distance between the inside of the tires at the rear, should be the same as the distance at the front, or range between that and 1/8" greater than the measurement at the front. If the toe-in or variation exceeds this amount or if the distance between the tires at the front is greater than the distance at the rear, the tie rod should be adjusted as follows:

1. Remove cotter pin, nut (25) and washer from tie rod pivot pin (28).

2. Drive out pivot pin lock (12), remove pivot pin and disconnect tie rod.

3. Loosen tie rod yoke clamp bolt (36), turn yoke (34) one complete turn to right if toe-in is too great, or to left if insufficient; drop tie rod pivot pin in place and check alignment. Repeated trials should be made if necessary, until the proper adjustment is obtained.

4. Replace tie rod, pivot pin, lock, washer, nut and cotter pin; tighten clamp bolt securely.

[5]

Hudson Rear Axle Springs (See page 18)

Rear Axle Group



- Ref. No. Name of Part Ref. No. Name of Part
 - 1. Rear wheel bearing adjusting nut lock
 - 2. Adjusting nut clamp bolt nut
 - 3. Adjusting nut clamp bolt
 - 4. Tension rod adjusting nut
 - 5. External brake band upper bracket
 - 6. Tension rod washer
 - 7. Tension rod spring
 - 8. Internal brake lining
 - 9. Internal brake band
 - 10. Internal brake band end bracket
 - 11. Internal brake anchor bracket
 - 12. Internal brake link
 - 13. Tension rod nut
 - 14. Internal brake spring clip
 - 15. Tension rod
 - 16. External brake bracket
 - 17. Internal brake shaft bracket
 - 18. External brake operating lever
 - 19. Internal brake link clevis pin
 - 20. Tension rod clevis pin
 - 21. Internal brake main spring
 - 22. External brake band lower bracket
 - 23. Internal brake tie bar
 - 24. External brake band
 - 25. Internal brake adjusting link nut
 - 26. Internal brake adjusting link
 - 27. Internal brake adjusting link clevis pin
 - 28. Internal brake band bracket clevis pin
 - 29. Internal brake stop bracket
 - 30. Internal brake shaft
 - 31. Axle shaft nut
 - 32. Rear wheel hub
 - 33. Axle shaft key
 - 34. Internal brake shaft bracket bushing
 - 35. Internal brake operating lever
 - 36. Operating lever clamp bolt nut
 - 37. Wheel bearing adjusting nut felt washer
 - 38. Internal brake operating lever clamp bolt
 - 39. Rear wheel bearing adjusting nut
 - 40. Axle drive shaft felt washer
 - 41. Rear wheel bearing
 - 42. Axle shaft felt washer
 - 43. Pinion shaft bearing cage lock
 - 44. Pinion shaft bearing cage clamp bolt
 - 45. Oil filler elbow
 - 46. Pinion shaft rear bearing
 - 47. Oil filler elbow plug
 - 48. Drive gear inspection plug
 - 49. Drive pinion
 - 50. Axle housing inner felt washer-small
 - 51. Axle housing inner felt washer-large
 - 52. Axle housing inner felt washer retainer
 - 53. Axle shaft
 - 54. Rear wheel bearing oiler
 - 55. External brake anchor bracket
 - 56. Differential bearing adjusting nut

- 57. Differential bearing
- 58. Differential bearing nut lock
- 59. Adjusting nut lock clevis pin
- 60. Differential gear
- 61. Drive gear bolt
- 62. Differential pinion
- 63. Differential case left hand
- 64. Drive gear bolt nut lock
- 65. Drive gear
- 66. External brake band spacer bar
- 67. Spacer stud
- 68. Spacer stud spring
- 69. Spacer stud washer
- 70. Spacer stud bracket
- 71. Spacer stud nut
- 72. Lining rivet
- 73. External brake lining
- 74. Internal brake spacer clip
- 75. Internal brake spacer bracket
- 76. Internal brake spacer spring
- 77. Internal brake spacer screw nut
- 78. Internal brake spacer screw
- 79. External brake anchor bracket spring
- 80. External brake band bracket-center
- 81. External brake anchor bracket screw
- 82. Anchor bracket screw lock
- 83. Pinion shaft felt washer retainer-front
- 84. Pinion shaft felt washer retainer-rear
- 85. Pinion shaft nut
- 86. Universal joint flange
- 87. Pinion shaft key
- 88. Pinion shaft adjusting sleeve lock nut
- 89. Pinion shaft adjusting sleeve nut lock
- 90. Pinion shaft adjusting sleeve
- 91. Pinion shaft dust collar
- 92. Pinion shaft felt washer
- 93. Pinion bearing cage
- 94. Pinion shaft front bearing
- 95. Pinion bearing oiler
- 96. Differential carrier

100. Rear axle housing

101. Housing cover gasket102. Differential carrier cap

103. Housing cover screw

106. Differential case screw

108. Differential spider
109. Drive gear bolt nut

110. Housing cover plug

111. Housing cover

97. Axle shaft thrust plug98. Differential carrier bolt

99. Differential carrier gasket

104. Differential carrier cap bolt

105. Differential case right hand

107. Differential case screw lock

[9]

(A) Repair or Renew Axle Housing

1. Jack up or block up car under rear springs ahead of rear axle, or raise rear end of car with chain hoist until car weight is off the rear springs.

2. Place receptacle under housing to catch lubricant, remove housing cover cap screws (103) and housing cover.

3. Remove rear hub caps, cotter pins and axle shaft nuts (31), pull rear wheels off axle shafts, using wheel puller shown on page 22, service tool section. Note: Be sure hand brakes are fully released before attempting to pull off wheels.

4. Remove clamp bolts (3) and bearing adjusting nut locks (1), unscrew bearing adjusting nuts (39), using bearing adjusting nut wrench shown on page 6, service tool section, pull out axle shafts and wheel bearings.

5. Remove clevis pins from internal and external brake operating levers (35, 18) and disconnect brake pull rods.

6. Remove flange bolts at rear universal joint and disconnect propeller shaft.

7. Place blocking or jacks under axle housing; takeoff rear spring clip nuts and plates, which will allow the lowering and removal of the axle from under car.

8. The axle may now be placed on a bench or axle stand, and the differential carrier and gear set assembly removed by taking off the cap screws (98), which secure it to the housing.

9. Remove external brake anchor bracket adjusting screw locks (82), adjusting screws (81) and springs (79).

10. Remove tension rod adjusting nuts (4), springs (7), and clevis pins (20).

11. Remove spacer stud nuts (71) and springs (68); this will permit the removal of the external brake bands.

12. Remove clamp bolts (38), take off internal brake operating levers (35).

13. Remove spacer bracket screws (78), springs (76), main springs (21) and adjusting link clevis pins (27); this will allow the removal of the internal brake bands and operating shafts (34).

14. Any necessary welding or riveting operations may, now be performed or new housing assembly installed and the axle reassembled, reversing the above operations, and making sure that the wheel bearings are properly adjusted as outlined in Article "N."

(B) Renew Carrier and Gear Set Assembly

1. Jack up or block up rear end of car.

2. Remove rear hub caps, cotter pins and axle shaft nuts (31), pull wheels off axle shafts, using wheel puller shown on page 22, service tool section. Note: Be sure hand brakes are fully released before attempting to pull off wheels.

3. Remove clamp bolts (3), bearing adjusting nut locks (1) and unscrew adjusting nuts (39), using bearing adjusting nut wrench shown on page 6, service tool section; pull out axle shafts and bearings.

4. Place receptacle under axle housing to catch lubricant, and remove lower carrier to housing cap screw (98).

5. Remove flange bolts at rear universal joint and disconnect propeller shaft.

6. Take off remaining screws holding carrier to axle housing and remove carrier and gear set assembly.

7. Install new carrier and gear set assembly and reassemble axle, reversing the above operations, and making sure that the wheel bearings are properly adjusted as detailed in Article "N."

[10]

(C) Renew Axle Drive Shaft

1. Jack up or block up car under rear axle.

2. Remove rear hubcap, cotter pin and axle shaft nut (31); pull wheel off axle shaft, using wheel puller shown on page 22, service tool section. Note: Be sure hand brakes are fully released before attempting to pull off wheels.

3. Remove clamp bolts (3), bearing adjusting nut locks (1), and unscrew bearing adjusting nuts (39), using bearing adjusting nut wrench shown on page 6, service tool section; pull out axle shafts and wheel bearings. Note: It is occasionally necessary, in the case of a broken axle shaft, to remove the shaft on the opposite side as well, so that a rod may be inserted to push out the inner part of the broken shaft.

4. Press bearing cone and rolls off axle shaft and install on new shaft, using arbor press, or bearing cone and roll puller shown on page 6, service tool section. If these are not available, this may be done by holding the shaft in a vertical position with the tapered end downward, and tapping upper side of cone with hammer and brass rod.

5. Install new shaft and reassemble axle, reversing above operations.

(D) Renew Differential Carrier

1. Jack up or block up car under rear axle.

2. Remove rear hub caps, cotter pins and axle shaft nuts (31); pull rear wheels off axle shafts, using puller shown on page 22, service tool section. Note: Be sure hand brakes are fully released before attempting to pull off wheels.

3. Remove clamp bolts (3) and bearing adjusting nut locks (1), unscrew bearing adjusting nuts (39), using bearing adjusting nut wrench shown on page 6, service tool section; pull out axle shafts and bearings.

4. Remove lower carrier to housing cap screw (98) and drain lubricant.

5. Remove flange bolts at rear universal joint and disconnect propeller shaft.

6. Take off remaining screws holding carrier to axle housing, remove carrier and gear set assembly and place on bench or stand.

7. Remove carrier cap bolts (104), and caps (102); take out differential and drive gear assembly.

8. Remove pinion bearing cage clamp bolt (44) and lock (43) from front of carrier, unscrew drive pinion cage (93), using spanner wrench shown on page 22, service tool section.

9. Fit new carrier and reassemble axle by reversing the above operations. Make sure that the pinion shaft, differential and wheel bearings, also drive gear and pinion are properly adjusted and lubricant added, as covered in Articles "L," "M" and "N."

(E) Renew Wheel Bearing

1. Jack up or block up car under rear axle.

2. Remove rear hub cap, cotter pin and axle shaft nut (31); pull rear wheel off axle shaft, using wheel puller shown on page 22, service tool section. Note: Be sure hand brakes are fully released before attempting to pull off wheel.

3. Remove clamp bolt (3) and bearing adjusting nut lock (1), unscrew bearing adjusting nut (39), using bearing adjusting nut wrench shown on page 6, service tool section; pull out axle shaft and bearing.

Rear Axle Group

4. Press bearing cone and rolls off axle shaft, using arbor press or bearing cone and rod puller shown on page 6, service tool section. If these are not available, this may be done by holding the shaft in a vertical position with the tapered end downward, and tapping upper side of cone with hammer and brass rod.

5. Fit new bearing cone to axle shaft taper, first making sure that cone and shaft are clean and free from burrs which might prevent the bearing from seating properly.

6. Remove bearing outer cup from adjusting nut, by screwing adjusting nut back into axle housing, and tapping cup loose by means of a punch or short piece of 7/32" rod, inserted through opposite holes drilled near edge of nut. When doing this, care should be taken to tap the bearing cup alternately through each hole, to insure its coming out straight.

7. Clean thoroughly inside of adjusting nut and new outer cup. The pressing in place of the cup is best done in an arbor press; however, if care is used a satisfactory job can be done with the aid of a large vise or soft hammer. In performing this operation, it is very essential that the inner side of the cup, when pressed in place, is parallel with the inside of the adjusting nut; otherwise, the binding which will take place when assembled in the axle may cause the destruction of the bearing.

8. The parts may now be reassembled by reversing operations 1, 2, and 3. The rear wheel bearings should be adjusted to allow an end play in the axle shafts of approximately .005" to .010". In addition, it is necessary that the adjusting nuts be screwed into the axle the same distance on each side to guard against interference between the brake drums and support brackets.

(F) Renew Drive Gear and Pinion, Differential Bearings or Pinion Shaft Bearings

1. Jack up or block up car under rear axle.

2. Remove hub caps, cotter pins and axle shaft nuts (3 1), pull wheels off axle shafts, using wheel puller shown on page 22, service tool section. Note-Be sure hand brakes are fully released before attempting to pull off wheels.

3. Remove clamp bolts (3) and bearing adjusting nut lock (1), unscrew bearing adjusting nuts (39), using bearing adjusting nut wrench shown on page 6, service tool section; pull out axle shafts and bearings.

4. Remove lower carrier to housing cap screw (98) and drain lubricant.

5. Remove flange bolts at rear universal joint and disconnect propeller shaft.

6. Take off remaining screws holding carrier to axle housing; remove carrier and gear set assembly and place on bench or stand.

7. Take off cap bolts (104) and caps (102); remove differential and drive gear assembly.

8. If new differential bearings are to be fitted, remove cone and rolls from differential case hubs and install new ones, using bearing cone and roll puller shown on page 5, service tool section.

9. Bend over ears on drive gear bolt nut locks (64), remove nuts (109) and bolts (61); take off drive gear.

10. Thoroughly clean differential case flange, also flange of new drive gear of chips and foreign matter; place gear in position and insert bolts. Fit new nut locks if necessary, draw up bolts securely and bend over nut lock ears.

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11. Remove pinion bearing cage clamp bolt (44) and lock (43) from front end of carrier and unscrew pinion bearing cage (93), using spanner wrench shown on page 22, service tool section.

12. Remove cotter pin and nut (85) from front end of pinion shaft and pull off universal joint flange (86), using universal joint flange puller shown on page 6, service tool section.

13. Bend over lugs on pinion shaft nut lock (89), remove lock nut (88), nut lock (89), adjusting nut (90), drive pinion and bearings.

14. Remove bearing cone and rolls from pinion shaft, using puller shown on page 5, service tool section, and press onto new drive pinion, or fit new bearing cone and rolls on old pinion if bearings are to be renewed.

15. Remove old bearing outer cups from pinion cage (93) using bearing race puller shown on page 5, service tool section, or by holding cage in upright position, and driving out cups by means of a long drift or piece of steel, inserted through opposite slots in inside flanges against which bearing cups seat.

16. Clean thoroughly inside of bearing cage and new outer cups. An arbor press or bearing race puller should be used when pressing the new cups into position; however, a soft hammer may be used to drive them in place, provided care is taken to start them straight, and tap evenly all around the edges of the cups.

17. The axle may now be reassembled by reversing operations 1 to 13, making sure that parts are properly lubricated and the pinion shaft, differential and wheel bearings, also drive gear and pinion, are properly adjusted as outlined in Articles "L," "M" and "N".

(G) Renew Pinion Shaft Felt Washer

1. Remove flange bolts at rear universal joint and disconnect propeller shaft.

2. Remove cotter pin and nut (85) from pinion shaft and pull off universal joint flange (86) using universal joint flange puller shown on page 6, service tool section.

3. Straighten lugs on pinion shaft nut lock (89) remove lock nut (88) and adjusting nut (90)

4. Remove felt washer retainer (83) using felt washer retainer puller. If no puller is available, insert hooked tool or offset screwdriver behind retainer, removing same by prying evenly around inside edge.

5. Remove felt washer (92) and replace with new part; straighten or replace retainer if damaged in removing, and tap in position.

6. To reassemble parts, reverse operations 1, 2 and 3, making sure that the drive gear and pinion, also pinion shaft bearings, are properly adjusted as outlined in Articles "L" and "M."

(H) Renew Axle Shaft Felt Washers

1. Jack up or block up car under rear axle.

2. Remove rear hub caps, cotter pins and axle shaft nuts (31), pull wheels off axle shafts, using wheel puller shown on page 22, service tool section. Note: Be sure hand brakes are fully released before attempting to pull off wheels.

3. Remove clamp bolts (3) and bearing adjusting nut locks (1), unscrew bearing adjusting nuts (39), using bearing adjusting nut wrench shown on page 6, service tool section; pull out axle shafts and bearings.

4. Remove felt washer (42, 37) from axle and bearing adjusting nuts and replace with new parts.

Rear Axle Group

5. To reassemble parts to axle, reverse the above operations, making sure that the wheel bearings are properly adjusted as outlined in Article "N."

(I) Renew Differential Case Gears, Pinions or Spider

1. Jack up or block up car under rear axle.

2. Remove rear hub caps, cotter pins and axle shaft nuts (31), pull wheels off axle shafts, using wheel puller shown on page 22, service tool section. Note: Be sure hand brakes are fully released before attempting to pull off wheels.

3. Remove clamp bolts (3) and bearing adjusting nut locks (1); unscrew bearing adjusting nuts (39), pull out axle shafts and wheel bearings.

4. Place receptacle under housing to catch lubricant, remove housing cover screws (103) and take off cover.

5. Remove carrier cap bolts (104), caps (102) and adjusting nuts (56); take out differential and drive gear assembly.

6. Place differential assembly on bench; bend back lugs on bolt locks (107), remove screws (106) and take apart case.

7. Replace case or any other differential parts which require renewal.

8. To reassemble parts to axle, reverse the above operations, using care to see that the drive gear and pinion, differential bearings and wheel bearings are properly adjusted as outlined in Articles "M" and "N."

(J) Reline Internal Brakes

1. Jack up or block up car under rear axle.

2. Remove rear hub caps, cotter pins and axle shaft nuts (31); pull wheels off axle shafts, using wheel puller shown on page 22, service tool section. Note: Be sure hand brakes are fully released before attempting to pull off wheels.

3. Remove clevis pins from external brake operating levers (18) and disconnect brake pull rods.

4. Remove clevis pins (20) and adjusting nuts (4) from tension rods; take off tension rods (15) and springs (7).

5. Remove lock wires (82), adjusting screws (81) and springs (79) from anchor brackets.

6. Remove nuts (71) and springs (68) from spacer studs (67); this will release external brake bands, which may now be removed.

7. Remove internal brake main springs (21).

8. Remove clevis pins (27) from adjustable links (26).

9. Remove internal brake spacer clip adjusting screws (78) and springs (76); take off internal brake bands.

10. Drive out lining rivets and remove old lining; fit new lining, making sure that it conforms to the curvature of the brake bands and that the rivet holes are countersunk sufficiently to allow the rivet heads to set well beneath the surface.

11. To reassemble parts to axle, reverse the above operations. Make sure that the brakes are properly adjusted as detailed in Articles "O" and "P."

(K) Reline External Brakes

1. Jack up or block up car under rear axle.

2. Remove rear hub caps, cotter pins and axle shaft nuts (31); pull wheels off axle shafts, using wheel puller shown on page 22, service tool section. Note: Be sure hand brakes are fully released before attempting to pull off wheels.

3. Remove clevis pins from external brake operating levers (18) and disconnect pull rods.

4. Remove clevis pins (20) and adjusting nuts (4) from tension rods, take off tension rods (15) and springs (7).

5. Remove lock wires (82), adjusting screws (81) and springs (79) from anchor brackets.

6. Remove nuts (71) and springs (68) from spacer studs (67); this will release external brake bands, which now may be removed.

7. Drive out lining rivets and remove old lining; fit new lining, making sure that it conforms to the curvature of the brake bands, and that the rivet holes are countersunk sufficiently to allow the rivet heads to set well beneath the surface.

8. To reassemble parts to axle, reverse the above operations. Make sure that the brakes are Proverlv adjusted as outlined in Articles "O" and "P."

(L) Adjust Drive Pinion Bearings

1. Straighten lugs on nut lock (89) and loosen lock nut (88).

2. Turn adjusting nut (90) until all perceptible play or looseness in the bearings is taken up, using care to see that they are not adjusted too tightly.

3. Tighten lock nut (88), then test bearing adjusting to make sure it has not been disturbed.

4. Bend over lugs on nut lock (89), locking adjusting and lock nuts in position.

(M) Adjust Drive Gear and Pinion and Differential Bearings

1. Make sure drive pinion bearings are properly adjusted as outlined in Article

2. Remove inspection plug (48) in side of carrier and examine position of drive gear and pinion.

3. Remove clamp bolt (44) and pinion bearing cage lock (43), from front of carrier.

4. Engage spanner wrench shown on page 22, service tool section, with slots in flange of pinion bearing cage (93); turn cage in housing until back face of drive pinion teeth is flush with outside face of drive gear teeth.

When in this position, the backlash or play between the drive gear and pinion teeth should be approximately .006" to .008". If the backlash is greater or less than this amount, it will be necessary to adjust the differential and drive gear, which is accomplished as follows:

5. Place receptacle under housing to catch lubricant, remove housing cover cap screws (103) and cover.

6. Disengage adjusting nut locks (58) from slots in adjusting nuts, and loosen cap bolts (104) very slightly.

Rear Axle Group

7. Back off adjusting nut (56) (R. H. if backlash is excessive, L. H. if insufficient) by turning to left or anti-clockwise.

8. Turn adjusting nut (L. H. if backlash is excessive, R. H. if insufficient) to right or clockwise, until required amount of play is present between drive gear and pinion teeth.

9. Turn adjusting nut (R. H. if backlash is excessive, L. H. if insufficient) to right or clockwise, until all perceptible looseness in differential bearings is taken up, using care to see that they are not adjusted too tightly.

10. Tighten cap bolts and wire heads, place nut locks in position; then inspect gear and bearing adjustments to see that they have not been disturbed.

11. Replace pinion bearing cage lock and clamp bolt at front of carrier.

12. Replace inspection plug in side of carrier.

13. Replace housing cover and fill housing with lubricant to level of pipe plug opening in cover.

14. The car should now be driven and results noted. If the axle is still noisy, it will be necessary to remove clamp bolt (44) and pinion bearing cage locks (43). Turn pinion bearing cage until next notch is in position, by means of spanner wrench, then replace lock and bolt. Repeated trials should be made if necessary, moving the bearing cage adjustment a notch at a time in either direction, until satisfactory results are obtained.

(N) Adjust Rear Wheel Bearings

1. Jack up or block up car under rear axle.

2. Remove rear hub caps, cotter pins and axle shaft nuts (31); pull wheels off axle shafts, using wheel puller shown on page 22, service tool section. Note: Be sure hand brakes are fully released before attempting to pull off wheels.

3. Remove clamp bolts (3) and bearing adjusting nut locks (1).

4. Adjust wheel bearings, turning adjusting nuts (39) to right or clockwise to tighten or to left or anti-clockwise to loosen, using wheel bearing adjusting nut wrench shown on page 22, service tool section. In making this adjustment it is important that an end play of from .005" to .010" remain in the axle shafts and that the adjusting nuts be screwed into the housing approximately the same distance on each side, to prevent interference between the brake drums and support brackets.

5. Reassemble, reversing operations 1, 2 and 3.

(O) Adjust Foot Brakes

1. Make sure external brake operating levers (18) rest against support brackets (16) when brakes are fully released.

With the operating levers in this position, the cross shaft levers should point to the ear at an angle of about 30° from the vertical. If they do not, it will be necessary to adjust as follows:

2. Disconnect cross shaft to rear axle pull rods by removing clevis pins from yokes at rear end.

3. Adjust stop screw at lower part of brake pedal so there will be approximately 1/4" clearance between pedal and toe board in fully released position.

4. Lengthen or shorten rod connecting brake pedal to equalizer bar, by loosening lock nuts and turning adjusting turnbuckle to right or left until cross shaft levers are in the position indicated in operation 1.

5. Lengthen or shorten rods connecting cross shaft to rear axle brake operating levers, by turning adjusting yokes to right or left until rods are correct length; then tighten lock nuts and replace clevis and cotter pins.

6. Remove lock wires (82) from anchor bracket screw heads.

7. Adjust anchor bracket screws (81) so that external brake bands just clear the brake drums at these points and replace lock wires.

8. Loosen lock nuts and turn tension rod nuts (13) down until lower halves of brake bands are raised sufficiently to just clear brake drums, then tighten lock nuts.

9. Turn tension rod adjusting nuts (4) down until the upper halves of the brake bands also just clear the brake drums.

10. Inspect adjustment of external brake spacer studs (67), and if necessary, loosen lock nuts (71) and adjust, so that with brakes fully released, the brake bands will be raised clear of the drums.

11. Test adjustments, by turning wheels by hand to make sure there is no tendency for the brakes to drag.

(P) Adjust Hand Brakes

1. Jack up or block up car under rear axle.

2. Remove rear hub caps, cotter pins and axle shaft nuts (3 1), pull wheels off axle shafts, using wheel puller shown on page 22, service tool section. Note: Be sure hand brakes are fully released before attempting to pull off wheels.

3. Make sure internal brake tie bars (23), rest against stop brackets (29), when the hand brake lever is fully released. With the tie bars and hand brake lever in this position, the internal brake cross shaft levers should point to the rear, at an angle of about 30° from the vertical. If they do not, it will be necessary to adjust, as follows:

4. Loosen lock nuts on pull rod connecting cross shaft to hand brake lever, turn turnbuckle to right or left as necessary until cross shaft levers are at proper angle, then tighten lock nuts.

5. Lengthen or shorten pull rods connecting cross shaft levers with rear axle internal brake shaft levers, by turning adjusting yokes to right or left until brake tie bars are in the position indicated in operation No. 3.

6. Place in position on axle shaft, brake band aligning fixture shown on page 22, service tool section.

7. Loosen spacer clip adjusting screw nuts (77) and turn adjusting screws (78) until brake bands just clear the drums at these points, then tighten nuts.

8. Remove clevis pins (27) from adjusting links (26).

9. Loosen link nuts (25) and expand brake bands until they just clear the brake drums, by turning adjusting links (26) to left or anti-clockwise.

10. Tighten lock nuts, replace clevis and cotter pins, then remove aligning fixture after turning same by hand to make sure the brake bands do not drag.

11. Place rear wheels in position, but do not draw them up tight on axle shaft taper. Pull up hand brake lever a notch at a time, grasping the rear wheels, and noting whether or not the braking effort is equal on both sides. If one wheel offers less resistance to turning than the other, it should be taken off and the brake bands expanded further, as outlined in operations 8, 9 and 10.

12. After the brakes have been properly adjusted and equalized, the parts may be reassembled by reversing operations No. 1 and 2.

Springs

(A) Renew Front Spring Assembly

1. Raise front end of car with chain hoist or by jacks or blocking under frame side members directly back of front springs, until weight of car is off springs.

2. Remove nuts from front spring clips and take off clips.

3. Remove cotter pins and nuts from front end and shackle bolts, take out bolts and shims; this will allow the removal of the front spring assembly.

4. Install new spring assembly, reversing operations 1, 2 and 3, making sure that the spring clip nuts are securely tightened. It is essential, when reassembling front end and shackle bolts, to draw the nuts up tight and then back them off 1/6th of a turn before inserting cotter pins to take up side play and insure freedom of spring action.

(B) Renew Front Spring Bushings

1. Raise up front end of car with hoist or by jacks or blocking under frame side members, directly back of front springs so that weight of car is off springs.

2. Remove nuts from bottom of clips holding spring to front axle and take off front spring clips.

3. Remove cotter pins and nuts from front end and shackle bolts, take out bolts and front end shims; this will allow the removal of the spring assembly.

4. Press out old bushings and insert new ones, using spring bushing remover shown on page 12, service tool section. If necessary, use 11/16" expansion reamer to bring bushings to size after pressing in place. When pressing rear bushings in position, be sure oil holes in bushings line up with holes in spring leaves.

5. Install springs on car, reversing operations 1, 2, and 3, making sure that spring clip nuts are securely tightened. When tightening front spring front end bolts, it is essential that the nuts be drawn up tight and then backed off 1/6th of a turn before inserting cotter pin, so that side play will be eliminated without interfering with the spring action. The rear end or shackle bolts should be backed off 1/6th of a turn after tightly screwing them into shackles; then tighten lock nut securely.

(C) Renew Rear Springs or Rear Spring Bushings

1. Raise rear end of car with hoist, or by jacks or blocking under frame ahead of rear springs, so that weight of car is just off springs.

2. Remove nuts and lock nuts from bottom of clips holding spring to rear axle and take off spring clip plate.

3. Remove cotter pin and nut from rear spring front end bolt, take out bolt and shims.

4. Remove nut and lock washer from rear end or shackle bolt and unscrew bolt out of shackle; this will allow the removal of the rear spring, which may be renewed or rebushed as necessary.

5. If spring is to be rebushed, press out old bushings and insert new ones, using spring bushing remover shown on page 12, service tool section. If necessary to bring bushings to size after pressing them in place, use 3/4" expansion reamer on front end bushing and 11/16" reamer on rear end bushing.

6. Install spring on car, reversing operations 1 to 4 inclusive, making sure that rear spring clip nuts and lock nuts are drawn up tightly. When assembling front end bolt,

care must be taken to back off the nut 1/6th of a turn after tightening, before inserting cotter pin, to insure free spring action. In like manner, the rear or shackle bolt should be backed off slightly after being tightly screwed into the shackle and before tightening lock nut.

(D) Remove Side Play from Front or Rear Springs

1. Remove cotter pins from ends of front and rear spring front end bolts.

2. Draw up front and rear spring front end bolt nuts tightly, then back them off 1/6th of a turn so that all side play will be eliminated without any tendency for the springs to bind.

- 3. Replace and spread cotter pins.
- 4. Loosen lock nuts on shackle bolts at rear ends of front and rear springs.

5. Screw shackle bolts tightly into shackles, then back them off slightly and tighten lock nuts securely. After tightening lock nuts, test spring action to make sure there is no tendency to bind.



(See page 28)





Steering Gear

Ref. No. Name of Part

- I. Throttle control hand lever
- 2. Control cover
- 3. Spark hand lever
- 4. Horn button
- 5. Horn button lock ring
- 6. Control cover plate
- 7. Horn button spring
- 8. Horn button screw
- 9. Horn button spring retainer
- 10. Horn wire terminal
- 11. Horn button contact cup
- 12. Stud nut-upper
- 13. Friction washer
- 14. Jacket tube bushing
- 15. Main tube-upper
- 16. Steering wheel key
- 17. Main tube nut
- 18. Sector tube plate
- 19. Steering wheel
- 20. Spark tube plate
- 21. Compression washer
- 22. Throttle tube plate
- 23. Throttle tube
- 24. Spark tube
- 25. Horn wire
- 26. Sector tube silencer
- 27. Sector tube bushing
- 28. Stud nut washer
- 29. Stud nut-lower
- 30. Stud
- 31. Control base
- 32. Jacket tube cowl bracket
- 33. Cowl bracket bolt
- 34. Jacket tube
- 35. Jacket tube bracket
- 36. Jacket tube bracket screw
- 37. Spark tube
- 38. Throttle tube
- 39. Sector tube
- 40. Worm wheel and shaft
- 41. Worm wheel bushing lock pin
- 42. Lock pin retaining wire
- 43. Worm wheel bushing
- 44. Worm wheel thrust washer-large
- 45. Main tube coupling bolt
- 46. Coupling bolt nut

Ref. No. Name of Part

- 47. Case cover gasket
- 48. Case cover
- 49. Worm wheel thrust washer-small
- 50. Thrust washer adjusting screw
- 51. Adjusting screw lock nut
- 52. Thrust bearing adjusting nut
- 53. Adjusting nut felt washer
- 54. Main tube coupling
- 55. Coupling key
- 56. Worm wheel shaft nut
- 57. Nut lock
- 58. Steering gear lever
- 59. Steering gear frame bolt nut
- 60. Steering gear bracket spacer
- 61. Steering gear frame bracket
- 62. Frame bracket bolt
- 63. Frame bracket clamp bolt nut
- 64. Case cover bolt-short
- 65. Case cover bolt-long
- 66. Steering case upper bushing
- 67. Main tube lower
- 68. Upper bushing dowel screw
- 69. Main tube lower key
- 70. Frame bracket clamp bolt
- 71. Sector tube clamp bracket gasket
- 72. Sector tube clamp bracket bolt
- 73. Throttle tube pinion screw
- 74. Throttle tube pinion
- 75. Spark tube pinion screw
- 76. Spark tube pinion
- 77. Sector tube clamp bracket screw
- 78. Sector tube clamp bracket
- 79. Throttle control sector
- 80. Spark control sector
- 81. Steering gear case plug
- 82. Steering worm
- 83. Steering gear case
- 84. Thrust bearing
- 85. Steering case lower bushing
- 86. Control sector shoulder bolt

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- 87. Drag link
- 88. Drag link ball seat
- 89. Drag link spring
- 90. Drag link plug
- 91. Drag link oiler

(A) Renew Case and Gear Complete

- 1. Loosen clamp screws (75, 73) in spark and throttle control pinions and remove pinions (76, 74).
- 2. Loosen sector tube bracket clamp bolt (72).
- 3. Disconnect at horn terminal, wire (25) leading from steering gear horn button to horn.
- 4. Remove screws (36) and cap from jacket tube bracket (35).

Steering Gear Group

5. Loosen main tube coupling bolts (45).

6. Disconnect upper and lower main tubes (15, 67) by grasping steering wheel and pulling column assembly upward, until spark tube is clear of lower main tube.

7. Remove bolts (65) from case cover (48), takeoff bracket supporting spark, throttle and oil control rods and levers.

8. Straighten lugs on nut lock (57) and remove nut (56) from worm wheel shaft.

9. Pull steering gear lever (58) off taper on worm wheel shaft, using puller shown on page 18, service tool section.

10. Remove nuts (59) and bolts (62) holding steering gear frame bracket (61) to frame; this will allow the removal of the lower case and gear assembly.

11. Install new case and gear assembly and reassemble, reversing the above operations.

(B) Renew Upper and Lower Case and Worm Wheel Bushings, Worm Wheel or Thrust Washers

1. Loosen clamp screws (75, 73) in spark and throttle control pinions and remove pinions (76, 74).

2. Loosen sector tube bracket clamp bolt (72).

3. Disconnect at horn terminal, wire (25) leading from steering gear horn button to horn.

4. Remove screws (36) and cap from jacket tube bracket (35).

5. Loosen main tube coupling bolts (45).

6. Disconnect upper and lower main tubes (15, 67), by grasping steering wheel and pulling column assembly upward, until spark tube is clear of lower main tube.

7. Remove bolts (65) from case cover (48), take off bracket supporting spark, throttle and oil control rods and levers.

8. Straighten lugs on nut lock (57) and remove nut (56) from worm wheel shaft.

9. Pull steering gear lever (58) off taper on worm wheel shaft, using puller shown on page 18, service tool section.

10. Loosen frame bracket clamp bolt (70); this will release steering gear lower case and gear assembly, which may now be removed from the car.

11. Loosen adjusting nut clamp bolt at top of case, unscrew adjusting nut (52) and remove upper bushing lock screw (68); this will allow the removal of the upper bushing (66), lower main tube (67), thrust bearings (84) and worm (82).

12. Remove sector tube bracket screws (77) and take off sector tube bracket (78) and gasket (71).

13. Remove case cover screws (64), take off case cover (48) and gasket (47); this will allow the removal of the worm wheel and shaft (40) and thrust washer (44).

14. Remove worm wheel bushing lock pin retainer (42) and lock pin (41); take out worm wheel bushing (43) and replace with new part.

15. Press out lower case bushing (85) and replace with new part, using arbor press or bushing drift shown on page 19, service tool section.

16. Fit new worm wheel or thrust washers if necessary and reassemble, reversing operations 1 to 13 inclusive, making sure parts are properly adjusted as detailed in articles "H", "I" and "J."

(C) Renew Jacket Tube Bushings

1. Loosen clamp screw (73, 75) in spark and throttle control pinions and remove pinions (76, 74).

2. Loosen sector bracket clamp bolt (72).

3. Disconnect at horn terminal, wire (2 5) leading from steering gear horn button to horn.

4. Loosen clamp bolt (70) in steering gear frame bracket (61).

5. Remove jacket tube bracket screws (36) and cap from bracket (35).

6. Grasp spark and throttle control mounting and pull spark, throttle, and sector tubes and horn wire out of steering gear main tube.

7. Remove nut (17) from top of steering gear upper main tube.

8. Pull steering wheel off upper main tube, using steering wheel puller shown on page 18, service tool section.

9. Slide jacket tube (34) off steering gear main tube; press out or drive out bushings (14) and replace with new parts.

10. Reassemble parts, reversing above operations.

(D) Renew Steering Gear Lever

1. Remove drag link rear end boot, remove cotter pin and takeout rear end adjusting plug; disconnect drag link from steering gear lever (58).

2. Straighten lugs on worm wheel nut lock (57), remove worm wheel nut (56) and nut lock.

3. Pull steering gear lever (58) off taper on worm wheel shaft, using steering gear lever puller shown on page 18, service tool section.

4. Install new steering lever and reassemble parts, reversing above operations.

(E) Renew Lower Tube, Worm or Thrust Bearings

1. Loosen spark and throttle control pinion clamp screws (75, 73) and remove pinions (76, 74).

2. Loosen sector tube bracket clamp bolt (72.)

3. Loosen clamp bolt (70) in steering gear frame bracket (61).

4. Disconnect at horn terminal, wire (2 5) leading from steering gear horn button to horn.

5. Remove screws (36) and cap from jacket tube bracket (35).

6. Loosen main tube coupling bolts (45).

7. Disconnect upper and lower main tubes (15, 67) by grasping steering wheel and pulling column assembly upward, until spark tube is clear of lower main tube.

8. Loosen adjusting nut clamp bolt at top of case, unscrew adjusting nut (52) and remove upper bushing lock screw (68).

9. The upper main tube, worm, thrust bearings and upper bushing may be removed and replaced with the new parts where necessary, and steering gear reassembled, reversing above operations.

(F) Renew Spark or Throttle Levers, Spark, Throttle or Sector Tubes, Friction Washers, or Column Silencers

1. Loosen spark and throttle control pinion clamp screws (75, 73) and remove pinions (76, 74).

2. Loosen sector tube bracket clamp bolt (72).

Steering Gear Group

3. Disconnect at horn terminal, wire (25) leading from steering gear horn button to horn.

4. Loosen clamp bolt (70) in steering gear frame bracket (61).

5. Remove jacket tube bracket screws (36) and cap from bracket (35).

6. Grasp spark and throttle control mounting and pull spark, throttle and sector tubes (24, 23, 39) and horn wire out of steering gear main tube.

7. Unscrew control cover (2) from control mounting and remove horn button assembly (4), horn button lock ring (5), spring (7); pull out horn wire assembly (25) and insulator (11).

8. Remove lower control cover stud nuts (29), disassemble spark and throttle levers (3, 1), friction washers (13) and control base (31).

9. The spark, throttle or sector tubes and levers, friction washers, control base or column silencers (26) may now be replaced with new parts where necessary and steering gear reassembled, reversing above operations.

(G) Renew Control Cover, Horn Button, Spring, Horn Wire or Compression Plate

1. Unscrew control cover (2) from control mounting; this will allow the removal of the horn button assembly (4), lock ring (5), spring (7), horn wire (25) and insulator

2. To renew control cover plate (6), or compression plate (21), remove control cover stud upper nuts (12), and disassemble.

3. Replace parts where necessary and reassemble, reversing above operations.

(H) Adjust Column for End Play

1. Loosen adjusting nut clamp bolt at top of steering gear case.

2. Turn adjusting nut (52) to right until all perceptible play is taken up, making sure that adjustment is not tight enough to cause binding.

3. Tighten adjusting nut clamp bolt.

(I) Adjust Worm Wheel and Shaft for End Play

1. Loosen nut (51) on steering gear worm wheel thrust washer screw.

2. Turn thrust washer screw (50) to right or clockwise just enough to eliminate all end play.

3. Tighten nut (51).

(J) Adjust Worm Wheel and Shaft for Back Lash or Play

1. Loosen clamp screws (75, 73) in spark and throttle control pinions, and remove pinions (76, 74).

2. Loosen sector tube bracket clamp bolt (72).

3. Loosen clamp bolt (70) in steering gear frame bracket (61).

4. Disconnect at horn terminal, wire (25) leading from steering gear horn button to horn.

5. Remove screws (36) and cap from jacket tube bracket (35).

6. Loosen main tube coupling bolts (45).

7. Disconnect upper and lower main tubes (15, 67), by grasping steering wheel and pulling column assembly upward, until spark tube is clear of lower main tube.

8. Remove bolts (65) from case cover (48), take off bracket supporting spark, throttle and oil control rods and levers.

9. Straighten lugs on nut lock (57) and remove nut (56) from worm wheel shaft.

10. Pull steering gear lever (58) off taper on worm wheel shaft, using puller shown on page 18, service tool section.

11. The steering gear lower case and gear assembly may now be removed from the car and the worm wheel bushing lock pin retainer (42) and lock pin (41) removed.

12. The steering gear case should now be placed in a vise, and the worm wheel bushing (43) adjusted, until only a slight amount of backlash or play is felt between the teeth of the worm (82) and worm wheel (40). The steering gear worm wheel bushing adjusting wrench shown on page 19 service tool section, should be used for this operation.

13. After replacing lock pin (41) and lock pin retainer (42) the adjustment should be tested by turning steering gear from extreme right to left positions to make sure there is no tendency to bind.

14. To reassemble steering gear, reverse operations 1 to 12.

Drag Link

(A) Renew Drag Link Seats, Springs, Adjusting Plugs or Drag Link Assembly

1. Remove drag link front and rear end boots and cotter pins from adjusting plugs.

2. Unscrew adjusting plugs (90), remove ball seats (88) and springs (89); disconnect drag link from steering arm and steering gear lever.

3. Replace or clean parts, thoroughly lubricate and reassemble, reversing above operations and adjusting as detailed in Article "B."

(B) Adjust Drag Link

1. Remove drag link front and rear end boots and take out cotter pins.

2. When in proper operating position, the drag link adjusting plugs (90) are screwed into the drag link approximately flush with the outer edge. It is important that this point be watched when reassembling drag link to car or adjusting, as, if the plugs are screwed in too far, the cushioning effect of the springs (89) to protect the steering gear from road shocks, will be lost. It is also essential that they be screwed in tar enough to insure a sufficient number of threads engaging and to properly compress springs. Clean and lubricate parts thoroughly, replace cotter pins and boots.

Hudson Clutch

Clutch Group



Hudson Clutch

Ref. No. Name of Part

- 1. Clutch driving disc
- 2. Clutch driving stud
- 3. Clutch silencing spring
- 4. Driving disc cork
- 5. Pressure plate
- 6. Driven disc
- 7. Spring stud
- 8. Clutch hub
- 9. Clutch pilot bearing
- 10. Clutch hub pin
- 11. Clutch hub pin nut
- 12. Clutch drum screw
- 13. Clutch cover
- 14. Clutch drum liner

Ref. No. Name of Part

- 15. Cover gasket
- 16. Silencing spring armed
- 17. Driving stud spacer
- 18. Drum
- 19. Spring retainer
- 20. Clutch spring
- 21. Spring stud nut
- 22. Clutch spider
- 23. Cover oil retaining ring
- 24. Clutch throwout bearing
- 25. Clutch throwout bearing retainer
- 26. Oil retaining washer
- 27. Throwout yoke
- 28. Cover cap screw

(A) Renew Clutch Assembly, Cover Assembly, Cover Gasket, Pilot Bearing, Thrust Bearing or Thrust Bearing Retainer

- 1. Remove toe and floor boards.
- 2. Remove clevis pin at bottom of hand brake lever and disconnect hand brake pull rod.
- 3. Remove clevis pin at bottom of brake pedal and disconnect foot brake pull rod.
- 4. Unscrew sleeve at rear end of speedometer shaft and disconnect speedometer shaft from transmission.
- 5. Remove bolts from flange of front universal joint and disconnect propeller shaft.
- 6. Remove clevis pin from lower end of starter pedal shaft lever, disconnect starter operating shaft and spring.
- 7. Remove cap screws holding transmission case cover to transmission and take off control hand lever assembly.
- 8. Remove clevis pin from clutch adjustable link and disconnect throwout yoke.
- 9. Remove bolts holding pedal control bracket to transmission case and take off pedal control assembly.
- 10. Remove clutch drain plug from flywheel and drain oil out of clutch.
- 11. Remove cap screws holding clutch cover to flywheel.

12. Remove 3 bolts and 2 cap screws holding transmission case to crankcase, taking out upper bolt last; this will allow the lowering and removal of the transmission and clutch assemblies from the car. The clutch pilot bearing (9) may now be removed from the flywheel and renewed if necessary.

13. Remove cotter pin and nut (11) from clutch hub pin (10), take out pin and pull clutch assembly off transmission main shaft drive gear, using clutch puller shown on page 19, service tool section; this will permit the removal of the clutch assembly, clutch cover, clutch driving studs, cover gasket, thrust bearing or retainer which may be replaced with new parts as required.

14. Install clutch assembly on transmission and reassemble, reversing above operations.
Clutch Group

(B) Replace Clutch Plates, Spider, Pressure Plate, Drum, Springs, Hub or Jaw Liners

1. Remove toe and floor boards.

2. Remove clevis pin at bottom of hand brake lever and disconnect hand brake pull rod.

3. Remove clevis pin at bottom of brake pedal and disconnect foot brake pull rod.

4. Unscrew sleeve at rear end of speedometer shaft and disconnect speedometer shaft from transmission.

5. Remove bolts from flange of front universal joint and disconnect propeller shaft.

6. Remove clevis pin from lower end of starter pedal shaft lever, disconnect starter operating shaft and spring.

7. Remove cap screws holding transmission case cover to transmission and take off control hand lever assembly.

8. Remove clevis pin from clutch adjustable link and disconnect throwout yoke.

9. Remove bolts holding pedal control bracket to transmission case and take off pedal control assembly.

10. Remove clutch drain plug from flywheel and drain oil out of clutch.

11. Remove cap screws holding clutch cover to flywheel.

12. Remove 3 bolts and 2 cap screws holding transmission case to crankcase, taking out upper bolt last; this will allow the lowering and removal of the transmission and clutch assembly from the car.

13. Remove cotter pin and nut (11) from clutch hub pin (10), take out pin and pull clutch assembly off transmission main shaft drive gear, using clutch puller shown on page 19, service tool section.

14. Place clutch assembly on clutch assembling fixture shown on page 21, service tool section, or on an arbor press, so that the clutch will rest on the face of the clutch hub, with the pressure plate on top.

15. Remove cotter pins and nuts (21) from clutch spring studs (7), applying pressure to plate (5) to counteract the pressure of the clutch springs.

16. The clutch may now be disassembled, and any parts requiring renewal replaced. The plates should be inspected and renewed if they show signs of being warped, or if the corks are worn down so that there is a possibility of metal to metal contact between driving and driven plates. It is also advisable to renew the plates if they are excessively loose on driving studs, to avoid clutch rattle. Reassemble parts, reversing the foregoing operations.

Hudson Transmission

Transmission Group



Ref. No. Name of Part

- 1. Transmission case bolt long
- 2. Mainshaft drive gear
- 3. Transmission case
- 4. Bearing outer cup lock screw
- 5. Mainshaft drive gear outer bearing
- 6. Mainshaft front bearing cap gasket
- 7. Case bolt nut
- 8. Front bearing cap bolt
- 9. Mainshaft drive gear inner bearing
- 10. Front bearing cap
- 11. Front bearing cap felt washer
- 12. Mainshaft thrust ball
- 13. Mainshaft drive gear key
- 14. Mainshaft drive gear steel washer-rear
- 15. Mainshaft drive gear bronze washer
- 16. Clutch pilot bearing
- 17. Mainshaft drive gear steel washer-front
- 18. Countershaft bronze washer
- 19. Countershaft steel washer
- 20. Countershaft
- 21. Countershaft bearing cap
- 22. Countershaft bearing
- 23. Countershaft gear spacer
- 24. Countershaft bearing cap screw
- 25. Countershaft bearing cap gasket
- 26. Countershaft drive gear
- 27. Countershaft second speed gear
- 28. Transmission case cover gasket
- 29. Mainshaft second and high speed gear
- 30. Mainshaft front steel washer
- 31. Mainshaft
- 32. Mainshaft shim
- 33. Mainshaft low and reverse gear

- Ref. No. Name of Part
 - 34. Countershaft gear key
 - 35. Countershaft low gear
 - 36. Reverse idler gear
 - 37. Reverse idler gear bearing
 - 38. Hand brake ratchet screw
 - 39. Hand brake ratchet
 - 40. Reverse idler gear thrust washer
 - 41. Reverse idler gear shaft
 - 42. Mainshaft rear bearing
 - 43. Mainshaft rear bearing cap shim
 - 44. Mainshaft rear bronze washer pin
 - 45. Mainshaft rear bearing cap bolt
 - 46. Mainshaft spacing collar
 - 47. Speedometer drive gear
 - 48. Speedometer drive gear washer
 - 49. Mainshaft steel washer-rear
 - 50. Mainshaft rear bearing cap
 - 51. Rear bearing cap felt washer
 - 52. Rear bearing cap bronze washer
 - 53. Countershaft bearing shim
 - 54. Countershaft reverse gear
 - 55. Clutch throwout yoke
 - 56. Rear bearing cap oil guide
 - 57. Mainshaft nut washer
 - 58. Mainshaft nut
 - 59. Transmission case bolt-medium
 - 60. Transmission case bolt-short
 - 61. Speedometer driven gear bushing
 - 62. Speedometer driven gear bushing shim
 - 63. Speedometer driven gear
 - 64. Oil level test plug
 - 65. Drain plug gasket
 - 66. Drain plug

(A) Renew Transmission

- 1. Remove toe and floor boards.
- 2. Remove clevis pin at bottom of hand brake lever and disconnect hand brake pull rod.
- 3. Remove clevis pin at bottom of brake pedal and disconnect foot brake pull rod.
- 4. Unscrew sleeve at rear end of speedometer shaft and disconnect speedometer shaft from transmission.
- 5. Remove bolts from flange of front universal joint and disconnect propeller shaft.
- 6. Remove clevis pin from lower end of starter pedal shaft lever, disconnect starter operating shaft and spring.
- 7. Remove cap screws holding transmission case cover to transmission and take off control hand lever assembly.
- 8. Remove clevis pin from clutch adjustable link and disconnect throwout yoke.
- 9. Remove bolts holding pedal control bracket to transmission case, and take off pedal control assembly.
- 10. Remove clutch drain plug from flywheel and drain oil out of clutch.
- 11. Remove cap screws holding clutch cover to flywheel.

Transmission Group

12. Remove cotter pins and nuts from 3 bolts, take out bolts and 2 cap screws holding transmission case to crankcase, taking out upper bolt last; this will allow the lowering and removal of the clutch and transmission assemblies from the car.

13. Remove cotter pin and nut from clutch hub pin, take out pin and pull clutch assembly off transmission mainshaft drive gear, using clutch puller shown on page 19, service tool section, if necessary.

14. Install clutch on new transmission assembly and reassemble, reversing above operations.

(B) Renew Mainshaft, Sliding Gears, Mainshaft Thrust Ball, Mainshaft Front or Rear Bearings, Mainshaft Rear Bearing Thrust Washers, or Speedometer Drive Gear

1. Remove toe and floor boards.

2. Remove clevis pin at bottom of hand brake lever and disconnect hand brake pull rod.

3. Remove clevis pin from lower end of starter pedal shaft lever, disconnect starter operating shaft and springs.

4. Remove cap screws holding transmission case cover to transmission and take off control hand lever assembly.

5. Unscrew sleeve at rear end of speedometer shaft and disconnect speedometer shaft from transmission.

6. Remove bolts from flange of front universal joint and disconnect propeller shaft.

7. Remove cotter pin and nut (58) from rear end of transmission mainshaft and pull off front universal joint flange, using universal joint flange puller shown on page 22, service tool section.

8. Remove bolts (45) holding mainshaft rear bearing cap (50) and take off cap; this will permit the removal of the mainshaft and assembled parts.

9. Parts (31, 33, 29, 12, 9, 42, 52,49, or 47) requiring renewal should now be replaced and transmission reassembled, by reversing above operations. It is very important in reassembling, that the correct number of shims (32) be placed on mainshaft to allow an end play of from .008" to .012", when rear bearing cap is tightly bolted in position.

(C) Renew Mainshaft Drive Gear, Mainshaft Outer Bearing, Mainshaft Drive Gear Thrust Washers, Front Bearing Cap Felt Washer or Bearing Cap

1. Remove toe and floor boards.

2. Remove clevis pin at bottom of hand brake lever and disconnect hand brake pull rod.

3. Remove clevis pin at bottom of brake pedal and disconnect foot brake pull rod.

4. Unscrew sleeve at rear end of speedometer shaft and disconnect speedometer shaft from transmission.

5. Remove bolts from flange of front universal joint and disconnect propeller shaft.

6. Remove clevis pin from lower end of starter pedal shaft lever, disconnect starter operating shaft and spring.

7. Remove cap screws holding transmission case cover to transmission and take off control hand lever assembly.

8. Remove clevis pin from clutch adjustable link and disconnect throwout yoke.

9. Remove bolts holding pedal control bracket to transmission case and take off pedal control assembly.

10. Remove clutch drain plug from flywheel and drain oil out of clutch.

11. Remove cap screws holding clutch cover to flywheel.

12. Remove cotter pins and nuts from 3 bolts, take out bolts and 2 cap screws holding transmission case to crankcase, taking out upper bolt last; this will allow the lowering and removal of the clutch and transmission assemblies from the car.

13. Remove cotter pin and nut from clutch hub pin, take out pin and pull clutch assembly off transmission mainshaft: drive gear, using clutch puller shown on page 19, service tool section, if necessary.

14. Remove cotter pin, nut (58) and washer from rear end of transmission mainshaft.

15. Pull front universal joint flange off mainshaft, using universal joint flange puller shown on page 22, service tool section.

16. Remove bolts (45) holding mainshaft rear bearing cap to transmission and take off cap (50); this will permit the removal of the mainshaft: (31) and parts assembled on it.

17. Remove bolts (8) holding mainshaft: front bearing cap to transmission and take off cap (10).

18. The mainshaft drive gear (2) and assembled parts may now be removed and renewed where necessary. If outer race of mainshaft: drive gear outer bearing (5) is to be renewed, mainshaft outer bearing race puller shown on page 15, service tool section, should be used to remove it from transmission case. To reassemble transmission, reverse the above operations. When reassembling make sure that from .008" to .012" end play exists in mainshaft, to insure proper lubrication of the thrust washers. Add or remove shims (32) as required, to obtain this end play.

(D) Renew Countershaft Gears, Countershaft, Countershaft Bearings or Thrust Washers

1. Remove toe and floor boards.

2. Remove clevis pin at bottom of hand brake lever and disconnect hand brake pull rod.

3. Remove clevis pin at bottom of brake pedal and disconnect foot brake pull rod.

4. Unscrew sleeve at rear end of speedometer shaft and disconnect speedometer shaft from transmission.

5. Remove bolts from flange of front universal joint and disconnect propeller shaft.

6. Remove clevis pin from lower end of starter pedal shaft lever, disconnect starter operating shaft and spring.

7. Remove cap screws holding transmission case cover to transmission and take off control hand lever assembly.

8. Remove clevis pin from clutch adjustable link and disconnect throwout yoke.

Transmission Group

9. Remove bolts holding pedal control bracket to transmission case, and take off pedal control assembly.

10. Remove clutch drain plug from flywheel and drain oil out of clutch.

11. Remove cap screws holding clutch cover to flywheel.

12. Remove cotter pins and nuts from 3 bolts, take out bolts and 2 cap screws holding transmission case to crankcase, taking out upper bolt last; this will allow the lowering and removal of the clutch and transmission assemblies from the car.

13. Remove cotter pin and nut from clutch hub pin, take out pin and pull clutch assembly off transmission mainshaft drive gear, using clutch puller shown on page 19, service tool section, if necessary.

14. Remove cotter pin, nut (58) and washer from rear end of transmission mainshaft.

15. Pull front universal joint flange off mainshaft, using universal joint flange puller shown on page 22, service tool section.

16. Remove bolts (45) holding mainshaft rear bearing cap to transmission and take off cap (501); this will permit the removal of the mainshaft (3 1) and parts assembled on it.

17. Remove screws (24) from countershaft bearing caps, and take off caps (21), shims (53) and bearing rollers and retainers.

18. Pull countershaft bearing outer races out of transmission case, using bearing race puller shown on page 14, service tool section.

19. Remove countershaft bronze and steel thrust washers (18, 19) and take out countershaft assembly, moving it slightly to rear and raising front end upward.

20. Countershaft or countershaft gears which require renewal, should now be removed and replaced, using an arbor press. Renew parts (22, 18, 19) as necessary, and reassemble transmission, reversing the foregoing operations. See that there are sufficient shims (32) on mainshaft to allow .008" to .012" end play for lubrication, after caps (10, 50) are bolted in place. Shims (53) should also be added or removed, if necessary, so that from .014" to .018" end play exists in countershaft.

(E) Renew Reverse Idler Gear, Shaft, Bearing or Thrust Washers

1. Remove toe and floor boards.

2. Remove clevis pin at bottom of hand brake lever and disconnect hand brake pull rod.

3. Remove clevis pin from lower end of starter pedal shaft lever, disconnect starter operating shaft and springs.

4. Remove cap screws holding transmission case cover to transmission and take off control hand lever assembly.

5. Unscrew sleeve at rear end of speedometer shaft and disconnect speedometer shaft from transmission.

6. Remove bolts from flange of front universal joint and disconnect propeller shaft.

7. Remove cotter pin and nut (58) from rear end of transmission mainshaft and pull off front universal joint flange, using universal joint flange puller shown on page 22, service tool section.

8. Remove bolts (45) holding mainshaft rear bearing cap (50) and take off cap; this will permit the removal of the mainshaft and assembled parts.

9. Remove screws (24) holding countershaft rear bearing cap to transmission and take off cap (21).

10. Pull reverse idler gear shaft out of rear of transmission case, by placing 3/8"-16 cap screw in hole tapped in end of idler shaft and using large screw-driver or piece of flat steel to pry under head of screw.

11. The reverse idler gear (36), bearing (37) and thrust washers (40) may now be removed and renewed where necessary and transmission reassembled, reversing above operations. Make sure that there is from .008" to .012" end play in mainshaft after reassembling.

(F) Renew Transmission Case

1. Remove toe and floor boards.

2. Remove clevis pin at bottom of hand brake lever and disconnect hand brake pull rod.

3. Remove clevis pin at bottom of brake pedal and disconnect foot brake pull rod.

4. Unscrew sleeve at rear end of speedometer shaft and disconnect speedometer shaft from transmission.

5. Remove bolts from flange of front universal joint and disconnect propeller shaft.

6. Remove clevis pin from lower end of starter pedal shaft lever, disconnect starter operating shaft and spring.

7. Remove cap screws holding transmission case cover to transmission and takeoff control hand lever assembly.

8. Remove clevis pin from clutch adjustable link and disconnect throwout yoke.

9. Remove bolts holding pedal control bracket to transmission case, and take off pedal control assembly.

10. Remove clutch drain plug from flywheel and drain oil out of clutch.

11. Remove cap screws holding clutch cover to flywheel.

12. Remove cotter pins and nuts from 3 bolts, take out bolts and 2 cap screws holding transmission case to crankcase, taking out upper bolt last; this will allow the lowering and removal of the clutch and transmission assemblies from the car.

13. Remove cotter pin and nut from clutch hub pin, take out pin and pull clutch assembly off transmission mainshaft drive gear, using clutch puller shown on page 19, service tool section, if necessary.

14. Remove cotter pin and nut (58) from rear end of transmission mainshaft and pull off front universal joint flange, using universal joint flange puller shown on page 22, service tool section.

15. Remove bolts (45) holding mainshaft rear bearing cap (50) and take off cap; this will permit the removal of the mainshaft (31) and assembled parts.

16. Remove bolts (8) holding mainshaft front bearing cap to transmission and take off cap (10); this will allow the removal of the mainshaft drive gear (2) and assembled parts.

17. Remove screws (24) from countershaft bearing caps, take off caps (21), shims (53) and bearing rollers and retainers.

18. Pull countershaft bearing outer races out of transmission case, using countershaft bearing race puller shown on page 14, service tool section.

19. Remove countershaft bronze and steel thrust washers (18, 19) and take out countershaft assembly, moving it slightly to rear and raising front end upward.

Transmission Group

20. Pull reverse idler gear shaft out of rear of transmission case, screwing Y8'-16 cap screw in hole tapped in end of idler shaft, and using large screw-driver or similar tool to pry under head of screw.

21. Remove reverse idler gear (36), bearing (37) and thrust washers (40).

22. Remove bearing outer sleeve lock screws (4), pull outer sleeves of mainshaft drive gear outer, and mainshaft rear bearings (5, 42) out of transmission case, using outer sleeve pullers shown on page 14, service tool section.

23. Remove drain and oil level plugs (66, 64), hand brake lever ratchet screws (38) and take off ratchet (39).

24. Replace case with new part and reassemble transmission, reversing above operations. When reassembling transmission allow .008" to .012" end play in mainshaft and .014" to .018" in countershaft for lubrication of thrust washers.

(G) Renew Clutch Throwout Yoke, Throwout Yoke Bushing or Bolt

1. Remove cotter and clevis pins from clutch adjustable link and disconnect from throwout yoke (55).

2. Remove cotter pin and nut from bottom of bolt connecting throwout yoke with transmission mainshaft front bearing cap and take off yoke.

3. Renew yoke or bolt or remove and replace_ bushing in yoke as necessary, and reassemble, reversing above operations.

(H) Renew Mainshaft Rear Bearing Cap Felt Washer

1. Remove bolts from flange of front universal joint and disconnect propeller shaft.

2. Remove cotter pin and nut (58) from rear end of transmission mainshaft and pull off front universal joint flange, using universal joint flange puller shown on page 22, service tool section.

3. Remove and replace felt washer (51) with new part and reassemble, reversing above operations.

(I) Remove End Play from Mainshaft

End play in the transmission mainshaft, which will develop after extensive service due to wear of the thrust washers, can be taken up by the removal of shims, as detailed below. In event the end play is very great, due to the thrust washers cutting or burning out on account of lack of lubrication, it will be necessary to fit new thrust washers. To renew front thrust washers (15, 17) it will be necessary to dismount clutch and transmission assemblies as outlined in Article "C." If the rear bearing thrust washers (52, 49) require renewal, proceed as outlined in Article "B."

1. Remove bolts from flange of front universal joint and disconnect propeller shaft.

2. Unscrew sleeve at rear end of speedometer shaft and disconnect speedometer shaft from transmission.

3. Remove cotter pin, nut (58) and washer from rear end of transmission mainshaft and pull off universal joint flange, using universal joint flange puller shown on page 22, service tool section.

4. Remove screws (45) holding mainshaft rear bearing cap to transmission and take off cap (50).

Transmission Group

5. Remove sufficient shims (43) to take out all but from .008" to .012" end play; this amount is essential to insure lubrication of the thrust washers.

6. Reassemble parts, reversing the above operations.

(J) Remove End Play from Countershaft

The proper end play in the countershaft of the Hudson transmission ranges from .014" to .018". End play in excess of this amount may be removed by the addition of shims placed between the countershaft rear bearing cap and rear bearing outer sleeve, as detailed below.

1. Remove screws (24) from countershaft rear bearing cap and take off cap (21).

2. Add sufficient shims (53) between bearing and cap to allow the end play above mentioned, replace cap and tightly bolt in place.

Hudson Pedal Control

Pedal Control Group



Hudson Pedal Control

Ref. No. Name of Part

- 1. Brake pull rod
- 2. Brake pedal adjusting screw
- 3. Pedal adjusting screw lock nut
- 4. Clutch pedal spring
- 5. Clutch pedal retaining pin
- 6. Pedal support bracket
- 7. Pedal pad screw
- 8. Pedal pad
- 9. Clutch pedal

Ref. No. Name of Part

- 10. Brake pedal
- 11. Pull rod clevis pin
- 12. Clutch pedal shaft lever
- 13. Pedal shaft
- 14. Clutch pedal adjusting yoke
- 15. Adjusting yoke clevis pin
- 16. Stationary yoke clevis pin
- 17. Stationary yoke

Group

(A) Renew or Rebush Pedal Support Bracket, Clutch or Brake Pedal

- 1. Remove toe and floor boards.
- 2. Remove clevis pin (11) from bottom of brake pedal (10) and disconnect foot brake pull rod.
- 3. Remove clevis pin (16) from clutch adjusting link (17) and disconnect clutch throwout yoke.
- 4. Remove screws holding pedal support bracket (6) to transmission. case and take off pedal control assembly.
- 5. Unhook clutch pedal spring (4) from support bracket.
- 6. Drive out taper pin (5) at lower end of clutch pedal and pull pedal (9) off pedal shaft.
- 7. The pedal shaft (13) and lever (12) may now be withdrawn from support bracket and the brake pedal (10) removed.

8. The brake pedal and pedal support bracket should be rebushed or renewed as necessary, and parts reassembled by reversing the above operations.

Hudson Hand Control Assembly





Hand Control Assembly

Ref. No. Name of Part

- 1. Hand brake lever latch screw
- 2. Hand brake lever latch
- 3. Latch rod end
- 4. Latch rod nut
- 5. Latch rod
- 6. Hand brake lever
- 7. Gearshift lever cover pin
- 8. Gearshift lever spring
- 9. Gearshift lever cover
- 10. Starter pedal
- 11. Control lock plunger
- 12. Hand brake lever latch rod spring
- 13. Control housing gasket
- 14. Housing cap screw
- 15. Hand brake lever ratchet spring
- 16. Starter shaft retaining pin
- 17. Starter shaft
- 18. Starter shaft lever
- 19. Starter shaft lever clevis pin
- 20. Gearshift lever spring seat
- 21. Gearshift lever felt washer
- 22. Gearshift lever ball cup
- 23. Control housing
- 24. Control lock
- 25. Control lock retaining pin
- 26. Control housing pin
- 27. Gearshift lever key
- 28. Oil filler plug

- Ref. No. Name of Part
- 29. Oil filler plug gasket
- 30. Starter shaft collar screw
- 31. Collar screw lock wire
- 32. Starter gear shaft
- 33. Starter shaft washer
- 34. Transmission case cover
- 35. Transmission case cover screw
- 36. Shifter shaft lock ball spring cap
- 37. Shifter shaft lock ball spring
- 38. Shifter shaft lock ball
- 39. Low and reverse shifter shaft
- 40. Inner lock plunger
- 41. Second and high speed shifter shaft
- 42. Gearshift lever ball
- 43. Gearshift lever
- 44. Hand brake lever spring washer
- 45. Pivot stud nut
- 46. Pivot stud
- 47. Brake lever latch clevis pin
- 48. Latch pivot stud
- 49. Latch pivot stud nut
- 50. Latch single end
- 51. Latch double end
- 52. Shifter fork lock screw
- 53. Low and reverse shifter fork
- 54. Second and high speed shifter fork
- 55. Starter shaft rod
- 56. Starter operating spring

(A) Renew Gearshift Lever, Cover, Spring, Ball Cup, Felt Washer or Lever Key

1. Remove ball (42) from top of gearshift lever (43).

2. Drive taper pin (7) out of gearshift lever cover (19).

3. Remove cover (9) spring (8) spring seat (20) and felt washer (21), unscrew gearshift lever ball cup (22).

4. Remove lock wire from gearshift lever pin (26) and pull out pin, this will allow the removal of the gearshift lever and key (27).

5. Any of the above parts requiring renewal should be replaced and control reassembled, reversing above operations.

- (B) Repair or Renew Control Lock or Plunger
- 1. Remove toe and floor boards.
- 2. Remove cotter and clevis pins from lower part of brake hand lever and disconnect hand brake pull rod.
- 3. Remove clevis pin (19) from bottom of starter shaft lever and disconnect starter operating shaft rod (55) and spring (56).

Hand Control Assembly Group

4. Remove transmission case cover screws (35) and take control hand lever assembly off transmission.

5. Remove screws (14) holding control housing to transmission case cover. Take off control housing (23) and assembled parts.

6. The control lock (24) is secured to the control housing (23) by means of a dowel pin (25) in diameter, which passes through the housing and enters a hole drilled in the lock. The pin is then fastened in place by welding to the housing. To remove the lock it is first necessary to chip out the metal surrounding the weld with a sharp cold chisel so that the dowel pin is exposed. This pin is next drilled out, using a drill and drilling to a depth not to exceed 9/16" from outside of housing. In performing this operation, it is important that the drill be accurately centered, otherwise all of the pin will not be removed, and the lock will not be released.

7. The lock may then be removed and repaired or replaced as necessary, together with plunger (11).

8. To reassemble, fit new dowel pin, weld in place and reverse above operations.

(C) Renew Transmission Case Cover, Shifting Forks, Shifting Shafts and Interlock Plungers

1. Remove toe and floor boards.

2. Remove cotter and clevis pins from lower part of brake hand lever and disconnect hand brake pull rod.

3. Remove clevis pin (19) from bottom of starter shaft lever and disconnect starter operating shaft rod (55) and spring (56).

4. Remove transmission case cover screws (35) and take control hand lever assembly off transmission.

5. Remove cotter pin, nut (45) and spring washer (44) from brake hand lever pivot and take off brake hand lever (6).

6. Remove screws (14) holding control housing to transmission case cover, take off control housing (23) and assembled parts.

7. Remove oil filler plug (28) and gasket (29).

8. Remove cotter pin and clevis pin (16) holding starter pedal shaft in place.

9. Drive taper pin out of bottom of starter pedal (10) pull. starter pedal shaft (17 out of pedal.

10. Remove lock wires and lock screws (52) from gear shifting forks (53, 54).

11. Remove shifting shaft lock spring caps (36) springs (37) and lock balls (38).

12. Slide shifting shafts (39, 41) out of shifting forks and transmission case cover and remove interlock plungers (40).

13. Renew parts where necessary and reassemble control lever assembly, reversing the above operations.

(D) Renew Control Housing

1. Remove toe and floor boards.

2. Remove cotter and clevis pins from lower part of brake hand lever and disconnect hand brake pull rod.

3. Remove clevis pin (19) from bottom of starter shaft lever and disconnect starter operating shaft rod (55) and spring (56).

4. Remove transmission case cover screws (35) and take control hand lever assembly off transmission.

5. Remove screws (14) holding control housing to transmission case cover, take off control housing and assembled parts 6. Remove ball (42) from top of gear shift lever (43).

7. Drive taper pin (7) out of gear shift lever cover (9).

8. Remove cover (9), spring (8), spring seat (20) and felt washer (21), unscrew gear shift lever ball cup (22).

9. Remove lock wire from gear shift lever pin (26) and pull out pin, this will allow the removal of the gear shift lever and key (27).

10. The control lock (24) is secured to the control housing (23) by means of a dowel pin (25), 3/16" diameter, which passes through the housing and enters a hole drilled in the lock. The pin is then fastened in place by welding to the housing. To remove the lock, it is first necessary to chip out the metal surrounding the weld with a sharp cold chisel, so that the dowel pin is exposed. The pin is next drilled out, using a 3/16" drill and drilling to a depth not to exceed 9/16" from outside of housing. In performing this operation, it is important that the drill be accurately centered, otherwise all of the pin will not be removed, and the lock will not be released.

11. The control lock end plunger (11) may now be removed and fitted to new housing and parts reassembled, reversing the foregoing operations.

Hudson Universal Joints and Propeller Shaft



Universal Joints and Propeller Shaft Group

Hudson Universal Joints and Propeller Shaft

Ref. No. Name of Part
1. Casing plug
2. Companion flange-rear
3. Flange bolt nut-rear
4. Flange bolt nut lock-rear
5. Flange bolt-rear
6. Outer casing spring
7. Outer casing spring retainer
8. Spring retainer bolt
9. Spring retainer bolt nut
10. Propeller shaft
11 Dust can felt washer disc

11. Dust cap left washer disc

- 12. Dust cap felt washer
- 13. Dust cap

Ref. No. Name of Part

- 14. Sleeve yoke
- 15. Cross
- 16. Outer casing
- 17. Bushing
- 18. Outer casing packing
- 19. Inner casing
- 20. Flange bolt-front
- 21. Flange bolt nut lock front
- 22. Flange bolt nut-front
- 23. Bushing retaining ring
- 24. Companion flange-front
- 25. Flange yoke

(A) Renew Front Universal Joint

1. Straighten lugs on nut locks (21), remove nuts from flange bolts (2), take out bolts and disconnect front joint from transmission flange (24).

2. Unscrew dust cap (13) from sleeve yoke (14) and slide front universal joint off propeller shaft.

3. Slide dust cap (13), dust washer (12) and disc (11) off front end of shaft and replace with corresponding parts of new universal joint.

4. If the front companion flange (24) requires renewal, remove cotter pin and nut from rear end of transmission main shaft and pull flange off mainshaft, using universal joint flange puller shown on page 22, service tool section.

Fit new flange to transmission shaft, tapping same in place with a lead or rawhide hammer; replace washer, then tighten and cotter pin nut securely.

5. Oil splines in sleeve yoke of new joint and place on propeller shaft, making sure that the arrow on the sleeve yoke lines up with the arrow on the front end of the propeller shaft.

6. Fill joint with fibre grease through opening in front end, then place in position and bolt to flange, bending over ears on nut locks after thoroughly tightening nuts.

(B) Renew Propeller Shaft, Universal Joint Flange or Sleeve Yokes, Crosses, Bushings, Inner or Outer Casings

1. Bend back ears on nut locks (4, 21), remove universal joint flange bolt nuts (3, 22) and take out flange bolts (5, 20), this will allow the removal of the shaft and joints.

2. Unscrew dust cap (13) from sleeve yoke (14) of front universal joint; pull front joint assembly off propeller shaft.

3. To renew front or rear universal joint parts, place joint or propeller shaft on bench and remove nuts (8) from spring retainer bolts (9); this will permit the removal of the retainers (7), springs (6), outer casings (16) and inner casings (19), which parts may be slipped over the shaft.

Universal Joints and Propeller Shaft Group

4. Drive bushings (17) from flange yokes (25) with drift or hammer and separate yokes from crosses (15).

5. Pry out lock rings (23) holding bushings in place in propeller shaft rear yoke and front sleeve yoke, using a screwdriver or similar tool which must be forced between the bushing and lock ring; this will allow the remaining bushings to be driven out, releasing the crosses (15).

6. Renew propeller shaft, flange or sleeve yokes, crosses, bushings or casings as necessary, and reassemble parts, reversing the foregoing operations. When installing assembled shaft in position, be sure that the arrow stamped on the propeller shaft (10) at the front end, lines up with the arrow stamped on the sleeve yoke (14) of the front universal joint, also that the joints are thoroughly lubricated.

(C) Renew Rear Universal joint Assembly and Propeller Shaft

1. Straighten ears on rear universal joint flange bolt nut locks (4), remove nuts (3), take out flange bolts (5) and disconnect rear end of the propeller shaft.

2. Remove dust cap (13) from sleeve yoke of front joint and pull propeller shaft out of sleeve yoke.

3. The rear universal joint companion flange (2) should now be removed from the rear axle pinion shaft if renewal is necessary. Remove cotter pin and nut from front end of shaft and pull off flange, using universal joint flange puller shown on page 22, service tool section. Remove all dirt and foreign matter from taper on shaft and flange and tap flange in place with a soft hammer. Replace washer, draw up pinion shaft nut tightly and spread cotter pin.

4. Clean splines at front end of new shaft and slide shaft in sleeve yoke of front joint, placing parts in position so the arrows stamped on the front of the propeller shaft and universal joint are in line with each other.

5. The rear universal joint should then be lubricated with fibre grease, and tightly bolted to the rear companion flange, after which the nut locks should be bent over to guard against the parts coming loose.

Hudson Carburetor

Carburetor Group



Hudson Carburetor

Ref. No. Name of Part

- 1. Adjusting shaft lever spring
- 2. Gear housing screw
- 3. Strainer plug gasket
- 4. Strainer plug
- 5. Adjusting shaft lever
- 6. Bell crank link
- 7. Bell crank clevis pin
- 8. Bell crank
- 9. Gasoline pipe union
- 10. Adjusting shaft lever clamp screw
- 11. Adjusting shaft lever swivel
- 12. Adjusting shaft lever swivel screw
- 13. Adjusting screw pawl
- 14. Adjusting screw
- 15. Adjusting screw pawl spring
- 16. Throttle body
- 17. Aspirating nozzle
- 18. Throttle body cap screw
- 19. Air valve cone
- 20. Throttle body gasket
- 21. Carburetor body
- 22. Air valve stem
- 23. Float needle valve cap
- 24. Float cover screw
- 25. Float weight axle
- 26. Float weight

Ref. No. Name of Part

- 27. Adjusting shaft gland
- 28. Adjusting shaft lock nut
- 29, Adjusting shaft packing nut
- 30. Adjusting shaft
- 31. Adjusting shaft packing
- 32. Throttle shaft packing
- 33. Butterfly screw
- 34. Butterfly valve
- 35. Throttle shaft
- 36. Metering pin
- 37. Gear housing
- 38. Gear housing gasket
- 39. Metering pin rack
- 40. Metering pin spring
- 41. Float needle valve
- 42. Needle valve seat
- 43. Filter screen
- 44. Gear housing cap
- 45. Gear housing cap gasket
- 46. Throttle shaft lever adjusting screw
- 47. Adjusting screw lock screw
- 48. Throttle shaft lever
- 49. Bell crank spring
- 50. Body plug
- 51. Clamp nut
- 52. Inlet elbow assembly

(A) Renew Carburetor

1. Shut off gasoline valve at bottom of vacuum tank and disconnect gasoline feed pipe at carburetor.

- 2. Disconnect accelerator rod at carburetor bell crank.
- 3. Disconnect mixture and throttle control wires at carburetor.
- 4. Remove set screw at carburetor air inlet at take off carburetor hot air pipe.
- 5. Remove three screws holding carburetor to inlet manifold and take off carburetor assembly.

6. Replace with new carburetor assembly, reversing above operations and fitting new gasket when bolting carburetor to inlet manifold.

(B) Renew Float Cover, Float Cover Weights, Float Needle Valve, Float Assembly, or Needle Valve Seat

1. Remove float chamber cover screws and take off cover assembly, float needle valve and float.

2. If float needle valve seat requires renewal, it should be removed from the carburetor body by means of a hexagon socket wrench, and replaced with a new part. The parts removed in operation 1, should be replaced with new parts where necessary and reassembled.

(C) Renew Air Valve, Cone, Air Valve Stem, or Aspirating Nozzle

1. Shut off gasoline valve at bottom of vacuum tank and disconnect gasoline feed pipe at carburetor.

2. Disconnect mixture control wire from lever at bottom of carburetor.

Carburetor Group

3. Remove cap screws (18) holding carburetor body to throttle body. This will release the lower carburetor assembly which may be placed on the workbench for further repairs.

4. Remove lower screws (2) holding gear housing to carburetor body, disconnect adjusting shaft lever spring (1) and remove gear housing from carburetor body.

5. Turn carburetor body assembly upside down and place in vise holding upper end of air valve cone (19) on flat faces, being careful not to spring cone out of shape.

6. Unscrew air valve stem and piston (22) from air valve cone (19) using special carburetor wrench having two small pins which engage holes drilled in the bottom of the piston.

7. This will release the aspirating nozzle (17) which, together with the cone and stem, may be renewed if necessary. It is advisable before reassembling, to make sure that the ball check valves in the bottom of the air valve stem move freely in their seats as if they are rusted or stuck in the seats the carburetor action will be sluggish. The air valve cone should also be inspected to make sure that the low speed air inlet holes are free from dirt.

(D) Clean Carburetor

1. Shut off gasoline valve at bottom of vacuum tank and disconnect gasoline feed pipe at carburetor.

2. Disconnect mixture and throttle control wires at carburetor.

3. Disconnect accelerator rod at carburetor bell crank.

4. Remove set screw at carburetor air inlet and take off carburetor hot air pipe.

5. Remove three screws holding carburetor to inlet manifold and take off carburetor assembly.

6. Thoroughly clean carburetor with a stiff brush and gasoline so there will be no danger of dirt working into the inside of the carburetor when it is disassembled.

7. Remove float chamber cover screws (24), take off float chamber cover assembly, float and needle valve.

8. Remove strainer from bottom of float chamber, unscrewing strainer plug (4) or union nut (51).

9. Remove cap screws (18) from carburetor body and take off throttle body assembly (16).

10. Remove screws (2) holding gear housing (37) to carburetor body and take off ear housing.

11. The carburetor body and disassembled parts may now be thoroughly cleaned in gasoline and blown out with compressed air, if available. Be sure that the openings through the needle valve seat, from float chamber to dashpot chamber and through air valve stem and aspirating nozzle are perfectly clean and free of obstructions which might hinder the flow of gasoline through these parts. Also make certain that the low speed air inlet holes in the air valve cone (19) are open, and that the adjusting pinion and metering pin assembly operate smoothly in the gear housing. The ball check valves in the bottom of the air valve stem (22) should be examined to make sure they are free to move up and down.

12. On account of their accurately machined surfaces, it is important when cleaning the air valve stem, metering pin and component parts, that no abrasives, files or emery cloth be used, otherwise the carburetor will not function properly when reassembled.

13. After all parts have been properly cleaned, the carburetor should be reassembled by reversing the operations listed above. When doing this be particularly careful to

see that the metering pin and air valve are free to slide up and down in the carburetor body in all positions of rotation. It is also advisable, if the carburetor has been in service for some time, to renew strainer plug gasket (3), throttle body gasket (20), and gear housing gasket (8), in addition to slightly tightening packing nut (29) surrounding the pinion shaft.

(E) Renew Gear Housing, Metering Pin Assembly, Adjusting Shaft and Pinion, Gland or Packing

1. Shut off gasoline by turning valve at bottom of vacuum tank, and unscrew gasoline feed pipe at carburetor.

2. Disconnect mixture control wire at carburetor adjusting lever (5).

3. Remove set screw holding carburetor hot air pipe to carburetor; take off pipe.

4. Remove cap screws (18) holding throttle body to carburetor body and take off lower carburetor assembly.

5. Unscrew gear housing cap (44) and remove metering pin spring (40).

6. Unhook adjusting shaft lever spring (1), remove gear housing screws (2) and take off gear housing assembly.

7. Loosen clamp screw (10) on adjusting shaft lever and pull lever off shaft.

8. Unscrew adjusting shaft gland (27) from gear housing, this will allow the removal of the shaft and pinion (30), also metering pin and rack (36). Renew gear housing or component parts where necessary and reassemble parts as follows:

9. Replace metering pin and rack assembly in gear housing.

10. Assemble pinion and shaft in gland; tighten packing and lock nuts (29, 28), and screw assembled parts in gear housing, meshing adjusting pinion with rack on metering pin.

11. Replace gear housing and parts, fitting new gasket between housing and carburetor body and tightening the screws.

12. Grasp end of adjusting shaft between fingers and turn shaft slowly to the left or anti-clockwise so the metering pin (36), will be forced up into the air valve (22), lifting it up from its seat in the carburetor body. (If the shaft turns too stiffly to be moved by the fingers, the lever (5) may be slipped on the end of the shaft and used as a wrench.)

13. Next turn the adjusting shaft in the opposite direction or to the right, very slowly until the air valve just touches the seat. When in this position, measurement should be taken of the distance between the bottom face of the metering pin rack (39), and the bottom face of the gear housing (37), against which the cap (44) seats. This can be done with a narrow scale or depth gauge inserted in the opening in which the rack operates.

14. The adjusting shaft should then be turned slightly further to the right so the bottom of the metering pin rack will be lowered 1/16" as measured by the scale.

15. Carefully slide adjusting shaft lever off end of shaft so the position of the shaft will not be disturbed; then turn adjusting screw (14) up or down as necessary so it will be in the center of its travel.

Then replace lever on shaft so the top edge of the lever will be just even with the bottom of the adjusting screw.

16. Tighten clamp screw (10) on lever and hook spring (1) in position. Make sure packing nut (29) is not too tightly adjusted to prevent the spring from keeping lever (5) against the screw.

Carburetor Group

17. Replace spring (40) in the bottom of metering pin rack and screw gear housing cap (44) on gear housing.

18. To complete the reassembling of the carburetor reverse operations 1 to 4 inclusive, using a new gasket between carburetor body and throttle body. After the motor has been run sufficiently to become warmed up the final adjustment of the carburetor should be made by turning the screw (5).

Hudson Motor



Hudson Motor

Ref. No. Name of Part

- 1. Flywheel bolt nut
- 2. Flywheel bolt
- 3. Flywheel drain plug
- 4. Flywheel
- 5. Starter-generator base adjusting plug
- 6. Starter-generator base bolt
- 7. Starter-generator base
- 8. Oil reservoir gasket
- 9. Oil reservoir
- 10. Generator cutout relay
- 11. Generator strap
- 12. Generator
- 13. Carburetor bolt
- 14. Carburetor gasket
- 15. Cylinder side plate
- 16. Cylinder side plate nut
- 17. Carburetor
- 18. Distributor bracket gasket
- 19. Water pump body to cylinder screw
- 20. Water pump body to cylinder gasket
- 21. Fan support arm clamp bolt
- 22. Fan arm stud

Ref. No. Name of Part

- 23. Timing advance arm
- 24. Distributor stud nut
- 25. Oil pump body cap
- 26. Oil pump body cap gasket
- 27. Timing arm link
- 28. Oil pump body plug
- 29. Oil pump body union elbow
- 30. Oil pump inlet connection gasket
- 31. Oil pump body stud nut
- 32. Oil pump inlet connection
- 33. Oil pump inlet connection elbow
- 34. Fan support arm
- 35. Fan spider
- 36. Fan spindle nut
- 37. Spark advance cross tube
- 38. Water outlet manifold
- 39. Water outlet manifold cap screw
- 40. Water outlet manifold gasket
- 41. Cylinder head nut
- 42. Ignition coil bracket
- 43. Ignition coil
- 44. Fan pulley



Hudson Motor

Ref. No. Name of Part

- 45. Starting crank guide
- 46. Fan belt
- 47. Starting crank jaw
- 48. Crankcase front cover
- 49. Crankcase front cover screw
- 50. Crankcase front cover gasket
- 51. Spark advance cross tube lever lock
- 52. Spark advance cross tube lever
- 53. Spark advance cross tube bracket
- 54. Spark advance bracket cap screw
- 55. Cylinder to crankcase gasket
- 56. Horn wire bracket
- 57. Oil control rocker shaft

- Ref. No. Name of Part
 - 58. Oil control rocker shaft lever
 - 59. Oil control rocker shaft lever lock
 - 60. Cylinder drain cock
- 61. Oil gauge glass cap
- 62. Oil gauge glass
- 63. Oil level indicator
- 64. Oil filler vent
- 65, Oil filler cover
- 66. Cylinder to crankcase stud nut
- 67. Oil filler cover screw
- W Oil filler cover spring
- 69. Flywheel pointer
- 70. Flywheel pointer screw



Hudson Motor.

Ref. No. Name of Part

- 71. Exhaust manifold
- 72. Tappet adjusting screw
- 73. Tappet adjusting screw nut
- 74. Exhaust manifold packing nut
- 75. Cylinder to crankcase stud
- 76. Cylinder to crankcase stud nut
- 77. Tappet guide clamp
- 78. Tappet adjusting screw plate
- 79. Cylinder head stud
- 80. Cylinder head gasket
- 81. Exhaust manifold gasket
- 82. Cylinder block
- 83. Valve spring
- 84, Valve spring seat
- 85. Cylinder side plate stud
- 86. Starter shaft front bushing
- 87. Starter gears
- 88. Starter shaft rear bushing
- 89. Starter operating shaft
- 90. Starter switch
- 91. Starting motor
- 92. Starting motor strap
- 93. Inlet manifold gasket
- 94. Inlet manifold stud-short
- 95. Inlet manifold stud-long
- 96. Inlet manifold

Ref, No. Name of Part

- 97. Generator coupling
- 98. Generator coupling bolt
- 99. Generator coupling clamp
- 100. Generator coupling bolt nut
- 101. Water pump packing nut-rear
- 101. Water pump packing 102. Water pump shaft
- 103. Water pump drain cock
- 104. Crankcase
- 105. Water pump body bolt nut
- 106. Water pump body gasket
- 107. Water pump body bolt
- 108. Water pump cover
- 109. Eccentric body gasket
- 110. Eccentric body
- 111. Water pump body to crankcase bolt
- 112. Water pump packing nut-front
- 113. Water pump body
- 114. Water pump grease cup
- 115. Distributor assembly
- 116. Timing arm clamp screw
- 117. Oil pipe clip
- 118. Oil pump suction pipe
- 119. Oil pump adjusting shaft bearing
- 120. Oil pump and drive gear housing
- 121. Oil pump and drive gear housing screw
- 122. Oil pump and drive gear housing gasket
(A) Remove Carbon, Grind Valves, Renew Cylinder Head, Cylinder Head Gasket, Valves or Valve Guides

- 1. Drain water out of cooling system.
- 2. Loosen rear hose clamp on upper water hose.
- 3. Remove nuts holding water outlet manifold to cylinder head and take off manifold.
- 4. Disconnect horn wires at terminals on horn, remove screws holding horn to cylinder head and take off horn.
- 5. Disconnect wires at spark plugs.
- 6. Remove screws holding cable tube and wires to cylinder head and take off cable tube.
- 7. Remove acorn nuts holding ignition coil bracket to cylinder head and take off coil.
- 8. Shut off gasoline valve at bottom of vacuum tank and disconnect gasoline feed pipe at carburetor.
- 9. Disconnect accelerator rod at carburetor bell crank.
- 10. Disconnect throttle and mixture control wires at carburetor.
- 11. Remove set screw from carburetor air inlet and take off carburetor hot air pipe.
- 12. Remove 3 bolts holding carburetor to inlet manifold and take off carburetor.
- 13. Remove nuts from cylinder side plate studs and take off cylinder side plates.

14. Remove nuts from cylinder head studs and take off cylinder head and cylinder head gasket, prying up evenly on opposite sides. The cylinder head as well as the tops of the pistons, valves and cylinder block may now be cleaned of carbon deposits by scraping or by means of a wire carbon-removing brush operated by an electric drill. It is advisable when doing this, to stuff rags in the cylinders on top of the pistons to prevent particles of carbon from getting between the pistons and cylinder walls.

15. Compress valve springs either singly or by means of multiple valve lifters, remove valve spring retainers and take out valves. Insert valve stems through holes drilled in a board in their order of removal from the cylinder block, to prevent them be coming mixed.

16. If valve guides require renewal, drive old guides out of cylinder block with a drift or piece of brass rod. Insert new guides, using valve stem guide puller shown on page 20, service tool section, to draw them into position. After installing, they should be reamed to size, using valve stem guide reamer shown on page 11, service tool section.

17. Thoroughly clean valves of carbon with wire brush or by other means, also clean inside of valve stem guides. Note carefully the condition of the seats on the valves and cylinder block; if they are at all badly pitted, a great deal of time will be saved and a far better job will be done by having the valve faces ground true on a valve refacing machine, and the seats refaced in the cylinder block. On page 17, service tool section, will be found equipment specially designed to cover this class of work, the use of which will greatly expedite valve grinding operations. After the valves and cylinder block have been refaced, or if the valves have been renewed, a slight grinding-in is necessary to insure a perfect seat; this is done as follows:

18. Crank the engine, if necessary, to make sure that the cam operating the valve to be ground is not holding the valve off its seat. Spread a thin coating of valve grinding compound, either water or oil mixed, on the face of the valve (a fine grade should be used). Place a light open coil spring over the valve stem and insert valve in position

in cylinder block. This spring should be of sufficient size and tension to just keep the valve off the cylinder block. Rotate valve on seat from right to left with a semi-circular movement, using an electric or hand operated valve grinder or by means of a screw driver held in the slot in the valve head. It is very important when doing this, that the head of the valve be frequently raised and turned around half a revolution to guard against cutting grooves in the valve and seat. When the grinding has been properly done, the valves and seats will have a silvery color throughout their entire circumference. After the grinding has been completed be sure to clean valves and cylinder to remove all traces of grinding compound.

19. Replace valves in their respective positions and insert spring seats and retainers.

20. Replace cylinder head, using new cylinder head gasket. When tightening cylinder head nuts, start at the center and work toward the ends, alternating on each side and with uniform pressure on the wrench. After the engine has been run and thoroughly warmed up, the nuts should again be drawn up tight.

21. Complete reassembling of motor by reversing operations 1 to 12 inclusive. The motor should then be run and warmed up, after which the tappets should be readjusted to allow a clearance of from .002" to .003" minimum on the inlet valves and .004" to .005" minimum on the exhaust valves. Replace cylinder side plates, using new gaskets if necessary, and tightening nuts sufficiently to prevent oil leaks without springing the side plates out of shape.

(B) Renew Valve Spring, Seat, Retainer, or Tappet Adjusting Screw

1. Remove cylinder side plate stud nuts, take off cylinder side plates.

2. Raise valve with valve lifter and remove valve spring retainer.

3. Remove valve spring, seat, and tappet adjusting screw; renew parts where necessary.

4. Reassemble parts, reversing the foregoing operations. Before replacing the cylinder side plates adjust intake valve tappets to .002" to .003" clearance minimum, and exhaust valve tappets to .004" to .005" clearance, with hot motor.

(C) Renew Valve Tappet, Tappet Guide, Tappet Roller or Roller Pin

1. Drain water out of cooling system.

2. Loosen rear hose clamp on upper water hose.

3. Remove nuts holding water outlet manifold to cylinder head and take off manifold.

4. Disconnect horn wires at terminals on horn, remove screws holding horn to cylinder head and take off horn.

5. Disconnect spark plug wires at spark plugs.

6. Remove screws holding cable tube and wires to cylinder head and take off cable tube. coil 1, Remove acorn nuts holding ignition coil bracket to cylinder head and take off

8. Shut off gasoline valve at bottom of vacuum tank and disconnect gasoline feed pipe at carburetor.

9. Disconnect accelerator rod at carburetor bell crank.

10. Disconnect throttle and mixture control wires at carburetor.

11. Remove set screw from carburetor air inlet and take off carburetor hot air pipe.

- 12. Remove 3 cap screws holding carburetor to inlet manifold and take off carburetor.
- 13. Remove nuts from cylinder side plate studs and take off cylinder side plates.

14. Remove nuts from cylinder head studs and take off cylinder head and gasket, prying up evenly on opposite sides.

15. Compress valve springs with valve lifter, remove valve spring retainers and take out valves, valve springs and seats.

16. Remove nuts from cylinder studs and take off tappet guide clamps.

17. The valve tappet assemblies may now be lifted out of position, and any parts which require renewal should be replaced. When removing the valve tappet assemblies, it is advisable to leave the adjusting screws, lock nuts and plates screwed into the tappets to preclude the possibility of the tappets dropping out of the guides and into the interior of the motor. It is extremely important when replacing tappet guides in the cylinder block, that the locating washers which fit over the cylinder studs, rest in the proper semi-circular grooves in the flanges of the guides.

If this is not done, the rollers will not ride squarely on the cams, and destruction of the camshaft and tappet mechanism will result. When the guides are installed correctly in the cylinder, the flat surfaces on the flanges will be exactly at right angles to the center line of the motor.

18. The motor should be reassembled by reversing operations 1 to 12, and 14 to 16 inclusive. After allowing the motor to run until warmed up, the tappets should be adjusted to .002" to .003" clearance minimum on the inlet valves, and .004" to .005" clearance on the exhaust valves. Replace cylinder side plates, fitting new gaskets, if necessary.

(D) Renew Inlet or Exhaust Manifold, Inlet or Exhaust Manifold Gaskets, or Exhaust Manifold Packing Nut

1. Remove machine screw holding carburetor air heater to inlet manifold.

2. Remove set screw from carburetor body and take off hot air pipe and air heater.

3. Disconnect vacuum tank suction pipe at inlet manifold.

- 4. Remove machine screws and clamp plate from inlet manifold and disconnect mixture control wire tube.
- 5. Remove 3 cap screws holding carburetor to inlet manifold.
- 6. Remove nuts from inlet manifold studs and take off inlet manifold and gasket.

7. Unscrew exhaust manifold packing nut out of exhaust manifold, using spanner wrench shown on page 26, service tool section.

8. Remove nuts from exhaust manifold studs and take off exhaust manifold.

9. Replace with new parts where necessary, fitting new packing to exhaust manifold and reassemble, reversing the above operations.

(E) Renew Distributor Drive and Oil Pump Support, Rebush or Renew Distributor Drive Bracket, Renew Oil Pump Drive Worm, Oil Pump Eccentric, Eccentric Shaft, Distributor Drive Shaft or Driven Gear

1. Unhook spring clamps on distributor and lift off distributor cap and wires.

2. Disconnect low tension wire from ignition coil at side of distributor.

3. Disconnect link from timing advance arm on distributor.

4. Remove nuts from distributor studs and take off distributor assembly.

5. Unscrew union nuts at bottom and side of oil pump and disconnect oil pump suction and pressure gauge pipes.

6. Remove nuts holding oil pump to distributor support and take off oil pump assembly.

7. Drive taper pin out of coupling and disconnect oil pump eccentric shaft from oil control rocker shaft.

8. Remove nuts from studs holding distributor support to crankcase and take off support assembly.

9. If the oil pump eccentric and gear or the eccentric shaft require renewal, remove cap screws and cap which will permit the removal of these parts.

10. The distributor shaft, gears, and bracket assembly may now be lifted off and disassembled for the replacement of the shaft, gears, or to rebush the bracket, by removing cotter pin and nut at bottom of shaft. To rebush bracket, drive out old bushings with a drift or piece of 1/8" steel rod and press new bushings in place on arbor press or by tapping with a hammer and block. To secure perfect alignment and correct size, the bushings should be line reamed after pressing in place, with distributor shaft line reamer shown on page 11, service tool section.

11. To reassemble motor, reverse the operations listed above. When replacing the distributor drive shaft and bracket assembly, it is important that the teeth on the distributor shaft driven gear be meshed with the water pump shaft so the slot in the distributor drive washer points directly toward the front of the car, when No. 1 cylinder is on upper dead center on the firing stroke.

After reassembling distributor to motor, it will be necessary to re-time the ignition, as follows:

12. Fully advance spark, pulling spark lever on steering wheel down to lowest position.

13. Remove spark plug from No. 1 cylinder and crank motor by hand until the rush of air indicates that the piston is coming up on compression stroke. This can be determined by placing finger over spark plug opening.

14. Crank motor very slowly until the pointer on the observation hole (on the left side of the flywheel case) is directly over the center of the mark "A" which is stamped on the flywheel.

It is permissible to time slightly ahead of this point if found necessary. Results should be checked on the road and spark retarded slightly if there is any tendency to knock.

15. Loosen clamp screw on timing arm at bottom of distributor.

16. Place rotor on cam and turn distributor housing to right or clockwise, until metal strip on rotor has just passed the terminal on the distributor head to which No. 1 spark plug wire is fastened.

17. Remove rotor from cam and turn distributor housing slightly to left or anticlockwise, until contact points just begin to separate.

18. Tighten clamp screw on timing arm and replace rotor and distributor head.

(F) Renew Timing Sprockets, Chain, Gear Case Cover, Cover Gasket, Camshaft, Camshaft Thrust Washer, Thrust Button, Thrust Spring, Generator Sprocket Stationary or Floating Coupling or Thrust Washer

1. Remove bonnet assembly.

2. Open drain cock at bottom of water pump cover and drain water out of cooling system.

3. Loosen hose clamp at front of upper and lower radiator hose.,

4. Disconnect radiator shutter operating rod at radiator.

5. Remove nuts from bolts holding radiator assembly to frame.

6. Unscrew radiator tie rod from upper radiator tank and lift off radiator assembly.

7. Loosen clamp bolt on fan support arm and remove fan assembly and fan belt.

8. Unscrew starting crank jaw at front end of crankshaft, using starting crank jaw wrench shown on page 23, service tool section.

9. Unscrew starting crank guide from front end of crankshaft, turning same in right hand or clockwise direction.

10. Pull fan pulley off crankshaft, using puller shown on page 19, service tool section.

11. Remove cap screws from timing gear cover and take cover assembly off motor.

12. Remove lock wire and cap screws holding camshaft sprocket to camshaft.

13. Take off camshaft sprocket, thrust button, guide and timing chain.

14. Remove nuts from cylinder side plate studs and take off cylinder side plates.

15. Raise valves and tappets and hold in wide open position by means of multiple valve lifters or by Y4' hexagon nuts placed on edge between top of valve tappet guides and tappet adjusting screw plates.

16. The camshaft may now be withdrawn from the crankcase and renewed, together with the camshaft thrust washer, as necessary.

17. If the crankshaft sprocket requires renewal, it should be removed from the crankshaft and the new sprocket driven on, by the use of the crankshaft sprocket puller and driver shown on page 23, service tool section.

18. To disassemble pump shaft sprocket and coupling, cut off riveted-over portion of stationary coupling pin, drive pin out of coupling and pull coupling off generator shaft.

This will permit the removal of the floating coupling, generator sprocket, generator sprocket thrust washer and thrust washer springs, which may be replaced with new parts if required.

19. The motor may be reassembled after renewing necessary parts, by reversing the foregoing operations. When replacing the camshaft sprocket and timing chain, it is very important that the following points be observed regarding the relation of the distributor and camshafts to the crankshaft, so the valves and ignition will be properly timed:

Turn water pump shaft until the metal strip on the top of the rotor points directly toward the front of the car.

Turn camshaft until exhaust valve has just closed and inlet valve is just about to open on No. 6 cylinder.

Turn crankshaft until No. 1 and No. 6 pistons are on upper dead center.

On the side of the chain facing the front of the motor, will be found arrows stamped on the links which should point in the direction in which the motor runs. Upon close observation, 2 punch marks will be seen on the link pins which are exactly 18 links apart. The chain should be placed on the camshaft sprocket so that one of these punch marks will coincide with similar punch marks on the sprocket teeth, while the other punch mark lines up with the marked teeth on the crankshaft sprocket. Be careful not to materially change the position of the distributor shaft when doing this.

After the reassembling has been completed, it is necessary to re-time the ignition, as follows:

20. Fully advance spark, moving spark lever on steering wheel down to lowest position.

21. Crank motor very slowly with No. 1 cylinder on the compression stroke, until the pointer on the observation hole (on the left side of the flywheel case) is directly over the center of the mark "A" which is stamped on the flywheel. The spark may be set slightly in advance of this point if deemed necessary, checking results on the road and retarding ignition if the motor shows a tendency to knock.

22. Adjust contact points to .020" gap at wide open position.

23. Loosen clamp screw on timing arm at bottom of distributor.

24. Place rotor on cam and turn distributor housing to right or clockwise, until the terminal on the distributor head to which No. 1 spark plug wire is fastened, has just passed the metal strip on the top of the rotor.

25. Remove rotor from cam and turn housing slightly to left or anti-clockwise, until contact points just begin to separate.

26. Tighten clamp screw on timing arm and replace rotor and distributor head.

(G) Rebush or Renew Adjusting Eccentric Body, Water Pump Body, Water Pump Cover, Water Pump Paddle, Water Pump Shaft, or Water Pump Shaft Rear Thrust Washer

1. Remove bonnet assembly.

2. Open drain cock at bottom of water pump cover and drain water out of cooling system.

3. Loosen hose clamps at front of upper and lower radiator hose.

4. Disconnect radiator shutter operating rod at radiator.

5. Remove nuts from bolts holding radiator assembly to frame.

6. Unscrew radiator tie rod from upper radiator tank and lift off radiator assembly.

7. Loosen clamp bolt on fan support arm and remove fan assembly and fan belt.

8. Unscrew starting crank jaw at front end of crankshaft, using starting crank jaw wrench shown on page 23, service tool section.

9. Unscrew starting crank guide from front end of crankshaft, turning same in right hand or clockwise direction.

10. Pull fan pulley off crankshaft, using puller shown on page 19, service tool section.

11. Remove cap screws from timing gear cover and take cover assembly off motor.

12. Remove lock wire and cap screws holding camshaft sprocket to camshaft.

13. Take off camshaft sprocket, thrust button, guide and timing chain.

14. Unhook spring clamps and remove distributor head and wires.

15. Disconnect low tension wire from ignition coil at side of distributor.

16. Disconnect link from timing arm at bottom of distributor.

17. Drive taper pin out of coupling sleeve and disconnect oil pump eccentric shaft from rocker shaft.

18. Remove nuts from distributor studs and take off distributor assembly.

19. Unscrew union nuts at bottom of oil pump and crankcase and take off oil pump suction pipe.

20. Remove cap screws holding distributor support to crankcase and lift off support assembly and distributor drive bracket assembly.

21. Disconnect generator wire at cutout on generator.

22. Remove generator coupling bolts, nuts and clamps and slide coupling forward off generator sleeve.

23. Remove clamp screw and nut from generator strap and take off generator.

24. Remove 2 cap screws holding water pump body to cylinder block.

25. Remove 3 cap screws holding water pump body and eccentric body to crankcase; this will permit the withdrawal of the water pump and eccentric assemblies, which may be placed on the bench for further disassembling.

26. Remove generator coupling sleeve from end of water pump shaft, using puller shown on page 19, service tool section, if necessary.

27. Remove 5 bolts holding water pump body and cover together and take off cover.

28. Remove cotter pin and drive taper pin out of water pump paddle.

29. Remove paddle and slide water pump body off pump shaft.

30. Cut off riveted-over portion of straight pin, holding stationary coupling to front end of pump shaft, drive out pin and remove stationary and floating couplings, pump shaft sprocket, thrust washer and thrust washer springs.

31. Remove 3 machine screws holding rear pump shaft thrust washer to eccentric body, take off washer and remove shaft.

32. If eccentric is to be renewed, remove 3 screws which hold it to eccentric body and replace with new part. To fit new bushing to rear end of body, press out old bushing n arbor press or with drift and hammer, and press new part in place, reaming to size with eccentric bushing line reamer shown on page 11, service tool section.

33. Rebush or renew water pump body or cover if necessary. New bushings should be reamed to size after pressing in place, with expansion reamer shown on page 11, service tool section. Any other parts which require renewal should now be replaced, and the motor reassembled, which is accomplished by reversing the above operations. When replacing distributor drive shaft and bracket assembly, it is important that the gear teeth on the water pump shaft and the distributor driven gear be meshed so the slot in the distributor drive washer at the top of the distributor shaft points directly toward the front of the motor when No. 1 cylinder is on upper dead center on the firing stroke.

This can be determined by placing a finger over No. 1 spark plug hole and cranking the motor by hand until the rush of air indicates that the piston is coming up on compression stroke. To insure correct timing of the valves, it is necessary, when replacing the camshaft sprocket and timing chain, that the following points be closely observed: The side of the chain facing the front of the motor has arrows stamped on the links, which must point in the direction in which the chain runs. Upon close observation, 2 punch marks will be seen on the link pins which are exactly 18 links apart. Place chain on camshaft sprocket so that one of these punch marks will coincide with similar punch marks on the sprocket teeth. The crankshaft should then be turned until the tooth on the crankshaft sprocket bearing punch marks, will engage the other link in the chain which is likewise marked.

After the reassembling has been completed, it will be necessary to re-time the ignition, as follows:

34. Fully advance spark, moving spark lever on steering wheel down to lowest position.

35. Crank motor very slowly with No. 1 cylinder on the compression stroke, until the pointer on the observation hole (on the left side of the flywheel case) is directly over the center of the mark "A" which is stamped on the flywheel.

The spark may be set slightly in advance of this point if deemed necessary, checking results on the road and retarding ignition if the motor shows a tendency to knock.

36. Loosen clamp screw on timing arm at bottom of distributor.

37. Adjust contact points to .020" gap at wide open position.

38. Place rotor on cam and turn distributor housing slightly to right or clockwise, until the terminal on the distributor head to which No. 1 spark plug wire is fastened, has just passed the metal strip on. the top of the rotor.

39. Remove rotor from cam and turn housing slightly to left or anti-clockwise, until contact points just begin to separate.

40. Tighten clamp screw on timing arm and replace rotor and distributor head.

After replacing the timing chain and camshaft sprocket, and before replacing the 3 bolts which hold the water pump and eccentric bodies to the crankcase, the chain must be adjusted. This is done by engaging the eccentric adjusting wrench shown on page 26, service tool section, with the notches on the eccentric flange and pulling wrench toward workman until only 1/8" backlash or play is visible when the coupling is grasped by the hand and rocked back and forth.

(H) Renew Generator Assembly

1. Disconnect wire at terminal on cutout relay or on top of generator.

2. Remove nuts, bolts, and clamps from generator coupling and slide coupling forward on shaft.

3. Loosen clamp screw on generator strap and remove generator from base.

4. Fit new generator assembly in place, after scraping excess paint off outside portion resting in base to insure a good ground contact. Slide coupling back, replace clamps and bolts and tighten nuts. The clamp screw in the generator strap should then

be drawn up securely. Upon completion of the installation of the generator, the alignment should be checked. If it is found that the front end of the generator is not concentric with the drive shaft it should be lined up by loosening the 3 cap screws holding starter-generator base in position.

This will allow any misalignment in a sidewise direction to be corrected; if the front end of the generator is too high or low, the forward cap screw should be removed entirely and the adjusting plug, through which the screw passes, moved up or down as necessary, using generator adjusting wrench shown on page 20, service tool section. When proper alignment has been secured, tighten the cap screws in the base.

(I) Renew Distributor Assembly

1. Pull spark plug and ignition coil high tension wires out of terminals on distributor head.

2. Disconnect low tension wire from ignition coil at side of distributor.

3. Remove nut from ball joint and disconnect link at spark advance arm on distributor.

4. Remove nuts from distributor studs and lift off distributor assembly.

5. Install new distributor assembly, and reassemble parts, reversing the above operations. When replacing high tension wires on distributor head, No. 1 spark plug wire must be fitted to the terminal nearest the front of the motor, followed, in right hand or clockwise order, by. wires leading to No. 5, No. 3, No. 6, No. 2, and No. 4 spark plugs. The ignition must then be re-timed as follows:

6. Place finger over spark plug opening in No. 1 cylinder and crank motor until the rush of air indicates that the piston is coming up on compression stroke.

7. Fully advance spark, pulling spark lever on steering wheel down to lowest position.

8. Crank motor very slowly until the pointer on the observation hole (on the left side of the flywheel case) is directly over the center of the mark "A" which is stamped on the flywheel. The motor can be timed slightly in advance of this point if necessary, checking results on the road and retarding spark if there is any tendency to knock.

9. Loosen clamp screw on timing arm at bottom of distributor.

10. Place rotor on cam and turn distributor housing to right or clockwise, until metal strip on rotor has just passed the terminal on the distributor head to which No. 1 spark plug wire is fastened.

11. Remove rotor from cam and turn housing slightly to left or anti-clockwise, until contact points just begin to separate.

12. Tighten clamp screw on timing arm and replace rotor and distributor head.

(J) Renew Pistons, Piston Pins, Piston Rings, Piston Pin Bushings, Connecting Rods or Connecting Rod Bearings

1. Place receptacle under oil reservoir, remove oil reservoir drain plug and drain oil.

2. Raise up front end of car with chain hoist or axle stands, remove oil reservoir cap screws and take off oil reservoir.

3. Drain water out of cooling system.

4. Loosen rear hose clamp on upper water hose.

- 5. Remove nuts holding water outlet manifold to cylinder head and take off manifold.
- 6. Disconnect horn wires at terminals on horn, remove screws holding horn to cylinder head and take off horn.

7. Disconnect spark plug wires at spark plugs.

- 8. Remove screws holding cable tube and wires to cylinder head and take off cable tube.
- 9. Remove acorn nuts holding ignition coil bracket to cylinder head and take off coil.
- 10. Shut off gasoline valve at bottom of vacuum tank and disconnect gasoline feed pipe at carburetor.
- 11. Disconnect accelerator rod at carburetor bell crank.
- 12. Disconnect throttle and mixture control wires at carburetor.
- 13. Remove set screw from carburetor air inlet and take off carburetor hot air pipe.
- 14. Remove 3 bolts holding carburetor to intake manifold and take off carburetor.
- 15. Remove tappet cover stud nuts and take off tappet covers.
- 16. Loosen fan support arm clamp bolt and remove fan assembly.

17. Unscrew exhaust manifold packing nut and loosen exhaust pipe in exhaust manifold, using exhaust manifold packing nut wrench shown on page 26, service tool section.

18. Remove 2 cap screws holding water pump body to cylinder.

19. Remove nuts holding cylinder block to crankcase, using wrenches shown on page 17, service tool section.

20. Remove spark plugs and screw motor lifting eyes, shown on page 17 service tool section, into No. 1 and 6 spark plug holes.

21. Raise cylinder block from crankcase, using chain hoist or block and tackle and motor lifting chain. The motor must be in a level position when doing this and the cylinder rocked back and forth slightly, which will assist in its removal, after which it should be placed on the work bench for piston fitting, etc.

22. Remove cotter pins and nuts from connecting rod bolts, take off caps and shims and remove connecting rods and pistons.

23. Remove piston pin lock rings from pistons, using piston pin lock ring remover shown on page 17, service tool section.

24. Before removing the piston pins, the pistons should be heated to a temperature of approximately 200 degrees or as hot as can be handled with gloves, using a piston pre-heating stove, electric or gas plate, or other means. The pins can then readily be removed without danger of damaging or breaking the pistons.

25. When replacing pistons, it is advisable to measure the cylinder bores with a cylinder indicator of the type shown in equipment section, to determine whether they are worn excessively out of round or tapered. If this condition exists, or if the bores are scored or damaged, they should be trued up with a cylinder hone or grinder, making them uniform in size and removing only enough stock to enable the next oversize piston to be used. A complete list of piston sizes furnished by the factory, together with their markings, will be found in reference sheet No. 18. New pistons should be fitted to the cylinder bores with a clearance of .003" to .004", and must be installed on the connecting rods so the sawcut or split in the skirt, will face the left side of the cylinder or the side opposite the valves.

26. To renew piston pins, a long piloted spiral expansion piston pin reamer similar to that shown on page 11, service tool section, should be used.

The reaming of the piston pin bushing in the connecting rod is best done by holding the connecting rod in a vise with the piston pin bushing in a vertical position, using a tap wrench of the type illustrated on page 26, service tool section, to turn the reamer. This generally produces more satisfactory results than holding the reamer in the vise and revolving the connecting rod around it, in which case there is a possibility of reaming the bushing bell-mouthed, due to the weight of the big end of the rod and the natural tendency of the mechanic to exert a downward pressure on the rod when turning it.

When fitting new piston pins to pistons, it is essential that the piston pin bosses be finished reamed approximately .002" under the diameter of the piston pins, to guard against looseness when the motor is heated up in operation. For this reason it is also necessary, when assembling the pins, that the pistons be preheated as outlined above.

27. To renew piston rings, place connecting rod in vise or secure piston in piston vise while removing or replacing rings. On page 25, service tool section, are shown a piston vise and piston ring spreader, which facilitate this work. Thoroughly clean ring grooves in piston of carbon and foreign matter and test fit of new rings in grooves. They should be of the proper width to slide freely in the piston grooves without perceptible play or looseness. If the rings are too wide it will be necessary to carefully dress them down until the above fit is obtained. This is best done by fastening the new ring to a small flat board into which a number of small brads are driven in a circle, so the heads project from the board slightly less than the width of the ring.

A sheet of No. 0 or No. 1/2 emery cloth should then be laid on a surface plate, and the board, with the ring attached, is moved back and forth with a light, even pressure of the hand. It is important when doing this, that the ring be occasionally turned around to insure removing an equal amount of metal on all sides, and also that the square edges of the ring are not removed. After the rings have been properly fitted to the piston grooves, any burrs on the faces should be removed, and the slots or gaps fitted to the cylinder bores.

Place piston without rings in cylinder with the bottom or open end outward, then place ring to be fitted in cylinder, straightening the ring by bringing the edge of the piston against it.

The slot clearance or gap should then be accurately measured with a feeler gauge and, if necessary, the edges of the ring dressed with a thin, smooth file until the opening measures from .006" to .008", after which they should be placed on their respective pistons.

28. To renew connecting rod bearings, proceed as follows:

Remove machine screws holding connecting rod bearings to rod and cap and take out bearings.

Fit new bearings to connecting rod and cap, making sure that no burrs or chips prevent the screws from drawing the bearings firmly into position.

File edges of the bearings down flush with the connecting rod and cap. This must be carefully done to prevent the surfaces of the rod and cap from being filed away.

Place an equal number of shims on each connecting rod bolt and replace cap on rod in proper position as indicated by numbers stamped on side of rod and cap, then securely tighten nuts on connecting rod bolts; (the combined thickness of the total number of shims on each side of the rod should be approximately .125").

After new bearings have been installed in the connecting rod and cap, the sides of the bearings or thrust faces must be finished so the overall width will be from .008" to .010" less than the distance between throws on the crankshaft. To insure an accurate job this should be done with a thrust bearing facing cutter; however a file may be used to dress the bearings if care is exercised

to get the width uniform at all points. The use of the telescoping gauge and micrometers shown on pages 27, 24, service tool section, will facilitate finishing the bearings to the proper dimensions so the end play mentioned above, which is necessary for lubrication, will be maintained.

Fitting the connecting rod bearings to the crankshaft is best done by means of a connecting rod bearing reamer, either of the adjustable or solid type shown on page 24, service tool section. With ordinary care a satisfactory bearing can be obtained by the use of this tool in far less time than that required by hand scraping. If no reamer is available and it is necessary to scrape the bearing in, proceed as follows:

Connecting rod bearings may be scraped to fit the crankshaft or an accurately machined arbor which is the same diameter as the crankshaft. Separate cap from rod and spread a thin coating of Prussian blue on the crankshaft or arbor, then replace shims and draw up cap tight. Rock connecting rod back and forth on the shaft a few times, then remove cap and examine bearings. The blue marks on the bearings indicate the points of contact with the shaft and must be removed by scraping. This must be very carefully done so that a very thin shaving of metal will be removed from the blued spots on the bearings.

After all of these "high spots" have been scraped down, the shaft should again be blued and the connecting rod cap tightened. Remove cap from rod after rocking rod on shaft and repeat scraping process described above. This should be done as many times as necessary, until the bearings finally show a fine series of spots, close together and uniformly distributed over the entire surface. When properly fitted, the connecting rod bearings will be from .001' to .0015' larger than the crankpins, and it is essential that this clearance be maintained when assembling the connecting rods to the crankshaft to provide space for an oil film.

29. When new connecting rod bearings or piston pin bushings have been installed or bearings fitted, it is necessary that the connecting rods be tested for alignment, as a satisfactory job cannot be done unless the piston pins are perfectly parallel with the crankshaft in all directions, and the proper clearance exists between the upper ends of the rods and the bosses on the inside of the pistons. On page 10, service tool section, a connecting rod aligning fixture is shown which enables a proper check of rod alignment to be made with a minimum expenditure of time and labor. When using a fixture of this type, it is advisable to remove the piston from the connecting rod before checking the alignment, as the varying diameters of the lands and skirt, together with the extensive relief surrounding the piston pin boss, do not afford a good contact between the side of the piston and the aligning disc on the fixture. If the connecting rods are found to be bent or twisted when checked on the aligning fixture, it will be necessary to straighten them with a bending iron until the contact plate, which is fitted to the upper end of the rod, touches the aligning disc at all points. The connecting rod bending iron illustrated on page 20, service tool section, will be found indispensable when doing this work.

30. Reassemble pistons to connecting rods after aligning has been completed, heating the pistons and placing them on the rods so the diagonal split in the skirt will be on the left side when assembled in position in the motor.

31. Assemble connecting rods and pistons to crankshaft, after thoroughly cleaning bearings and shaft and spreading a film of oil on the surfaces. When doing this, be sure that a sufficient number of shims is used to allow a clearance of approximately .001' for lubrication when the cap bolts are drawn up tight. Connecting rod bearings adjusted with this clearance will fit the crankshaft just tight enough to prevent the rods and pistons from falling sidewise when placed in a vertical position. It is essential, when doing this work, that all of the connecting rods be adjusted evenly as the additional friction of one bearing adjusted tighter than the others would prevent smooth and quiet operation. Make sure that all of the nuts are securely cotter pinned after adjustment is completed.

32. Examine cylinder block to crankcase gasket and replace with a new one if necessary, shellacking it to the crankcase.

33. Thoroughly clean cylinder bores, pistons and piston rings, and spread a film of oil over them, turning the rings in the grooves in the pistons until the slots are 120 degrees apart.

34. Fasten cylinder to chain hoist or block and tackle as outlined in operations 20 and 21, suspending block in perfectly level position. Maneuver position of car if necessary, so the cylinder block will be directly over the pistons; then turn crankshaft until No. 1 and No. 6 pistons are on upper dead centers.

35. Clean the lower face of the cylinder block and top of the crankcase of all dirt or chips, and -slowly lower block in position, using piston ring compressors shown on page 25, service tool section, to compress the rings and guide the pistons into the cylinders. After No. 1 and 6 pistons have entered the cylinder block, the crankshaft should be turned slightly and the block lowered over No. 2 and 5 pistons. Repeat this for No. 3 and 4 pistons and lower block to crankcase.

Too much stress cannot be laid upon the necessity for careful handling during this operation, as it is easily possible to set up strains which would spring the connecting rods, thereby offsetting any accurate aligning which may have been done.

36. Securely tighten nuts holding cylinder block to crankcase, using wrenches shown on page 17, service tool section. Make sure that the tappet guide locating washers are placed over the studs in the valve compartment before replacing the tappet guide clamps and also that the guides themselves are in the proper position before tightening the nuts. When the tappet guides are correctly installed the flat surfaces on the flanges are exactly at right angles to the crankshaft.

37. The reassembling of the motor may be completed by reversing operations 1 to 18 inclusive, fitting new gaskets where necessary and new packing at exhaust pipe to manifold joint.

38. Inspect clearance between tappet adjusting screws and valve stems and adjust if necessary. After the assembling of the motor has been completed, it should be run long enough to attain a normal operating temperature, after which the tappets should be adjusted to .002" to .003" clearance on the intake valves, and .004" to .005" clearance on the exhaust valves.

(K) Renew Motor Assembly, Crankshaft, or Camshaft Bearings; Renew or Refit Crankshaft Bearings

- 1. Remove bonnet assembly.
- 2. Open drain cock at bottom of water pump cover and drain water out of cooling -system.
- 3. Loosen hose clamps at front of upper and lower radiator hose.
- 4. Disconnect radiator shutter operating rod at radiator.
- 5. Remove nuts from bolts holding radiator assembly to frame.
- 6. Unscrew radiator tie rod from upper radiator tank and lift off radiator assembly.
- 7. Loosen clamp bolt on fan support arm and remove fan assembly and fan belt. Remove toe and floor boards.

9. Remove clevis pin at bottom of hand brake lever and disconnect hand brake pull rod.

10. Remove clevis pin at bottom of brake pedal and disconnect foot brake pull rod.

11. Unscrew sleeve at rear end of speedometer shaft and disconnect speedometer shaft from transmission.

12. Remove bolts from flange of front universal joint and disconnect propeller shaft.

13. Remove clevis pin from lower end of starter pedal shaft lever, disconnect starter operating shaft and spring.

14. Remove cap screws holding transmission case cover to transmission and take off control hand lever assembly.

15. Remove clevis pin from clutch adjustable link and disconnect throwout yoke.

16. Remove bolts holding pedal control bracket to transmission case, and take off pedal control assembly.

17. Remove clutch drain plug from flywheel and drain oil out of clutch.

18. Remove cap screws holding clutch cover to flywheel.

19. Remove cotter pins and nuts from 3 bolts, take out bolts and 2 cap screws holding transmission case to crankcase, taking out upper bolt last; this will allow the lowering and removal of the clutch and transmission assemblies from the car.

20. Disconnect horn wires at terminals on horn, remove screws holding horn to cylinder head and take off horn.

21. Disconnect wires at spark plugs.

22. Remove screws holding cable tube and wires to cylinder head and take off cable tube.

23. Remove acorn nuts holding ignition coil bracket to cylinder head and take off coil.

24. Shut off gasoline valve at bottom of vacuum tank and disconnect gasoline feed pipe at carburetor.

25. Disconnect accelerator rod at carburetor bell crank .

26. Disconnect throttle and mixture control wires at carburetor.

27. Remove set screw from carburetor air inlet and take off carburetor hot air pipe.

28. Remove 3 bolts holding carburetor to inlet manifold and take off carburetor.

29. Unscrew union nut and disconnect vacuum tank suction pipe from elbow at intake manifold.

30. Unscrew exhaust manifold packing and disconnect exhaust pipe, using exhaust manifold packing nut wrench shown on page 26, service tool section.

31. Disconnect starter cable and wires at terminals on starter base and top of generator.

32. Disconnect oil gauge pressure tube at union between oil pump and dash.

33. Disconnect spark and oil control pull rods from rocker shaft levers (52, 58) at front of motor.

34. Place receptacle under oil reservoir, remove drain plug and drain out motor oil.

35. Remove cotter pins and nuts from motor support bolts and take out bolts.

36. Remove spark plugs and screw motor lifting eyes shown on page 17, service tool section, into No. 1 and 6 spark plug holes.

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37. Fasten hooks to eyes and raise motor by chain hoist and motor lifting chain and place on bench or motor stand.

38. Remove tappet cover stud nuts and take off tappet covers.

39. Remove 2 cap screws holding water pump body to cylinder block.

40. Remove nuts holding cylinder block to crankcase, using wrenches shown on pages 17, 20, service tool section.

41. Remove cylinder block from motor, being careful when doing so to keep the block level and avoid bending the connecting rods.

42. Remove cap screws holding oil reservoir to crankcase and take off oil reservoir.

43. Unscrew starting crank jaw at front end of crankshaft, using starting crank jaw wrench shown on page 23, service tool section.

44. Unscrew starting crank guide from front end of crankshaft, turning same in right hand or clockwise direction.

45. Pull fan pulley off crankshaft, using puller shown on page 19, service tool section.

46. Remove cap screws from timing gear cover and take cover assembly off motor.

47. Remove lock wire and cap screws holding camshaft sprocket to camshaft.

48. Take off camshaft sprocket, thrust button, guide and timing chain.

49. Unscrew union nuts at bottom of oil pump and union on crankcase and disconnect oil pump suction pipe.

50. Remove cotter pins and nuts from connecting rod bolts, take off caps and shims and remove connecting rods and pistons.

51. Remove nuts from flywheel bolts and take flywheel off crankshaft.

52. Pull crankshaft sprocket off front end of crankshaft, using sprocket puller shown on page 23, service tool section.

53. Turn crankcase upside down in motor stand and remove cotter pins and nuts from main bearing cap studs, using wrench shown on page 24, service tool section.

54. Remove packing from front and rear bearing caps, using a packing hook or drilling the packing out.

55. Remove main bearing caps, using main bearing cap puller shown on page 27, service tool section, on the front and rear caps if necessary, and lift out crankshaft.

56. For the service station doing even a small amount of crankshaft bearing work, a main bearing line reamer of the type shown on page 31, service tool section, will prove an excellent investment. With this equipment, it is not only possible to fit a set of bearings in a fraction of the time required by the laborious hand scraping method, but a comparatively unskilled mechanic can turn out a job which is superior to the best efforts of an experienced bearing scraper. In addition to securing a greater percentage of actual bearing surface, the line reaming method insures accurate alignment of all the bearings, which is a factor of vital importance in turning out a satisfactory and lasting job.

Whenever a main bearing line reamer is available it is recommended that a complete set of new main bearings be installed when renewing the crankshaft or when refitting f the bearings becomes necessary. The great saving of time in such cases more than offsets the cost of new bearings, with the additional assurance that the work will stand up in service.

57. Before reaming or scraping in the main bearings, it is necessary that the crankhaft be carefully inspected for trueness and out of round crankpins and journals, as well as for rough surfaces on these parts. If any of these defects exist, they must obviously be corrected by straightening, grinding or polishing, if a satisfactory job is to be done. On page 16, service tool section, a surface plate, vee blocks and dial indicator are shown, which make it easy to readily detect a sprung crankshaft. Crankpins and journals can be checked for roundness with a 2" to 3" micrometer, taking measurements at various points around the circumference. Following is the method of procedure when renewing main bearings:

58. Remove countersunk head machine screws holding bearings to caps and crankcase and take out bearings.

59. Remove all burrs, dirt and chips from crankcase and backs of new bearings, and fit bearings to crankcase and caps. After firmly tightening the screws drawing the bearings into place, it is necessary that the projecting edges be filed perfectly even with the crankcase or caps. The bearing filing blocks shown on page 27, service tool section, will save a great deal of time and labor when doing this operation, as it is possible to file the bearings accurately to size before installing them in crankcase.

60. In event no line reamer is at hand and the bearings are to be scraped in, the thrust faces on the center rear main bearing should be filed down so there will be .006' end play when the crankshaft is in position. If the bearings are to be line reamed, this operation can be deferred until the line reaming is done, at which time the thrust faces can be smoothly and accurately finished to the required size, with the thrust bearing facing cutter furnished with the tool.

61. To scrape in main bearings to fit the crankshaft, remove bearing caps, spread a thin coat of Prussian blue on the crankshaft journals and place crankshaft in crankcase. Place an equal number of shims (total thickness .140"), over each stud, replace bearing caps in their respective positions and tighten stud nuts. The crankshaft should then be revolved a few times by means of a bar placed between the flywheel bolts, then the stud nuts and bearing caps removed. Lift crankshaft out of crankcase and examine bearings. The blue marks on the bearings indicate the points of contact with the shaft and must be removed by scraping. This requires considerable skill and care, as only a very thin shaving of babbitt should be scraped from the points marked with blue.

After all of these "high spots" have been scraped down, the shaft should again be blued, placed in the crankcase and the bearing caps tightened. Turn crankshaft in bearings a few times and remove stud nuts and bearing caps. Remove crankshaft from crankcase, examine bearings and repeat scraping process described above. This should be done as many times as necessary until the bearings finally show a fine series of spots, close together and uniformly distributed over the entire surface. When properly fitted, the bearings will be from .001" to .0015" larger than the crankshaft and it is important that this clearance be maintained when assembling the shaft and adjusting the main bearings to provide space for an oil film.

62. Renewing camshaft bearings: Due to their inaccessibility and non-adjustable construction, it is extremely difficult when renewing them, to secure proper alignment and sufficient bearing surface unless a bearing line reamer is used. The main bearing line reaming equipment shown on page 31, service tool section, is very well adapted for this work, the camshaft cutters furnished with the tool enabling all of the bearings to be reamed in alignment and to exact size with a minimum expenditure of time. The following procedure is necessary when renewing camshaft bearings:

Remove brass dowel pins holding camshaft bearings in position in crankcase, by driving them into the bearings with a hammer and drift. The bearings to be renewed should next be removed from the crankcase; this should be done with a bearing puller of some kind to prevent damage to the crankcase. On page 29, service tool section, is shown a very simple and effective puller, designed to remove and install Hudson and Essex camshaft bearings in the least possible time and without injury to bearings or crankcase.

When drawing the new bearings into position, it is very important that the oil holes register with the oil holes in the crankcase; if they do not, new holes should be drilled in the bearings after assembling. The bearings should next be drilled and pinned against movement with brass dowel pins, which should be a tight fit in both bearings and crankcase. If an expansion type line reamer is used to ream the bearings, care should be taken to ream them from .001" to .003" larger than the camshaft journals so there will be sufficient clearance for lubrication. After the bearing fitting and reaming has been completed, the crankcase should be thoroughly cleaned of chips and dirt before reassembling of the motor is started.

63. Place camshaft in position in crankcase, remove crankshaft bearing caps, clean and spread oil film on bearings and drop crankshaft in place. Replace shims and bearing caps, being careful to put the shims back in their proper places and the center bearing caps on their studs so the serial numbers will be on the ends nearest a corresponding number stamped on the lower flange of the crankcase. The proper replacing of the center bearing caps is important, as if this is not done the bearing alignment will be destroyed.

Fit plates on center bearing caps, screw nuts on studs and tighten bearings securely, one by one, turning crankshaft after each bearing has been drawn up to test the adjustment. After the bearing adjustment has been completed, be sure to replace and spread cotter pins in studs. Fit new wick packing to front and rear bearing caps to guard against oil leaks at these points.

64. The reassembling of the motor may be completed and its installation in the car accomplished by reversing operations 1 to 52 inclusive. When replacing timing chain on sprockets, it is imperative that the distributor drive shaft and camshaft be properly timed as outlined in operation 33, Article "G". It is also advisable to have the connecting rods aligned before fitting them to the crankshaft, and to use new cylinder to crankcase, oil reservoir and gear case cover gaskets.

Follow instructions given in Article "I" covering replacement and timing of ignition distributor and wires.

(L) Renew Flywheel

1. Remove toe and floor boards.

2. Remove clevis pin at bottom of hand brake lever and disconnect hand brake pull rod.

3. Remove clevis pin at bottom of brake pedal and disconnect foot brake pull rod.

4. Unscrew sleeve at rear end of speedometer shaft and disconnect speedometer shaft from transmission.

5. Remove bolts from flange of front universal joint and disconnect propeller shaft.

6. Remove clevis pin from lower end of starter pedal shaft lever, disconnect starter operating shaft and spring.

7. Remove cap screws holding transmission case cover to transmission and take off control hand lever assembly.

8. Remove clevis pin from clutch adjustable link and disconnect throwout yoke.

9. Remove bolts holding pedal control bracket to transmission case, and take off pedal control assembly.

10. Remove clutch drain plug from flywheel and drain oil out of clutch.

11. Remove cap screws holding clutch cover to flywheel.

12. Remove 4 cap screws holding flywheel splash pan to crankcase and take off pan.

13. Remove cotter pins and nuts from 3 bolts, take out bolts and 2 cap screws holding transmission case to crankcase, taking out upper bolt last; this will allow the lowering and removal of the clutch and transmission assemblies from the car.

14. Remove nuts from flywheel bolts and take flywheel off crankshaft, using a bar to pry it loose if necessary.

15. Remove clutch pilot bearing from old flywheel and tap in position in new flywheel.

16. Remove all dirt and chips from face of new flywheel and flange on crankshaft, place flywheel on shaft and securely tighten bolt nuts. It will be found that it is only possible to install the flywheel on the crankshaft in one position, as one of the bolts is offset 1/16" to prevent incorrect installation, which would affect the timing marks.

(M) Adjust Connecting Rod Bearings

1. Place receptacle under oil reservoir, remove oil reservoir drain plug and drain motor oil.

2. Raise up front end of car and place axle stands under front axle.

3. Remove cap screws holding oil reservoir to crankcase and take off oil reservoir.

4. Remove cotter pins from connecting rod bolt nuts and loosen caps by backing off nuts.

5. Take nuts off No. 1 connecting rod bolts and remove cap and shims from rod, being careful not to drop the shims or get the "packs" mixed.

6. Remove a.002" or.003" shim from each pack and place the remainder in position on the rod bolts in exactly the order of removal, then replace cap on rod so the number stamped on the side of the cap will be on the same side as the number stamped on the connecting rod.

7. Draw up rod bolts as tightly as possible, lining up slots in nuts with cotter pin holes in bolts.

8. Next test rod adjustment; if the lower end of the rod can be readily moved endwise when grasped by the hand, it is too loose and the cap will again have to be taken off and an additional shim or shims removed. If the shim "packs" contain no more .002" thick shims, a similar adjustment may be obtained by removing a .003" shim and adding one .002" thick or removing a .005" shim and adding one .003" thick. It is important that the same number and thickness shims be removed from both sides of the rod when doing this.

9. Replace cap, tighten nuts and again test rod adjustment. If the rod is still too loose, repeat the above process until the adjustment is tight enough to require a light hammer blow on either side, to take up the end play on the crankpin.

10. After the above fit has been secured, it is well to verify the adjustment by cranking the motor by hand, with the spark plugs removed. When properly adjusted, the additional resistance of the tightened bearing will be just perceptible when cranking the motor.

11. Loosen the adjustment on No. 1 rod, and proceed to adjust the other five rods in exactly the same manner, tightening No. 2 next. When the caps are taken off for the removal of shims, the bearings and crankpins should be wiped clean and receive a film of new oil before being replaced. When taking up connecting rod bearings, it is essential that all of the rods be adjusted evenly, as the additional friction of one bearing adjusted tighter than the others may prevent smooth and quiet operation.

12. Insert and spread cotter pins in bolts and reassemble parts, reversing operations 1 to 3 inclusive.

(N) Adjust Crankshaft Bearings

1. Place receptacle under oil reservoir, remove oil reservoir drain plug, and drain motor oil.

2. Raise up front end of car and place axle stands under front axle.

3. Remove cap screws holding oil reservoir to crankcase and take off oil reservoir.

4. Remove spark plugs from cylinder head.

5. Remove cotter pins from connecting rod bolts and loosen caps of all rods slightly by backing off the nuts a turn or two.

6. Remove cotter pins from main bearing studs and bolts and slightly back off nuts; this will free main bearings. The motor should then be cranked by hand and the freedom with which it revolves noted.

7. Remove 2 cap screws passing through lower part of front gear case cover into bearing cap.

8. Remove packing from cap, using small hook or by drilling it out.

9. Remove nuts from front bearing studs, take off washers, bearing cap and shims. Due to the tight fit of the front and rear bearing caps in the crankcase, the main bearing cap puller illustrated on page 27, service tool section, will greatly assist in this work.

10. Remove a.002" shim from each side of the bearing and replace the remainder in the position exactly as removed.

11. Replace bearing cap and washers and tighten stud nuts securely, lining up slots in nuts with cotter pin holes in studs, then crank motor by hand. If no additional resistance to turning is noted after the removal of a shim, the cap must again be removed and an additional shim or shims taken out. If the shim "packs" contain no thin shims, remove a .003" or .005" shim and replace with one .002" or .003" thick. When making bearing adjustments it is necessary that the same thickness and number of shims be removed from both sides of the bearings.

12. Replace bearing cap, draw up stud nuts tightly and again test bearing adjustment. If the bearing is still loose, the above operations must be repeated until it is adjusted tight enough to offer a very slight resistance when turning the crankshaft.

13. After the proper adjustment of the front bearing has been obtained, the stud nuts should be loosened and the bearing freed up, after which the other main bearings should be adjusted, following the same procedure. The center main bearings will prove less difficult to adjust due to having less contact in the crankcase and fewer studs. Care must be exercised, however, to replace the caps in exactly their order of removal so the alignment of the bearings will be retained. To facilitate this, the caps have a serial number stamped at one end and they should be placed on the studs so the numbered end will be nearest the side of the crankcase flange bearing a corresponding number.

Due to the overhanging of the flywheel, the rear bearing cap is provided with bolts instead of studs to allow the removal of the cap. When removing the rear bearing, the bolts should be pushed up out of the way, when the cap and bearing may be withdrawn.

14. When the adjustment of the bearings has been completed, replace and spread cotter pins in studs and fit new wick packing to front and rear caps to guard against oil leaks at these points.

15. The reassembling of the motor may be completed by reversing operations 1 to 5 inclusive, making sure that cotter pins are inserted in the connecting rod bolt nuts after tightening them.

ESSEX

SERVICE - REPAIRS

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Essex Six Front Axle



Essex Six Front Axle

Ref. No. Name of Part

- 1 Front wheel outer bearing
- 2. Spindle washer
- 3. Spindle nut
- 4. Spindle left hand
- 5. Front wheel inner bearing
- 6. Dust washer retainer-outer
- 7. Dust washer
- 8. Dust washer retainer inner
- 9. Spindle pivot pin oiler
- 10. Spindle oiler elbow
- 11. Steering arm nut
- 12. Pivot pin oiler elbow
- 13. Spindle shim
- 14. Spindle pivot pin lower bushing
- 15. Pivot pin lower bushing expansion plug
- 16. Pivot pin dust washer shield
- 17. Pivot pin dust washer
- 18. Spindle pivot pin bushing-upper
- 19. Spindle pivot pin

Ref. No. Name of Part

- 20. Thrust washer dust shield
- 21. Thrust washer-upper
- 22. Thrust washer-lower
- 23. Thrust washer dowel pin
- 24. Steering arm key
- 25. Tie rod pivot pin bushing
- 26. Tie rod pivot pin
- 27. Tie rod pivot pin nut
- 28. Steering arm ball
- 29. Steering arm-left hand
- 30. Steering arm ball nut
- 31. Front axle center
- 32. Tie rod clamp bolt nut
- 33. Tie rod yoke
- 34. Tie rod
- 35. Tie rod clamp bolt
- 36. Spindle right hand
- 37. Steering arm-right hand

(A) Renew Spindle Pivot Pin Bushings and Pins

1. Jack up or block up front end of car.

2. Remove front hub caps and spindle nuts (3); take off wheels.

3. Remove drag link front end boot, cotter pin and front end adjusting plug, then disconnect drag link from steering arm ball (28).

4. Remove cotter pins and nuts (27) from bottom of tie rod pivot pins (26), take out pins and remove tie rod assembly.

5. Remove cotter pins and castle nuts (11) from steering arms and drive arms out of spindles, using soft hammer.

6. Remove oiler elbows (12), dust washers (17), and dust washer shields (16), from top of spindle pivot pins (19), and drive out pins through bottom of axle, using piece of 5/8" brass rod as a drift.

7. The spindles (4), thrust washers (21, 22), and shims (13), can now be taken off and the upper and lower axle bushings (18, 14) removed. This is best accomplished by the use of the spindle bushing press shown on page 12, service tool section, which should also be used when installing new bushings in the axle center. The use of a tool of this type is necessary to prevent damage to the parts as well as to insure the proper alignment of the new bushings. After the new bushings have been pressed in place, they should be line reamed, using spindle bushing line reamer shown on page 11, service tool section.

8. Renew expansion plugs (15) in axle center under lower bushings (14), inserting plugs with convex faces downward, and expanding with hammer and drift.

9. To reassemble, reverse above operations, making sure that the pivot pins turn freely, without shake, and that the proper number of shims are inserted between lower end of spindles and axle to eliminate up and down play.

(B) Renew Tie Rod Pivot Pin Bushings and Pins

1. Remove cotter pins and nuts (27) from bottom of tie rod pivot pins (26), take out pins and remove tie rod assembly.

Front Axle Group

2. Remove bushings (25) from steering arms and insert new ones, using bushing press shown on page 12, service tool section, which will prevent damage to the parts, and insure proper alignment. After pressing in place the bushings should be reamed to size with the expansion reamer shown on page 11, service tool section.

3. To reassemble, reverse above operations.

(C) Straighten* or Replace Front Axle Center

*This procedure we do not recommend unless the axle is only slightly bent and the proper equipment available to straighten it cold. Heating the axle to straighten it should be avoided, as this destroys the original heat treatment, with the result that the part is weakened and a satisfactory or lasting job is seldom obtained.

1. Raise front end of car with chain hoist or by jacks or blocking under frame side members, directly back of the front springs.

2. Remove front hub caps and spindle nuts (3); take off wheels.

3. Remove drag link front end boot, cotter pin and front end adjusting plug, then disconnect drag link from steering arm ball (28).

4. Remove cotter pins and nuts (27) from bottom of tie rod pivot pins (26), take out pins and remove tie rod assembly.

5. Remove cotter pins and castle nuts (11) from steering arms and drive arms out of spindles, using soft hammer.

6. Remove oiler elbows (12), dust washers (17), and dust washer shields (16), from top of spindle pivot pins (19), and drive out pins from bottom of axle, using piece of 5/8" brass rod as adrift. This will release the spindles (4), which can now betaken off, together with the thrust washers (21, 22), and shims (13).

7. Remove front spring clip nuts, clips and rubber bumpers. This will release the front axle center (31) which may now be straightened or replaced with a new part. (See note above). In case the part is straightened, care should be exercised to see that the pivot pins will be parallel to each other in all directions, and perpendicular to the spring seats. It is very necessary that these points be observed, as they materially affect the steering of the car and tire wear.

8. To reassemble, reverse above operations.

(D) Renew Front Wheel Bearings, Felt Washers, or Retainers

1. Remove front hub caps, cotter pins and spindle nuts (3); take off front wheels.

2. Remove inner bearing cone and rolls from spindle, using bearing cone and roll puller shown on page 26, service tool section, if necessary; this will allow the removal of the felt washer retainers (6) and felt washers (7).

3. The bearing cups are best removed from the wheel hubs by the use of the bearing outer cup puller shown on page 12, service tool section, inserting the lugs of the puller through the openings in the inside flanges of the hubs, against which the cups seat. They may, however, be removed by inserting a drift through these openings and tapping on opposite sides lightly with a hammer. The new bearing cups should be fitted into position with the puller or by means of a soft hammer.

4. The parts may be reassembled by reversing the above operations, using care to make sure that the bearings are properly adjusted as outlined in Article "E."

(E) Adjust Front Wheel Bearings

1. Jack up car under front axle.

2. Remove front hub caps and spindle nut cotter pins.

3. Adjust spindle nuts (3), so that when the wheel is grasped at the top and bottom, all perceptible play or looseness will be taken up. If the wheels do not turn freely after the cotter pins are replaced, the spindle nuts should be backed off and the cotter pins inserted in the next notch, otherwise destruction of the bearings may result.

4. Add grease if necessary, and replace hub caps.

(F) Align Front Wheels

One of the most important factors governing the life of the front tires and ease of steering, is the alignment of the front wheels. In view of this, it is advisable to check the alignment of the wheels after front axle repairs have been made, or whenever there is a possibility of the parts having been damaged by skidding or accident.

The operation of checking wheel alignment is greatly simplified and the time reduced by the use of a wheel aligning gauge, similar to that shown in the equipment section. This instrument is used by telescoping it and inserting it between the tires, ahead of the front axle, so that the ends of the chains just touch the floor. The pointer should then be set to zero, and the car moved forward until the gauge is to the rear of the front axle, with the ends of the chains just touching the floor. The difference between the measurements taken between the inside of the tires ahead of and behind the axle, or the amount of toe-in, will then be immediately apparent by reading the scale on the gauge.

The distance between the inside of the tires at the rear should be the same as the distance at the front, or range between that and 1/8" greater than the measurement at the front. If the toe-in or variation exceeds this amount, or if the distance between the tires at the front is greater than the distance at the rear, the tie rod should be adjusted as follows:

1. Remove cotter pin, nut (27) and washer from tie rod pivot pin (26), take out pivot pin and disconnect tie rod.

2. Loosen tie rod yoke clamp bolt (35), turn yoke (33) one complete turn to right if toe-in is too great, or to left if insufficient; drop tie rod pivot pin in place and check alignment. Repeated trials should be made if necessary, until the proper adjustment is obtained.

3. Replace tie rod, pivot pin, washer, nut, and cotter pin; tighten clamp bolt securely.

Essex Six Rear Axle

Springs



Essex Six Rear Axle

- Ref. No. Name of Part
 - 1. Internal brake shaft oiler
 - 2. Internal brake shaft bushing
 - 3. Rear wheel bearing cap
 - 4. Wheel bearing cap felt washer
 - 5. Axle shaft key
 - 6. Axle shaft nut washer
 - 7. Axle shaft nut
 - 8. Tension rod adjusting nut
 - 9. External brake band upper bracket
 - 10. Tension rod washer
- 11. Tension rod spring
- 12. Internal brake lining
- 13. Internal brake band
- 14. Internal brake band end bracket
- 15. Internal brake anchor bracket
- 16. Internal brake adjusting link clevis pin
- 17. External brake stop bracket
- 18. Tension rod nut
- 19. Tension rod lock nut
- 20. Tension rod
- 21. External brake operating lever
- 22. Tension rod clevis pin
- 23. External brake band clevis pin
- 24. Axle shaft
- 25. Rear wheel bearing
- 26. Rear wheel bearing cap shim
- 27. External brake anchor bracket
- 28. Adjusting link nut
- 29. Adjusting link
- 30. External brake band lower bracket
- 31. Internal brake stop bracket
- 32. Stationary link
- 33. Internal brake main spring
- 34. Internal brake lever pin
- 35. Internal brake shaft key
- 36. Internal brake shaft bracket
- 37. Internal brake operating lever
- 38. Axle housing felt washer retainer inner
- 39. Axle housing felt washer retainer outer
- 40. Axle housing felt washer
- 41. Internal brake tie bar
- 42. Tie bar clevis pin
- 43. Internal brake shaft
- 44. Internal brake shaft outer lever
- 45. Internal brake main spring clip
- 46. Rear wheel bearing cap bolt
- 47. Rear axle housing
- 48. Differential bearing
- 49. Differential bearing adjusting nut
- 50. Adjusting nut lock
- 51. Differential gear
- 52. Differential pinion
- 53. Drive gear bolt

[95]

54. Drive gear bolt nut

Ref. No. Name of Part

- 55. Drive gear bolt nut lock
- 56. Drive gear
- 57. Internal brake spacer clip bracket
- 58. Internal brake spacer clip spring
- 59. Spacer clip washer
- 60. Spacer bracket bolt nut
- 61. Spacer clip
- 62. Spacer bracket screw
- 63. External brake band
- 64. External brake lining
- 65. External brake band center bracket
- 66. External brake anchor bracket spring
- 67. External brake anchor spring washer
- 68. External brake anchor bracket screw
- 69. Anchor bracket bolt lock.
- 70. Pinion housing shim
- 71. Differential carrier
- 72. Housing cover plug
- 73. Housing cover
- 74. External brake band spacer bar
- 75. External brake band spacer spring
- 76. Spacer bar stud
- 77. Spacer bar stud washer
- 78. Spacer stud bracket
- 79. Spacer stud nut
- 80. Spacer stud lock nut
- 81. Pinion shaft nut
- 82. Pinion shaft nut washer
- 83. Pinion shaft key
- 84. Drive pinion shaft
- 85. Pinion shaft lock nut
- 86. Pinion shaft nut lock
- 87. Pinion shaft adjusting sleeve
- 88. Pinion shaft dust shield
- 89. Pinion shaft felt washer
- 90. Pinion shaft felt washer retainer
- 91. Pinion shaft front bearing
 - 92. Pinion housing

97.

98.

99.

100.

101.

102.

103.

104.

105.

106.

107.

108.

- 93. Pinion housing plug
- 94. Pinion housing stud
- 95. Pinion housing stud nut
- 96. Pinion shaft rear bearing

Differential carrier cap screw

Differential carrier gasket

Differential carrier cap bolt

Housing cover gasket Housing cover screw

Differential carrier cap

Axle shaft thrust plug Differential case right hand

Differential case stud

Differential spider

Differential case stud nut

Differential case - left hand

Rear Axle Group

(A) Repair or Renew Axle Housing

1. Jack up or block up car under rear springs ahead of rear axle, or raise rear end of car with chain hoist until car weight is off the rear springs.

2. Place receptacle under housing to catch lubricant, remove housing cover cap screws (100) and housing cover,

3. Remove rear hub caps, cotter pins and axle shaft nuts (7), pull rear wheels off axle shafts, using wheel puller shown on page 22, service tool section. Note-Be sure hand brakes are fully released before attempting to pull off wheels.

4. Remove wheel bearing cap bolts (46), bearing caps (3) and shims (26), pull out axle shafts and bearings.

5. Remove clevis pins from internal and external brake operating levers (37, 21), and disconnect brake pull rods.

6. Remove flange bolts at rear universal joint and disconnect propeller shaft.

7. Place blocking or jacks under axle housing; take off rear spring clip nuts and plates, which will allow the lowering and removal of the axle from under the car.

8. The axle may now be placed on a bench or axle stand, and the differential carrier and gear set assembly removed by taking off the cap screws (97), which secure it to the housing.

9. Remove external brake anchor bracket adjusting screw locks (69), adjusting screws (68) and springs (66).

10. Remove tension rod adjusting nuts (8), springs (11) and clevis pins (22).

11. Remove spacer stud nuts (79) and springs (75); this will permit the removal of the external brake bands.

12. Drive out internal brake shaft inner lever taper pin (34) and pull off lever (37).

13. Remove spacer bracket screws (62), springs (58), main springs (33) and adjusting link clevis pins (16); this will allow the removal of the internal brake bands and operating shafts (43).

14. Any necessary welding or riveting operations may now be performed or new housing assembly installed and the axle reassembled, reversing the above operations, and making sure that the wheel bearings are properly adjusted as outlined in Article "N".

(B) Renew Carrier and Gear Set Assembly

1. Jack up or block up rear end of car.

2. Remove rear hub caps, cotter pins and axle shaft nuts (7), pull wheels off axle shafts, using wheel puller shown on page 22, service tool section. Note-Be sure hand brakes are fully released before attempting to pull off wheels.

3. Remove wheel bearing cap bolts (46), bearing caps (3) and shims (26); pull out axle shafts and wheel bearings.

4. Place receptacle under axle housing to catch lubricant, and remove lower carrier to housing cap screws (97).

5. Remove flange bolts at rear universal joint and disconnect propeller shaft.

6. Take off remaining screws holding carrier to axle housing and remove carrier and gear set assembly.

7. Install new carrier and gear set assembly and reassemble axle, reversing the above operations and making sure that the wheel bearings are properly adjusted as outlined in Article "N".

(C) Renew Axle Drive Shaft

1. Jack up or block up car under rear axle.

2. Remove rear hub cap, cotter pin and axle shaft nut (7); pull wheel off axle shaft, using wheel puller shown on page 22, service tool section. Note-Be sure hand brakes are fully released before attempting to pull off wheels.

3. Remove wheel bearing cap bolts (46), bearing cap (3) and shims (26); pull out axle shaft and wheel bearing. Note It is occasionally necessary, in the case of a broken axle shaft, to remove the shaft on the opposite side as well, so that a rod may be inserted to push out the inner part of the broken shaft.

4. Press bearing cone and rolls off axle shaft, and install on new shaft, using arbor press. If no press is available, this may be done by holding the shaft in a vertical position with the tapered end downward, and tapping upper side of cone with hammer and brass rod.

5. Install new shaft and reassemble axle, reversing above operations.

(D) Renew Differential Carrier

1. Jack up or block up car under rear axle.

2. Remove rear hub caps, cotter pins and axle shaft nuts (7); pull rear wheels off axle shafts, using puller shown on page 22, service tool section. Note--Be sure hand brakes are fully released before attempting to pull off wheels.

3. Remove cap screws (46) holding wheel bearing caps to housing, take off caps (3) and shims (26), pull out axle shafts and wheel bearings.

4. Remove lower carrier to housing cap screw (97) and drain lubricant.

5. Remove flange bolts at rear universal joint and disconnect propeller shaft.

6. Remove remaining screws holding carrier to axle housing, take off carrier and gear set assembly and place on bench or stand.

7. Remove carrier cap bolts (101) and caps (102); take out differential and drive gear assembly.

8. Remove pinion housing stud nuts (95), and take off drive pinion and housing assembly.

9. Assemble parts to new carrier by reversing the above operations. Make sure that the pinion shaft, differential and wheel bearings, also drive gear and pinion, are properly adjusted and lubricated, as covered in Articles "L," "M," and "N."

(E) Renew Wheel Bearing

1. Jack up or block up car under rear axle.

2. Remove rear hub cap, cotter pin and axle shaft nut (7); pull rear wheel off axle shaft, using wheel puller shown on page 22, service tool section. Note-Be sure hand brakes are fully released before attempting to pull off wheels.

3. Remove wheel bearing cap bolts (46), bearing cap (3) and shims (26); pull out axle shaft and wheel bearing.

4. Press bearing cone and rolls off axle shaft, using arbor press. If no press is available, this may be done by holding the shaft in a vertical position with the tapered end downward, and tapping upper side of cone with hammer and brass rod.

5. Fit new bearing cone to axle shaft taper, first making sure that cone and shaft are free from burrs which might prevent the bearing from seating properly.

6. Remove bearing outer cup from wheel bearing cap (3), using bearing cup puller shown on page 14, service tool section.

7. Clean thoroughly inside of adjusting cap and new outer cup. The pressing in place of the cup is best done in an arbor press; however, if care is used, a satisfactory job can be done with the aid of a large vise or soft hammer. In performing this operation

Rear Axle Group

it is very essential that the inside of the cup, when pressed in place, is parallel with the inner side of the adjusting nut; otherwise, the binding which will take place when assembled in the axle, may cause the destruction of the bearing.

8. The parts may now be reassembled by reversing operations 1, 2, and 3. The rear wheel bearings should be adjusted to allow an end play in the axle shafts of approximately .005' to .010'. In addition, it is necessary that the bearing caps have the same number of shims on each side to guard against interference between the brake drums and support brackets.

(F) Renew Drive Gear and Pinion, Differential Bearings or Pinion Shaft Bearings

1. Jack up or block up car under rear axle.

2. Remove rear hub caps, cotter pins and axle shaft nuts (7); pull wheel off axle shafts, using steel wheel puller shown on page 22, service tool section. Note----Be sure hand brakes are fully released before attempting to pull off wheels.

3. Remove bolts (46) holding wheel bearing caps to housing', take off caps (3) and shims (26).

4. Remove lower carrier to housing cap screw (97) and drain lubricant.

5. Remove flange bolts at rear universal joint and disconnect propeller shaft.

6. Take off remaining screws holding carrier to axle housing, remove carrier and gear set assembly and place on bench or stand.

7. Remove carrier housing cap bolts (101) and caps (102); take out differential and drive gear assembly.

8. If new differential bearings are to be fitted, remove cone and rolls from differential case hubs, using differential bearing cone and roll puller shown on page 26, service tool section, and install new parts.

9. Bend over ears on drive gear bolt nut locks (55), remove nuts (54) and bolts (53), take off drive gear.

10. Thoroughly clean differential case flange, also flange of new drive gear of chips and foreign matter; place gear in position and insert bolts. Fit new nut locks, if necessary, draw up bolts securely and bend over nut lock ears.

11. Remove drive pinion housing stud nuts (95), take off drive pinion and pinion housing assembly.

12. Remove cotter pin and nut (81) from front end of pinion shaft, pull off universal joint flange, using universal joint flange puller shown on page 22, service tool section.

13. Bend over lugs on pinion shaft nut lock (86), remove lock nut (85), nut lock adjusting nut (87). drive pinion and bearings.

14. Remove bearing cone and rolls from pinion shaft, using puller shown on page 26, service tool section, and install on new pinion, or install new bearing cone and rolls if bearings are to be renewed.

15. Remove bearing outer cups from pinion housing (92), using bearing race puller shown on page 14, service tool section, or by means of a suitable drift inserted through inside of housing.

16. Clean thoroughly inside of pinion housing and new bearing cups. An arbor press or bearing race puller should be used when pressing the new cups into the pinion housing; however, a soft hammer may be used to drive them in place, provided care is used to start the cups straight and tap evenly all around the edges.

17. The parts may now be reassembled by reversing operations 1 to 13, making sure that parts are properly lubricated and the pinion shaft, differential and wheel bearings, also drive gear and pinion, are properly adjusted as outlined in Articles "L," "M" and "N."

(G) Renew Pinion Shaft Felt Washer

1. Remove flange bolts at rear universal joint and disconnect propeller shaft.

2. Remove cotter pin and nut (81) from pinion shaft and pull off universal joint flange, using universal joint flange puller shown on page 22, service tool section.

3. Straighten lugs on pinion shaft nut lock (86), remove lock nut (85) and adjusting nut (87).

4. Remove felt washer retainer (90), using felt washer retainer puller. If no puller is available, insert hooked tool or offset screwdriver behind retainer, removing same by prying evenly around inside edge.

5. Remove felt washer (89) and replace with new part; straighten retainer if damaged in removing and tap in position.

6. To reassemble parts, reverse operations 1, 2 and 3, making sure that the drive gear and pinion, also pinion shaft bearings, are properly adjusted as outlined in Articles "L" and "M."

(H) Renew Axle Shaft Felt Washers

1. Jack up or block up car under rear axle.

2. Remove rear hub caps, cotter pins and axle shaft nuts (7); pull wheels off axle shafts, using wheel puller shown on page 22, service tool section. Note-Be sure hand brakes are fully released before attempting to pull off wheels.

3. Remove cap bolts (46) holding wheel bearing caps to housing; take off caps (3) and shims (26); pull out axle shafts and wheel bearings.

4. Remove felt washers (40, 4) from axle and bearing adjusting caps and replace with new parts.

5. To reassemble parts to axle, reverse the above operations, making sure that the wheel bearings are properly adjusted as outlined in Article "N."

(I) Renew Differential Case, Gears, Pinions or Spider

1. Jack up or block up car under rear axle.

2. Remove rear hub caps, cotter pins and axle shaft nuts (7), pull wheels off axle shafts, using wheel puller shown on page 22, service tool section. Note--Be sure hand brakes are fully released before attempting to pull off wheels.

3. Remove cap bolts (46) holding wheel bearing caps to housing; take off caps (3) and shims (26).

4. Place receptacle under housing to catch lubricant, remove housing cover screws (100) and take off cover.

5. Remove carrier cap, bolts (101), caps (102) and adjusting nuts (49); take out differential and drive gear assembly.

6. Place differential assembly on bench; remove cotter pins and stud nuts (106) and take apart differential case.
Rear Axle Group

7. Replace case or any other differential parts which require renewal.

8. To reassemble parts to axle, reverse the above operations, using care to see that the drive gear and pinion, differential and wheel bearings are properly adjusted as outlined in Articles "M" and "N."

(J) Reline Internal Brakes

1. Jack up or block up car under rear axle.

2. Remove rear hub caps, cotter pins and axle shaft nuts (7); pull wheels off axle shafts, using wheel puller shown on page 22, service tool section. Note-Be sure hand brakes are fully released before attempting to pull off wheels.

3. Remove clevis pins from external brake operating levers (21) and disconnect pull rods.

4. Remove clevis pins (22) and adjusting nuts (8) from tension rods, take off tension rods (20) and springs (11).

5. Remove lock wires (69), adjusting screws (68) and springs (66) from anchor brackets.

6. Remove nuts (79) and springs (75) from spacer studs (76); this will release external brake bands, which may now be removed.

7. Remove internal brake main springs (33).

8. Remove clevis pins (42) from adjustable links (29).

9. Remove internal brake spacer clip adjusting screws (62) and springs (58); take off internal brake bands.

10. Drive out lining rivets and remove old lining; fit new lining, making sure that it conforms to the curvature of the brake bands and that the rivet holes are countersunk sufficiently to allow the rivet heads to set well beneath the surface.

11. To reassemble parts to axle, reverse the above operations. Make sure that brakes are properly adjusted as covered by Articles "O" and "P."

(K) Reline External Brakes

1. Jack up or block up car under rear axle.

2. Remove rear hub caps, cotter pins and axle shaft nuts (7); pull wheels off axle shafts, using wheel puller shown on page 22, service tool section. Note-Be sure hand brakes are fully released before attempting to pull off wheels.

3. Remove clevis pins from external brake operating levers (21) and disconnect pull rods.

4. Remove clevis pins (22) and adjusting nuts (8) from tension rods, take off tension rods (20) and springs (11).

5. Remove lock wires (69), adjusting screws (68) and springs (66) from anchor brackets.

6. Remove nuts (79) and springs (75) from spacer studs (76); this will release external brake bands, which now may be removed.

7. Drive out lining rivets and remove old lining; fit new lining, making sure that it conforms to the curvature of the brake bands, and that the rivet holes are countersunk sufficiently to allow the rivet heads to set well beneath the surface.

8. To reassemble parts to axle, reverse the above operations. Make sure that brakes are properly adjusted as covered by Articles "O" and "P."

(L) Adjust Drive Pinion Bearings

1. Straighten lugs on nut lock (86) and loosen lock nut (85).

2. Turn adjusting nut (87) until all perceptible play or looseness in the bearings is taken up, being careful to see that they are not adjusted too tightly.

3. Tighten lock nut (85) then test bearing adjustment to make sure it has not been disturbed.

4. Bend over lugs on nut lock (86), locking adjusting and lock nuts in position.

(M) Adjust Drive Gear and Pinion and Differential Bearings

1. Make sure that drive pinion bearings are properly adjusted as outlined in Article "L."

2. Place receptacle under housing to catch lubricant, remove cover screws (100) and take off housing cover.

3. Inspect drive gear and pinion. When properly meshed, the back face of the drive pinion teeth will be approximately flush with outside face of drive gear teeth. If they do not line up correctly it will be necessary to adjust as follows: -

4. Disconnect propeller shaft at rear end by bending back ears on nut locks and removing 6 bolts from rear universal joint flange.

5. Remove nuts (95) holding pinion shaft housing (92) in place; take off housing assembly.

6. Add or remove required number of shims (70), replace pinion housing assembly and tighten nuts.

7. Connect propeller shaft rear universal joint, replace bolts and tighten nuts. Do not bend ears on nut locks.

With the drive gear and pinion in correct relation as outlined in operation No. 3, the backlash or play between the teeth should be approximately .006" to .008". If the backlash is greater or less than this amount, it will be necessary to adjust the differential and drive gear, which is accomplished as follows:

8. Remove cotter pins and take off adjusting nut locks (50).

9. Loosen very slightly, bolts (101) holding differential carrier caps.

10. Back off adjusting nut (49) (R. H. if backlash is excessive, L. H. if insufficient) by turning to left or anti-clockwise.

11. Turn adjusting nut (L. H. if backlash is excessive, R. H. if insufficient) to right or clockwise until only required amount of play is present between gear and pinion teeth.

12. Turn adjusting nut (R. H. if backlash is excessive, L. H. if insufficient) to right until all perceptible looseness in differential bearings is taken up, using care to see that they are not adjusted too tightly.

13. Tighten cap bolts and wire heads, place adjusting nut locks in position.

14. Replace housing cover and fill with lubricant to proper level.

15. The car should now be driven and results noted. If the axle is still noisy, it will be necessary to add or remove additional shims between pinion housing and carrier, as outlined in operations 4 to 7 inclusive. Repeated trials should be made if necessary, adding or removing one shim at a time until quiet operation is secured.

16. After a satisfactory adjustment is obtained, the ears on the rear universal joint bolt nut locks should be bent over to insure the bolts against working loose.

Rear Axle Group

(N) Adjust Rear Wheel Bearings

1. Jack up or block up car under rear axle.

2. Remove rear hub caps, cotter pins and axle shaft nuts (7); pull wheels off shafts, using wheel puller shown on page 22, service tool section. Note--Be sure hand brakes are fully released before attempting to pull wheels.

3. Remove cap bolts (46) holding wheel bearing caps to housing; take off caps (3) shims (26).

4. Add or remove shims if necessary, so that there will be an end play of from .005" to .010" in the axle shafts when caps are tightly bolted in place. It is important that the shims be equally divided between both bearing caps, as an excessive number on either side may cause interference between the brake drums and support brackets.

5. Reassemble, reversing operations 1, 2 and 3.

(0) Adjust Foot Brakes

1. Make sure external brake operating levers (21) rest against support brackets (17), when brakes are fully released. If they do not, it will be necessary to adjust the equalizer bar to brake pedal rod, as follows:

2. Remove clevis pin from yoke at bottom of brake pedal and disconnect pull rod.

3. Loosen lock nut on adjusting screw at lower part of brake pedal and adjust screw so that there will be approximately 1/4' clearance between the pedal and toe board in full release position, then tighten lock nut.

4. Turn adjusting yoke on equalizer to pedal pull rod until rod is correct length to allow operating levers (21) to rest against support brackets (17) when pedal adjusting screw is against stop.

5. Connect adjusting yoke to pedal, tighten lock nut, replace clevis and cotter pins.

6. Remove locks (69) from external brake anchor bracket adjusting screws (68).

7. Adjust anchor bracket screws so that external brake bands just clear the drums at these points and replace locks.

8. Loosen lock nuts and turn tension rod nuts (18) down until lower halves of brake bands are raised sufficiently to just clear brake drums, then tighten lock nuts.

9. Turn tension rod adjusting nuts (8) down until the upper halves of the brake bands also just clear the brake drums.

10. Inspect adjustment of external brake spacer studs (76), and if necessary, loosen lock nuts (79) and adjust so that with brakes fully released, the brake bands will be raised clear of the drums.

11. Test adjustments by turning wheels by hand, to make sure there is no tendency

(P) Adjust Hand Brakes

1. Jack up or block up car under rear axle.

2. Remove rear hub caps, cotter pins and axle shaft nuts (7); pull wheels off axle shafts, using wheel puller shown on page 22, service tool section. Note--Be sure hand brakes are fully released before attempting to pull off wheels.

3. Make sure internal brake tie bars (41) rest against stop brackets (31) when the hand brake lever is fully released. If they do not, it will be necessary to lengthen or shorten the pull rod connecting hand brake lever with cross shaft lever, as follows: [

4. Remove clevis pin at bottom of hand brake lever, loosen lock nut on hand brake lever to cross shaft pull rod.

5. Turn adjusting yoke on pull rod to right or left until rod is correct length, then tighten lock nut and replace clevis pin.

6. Place in position on axle shaft, brake band aligning fixture shown on page 22, service, tool section.

7. Loosen spacer clip adjusting screw nuts (60) and turn adjusting screws (62) until brake bands just clear the drums at these points, then tighten nuts.

8. Remove clevis pins (42) from adjusting links (29).

9. Loosen link nuts (28) and expand brake bands until they just clear the drums, by turning adjusting links (29) to left or anti-clockwise.

10. Tighten lock nuts, replace clevis and cotter pins, then remove aligning fixture, after turning same by hand to make sure the brake bands do not drag.

11. Place rear wheels in position, but do not draw them up tight on axle shaft taper. Pull up hand brake lever a notch at a time, grasping the rear wheels and noting whether the braking effort is equal on both sides. If one wheel offers less resistance to turning than the other, it should be taken off and the brake band expanded further, as outlined in operations 8, 9 and 10.

12. After the brakes have been properly adjusted and equalized, the parts may be reassembled by reversing operations No. 1 and 2.

Springs (A) Renew Front Spring Assembly

1. Raise front end of car with chain hoist or by jacks or blocking under frame side members directly back of front springs, until weight of car is off springs.

2. Remove bumper straps and take off front spring rubber bumpers.

3. Remove nuts from bottom of front axle spring clips and take off clips.

4. Remove nuts and take off shackle and front end bolts; this will allow the removal of the spring assembly.

5. Install new spring assembly, reversing operations 1, 2 and 3, making sure that the spring clip nuts are securely tightened. It is essential, when reassembling front end and shackle bolts, to draw the nuts up tight and then back them off 1/6th of a turn before inserting cotter pins, to take up side play and insure freedom of spring action.

(B) Renew Front Spring Bushings

1. Raise up front end of car with hoist or by jacks or blocking under frame side members, directly back of front springs, so that weight of car is off springs.

2. Remove straps and take off front spring rubber bumpers.

3. Remove front spring clip nuts and take off clips holding springs to front axle.

4. Remove cotter pins and nuts from front end and shackle bolts and take out shackle bolts; this will permit the removal of the front springs.

5. Press old bushings out of springs and insert new ones using bushing press shown on page 12, service tool section. When pressing rear bushings in place, be sure oil holes in bushings line up with holes in spring leaves. If necessary, use 5/8" expansion reamer to bring bushings to size after pressing in position.

6. Install springs on car, reversing operations 1, 2, 3, and 4, making sure that front axle spring clip nuts are securely tightened. When replacing front end bolts, it is important that the nuts be drawn up tightly and then backed off 1/6th of a turn before inserting cotter pins, so that side play will be eliminated without interfering with the spring action. For this reason, the rear end or shackle bolts should also be backed off slightly after tightly screwing them into the shackles and before tightening lock nuts.

(C) Renew Rear Spring or Rear Spring Bushings

1. Raise rear end of car with hoist or by jacks or blocking under frame ahead of rear springs, so that weight of car is just off springs.

2. Remove nuts and lock nuts from bottom of clips holding spring to rear axle and take off spring clip plate.

3. Remove cotter pin and nut from rear spring front end bolt and take out bolt.

4. Remove nut and lock washer from rear end or shackle bolt and unscrew bolt out of shackle, this will permit the removal of the rear spring, which may be renewed or rebushed, as necessary.

5. If spring is to be rebushed, press out old bushings and insert new ones, using bushing press shown on page 12, service tool section. If necessary, use 5/8" expansion reamer to bring bushings to size after pressing in place.

6. Install spring on car reversing operations 1 to 4 inclusive, making sure that rear spring clip nuts and lock nuts are drawn up tightly. When replacing front end bolt, the nut should be backed off 1/6th of a turn after tightening, before inserting cotter pin, to insure free spring action. in like manner, the rear or shackle bolt should be backed slightly after being tightly screwed into the shackle and before tightening lock nut.

Essex Six Steering Gear



Essex Six Steering Gear

- Ref No. Name of Part
 - 1. Steering wheel
 - 2. Steering wheel nut
 - 3. Steering wheel key
 - 4. jacket tube
 - 5. Jacket tube bushing
 - 6. Worm wheel bushing lock plate screw
 - 7. Worm wheel bushing lock plate
 - 8. Cowl bracket bolt
 - 9. Jacket tube bracket
 - 10. Jacket tube clamp bolt
 - 11. Worm wheel shaft nut
 - 12. Worm wheel shaft nut lock
 - 13. Worm wheel shaft nut washer
 - 14. Steering gear lever
 - 15. Steering gear frame bracket
 - 16. Worm wheel eccentric bushing
 - 17. Case cover stud
 - 18. Case cover stud nut
 - 19. Worm wheel thrust washer large
 - 20. Case cover stud washer
 - 21. Worm wheel thrust washer small

- Ref. No. Name of Part
- 22. Steering gear case
- 23. Worm wheel and shaft
- 24. Worm wheel thrust washer adjusting screw
- 25. Adjusting screw nut
- 26. Steering worm
- 27. Worm key
- 28. Thrust bearing
- 29. Upper cap bushing
- 30. Upper cap shim
- 31. Upper cap
- 32. Steering gear case plug
- 33. Lower case cap gasket
- 34. Lower case cap bushing
- 35. Steering column
- 36. Lower case cap expansion plug
- 37. Lower case cap
- 38. Case cap bolt
- 39. Drag link
- 40. Drag link ball seat
- 41. Drag link spring
- 42. Drag link adjusting plug

(A) Renew Complete Steering Gear

1. Remove steering column nut (2) from top of column and pull off steering wheel, using steering wheel puller shown on page 18, service tool section.

2. Remove cowl bracket bolt (8); disconnect jacket tube bracket (9) and slide jacket tube assembly off steering column.

3. Remove 2 bolts securing steering gear frame bracket (15) to frame side member, this will release steering gear assembly.

4. Bend back ears on worm wheel shaft nut lock (12), remove nut lock and nut (11) and pull steering gear lever (14) off shaft, using steering gear lever puller shown on page 18, service tool section.

5. Remove steering gear assembly from car and install new part and reassemble, reversing above operations.

(B) Renew Case Bushings, Thrust Washers, Column, Worm, Worm Wheel or Thrust Bearings

1. Remove steering column nut (2) from top of column and pull off steering wheel, using steering wheel puller shown on page 18, service tool section.

2. Remove cowl bracket bolt (8); disconnect jacket tube bracket (9) and slide jacket tube assembly off steering column.

3. Remove 2 bolts holding steering gear frame bracket (15) to frame side member.

4. Straighten lugs on worm wheel shaft nut lock (12), remove nut lock and nut

5. Pull steering gear lever (14) off taper on worm wheel shaft, using steering gear lever puller shown on page 18, service tool section. This will allow the removal of the steering gear assembly from the car.

6. Remove bolts holding upper cap (31) in position; take out shims and cap.

Steering Gear Group

7. Remove bolts (38) holding lower cap (37) to case, take off lower cap, column, worm and thrust bearings.

8. The bushings (29, 34) in the upper and lower caps may now be pressed out in an arbor press, or by means of the bushing press shown on page 13, service tool section, and replaced with new parts. After installing new bushing in lower cap, it will be necessary to renew expansion plug (36) at lower end of bushing (34).

9. Remove 4 nuts (18) holding frame bracket to steering gear case, take off frame bracket, gasket, worm wheel and thrust washer.

10. Remove worm wheel bushing (16) and replace with new part.

11. Where replacement is necessary, renew column, worm, thrust bearings, worm wheel or any other parts contained in the case assembly. Reassemble steering gear, reversing above operations, making sure that adjustments are properly made as covered by Articles "I", 'T' and "K."

(C) Renew Jacket Tube Bushings

1. Remove nut (2) from top of steering column.

2. Pull steering wheel off taper on steering column using steering wheel puller shown on page 18, service tool section.

3. Remove cowl bracket bolt (8) holding jacket tube bracket (9) to cowl.

4. Slide jacket tube and bracket off column, press out or drive out old bushings (5) and replace with new parts.

5. Reassemble parts, reversing above operations.

(D) Renew Steering Gear Lever

1. Remove cowl bracket bolt (8) holding jacket tube bracket (9) to cowl.

2. Remove drag link rear end boot, remove cotter pin and rear end adjusting plug; disconnect drag link from steering gear lever (14).

3. Straighten lugs on worm wheel nut lock (12), remove worm wheel nut (11) and nut lock.

4. Remove 2 bolts holding steering gear frame bracket (15) to frame side member.

5. Pull steering gear lever (14) off taper on worm wheel shaft, using steering gear lever puller shown on page 18, service tool section.

6. Install new steering gear lever and reassemble parts, reversing above operations.

(E) Adjust Column for End Play

1. Remove cap screws holding upper cap (31) to steering gear case and take out shims (30).

2. Replace screws and tighten cap securely, then test adjustment. If necessary, repeat and remove additional shims until up and down play is eliminated, making sure there is no tendency to bind.

(F) Adjust Worm Wheel and Shaft for End Play

1. Loosen nut (25) on steering gear worm wheel thrust washer screw.

2. Turn thrust washer screw (24) to right or clockwise just enough to eliminate all end play.

3. Tighten nut (25).

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(G) Adjust Worm Wheel and Shaft for Backlash

1. Remove cap screws (6) and lock plate (7) from outer edge of steering gear case.

2. Adjust worm wheel bushing (16) until only a slight amount of backlash or play is present between the teeth of the worm (26) and worm wheel (23). The steering gear worm wheel bushing adjusting wrench, shown on page 26, service tool section, should be used for this operation.

3. Replace lock plate (7) and cap screws (6), test adjustment by turning steering gear from extreme right to left positions to make sure there is no tendency to bind.

(A) Renew Drag Link Seats, Springs, Adjusting Plugs or Drag Link Assembly

1. Remove drag link front and rear end boots and cotter pins from adjusting plugs.

2. Unscrew adjusting plugs (42), remove ball seats (40) and springs (41); disconnect drag link from steering arm and steering gear lever.

3. Renew or clean parts, thoroughly lubricate and reassemble, reversing above operations and adjusting as detailed in Article "B."

(B) Adjust Drag Link

1. Remove drag link front and rear end boots and take out cotter pins.

2. When in proper operating position, the drag link adjusting plugs (42) are screwed into the drag link approximately flush with the outer edge. It is important that this point be watched when reassembling drag link to car or adjusting, as, if the plugs are screwed in too far, the cushioning effect of the springs (41) to protect the steering gear from road shocks, will be lost. It is also essential that they be screwed in far enough to insure a sufficient number of threads engaging and to properly compress springs. Clean and lubricate parts thoroughly, replace cotter pins and boots.

Essex Six Clutch



Essex Six Clutch

Ref. No. Name of Part

Ref. No. Name of Part

- 1. Clutch cover gasket
- 2. Clutch cover cap screw
- 3. Pressure plate
- 4. Driving disc
- 5. Driving disc cork
- 6. Driven disc
- 7. Drum plate
- 8. Clutch drum pin
- 9. Clutch drum pin nut
- 10. Driving stud collar

- 11. Driving stud sleeve
- 12. Driving stud
- 13. Silencing spring
- 14. Silencing spring-armed
- 15. Cover drain plug
- 16. Clutch cover
- 17. Drum jaw liner
- 18. Clutch drum
- 19. Drum plate rivet
- 20. Clutch spider

Ref. No. Name of Part

- 21. Clutch cover oil ring
- 22. Clutch thrust bearing
- 23. Clutch cover oil retaining ring
- 24. Oil retaining washer
- 25. Thrust bearing retainer
- 26. Thrust yoke
- 27. Spring stud
- 28. Spring stud nut
- 29. Spring
 - 30. Spring retainer

(A) Renew Clutch Assembly, Clutch Cover Assembly, Pilot Bearing, Thrust Bearing, or Thrust Bearing Retainer

1. Remove toe and floor boards.

2. Remove clevis pin at bottom of hand brake lever and disconnect hand brake pull rod.

3. Remove clevis pin at lower part of brake pedal and disconnect foot brake pull rod.

4. Unscrew sleeve at rear end of speedometer drive shaft and disconnect shaft from transmission.

5. Remove bolts from flange of front universal joint and disconnect propeller shaft.

6. Remove cap screws holding transmission case cover to transmission and take off control hand lever assembly.

7. Remove clevis pin from clutch adjustable link and disconnect clutch throwout yoke.

8. Remove bolts holding pedal control bracket to transmission and take off pedal control assembly.

9. Unscrew exhaust manifold packing nut at rear end of exhaust manifold.

10. Remove 2 bolts holding front end of muffler to muffler bracket.

11. Loosen bolt clamping front end of muffler to exhaust pipe; slide exhaust pipe out of exhaust manifold and turn out of way of transmission.

12. Remove bolts holding flywheel guard to rear motor plate, also screw holding rear end of guard to transmission case; take off flywheel guard.

13. Remove clutch drain plug from clutch cover and drain oil out of clutch.

- 14. Remove cap screws holding clutch cover to flywheel.
- 15. Remove nuts from rear ends of 3 starting motor studs.

16. Remove 2 bolts holding lower part of transmission case to rear motor plate.

17. Remove nuts from 2 studs holding transmission to motor; this will release transmission and clutch assembly which may now be lowered and removed from the car.

18. Remove cotter pin and nut (9) from clutch hub pin (8), pull clutch assembly off transmission mainshaft drive gear.

Clutch Group

19. The clutch assembly may now be replaced with a new unit if necessary, and the cover assembly, pilot bearing, thrust bearing or thrust bearing retainer renewed as required. Reassembling of the parts is accomplished by reversing the preceding operations.

(B) Renew Clutch Driving or Driven Discs, Spider, Drum, Drum Liners, Drum Plate or Springs

1. Remove toe and floor boards.

2. Remove clevis pin at bottom of hand brake lever and disconnect hand brake pull rod.

3. Remove clevis pin at lower part of brake pedal and disconnect foot brake pull rod.

4. Unscrew sleeve at rear end of speedometer drive shaft and disconnect shaft from transmission.

5. Remove bolts from flange of front universal joint and disconnect propeller shaft.

6. Remove cap screws holding transmission case cover to transmission and take off control hand lever assembly.

7. Remove clevis pin from clutch adjustable link and disconnect clutch throwout yoke.

8. Remove bolts holding pedal control bracket to transmission and take off pedal control assembly.

9. Unscrew exhaust manifold packing nut at rear end of exhaust manifold.

10. Remove 2 bolts holding front end of muffler to muffler bracket.

11. Loosen bolt clamping front end of muffler to exhaust pipe; slide exhaust pipe out of exhaust manifold and turn out of way of transmission.

12. Remove bolts holding flywheel guard to rear motor plate, also screw holding rear end of guard to transmission case; take off flywheel guard.

13. Remove clutch drain plug from clutch cover and drain oil out of clutch.

14. Remove cap screws holding clutch cover to flywheel.

15. Remove nuts from rear ends of 3 starting motor studs.

16. Remove 2 bolts holding lower part of transmission case to rear motor plate.

17. Remove nuts from 2 studs holding transmission to motor; this will release transmission and clutch assembly which may now be lowered and removed from the car.

18. Remove cotter pin and nut (9) from clutch hub pin (8), pull clutch assembly off transmission mainshaft drive gear.

19. Place clutch assembly on clutch assembling fixture shown on page 21, service tool section, with the hub of the spider (28) downward. Place clamp casting of fixture on the uppermost or pressure plate and tighten wing nut slightly.

20. Remove cotter pins and nuts (28) from clutch spring studs (27), then unscrew wing nut on fixture which will allow the removal and complete disassembling of the clutch.

21. All worn and damaged clutch parts requiring renewal should now be replaced with new material. If the corks (5) in the driving discs (4) are worn down to such extent that there is a possibility of metal to metal contact with the driven discs, or if the surfaces of the corks have been burned from insufficient lubrication, it is advisable to have them recorked or renewed to insure a satisfactory job. The driven discs (6) should also be replaced with new ones if they are warped or if the faces are rough or scored. Reassemble clutch and replace parts, by reversing the preceding operations.

Essex Six Transmission



Essex Six Transmission

Ref. No. Name of Part

- 1. Mainshaft front bearing cap bolt-short
- 2. Mainshaft front bronze washer dowel pin.
- 3. Mainshaft thrust ball
- 4. Mainshaft front bearing cap bolt-long
- 5. Mainshaft front thrust washer-bronze
- 6. Mainshaft front thrust washer-steel
- 7. Mainshaft front bearing cap
- 8. Mainshaft front bearing cap gasket
- 9. Mainshaft drive gear outer bearing
- 10. Countershaft expansion plug
- 11. Countershaft
- 12. Countershaft gear bushing-front
- 13. Countershaft drive and second speed gear
- 14. Clutch throwout yoke bushing
- 15. Clutch throwout yoke bolt
- 16. Clutch throwout yoke
- 17. Bearing outer sleeve lock screw
- 18. Mainshaft drive gear inner bushing
- 19. Mainshaft drive gear
- 20. Shifter fork lock screw
- 21. Mainshaft second and high speed gear
- 22. Low and reverse gear shifter fork
- 23. Mainshaft
- 24. Mainshaft low and reverse gear
- 25. Shifter shaft lock spring cap
- 26. Shifter shaft lock spring
- 27. Shifter shaft lock ball
- 28. Shifter shaft interlock plunger

- Ref. No. Name of Part
 - 29. Low and reverse gear shifter shaft
 - 30. Reverse idler gear shaft expansion plug
 - 31. Reverse idler gear shaft
 - 32. Reverse idler gear bushing
 - 33. Reverse idler gear
 - 34. Mainshaft steel washer-front
 - 35. Mainshaft rear bearing
 - 36. Speedometer drive gear
 - 37. Mainshaft shim
 - 38. Mainshaft: rear bronze washer dowel pin
 - 39. Mainshaft rear bearing cap
 - 40. Mainshaft rear bearing cap gasket
 - 41. Countershaft lock screw
 - 42. Countershaft low and reverse gear
 - 43. Countershaft gear rear bushing
 - 44. Transmission case
 - 45. Mainshaft rear bearing inner sleeve
 - 46. Mainshaft rear bearing bronze washer
 - 47. Mainshaft rear bearing steel washer
 - 48. Mainshaft rear bearing cap bolt-long
 - 49. Mainshaft nut washer
 - 50. Mainshaft nut
 - 51. Mainshaft rear bearing cap bolt-short
 - 52. Speedometer driven gear sleeve
 - 53. Speedometer driven gear sleeve shim
 - 54. Oil level test plug
 - 55. Speedometer driven gear

(A) Renew Transmission

1. Remove toe and floor boards.

- 2. Remove clevis pin at bottom of hand brake lever and disconnect hand brake pull rod.
- 3. Remove clevis pin at lower part of brake pedal and disconnect foot brake pull rod.
- 4. Unscrew sleeve at rear end of speedometer drive shaft and disconnect shaft from transmission.
- 5. Remove bolts from flange of front universal joint and disconnect propeller shaft.
- 6. Remove cap screws holding transmission case cover to transmission and take off control hand lever assembly.
- 7. Remove clevis pin from clutch adjustable link and disconnect clutch throwout yoke.
- 8. Remove bolts holding pedal control bracket to transmission and take off pedal control assembly.
- 9. Unscrew exhaust manifold packing nut at rear end of exhaust manifold.
- 10. Remove 2 bolts holding front end of muffler bracket.

11. Loosen bolt clamping front end of muffler to exhaust pipe; slide exhaust pipe out of exhaust manifold and turn out of way of transmission.

12. Remove bolts holding flywheeel guard to rear motor plate, also screw holding rear end of guard to transmission case and take off flywheel guard.

13. Remove clutch drain plug from clutch cover and drain oil out of clutch.

14. Remove cap screws holding clutch cover to flywheel.

15. Remove nuts from rear ends of 3 starting motor studs.

16. Remove 2 bolts holding lower part of transmission case to rear motor plate.

17. Remove nuts from 2 studs holding upper part of transmission to motor; this will release transmission and clutch assembly which may now be lowered and removed from the car.

18. Remove cotter pin and nut from clutch hub pin, pull clutch assembly off transmission mainshaft drive gear.

19. Install clutch on new transmission assembly and reassemble, reversing above operations.

(B) Renew Mainshaft, Mainshaft Thrust Ball, Sliding Gears, Mainshaft Rear Bearing, Mainshaft Rear Bearing ThrustWashers, Speedometer Drive Gear, Shifting Forks, Shifting Shafts or Interlock Plunger

1. Remove floor boards.

2. Remove clevis pin at bottom of hand brake lever and disconnect hand brake pull rod.

3. Remove cap screws holding transmission case cover to transmission and take off hand control lever assembly.

4. Unscrew sleeve at rear end of speedometer shaft and disconnect speedometer shaft from transmission.

5. Remove bolts from flange of front universal joint and disconnect propeller shaft.

6. Remove cotter pin, nut (50) and washer from rear end of mainshaft, pull off front universal joint flange, using universal joint flange puller shown on page 22, service tool section.

7. Remove speedometer driven gear sleeve (52) take out gear (55) and shims (53).

8. Remove bolts (51) holding mainshaft rear bearing cap to transmission and take off cap (3 9).

9. Remove gear shifting shaft lock spring caps (25) take out springs (26) and lock balls (27).

10. Remove gear shifting fork lock screws (20) slide shifting shafts (29) out of shifting forks (22) and rear end of transmission case.

11. Remove shifting shaft interlock plungers (28).

12. The mainshaft may now be removed and any of the above parts which require renewal replaced. The transmission may then be reassembled by reversing the above operations. In reassembling it is very important that the correct number of shims (37) be placed on mainshaft to allow an end play of from .008" to .012" when rear bearing cap is tightly bolted in place.

(C) Renew Mainshaft Drive Gear, Mainshaft Outer Bearing, Mainshaft Drive Gear Thrust Washers, Mainshaft Drive Gear Bushing or Front Bearing Cap

1. Remove toe and floor boards.

2. Remove clevis pin at bottom of hand brake lever and disconnect hand brake pull rod.

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3. Remove clevis pin at lower part of brake pedal and disconnect foot brake pull rod.

4. Unscrew sleeve at rear end of speedometer drive shaft and disconnect shaft from transmission.

5. Remove bolts from flange of front universal joint and disconnect propeller shaft.

6. Remove cap screws holding transmission case cover to transmission and take off control lever assembly.

7. Remove clevis pin from clutch adjustable link and disconnect clutch throwout yoke.

8. Remove bolts holding pedal control bracket to transmission and take off pedal control assembly.

9. Unscrew exhaust manifold packing nut at rear end of exhaust manifold.

10. Remove 2 bolts holding front end of muffler to muffler bracket.

11. Loosen bolt clamping front end of muffler to exhaust pipe; slide exhaust pipe out of exhaust manifold and turn out of way of transmission.

12. Remove bolts holding flywheel guard to rear motor plate, also screw holding rear end of guard to transmission case and take off flywheel guard.

13. Remove clutch drain plug from clutch cover and drain oil out of clutch.

14. Remove cap screws holding clutch cover to flywheel.

15. Remove nuts from rear ends of 3 starting motor studs.

16. Remove 2 bolts holding lower part of transmission case to rear motor plate.

17. Remove nuts from 2 studs holding upper part of transmission to motor; this will release transmission and clutch assembly, which may now be lowered and removed from the car.

18. Remove cotter pin and nut from clutch hub pin and pull clutch assembly off transmission mainshaft drive gear.

19. Remove cotter pin, nut (50) and washer from rear end of mainshaft and pull off front universal joint flange, using universal joint flange puller shown on page 22, service tool section.

20. Remove speedometer driven gear sleeve (52), take out gear (55) and shims (53).

21. Remove screws (48) holding mainshaft rear bearing cap to transmission and take off cap (39).

22. Remove gear-shifting shaft lock spring caps (25), takeout springs (26) and lock balls (27).

23. Remove gear shifting fork lock screws (20), slide shifting shafts (29) out of shifting forks (22), and rear end of transmission case; this will allow the removal of the mainshaft and parts assembled on it.

24. Remove screws (4) holding mainshaft front bearing cap to transmission and take off cap (7).

25. The mainshaft drive gear (19) and assembled parts (9, 5, 6, 18, 7) may now be removed and renewed where necessary, and transmission reassembled, reversing the above operations. When reassembling, make sure that from .008" to .012" end play exists in mainshaft, to insure proper lubrication of the thrust washers. Add or remove shims (37) as required, to obtain this end play. If it is necessary to renew outer race of bearing (9), main shaft drive gear outer bearing race puller shown on page 12, service to section, should be used to remove it from transmission case.

(D) Renew Countershaft, Countershaft Gears or Countershaft Gear Bushings

1. Remove toe and floor boards.

2. Remove clevis pin at bottom of hand brake lever and disconnect hand brake pull rod.

3. Remove clevis pin at lower part of brake pedal and disconnect foot brake pull rod.

4. Unscrew sleeve at rear end of speedometer drive shaft and disconnect shaft from transmission.

5. Remove bolts from flange of front universal joint and disconnect propeller shaft.

6. Remove cap screws holding transmission case cover to transmission and take off control hand lever assembly.

7. Remove clevis pin from clutch adjustable link and disconnect throwout yoke.

8. Remove bolts holding pedal control bracket to transmission and take off pedal control assembly.

9. Unscrew exhaust manifold packing nut at rear end of exhaust manifold.

10. Remove 2 bolts holding front end of muffler to muffler bracket.

11. Loosen bolt clamping front end of muffler to exhaust pipe; slide exhaust pipe out of exhaust manifold and turn out of way of transmission.

12. Remove bolts holding flywheel guard to rear motor plate, also screw holding rear end of guard to transmission case and take off flywheel guard.

13. Remove clutch drain plug from clutch cover and drain oil out of clutch.

14. Remove cap screws holding clutch cover to flywheel.

15. Remove nuts from rear ends of 3 starting motor studs.

16. Remove 2 bolts holding lower part of transmission case to rear motor plate.

17. Remove nuts from 2 studs holding upper part of transmission to motor; this will release transmission and clutch assembly which may now be removed from the car.

18. Remove cotter pin and nut from clutch hub pin and pull clutch assembly off transmission mainshaft drive gear.

19. Remove cotter pin, nut (50) and washer from rear end of mainshaft and pull off front universal joint flange, using universal joint flange puller shown on page 22, service tool section.

20. Remove speedometer driven gear sleeve (52), takeout gear (55) and shims (53).

21. Remove screws (48) holding mainshaft rear bearing cap to transmission and take off cap (39).

22. Remove gear shifting shaft lock spring caps (25), take out springs (26) and lock balls (27).

23. Remove gear shifting fork lock screws (20), slide shifting shafts (29) out of shifting forks (22) and rear end of transmission case; this will allow the removal of the mainshaft and parts assembled on it.

24. Remove screws (4) holding mainshaft front bearing cap to transmission, and take off cap (7); this will permit the removal of the mainshaft drive gear and assembled parts.

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25. Drill 7/32" hole in center of rear countershaft expansion plug (10), insert hooked tool in opening and pull out plug.

26. Remove countershaft lock screw (41) from bottom of transmission case.

27. Insert hooked tool in lock screw hole at rear end of countershaft and pull out countershaft through rear of transmission case.

28. The countershaft gears may now be removed from transmission and renewed or rebushed, if necessary, using bushing press shown on page 12, service tool section. The countershaft may also be renewed if required.

29. Reassemble transmission, reversing above operations, making sure that from .008" to .012" end play exists in main shaft after caps are bolted in place. Expansion plug (10), at rear end of countershaft, should be renewed when reassembling transmission; however, in an emergency, the old part may be used if the hole is tapped out and plugged with a small machine screw to prevent loss of lubricant.

(E) Renew Reverse Idler Gear, Shaft or Idler Gear Bushing

1. Remove floor boards.

2. Remove clevis pin at bottom of hand brake lever and disconnect hand brake pull rod.

3. Remove cap screws holding transmission case cover to transmission and take off hand control lever assembly.

4. Unscrew sleeve at rear end of speedometer shaft and disconnect speedometer shaft from transmission.

5. Remove bolts from flange of front universal joint and disconnect propeller shaft.

6. Remove cotter pin, nut (50) and washer from rear end of mainshaft and pull off front universal joint flange, using universal joint flange puller shown on page 22, service tool section.

7. Remove speedometer driven gear sleeve (52), take out gear (55) and shims (53).

8. Remove bolts (51) holding mainshaft rear bearing cap to transmission and take off cap (39).

9. Remove gear shifting shaft lock spring caps (25), take out springs (26) and lock balls (27).

10. Remove gear shifting fork lock screws (20), slide shifting shafts (29) out of shifting forks (22) and rear end of transmission case; this will allow the mainshaft and parts assembled to it to be removed.

11. Remove from lower part of transmission case, lock screw holding reverse idler gear shaft in position.

12. Drill 7/32" hole in center of reverse idler shaft expansion plug (30) located in rear of transmission case, and pry out plug with cotter pin remover or similar bent tool.

13. The reverse idler shaft may now be pushed out through rear end of transmission and reverse idler gear removed.

14. If bushing (32) is to be renewed, press out old part and insert new one, using bushing press shown on page 12, service tool section. Renew gear (33) or shaft (31), if necessary, and reassemble transmission, reversing foregoing operations. See that proper number of shims (37) are placed on mainshaft to allow from .008" to .012" end play.

(F) Renew Transmission Case

1. Remove toe and floor boards.

2. Remove clevis pin at bottom of hand brake lever and disconnect hand brake pull rod.

3. Remove clevis pin at lower part of brake pedal and disconnect foot brake pull rod.

4. Unscrew sleeve at rear end of speedometer drive shaft and disconnect shaft from transmission.

5. Remove bolts from flange of front universal joint and disconnect propeller shaft.

6. Remove cap screws holding transmission case cover to transmission and take off control hand lever assembly.

7. Remove clevis pin from clutch adjustable link and disconnect clutch throwout yoke.

8. Remove bolts holding pedal control bracket to transmission and take off pedal control assembly.

9. Unscrew exhaust manifold packing nut at rear end of exhaust manifold.

10. Remove 2 bolts holding front end of muffler to muffler bracket.

11. Loosen bolt clamping front end of muffler to exhaust pipe; slide exhaust pipe out of exhaust manifold and turn out of way of transmission.

12. Remove bolts holding flywheel guard to rear motor plate, also screw holding rear end of guard to transmission case and take off flywheel guard.

13. Remove clutch drain plug from clutch cover and drain oil out of clutch.

14. Remove cap screws holding clutch cover to flywheel.

15. Remove nuts from rear ends of 3 starting motor studs.

16. Remove 2 bolts holding lower part of transmission, case to rear motor plate.

17. Remove nuts from 2 studs holding upper part of transmission to motor; this will release transmission and clutch assembly which may now be lowered and removed from the car.

18. Remove cotter pin and nut from clutch hub pin, pull clutch assembly off transmission mainshaft drive gear.

19. Remove cotter pin, nut (50) and washer from rear end of mainshaft, pull off front universal joint flange, using universal joint flange puller shown on page 22, service tool section.

20. Remove speedometer driven gear sleeve (52), take out gear (55) and shims (53).

21. Remove bolts (51) holding mainshaft rear bearing cap to transmission and take off cap (39).

22. Remove gear shifting shaft lock spring caps (25), take out springs (26) and lock balls (27).

23. Remove gear shifting fork lock screws (20), slide shifting shafts (29) out of shifting forks (22) and rear end of transmission case; this will allow the removal of the mainshaft and parts assembled on it.

24. Remove shifting shaft interlock plungers (28).

25. Remove screws (1, 4), holding mainshaft front bearing cap (7) to transmission, take off cap, mainshaft: drive gear and assembled parts.

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26. Drill 7/32" hole through center of rear countershaft expansion plug (10), insert hooked tool in opening and pull out plug.

27. Remove countershaft lock screw (41) from bottom of transmission case.

28. Insert hooked tool in lock screw hole at rear end of countershaft and pull out countershaft (11) through rear of transmission case; take out countershaft gears (13, 42).

29. Remove from lower part of transmission case, lock screw holding reverse idler gear shaft in place.

30. Drill 7/32" hole in center of reverse idler shaft expansion plug (30) located in rear of transmission case, and pry out plug with cotter pin remover or similar bent tool.

31. Push out reverse idler gear shaft through rear of transmission and remove idler gear.

32. Replace transmission case with new part and reassemble, reversing above operations. See that sufficient shims (37) are placed on mainshaft to allow from .008' to .012' end play after caps (7, 39) are bolted in place.

(G) Renew Clutch Throwout Yoke or Throwout Yoke Bushing

1. Remove toe and floor boards.

2. Remove clevis pin at bottom of hand brake lever and disconnect hand brake pull rod.

3. Remove clevis pin at lower part of brake pedal and disconnect foot brake pull rod.

4. Unscrew sleeve at rear end of speedometer drive shaft and disconnect shaft from transmission.

5. Remove bolts from flange of front universal joint and disconnect propeller shaft.

6. Remove cap screws holding transmission case cover to transmission and take off control hand lever assembly.

7. Remove clevis pin from clutch adjustable link and disconnect clutch throwout yoke.

8. Remove bolts holding pedal control bracket to transmission and take off pedal control assembly.

9. Unscrew exhaust manifold packing nut at rear end of exhaust manifold.

10. Remove 2 bolts holding front end of muffler to muffler bracket.

11. Loosen bolt clamping front end of muffler to exhaust pipe; slide exhaust pipe out of exhaust manifold and turn out of way of transmission.

12. Remove bolts holding flywheel guard to rear motor plate, also screw holding rear end of guard to transmission case and take off flywheel guard.

13. Remove clutch drain plug from clutch cover and drain oil out of clutch.

14. Remove cap screws holding clutch cover to flywheel.

15. Remove nuts from rear ends of 3 starting motor studs.

16. Remove 2 bolts holding lower part of transmission case to rear motor plate.

17. Remove nuts from 2 studs holding upper part of transmission to motor; this will release transmission and clutch assembly which may now be lowered and removed from the car.

18. Remove cotter pin and nut from clutch hub pin, pull clutch assembly off transmission mainshaft drive gear.

19. Remove cotter and clevis pin holding the Throwout yoke to transmission front bearing cap and take off yoke.

20. Renew or rebush yoke (16), reassemble transmission, reversing the preceding operations.

(H) Remove End Play from Mainshaft

To insure proper lubrication of the mainshaft thrust washers, it is necessary that there be from .008" to .012" end play in the transmission mainshaft at all times. End play in excess of this amount, which will develop after extensive service, should be removed by the addition of shims as detailed below, unless the amount is very great, in which case it will be necessary to renew thrust washers 5 and 6, or 46 and 47. To renew front thrust washers (5, 6) follow operations listed in Article "C." To fit new rear bearing thrust washers (46, 47) proceed as instructed in Article "B."

1. Remove bolts from flange of front universal joint and disconnect propeller shaft.

2. Unscrew sleeve at rear end of speedometer shaft and disconnect speedometer shaft from transmission.

3. Remove cotter pin, nut (50) and washer from rear end of transmission mainshaft: and pull off universal joint flange, using universal joint flange puller shown on page 22, service tool section.

4. Remove rear bearing cap screws (48, 51), and take off rear bearing cap (39).

5. Add required number of shims (37) to mainshaft to allow .008" to .012" end play after cap is bolted in place, and reassemble, reversing the foregoing operations.

(I) Renew Shifting Shaft Lock Ball, Lock Ball Spring or Cap

1. Remove shifting shaft lock plunger spring caps (2 5), -take out springs (2 6) and lock balls (27).

2. Replace parts where necessary, reassemble parts and tighten caps.

Essex Six Pedal Control



Essex Six Pedal Control

Ref. No. Name of Part

- 1. Clutch pedal pin
- 2. Clutch pedal yoke
- Clutch pedal yoke spring
- 4. Clutch pedal yoke nut
- 5. Clutch pedal adjustable yoke
- 6. Clutch pedal yoke clevis pin
- 7. Brake pedal stop screw
- 8. Brake pedal stop screw nut

- Ref. No. Name of Part
- 9. Pedal shaft
- 10. Clutch pedal hub
- 11. Brake pedal hub
- 12. Pedal support bracket
- 13. Clutch pedal pad
- 14. Brake pedal pad
- 15. Pedal arm
- 16. Pedal shaft lever

(A) Renew or Rebush Pedal Support Bracket

- 1. Disconnect accelerator pedal and remove toe and floor boards.
- 2. Remove cotter and clevis pins from bottom of brake pedal (11) and disconnect foot brake pull rod.
- 3. Unhook clutch pedal retaining spring (3) from clutch throwout yoke and pedal support bracket.
- 4. Remove clevis pin (6) from clutch adjusting yoke (5) and disconnect clutch throwout yoke.
- 5. Remove screws holding pedal support bracket (12) to transmission case and take off pedal control assembly.
- 6. Drive out taper pin (1) from clutch pedal hub (10) and pull clutch pedal off pedal shaft (9).
- 7. The brake pedal may now be removed and the pedal shaft and lever (16) withdrawn from the support bracket.
- 8. Renew or rebush pedal support bracket (12) as necessary, and reassemble parts, reversing the foregoing operations.

(B) Rebush or Renew Clutch or Brake Pedal Assembly

- 1. Disconnect accelerator pedal and remove toe and floor boards.
- 2. Remove cotter and clevis pins from bottom of brake pedal and disconnect foot brake pull rod.
- 3. Drive out taper pin (1) from clutch pedal hub (10), pull clutch pedal off pedal shaft and take off brake pedal.
- 4. Rebush or renew pedal assemblies as necessary, and reassemble parts, reversing the above operations.

Essex Six Hand Control



Essex Six Hand Control

Ref. No. Name of Part

- 1. Gearshift lever ball
- 2. Gearshift lever cover screw
- 3. Gearshift lever pivot screw
- 4. Oil filler cover screw
- 5. Control lock dowel screw
- 6. Brake lever shaft pin
- 7. Brake lever latch rod washer
- 8. Brake lever latch pivot
- 9. Brake lever shaft washer
- 10. Brake lever shaft spring
- 11. Brake lever shaft
- 12. Brake pull rod clevis pin
- 13. Gearshift lever pivot
- 14. Gearshift lever cover
- 15. Gearshift lever spring
- 16. Oil filler cover
- 17. Control lock

Ref. No. Name of Part

- 18. Control housing
- 19. Control lock plunger washer
- 20. Control lock plunger spring
- 21. Brake lever latch spring
- 22. Control housing screw
- 23. Brake pull rod adjusting yoke
- 24. Brake pull rod nut
- 25. Brake pull rod
- 26. Brake hand lever latch grip
- 27. Brake hand lever latch screw
- 28. Brake hand lever latch rod
- 29. Brake hand lever
- 30. Gearshift lever
- 31. Control lock plunger
- 32. Brake ratchet
- 33. Brake lever latch
- 34. Brake lever latch bolt

(A) Renew Gearshift Lever, Gearshift Lever Spring or Cover

1. Remove gearshift lever ball (1).

2. Remove gearshift lever cover screws (2) and cover (14).

3. Takeout lever (30) and spring (15), replace parts where necessary and reassemble, reversing operations 1 and 2.

(B) Renew Control Lock, Plunger or Spring

1. Remove control lock retaining screw (5), insert key in lock and turn key as far as possible; this will permit the removal of the lock (17), plunger (3 1), plunger spring (2 0) and plunger washer (19).

2. Renew parts where necessary and reassemble.

(C) Renew Control Housing

1. Remove floor boards.

2. Remove clevis pin (12) from bottom of brake hand lever and disconnect hand brake pull rod.

3. Remove screws (22) holding control housing to transmission, and take off control hand lever assembly.

4. Remove screws (2) holding gearshift lever cover to control housing, take off cover (14), gearshift lever (30) and spring (15).

5. Remove pivot screw (3) from control housing.

6. Remove oil filler cover screws (4) and cover (16).

7. Remove control lock retaining screw (5) insert key in lock and turn key as far as possible; take out lock (17), plunger (3 1), plunger spring (2 0) and plunger washer (19).

Hand Control Group

- 8. Remove cotter pin, washer (9) and spring (10) from brake hand lever pivot and take off brake hand lever assembly.
- 9. Remove screws (34) holding hand brake lever ratchet to control housing and take off ratchet (32).
- 10. Replace control housing with new part and reassemble, reversing above operations.

Essex Six Universal Joints and Propeller Shaft



Essex Six Universal Joints and **Propeller Shaft**

Ref. No. Name of Part Ref. No. Name of Part 1. Flange yoke 16. Propeller shaft washer 2. Companion flange-rear 17. Propeller shaft nut 3. Flange bolt 18. Sleeve yoke-rear 4. Flange bolt nut 19. Sleeve yoke retaining pin 5. Bushing 20. Outer casing spring-front 6. Bushing lock ring 21. Outer casing spring retainer-front 22. Spring retainer lock ring-front 7. Cross 23. Sleeve yoke dust cap 8. Inner casing plug 24. Dust cap felt washer 9. Inner casing 25. Dust cap felt washer disc 10. Outer casing packing 26. Flange bolt nut lock 11. Outer casing-rear 12. Outer casing spring-rear 27. Companion flange-front 28. Outer casing-front 13. Outer casing spring retainer-rear

- 14. Spring retainer lock ring-rear
- 15. Sleeve yoke rear

- 29. Sleeve yoke

(A) Renew Rear Universal Joint and Propeller Shaft

1. Straighten lugs on nut locks, unscrew rear universal joint flange bolt nuts (4), take out bolts (3) and drop rear end of propeller shaft.

2. Unscrew dust cap (23) from sleeve yoke (29) of front universal joint and pull out propeller shaft.

3. Pry lock ring (14) out of groove in propeller shaft or rear universal joint yoke, using screw driver or similar tool inserted in slot in ring; this will release spring retainer (13), spring (12) outer casing (11), which may be moved forward on the shaft.

4. If the propeller shaft is of the double taper type having a smaller diameter at front and rear ends, it will be necessary to remove the rear joint assembly from the shaft before it can be disassembled. Two methods were used to fasten the joints to the shaft, the rear joint sleeve yoke (18) in one instance, being secured by a straight pin (19) which passed through shaft and yoke; in the other construction the yoke (15) was fastened to the shaft by a castle nut (17) and washer (16). To remove rear universal joint from the propeller shaft, drive out the retaining pin with a hammer and drift, or remove cotter pin and castle nut from the rear end of the shaft, using a hexagon socket wrench.

5. If the rear universal joint flange (2) requires renewal, remove cotter pin and nut at front end of pinion shaft and pull flange off shaft, using universal joint flange puller shown on page 22, service tool section.

6. Clean taper on pinion shaft and inside of new flange and drive flange on shaft, using a soft hammer; then securely tighten cotter pin nut.

7. The rear joint assembly or propeller shaft should be renewed as necessary and parts reassembled, by reversing operations 1 to 5 inclusive, taking care to see that the flange bolt nuts are tightly drawn up and nut locks bent over to guard against the parts loosening up. Before bolting joint to rear axle flange, thoroughly lubricate it with fibre grease.

(B) Renew Flange or Sleeve Yokes, Bushings, Crosses, and Inner or Outer Casings

1. Bend over lugs on front and rear flange bolt nut locks, remove nuts and bolts from front and rear flanges, and drop propeller shaft and universal joints.

Universal Joints and Propeller Shaft Group

2. Remove dust cap (23) and felt washer (24) from front joint sleeve yoke and slide front joint off propeller shaft.

3. Pry lock rings (14, 22) out of grooves in propeller shaft and sleeve yoke with a screw driver or similar tool inserted in ring slot. This will release spring retainers (13), (21), springs (12, 20), outer casings (11) and inner casings (9), which may be moved along the shaft. If the propeller shaft is of the tapered rear end type, it will be necessary to remove rear universal joint from the shaft. This is done either by driving out straight pin (19), or by taking off nut (17) and washer (16) and tapping the rear flange with a soft hammer.

4. Remove bushings from flange yokes (1) by tapping them with a drift and hammer; this will permit the removal of the flange yoke.

5. Remove lock rings (6) from bushings in sleeve yokes and rear end of shaft by forcing a small screw driver between the bushing and lock ring; then drive out bushings with a hammer and drift.

6. Renew worn bushings, crosses and other universal joint parts where required and reassemble joints and shaft, which is done by reversing the operations listed above. Before bolting propeller shaft in position be sure to adequately lubricate the universal joints with fibre grease and oil splines of front joint sleeve yoke. When fitting bushings to sleeve yokes of front and rear joints or to rear end of propeller shaft it is important that the lock rings (6) be inserted in the grooves between the yokes and bushings, to prevent the bushings coming loose and damaging the casings. Also be sure that the lugs on the flange bolt nuts are bent over after the nuts have been securely tightened.

(C) Renew Front Universal Joint

1. Bend over front universal joint nut locks (26) remove flange bolt nuts and take out front flange bolts.

2. Drop front end of propeller shaft, unscrew dust cap (23) from sleeve yoke (29) and pull joint assembly off shaft.

3. Slide dust cap (23), dust washer (24) and disc (25) off front end of shaft and replace with corresponding parts of new joint, then fit new universal joint to propeller shaft and tighten dust washer cap.

4. Renew front universal joint companion flange on transmission mainshaft, if necessary, taking off cotter pin and mainshaft nut and pulling off flange with universal joint flange puller shown on page 2 2, service tool section. Drive new flange on shaft, using a soft hammer; draw up mainshaft nut tightly and cotter pin.

5. Fill front joint with fibre grease through opening in end and bolt to companion flange, drawing nuts up tightly and locking them.
Essex Six Carburetor



Essex Six Carburetor

Ref. No	b. Name of Part	Ref. No.	Name of Part
1.	Float needle valve cap	34.	Adjusting shaft lever clan
2.	Float needle valve	35.	Adjusting screw
3.	Float chamber cover	36.	Adjusting shaft lever
4.	Float counterweight	37.	Adjusting shaft lever swive
5.	Float counterweight axle	38.	Throttle body
6.	Float	39.	Butterfly valve screw
7.	Carburetor body	40.	Suction pipe union
8.	Carburetor body plug	41.	Bell crank swivel
9.	Gasoline pipe union	42.	Hot air pipe lock screw
10.	Float needle valve seat	43.	Air inlet elbow screw
11.	Filter screen and plug	44.	Air inlet elbow
12.	Filter plug gasket	45.	Adjusting shaft lever swive
13.	Adjusting shaft	46.	Throttle body screw
14.	Adjusting shaft packing nut	47.	Aspirating nozzle
15.	Packing nut lock nut	48.	Gear housing gasket
16.	Adjusting shaft packing	49.	Gear housing
17.	Adjusting shaft gland	50.	Gear housing screw
18.	Adjusting shaft gland washer	51.	Gear housing cap gasket
19.	Mixture control tube clip	52.	Gear housing cap
20.	Clip bolt	53.	Throttle shaft lever pin
21.	Float chamber cover screw	54.	Throttle adjusting screw
22.	Bell crank link	55.	Adjusting screw lock scree
23.	Bell crank spring	56.	Air valve cone
24.	Bell crank link nut	57.	Throttle body gasket
25.	Bell crank clevis pin	58.	Metering pin
26.	Bell crank	59.	Air valve stem

- 27. Throttle shaft packing
- 28. Throttle shaft lever
- 29. Butterfly valve
- Throttle shaft 30.
- 31. Adjusting screw pawl spring
- 32. Adjusting screw pawl
- 33. Adjusting shaft lever spring

- np screw
- vel

vel screw

- ew
- 60. Air valve stem guide
- 61. Check valve seat
- 62. Check valve
- Metering pin gland 63.
- 64. Metering pin rack
- Metering pin spring 65.

(A) Renew Carburetor

1. Shut off gasoline valve at bottom of vacuum tank and disconnect gasoline feed pipe at carburetor.

2. Disconnect throttle and mixture control wires at carburetor.

3. Disconnect accelerator rod at carburetor bell crank.

4. Remove set screw from carburetor air inlet and take off hot air pipe.

5. Disconnect vacuum tank suction pipe at top of carburetor.

6. Remove 4 cap screws holding carburetor to cylinder, take off carburetor assembly and replace with new part. Install on motor, reversing above operations.

(B) Renew Float Needle Valve, Weights, Float or Needle Valve Seat

1. Remove screws holding float chamber cover assembly to carburetor and take off cover, float weights and needle valve stem. If any of these parts require renewal, remove float weight pins (5), releasing float weights and valve stem.

Carburetor Group

2. To renew needle valve seat (10), unscrew old seat from carburetor body, using hexagon socket wrench and replace with a new part.

3. Replace parts, fitting new float if necessary, and tighten cover screws.

(C) Renew Air Valve Stem, Cone or Aspirating Nozzle

1. Shut off gasoline valve at bottom of vacuum tank and disconnect gasoline feed pipe at carburetor.

2. Disconnect mixture control wire from adjusting shaft lever (36) at bottom of carburetor.

3. Remove set screw from carburetor air inlet and take off hot air pipe.

4. Remove cap screws (46) holding throttle body to carburetor body and take off lower portion of carburetor assembly.

5. Remove machine screws (50) holding gear housing to carburetor body, unhook spring (33), and take off gear housing assembly (49).

6. Hold the flat surfaces of the air valve cone (56) in a vise or with a wrench while unscrewing the air valve stem (59). A special dowel wrench is required to fit the holes drilled in the bottom of the valve stem when doing this.

7. This will release the aspirating nozzle (47) which, together with the air valve stem and cone, may be renewed if necessary.

It is advisable, before reassembling, to make sure that the ball check valves (62) in the bottom of the air valve stem move freely in their seats, otherwise the carburetor action will be sluggish. The air valve cone should also be inspected to make sure that the low speed air inlet holes are not obstructed.

8. Place air valve stem in position in carburetor body, fit nozzle to top of stem and screw air valve cone tightly on stem. Care must be exercised when doing this to see that the parts are entirely free from dirt, etc., and that the stem and cone after assembly slide freely up and down in the carburetor body.

9. Reassembling of the carburetor may be completed by reversing operations 1 to 4 inclusive, fitting new gaskets (48, 57) to gear housing and throttle body.

(D) Clean Carburetor

1. Shut off gasoline valve at bottom of vacuum tank and disconnect gasoline feed pipe at carburetor.

2. Disconnect mixture and throttle control wires at carburetor.

3. Disconnect accelerator rod at carburetor bell crank.

4. Remove set screw at carburetor air inlet and take off carburetor hot air pipe.

5. Remove four screws holding carburetor to cylinder block and take off carburetor assembly.

6. Thoroughly clean carburetor with a stiff brush and gasoline so there will be no danger of dirt working into the inside of the carburetor when it is disassembled.

7. Remove float chamber cover screws (21), take off float chamber cover assembly, float and needle valve.

8. Remove strainer from bottom of float chamber, unscrewing strainer plug (11).

9. Remove cap screws (46) from carburetor body and take off throttle body assembly.

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10. Remove screws (50) holding gear housing (49) to carburetor body and take off gear housing.

11. The carburetor body and disassembled parts may now be thoroughly cleaned in gasoline and blown out with compressed air, if available. Be sure that the openings through the needle valve seat, from float chamber to dashpot chamber and through air valve stem and aspirating nozzle, are perfectly clean and free of obstructions which might hinder the flow of gasoline through these parts.

Also make certain that the low speed air inlet holes in the air valve cone (56) are open, and that the adjusting pinion and metering pin assembly operate smoothly in the gear housing. The ball check valves in the bottom of the air valve stem (59) should be examined to make sure they are free to move up and down.

On account of their accurately machined surfaces, it is important when cleaning the air valve stem, metering pin and component parts, that no abrasives, files or emery cloth be used, otherwise the carburetor will not function properly when reassembled.

12. After all parts have been properly cleaned, the carburetor should be reassembled by reversing the operations listed above. When doing this be particularly careful to see that the metering pin and air valve are free to slide up and down in the carburetor body in all positions of rotation. It is also advisable, if the carburetor has been in service for some time, to renew strainer plug gasket (12), throttle body gasket (57), and gear housing gasket (48), in addition to slightly tightening packing nut (14) surrounding the pinion shaft.

(E) Renew Gear Housing, Metering Pin Assembly, Adjusting Shaft and Pinion, Gland or Packing

1. Shut off gasoline by turning valve at bottom of vacuum tank, and disconnect gasoline feed pipe at carburetor.

2. Disconnect mixture control wire at carburetor adjusting lever (36).

3. Remove set screw holding carburetor hot air pipe to carburetor; take off pipe.

4. Remove cap screws (46) holding throttle body to carburetor body and take off lower carburetor assembly.

5. Unscrew gear housing cap (52) and remove metering pin spring (65).

6. Unhook adjusting shaft lever spring (33), remove gear housing screws (50) and take off gear housing assembly.

7. Loosen clamp screw (34) on adjusting shaft lever (36) and pull lever off shaft.

8. Unscrew adjusting shaft gland (17) from gear housing, this will allow the removal of the shaft and pinion (13), also metering pin and rack (58). Renew gear housing or component parts where necessary and reassemble parts as follows:

9. Replace metering pin and rack assembly in gear housing.

10. Assemble pinion and shaft in gland; tighten packing and lock nuts (14, 15), and screw assembled parts in gear housing, meshing adjusting pinion with rack on metering pin.

11. Replace gear housing and parts, fitting new gasket between housing and carburetor body and tightening the screws.

12. Grasp end of adjusting shaft between fingers and turn shaft slowly to the left or anti-clockwise so the metering pin (58), will be forced up into the air valve (59), lifting it up from its seat in the carburetor body. (If the shaft turns too stiffly to be moved by the fingers, the lever (36) may be slipped on the end of the shaft and used as a wrench.)

Carburetor Group

13. Next turn the adjusting shaft in the opposite direction or to the right, very slowly until the air valve just touches the seat. When in this position, measurement should be taken of the distance between the bottom face of the metering pin rack (64), and the bottom face of the gear housing (49) against which the cap (52) seats. This can be done with a narrow scale or depth gauge inserted in the opening in which the rack operates.

14. The adjusting shaft should then be turned slightly further to the right so the bottom of the metering pin rack will be lowered 1/16" as measured by the scale.

15. Carefully slide adjusting shaft lever off end of shaft so the position of the shaft will not be disturbed; then turn adjusting screw (35) up or down as necessary so it will be in the center of its travel.

Replace lever on shaft so the top edge of the lever will be just even with the bottom of the adjusting screw (35).

16. Tighten clamp screw (34) on lever and hook spring (33) in position. Make sure packing nut (14) is not too tightly adjusted to prevent the spring from keeping lever (36) against the screw.

17. Replace spring (65) in the bottom of metering pin rack and screw gear housing cap (52) on gear housing.

18. To complete the reassembling of the carburetor reverse operations 1 to 4 inclusive, using a new gasket between carburetor body and throttle body. After the motor has been run sufficiently to become warmed up the final adjustment of the carburetor should be made by turning the screw (35).

Essex Six Motor



Essex Motor

Ref. No. Name of Part

- 1. Exhaust manifold stud-long
- 2. Exhaust manifold stud nut
- 3. Exhaust manifold clamp
- 4. Exhaust manifold stud-short
- 5. Exhaust manifold
- 6. Carburetor to cylinder cap screw
- 7. Carburetor
- 8. Cylinder side plate nut
- 9. Cylinder side plate
- 10. Cylinder side plate gasket
- 11. Flywheel
- 12. Flywheel weight bolt lock plate
- 13. Flywheel weight bolt
- 14. Flywheel weight plate
- 15. Flywheel weight
- 16. Clutch stud sleeve
- 17. Flywheel bolt
- 18. Flywheel bolt nut
- 19. Rear motor support plate
- 20. Oil reservoir drain plug

Ref. No. Name of Part

- 21. Oil reservoir
- 22. Oil reservoir gasket
- 23. Cylinder oil deflecting shield
- 24. Distributor assembly
- 25. Oil pump to front motor plate pipe
- 26. Oil pump pipe union nut
- 27. Distributor lock stud nut
- 28. Distributor lock stud
- 29. Distributor support pipe plug
- 30. Distributor support bolt
- 31. Oil pump body bolt
- 32. Distributor support spacer
- 33. Distributor support
- 34. Gear case cover gasket
- 35. Gear case cover bolt
- 36. Distributor support Welch plug
- 37. Distributor support lower plug gasket
- 38. Distributor support lower plug
- 39. Oil pump body gasket



Essex Motor

Ref. No. Name of Part

- 40. Cylinder head stud nut
- 41. Fan support arm stud
- 42. Fan support arm stud gasket
- 43. Front motor support plate gasket
- 44. Front motor support plate cap screw
- 45. Gear case cover cap screw
- 46. Gear case cover
- 47. Starting crank jaw
- 48. Fan pulley
- 49. Front motor support plate
- 50. Water outlet manifold
- 51. Water outlet manifold stud nut
- 52. Water outlet manifold gasket
- 53. Water inlet elbow gasket

Ref. No. Name of Part

- 54. Water inlet elbow
- 55. Water inlet elbow stud-short
- 56. Water inlet elbow stud-long
- 57. Oil reservoir gauge
- 58. Oil filler cover
- 59. Oil filler body
- 60. Starter stud nut
- 61. Starter stud
- 62. Bendix drive spring screw
- 63. Bendix drive head
- 64. Bendix drive spring
- 65. Bendix drive counterweight
- 66. Bendix drive pinion
- 67. Starting motor



Essex Motor

Ref. No. Name of Part

- 68. Cylinder head stud
- 69. Cylinder head gasket
- 70. Exhaust manifold ring
- 71. Exhaust manifold gasket
- 72. Valve spring
- 73. Tappet adjusting screw
- 74. Valve spring seat
- 75. Tappet adjusting screw nut
- 76. Tappet adjusting screw plate
- 77. Tappet oil baffle plate
- 78. Cylinder side plate stud
- 79. Tappet guide clamp screw
- 80. Tappet guide clamp
- 81. Generator strap
- 82. Generator bracket bolt

Ref. No. Name of Part

- 83. Generator strap screw
- 84. Generator strap screw nut
- 85. Generator
- 86. Generator bracket
- 87. Oil pump suction pipe
- 88. Generator coupling
- 89. Generator coupling bolt nut
- 90. Generator coupling bolt
- 91. Generator coupling clamp
- 92. Oil pump body
- 93. Oil pump inlet connection gasket
- 94. Oil pump inlet connection
- 95. Oil pump inlet connection elbow
- 96. Oil pump pipe union nut

(A) Remove Carbon, Grind Valves, Renew Cylinder Head, Cylinder Head Gasket, Valves or Valve Guides

1. Open drain cock at bottom of radiator and drain water out of cooling system.

2. Loosen hose clamps on upper water hose and slide hose off water outlet manifold.

3. Disconnect spark plug wires at spark plugs, pry cable tube out of clips and remove.

4. Disconnect high and low tension wires at terminals on ignition coil.

5. Remove set screw in carburetor air inlet elbow and take off hot air pipe.

6. Remove 3 nuts from exhaust manifold studs and take off carburetor air heater.

7. Disconnect vacuum tank suction pipe at carburetor.

8. Shut off valve at bottom of vacuum tank and disconnect gasoline feed pipe at carburetor.

9. Disconnect accelerator rod at carburetor bell crank.

10. Disconnect throttle and mixture control wires at carburetor.

11. Remove 4 cap screws holding carburetor to cylinder and take off carburetor.

12. Remove cylinder side plate nuts and take off side plates.

13. Remove nuts from cylinder head studs and take off cylinder head and cylinder head gasket, prying up evenly on opposite sides. The cylinder head as well as the tops of the pistons, valves and cylinder block may now be cleaned of carbon deposits by scraping or by means of a wire carbon removing brush operated by an electric drill. It is advisable when doing this, to stuff rags in the cylinders on top of the pistons to prevent particles of carbon from getting between the pistons and cylinder walls.

14. Compress valve springs either singly or by means of multiple valve lifters, remove valve spring retainers and take out valves. Insert valve stems through holes drilled in a board in their order of removal from the cylinder block to prevent them becoming mixed.

15. If valve guides require renewal, drive old guides out of cylinder block with a drift or piece of brass rod. Insert new guides, using valve stem guide puller shown on page 20, service tool section, to draw them into position. After installing, they should be reamed to size, using valve stem guide reamer shown on page 11, service tool section.

16. Thoroughly clean values of carbon with wire brush or by scraping, also clean inside of value stem guides. Note carefully the condition of the seats on the values and cylinder block; if they are at all badly pitted, a great deal of time will be saved and a far better job will be done by having the value faces ground true on a value refacing machine, and the seats refaced in the cylinder block. On page 17, service tool section, will be found equipment specially designed to cover this class of work, the use of which will greatly expedite value grinding operations. After the values and cylinder block have been refaced, or if the values have been renewed, a slight grinding in is necessary to insure a perfect seat; this is done as follows:

17. Crank the engine if necessary to make sure that the cam operating the valve to be ground, is not holding the valve off its seat. Spread a thin coating of valve grinding compound, either water or oil mixed, on the face of the valve (a fine grade should be used). Place a light open coil spring over the valve stem and insert valve in position in cylinder block. This spring should be of sufficient size and tension to just keep the valve off the cylinder block. Rotate valve on seat from right to left with a semi-circular movement, using an electric or hand operated valve grinder or by means of a screw driver held in the slot in the

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valve head. It is very important when doing this, that the head of the valve be frequently raised and turned around half a revolution to guard against cutting grooves in the valve and seat. When the grinding has been properly done, the valves and seats will have a silvery color throughout their entire circumference. After the grinding has been completed be sure to clean valve and cylinder to remove all traces of grinding compound.

18. Replace valves in their respective positions and insert spring seats and retainers.

19. Replace cylinder head, using new cylinder head gasket. When tightening cylinder head nuts, start at the center and work toward the ends, alternating on each side and with uniform pressure on the wrench. After the engine has been run and thoroughly warmed up, the nuts should again be drawn up tight.

20. The motor assembling may now be completed by reversing operations 1 to 11 inclusive. It should then be run a sufficient length of time to become warmed up, after which the tappets should be readjusted to allow a clearance of from .002" to .003" minimum on the inlet valves, and from .004" to .005" minimum on the exhaust valves. Replace cylinder side plates, using new gaskets if necessary and tightening side plate nuts sufficiently to prevent oil leaks without springing the side plates out of shape.

(B) Renew Valve Spring, Seat, Retainer, or Tappet Adjusting Screw

1. Remove cylinder side plate stud nuts, take off cylinder side plates.

2. Raise valve with valve lifter and remove valve spring retainer.

3. Remove valve spring, seat, and tappet adjusting screw; renew parts where necessary.

4. Reassemble parts, reversing the foregoing operations. Before replacing the cylinder side plates adjust intake valve tappets to .002" to .003" clearance minimum, and exhaust valve tappets to .004" to .005" clearance, with hot motor.

(C) Renew Valve Tappet, Tappet Guide, Tappet Roller or Roller Pin

1. Open drain cock at bottom of radiator and drain water out of cooling system.

2. Loosen hose clamps on upper water hose and slide hose off water outlet manifold.

3. Disconnect spark plug wires at spark plugs, pry cable tube out of clips and remove.

4. Disconnect high and low tension wires at terminals on ignition coil.

5. Remove set screw in carburetor air inlet elbow and take off hot air pipe.

6. Remove 3 nuts from exhaust manifold studs and take off carburetor air heater.

7. Disconnect vacuum tank suction pipe at carburetor.

8. Shut off valve at bottom of vacuum tank and disconnect gasoline feed pipe at carburetor.

9. Disconnect accelerator rod at carburetor bell crank.

10. Disconnect throttle and mixture control wires at carburetor.

11. Remove 4 cap screws holding carburetor to cylinder and take off carburetor.

12. Remove cylinder side plate nuts and take off side plates.

13. Remove nuts from cylinder head studs and take off cylinder head and cylinder head gasket, prying up evenly on opposite sides.

14. Compress valve springs with valve lifter, remove valve spring retainers and take out valves, valve springs and seats. Insert valve stems through holes drilled in a board in their order of removal from the cylinder block to prevent them becoming mixed.

15. Remove tappet guide clamp screws, clamps and oil shields.

16. The valve tappet assemblies may now be lifted out of position and any parts which require renewal should be replaced. When removing the tappet assemblies, it is advisable to leave the adjusting screws, lock nuts and plates, screwed into the tappets so there will be no danger of the tappets dropping out of the guides and into the interior of the motor. As smaller diameter rollers requiring different tappets and guides were used on motors numbered 384086 and upward, it is very essential, when renewing tappets, guides or rollers, to make certain that the proper parts are used, otherwise serious damage will be done. The guides used with the old type large rollers have the roller slots milled 1" deep, while the small roller guides are slotted 13/16" in depth. This difference in the depth of the slots prevents interchangeability as the large rollers would bottom in the new type guides.

17. Reassemble motor, reversing operations 1 to 11 inclusive, also 13 and 14. After the motor has been run sufficiently to become thoroughly warmed up, the tappets should be adjusted to a clearance of from .002" to .003' on the inlet valves and .004" to .005" on the exhaust valves. Replace cylinder side plates, tightening nuts just sufficiently to prevent oil leaks.

(D) Renew Exhaust Manifold, Exhaust Manifold Gasket or Packing Nut

1. Disconnect spark plug wires at spark plugs, pry cable tube out of clips and remove.

2. Disconnect high and low tension wires at terminals on ignition coil.

3. Remove set screw in carburetor air inlet elbow and take off hot air pipe.

4. Remove 3 nuts from exhaust manifold studs and take off carburetor air heater.

5. Unscrew exhaust manifold packing nut out of exhaust manifold, using spanner wrench shown on page 26, service tool section.

6. Remove nuts and clamps from exhaust manifold studs.

7. The exhaust manifold may now be removed and renewed, together with packing nut and gaskets, as necessary.

8. To reassemble motor, the foregoing operations should be reversed, fitting new packing to exhaust manifold before tightening packing nut.

(E) Rebush or Renew Distributor and Oil Pump Support, Distributor Drive Gear, Distributor Shaft, Oil Pump Eccentric, Oil Pump Eccentric Shaft,

Support Gasket, Eccentric Adjusting Plate or Generator Shaft Ball Bearing

1. Disconnect generator wire at terminal on top of generator.

2. Remove nut, bolt and clamps at front end of generator coupling.

3. Remove clamp screw from generator strap and take off generator.

4. Unscrew union nuts and disconnect oil pump suction, pressure gauge and delivery pipes at oil pump.

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5. Remove cap screws holding oil pump to support and take off oil pump assembly.

6. Unhook spring clamps holding distributor head to distributor and take off head and wires.

7. Disconnect low tension wire from ignition coil at side of distributor.

8. Loosen nut on distributor lock stud and lift distributor out of support.

9. Pull coupling sleeve off rear end of generator drive shaft.

10. Remove 3 bolts holding distributor support to front motor plate and take off support assembly, gasket, eccentric adjusting plate and generator shaft ball bearing.

11. Remove plug and gasket from bottom of distributor support.

12. Remove hexagon nut from bottom of distributor shaft by means of socket wrench inserted through plug opening.

13. Remove distributor shaft by driving shaft upward through gear and housing, using a hammer and piece of 3/8" brass rod.

14. To rebush or renew oil pump worm wheel and eccentric or eccentric shaft, drill hole through center of expansion plug and pry plug out of support with pointed instrument inserted through hole in plug.

15. Pull out dowel pin projecting through support at oil pump flange face.

16. Remove oil pump eccentric shaft by pressing shaft outward from inside of support, this will release oil pump eccentric and gear.

17. Rebush or renew support and other parts where necessary. If the support is to be rebushed, press out old bushings and install new ones, using drift and hammer or arbor press. After new bushings have been pressed in place, they should be line reamed with distributor support line reamer shown on page 11, service tool section. The use of this reamer will insure the correct sizing of the bushings as well as proper alignment.

18. The reassembling of the parts is accomplished by reversing the preceding operations, fitting a new expansion plug to support after installing oil pump eccentric and shaft. When replacing the distributor support assembly, it is important that the gear teeth on the generator drive shaft and the distributor driven gear, be meshed so the driving slot at the top of the distributor shaft is lengthwise of the motor, or parallel with the crankshaft, when No. 1 cylinder is on dead center on the firing stroke.

19. Crank motor very slowly until the mark "DC 1-6," which is stamped on the flywheel, is exactly even with the lower edge of the square opening in the right side of the rear motor support plate.

20. Replace distributor assembly, making sure that the oiler and low tension wire terminal, as well as the metal segment on the rotor, point directly away from the cylinder.

2 1. Place rotor on distributor cam and turn distributor housing to right or clockwise, until metal strip on rotor has just passed the terminal on the distributor head to which No. 1 spark plug wire is fastened.

22. Remove rotor from cam and turn housing slightly to left or anti-clockwise, until the contact points just begin to separate, then tighten nut on distributor lock stud.

(F) Renew Timing Sprockets, Chain, Gear Case Cover, Cover Gasket, Camshaft, Camshaft Thrust Button, Thrust Spring, Thrust Washer, Generator Sprocket Stationary or Floating Coupling or Thrust Washer

1. Remove bonnet assembly.

2. Open drain cock at bottom of radiator and drain water out of cooling system.

3. Loosen hose clamps on upper water hose and slide hose off water outlet manifold.

4. Loosen hose clamp at forward part of lower water hose and slide hose off radiator outlet.

5. Remove nuts from bolts at bottom of radiator holding radiator to frame cross member.

6. Disconnect radiator shutter operating rod at radiator.

7. Unscrew radiator tie rod from upper tank and remove radiator.

8. Loosen fan support arm lock stud nut and remove fan and fan belt.

9. Unscrew starting crank jaw at front end of crankshaft using starting crank jaw wrench shown on page 23, service tool section, and take off washer and fan pulley.

10. Remove cap screws and bolts from gear case cover and take off cover.

11. Remove lock wire and cap screws from camshaft sprocket.

12. Take off sprocket, thrust plunger, washer, spring, guide, and timing chain.

13. Remove nuts from cylinder side plate studs and take off side plates.

14. Raise valves and tappets and hold in wide open position by means of multiple valve lifters or by 1/4" hexagon nuts placed on edge between top of tappet guides and tappet adjusting screw plates.

15. The camshaft may now be withdrawn from the crankcase and renewed, together with the camshaft thrust washer, as necessary.

16. If the crankshaft sprocket requires renewal, it should be removed from the crankshaft and the new sprocket driven on, by the use of the crankshaft sprocket puller and driver shown on page 23, service tool section.

17. To disassemble generator drive shaft sprocket and coupling, cut off riveted portion of stationary coupling pin, drive pin out of coupling and pull coupling off generator shaft.

This will permit the removal of the floating coupling, generator sprocket, generator sprocket thrust washer and thrust washer springs which may be replaced with new parts if required.

18. To reassemble motor, the foregoing operations should be reversed. When installing the camshaft sprocket and timing chain, it is necessary to re-time the valves and ignition, which is accomplished as follows: On the side of the chain facing the front of the motor, will be found arrows stamped on the links which should point in the direction in which the motor runs. Upon close observation, two punch marks will be seen on the link pins which are exactly 20 links apart. The chain should be placed on the camshaft sprocket so that one of these punch marks will coincide with similar punch marks on the sprocket teeth. The crankshaft should then be turned until the tooth in the crankshaft sprocket bearing a punch mark will engage the link in the chain which is likewise marked. The generator drive sprocket must be meshed with the chain so that the slot in the top of the distributor drive shaft will be lengthwise of the motor when No. 1 piston is on upper dead center on the firing stroke.

19. To re-time the ignition, remove spark plug in No. 1 cylinder and crank motor very slowly until the mark "DC 1-6" which is stamped on the flywheel, is exactly even with the lower edge of the square opening in the right side of the rear motor support plate. It is possible, however, to time slightly ahead of this point if considered necessary, checking results by tests on the road, and retarding spark if the motor shows a tendency to knock.

20. Loosen nut on clamp stud at bottom of distributor.

21. Place rotor on cam and turn distributor housing to right or clockwise, until metal strip on rotor has just passed the terminal on the distributor head to which No. 1 spark plug wire is fastened.

22. Remove rotor from cam and turn distributor housing slightly to left or anti-clockwise, until contact points just begin to separate.

23. Tighten nut on clamp stud and replace rotor and distributor head.

(G) Renew Generator Drive Shaft

1. Remove bonnet assembly.

2. Open drain cock at bottom of radiator and drain water out of cooling system.

3. Loosen hose clamps on upper water hose and slide hose off water outlet manifold.

4. Loosen hose clamp at forward part of lower water hose and slide hose off radiator outlet.

5. Remove nuts from bolts at bottom of radiator holding radiator to frame cross member.

6. Disconnect radiator shutter operating rod at radiator.

7. Unscrew radiator tie rod from radiator upper tank and remove radiator.

8. Loosen stud nut on fan supporting arm and remove fan and fan belt.

9. Unscrew starting crank jaw at front end of crankshaft using starting crank jaw wrench shown on page 23, service tool section, and take off washer and fan pulley.

10. Remove cap screws and bolts from gear case cover and take off cover assembly.

11. Remove lock wire and cap screws from camshaft sprocket.

12. Take off sprocket, thrust button, guide, and timing chain.

13. File or cut off riveted portion of stationary coupling pin, drive pin out of coupling and pull coupling off generator shaft, this will permit the removal of the floating coupling, generator sprocket, generator sprocket thrust washer and thrust washer springs.

14. Disconnect generator wire at terminal on top of generator.

15. Remove nut and take off generator coupling bolt and clamp.

16. Remove clamp screw from generator strap and take off generator.

17. Unscrew union nuts and disconnect oil pump suction, pressure, and delivery pipes from oil pump.

18. Remove cap screws holding oil pump to support and take off oil pump assembly.

19. Unhook spring clamps holding distributor head to distributor and take off head and wires.

20. Disconnect low tension wire from ignition coil at side of distributor.

21. Loosen nut on distributor lock stud and lift distributor assembly out of support.

22. Remove three bolts holding distributor support to front motor plate and remove support assembly, eccentric, eccentric adjusting plate and gaskets and generator drive shaft.

23. The reassembling of the parts is accomplished by reversing the preceding operations, fitting a new expansion plug to support after installing oil pump eccentric and shaft. When replacing the timing chain, it is important that the driving slot at the top of the distributor shaft is parallel with the crankshaft when No. I cylinder is on dead center on the firing stroke. To properly time the valves, it is also necessary when doing this, to make sure that the punch marked link pins on the front face of the timing chain which are exactly 20 links apart, mesh with the teeth on the crank and cam shaft sprockets similarly marked.

24. Crank motor very slowly until the mark "DC 1-6" which is stamped on the flywheel, is exactly even with the lower edge of the square opening in the right side of the rear motor support plate.

25. Replace distributor assembly, making sure that the oiler and low tension wire terminal as well as the metal segment on the rotor, point directly away from the cylinder.

26. Place rotor on distributor cam and turn distributor housing to right or clock-wise, until metal strip on rotor has just passed the terminal on the distributor head to which No. 1 spark plug wire is fastened.

27. Remove rotor from cam and turn housing slightly to left or anti-clockwise, until the contact points just begin to separate, then tighten nut on distributor lock stud.

(H) Renew Generator Assembly

1. Disconnect wire at terminal on top of generator.

2. Remove nut from rear generator coupling bolt, and take out bolt and clamps.

3. Loosen clamp screw at bottom of generator strap, pull generator backward out of coupling and remove from motor.

4. Place new generator in position on bracket, seeing that sufficient paint has been removed to allow a positive ground connection. After replacing coupling bolt and clamps, and securely tightening the bolt nut, the clamp screw on the generator strap should be firmly drawn up so there will be no opportunity for the generator to work around in the bracket and become short circuited.

Also carefully check the alignment of the generator after completing the installation as it is imperative that the generator be central with the drive shaft, otherwise rapid deterioration and failure of the coupling will result. Lining up of the generator can be accomplished by removing the generator bracket from the crankcase and filing the bolt holes slightly, or by bending the bracket., Place several drops of light oil in the oilers provided at either end of the generator.

(I) Renew Distributor Assembly

1. Disconnect spark plug and coil wires at distributor head.

2. Disconnect low tension wire from coil at side of distributor.

3. Loosen nut on distributor lock stud and lift off distributor assembly.

4. Place finger over spark plug opening on No. 1 cylinder and crank motor by hand until the rush of air indicates that the piston is coming up on the compression stroke. Continue to crank motor very slowly until the mark "DC 1-6," which is stamped on the flywheel, is exactly even with the lower edge of the square sight hole in the right side of the rear motor support plate.

5. Remove head from new distributor, turn shaft and rotor so that metal segment on rotor will point directly away from the cylinder. Install distributor on motor, turning housing so the oiler and low tension wire terminal will also point directly away from the cylinder.

6. Adjust contact points to .020" gap at wide open position.

7. Connect spark plug and coil wires to distributor. No. 1 spark plug wire must be fastened to the terminal on the distributor head which is farthest from the cylinder block, followed, in right hand or clockwise order, by wires leading to No. 5, No. 3, No. 6, No. 2 and No. 4 spark plugs.

8. Turn distributor housing slightly to right or clockwise, until the terminal on the distributor head to which No. 1 spark plug wire is fastened, has just passed the metal strip on the rotor.

9. Remove head and rotor and turn housing slightly to left or anti-clockwise, until the contact points just begin to separate.

10. Tighten nut on distributor lock stud and replace rotor and distributor head.

(J) Renew Pistons, Piston Pins, Piston Rings, Piston Pin Bushings, Connecting Rods or Refit Connecting Rod Bearings

1. Open drain cock at bottom of radiator and drain water out of cooling system.

2. Loosen hose clamps on upper water hose and slide hose off water outlet manifold.

3. Disconnect spark plug wires at spark plugs, pry cable tube out of clips and remove.

4. Disconnect high and low tension wires at terminals on ignition coil.

5. Remove set screw in carburetor air inlet elbow and take off carburetor hot air pipe.

6. Remove 3 nuts from exhaust manifold studs and take off carburetor air heater.

7. Loosen packing nut at rear end of exhaust manifold, using exhaust manifold packing nut wrench shown on page 26, service tool section.

8. Remove nuts from exhaust manifold studs, take off clamps and exhaust manifold.

9. Remove nuts from cylinder head studs, using cylinder head nut wrench shown on page 24, special tool section; take off cylinder head and gasket, prying up evenly on opposite sides.

10. Place receptacle under oil reservoir, remove drain plug and drain motor oil.

11. Remove cap screws holding oil reservoir to crankcase and take down oil reservoir.

12. Remove cotter pins and nuts from connecting rod bolts, take off caps and shirns and remove connecting rods and pistons through bottom of cylinder. This operation requires care to prevent damaging the pistons and is best accomplished by slowly turning the crankshaft when removing the parts. On late type motors having detachable counterweights, it is necessary to remove the weights before the connecting rods and pistons can be taken out in this manner. This may be done by removing the cotter pins and nuts securing them to the crankshaft, after first having carefully marked the weights with a prick punch or other means to insure their replacement in exactly the original positions. It is extremely important that this detail is followed out and the weights properly replaced, otherwise the crankshaft will be thrown out of balance and destructive vibration will result.

13. Remove piston pin lock rings from pistons, prying them out of the grooves with a screwdriver.

14. To eliminate the possibility of damaging or breaking the pistons when removing or replacing piston pins, the pistons should be heated to a temperature of approximately 200 degrees or as hot as can be handled with gloves. This may be done by means of a small electric piston preheating stove, plans of which we will furnish upon request, or by an electric or gas plate or blow torch.

15. When pistons are to be renewed, it is advisable to measure the cylinder bores to determine whether they are worn excessively out of round or tapered. In the equipment section is shown a type of cylinder measuring gauge which enables this work to be accurately done within minimum expenditure of time. In event this condition exists, or if the bores are scored or damaged, they should be trued up with a cylinder hone or grinder, making them uniform in size and removing only enough stock

to enable the next oversize piston to be used. A complete list of piston sizes furnished by the factory, together with their markings, will be found in reference sheet No. 18. New pistons should be fitted to the cylinder bores with a clearance of .0015" to .002", and must be installed on the connecting rods so the sawcut or split in the skirt will face the left side of the cylinder or the side opposite the valves.

16. To ream piston bosses for new or oversize piston pins, a long pilot, spiral expansion piston pin reamer similar to that shown on page 11, service tool section, should be used. It is essential that the piston bosses be finished reamed from .0015" to .002" under the diameter of the pin to be used to insure a good fit when the motor is in operation.

The reaming of the piston pin bushing in the connecting rod is best done by holding the connecting rod in a vise with the piston pin bushing in a vertical position, using a tap wrench of the type illustrated on page 26, service tool section, to turn the reamer. This generally produces more satisfactory results than holding the reamer in the vise and revolving the connecting rod around it, in which case there is a possibility of reaming the bushing bell-mouthed due to the weight of the big end of the rod and the natural tendency of the mechanic to exert a downward pressure on the rod when turning it.

17. To renew piston rings, place connecting rod in vise or hold piston in piston vise while removing or replacing rings. On page 25, service tool section, is shown a piston vise and piston ring spreader which facilitate this work. Thoroughly clean ring grooves in piston of dirt and carbon and test fit of new rings in grooves. They should be of the proper width to slide freely in the piston grooves without perceptible play or looseness. If they are too wide it will be necessary to carefully dress them down until the above fit is obtained. This is best done by fastening the ring to a small flat board into which a number of small brads are driven in a circle, so the heads project from the board slightly less than the width of the ring.

A sheet of No. 0 or No. 1/2 emery cloth is then laid on a surface plate, and the board with the ring attached, is moved back and forth with a light even pressure of the hand. It is important when doing this, that the ring be occasionally turned around to insure removing an equal amount of metal on all sides, and also that the square edges of the ring are not removed. After the rings have been properly fitted to the piston grooves, any burrs on the faces should be removed, and the slots or gaps fitted to the cylinder bores.

The gap should be tested by inserting the ring in the cylinder in which it is to be used and pressing the open end of the piston against it so that it will be perfectly square in the bore. The slot clearance or gap should then be accurately measured with a feeler gauge, and if necessary, the edges of the ring dressed with a thin smooth file until the opening measures .006", after which they should be placed on their respective pistons.

18. To renew connecting rods, proceed as follows:

Due to the babbitt of the big end bearing being poured directly into the rod, it is necessary to renew the connecting rod when replacing a burned out bearing. Old connecting rods requiring new bearings may be exchanged at the factory for re-babbitted rods at a price of \$1.50 each. The new rods as supplied by the factory have the bearings finished approximately to size so that very little work is necessary to fit them to the crankshaft.

When renewing rods the piston pin bushings should first be reamed to fit the piston pins properly, as outlined in operation No. 16, then face the sides of the bearings until the end play on the crankpins is .008". Fitting the connecting rod bearings to the crankshaft is best done by means of a connecting rod bearing reamer, either of the adjustable or solid type shown on page 24, service tool section. With ordinary care a satisfactory bearing can be obtained by the use of this tool in far less time than that required by hand scraping. If no reamer is available and it is necessary to scrape the bearing in, proceed as follows:

Connecting rod bearings may be scraped to fit the crankshaft or an accurately machined arbor which is the same diameter as the crankshaft. Separate cap from rod and spread a thin coating of Prussian blue on the crankshaft or arbor, then replace shims and draw up cap tight. Rock connecting rod back and forth on the shaft a few times, then remove cap and examine bearings. The blue marks on the bearings indicate the points of contact with the shaft and must be removed by scraping. This must be very carefully done so that a very thin shaving of metal will be removed from the blued spots on the bearings.

After all of these "high spots" have been scraped down, the shaft should again be blued and the connecting rod cap tightened. Remove cap from rod after rocking rod on shaft and repeat scraping process described above.

This should be done as many times as necessary, until the bearings finally show a fine series of spots, close together and uniformly distributed over the entire surface. When properly fitted, the connecting rod bearings will be .001" larger than the crankpins, and it is essential that this clearance be maintained when assembling the connecting rods to the crankshaft to provide space for an oil film.

19. When new connecting rods or piston pin bushings have been installed or bearings fitted, it is necessary that the connecting rods be tested for alignment, as a satisfactory job cannot be done unless the piston pins are perfectly parallel with the crankshaft in all directions, and the proper clearance exists between the upper ends of the rods and the bosses on the inside of the pistons. On page 10, service tool section, a connecting rod aligning fixture is shown which enables a proper check of rod alignment to be made with a minimum expenditure of time and labor. When using a fixture of this type, it is advisable to remove the piston from the connecting rod before checking the alignment, as the varying diameters of the lands and skirt, together with the extensive relief surrounding the piston pin boss, do not afford a good contact between the side of the piston and the aligning disc on the fixture. If the connecting rods are found to be bent or twisted when checked on the aligning fixture, it will be necessary to straighten them with a bending iron until the contact plate, which is fitted to the upper end of the rod, touches the aligning disc at all points. The connecting rod bending iron illustrated on page 20, service tool section, will be found indispensable when doing this work.

20. Reassemble pistons to connecting rods after aligning has been completed, heating the pistons and placing them on the rods so the diagonal split in the skirt will be on the left side when assembled in position in the motor.

21. Assemble connecting rods and pistons to motor, after thoroughly cleaning bearings and cylinder, and spreading a film of oil on surfaces. When doing this, be sure that a sufficient number of shims is used to allow a clearance of approximately .001' for lubrication when the cap bolts are drawn up tight. Connecting rod bearings adjusted with this clearance will fit the crankshaft just tight enough to require a light hammer blow to take up the end play of the rod on the crankpin.

It is essential, when doing this work, that all of the connecting rod bearings be adjusted evenly as the additional friction of one bearing adjusted tighter than the others would prevent smooth and quiet operation. Make sure that all of the connecting rod bolt nuts are securely cotter pinned after adjustment has been completed.

22. If the counterweights have been removed, they should be replaced in exactly he same positions as originally installed at the factory, tightening the nuts thoroughly and cotter pinning them.

23. Complete reassembling of motor by reversing operations 1 to 11 inclusive, fitting new cylinder head gasket and new packing at exhaust pipe to manifold joint.

(K) Renew Motor Assembly, Crankshaft or Camshaft Bearings; Renew or Refit Crankshaft Bearings

1. Remove bonnet assembly.

2. Open drain cock at bottom of radiator and drain water out of cooling system.

3. Loosen hose clamps on upper water hose and slide hose off water outlet manifold.

- 4. Loosen hose clamp at forward part of lower water hose and slide hose off radiator outlet.
- 5. Remove nuts from bolts at bottom of radiator holding radiator to frame cross member.
- 6. Disconnect radiator shutter operating rod at radiator.
- 7. Unscrew radiator tie rod from upper tank and remove radiator.
- 8. Loosen fan support arm lock stud nut and remove fan and fan belt.
- 9. Disconnect spark plug wires at spark plugs, pry cable tube out of clips and remove.

10. Disconnect high and low tension wires at terminals on ignition coil.

11. Remove set screw in carburetor air inlet elbow and take off hot air pipe.

- 12. Remove three nuts from exhaust manifold studs and take off carburetor air heater.
- 13. Disconnect vacuum tank suction pipe at carburetor.
- 14. Shut off valve at bottom of vacuum tank and disconnect gasoline feed pipe at carburetor.
- 15. Disconnect accelerator rod at carburetor bell crank.
- 16. Disconnect throttle and mixture control wires at carburetor.
- 17. Remove four cap screws holding carburetor to cylinder and take off carburetor.
- 18. Remove cylinder side plate nuts and take off side plates.

19. Remove toe and floor boards.

- 20. Remove clevis pin at bottom of hand brake lever and disconnect hand brake pull rod.
- 21. Remove clevis pin at lower part of brake pedal and disconnect foot brake pull rod.
- 22. Unscrew sleeve at rear end of speedometer drive shaft and disconnect shaft from transmission.
- 23. Remove bolts from flange of front universal joint and disconnect propeller shaft.
- 24. Remove cap screws holding transmission case cover to transmission and take off control hand lever assembly.
- 25. Remove clevis pin from clutch adjustable link and disconnect clutch throwout yoke.
- 26. Remove-bolts holding pedal control bracket to transmission and take off pedal control assembly.
- 27. Unscrew exhaust manifold packing nut at rear end of exhaust manifold.
- 28. Remove two bolts holding front end of muffler to muffler bracket.
- 29. Loosen bolt clamping front end of muffler to exhaust pipe; slide exhaust pipe out of exhaust manifold and turn out of way of transmission.
- 30. Remove bolts holding flywheel guard to rear motor plate, also screw holding rear end of guard to transmission case and take off flywheel guard.
 - 31. Remove clutch drain plug from clutch cover and drain oil out of clutch.
 - 32. Remove cap screws holding clutch cover to flywheel.
 - 33. Remove nuts from rear ends of three starting motor studs.
 - 34. Remove two bolts holding lower part of transmission case to rear motor plate.
- 35. Remove nuts from two studs holding upper part of transmission to motor; this will release transmission and clutch assembly which may now be lowered and removed from the car.
 - 36. Disconnect oil pressure gauge to oil pump pipe at union.
 - 37. Disconnect battery cable and switch wire at terminal on starting motor.
 - 38. Disconnect wire at terminal on top of generator.

39. Place receptacle under oil reservoir, remove drain plug and drain out motor oil.40. Remove cotter pins and nuts and take out front and rear motor support bolts.

41. Fasten rope sling around motor or through water outlet manifold and raise motor out of car using chain hoist and tackle, and place on bench or motor stand.

42. Remove cylinder head nuts using cylinder head nut wrenches shown on page 24, service tool section, and take off head and gasket.

43. Unscrew starting crank jaw from front end of crankshaft, using starting crank jaw wrench illustrated on page 23, service tool section, and take off fan pulley.

44. Remove bolts and cap screws holding gear case cover to front motor support plate and take off cover.

45. Remove lock wire and cap screws from camshaft sprocket and take off sprocket, thrust button, guide, spring and timing chain.

46. Raise valves with valve lifter, and hold in wide open position by means of 1/4" hexagon nuts placed on edge between bottom of tappet adjusting screw plates and tops of valve tappet guides, then pull out camshaft.

47. Remove crankshaft sprocket from crankshaft, using sprocket puller shown on page 19, service tool section.

48. Turn motor upside down in motor stand; remove cap screws from oil reservoir and take off reservoir.

49. Remove nuts from flywheel bolts and take flywheel off crankshaft.

50. Remove cotter pins and nuts from connecting rod bolts, take off caps and shims and remove connecting rods and pistons.

51. Remove wick packing from front and rear bearing caps using a packing removing hook or drilling it out.

52. Remove cotter pins and nuts from main bearing studs, using wrench listed on page 24, service tool section.

53. Remove bearing caps using main bearing cap puller shown on page 27, service tool section, on the front and rear caps, and lift out crankshaft.

54. For the service station doing even a small amount of crankshaft bearing work, a main bearing line reamer of the type shown on page 31, service tool section, will prove an excellent investment. With this equipment, it is not only possible to fit a set of bearings in a fraction of the time required by the laborious hand scraping method, but a comparatively unskilled mechanic can turn out a job which is superior to the best efforts of an experienced bearing scraper. In addition to securing a greater percentage of actual bearing surface the line reaming method insures accurate alignment of all the bearings, which is a factor of vital importance in turning out a satisfactory and lasting job.

Whenever a main bearing line reamer is available it is recommended that a complete set of new main bearings be installed when renewing the crankshaft or when refitting of the bearings becomes necessary. The great saving of time in such cases more than offsets the cost of new bearings, with the additional assurance that the work will stand up in service.

55. Before reaming or scraping in the main bearings, it is necessary that the crankshaft be carefully inspected for trueness and out of round crankpins and journals, as well as for rough surfaces on these parts. If any of the above defects exist, they must obviously be corrected by straightening, grinding or polishing, if a satisfactory job is to be done. On page 16, service tool section, a surface plate, vee blocks and dial indicator are shown which make it easy to readily detect a sprung crankshaft. Crankpins and journals can be checked for roundness with a 2" to 3' micrometer taking measurements at various points around the circumference. Following is the method of procedure when renewing main bearings:

56. Remove countersunk head machine screws holding bearings to caps and crankcase and take out bearings.

57. Remove all burrs, dirt and chips from crankcase and backs of new bearings, and fit bearings to crankcase and caps. After firmly tightening the screws drawing the bearings into place, it is necessary that the projecting edges be filed perfectly even with the crankcase or caps. The bearing filing blocks shown on page 27, service tool section, will save a great deal of time and labor when doing this operation, as it is possible to file the bearings accurately to size before installing them in the crankcase.

58. In event no line reamer is at hand and the bearings are to be scraped in, the thrust faces on the center main bearing should be filed down so there will be .006' end play when the crankshaft is in position. If the bearings are to be line reamed, this operation can be deferred until the line reaming is done, at which time the thrust faces can be smoothly and accurately finished to the required size, with the thrust bearing facing cutter furnished with the tool.

59. To scrape in main bearings to fit the crankshaft, remove bearing caps, spread a thin coat of Prussian blue on the crankshaft journals and place crankshaft in crankcase. Place an equal number of shims (total thickness .140"), over each stud, replace bearing caps in their respective positions and tighten stud nuts. The crankshaft should then be revolved a few times by means of a bar placed between the flywheel bolts, then the stud nuts and bearing caps removed. Lift crankshaft out of crankcase and examine bearings. The blue marks on the bearings indicate the points of contact with the shaft and must be removed by scraping. This requires considerable skill and care as only a very thin shaving of babbit should be scraped from the points marked with blue.

After all of these "high spots" have been scraped down, the shaft should again be blued, placed in the crankcase and the bearing caps tightened. Turn crankshaft in bearings a few times and remove stud nuts and bearing caps. Remove crankshaft from crankcase, examine bearings and repeat scraping process described above. This should be done as many times as necessary until the bearings finally show a fine series of spots, close together and uniformly distributed over the entire surface. When properly fitted, the bearings will be from .001" to .0015" larger than the crankshaft and it is important that this clearance be maintained when assembling the shaft and adjusting the main bearings to provide space for an oil film.

60. Renewing camshaft bearings: Due to their inaccessibility and non-adjustable construction, it is extremely difficult when renewing them, to secure proper alignment and sufficient bearing surface unless a bearing line reamer is used. The main bearing line reaming equipment shown on page 30, service tool section, is very well adapted for this work, the camshaft bearing cutters furnished with the tool enabling all of the bearings to be reamed in alignment and to exact size with a minimum expenditure of time. The following procedure is necessary when renewing camshaft bearings:

61. Remove brass dowel pins holding camshaft bearings in position in crankcase, by driving them into the bearings with a hammer and drift. The bearings to be renew-ed should next be removed from the crankcase; this should be done with a bearing puller of some kind to prevent damage to the crankcase. On page 29, service tool section, is shown a very simple and effective puller, designed to remove and install Hudson and Essex camshaft bearings in the least possible time and without injury to bearings or crankcase.

When drawing the new bearings into position, it is very important that the oil holes register with the oil holes in the crankcase, if they do not, new holes should be drilled in the bearings after assembling. The bearings should next be drilled and pinned against movement with brass dowel pins, which should be a tight fit in both bearings and crankcase.

If an expansion type line reamer is used to ream the bearings, care should be taken to ream them from .001" to .002" larger than the camshaft journals so there will be sufficient clearance for lubrication. After the bearing fitting and reaming has been completed, the crankcase should be thoroughly cleaned of chips and dirt before reassembling of the motor is started.

62. Place camshaft in position in crankcase, remove crankshaft bearing caps, clean and spread an oil film on bearings and drop crankshaft in place. Replace shims and bearing caps, being careful to put the shims back in their proper places and the center bearing cap on its studs so the serial numbers will face the same direction as a corresponding number stamped on the lower flange of the crankcase. The proper replacing of the center bearing cap is important, as if this is not done the bearing alignment will be destroyed. Screw nuts on studs and tighten bearings securely, one by one, turning crankshaft after each bearing has been drawn up to test the adjustment. After the bearing adjustment has been completed, be sure to replace and spread cotter pins in studs. Fit new wick packing to front and rear bearings caps to guard against oil leaks at these points.

63. The reassembling of the motor may be completed and its installation in the car accomplished by reversing operations 1 to 50 inclusive. When replacing timing chain on sprockets, it is imperative that the distributor drive shaft and camshaft be properly timed as follows:

Turn crankshaft until marks "DC 1-6" stamped on the flywheel, are even with the bottom of the square sight hole in the right side of the rear motor support plate. Place camshaft sprocket on camshaft, screwing cap screws in camshaft with the fingers, then turn camshaft in clockwise direction until No. 6 exhaust valve has just seated.

Next remove camshaft sprocket without disturbing position of camshaft and turn generator sprocket to right until metal strip on distributor rotor points directly away from the cylinder block. On the side of the chain facing the front of the car, arrows will be found which should point in the direction in which the chain runs. Two of the link pins on this side of the chain are marked with punch marks. These pins are exactly 20 links apart and when replacing the chain it is necessary that they engage the teeth on the crankshaft and camshaft sprockets which are similarly marked, being careful not to materially change the positions of generator and camshafts, when so doing.

Renew Flywheel

1. Remove toe and floor boards.

2. Remove clevis pin at bottom of hand brake lever and disconnect hand brake pull rod.

3. Remove clevis pin at lower part of brake pedal and disconnect foot brake pull rod.

4. Unscrew sleeve at rear end of speedometer drive shaft and disconnect shaft from transmission.

5. Remove bolts from flange of front universal joint and disconnect propeller shaft.

6. Remove cap screws holding transmission case cover to transmission and take off control hand lever assembly.

7. Remove clevis from clutch adjustable link and disconnect clutch throwout yoke.

8. Remove bolts holding pedal control bracket to transmission and take off pedal control assembly.

9. Unscrew exhaust manifold packing nut at rear end of exhaust manifold.

10. Remove 2 bolts holding front end of muffler to muffler bracket.

11. Loosen bolt clamping front of muffler to exhaust pipe; slide exhaust pipe out of exhaust manifold and turn out of way of transmission.

12. Remove bolts holding flywheel guard to rear motor plate, also screw holding rear end of guard to transmission case and take off flywheel guard.

13. Remove clutch drain plug from clutch cover and drain oil out of clutch.

14. Remove cap screws holding clutch cover to flywheel.

15. Remove nuts from rear ends of 3 starting motor studs.

16. Remove 2 bolts holding lower part of transmission case to rear motor plate.

17. Remove nuts from 2 studs holding upper part of transmission to motor; this will release transmission and clutch assemblies which may now be lowered and removed from the car.

18. Remove nuts from flywheel bolts and take flywheel off crankshaft, using a bar to pry it loose if necessary.

19. Remove all dirt and chips from face of new flywheel and flange on crankshaft, place flywheel on shaft and securely tighten bolt nuts. It will be found that it is only possible to install the flywheel on the crankshaft in one position, as one of the bolts is offset 1/16" to prevent incorrect installation, which would affect the timing marks.

20. Reassemble parts, reversing operations 1 to 17 inclusive.

(M) Adjust Connecting Rod Bearings

1. Place receptacle under oil reservoir, remove oil reservoir drain plug and drain motor oil.

2. Raise up front end of car and place axle stands under front axle.

3. Remove cap screws holding oil reservoir to crankcase and take off oil reservoir.

4. Remove cotter pins from connecting rod bolt nuts and loosen caps by backing off nuts.

5. Take nuts off No. I connecting rod bolts and remove cap and shims from rod, being careful not to drop the shims or get the "packs" mixed.

6. Remove a .002" or .003" shim from each pack and place the remainder in position on the rod bolts in exactly the order of removal, then replace cap on rod so the number stamped on the side of the cap will be on the same side as the number stamped on the connecting rod.

7. Draw up rod bolts as tightly as possible, lining up slots in nuts with cotter pin holes in bolts.

8. Next test rod adjustment, if the lower end of the rod can be readily moved endwise when grasped by the hand, it is too loose and the cap will again have to be taken off and an additional shim or shims removed. If the shim "packs" contain no more .002" thick shims, a similar adjustment may be obtained by removing a .003' shim and adding one .002' thick or removing a .005' shim and adding one .003" thick. It is important that the same number and thickness shims be removed from both sides of the rod when doing this.

9. Replace cap, tighten nuts and again test rod adjustment. If the rod is still too loose, repeat the above process until the adjustment is tight enough to require a light hammer blow on either side, to take up the end play on the crankpin.

10. After the above fit has been secured, it is well to verify the adjustment by cranking the motor by hand, with the spark plugs removed. When properly adjusted, the additional resistance of the tightened bearing will be just perceptible when cranking the motor.

11. Loosen the adjustment on No. 1 rod, and proceed to adjust the other five rods in exactly the same manner, tightening No. 2 next. When the caps are taken off for the removal of shims, the bearings and crankpins should be wiped clean and receive a film of new oil before being replaced. When taking up connecting rod bearings, it is essential that all of the rods be adjusted evenly, as the additional friction of one bearing adjusted tighter than the others may prevent smooth and quiet operation.

12. Insert and spread cotter pins in bolts and reassemble parts, reversing operations 1 to 3 inclusive.

(N) Adjust Crankshaft Bearings

1. Place receptacle under oil reservoir, remove oil reservoir drain plug, and drain motor oil.

2. Raise up front end of car and place axle stands under front axle.

3. Remove cap screws holding oil reservoir to crankcase and take off oil reservoir.

4. Remove spark plugs from cylinder head.

5. Remove cotter pins from connecting rod bolts and loosen caps of all rods slightly by backing off the nuts a turn or two.

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6. Remove cotter pins from main bearing studs and slightly back off nuts, this will free the main bearings. The motor should then be cranked by hand and the freedom with which it revolves noted.

7. Remove 2 cap screws passing through lower part of front gear case cover into bearing cap.

8. Remove packing from cap using packing, hook or by drilling it out.

9. Remove nuts from front bearing studs, take off washers, bearing cap and shims. Due to the tight fit of the front and rear bearing caps in the crankcase, the main bearing cap puller illustrated on page 27, service tool section, will greatly assist in this work.

On account of the slight overhanging of the front end of the front crankshaft bearing, it is sometimes necessary to remove the lower gear case cover screws for some distance on either side of the crankshaft, to allow the front motor support plate to be sprung forward slightly, so the bearing may be removed. This may be done by wedging two screwdrivers between cap and support plate, using care not to damage gasket.

10. Remove a .002" shim from each side of the bearing and replace the remainder in position exactly as removed.

11. Replace bearing cap and washers and tighten stud nuts securely; lining up slots in nuts with cotter pin holes in studs, then crank motor by hand. If no additional resistance to turning is noted after the removal of a shim, the cap must again be removed and an additional shim or shims taken out. If the shim "packs" contain no thin shims, remove a .003" or .005" shim and replace with one .002" or .003" thick. When making bearing adjustments it is necessary that the same thickness and number of shims be removed from both sides of the bearings.

12. Replace bearing cap, draw up stud nuts tightly and again test bearing adjustment. If the bearing is still loose the above operations must be repeated until it is adjusted tight enough to offer a slight resistance when turning the crankshaft.

13. After the proper adjustment of the front bearing has been obtained, the stud nuts should be loosened and the bearing freed up, after which the other main bearings should be adjusted, following the same procedure. The center main bearing will prove less difficult to adjust due to having less contact in the crankcase and fewer studs. Care must be exercised, however, to replace the caps in exactly their order of removal so the alignment of the bearings will be retained. To facilitate this, the caps have a serial number stamped on them and they should be placed on the studs so these numbers will face the same direction as a corresponding number stamped on the bottom flange of the crankcase.

14. When the adjustment of the bearings has been completed, replace and spread cotter pins in studs and fit new wick packing to front and rear caps to guard against oil leaks at these points.

15. The reassembling of the motor may be completed by reversing operations 1 to 5 inclusive, making sure that cotter pins are inserted in the connecting rod bolt nuts after tightening them.

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- Reference Sheets -

Carburetor Inspection

It is necessary that the carburetor be periodically inspected, if maximum performance and economy is to be maintained. A glance at the sectional illustration shown below, will show clearly the location of the packing gland nut and the pneumatically controlled piston. As they have a direct bearing on the gasoline consumption, the importance of their proper functioning is apparent. Owing to the accessibility of the parts the following inspections can be very quickly and easily made.

THE PISTON

The piston performs the function of automatically regulating the mixture and for this reason must at all times work freely in the cylinder.

Remove the cover screws from the top of the carburetor. Lift out the piston and metering pin assembly. Carefully polish the surface of the piston with metal polish, being careful not to scratch or dent it. Clean the walls of the cylinder in which the piston operates. When replacing make sure that the groove in the metering pin points toward the motor and that the cover joint is air tight.

THE PACKING GLAND

It is essential that this gland fit properly on the regulating sleeve. Should it not, then gasoline will enter the motor by way of the outside of the sleeve instead of being regulated by the metering pin, which operates inside the sleeve.



Remove the jet housing screw and the float chamber. The packing gland nut is then accessible and can be removed or tightened by the use of the wrench shown. If a wrench is not available then a broad screw driver can be used. The use of the proper wrench is preferable because it is constructed so that the sleeve can be raised and lowered during the tightening process, thereby assisting in getting the desired result. If necessary remove the old packing and repack with soft candle wicking.

When assembling the float chamber and carburetor body be sure that the fuel inlet screen is perfectly clean before returning the jet housing screw to place.



WIRING DIAGRAMS

Diagram 1. Bendix Starter. One Terminal on Generator NOTE—If Generator has Two Terminals, attach lower wire to terminal marked "coil" on switch



Diagram 2. Manual Shift Starter. Two Terminals on Generator



Diagram 3. Manual Shift Starter with 9 point Switch



Diagram 4. American Bosch System

THE HUDSON AND ESSEX CHAIN FRONT END DRIVE

The cam and accessory shafts in the Hudson and Essex motors are driven by a Morse "rocker joint" silent chain. The adjustment of the chain is taken care of by an eccentric device which is built into the motor forming part of the generator drive shaft. By means of this adjustment it is possible to eliminate the slackness in the chain which develops during its first few thousand miles of use. When the limit of the adjustment has been reached means are provided for shortening the chain so that many additional miles of service can be secured by again making use of the eccentric control.

The following instructions have been prepared to instruct Hudson and Essex dealers and mechanics on its proper adjustment and maintenance.

To Determine When Adjustment Is Necessary

After the car has been placed in service an initial inspection, and adjustment if necessary, should be given the chain at the expiration of from 500 to 1000 miles of traveling. THIS INSPECTION SHOULD BE GIVEN EVEN IF NOISE HAS NOT DEVELOPED. Subsequent inspections should be made at intervals of approximately 4000 miles.

To determine the need of adjustment, grasp the generator shaft immediately forward of the generator, turning it back and forth as far as possible. The travel on the circumference should be approximately 1/8".

How to Adjust

Forward of the generator you will find the adjusting member pictured in the accompanying illustrations.



Remove the Cap Screws "C", three are provided on the Hudson, two on the Essex-4, and three on the Essex-6.



Engage the wrench, which is supplied in the tool kit, with a notch on the eccentric, and pull flange toward you until the next holes in the eccentric line up with the openings where cap screws "C" were removed.

Then determine the amount of slack in the chain by the method explained in the preceding article. When only the necessary play is present insert cap screws "C" and tighten. If any of the screws which have been removed, cannot be returned, it will be necessary to back off the adjustment slightly until they will enter. It should be borne in mind that the 1/8" play mentioned in the foregoing article is essential, otherwise the chain and bearings will be overloaded and noisy operation will result.

How to Determine the Condition of a Chain

When a chain has been removed and separated at one of the links it will be seen that there is considerable to and fro movement in it when it is stretched out on a flat surface. This frequently misleads the mechanic into thinking that an excessive amount of play has developed in the chain and that it is much longer than its normal length. Such is not the case however, as the following explanation will show:

An allowance of approximately .010" at each joint is made in a new chain for lubrication and freedom of movement. The Essex-6 chain consisting of 57 links, therefore, has an initial play of about 9/16".

If a worn chain shows a total come and go of 1-9/16" when laid out flat, it is obvious that 1 inch of play over what was built into it has been accumulated. Only one half of this increased slackness or 1/2" represents the lengthening of the chain due to wear. The other 1/2" of slackness will be apparent when it is seen that the worn chain will compress 1/2" shorter than is possible with the new chain. Remember that the chain runs under tension when on the sprockets, not compressed. Comparing a new and worn chain when both are fully extended will clearly show that the added length due to wear is only a small portion of the total slackness, and remember also that the eccentric will take care of a great deal of this slackness before it is necessary to shorten the chain.

How to Shorten Chain

When the limit of adjustment has been reached it is possible to shorten the chain to prolong its life in the following manner: After the chain has been removed examination will disclose a so-called hunting



link which is a thin leafed section shown in the illustration "H. L." To remove this link take a sharp chisel and split the washers "A. B." by striking them vertically with the edge of the chisel at right angles to them. This releases the pins in these joints which can then be driven out and the hunting link will fall away when chain is lifted up. The chain is thus reduced in length one link and all that is necessary to put it again in running order is to link it together and mesh the link plates in regular order making connections as follows:



Bring ends of chain together and lap the link plates in regular order, insert seat pin (see illustration) with washer riveted at one, end, from far side of chain, taking care that the ribbed side of pin points in direction of rotation of chain and the flying arrows stamped on the side of it. Insert "rocker pin" from near side of chain with pointed side of pin against flat side of "seat pin" toward direction of rotation of chain. The relative positions of the two pins with respect to the flying arrow are shown in the accompanying illustrations. Place washer on end of seat pin and after backing up with bar or wedge,



rivet over the end with a few sharp blows of a hammer. Always use the old rocker pins and new seat pins.

If this procedure with respect to installation of pins is not followed breakage of chain will result.
Parts

The necessary parts may be secured from Service Stores.

Hudson	Essex-4	Essex-6	
Symbol	Symbol	Symbol	
24954	24954	57157	Morse Chain Link
24955	24955	57158	Morse Chain Link Spacer
24956	24956	57159	Morse Chain Link Pin Washer
24957	57160	57160	Morse Chain Link Rocker
24958	57161	57161	Morse Chain Link Pin

Installation and Timing

It is not necessary to separate the links when removing or installing the chain. If the eccentric is turned to the point of minimum adjustment, it will permit the camshaft sprocket to be easily removed or replaced with the chain mounted on it.



The following instructions should be strictly adhered to in replacing the chain, in order that the motor timing may remain the same as predetermined at the factory.

The flying arrows should be visible, pointing in the direction in which the chain runs, and the punch marks (D) on the pins coincide with similar marks on the cam and crankshaft sprockets. The Essex-4 chain has twenty-four pins; the Essex-6, twenty, and the Hudson, eighteen (as when measuring distance) between these points. It is also advisable to check the ignition timing as the position of the small sprocket that drives the accessory shaft may have been disturbed.

Hudson and Essex Information

For License Purposes:

					No.	No.		N.A.C.C.		Ship-		
Type of Body	Mod	lel	Serial Ca	r No.	of	Bore	Stroke	H.P.	Wheel	ping		
					Cyl.			Rating	Base	Weight		
Hudson Open Roadster	1910	20	1 to	4000	4	334"	436*	22.5	110"	1900		
Hudson Fore-Door Roadster	1910	20	4001 to	5000	4	3 1/4"	436"	22.5	110"	2090		
Hudson Touring Car	1910	20	5001 to	7100	4	3 36"	436"	22.5	110"			
Hudson Roadster	1910	20	7101 to	7500	4	3 ¾	436"	22.5	110"	1900		
Hudson Open Touring Car	1911	33	7501 to	9000	4	4*	436"	25.6	114"	2400		
Hudson Fore-Door Touring Car	1911	33	9001 to	9500	4	4"	435	25.6	114"			
Hudson Torpedo Touring Car	1911	33	9501 to	11500	1		4.59	25.6	114*	2460		
Hudson Touring Car	1911	33	11301 to	15000	4	4	472	25.0	114	2300		
Hudson Tornedo	1012	33	21001 to	23000		4.	414	25.0	114 14*	2799		
Hudson Speed Roadster.	1912	33	23001 to	24000	4	4*	414	25.6	114 14"	2/3/		
Hudson Commercial Roadster	1912	33	24001 to	26000	4	4*	416"	25.6	114 16"	2631		
Hudson Limousine	1912	33	26001 to	26500	4	4"	416"	25.6	11436	2001		
Hudson Coupe	1912	33	26501 to	27000	4	4*	436"	25.6	11436*			
Hudson 5-Passenger Torpedo	1912	33	27200 Up	ward	4	4"	436"	25.6	11434			
Hudson Touring Car	1913	37	30001 to	35000	4	436*	536"	27.23	118"	3390		
Hudson Torpedo	1913	37	35001 to	37000	4	43%*	534"	27.23	118"	3350		
Hudson Roadster	1913	37	37001 to	39000	4	43%	534	27.23	118"	3173		
Hudson Coupe	1913	37	39001 to	39100	4	43%*	534"	27.23	118"	3408		
Hudson Limousine	1913	37	39101 to	39200	4	43%	534"	27.23	118"	3680		
Hudson Touring Car	1913	54	45001 to	50000	6	4.3%*	5 14	40.84	127"	3823		
Hudson Torpedo	1913	54	50001 to	52000	0	4.38"	5 %	40.84	127"	3748		
Hudson Rondster	1913	54	52001 to	54000	6	4.36*	5 14	40.84	127*	3588		
Hudson Limousine	1913	54	54001 to	54100	0	4.28	5 34	40.84	127*	3933		
Hudson 7-Passenger Touring Car	1013	54	55000 to	56000	6	4.14*	0 74 5 1/4	40.84	127	4110		
Hudson Touring Car	1014	54	56501 to	50000	6	416*	514	40.84	135*	3070		
Hudson Sedan	1914	54	61501 to	61700	6	436	514"	40.84	135*	4100		
Hudson Touring Car.	1914	40	63001 to	73000	6	316*	5*	29.4	123*	2968		
Hudson Roadster	1914	40	73001 to	73500	6	334"	5*	29.4	123"	2822		
Hudson Cabriolet	1914	40	75001 to	75500	6	3 1/2"	5"	29.4	123"	2976		
Hudson Phaeton	1914	40	76251 to	76800	6	3 3/2"	5"	29.4	123"	2977		
Hudson R. H. Drive Touring Car	1914	40	77001 to	77201	6	334"	5"	29.4	123"	2974		
Hudson Roadster	1915	40	73501 to	75000	6	334"	5*	29.4	123*	2772		
Hudson Cabriolet	1915	40	75501 to	76000	6	3 3/2"	5'	29.4	123"	2946		
Hudson Coupe	1915	40	76001 to	76250	6	31/1"	5"	29.4	123"	3162		
Hudson Limousine	1915	40	76801 to	76950	6	332	5.	29.4	123"	3362		
Hudson K. H. Phaeton	1915	40	77201 to	77600	6	3 32"	5.	29.4	123*	2961		
Hudson L. H. 6-Passenger Phaeton	1915	40	77601 to	90000	6	314	5,	29.9	123*	2432		
Hudson Phaeton	1915	54	59001 to	61500	6	434*	514"	40.84	135*	3965		
Hudson Limousine	1915	54	61701 to	62000	6	436*	514"	40.84	135"	4226		
Hudson Phaeton	1916	40	G10001 to	G30000	6	3 16*	5'	29.4	123"	3033		
Hudson Rosdster	1916	40	G30001 to	G33000	6	336"	5'	29.4	123"	2900		
Hudson Cabriolet	1916	40	G33001 to	G35000	6	3 1/2"	5"	29.4	123"	3009		
Hudson Limousine	1916	40	G35001 to	G36000	6	3 34"	5*	29.4	123"	3535		
Hudson Town Car	1916	40	G36001 to	G37000	6	3 3/2"	5″	29.4	123"	3370		
Hudson Coupe	1916	40	G37001 to 4	G38000	6	334"	5'	29.4	123"	3240		
Hudson Touring Sedan	1916	40	G38001 to 0	G40000	6	334"	5'	29.4	123*	3330		
Hudson Phaeton	per-Si	x H	1 to	H56999	6	334"	5	29.4	1253%	3385		
Hudson Roadster		11	64000 to .	H67999	6	3 32	5	29.4	125 1/2"	3170		
Hudson Limousine		H H	71000 to 1	H81999	6	3 59	5'	29.4	12536	3310		
Hudson Landau Limousine		11	87500 10	H87999	6	3 14*	5.*	29.9	125 1/*	3750		
Hudson Town Car		H	88000 to	H80400	6	314	5.0	29.4	1051/*	2/62		
Hudson Landaulet Town Car		H	89500 to	H89990	6	314"	5"	29.4	12514	90.00		
Hudson Touring Sedan.		н	90000 to	H99999	6	334*	5*	29.4	12514*	3600		
Hudson 7-Passenger Phaeton		J	1 to	39999	6	334*	5*	29.4	125 14"	3220		
Hudson 7-Passenger Phaeton, R. H. D		J	40000 to	41999	6	3 34"	5*	29.4	125 14"	3220		
Hudson 4-Passenger Phaeton		J	45000 to	48999	6	3 3/2"	5*	29.4	12536"	3180		

Type of Body	Model	Serial Car	No.	No. of Cyl.	Bore	Stroke	N.A.C.C. H.P. Rating	Wheel Base	Ship- ping Weight
Hudson 4-Passenger Phaeton, R. H. D	J	49000 to	49999	6	3 1/2"	5*	29.4	$125\frac{1}{2}$	3180
Hudson Runabout Landau	ĩ	54000 to	55499	6	3 1/5"	5*	29.4	125 3/2"	3250
Hudson Kunabout Landau, R. H. D	1	55500 to	55999	6	3 35"	5.	29.4	12534*	3250
Hudson Cabriolet, R. H. D.	J	65000 to	65000	6	314"	5'	29.4	125 14*	3195
Hudson Touring Sedan, Two Door	ĩ	70000 to	74999	6	3 16"	5*	29.4	125 36*	3450
Hudson Touring Sedan, Two Door, R. H. D	J	79000 to	79499	6	3 3%"	5*	29.4	125 36"	3450
Hudson Touring Sedan, Four Door	4J	75000 to	75999	6	3 15"	5*	29.4	125 36"	3700
Hudson Limousine	J	80000 to	80999	б	316"	5"	29.4	1251/2"	3600
Hudson Limousine, R. H. D.	J	84000 to	84099	6	3 3%"	5*	29.4	$125\frac{1}{2}$	3600
Judson Limousine	4J	81000 to	81999	6	3 1/2"	5'	29.4	1253/2"	3715
Judson Limousine, R. H. D.	4]	84100 to	84199	6	336"	5'	29.4	125 3/2"	3715
Hudson Touring Limousine, P. H. D.	4J	82000 to	82999	0	3 59	5.	29.4	125 32	3655
Hudson Landau Limousine, R. H. D.		85000 to	85999	6	3 1.4"	5*	29.4	12514*	3600
Hudson Landau Limousine, R. H. D	Ĩ	86000 to	86999	6	3 16"	5*	29.4	12514"	3690
Hudson Landau Limousine	4J	87000 to	87999	6	316*	5*	29.4	12536*	3760
Hudson Landau Limousine, R. H. D	4 J	88000 to	88099	6	3 1/2"	5*	29.4	12536"	3760
Hudson Town Car	J	90000 to	90999	6	3 15"	5*	29.4	125 34"	3530
Hudson Town Car, R. H. D	l	91000 to	91999	6	31/2"	5"	29.4	125 14"	3530
Hudson Town Car	4J	92000 to	92999	6	3 34"	5*	29.4	125 36"	3605
Hudson Town Car, R. H. D.	4 J	93000 to	93999	6	3 1/2"	5*	29.4	125 1/5"	3605
Hudson Landau Town Car	J	95000 to	95499	6	3 3%"	5*	29.4	125 3/2"	3585
Hudson Landau Town Car, R. H. D	J	96000 to	96499	6	3 1/2"	5*	29.4	$125\frac{1}{2}$	3585
Hudson Landau Town Car	4J	95500 to	95999	6	336"	5*	29.4	125 36"	3665
Hudson Landau Town Car, R. H. D	4J	96500 to	96999	6	3 35"	5.	29.4	125 1/2"	3665
Audson Full Folding Landau	4J	97000 to	97999	0	3 1/2	5-	29.4	125 32"	3765
Judson 7-Passenger Phaeton P H D	M	40000 to	41000	6	3 32	5.	29.4	125 32	3400
Indson 4.Passenger Phaeton	M	42000 to	48900	6	3 16"	5.	20.4	125 1/4	3900
Hudson 4-Passenger Phaeton, R. H. D.	M	49000 to	40030	6	316"	5*	20.4	1251/*	3243
Hudson Runsbout Landau	M	54000 to	56499	6	316"	5*	20.4	12514"	3250
Hudson Runabout Landau, R. H. D.	M	56500 to	56999	6	316"	5*	29.4	125 14"	3250
Hudson 4-Passenger Coupe	M	58000 to	58899	6	3 16"	5"	29.4	12536"	3450
Hudson 4-Passenger Coupe, R. H. D	M	58900 to	58999	6	3 34*	5*	29.4	12536*	3450
Hudson 3-Passenger Cabriolet	M	60000 to	60499	6	3 3%"	5*	29.4	125 3/2"	3500
Hudson 3-Passenger Cabriolet, R. H. D	M	65000 to	65499	6	3 35"	5*	29.4	$125\frac{1}{2}$	3500
Hudson 4-Door Sedan	M	75000 to	79499	6	31/2"	5*	29.4	125 3/2"	3700
Hudson 4-Door Sedan, R. H. D	M	79500 to	79999	6	3 3%"	5"	29.4	125 3/2"	3700
Hudson Limousine	M	80000 to	90799	6	3 1/2"	5*	29.4	125 1/2"	3715
Hudson Limousine, R. H. D.	M	80800 to	80999	0	3 35	5.	29.4	125 3%	3715
Hudson Touring Limousine P. H. D.	M	82000 to	82999	0	3 52	5.	29.4	125 35"	3055
Hudson Limonsine Landau	M	85000 to	85700	6	3 29	5'	29.4	125 32	3055
Hudson Limousine Landau, R. H. D.	M	85800 to	85000	6	314*	5"	29.4	12514	3760
Hudson Town Car	M	90000 to	90799	6	316*	5"	20.4	12514	3605
Hudson Town Car. R. H. D.	M	90800 to	90999	6	316"	5'	29.4	12514	3605
Judson Town Car Landau	M	95000 to	95799	6	3 35*	5*	29.4	12534"	3665
Hudson Town Car Landau, R. H. D	M	95800 to	95999	6	3 35*	5*	29.4	125 1/2"	3665
Hudson Full Folding Landau	M	97000 to	97499	6	3 34"	5"	29.4	12534*	3765
Judson 7-Passenger Phaeton	0	5000 to	39999	6	3 1/2"	5"	29.4	125 1/2*	3475
Hudson 7-Passenger Phaeton, R. H. D	0	40000 to	41999	6	3 1/2"	5"	29.4	125 1/2"	3475
Iudson 4-Passenger Phaeton	0	42000 to	48999	6	3 1/2"	5*	29.4	$125\frac{1}{2}$	3320
Judson 4-Passenger Phaeton, R. H. D	0	49000 to	49999	6	3 3/9"	5*	29.4	125 3/2"	3320
Iudson 4-Passenger Coupe	0	58000 to	58899	. 6	3 3 5 "	5*	29.4	125 1/2"	3530
ludson 4-Passenger Coupe, R. H. D	0	58900 to	58999	6	336	5"	29.4	125 1/2"	3530
Iudson 3-Passenger Cabriolet	0	60000 to	64999	6	335"	5*	29.4	125 34*	3500
Indian Touring Sedan	0	05000 to	20400	0	3 1/1	5'	29.4	125 32	3500
Judson Touring Sedan, P. H. D.	0	79500 to	79000	6	314"	5.	20.4	1251/*	3775
Judson Limousine	0	80000 to	80199	6	314"	5*	20 4	12514	3775
Judson Limousine, R. H. D.	0	80200 to	80299	6	314*	5*	29.4	12514*	3800
Judson Touring Limousine	0	82000 to	82999	6	314*	5*	29.4	12514"	3730
Judson Touring Limousine, R. H. D.	0	83000 to	83199	6	3 16"	5"	29.4	12514"	3730
Audson Town Car.	0	90000 to	90799	6	316	5*	29.4	125 44*	3680
Judson Town Car, R. H. D.	0	90800 to	90999	6	316"	5*	29.4	12514*	3680
			0.0000	-					2000
Hudson 7-Passenger Phaeton	10-0 to 12-0	5000 to	26999	6	3 36"	5"	29.4	125 1/5"	3575
Hudson 7-Passenger Phaeton Hudson 7-Passenger Phaeton, R. H. D	10-0 to 12-0 10-0 to 12-0	5000 to 27000 to	26999 29999	6	3 36"	5*	29.4	125 1/2*	3575

Type of Body	Model	Serial Car 1	ło.	No. of Cyl.	Bore	Stroke	N.A.C.C. H.P. Rating	Wheel Base	Ship- ping Weight
Rudson 4-Passenger Phaeton, R. H. D	10-0 to 12-0	49000 to 4	9999	6	33/2"	5'	29.4	1253/2"	3405
Iudson 4-Passenger Coupe	10-0 to 12-0	50000 to 5	9499	6	332	5'	29.4	12532	3620
Judson 4-Passenger Coupe, R. H. D	10-0 to 12-0	59500 to 5	9999	6	3 3/2"	5'	29.4	125 3/2"	3620
Iudson Runabout Landau	10-0 to 12-0	60000 to 6	1899	6	3 1/2"	5'	29.4	125 3/2"	3550
Iudson Runabout Landau, R. H. D	10-0 to 12-0	61900 to 6	1999	6	3 12	5'	29.4	12536	3550
Hudson Sedan	10-0 to 12-0	70000 to 7	9999	0	3 /2	5.	29.4	125 32	3815
fudson Sedan, R. H. D.	10-0 to 12-0	81000 to 8	1999	0	3 32	5.	29.4	125 32	3815
Judson Touring Limousine	10-0 to 12-0	82000 to 8	3333	0	3 92	5.	29.4	125 52	3840
Judson Touring Limousine, R. H. D	10.0 to 12.0	84000 to 8	1400	6	372	÷.	29.4	125 79	3840
Judson Limousine, R. H. D.	10-0 to 12-0	91500 to 9	1000	6	316"	5.	20.4	12534	3860
Judson 7-Passenger Phaeton	10-0 10 11-0	100000 to 10	4346	6	314	5*	29.4	126"	3575
Judson 7-Passenger Phaeton, R. H. D.		175000 to 17	5191	6	314"	5'	29.4	126"	3575
Judson 4-Passenger Phaeton		200000 to 20	6284	6	334"	5'	29.4	126*	3405
Judson 4-Passenger Phaeton, R. H. D.		275000 to 27	5128	6	3 1/2"	5*	29.4	126"	3405
Iudson Sedan		300000 to 30	2051	6	3 34"	5*	29.4	126"	3815
Hudson Sedan, R. H. D.		329000 to 32	9001	6	3 3/2"	5*	29.4	126"	3815
Judson Coupe		330000 to 33	1537	6	315'	5*	29.4	126"	3620
fudson Coupe, R. H. D		349000 to 34	9999	6	31/2"	5*	29.4	126"	3620
Judson Touring Limousine		350000 to 35	1174	6	335'	5"	29.4	126"	3840
Judson Touring Limousine, R. H. D		359000 to 35	9003	6	3 34'	5*	29.4	126"	3840
Hudson Cabriolet		360000 to 36	0311	6	3 1/2"	5*	29.4	126*	3550
Hudson Cabriolet, R. H. D.		364000 to 36	4999	6	3 3 2	5"	29.4	126"	3550
Hudson Limousine.		370000 to 37	0157	6	3 1/2"	5"	29.4	126*	3860
Judson Limousine, R. H. D.		374000 to 37	4999	6	3 39	5"	29.4	126"	3860
Iudson Chassis		380000 to 38	0032	6	3 32	5.	29.4	126*	2690
Audson Chassis, R. H. D.		385000 to 38	5064	6	3 1/2	5.	29.4	126*	2690
Audson Coach		400000 to 40	1129	0	3 22	3.	29.4	126	3435
Hudson Coach, R. H. D.		490000 to 49	9999	. 0	3 72	5.	29.4	126	3435
Iudson 7-Passenger Phaeton		104347 to 17	4999	0	3 22	3.	29.4	120	3995
Judson 7-Passenger Phaeton, R. H. D		1/5142 to 19	4000	6	3 52	5	29.4	126	3995
Judson 4-Passenger Phaeton		200283 to 2/	0000	6	314	5.4	29.4	126*	3395
Judeon Reden		2/3129 to 29	2001	6	3 1/2	5	29.4	126*	3393
Judson Sedan P H D		329002 to 32	9006	6	314"	51	29.4	126*	3785
Hudson Coune		331538 to 34	8999	6	316"	5"	29.4	126"	3620
Judson Coupe, R. H. D.		349002 to 34	0000	6	314	5*	29.4	126*	3620
Hudson Touring Limousine		351175 to 35	8999	6	316"	5*	29.4	126*	3870
Hudson Touring Limousine, R. H. D.		359004 to 35	9999	6	336"	5*	29.4	126*	3870
Hudson Cabriolet.		360312 to 36	3999	6	3 3/2"	5"	29.4	126"	3480
Hudson Cabriolet, R. H. D.		364000 to 36	4999	6	335"	5"	29.4	126"	3480
Hudson Limousine		370158 to 37	3999	6	314"	5"	29.4	126"	3860
Hudson Limousine, R. H. D.		374000 to 37	4999	6	334"	5"	29.4	126*	3860
Hudson Chassis		380033 to 38	4999	6	334"	5*	29.4	126*	2690
Hudson Chassis, R. H. D.		385065 to 38	9999	6	3 1/2"	5*	29.4	126*	2690
Hudson Coach		401125 to 48	9999	6	336"	5*	29.4	126"	3435
Hudson Coach, R. H. D		490000 to 49	9999	6	3 1/2"	5*	29.4	126"	3435
Hudson Sedan		302992 to 31	0505	6	3 1/2"	5*	29.4	126"	3720
Hudson Sedan, R. H. D		329007 to 32	9124	6	31/2"	5'	29.4	126"	3720
Hudson Sedan		310506 to 32	8999	6	3 1/2"	5*	29.4	126"	3620
Hudson Sedan, R. H. D		329125 to 32	9999	6	31/2"	5*	29.4	126*	3620
Hudson 7-Passenger Phaeton		100001 to 50	0695	6	31/2"	5*	29.4	126*	3390
Hudson 4-Passenger Phaeton	l	NUUUI to 50	0025	6	336"	5"	29.4	126"	3285
Hudson Coach		Regardle Rodu S	as of	6	335"	5"	29.4	126"	3415
Hudson Sedan		Dody S	gres	6	31/2"	5"	29.4	126*	3590
Judson 7-Passenger Phaeton				6	31/2"	5″	29.4	127"	3425
Hudson 4-Passenger Phaeton		00626 to 526	5856	6	33/2"	5"	29.4	127*	3300
Hudson Coach	•	Regardles	is of	6	31/2"	5″	29.4	127"	3450
Hudson 5-Passenger Sedan		Body St	yles	6	335"	5°	29.4	127*	3605
Hudson 7-Passenger Sedan)				(6	31/2"	5*	29.4	127*	3675
Hudson 7-Passenger Phaeton				6	31/4"	5*	29.4	12736"	3400
Hudson 4-Passenger Phaeton		526853	7 to	6	3 36"	5"	29.4	127%	3275
Hudson Coach	1	999	999	6	3 34"	5"	29.4	127%*	3385
Hudson 5-Passenger Sedan	ſ	Regardles	s of	6	334"	5″	29.4	12736"	3585
Hudson 7-Passenger Sedan		Body Sty	ytes	6	334"	5*	29.4	12736"	3640

ESSEX 4 CYLINDER MODELS

		Cold Con Ma	No.	Berry	Ctro-ke	N.A.C.C.	Wheel	(Ship-
Type of Body	Model	Seriai Car No.	Cyl.	BOLE	Btroke	Rating	Base	Weight)
Essex Phaeton	A	5000 to 34999	4	33/8	5"	18.2	$108\frac{1}{2}$	2450
Essex Phaeton, R. H. D	A	35000 to 39999	4	33/8	5″	18.2	$108\frac{1}{2}$	2450
Essex Cabriolet	A	50000 to 54999	4	33%	5″	18.2	$108\frac{1}{2}$	2595
Essex Cabriolet, R. H. D	A	55000 to 55999	4	33/8	5″	18.2	$108\frac{1}{2}$	2595
Essex Roadster	A	60000 to 62999	4	33/8	5"	18.2	$108\frac{1}{2}$	2625
Essex Roadster, R. H. D	A	63000 to 63999	4	33%	5″	18.2	$108\frac{1}{2}$	2625
Essex Sedan	A	70000 to 74999	4	33%	5"	18.2	$108\frac{1}{2}$	2955
Essex Sedan, R. H. D.	A	75000 to 75999	4	3 3%	5"	18.2	$108\frac{1}{2}$	2955
Essex Phaeton	5-A to 7-A	5000 to 52999	4	33/8	5″	18.2	$108\frac{1}{2}$	2560
Essey Phaeton, R. H. D.	5-A to 7-A	53000 to 59999	4	33%	5″	18.2	$108\frac{1}{2}$	2560
Essey Roadster	5-A to 7-A	60000 to 68999	4	33/8	5″	18.2	$108\frac{1}{2}$	2545
Essex Roadster, R. H. D.	5-A to 7-A	69000 to 69999	4	33%	5"	18.2	$108\frac{1}{2}$	2545
Essex Sedan	5-A to 7-A	70000 to 83999	4	3 8/8	5″	18.2	$108\frac{1}{2}$	2900
Forey Sedan R H D.	5-A to 7-A	84000 to 84999	4	33/8	5"	18.2	$108\frac{1}{2}$	2900
Essex Cabriolet	5-A to 7-A	85000 to 89499	4	33%	5″	18.2	1081/2	2675
Esser Cabriolet R. H. D.	5-A to 7-A	89500 to 89999	4	33%	5″	18.2	1081/2	2675
Essex Coach		500,000 to 504,900	4	33%	5"	18.2	1081/2	2700
Essex Coach P H D		585,000 to 599,999	4	33%	5"	18.2	1081/2	2700
Essex Disaton		600,000 to 608,664	4	33%	5"	18.2	1081/2	2560
Essex Phaeton P H D		750,000 to 750,126	4	33%	5"	18.2	1081/2	2560
Essex Phaeton, R. H. D		800.000 to 801.057	4	38%	5"	18.2	10816	2545
Essex Roadster P U D		835.000 to 839.999	4	33%	5"	18.2	10816	2545
Essex Roudster, R. D. D.		840.000 to 841.027	4	336	5"	18.2	10816	2675
Essex Cabrielet P H D		849.000 to 849.999	4	386	5"	18.2	10816	2675
Essex Cabilolet, R. H. D.		850,000 to 851,131	4	33%	5"	18.2	1081%	2900
Essex Sedon P H D		875,000 to 876,999	4	33%	5"	18.2	10816	2900
Essex Sedan, R. A. D.		504 001 to 584 999	4	386	5"	18.2	10816	2700
Essex Coach, P. H. D.		585 000 to 500 000	4	386	5"	18.2	10816	2700
Essex Coach, K. H. D.		608 664 to 740 000	4	386	5"	18.2	10816	2600
Essex Phaeton D U D		750 127 to 770 000	4	386	5"	18.2	10816	2600
Essex Phaeton, K. H. D		801.058 to 834.000	4	384	5"	18.2	10814	2545
TLSSEX ROADSLEF		835 000 to 830 000	4	334	5"	18.2	10814	2545
Essex Roadster, R. H. D		841.027 to 848.000	4	334	5"	18.2	10814	250
Essex Cabriolet P U D		840 000 to 840 000	4	384	5"	18.2	10814	250
Essex Cabriolet, R. H. D		851 131 to 874 000	4	334	5."	18.2	10814	2880
Essex Sedan		031,131 to 074,999	4	23/	50	18.0	10814	2880
Essex Sedan, R. H. D		010,000 to 010,999	4	378	3	10.2	10072	2000

ESSEX 6 CYLINDER MODELS

Essex Coach	100,001 to 144,376 Regardless of Body Styles	6 6	$2\frac{5}{8}$ $2\frac{5}{8}$	4″ 4″	16.53 16.53	110½ 110½	2305 2130
Essex Coach	144,377 to 196,599 Regardless of Body Styles	6 6	$2\frac{11}{16}\\2\frac{11}{16}$	4¼″ 4¼″	$\begin{array}{c}17.32\\17.32\end{array}$	$110\frac{1}{2}$ $110\frac{1}{2}$	2370 2185
Essex Coach	196,600 to 499.999 Regardless of Body Styles	6 6	$2\frac{11}{16}\\2\frac{11}{16}$	$\begin{array}{c} 4\frac{1}{4}^{\prime\prime}\\ 4\frac{1}{4}^{\prime\prime}\end{array}$	17.32 17.32	$110\frac{1}{2}$ $110\frac{1}{2}$	2395 2185

Hudson and Essex Alloy Pistons

The following information will assist in ordering and fitting Hudson and Essex aluminum alloy pistons when replacement becomes necessary. It is recommended that you adhere strictly to the clearances given. The size of the various cylinder bores will always be found stamped on the cylinder block under the cylinder side plate, as shown in the illustration. On the Essex Six model code letters are used. See explanation on page 4.



Each piston head is stamped with a code letter such as "C" "D," etc., and the weight of the bare piston. The piston weights are given in ounces and quarter-ounces. Suffixes are used to indicate quarter-ounces; for instance, in the illustration given the large figure "16" indicates 16 ounces, and the suffix "1" above, indicates 1 quarter-ounce. Thus the figures "16¹" mean that the piston weight is 16 and one-quarter ounces.

The following tables show clearly what pistons to select for the cylinder bores. When regrinding or honing cylinder blocks, be sure to specify that the cylinder bores be kept within the limits prescribed, as we can supply finished pistons only in the sizes shown in the tables.

HUDSON PISTONS

Standard equipment on motors numbered 126700 and up.

Symbol 22700-Piston. 22706-Piston ring (furnished; standard .010, .020, .030 oversize). 22702-Piston pin (furnished; standard .002, .005, .010, .015, .020 oversize).

PISTON SIZES

GO

ST	CODE
E-	-3.497
G-	-3.498
J-	-3.499
	-3.501

CODE OVERSIZE EO-3.507 -3.508JO-3.509 -3.511

C(OVE	DDE RSIZE
EE-	-3.517
GG-	-3.518
JJ-	-3.519

Cylinder l	ore	3.500		F	Cylinder	ler bore 3.510		FO	Cylinder bore 3.520			3.520	use FF		
64	**	3.5005	use	E	**	**	3.5105 🤇	use	EO		**	**	3.5205)	use	EE
64	**	3.501		~	**	**	3.511		60	-	**	**	3.521		~~
**	**	3.5015∫	use	G	**	"	3.5115	use	GO		**	**	3.5215	use	GG
**	**	3.502	use	J		**	3.512	use	јо		** .	**	3.522	use	JJ
**	**	3.504	use	3.501	**		3.514	use	3.511						

ESSEX PISTONS

4-CYLINDER

Installed in motors numbered 5000 to 57840. This piston has a plain skirt and is fitted with two rings above the piston pin and one ring at the bottom of the skirt.

Symbol 50050 - Piston. 50120 - Piston ring (furnished; standard .010, .020, .030 oversize). 50118 - Piston pin (furnished; standard .002, .005, .010, .015, .020 oversize).

PISTON SIZES

CODE STANDARD	CODE OVERSIZE
C - 3.367	CC - 3.387
E - 3.368	EE - 3.388
G - 3.369 - 3.371	GG - 3.389

Cylinder bore 3.375 }				}			
"	"	} 3.3755}	use C	٠٠	"	3.39551	} use CC }
"	"	3.376 }	uso F	"	"	3.396	}
"	"	3.3765}	use L	"	"	3.3965	} use EE }
"	"	3.377	use G	"	"	3.397	use GG
"	"	3.379	use 3.371				

ESSEX PISTONS

4-CYLINDER

Installed in motors numbered 57841 to 140499. This piston is fitted with three rings above the piston pin. The skirt is slotted or split and carries no rings.

Symbol
54880 - Piston.
54882 - Piston ring (furnished; standard .010, .020, .030 oversize).
50118 - Piston pin (furnished; standard .002, .005, .010, .015, .020 oversize).
Note: To install this type of piston (split skirt) in previous models it is necessary to install new connecting rods also because of a change in design.
Symbol
54967 - Connecting rod with bearings-Right.
54968 - Connecting rod with bearings-Left.

PISTON SIZES

CODE	CODE	CODE
STANDARD	OVERSIZE	OVERSIZE
D - 3.3715	DO - 3.3815	DD - 3.3915
F - 3.3725	FO - 3.3825	FF - 3.3925
Н - 3.3735	HO - 3.3835	HH - 3.3935
- 3.3755		

Cylinder bore 3.375			3.375		Cylinder bore 3.385			Cylinder	Cylinder bore 3.395			
	"	"	3.3755 ∫	use D	••	"	3.3855∫	use DO		"	3.3955	use DD
	**	**	3.376	-	"	**	3.386	EO.	**	**	3.396	THE PP
	"	**	3.3765	use F	"	**	3.3865	use FO	**	" " 3.3965	3.3965∫	use FF
	"	"	3.377	use \mathbf{H}	"	**	3.387	use HO		••	3.397	use $\mathbf{H}\mathbf{H}$
			3.379	use 3.3755								

ESSEX PISTONS 6-CYLINDER

Standard equipment on motors numbered from 140501 to 199999.

Symbol

60060-Piston.

60061-Piston ring (furnished; standard .010, and .020, oversize).

60059-Piston pin (furnished; standard .002, .005, .010, .015, .020 oversize).

PISTON SIZES

STANDARD	OVERSIZE	OVERSIZE
B-2.6235	BO-2.6335	BB-2.6435
D-2.6245	DO-2.6345	DD-2.6445
F-2.6255	FO-2.6355	FF- 2.6455
-2.6275	2.6375	

HOW TO SELECT PISTONS

			PISTON				PISTON				PISTON
Cylinder	bore	2.625	P	Cylinder	bore	2.635	PO	Cylinder	bore	2.645	DD.
۰.		2.6255	use B	**	-	2.6355	use BO	**	**	2.6455	use DD
44	**	2.626	-	**	**	2.636)		44	**	2.646)	
"	**	2.6265	use D		**	2.6365	use DO	"		2.6465	use DD
."	**	2.627	use F	**	**	2.637	use FO	**	**	2.647	use FF
**	**	2.629	use 2.6275		**	2.639	use 2.6375				

Standard equipment on motors num-Standard equipment on motors numbered 200001 to 228655 inc. bered 228656 and up. Symbol Symbol 61335-Piston. 61515-Piston. 61336-Piston ring (furnished; standard .010, and 61336-Piston ring (furnished; standard, .010, and .020, oversize). .020, oversize). 60059-Piston pin (furnished; standard, .002, .005, 61516-Piston pin (furnished; standard .002, .005, .010, .015, and .020 oversize). .010, .015, and .020 oversize).

PISTON SIZES

STANDARD	OVERSIZE	OVERSIZE
B-2.6855	BO-2.6955	BB-2.7055
D-2.6865	DO-2.6965	DD-2.7065
F-2.6875	FO-2.6975	FF-2.7075
-2.6895	-2.6995	

Note: On late models a code letter is stamped on block.

Code letters and corresponding cylinder bore sizes are listed below.

Cylinder	bore	"A" "B"	2.687 2.6875	} use B	Cylinder	bore	"AO" "BO"	2.697 2.6975	BO	Cylinde	r bore	"AA" "BB"	2.707 2.7075	use BB
	"	"C"	2.688 2.6885	use D		"	"CO" "DO	2.698 2.6985	DO	**		"CC" "DD"	2.708 2.7085	use DD
	**	"E"	2.689	use F		**	"EO"	2.699 use	FO	**	**	"EE"	2.709 us	e FF
			2.6915	use 2.68	95 "	**		2.701 use	2.699	5				

Specifications of Windshield, Top and Body Glass used on

Hudson-Essex Phaeton - Briggs Bodies Hudson 5 & 7-pass. Sedan - Biddle & Smart Bodies Hudson-Essex Coach

Windshield, top, and body glass for Hudson-Essex cars is not carried in stock by us. To facilitate the ordering of this material, the following list has been compiled, giving essential measurements and information. The firms listed below have been furnished with blue prints of Hudson-Essex glass, and in event of ordering from them be sure to supply the correct part number of the glass required.

Pittsburgh Plate Glass Company Warehouses

Akron, Ohio Albany, N. Y Atlanta, Ga Baltimore, Md Birmingham, Ala Boston, Mass Brooklyn, N. Y Buffalo, N. Y Chicago, III Cincinnati, Ohio Cleveland, Ohio Columbus, Ohio Dallas, Texas Davenport, Iowa Denver, Colorado Des Moines, Iowa Detroit, Michigan Ft. Worth, Texas Grand Rapids, Mich Harrisburg, Pa High Point, N. C Houston, Texas Indianapolis, Ind Jacksonville, Fla

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Other Glass Sources

Boise, Idaho Boise, Idaho Detroit, Michigan Fairfield, Iowa Fresno, California Lincoln, Neb Los Angeles, California Montreal, Canada Intermountain Glass Co. W. P. Fuller Co. The Auto Glass Co. Thoma & Son W. P. Fuller Co. Western Paint & Glass Company W. P. Fuller Co. Consolidated Plate Glass Co. Salt Lake City, Utah San Diego, California San Francisco, California Seattle, Washington Spokane, Washington Toronto, Canada Walla Walla, Washington Yakima, Washington W. P. Fuller Co.
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W. P. Fuller Co.

WINDSHIELD GLASS			I Phaeton (4	Hudson and 7 passenger)	
Par	t No.	Page No.	Description	For	cars numbered
241	10	4	Upper glass		500,000 to 532,781
241 264	12 179	4	Lower glass One piece glass		} 532,781 and upward
				Coach	, ,
239	934	4	Upper glass		} 400 000 to 500 000
239	941	5	Lower glass		}
239	934	4	One piece glass		500.000 to 526.857
262	209	6	One piece glass		526.857 to 582.324
275	541	6	One piece glass		582.324 to body No. 73-15801
276	542	6	One piece glass		Body No. 73-15801 and upward
	–	-	Sedan	(5 and 7 passenger)	
243	377	5	Upper glass	(o unu / pussenger)	} 302.992 to 310.506
243	384	5	Lower glass		7 pass only: no 5 pass built
229	974	6	Front triangular glass		} / puss. only, no 5 puss. ount
250)79	5	Unner glass		$\frac{1}{310506}$ to 511 238
250	080	5	Lower glass		5 pass only: no 7 pass built
229) 00 074	6	Front triangular glass		} 5 puss. only, no 7 puss. oun
257	785	5	Unner glass		}
257	186	5	Lower glass		5 511 238 to 526 857
257	187	6	Front triangular glass		}
262	288	6	One piece glass		 526,857 to 5 pass. body No. 45672. 7 pass. body No. 41661
267	751	7	One piece glass		 5 pass. body No. 45672 and upward 7 pass. body No. 41661 to 59413
277	/66	7	One piece glass		 7 pass. body No. 59413 and upward 5 pass. superseded by Brougham
				Brougham	
276	552	6	One piece glass	0	600,849 and upward
				Essex 4	
				Phaeton	
562	206	4	Upper glass		608,664 to 630,320
565	548	4	Lower glass		
				Coach	
230	934	4	Unner glass	Couch	500 000 to 542 897
239	941	5	Lower glass		500,000 10 5 12,077
		-			
				Cabriolet	
239	934	4	Upper glass		841,028 to 847,210
239	941	5	Lower glass		
				Essex 6 Phaeton	
610)83	4	One piece glass		100,000 and upward
				Coach	
239	934	4	One piece glass		100,000 to 144,376
262	209	6	One piece glass		144,376 to 200,279
275	541	6	One piece glass		200,279 to body No. 22-21468
276	542	6	Ore piece glass		Body No. 22-21468 and upward

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DOOR GLASS		Hudson Coach	
Part No.	Page No.	Description	For cars numbered
23956	8	Door glass	400,000 to 406,200
24762	8	Door glass	406,200 to 500,000
25528	8	Door glass	500,000 to 526,857
26208	8	Door glass	526,857 to 582,324
27493	8	Door glass	582,324 and upward
		Sedan (5 and 7 passenger)	
24584	8	Door glass-front and rear	302,992 to 511,238
25782	9	Door glass - front and rear	511,238 to 526,857
26284	9	Door glass-front	526,857 and upward
26285	9	Door glass-rear	526,857 and upward
27 (10	0	Brougham	
27649	9	Door glass-front	600,849 and upward
27650	9	Door glass-rear	600,849 and upward
		Essex 4	
	_	Coach	
23956	8	Door glass	500,000 to 509,600
24762	8	Door glass	509,600 and upward
		Cabriolet	
23956	8	Door glass	841,028 to 842,300
24762	8	Door glass	842,300 and upward
		Essex 6 Coach	
25528	8	Door glass	100.000 to 144.376
26208	8	Door glass	144.376 to 200.279
27493	8	Door glass	200,279 and upward
OUADTED WIN		Hudson	
QUARIER WIN	DOW GLASS	Coach	
23957	8	Quarter glass	400,000 to 500,000
25528	8	Quarter glass	500,000 to 582,324
27493	8	Quarter glass	582,324 and upward
		Sedan (5 and 7 passenger)	
24634	8	Quarter glass	302,992 to 511,238
25783	9	Quarter glass	511,238 to 526,857
26286	9	Quarter glass (7 pass.)	526,847 to 537,832
26417	9	Quarter glass (5 pass.)	526,857 to 537,832
27456	10	Quarter glass (7 pass.)	537,832 and upward
27458	10	Quarter glass (5 pass.)	537,832 and upward
		Essex 4 Coach	
23957	8	Quarter glass	500,000 and upward
		Essex 6 Coach	
25528	8	Quarter glass	100 000 to 200 279
27493	8	Ouarter glass	200,279 and upward
	-		· · · · · · · · · · · · · · · · · · ·

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REAR WIN	DOW GLASS		Hudson Phaeton (7 passenger)	
Part No	D. Page No.		Description	For cars numbered
23084	11	Rear glass		104,347 to 107,958
24943	11	Rear glass		107,958 and upward
			Phaeton (4 passenger)	
23085	11	Rear glass		206,285 to 210,582
24943	11	Rear glass Coach		210,582 and upward
23958	11	Rear glass		400,000 and upward
			Sedan (5 and 7 passenger)	
17022	11	Rear glass		302,992 to 511,238
25784	11	Rear glass		511,238 to 526,857
26287	11	Rear glass		526,857 and upward
		Brougham		
27651	11	Rear glass		600,849 and upward
			Essex 4	
			Phaeton	
23085	11	Rear glass		608,664 to 622,906
24943	11	Rear glass		622,906 and upward
			Coach	
23958	11	Rear glass		500,000 and upward
		Cabriolet		-
23958	11	Rear glass		841,028 and upward
			Essex 6	
24943	11	Rear glass	Phaeton	100,000 and upward
			Coach	
23958	11	Rear glass		100,000 and upward



Windshield Glass - Continued



















Door Regulator Repairs - Hudson and Essex Coaches

- 1. Remove window glass and trim panel as explained in instructions covering "Replacement of door glass."
- 2. If regulator arm "A" is bent slightly, it can be straightened without removing regulator from door.
- 3. If necessary, remove regulator mechanisim from door as follows:
- 4. Wind regulator arm "A" up to the top.
- 5. File or chip off end of rivet "B" and punch out rivet.
- 6. Unfasten springs "D" from hooks "C" and remove.
- 7. Remove 3 screws "E" from regulator gear housing "F".

- 8. Turn housing "F" over and remove 2 screws "G" from back of housing. This separates gears "H" and "K".
- 9. Remove Regulator from door.
- 10. If nut "L" which is riveted to arm "A" is stripped or badly worn, replace arm "A" complete.
- 11. If gears "H" and "K" are stripped or badly worn, but regulator is otherwise O. K., the gears can be driven off and replaced. Gears "H" and "K" are identical.
- 12. If the entire regulator is worn out, replace with new regulator complete.



To re-assemble regulator on door proceed as follows:

- 1. Disconnect housing "F" by removing 2 screws "G."
- 2. Insert regulator in door and assemble housing with screws "G".

(See that gears have supply of grease.)

- 3. Fasten housing to door with 3 screws "E".
- 4. Rivet arm "A" to door with special rivet "B."
- 5. Wind regulator arm "A" up to the top

- 6. Place springs "D" inside door, hooking lower ends to holes in arm "A."
- 7. Insert spring hooks "C" in door.
- 8. Use a strong piece of string, or wire, or a suitable hook and extend springs, one at a time till they can be hooked in place on spring hooks "C."
- 9. Apply oil or grease to working parts of regulator.
- 10. Wind regulator up and down to full extend to see that every-thing works O. K.
- 11. Carefully replace window glass, trim panel, etc



To Replace Door - Glass-Hudson and Essex Coaches

- 1. Remove nut "A" on top of inside latch handle "B."
- 2. Remove inside latch handle "B."
- 3. Remove 4 screws "C" and lift off door header "D."
- 4. Remove 4 screws "E" and lift off door sill "F."
- 5. Wind regulator up to full extent and remove glass through top of door.
- 6. When a new glass is to be installed it will be necessary first to remove the metal channel and packing from the old glass and fit it carefully to the new glass. See Instructions "How to Fit Channel to Window Glass."
- 7. Before placing new glass in door, see that all broken glass, etc., is removed from bottom of door.

- To Remove Pieces of Glass, etc., From Bottom of Door
- 1. Remove 2 screws "G" fastening check strap to door.
- 2. Remove screw "H" on regulator handle.
- 3. Remove regulator handle "K."
- 4. Remove 4 screws "L" in rear edge of door and lift off door panel retainer
- 5. Insert screwdriver in bottom of trim panel "N" and pull panel from door. This will give access to the "well" part of the door.
- 6. In replacing trim panel, note that the lower edge of panel is fastened to the door with snap buttons " 0, " and when these have been taken apart, the part that fastens to the door can not be used again. It is therefore necessary to have on hand a supply of snaps to be used when replacing a door panel or other part where they are used. After panel is back in place, replace all parts in reversed order to that of removal.



To Eliminate Squeaks at Top Corners - Hudson and Essex Coaches

The following instructions apply to the rear corners. The front corners can be treated in a similar manner.

- 1. Loosen the drip moulding finish plate "B" and drip moulding "A" for a distance of about 10 inches from the conrner, taking care not to bend them any more than is necessary.
- 2. Loosen the beading or moulding "C" at the back for a distance of about 10 inches from the corner
- 3. Remove tacks from decking "D" and fold back corner of decking exposing wood frame
- 4. Tighten all screws thus exposed with a heavy screw driver. Two screws are under the head lining and can be reached by inserting the point of screw driver under the edge of head lining. Before replacing decking, et cetera, run car to see if squeak is stopped. Sometimes a further tightening of the screws may be necessary.

NOTE - The screws referred to, pass through the wood frame and also through a metal angle brace under the frame. Square nuts are used on the underneath side and sometimes these nuts may turn with the screw, screw, preventing it from tightening up, If this happens, it will be necessary to get to the nut and hold it with a wrench while the screw driver is used.

To reach the nuts proceed as follows:

- 1. Remove rear seat and swing the back forward.
- 2, Remove all of the back window moulding if necessary to get at both corners, or top and bottom and side nearest corner if only one corner squeeks.
- 3. Loosen trim carefully from rear side of quarter light.
- 4. Remove tacks from lower edge of trim panel and pull out rear and side corner panel carefully from the bottom until room is made to reach up underneath to the nuts with a wrench.
- 6. Replace all parts carefully.

NOTE - The drip moulding finish plate which conceals the screws in drip moulding will tend to curl when removed. It can be put back in place easily by means of a flat drift or blunt cold chisel and ahammer. Work along the lower edge beginning at the point where it is in place and carefully hammer into position.



How to Fit Channel to Window Glass - Hudson and Essex Coaches

To properly fit the channel to the glass, great care must be taken not to chip or crack the glass, and the two must be fitted tightly together so the glass will not work loose from the channel.

The thickness of window glasses varies, therefore the packing used must be deter-mined by the thickness of the glass. A thick glass will require thin packing and vice-versa. If the cork packing as used by the factory is available it should be used.

Other materials, however, such as felt, or good soft cloth can be used with good results. When using felt or cloth, a thin coat of shellac should be applied next to the glass, before assembling. This will make the felt or cloth adhere to the glass and prevent loosening. Do not use shellac with cork packing. To prevent chipping of the glass a perfectly flat board "A" or bench is necessary and should be covered with a piece of carpet "B." The board should also be longer than the width of the glass. Having everything ready, proceed as follows:

- 1. Apply shellac to one side of felt or cloth.
- 2. Turn glass "C" upside down with top edge resting on carpet.
- 3. Place packing "D" on edge of glass "C" where channel "E" is to be applied, with she lacked side next to glass.
- 4. Place channel "E" on top of packing, and see that glass "C" overhangs equally at both ends of channel "E."
- 5. Use a rawhide hammer, or hammer and block of wood, and carefully drive channel down over packing and glass till glass is completely in place.
- 6. Trim off any surplus packing flush with edges of channel.



To Replace Quarter Glass - Hudson and Essex Coaches

- 1. Remove 2 screws "A" fastening check strap to body.
- 2. Loosen 4 screws "B" in door sill "C."
- 3. Remove 4 screws "D" and lift off upper front moulding "E," disconnecting it from felt channel at upper end.
- 4. Carefully loosen trim panel "F" below window far enough to expose regulator arm "G."
- 5. Remove cotter pin "H" from pin on window channel connecting to regulator arm "G."
- 6. Hold regulator handle "K" firm and disconnect regulator arm "G" from pin. At the same time, hold glass to

keep it from dropping. Then lower glass to bottom.

- 7. Remove 2 screws "L" in front end of regulator plate and 2 screws "M" in rear end. Then lift off regulator plate assembly "N."
- 8. Lift glass up and then to the front.
- 9. When a new glass is to be installed it will be necessary first to remove the metal channel and packing from the old glass and fit it carefully to the new glass. (See Instructions "How to Fit Channel to Window Glass.")
- 10. After new glass has been put in place, reverse above operations.



Rev. G. P. 5M - 3-2-26 PRINTED IN U. S. A.

Minor Repairs and Adjustments -Hudson and Essex Coaches

Striker Plate Too Tight

When the door fails to close or closes too tight, the striker plate screws on the door post should be loosened and striker plate moved outward until the proper adjustment is made.

When the door closes but is not tight enough, the striker plate screws should be loosened and striker plate moved inward until the proper adjustment is made.

NOTE-Loosen the screws in striker plate just enough so the plate has to be tapped with a hammer to move it. See that both screws are properly tightened after adjustment is 0. K.

If door plunger does not engage deep enough in striker plate, allowing door to jar open, put a metal shim about thick between striker plate and post.

Squeaks in Dovetail

The dovetail is just above the door plunger and must be set so that the corresponding part on the body fits properly in place when the door is closed.

To make the dovetail fit closely, the female dovetail should be removed from the door and taken apart. The flat spring holding the rubber pads can then be squeezed closer together and reassembled. If the rubber pads are worn out they should be replaced.

Leaks in Cowl

1. Tighten all screws in cowl. These can be reached from the inside with a screw driver.

2. Fill in any open space between cowl and dash with ordinary black putty. (This can be purchased ready to use in any hardware store.) Yarn saturated with black shellac can also be used if putty can not

be obtained, or beeswax mixed with lampblack

To Replace Back Window Glass

1. Remove all inside moulding and old glass.

2. Scrape off all old putty or filling material from window frame.

3. Place rubber moulding around edge of glass.

4. Apply black putty, or beeswax mixed with lampblack, to rubber mould ing on rear side.

5. Press glass firmly in place.

6. Replace moulding.

7. Remove all excess putty from outside of glass.

Door Glass Too Tight

1 Apply oil to the felt channels. This will usually make the glass slide easily.

2. Due to the variation in thickness of glass, it may happen that the glass is too thick to slide freely in the

channels. In this case, if oiling the felt does not make it work easily, proceed as follows:

If glass moves freely in lower part of movement but is stiff toward the top -

1. Remove the glass. (See "To Replace Door Glass".)

2. Remove felt channels. (See below.)

3. Use a block of hardwood and a hammer and widen the space in door post in which the felt channel fits. This is done by pounding the metal on the inner side of post.

4. Try the glass in place until it moves freely. Then replace door sill, header, etc.

If glass moves freely in upper part of movement but is stiff towards the bottom -

1. Remove the glass. (See "To Replace Door Glass".)

2. Remove felt channels. (See below.)

3. Cut away the sides of felt channels at the lower end for a distance of about 6 inches, or until sufficient freedom of movement has been obtained for the glass.

4. Replace all trim mouldings, etc. carefully.

If glass moves stiffly in all positions combine the above instructions.

Door Glass Too Wide

Sometimes the glass may be too wide causing it to bind slightly on the edges. In this case proceed as follows:

1. Remove the glass. (See "To Replace Door Glass".)

2. Remove felt channels. (Seebelow.)

3. Use a hammer and blunt chisel or drift, and pound back the bottom of metal channels so as to make more room for width of glass.

4. Replace all parts carefully.,

To Remove Felt Channels from Door

1. Remove glass and trim panel. (See "To Replace Door Glass".)

2. Unhook upper end of felt channel from door post.

3. Unhook lower end.

Door Glass Too Loose

Take a strip of cardboard about 1/2" wide and insert it behind one of the felt channels.

The cardboard should be long enough so it can be pushed down as far as it will go, and should

extend almost to the top of the felt channel. Usually this will tighten up the glass sufficiently. In case of an exceptionally thin glass, the space in the door posts can be made narrower by pounding the metal in the reverse direction to that explained above for thick glass.

Quarter Glass Too Tight

1. Apply oil to the felt channels. This will usually make the glass slide easily.

2. If oiling the felt channels does not make the glass move freely, loosen the side mouldings and move them further away from glass. This will allow more room for the glass.

Quarter Glass Too Loose

Use a strip of cardboard as explained above for "Door Glass Too Tight." If this does not tighten the glass sufficiently loosenthe side mouldings and move them closer to the glass. This will make the felt channels narrower and cause the glass to fit more closely.

Quarter Regulator

To remove quarter regulator see instructions "To Replace Quarter Glass." If the regulator arm is only slightly bent it may be straightened and used again, but if necessary, a new arm can be easily installed. If the quarter glass goes all the way up before the lever engages in the notch in sill, file the notch until the lever engages and holds securely.

When Screws Are Stripped

Most of the machine screws used in mouldings, door handles, check straps, etc. are No.10-32 threads. When necessary to re-tap, use a No.12-24 tap and have on hand a supply of No. 12-24 screws of the proper length, size and shape of head, etc., for quick replacement and to make a clean, neat job.

Service Hinges for Coach Doors Note

Male Hinges

Male hinges can be used to repair all doors in which the hinges form part of the door pillar. The method of cutting away the broken hinge and fitting the service hinge in place is explained below.

Male hinges are supplied in two widths - 1-1/2" and 1-7/8" and in both cases the lower hinge differs from the center and upper hinges. Therefore, note carefully the width of hinge required, and whether lower or otherwise and order by number from the list below:

BO-27859 Door hinge, male, center and upper - 1-1/2" wide.

BO-27860 Door hinge, male, lower only - 1-1/2" wide. BO-27861 Door hinge, male, center and upper-1-7/8" wide.

BO-27862 Door hinge, male, lower only-1-7/8" wide.

Female Hinges

Female hinges are supplied in two widths to match male hinges, and are attached to the body with bolts. Some require one bolt only while others require two, and in the latter case a variation in the distance between centers of bolt holes occurs.

To Replace Broken Male Hinge on Door

1. Cut away the old hinge where it comes through the overlap, as shown at the left below, until the service hinge fits properly in place.

2. Hang the door and assemble service hinge with hinge pin in place.

3. Bring base of service hinge up against edge of door and hold securely while carefully marking off the three holes to be drilled for screws.

All replacement doors have hinges 1 7,~" wide. To adapt a new door to a coach having I Y~ " hinges it will therefore be necessary to replace the female hinges also with new hinges 17/8" wide. Hinges BO-27863 and BO-27864 are specially supplied for this purpose.

BO-27863 Door hinge, female, one bolt type - 1-7//8" wide.

BO-27864 Door hinge, female, two bolt type - 1-7/8" wide, holes 13/16 centers.

BO-27549 Door hinge, female, one bolt type - 1-1/2" wide.

BO-27576 Door hinge, female, two bolt type - 1-1/2" wide, holes 13/16' centers.

BO-27578 Door hinge, female, two bolt type - 1-7/8" wide, holes 1-3/16" centers.

In all cases where female hinges are required note carefully-the width of hinge, whether one or two bolts, and distance between centers of bolt holes. Consult the above list for correct hinge and order by number.

4. Use a No. 18 drill (.1659) and drill through the door pillar. Then tap with a No. 12 x 24 tap until the screws fit tight in the threads.

5. Use No. 12 x 24 flat or oval head machine screws and see that the points do not project inside of the pillar so as to interfere with the operation of the window.


How to Unload Staged Cars



Figure 1, showing method of loading three Hudson Coaches in thirty-six foot box car by staging or elevating the two end cars. Wheels and tires of staged cars, as well as front tires and rims of center car which have been removed to permit running front end under the staged automobile, are secured to the floor of the box car in the manner shown. This view shows the construction of the "A" frames used to support the elevated cars, also the method of blocking the wheels and straps over springs to car floor.

showing rear staged car supported by chain hoist while "A" frame on right-hand side is removed, preparatory to moving out center car. The chain hoist is supported by the grab hook which grips the center roof timber, while the lifting chain is hooked around the front axle center. To prevent damaging the front end of the car, the lifting chain is held at the proper distance by a wooden block resting against the bottom of the front springs. If the freight car has a steel roof, suspend chain hoist as shown in Figure 7.



Figure 2



Figure 4 illustrates in detail the method of supporting the end or staged automobiles in the box car. The rear wheels rest in heavy wheel blocks securely spiked to the car floor, while metal straps, which pass over the rear springs and are fastened to the floor, prevent any up and down movement. The front end of the car is supported by "A" frames fastened to the box car floor with metal brackets. Holes bored through the cross pieces a t the upper ends of these frames receive the front axle spindles of the staged car, while braces between the upper ends of the frames and the sides of the freight car prevent any side movement. A water and oil proof cover of sufficient size is fastened by wooden cleats and wires to the bottom of the car to prevent damage to the finish of the car below. The unloading of staged automobiles is accomplished as follows:

Suspend chain hoist in box car by methods shown in Figures 2 and 7, or use staging crane as shown in Figure 8.

Figure 3. This view shows the center automobile being unloaded. After removing the wheels, rims and tires which are fastened to the floor of the box car, the wheel blocks and the metal straps over the rear springs are pried loose and the car moved forward as far as possible. The front end of the rear staged automobile is then raised up slightly by means of the chain hoist, giving sufficient working space to permit placing dollies under the rear wheels of the center car. The center automobile is then re-moved from the box car by sliding the rear end sidewise while the front end is guided by the steering mechanism. If reasonable care is exercised this operation can be readily done without danger of damage to the bodies or fenders



After the chain hoist has been securely fastened in place, the lifting chain is attached to the front axle center as shown in Figure 2, and the hoist is operated until the weight of the front end of the car is off the "A" frames. The braces between the upper ends of the frames and the sides of the car are next removed and the frames spread apart and pried loose from the car floor. The straps over the rear springs are then removed and the front end of the automobile lowered to a convenient height to permit the installation of the front wheels. When replacing front wheels,

care should be used to adjust the bearings so the wheels will turn freely without shake, to lubricate parts thoroughly and to replace cotter pins in spindle nuts.

Lower car to floor, remove chain hoist and support, also wheel blocks from rear wheels. Place dollies under rear wheels and remove automobile from box car as shown in Figure 3. The staged automobile at the opposite end of the freight car is then unloaded in exactly the same manner as above described.

Figure 5, shows four Essex Coaches loaded in a forty foot box car, the two end cars being staged. The two cars in the center, which face opposite directions, have the front tires and rims removed to allow the front ends sufficient clearance under the staged cars. The first step in unloading consists of removing the straps securing the wheels, tires and rims to the car floor as well as the wheel blocks from the two center cars and the metal straps which hold these cars to the floor.



Figure 5



Figure 6. In this illustration is shown the unloading of one of the center automobiles. As will be noted. It is not necessary to disturb the staging supporting the two end cars when removing the two center cars of a four Essex Coach load. The two center cars are moved away from each other as far as possible, and dollies are placed under the rear wheels of one of them. The rear end of the car is then moved out sidewise through the door while the movement of the front end is controlled by the steering gear.



Figure 8 illustrates the manner of unloading staged cars using a staging crane, the use of which eliminates the necessity of putting up an overhead cross beam when unloading steel roofed freight cars. The heavy lifter bar is attached under the front springs and is prevented from slipping off by a hook forged on one end and a lock plate at the opposite end. When the crane is properly placed the handle is raised in a vertical position as shown and secured by a latch fastened to one of the crane cross members. With the handle in this position the load at one end of the crane is transferred from the swivel caster to the handle proper which effectively prevents movement in any direction.

Figure 7, showing the method of suspending the chain hoist when unloading staged automobiles in a steel roofed freight car. A wood beam 6' x 6' in section, or a steel beam of adequate strength, is cut to the proper length to fit across the freight car andifastened in place just in front of the-automobile to be lowered. One end of the beam rests in the steel channel above the car door while the other end is supported by a cleat nailed to the side of the car.



Figure 9. This view shows the design and construction of the staging crane referred to in the preceding paragraphs and shown unloading a staged car in Figure 8. Such a device greatly simplifies this work, reducing the time necessary and will soon pay for itself in the hands of the distributor or dealer who has a considerable number of cars to unload.



The Hudson oil pump is the plunger type. The stroke of the pump varies according to throttle opening controlled by an eccentric through an arrangement of levers hooked up with the foot accelerator and throttle control. The illustration gives details of the pump construction, also operating position of oil pump adjusting shaft and cross shaft lever at closed throttle.

To adjust the oil pump proceed as follows:

- 1. With engine throttle fully closed, loosen the oil control cross shaft lever clamp nut "A."
- 2. Turn oil control cross shaft "B" with a screw driver until pin "C" is inline with pin "D".
- 3. Make sure that oil control cross shaft lever "E" is pointing down.
- 4. Remove plug "F" and insert a short piece of wire until it touches end of plunger. If the engine is turned over by hand or run at idling speed, the stroke of the plunger can be measured by means of a steel scale as shown.
- 5. The correct stroke is 3/16" for normal driving speeds, and 5/32" for high speeds.
- 6. Turning the shaft "B" to the left decreases the plunger stroke, and to the right increases it.
- 7. After the proper setting has been made tighten the clamp nut "A," replace oil pipe plug "F" and make sure that all oil connections are tight.

May, 1926 DATA FOR HUDSON AND ESSEX CARS

		No	. of	We	ight	Color of	Maker of	Upholstery	Make of
		Do	ors	Ship.	Running	Paint	Paint	Material	Body
	7-Pass.	Phae.	4	3365	3565	Blue	Dibble	Leather	Briggs
Hud.	5- "	Coach	2	3405	3605	Blue	Color	Granite weave	Briggs
	4- "	Brougham	4	3495	3695	India Blue	Со.,	Velour	(Biddle
	7- "	Sedan	4	3645	3845	" "	Det.	Velour	(Smart
SX.	5-Pass.	Phae.	4	2290	2430	Blue	"	Leather	Briggs
	5- "	Coach	2	2455	2595	Blue	"	Granite weave	Briggs

* Weight of car with gasoline, water and oil.

STANDARD EQUIPMENT

Hudson - Phaeton - Wood wheels, cowl ventilator, heat indicator, gearset lock, front and rear bumpers, windshield wiper, stop light, Radiator shutter.

- " Coach Same as Phaeton with rear view mirror, door lock, sunvisor and trunk rack added.
- " Brougham- Same as Coach with side lights added.
- " Sedan Same as Brougham except trunk rack.
- Essex Phaeton Wood wheels, cowl ventilator, heat indicator, gearset lock, front and rear bumpers, windshield wiper, stop light, radiator shutter.
 - " Coach Same as Phaeton with rear view mirror, door lock and sun visor added.

ENGINE, FUEL SYSTEM, COOLING SYSTEM, LUBRICATION

		Hudson	Essex
Engine 1	Make	Own	Own
-	Type of head	L	L
	No. of cylinders	6	6
	Arrangement	Vertical	Vertical
	Firing order	1-5-3-6-2-4	1-5-3-6-2-4
	Bore & Stroke	3½ x 5	2-11/16 x 4¼
	Displacement	288	144.67
	Taxable H. P.	29.4	17.32
	Cylinder Head	Detachable	Detachable
	Crankcase	Separate	Cast with cylinders)
	Suspension	4 point	4 point

		Hudson	Essex
Pistons			
	Material	Aluminum Alloy	Aluminum Alloy
	Туре	Slotted Skirt	Slotted Skirt
	Weight	16 ounces	8 ounces
	Clearance (skirt)	.0035	.002
	Depth of groove for rings	.164	.156
Piston			
<u>Rings</u>	Material	Cast iron	Cast iron
	Type of joint	Mitro	Mitro
	No. per piston	3	
	Width	1/8"	1/8"
	Thickness	135	113
	Gan clearance	006-008	006- 008
	Sup clearance	.000 .000	.000 .000
Piston Pins	Diameter	1_3/32"	3//1"
<u>1 1115</u>	Length	2-11/16"	2_3/32"
	Type	Floating	Floating
	Type	Tiouting	Tioating
Piston	Length	1-3/16"	15/16"
Pin Bus	h-Outside diameter	1-9/32"	15/16"
<u>ing</u>	Inside "	1-3/32"	3/4"
Crank-	No. of bearings	4	3
shaft	Diameter and length No. 1 (front)	2-9/32 x 2-3/8	2-7/32 x 1-5/8
	" " 2	2-9/32 x 1-7/8	2-1/4 x 1-3/4
	" " 3	2-5/16 x 2-1/8	2-9/32 x 2
	" " " 4	2-11/32 x 3-1/8	
	Crank pin diameter	2-1/4	1-13/16
	Main bearing clearance	.001	.001
	" " end play	.004	.004
	End thrust taken by	Rear center brg.	Center bearing
	Sprocket	21 teeth	19 teeth
Connect	-Diameter	2-1/4	1-13/16
ing rod	Length	2	1-3/8
<u>bearing</u>	Clearance - endwise	.004 to .010	.004 to .010
Valves,	Head - diameter	1-13/16	1-1/4
Springs	Stem - diameter	3/8	5/16
and Tap	- Length overall	6 - 7/8	5 - 1/16
pets	Valve guide	Removable	Removable
Tappets		Roller	Roller
	Lift (intake)	9/32	9/32
	" (exhaust)	19/64	19/64
	Tappet clearance (intake)	.002003	.002003
	" (exhaust)	.004005	.004005
	Valve spring pressure	62 lbs.	40 lbs.
	" " length valve closed	2-3/8"	2"

Valve <u>Timing</u>	Intake opens " closes Exhaust opens " closes
Cam <u>Shaft</u>	No. of bearings No. 1 bearing (front) dia. & length No. 2 " " " No. 3 " " " No. 4 " " " Sprocket
Front End Drive	Type Width of chain No. of links Pitch Adjustment Generator Drive Sprocket
Muffler	Exhaust pipe dia.
Fuel <u>System</u>	Carburetor - Make "size Fuel feed Gasoline tank make "capacity Method of heating mixture
Cooling <u>System</u>	Type Radiator-make " type Capacity of system Upper radiator hose) diameter and length) Lower radiator hose) diameter and length) Fan belt type " " width " " length
Lubri- cation	Type Type of pump Capacity of oil reservoir only """ & troughs Mesh of screen Stroke of oil-pump-motor idling
	Grade of oil

<u>Hudson</u>	Essex
7° after T.D.C.	7° after T.D.C
42° " B.D.C.	50° " B.D.C.
55° before B.D.C.	55° before B.D.C.
8° after T.D.C.	8° after T.D.C.
4 2-19/32 x 1-5/8 2-11/32 x 1-1/16 2-5/13 x 1-1/16 1-1/2 x 1-3/4 42 teeth	3 2 x 1-1/6 1-31/32 x 1-1/16 1-1/2 x 15/16 38 teeth
Morse chain	Morse chain
1-1/2	1-1/4
63	57
1/2	1/2
Adjustable Eccen.	Adjustable Eccen.
16 teeth	16 teeth
2-1/4	1-3⁄4
Stewart	Stewart
1-1/2	1
Stewart vac. tank	Stewart Vacuum tank
Own	Own
19 gallons	11-1/2 gallons
Exhaust stove	Exhaust stove
and hot spot	and hot spot
Centrifugal pump	Thermo-syphon
Harrison	Harrison
Ribbon cellular	Ribbon cellular
4 gallons	4-3/4 gallons
1-1/2 x 7	2-1/4 x 5-1/2
1-1/2 x 10-1/2	2-1/4 x 14-1/2
Flat	Flat
1"	1"
35	36
Circulating Splash	Circulating splash
Plunger	Plunger
7 quarts	5 quarts
9 "	5½ "
50	50
3/32" min1/8" max. Medium heavy - use low cold test in	Medium heavy - use low cold test in

Winter

Winter

CLUTCH. TRANSMISSION, SPEEDOMETER DRIVE (Continued)

		<u>Hudson</u>	Essex
Clutch	Driving mombars	6	1
Clutch	Driven	6	4
	Diiven	0	5
	Cork inserts		
	in driving plate	52 per plate	12 per plata
	In driving plate	Mixture 14 pt	42 per plate
	Luoneation	(Wrixture 74 pt.) (Karosana & 1/4	(Wirkture 74 pt.
		(nint motor oil	(nint motor oil
	Throwout	(pint motor on 5/16"	(pint motor on 5/16"
	Clearance at floor board	3/8"	3/8"
Trans	Creatance at noor board	5/0	5/0
mission	Location	Unit	Unit
<u>mission</u>	Speeds	3 Forward 1 Rev.)	Forward 1 Rev
	Gear ratio low	3304 to 1	3.244 to 1
	" " second	1 81 to 1	1 961 to 1
	" " reverse	3 69 to 1	1.901 to 1
	Oil capacity (approx)	116 quarts	1.170 to 1
	On capacity (approx)	172 quarts	I quait
Speedo-	Make	Stewart Warner	Stewart Warner
meter	Gear No of teeth	6	
meter	Pinion " " "	16	4 1/
	1 mion	10	14
	FRONT AXLE, FRONT SPRINGS, STEER	ING GEAR	
Front	Section	T	T
Avle	Type of end	Filiott	Flliott
AAIC	Type of end	Linou	Linott
Front	Type	Semi-elliptic	Semi-elliptic 3
Springs	Length	39"	6"
opringo	Width	21/4"	° 2"
	Bolts - dia	11/16"	2 5/8"
	Bushings	Phosphor Bronze	Phosphor Bronze
	8-	r	P
Steering	Make	Gemmer	Own
Gear	Type	Worm&Sector	Worm & Wheel
	51		
	<u>REAR AXLE, DIFFERENTIAL, BRAKES, RI</u>	EAR SPRINGS	
Rear	Type	Semi-floating	Semi-floating
Axle	Propulsion through	Springs	Springs
Differ-	Type of drive	Spiral bevel	Spiral bevel
ential	No. of teeth in gear	49	56
	" " " pinion	11	10
	Gear ratio	4-5/11 to 1	5.6 to 1
	Pinion adjustment	Screw	Shims
	·		
Service	Location	Rear wheels	Rear wheels
Brakes	Туре	External	External
	Operated by	Foot pedal	Foot pedal
	Drum dia (Int.)	151/2"	14"
	Lining per brake	441/2"	39-3/8"

CLUTCH. TRANSMISSION, SPEEDOMETER DRIVE (Continued)

		Hudson	Essex
Service	Lining width	21/2"	13/4"
Brakes	Lining thickness	3/16"	3/16"
	8		
Emergency	Location	Rear Wheels	Rear wheels
Brakes	Type	Internal	Internal
	Operated by	Hand lover	Hand lever
	Drum dia (Int.)	1514	14
		1572	14
	Lining per brake - length	40	35
	" width	21/2	11/2
	" thickness	3/16"	3/16"
Rear	Type	Semi-elliptic	Semi-elliptic
Springe	Longth	57 11/16	54 7/9"
<u>springs</u>		57-11/10	34-778
	Width	21/2	2
	Front end bolt-dia.	3/4"	5/8"
	Bushings	Phosphor Bronze	Phosphor Bronze
	Shackle bolts-dia.	11/16"	5/8"
	WHI	<u>EELS, TIRES</u>	
Wheels	Type	Wood-Steel felloe	Wood-steel felloe
	Make of rime	Firestone	Iavon
		Filestolle	Jaxon
	loe-in of front wheels	None (or not	None (or not
		over 1/8")	over 1/8")
Tires	Tires	Goodyear & U.S.	Goodyear & U.S.
	Size	33x6.00 balloon	30x4.75 balloon
Tire	Sedan	26 lbs front	
Draggurag	"	20 103 Hold	
<u>Flessules</u>	— •	54 Ieai	
	Brougham	26 " front	
	"	34 " rear	
	Coach	26 " front	28 lbs front
	"	30 " rear	34 " rear
	Phaeton	26 " front	28 " front
	Theton	30 " rear	34 " rear
	В	BEARINGS	
Trans		Livett No. 47025	Unott N.C. 206
11/2/18-		Hyatt No. 47023	Hyatt N.C. 500
mission	- rear	" " 16684	" N.C.306
	Countershaft front	" " 16506	
	" " rear	" " 16506	
	Reverse idler	" " 16820	
	Pocket	" " 16820	
	nilot hall bearing in grankshaft	N D No 1205	N D No 1202
	phot ban bearing in crankshart	N. D. NO. 1205	IN. D. INO. 1202
<u>Clutch</u>	Throwout bearing	Nice No. S.K.2157	Nice No.S.K. 2156
Front	Inner	Timken No. 412A & 415	Tim. 2520 & 2554
Wheels	Outer	" " 312 & 315	" 2320 & 2362
_	Thrust	Nice " 4984	Nice 607
			507
Rear Wheel		Timken 454 & 458T	Tim. 412A & 415TV
Bearing			

Sheet #5 Ser :854

BEARINGS (Continued)

		<u>Hudson</u>	Essex
Differen-	Right	Timken 3720 & 377	Timken 3320 & 336
tial	Left	" 3720 & 377	" 3320 & 336
Drive	Front	" 3120 & 3196	" 2620 & 2690
Pinion	Rear	" 432 & 439T	" 3320 & 346
<u>r mion</u>			5520 a 510
	<u>ELEC</u> Separate moto	r, Generator and Ignition units	
Storting	Maka	Amorican Bosch	American Bosch
Matan	Drive	American Bosch	American Bosch
Motor	Drive	Manual-sliding gear	Bendix
Genera-	Make	American Bosch	American Bosch
tor	Regulation	Third Brush	Third Brush
	-		
Ignition	Make	American Bosch	American Bosch
<u>System</u>	Spark Control	Semi-Automatic	Automatic
	" timing	Time 10° Before D.C.	Time spark on D.C.
		(Lever fully advanced)	(Fully retarded)
	Breaker points-material	Tungsten	Tungsten
	" " gap	.020	.020
	Distributor gear-teeth	21	19
	Drive gear-teeth	8	8
Spork	Maka	A C Titon	A C Titan
Dlugs	Sizo	A.C. Indii Matria 18 M/M	A. C. Intan Matria 18 MOM
<u>Flugs</u>	Size	Nettic 10 M/M	Short
	Type	SHOR 025 028	SHOR 025 028
	Gap	,025028	.025028
Storage	Make	Prest-o-Lite	Prest-o-Lite
Battery	Туре	6-15-J.F.K.	6-13-J.F.K.
	Voltage	6	6
	No. of plates	15	13
	Rating	120 Amp. hours	105 Amp. hours
	Terminal grounded	Neg.	Neg.
	Length overall	101/4"	9"
	Width "	71/2"	71/2"
	Height of box	8"	8"
	" over terminals	9"	9"
	Terminals	Std_clamp type	Std_clamp type
	Terminars	Std. clamp type	Sta. clamp type
<u>Horn</u>	Make	E.A.	E.A.
	Туре	Motor	Motor
LAMPS	Headlight voltage	6-8	6-8
	" C P	21	21
	" contact	Single	Single
	" long make	Spreadlight	Spreadlight
	" diameter	o"	o"
	Dash and tail voltage	2 4	8
		3-4	5-4
	U.P.	<u>/</u>	2 0: 1
	Contact	Single	Single
	connected	Inseries	In series
	Stop light voltage	6-8	6-8
	" " C.P.	15	15
	" " Contact	Single	Single

MISCELLEANOUS

Wheel Base Turning Frame-denth	127-3/8" 24½ feet 7"	110-1/2" 23 feet 41/2"
" width of flange	2-1/4"	1-7/8"
Overall length including bumpers	15' - 6"	14' 6"

To obtain motor RPM in relation to car speed, use the following formula:-

 $\frac{\text{Car speed (M.P.H.) x Rear axle gear ratio x 336}}{\text{Wheel diameter in inches}} = \text{Motor R.P.M.}$

Example - What is the R.P.M. of the Super-Six Motor at 10 miles per hour?

Answer - $\frac{10 \text{ (car speed x 4.45 (gear ratio) x 336 = 14952)}}{33"}$ (Wheel diameter) 33.

To obtain the number of revolutions of the motor required for one revolution of the rear wheel:

Multiply the rear axle ratio by the transmission ratio.

Example: 4.45 (rear axle ratio) multiplied by 3.04 (low gear ratio) equals 13.528 revolutions of the motor to one revolution of rear wheel.

The following list shows the various motor to wheel ratios -worked out as above for Super-Six, and Essex-Six cars.

			<u>Super-Six</u>	Essex-Six
With tr	ansmissi	ion in low	13.523 to 1	18.166 to 1
"	"	" second	8.054 to 1	10.981 to 1
"	"	" high	4.45 to 1	5.6 to 1
"	"	" reverse	16.420 to 1	23.352 to 1

January, 1926



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HE-116-Clutch Assembling and Disassembling Fixture greatly reduces time necessary in performing repair operations on Hudson and Essex clutches.

Above is shown the manner of using the fixture in assembling the Hudson clutch plates. To adapt the fixture for use on the Essex clutch, it is only necessary to change the position of the aligning pins from the outer to the inner series of holes in the main body casting.



HE-115—Bushing Press with sleeve No. 16 and plug No. 15, removing Essex spring bushing. To remove Hudson front and rear spring rear end bushings use sleeve No. 16 and plug No. 31. To remove Hudson rear spring front end bushing use sleeve No. 16 and plug No. 32. To install bushings use press with plugs only.



H-129-Clutch Puller, removing Hudson clutch assembly from transmission main shaft drive gear.



HE-116—Clutch Assembling and Disassembling Fixture. Above is shown the fixture with the clutch plates and springs fully compressed by means of the upper clamp casting and wing nut. In this position the castle nuts may be easily tightened in place on the spring studs and cotterpinned, and the clutch assembly when removed from the fixture will be properly aligned to assemble in clutch cover.





H-75

H-75-Adjusting Eccentric and Eccentric Body Bushing Line Reamer. Spiral type reamer (size .750" and 1.250 "). Used to ream adjusting eccentric and eccentric body bushings in Hudson motor.

E-90

- H-76-Distributor Drive Shaft Bushing Line Reamer. Used to ream distributor drive shaft bushing on Hudson motor. (Size .5625".)
- H-77-Valve Stem Guide Reamer. Long expansion type (size .375"). Used to ream valve stem guides in Hudson and Essex Four motors.
- H-78-Piston Pin Bushing Line Reamer. Piloted spiral expansion type (size 1.0937"). Used to ream connecting rods, bushings and pistons in Hudson motors.
- H-80-Steering Gear Lower Case Line Reamer with pilot bushing. Used to ream steering gear lower case bushing in Hudson steering gear. (Size .980".)
- H-81-Expansion Reamer (size .750"). Used to ream internal brake shaft bushings and rear spring front end bushings on Hudson car.
- E-84-Piston Pin Line Reamer. Piloted spiral expansion type. Used to ream connecting rod bushings and pistons in Essex Four motors. (Size .875".)
- E-85-Distributor Shaft Bushing Line Reamer. Used to line ream upper and lower bushings in Essex distributor support. (Sizes .620" and .500".)

- E-86-Piston Pin Line Reamer. Piloted spiral expansion (size .750 "). Used to ream connecting rods, bushings and pistons on Essex Six motors.
- E-87-Valve Stem Guide Reamer. Long expansion type (size .3125"). Used to ream valve stem guide in Essex Six motor.
- E-89—Transmission Gear Bushing Reamer. Piloted type (size .870°). Used to ream countershaft and reverse idler gear bushings in Essex Six transmission.
- E-90—Transmission Main Shaft Drive Gear Bushing Line Reaming Fixture. Used with reamer E-90-1 (size .750") to ream bushing in end of main shaft drive gear in Essex transmission.
- E-91-Spindle Pivot Pin Bushing Reamer. Long spiral piloted expansion type (size .750"). Used to ream spindle pivot pin bushings on Essex front axle.
- E-92—Steering Arm Bushing Reamer. Standard ex-pansion (size .500 °). Used to ream steering arm bushings in Essex front axle.
- E-93-Expansion Reamer (size .625"). Used to ream rear axle internal brake shaft and spring bushings in Essex rear axle.
- E-94-Expansion Reamer (size .875"). Used to ream steering gear case cap bushings in Essex steering gear.



[12]

HE-115-Bushing Press

Below are listed some of the operations performed by HE-115 Bushing Press, together with the equipment required.

FRONT AXLE

Car	Equipment
Hudson	Use sleeve No. 22, plug No. 21
Hudson	"sleeve No. 22, plug No. 21
Essex	"sleeve No. 2, plug No. 3
Essex	"sleeve No. 2, plug No. 3
Hudson	"sleeve No. 23, plug No. 15
Hudson	"sleeve No. 23, plug No. 15
Essex	"sleeve No. 4, plug No. 5
Essex	"sleeve No. 4, plug No. 5
	Car Hudson Hudson Essex Essex Hudson Hudson Essex Essex

STEERING GEAR

Remove main tube lower cap bushing Install main tube lower cap bushing Remove main tube upper cap bushing	Essex Essex Essex	Use sleeve No. 19, plug No. 18 " plug No. 18 " sleeve No. 19, plug No. 18
Install main tube upper cap bushing	Essex	" plug No. 18
TRANSMISSION		
Remove countershaft gear bushings	Essex	Use sleeve No. 19, plug No. 18
Install countershaft gear bushings	Essex	" plug No. 18
Remove reverse idler gear bushings	Essex	" sleeve No. 19, plug No. 18
Install reverse idler gear bushings	Essex	" plug No. 18

SPRINGS

Remove front spring or rear spring rear end bushing	Hudson	Use sleeve No. 16, plug No. 31
Install front spring or rear spring rear end bushing	Hudson	" plug No. 31
Remove rear spring front end bushing	Hudson	" sleeve No. 16, plug No. 32
Install rear spring front end bushing	Hudson	" plug No. 32
Remove front and rear spring bushings	Essex	" sleeve No. 16, plug No. 15
Install front and rear spring bushings	Essex	" plug No. 15



[14]

HE-180-Bearing Outer Cup Remover and Inserter

Operations handled by HE-180 Bearing Outer Cup Remover and Inserter are listed below, also

necessary equipment.

Screw and Wing Nut No. 1 is used in all the following operations.

FRONT AXLE

Operation

Car Equipment

Remove front wheel outer bearing outer cup Install front wheel outer bearing outer cup Remove front wheel outer bearing outer cup

Install front wheel outer bearing outer cup Remove front wheel inner bearing outer cup Install front wheel inner bearing outer cup Remove front wheel inner bearing outer cup Install front wheel inner bearing outer cup

REAR AXLE

Remove rear wheel bearing outer cup

Install rear wheel bearing outer cup Install rear wheel bearing outer cup Remove pinion shaft rear bearing outer cup Install pinion shaft rear bearing outer cup Remove pinion shaft rear bearing outer cup

Install pinion shaft rear bearing outer cup Remove pinion shaft front bearing outer cup Install pinion shaft front bearing outer cup

TRANSMISSION

Remove main shaft front bearing outer cup

Install main shaft front bearing outer cup Remove main shaft front bearing outer cup Install main shaft front bearing outer cup Remove main shaft rear bearing outer cup Install main shaft rear bearing outer cup Remove main shaft rear bearing outer cup Install main shaft rear bearing outer cup Remove countershaft bearings outer cup Install countershaft bearings outer cup

Hudson	Use plate	No, 26, bracket No. 25			
Hudson 11 discs No. 17, 39					
Essex	cc plate	No. 9, bracket No. 8			
	-				
Essex	discs	No. 41, 42			
Hudson	plate	No. 24, bracket No. 10			
Hudson	discs	No. 17, 39			
Essex	plate	No. 7, bracket No. 6			
Essex	discs	No. 41, 42			

Essex	Use block No. 11, bracket No. 10
	sleeve No. 12
Essex	discs No. 40, 43
Hudson	discs No. 35, 42
Hudson	plate No. 2 8, bracket No. 2 7
Hudson	discs No. 40, 17
Essex	block No. 13, bracket No. 14
	sleeve No. 12
Essex	discs No. 60, 63

discs No. 60, 63 plate No. 30, bracket No. 29 discs No. 40, 17

Hudson Use discNo. 33, bracket No. 34

"	disc	No. 33, bracket No. 34
94	disc	No. 17, bracket No. 14
99	disc	No. 17, bracket No. 14
	disc	No. 35, bracket No. 34
	disc	No. 35, bracket No. 34
	disc	No. 17, bracket No. 14
	disc	No. 17, bracket No. 14
	disc	No. 37, bracket No. 38
	disc	No. 37, bracket No. 38
	" 94 99	" disc 94 disc 99 disc disc disc disc disc disc disc disc

Hudson

Hudson





Bottom View

HE-136-Bottom view of surface plate, showing method of construction.



HE-184—Vee Blocks, cast iron, machined to close limits. Used with surface plate HE-136 and indicator HE-135.



HE-135—Surface Gauge and Dial Indieator. Used in conjunction with surface plates HE-136 and HE-185 and vee blocks HE-184 in testing accuracy of crankshafts, camshafts, etc.



HE-185—Surface Plate, cast iron, 18 ' square, useful in handling small work. Same construction as plate HE-136.





HE-194—Speed Wrench Socket Set. Provided with extension bar and seven casehardened hexagon steel sockets. Broached openings 59", 78", 54", 14", 34", 34", 34", 34"



HE-53-Steering Wheel Puller, steel construction throughout. Used to remove Hudson and Essex steering wheels. Radius on inside of jaws conforms perfectly with hub on steering wheel, eliminating any possibility of marring or breaking spider.



HE-166—Dolly, steel construction throughout, fitted with ball bearing swiveling casters. Useful in unloading Hudson and Essex automobiles from freight cars or turning cars in close quarters in shop. Low mounting of wheel plate makes it possible to run car into position without danger of dolly rolling away.



HE-173—Tee Handle Socket Set. Sliding tee handle type provided with long and short extension bars and seven case-hardened bexagon steel sockets, broached openings 347, 47, 547, 417, 347, 547 and 447. Furnished in leatheratte case.



HE-20—Steering Gear Lever Puller, body crucible steel casting, screw 1° in diameter, case-hardened steel. Used to remove steering gear levers on Hudson and Essex cars

> H-142 — Clutch Drain Plug Wrench, tee handle, shank ¹¹/₂₁ ' square on end by 14' long. Fits clutch drain plug in Hudson flywheel.



HE-178—Grab Hook, forged steel jaws and chain, used to support chain hoist from hox car roof timber or eye beam when unloading staged or decked automobiles.












[24]









3rd Oper.-Checking thrust bearing in crankcase, after using facing reamer HE-200-38 (using HE-39 micrometers).



View Showing Application of Hudson and Essex Filing Block Bearings are filed flush with face of filing block, eliminating any filing after bearings are assembled.









PRICE LIST

Hudson-Essex Service Tools

HE-20 Steering Gear Lever Puller	\$ 2.00
HE-39 Micrometer 2" to 311	6.50
HE-40 Telescoping Gauge	2.40
HE-45 Valve Stem Guide Puller and Drift	3.25
H-46 Steering Case Lower Bushing Drift	.90
HE-48 Universal joint Companion Flange Puller	2.00
E-49 Crankshaft Sprocket Puller and Parts (Essex)	3.75
H-50 Crankshaft Bearing Filing Blocks-Set of Four (Hudson)	4.00
HE-52 Camshaft Bearing Puller (Hudson and Essex)	12.50
HE-53 Steering Wheel Puller	3.00
HE-54 Crankshaft Bearing Cap Puller (Hudson and Essex)	3.75
E-55 Crankshaft Bearing Filing Blocks-Set of Three (Essex)	3.00
E-58 Bushing Puller	4.00
H-62 Crankshaft Sprocket Puller and Parts (Hudson)	3.75
HE-66 Wheel Puller	1.50
HE-70 Bearing Cone and Roll Puller Complete	8.00
HE-70-59 Clamp only	2.00
HE-70-36 Washer only	.25
H-75 Adjusting Eccentric and Eccentric Body Bushing Line Reamer	7.00
H-76 Distributor Drive Shaft Bushing Line Reamer	4 00
H-77 Valve Stem Guide Reamer	4 50
H-78 Piston Pin Bushing Line Reamer	12.50
H-79 Connecting Rod Bearing Reamer	8.00
H-80 Steering Gear Lower Case Bushing Line Reamer	3.75
H-81 Expansion Reamer	4 00
F-84 Piston Pin Line Reamer (Essex 4)	10.00
E-85 Distributor Shaft Bushing Line Reamer	5.00
E-86 Piston Pin Line Reamer (Essex 6)	8.00
E-87 Valve Stem Guide Reamer	4 00
E-88 Connecting Rod Bearing Reamer (Essex)	7.00
F-89 Transmission Gear Bushing Reamer	6.00
E-90 Transmission Main Shaft Drive Gear Bushing Line Reaming Fixture	20.00
F-91 Spindle Pivot Pin Bushing Reamer	8 50
E-92 Steering Arm Bushing Reamer	3.00
E-93 Expansion Reamer	3 50
F-94 Expansion Reamer	4 50
H-110 Hub Can Wrench	1.00
F-111 Hun Can Wrench	1.00
HF-112 Starting Crank Jaw Wrench	1.00
HE-113 Axle Drive Shaft Nut Wrench	2 00
H-114 Rear Wheel Bearing Adjusting Nut Wrench	3 50
HE-115 Bushing Press	18 50

HE-116	Clutch Assembling and Disassembling Fixture	\$ 7.50
E-117	Pinion Shaft Bearing Sleeve Wrench	1.35
HE-118	Spindle Pivot Pin Press	16.00
E-119	Cylinder Head Nut Wrench	1.25
HE-120	Valve Reseating Equipment	6.75
E-121	Exhaust Manifold Packing Nut Wrench	1.60
H-122	Pinion Shaft Bearing Sleeve Wrench	1.65
H-123	Pinion Shaft Bearing Cage Adjusting Wrench	1.65
H-124	Differential Bearing Adjusting Nut Wrench	1.75
HE-125	Piston and Connecting Rod Aligning Fixture	35.00
HE-126	Straightening Bar	2.00
E-128	Steering Gear Eccentric Bushing Wrench	.50
HE-129	Universal Puller	2.25
H-132	Water Pump Packing Nut Wrench	1.00
H-133	Cylinder Head Nut Wrench	1.25
HE-135	Surface Gauge and Dial Indicator	21.00
HE-136	Surface Plate 20" x 36	40.00
H-137	Generator Adjusting Plug Wrench	1.90
H-139	Exhaust Manifold Packing Nut Wrench	1.75
H-140	Cylinder Head Nut Wrench	1.25
H-141	Oil Pump Body Nut Wrench	.75
H-142	Clutch Drain Plug Wrench	1.00
HE-143	Screw Driver	1.25
E-144	Clutch Drain Plug Wrench (Essex)	1.25
E-145	Differential Bearing Adjusting Nut Wrench	1.65
E-146	Eccentric Adjusting Wrench	.50
E-147	Brake Band Adjusting Fixture (Essex)	7.50
H-148	Brake Band Adjusting Fixture (Hudson)	7.50
HE-149	Starting Crank	3.00
HE-150	Feeler Gauge	2.00
HE-151	Universal Tee Handle Socket Wrench	1.75
HE-152	Copper Hammer	1.65
HE-153	Rawhide Hammer	2.50
H-154	Lifting Chain and Eye Bolts	3.50
H-155	Piston Ring Compressor (Hudson)	1.65
E-156	Piston Ring Compressor (Essex)	1.65
HE-157	Piston Vise	5.00
E-158	Tappet Adjusting Screw Wrench	.65
H-159	Tappet Adjusting Screw Wrench	.65
HE-160	Lead Hammer	.90
HE-161	Front Axle Stand-12	2.75
HE-162	Front Axle Stand-15Y2	3.50
HE-163	Rear Axle Stand-17Y2	3.50
HE-164	Rear Axle Stand-22	3.75
HE-165	Valve Lifter	2.50
HE-166	Dolly	7.00
HE-167	Brass Drifts	2.75
HE-168	Cylinder Compression Gauge	5.00
HE-169	Spark Plug Wrench	1.25

	HUDSON - ESSEX SERVICE TOOLS	
HE-170	Piston Ring Spreader	\$ 1.35
HE-171	Valve Grinding Brace	1.00
HE-172	Oil Reservoir Depth Gauge	2.50
HE-173	Tee Handle Socket Set	1.50
HE-174	Bearing Scrapers	1.75
HE-176	Universal Socket Wrench	1.75
H-177	Universal Tee Handle Socket Wrench	1.75
HE-178	Grab Hook	5.00
HE-179	Tap and Reamer Wrench-21	5.00
HE-180	Bearing Outer Cup Remover and Inserter	30.75
HE-181	Micrometer-3" to 4	7.00
HE-182	Tap and Reamer Wrench-11	3.50
HE-183	Crankshaft Sprocket Driver	1.00
HE-184	Vee Blocks	5.00
HE-185	Surface Plate-18" x 18	17.50
HE-186	Feeler Gauge	1.50
E-187	Cylinder Head Nut Wrench	1.25
E-188	Connecting Rod Nut Wrench (Essex)	1.10
E-189	Main Bearing Nut Wrench (Essex)	1.15
H-190	Connecting Rod Nut Wrench (Hudson)	1.10
H-191	Main Bearing Nut Wrench (Hudson)	1.15
HE-192	Piston Pin Lock Ring Remover	1.00
HE-193	Ignition Wrench Kit	1.50
HE-194	Speed Wrench Socket Set	2.50
HE-195	Flat Cold Chisels-12	1.20
HE-196	Flat Cold Chisels-18	1.60
HE-197	Flat Cold Chisels-24	2.00
H-198	Steering Gear Eccentric Bushing Wrench	1.00
H-199	Adjusting Eccentric Body Wrench	1.00
HE-200	Main and Cam Bearing Line Reaming Tool (Hudson-Essex)	146.50
H-200	Main and Cam Bearing Line Reaming Tool'(Hudson only)	104.50
E-200	Main and Cam Bearing Line Reaming Tool (Essex only)	104.50
HE-500	Puller Equipment Complete (HE-115 and HE-180)	49.25

PRICE LIST OF PARTS

For HE-200 Line Reaming Tool

HE-200-2	200-2 Finishing shell (Front main-Hudson) (Front center main-Essex) (2.250)		\$ 4.00
HE-200-3	Finishing reamer (Front center main-Hudson) (Rear main-		
	Essex)	(2.2812)	4.00
H-200-4	Finishing reamer (Rear center main and rear center cam - Hudson)	(2.3125)	4.00
H-200-5	Finishing reamer (Rear main and front center cam - Hudson)	(2.3437)	4.00
H-200-6	Finishing reamer (Front cam-Hudson)	(2.5937)	4.00
HE-200-7	Finishing reamer (Rear cam-Hudson) (Rear cam - Essex).	(1.500)	4.00
E-200-26	Finishing reamer (Front main-Essex).	(2.218)	4.00
E-200-27	Finishing reamer (Front cam-Essex)	(2.000)	4.00
E-200-28	Finishing reamer (Center cam-Essex)	(1.968)	4.00
HE-200-8	Roughing reamer (Front main-Hudson) (Center main - Essex)	(2.245)	4.00
HE-200-9	Roughing reamer (Front center main-Hudson) (Rear main - Essex)	(2.276)	4.00

H-200-10	Roughing reamer (Rear center main and rear center cam - Hudson)	(2.3075)	\$ 4.00
H-200-11	Roughing reamer (Rear main and front center cam - Hudson)	(2.3387)	4.00
B-200-12	Rougbjng reamer (Front camHudson)	(2.5887)	4100
HE-200-13	Roughing reamer (Rear cam-Hudson) (Rear cam-Essex)	(1.495)	4.00
E-200-29	Roughing reamer (Front mainEssex)	(2.213)	4.00
E-200-30	Roughing reamer (Front cam-Essex)	(1.995)	4.00
E-200-31	Roughing reamer (Center cam-Essex)	(1.963)	4.00
H-200-24	Reamer bar 1.250 x 38" (Used on Hudson and Essex)		15.00
H-200-25	Pilot bar 1.250 x 36" (Used on Hudson and Essex).		12.00
H-200-22	Aligning fixtures (two required) (Used on Hudson only)		10.00
E-200-37	Aligning fixtures (two required) (Used on Essex only)		10.00
HE-200-14	Bushing (Hudson front main bearing with finished shell in place)		
	(Essex front cam bearing with shell removed)	(2.250)	1.50
H-200-15	Bushing (Hudson rear main bearing with finished shell in place)	(2.3437)	1.50
H-200-16	Bushing (Hudson front main with bearing shell removed)	(2.750)	1.50
H-200-17	Bushing (Hudson rear main with bearing shell removed)	(2.8437)	1.50
HE-200-18	Bushing (Hudson front cam with bearing in place) (Essex front		
	main bearing removed)	(2.593)	1.50
HE-200-19	Bushing (Hudson rear cam with bearing in place) (Essex rear cam		
	with bearing in place)	(1.500)	1.50
H-200-20	Bushing (Hudson front cam with bearing removed)	(2.878)	1.50
H-200-21	Bushing (Hudson rear cam with bearing removed)	(1.753)	1.50
E-200-32	Bushing (Essex front main with finished bearing in place)	(2.218)	1.50
E-200-33	Bushing (Essex rear main with finished shell in place)	(2.281)	1.50
E-200-34	Bushing (Essex rear main with shell removed)	(2.656)	1.50
E-200-35	Bushing (Essex front cam with bearing in place)	(2.000)	1.50
E-200-36	Bushing (Essex rear cam with bearing removed)	(1.750)	1.50
H-200-23	Handle for turning reamer bar (Used on Hudson and Essex)		1.50
HE-200-38	Thrust bearing facing reamer (Used on Hudson and Essex)		6.50