7. **Gauge shows an excessively high reading**
   7a. Check voltage regulator for *10* volts output
   7b. Check the wiring to each unit for a short circuit
8. **Gauge shows an intermittent reading**
   8a. Substitute a new voltage regulator
   8b. Check terminals and ground at each transmitter unit
   8c. Substitute a new gauge or transmitter unit for checking

OVERHAULING A JAGUAR TRANSMISSION

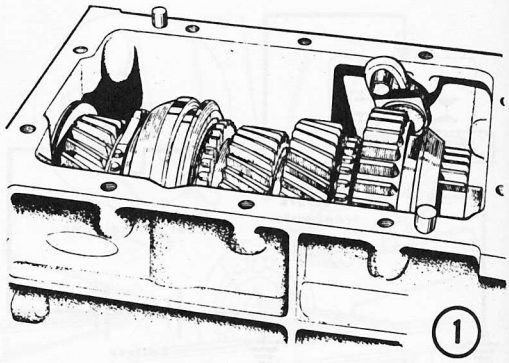
DISASSEMBLING

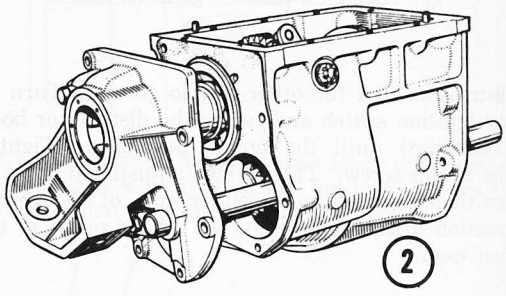
1. Drain the transmission by removing the plug and fiber washer at the base of the casting. Place the transmission in neutral and remove the ten bolts holding the top cover. Lift off the cover. Remove the clutch slave cylinder from the clutch housing. Detach the spring clips and remove the clutch release bearing. Release the locknut and remove the Allen-headed screw holding the clutch fork to the shaft. Withdraw the shaft downwards and remove the fork. From inside the clutch housing, remove the locking wire from the two bolts and tap back the tabs on the locking washers. Unscrew the eight bolts and remove the clutch housing. Remove the locking screw holding the speedometer driven gear bushing in the extension. Withdraw the driven gear and bearing. Remove the fiber washer at the front end of the countershaft.

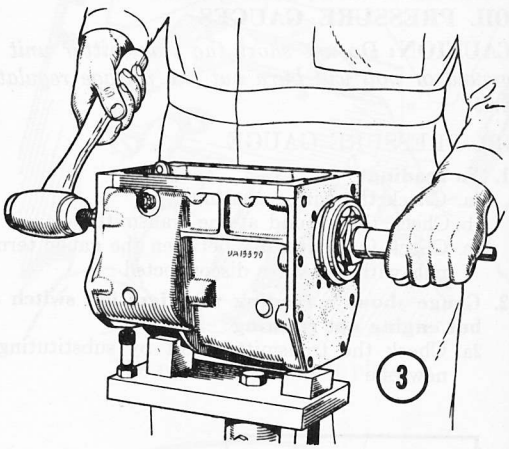
2. On a transmission without an overdrive, remove the seven bolts holding the rear extension to the case. **NOTE:** *Do not disturb the clustergear shaft reverse idler locking plate.* Withdraw the extension complete with shafts, at the same time inserting a dummy countershaft into the countershaft bore at the front of the casting. The dummy shaft and countershaft must be kept in contact until the countershaft is clear of the case.

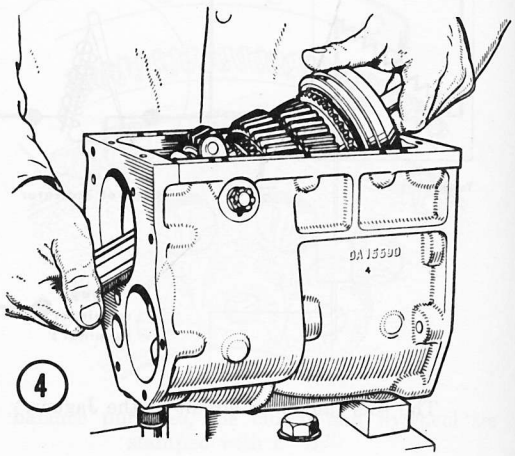
3. Engage the high and first gears. On non-overdrive transmissions, tap back the tab washer holding the locknut at the rear of the mainshaft and unscrew the locknut. Withdraw the speedometer drive gear. Remove the Woodruff key from the mainshaft. Withdraw the dummy countershaft allowing the clustergear unit to drop to the bottom of the case. On transmissions equipped with an overdrive, remove the lock ring, plain washer, and shims from behind the rear bearing. Rotate the constant pinion shaft (clutch shaft) until the two cutaway portions of the driving gear are facing the top and bottom of the case. Tap the mainshaft to the front to force the constant pinion shaft out of the case. Continue to tap the mainshaft forward until it is free of the rear bearing. Tap the bearing rearwards and out of the case.

4. Push the reverse gear forward and out of engagement to clear the mainshaft first speed gear. Lift the front end of the mainshaft upwards and remove the assembly from the front of the case, leaving the countershaft in the bottom. Draw the reverse gear rearwards as far as it will go to clear

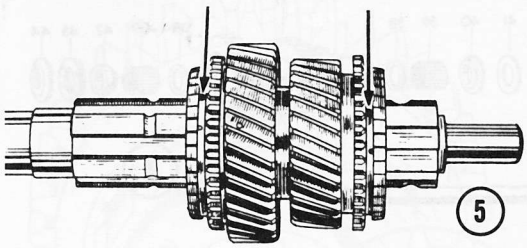






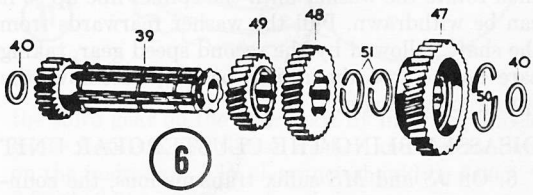


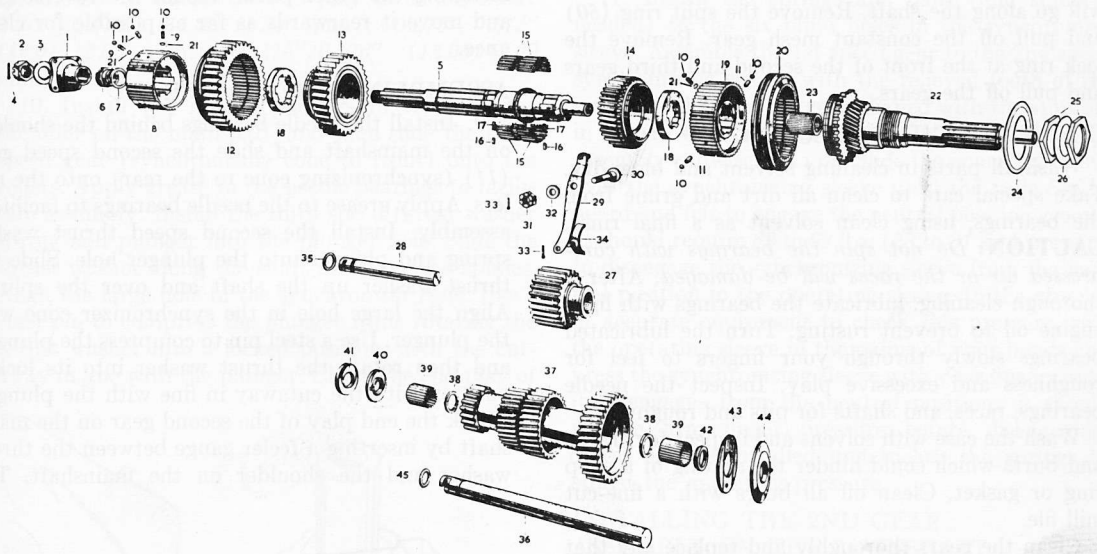
the countershaft first speed gear. Lift out the countershaft gear unit and the inner and outer thrust washers at each end. Be careful not to lose any needle bearings which are located at each end of the gear. Push the reverse gear back into the case and remove it through the top.



DISASSEMBLING THE MAINSHAFT

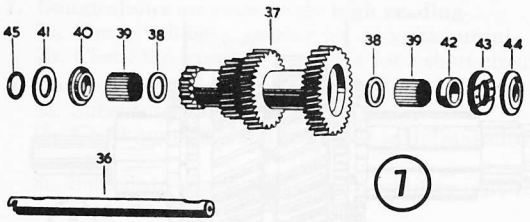
5. Pull the top/third gear operating and synchronizing sleeves forward from the shaft. Press the operating sleeve off the synchronizing sleeve and remove the six synchronizing balls and springs. Remove the interlock plungers and balls from the synchronizing sleeve. Withdraw the second gear synchronizing sleeve, complete with first speed gear, rearwards from the shaft. Press the first speed gear off the synchronizing sleeve and remove the six synchronizing balls and springs. Remove the interlock ball and plunger from the synchronizing sleeve. Press in the plunger which locks the third speed gear thrust washer, and then rotate the washer until the splines line up so the washer can be withdrawn. Pull the washer forwards from the shaft followed by the third speed gear, taking care not to lose the needle





Exploded view of the transmission.

1. Flange
2. Nut
3. Washer
4. Split pin
5. Main shaft
6. Speedometer driving gear
7. Distance piece
8. Synchronising sleeve—2nd gear
9. Spring
10. Ball
11. Plunger
12. 1st speed gear
13. 2nd speed gear
14. 3rd speed gear
15. Needle roller
16. Plunger
17. Spring
18. Thrust washer
19. Synchronising sleeve
20. Operating sleeve
21. Shim
22. Constant pinion shaft
23. Roller bearing
24. Oil thrower
25. Locknut
26. Tab washer
27. Reverse gear
28. Reverse spindle
29. Lever
30. Fulcrum pin
31. Slotted nut
32. Plain washer
33. Split pin
34. Reverse slipper
35. Sealing ring
36. Countershaft
37. Gear unit on countershaft
38. Retaining ring
39. Needle roller
40. Thrust washer
41. Thrust washer
42. Retaining ring
43. Thrust washer
44. Thrust washer
45. Sealing ring



bearings which will emerge as the gear is removed. Remove the spring and plunger. Press in the plunger which locks the second speed gear thrust washer, and then rotate the washer until the splines line up so it can be withdrawn. Pull the washer rearwards from the shaft, followed by the second speed gear, taking care not to lose the needle bearings. Remove the spring and plunger.

DISASSEMBLING THE CLUSTERGEAR UNIT

6. On *JS* and *MS* suffix transmissions, the countershaft gear unit is a cluster. On other types the second, third, and top gears are mounted on a splined extension of the first gear. To disassemble, remove the lock ring (*51*) located behind the constant mesh gear (*47*) and push the gear as far as it will go along the shaft. Remove the split ring (*50*) and pull off the constant mesh gear. Remove the lock ring at the front of the second and third gears and pull off the gears.

CLEANING AND INSPECTING

Wash all parts in cleaning solvent and blow dry. Take special care to clean all dirt and grime from the bearings, using clean solvent as a final rinse. **CAUTION:** *Do not spin the bearings with compressed air or the races will be damaged.* After a thorough cleaning, lubricate the bearings with light engine oil to prevent rusting. Turn the lubricated bearings slowly through your fingers to feel for roughness and excessive play. Inspect the needle bearings, races, and shafts for pits and roughness.

Wash the case with solvent and inspect for cracks and burrs which could hinder the seating of a snap ring or gasket. Clean off all burrs with a fine-cut mill file.

Clean the gears thoroughly and replace any that are worn or damaged. Check the bushings in the case for excessive wear. The proper clearance between the shaft and bushing is *0.002-0.004* inch (*0.05-0.10* mm.).

Thrust washers should be inspected for wear or damage. They should be replaced if worn as they control the end play of the gears.

Check the synchronizer cones for wear or looseness. Replace any gear or cone that is defective as it will affect shifting.

ASSEMBLING

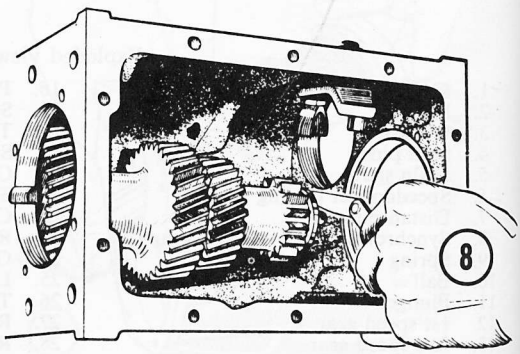
7. On transmissions with a built-up clustergear unit, press the second and third gears onto the splined extension of the first gear and retain the assembly with the lock ring. Install the 2nd gear lock ring below its groove. Press the constant mesh gear on as far as possible. Install the split ring and draw the gear forward onto the ring. Install the lock ring behind the constant mesh gear. Install the needle roller retaining rings into either end of the countergear unit followed by the needle rollers (*29* per end). Apply grease to the needle rollers to facilitate assembly. Install the outer roller retaining ring at the front end. Position the inner and outer thrust washers at either end of the gear unit and lower the assembly into the case through the top. Insert a dummy countershaft to position the clustergear unit properly.

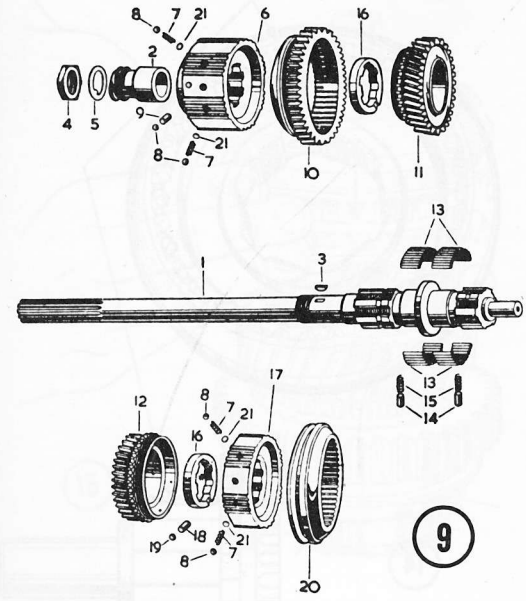
CHECKING THE CLUSTERGEAR END PLAY

8. Check the clearance between the bronze thrust washer and the case at the rear, which should be *0.002"* to *0.004"* (*0.05* to *0.10* mm.). Thrust washers are available in thicknesses of *0.152"*, *0.156"*, *0.159"*, *0.162"* and *0.164"* (*3.86*, *3.96*, *4.04*, *4.11* and *4.17* mm.) to provide a means of adjusting the end play. **NOTE:** *The transmission must not be gripped in a vise when checking the end play; otherwise, a false reading will be obtained.* Remove the dummy countershaft and insert a thin rod in its place to lower the countershaft assembly to provide clearance for installing the other parts. Install the reverse gear and move it rearwards as far as possible for clearance.

ASSEMBLING THE MAINSHAFT

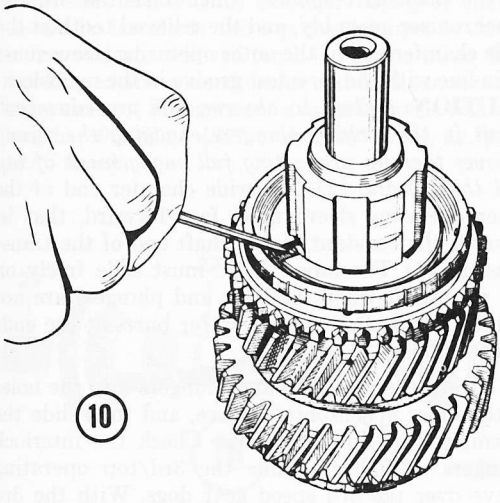
9. Install the needle bearings behind the shoulder on the mainshaft and slide the second speed gear (*11*) (synchronizing cone to the rear) onto the rollers. Apply grease to the needle bearings to facilitate assembly. Install the second speed thrust washer spring and plunger into the plunger hole. Slide the thrust washer up the shaft and over the splines. Align the large hole in the synchronizer cone with the plunger. Use a steel pin to compress the plunger, and then rotate the thrust washer into its locked position with the cutaway in line with the plunger. Check the end play of the second gear on the mainshaft by inserting a feeler gauge between the thrust washer and the shoulder on the mainshaft. The

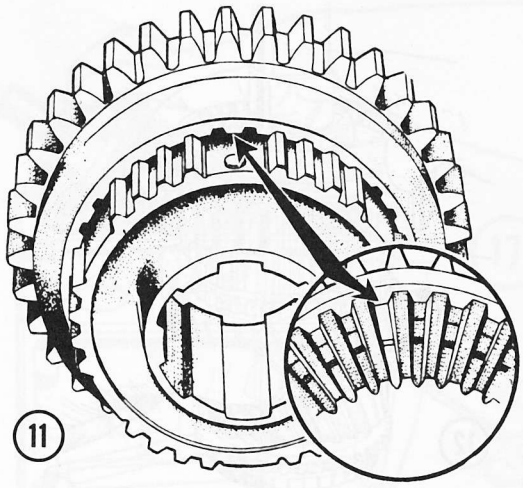




clearance should be *0.002" to 0.004"* (*0.05* to *0.10* mm.). Thrust washers are available in the following thicknesses to enable the end play to be adjusted: *0.471"/0.472"* (*11.96/11.99* mm.); *0.473"/0.474"* (*12.01/12.03* mm.); *0.475"/0.476"* (*12.06/12.09* mm.).

10. Install the needle bearings in front of the shoulder on the mainshaft, and then slide the third speed gear (synchronizing cone to front) onto the rollers. Apply grease to the needle bearings to facilitate assembly. Install the third speed thrust washer spring and plunger into the plunger hole. Slide the thrust washer along the shaft and over the splines. Align the large hole in the synchronizer cone. Use a steel pin to compress the plunger while rotating the thrust washer into a locked position, with the cutaway in line with the plunger. Check the end play of





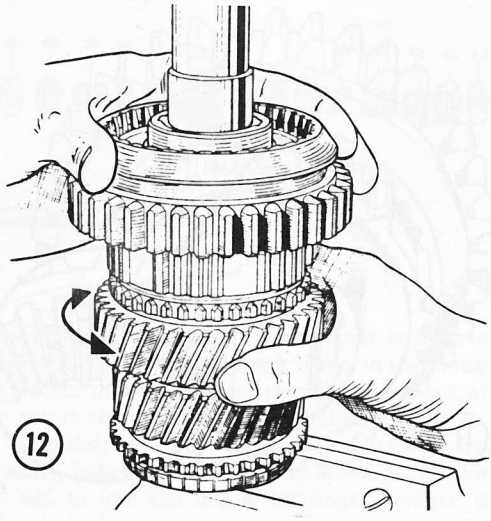
the third gear on the mainshaft by inserting a feeler gauge between the thrust washer and the shoulder on the mainshaft. The clearance should be *0.002"* to *0.004"* (*0.05* to *0.10* mm.) and shims, similar to those above, are available for service.

ASSEMBLING THE 2ND GEAR SYNCHRONIZER ASSEMBLY

11. Install the springs and balls (and shims if needed) to the six blind holes in the synchronizer sleeve. Assemble the 1st speed gear to the 2nd speed synchronizing sleeve, with the relieved tooth of the internal splines in the gear aligned with the stop pin in the sleeve. Compress the springs by inserting the assembly endwise in a vise. Slide the operating sleeve over the synchronizing sleeve until the balls can be heard and felt to engage the neutral position groove. It should require *62* to *68* lbs. (*28* to *31* kg.) pressure to disengage the synchronizing sleeve from the neutral position in the operating sleeve. In the absence of accurate equipment to check this pressure, grip the operating sleeve in the palms of your hands and press the synchronizing sleeve with your fingers until it disengages from the neutral position; it should require firm finger pressure before disengaging. Shims can be installed underneath the springs to adjust the operating pressure.

INSTALLING THE 2ND GEAR ASSEMBLY ON THE MAINSHAFT

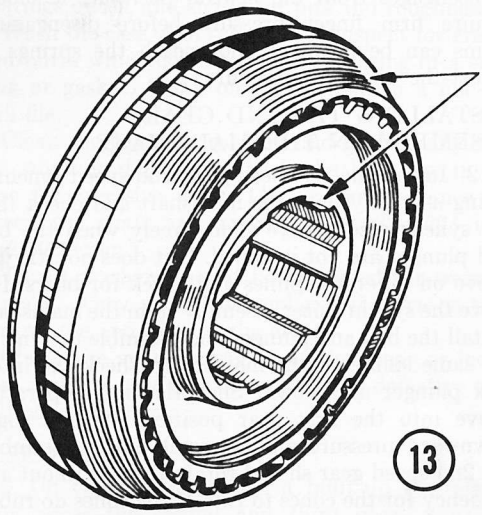
12. Install the 1st speed gear/2nd speed synchronizing assembly onto the mainshaft and check that the synchronizer sleeve slides freely when the ball and plunger are not installed. If it does not, try the sleeve on different splines and check for burrs. Remove the synchronizer assembly from the mainshaft. Install the ball and plunger and assemble the unit to the same spline on the mainshaft. Check the interlock plunger as follows: Slide the outer operating sleeve into the first gear position. With a slight downward pressure on the synchronizer assembly, the 2nd speed gear should rotate freely without any tendency for the cones to rub. If the cones do rub, a

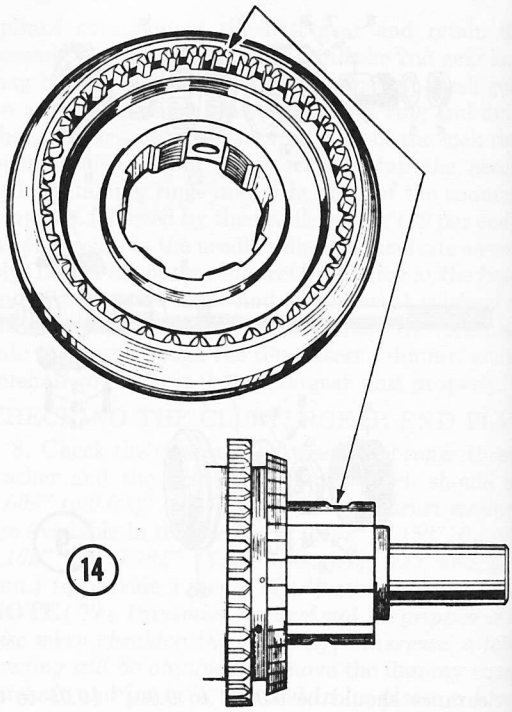


longer plunger should be installed in the synchronizer sleeve. Plungers are available in the following lengths: *0.490"*, *0.495"* and *0.500"* (*12.4*, *12.52* and *12.65* mm.).

ASSEMBLING THE 3RD/TOP SYNCHRONIZER ASSEMBLY

13. Install the springs and balls (and shims if needed) to the six blind holes in the inner synchronizing sleeve. Install the wide chamfer end of the operating sleeve toward the large boss end of the inner synchronizing sleeve, with the two relieved teeth in the operating sleeve in line with the two ball and plunger holes in the synchronizing sleeve. Compress the springs by inserting the assembly endwise in a vise. Slide the operating sleeve over the synchronizing sleeve until the balls can be heard and felt to engage the neutral position groove. It should require *52* to *58* lbs. (*24* to *26* kg.) pressure to disengage the synchronizing sleeve from the neutral position in the operating sleeve. In the absence of accurate equipment to check this pressure, grip the operating sleeve in the palms of your hands and press the synchronizing sleeve with your fingers until it disengages from the neutral position; it should require firm finger pressure before disengaging. Shims can be installed underneath the springs to adjust the operating pressure.

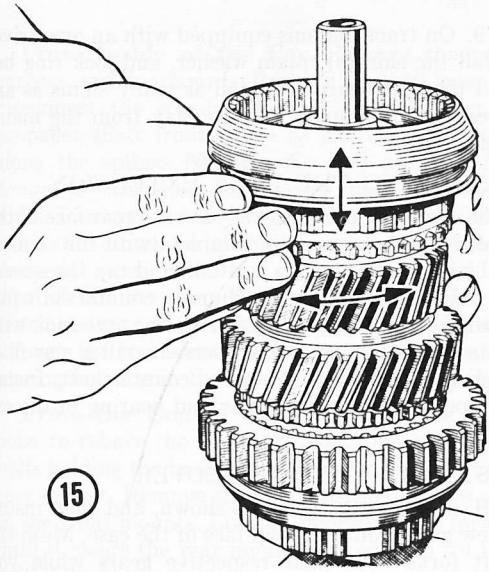




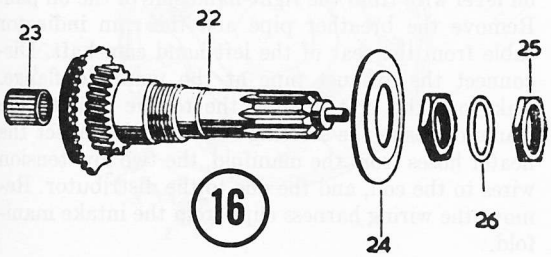
INSTALLING THE 3RD/TOP SYNCHRONIZER ASSEMBLY ON THE MAINSHAFT

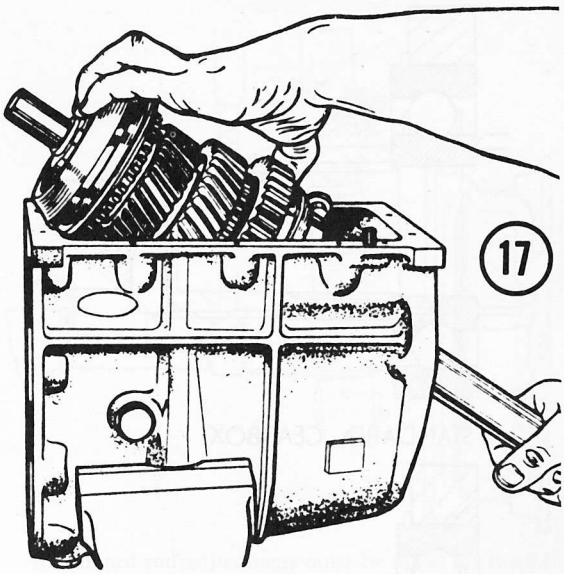
14. When installing the 3rd speed/top gear synchronizer assembly on the mainshaft, note the following points: (*1*) There are two transverse grooves on the mainshaft splines, which take the 3rd/top synchronizer assembly, and the relieved tooth at the wide chamfer end of the outer operating sleeve must be in line with the *foremost* groove in the mainshaft. **CAUTION:** *Failure to observe this procedure will result in the locking plungers engaging the wrong grooves thereby preventing full engagement of top and third gears.* (*2*) The wide chamfer end of the outer operating sleeve must face forward, that is, towards the constant pinion shaft end of the transmission. (*3*) The inner sleeve must slide freely on the mainshaft when the balls and plungers are not installed. If it does not, check for burrs at the ends of the splines.

15. Slip the two balls and plungers into the holes in the inner synchronizer sleeve, and then slide the assembly onto the mainshaft. Check the interlock plungers as follows: Slide the 3rd/top operating sleeve over the 3rd speed gear dogs. With the 3rd



gear engaged, lift and lower the synchronizer assembly; it should be possible to move it approximately *3/32"* (*2.5* mm.) without any drag being felt. If the assembly does not move freely, a shorter 3rd speed plunger should be installed. This is the plunger that is not opposite the relieved tooth in the operating sleeve (looking at the wide chamfer end of the outer operating sleeve). Plungers are available in the following lengths: *0.490", 0.495",* and *0.500"* (*12.4, 12.52* and *12.65* mm.). Next slide the operating sleeve into the top gear position. Lift and lower the synchronizer assembly; it should be possible to move it approximately *3/16"* (*4.5* mm.) without any drag being felt. Also, with slight downward pressure exerted on the synchronizer assembly, the 3rd speed gear should be free to rotate without any tendency for the synchronizer cones to rub. If the assembly does not move freely, a shorter top gear plunger should be installed. If the 3rd gear synchronizer cones are felt to rub, a longer top gear plunger should be installed; the top gear plunger is the one in line with the relieved tooth in the operating sleeve (looking at the wide chamfer end of the outer operating sleeve). Plungers are available in the following lengths: *0.490", 0.495" and 0.500"* (*12.4, 12.52* and *12.65* mm.).





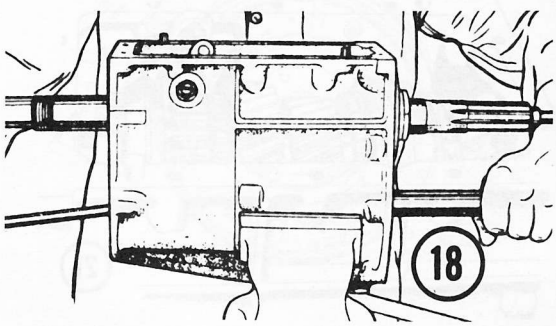
ASSEMBLING THE CONSTANT PINION SHAFT

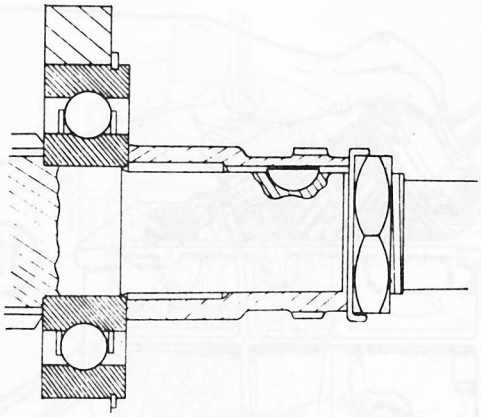
16. Install the oil thrower, followed by the ball bearing, onto the shaft, with the lock ring and collar installed on the outer groove of the bearing. Screw on the nut (right-hand thread) and install the tab washer and locknut. Install the roller race into the shaft bore.

INSTALLING THE GEARS INTO THE CASE

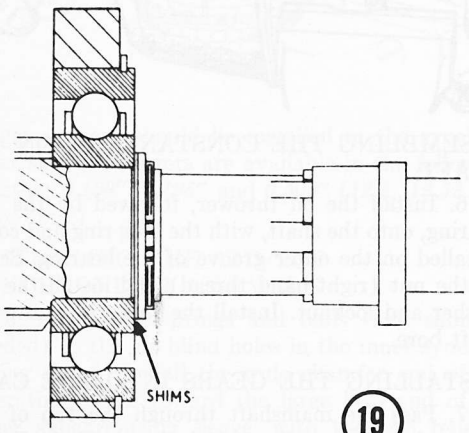
17. Pass the mainshaft through the top of the case and to the rear through the bearing hole. Install a new gasket on the front face of the case. Position the constant pinion shaft at the front of the case, with the cutaway portions of the toothed driving member facing the top and bottom of the case. Tap the constant pinion shaft to the rear until the collar and lock ring on the bearing butt against the housing. Holding the constant pinion shaft in position, tap the rear bearing of the mainshaft into position.

18. Lift the clustergear into mesh with the thin rod and insert a dummy countershaft through the countershaft bore in the front face of the case. Engage high and first gears. On non-overdrive transmissions, install the Woodruff key and speedometer drive gear on the mainshaft. Install the tab washer and locknut and secure it. Position the transmission in neutral.





STANDARD GEARBOX



OVERDRIVE GEARBOX

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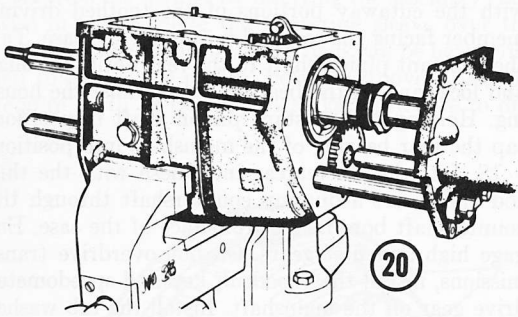

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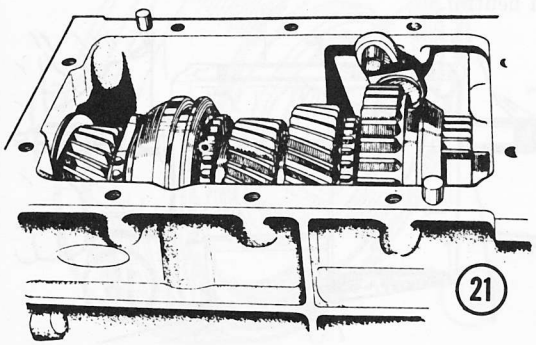

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19. On transmissions equipped with an overdrive, install the shim(s), plain washer, and lock ring behind the rear bearing. Install as many shims as are necessary to eliminate all end play from the mainshaft.

INSTALLING THE REAR EXTENSION

20. Position a new gasket onto the rear face of the case. Slide the extension, complete with the counter and reverse shafts, into position, and tap the assembly into place, driving the dummy countershaft forwards and out of the case. Secure the extension with the seven bolts and lockwashers. Install a new fiber washer at the front end of the countershaft. Install the speedometer driven gear and bearing in the extension.

INSTALLING THE TOP COVER

21. Position the gears as shown, and then install a new gasket onto the top face of the case. Mesh the shift forks with their respective gears while you slide the cover into position, noting that it is located by two dowels. Attach it with ten bolts and lockwashers. **NOTE:** *The two long bolts are inserted at the rear and the two short ones at the front.* Install the drain plug and fiber washer.

INSTALLING THE CLUTCH HOUSING

22. Install a new oil seal into the clutch housing (lip of the seal must face the transmission). Install the clutch housing and secure it with the eight bolts and lockwashers, and then lock the assembly with wire. Install the clutch operating fork and insert the shaft. Install the lockscrew and locknut. Install the release bearing and spring clips. Engage the slave cylinder with the operating rod and slide it onto the studs. Install the spring anchor plate-to-lower stud and secure it with the nuts. Install the return spring.

ENGINE REMOVAL—JAGUAR XK 120

The engine and transmission are removed as a unit.

From Inside of the Engine Compartment. Remove the hood and radiator. Remove the generator and the air cleaners. Disconnect the fuel line at the flexible pipe joint and the electrical connections to the carburetor solenoid. Loosen the two bolts holding the rear clamp to the accelerator rod. Slide the clamp forward and remove the rod. Disconnect the oil gauge line at the filter and the temperature gauge bulb from its housing. Disconnect the wires and ground strap from the starter. Disconnect the oil level wire from the right-hand side of the oil pan. Remove the breather pipe and the rpm indicator cable from the rear of the left-hand camshaft. Disconnect the exhaust pipe at the manifold flange. Take out the bolt holding the torque arm to the frame opposite the steering column. Disconnect the heater hoses from the manifold, the two low-tension wires to the coil, and the one to the distributor. Remove the wiring harness clips from the intake manifold.