

*Step 2.*—Three threaded puller holes have been incorporated in the master gear retaining plate flange. Insert a master gear retaining plate capscrew in each of the puller holes. Turn the screws clockwise alternately and withdraw the master gear retaining plate, as shown in Figure 96.

*Step 3.*—Remove the laminated shim from the face of the hub, as shown in Figure 97.

*Step 4.*—Withdraw the master gear and attached bearing assembly using the hands only, as shown in Figure 98.

#### NOTE

Do not remove the snap ring from the master gear unless it is necessary to replace the master gear bearings or bearing race.

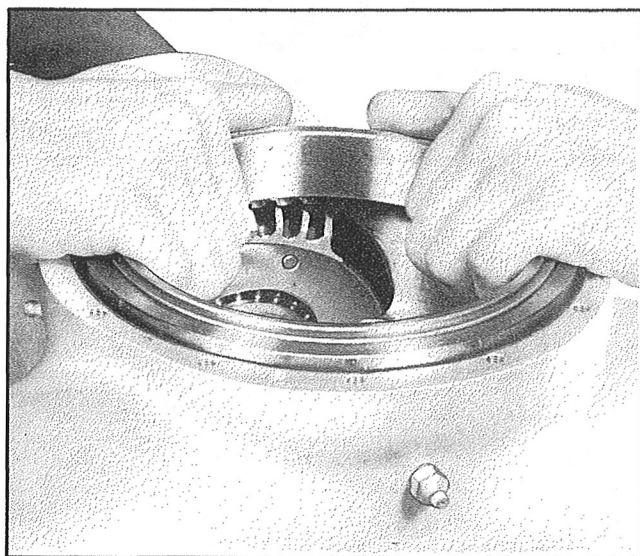


Figure 98—Removal of the Master Gear

*Step 5.*—Remove the snap ring from the propeller hub bore, using a 10" screwdriver, as shown in Figure 99.

*Step 6.*—Withdraw the propeller shaft nut and front cone, using caution not to drop or damage the cone halves.

### (3) PROCEDURE FOR INSTALLATION OF THE PROPELLER SHAFT NUT AND MASTER GEAR.

*Step 1.*—Clean and dry all parts thoroughly, including the propeller hub bore.

*Step 2.*—Check the mating of the front cone halves. Use only cone halves with matched serial numbers, as shown in Figure 100.

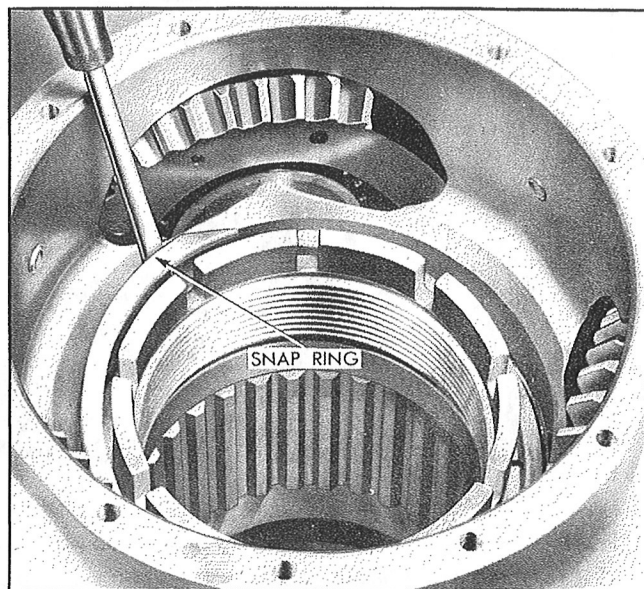


Figure 99—Removal of Shaft Nut Locking Ring

Apply anti-seize compound to the front cone groove and place the cone halves on the propeller shaft nut so that the groove in the cone halves mates with the flange of the nut. See Figure 101.

*Step 3.*—Insert the front cone halves and the propeller shaft nut into the hub bore so that the front cone halves bottom on the hub bore taper. See Figure 102.

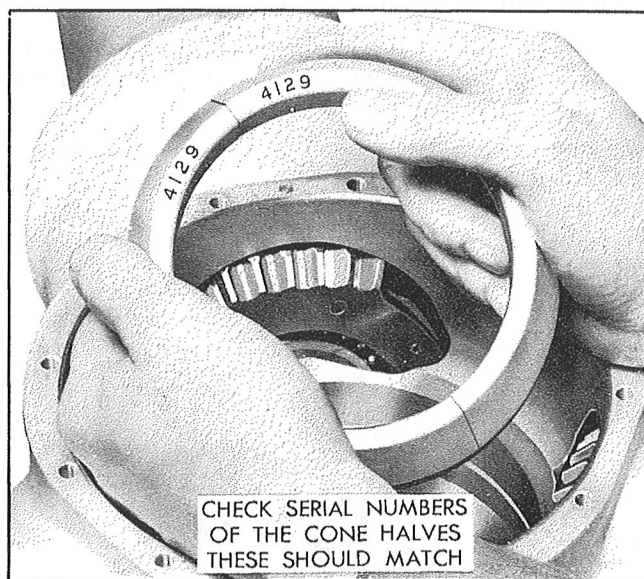


Figure 100—Installation of Shaft Nut and Front Cone

*Step 4.*—Press the propeller shaft nut snap ring into its groove in the propeller hub bore, as shown in Figure 103.

*Step 5.*—Turn each blade to the minimum angle.

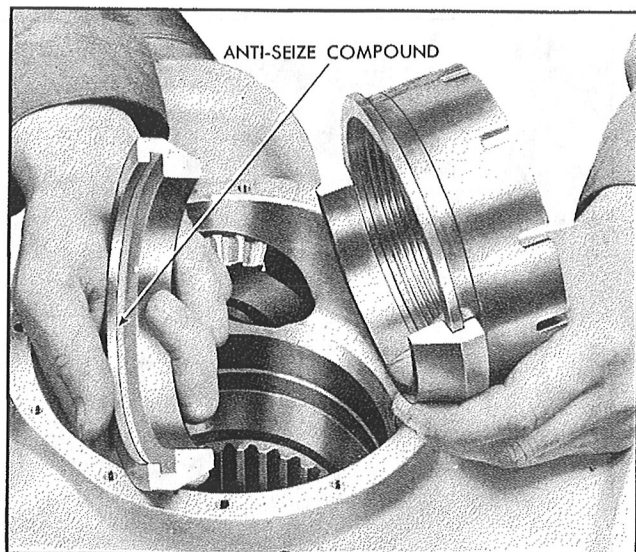


Figure 101—Installation of Shaft Nut and Front Cone

**Step 6.**—Insert the master gear and bearing assembly into the hub bore, lining up the part number of both the gear and the outer bearing race with the number 1 socket. See Figure 104.

**Step 7.**—Install the master gear shim. See Figure 97.

**Step 8.**—Replace the master gear retaining plate and secure it with the  $\frac{1}{4}$ " x 28 attaching capscrews. Safety with .032" wire. See Figure 105.

**Step 9.**—Lubricate the hub with recommended grease in accordance with the procedure outlined under step 20, Section III 2c.

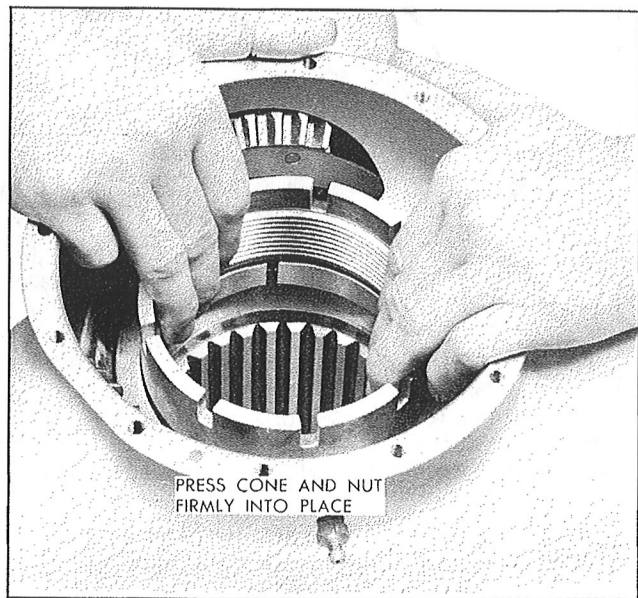


Figure 102—Installation of Shaft Nut and Front Cone

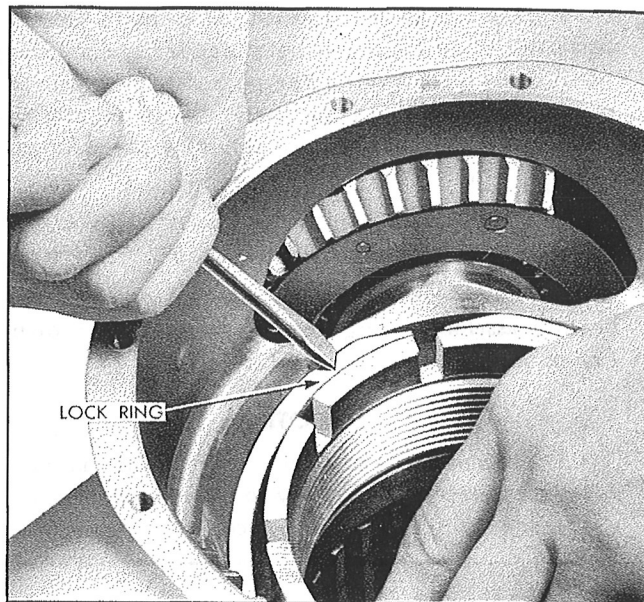


Figure 103—Installation of Shaft Nut Locking Ring

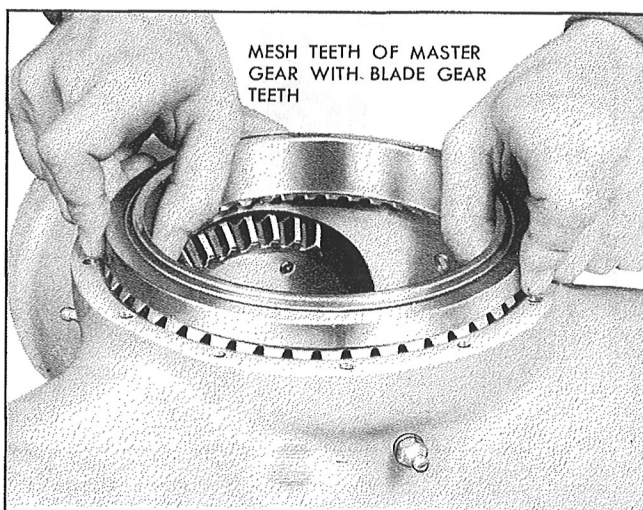


Figure 104—Installation of Master Gear

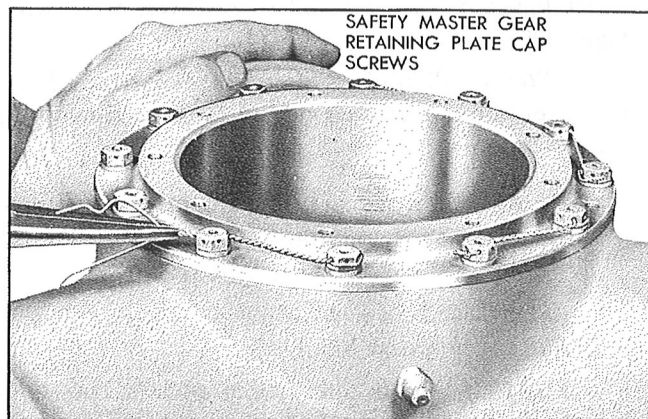


Figure 105—Installation of Master Gear Retaining Plate



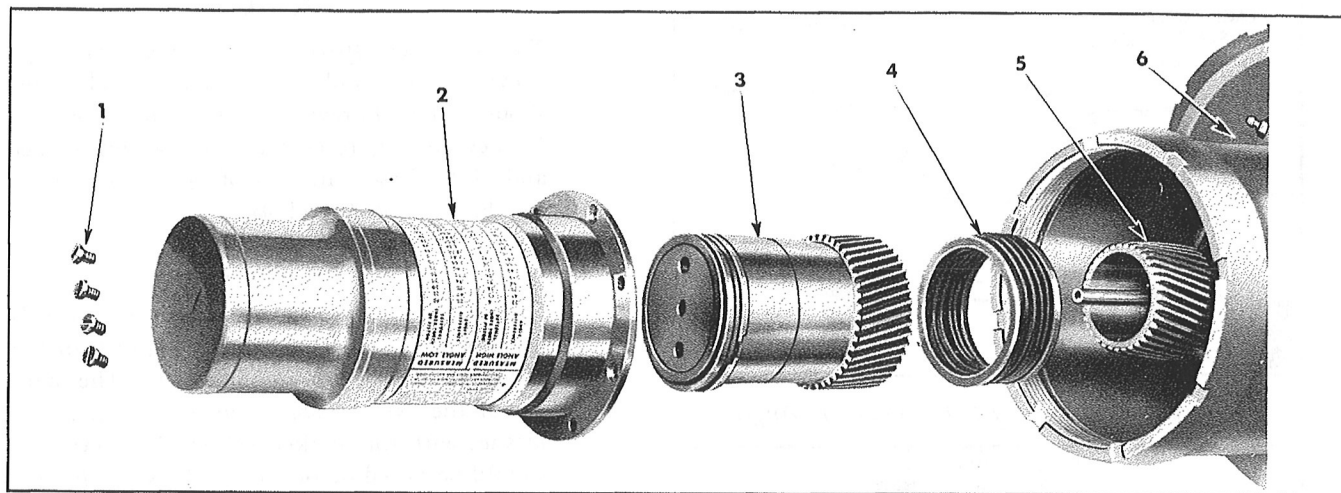


Figure 106A—Torque Unit Parts

- |   |           |                 |
|---|-----------|-----------------|
| 1. Blade Cylinder Attaching Screws—<br>4 required | 3. Piston | 5. Fixed Spline |
| 2. Blade Cylinder                                 | 4. Seals  | 6. Hub          |

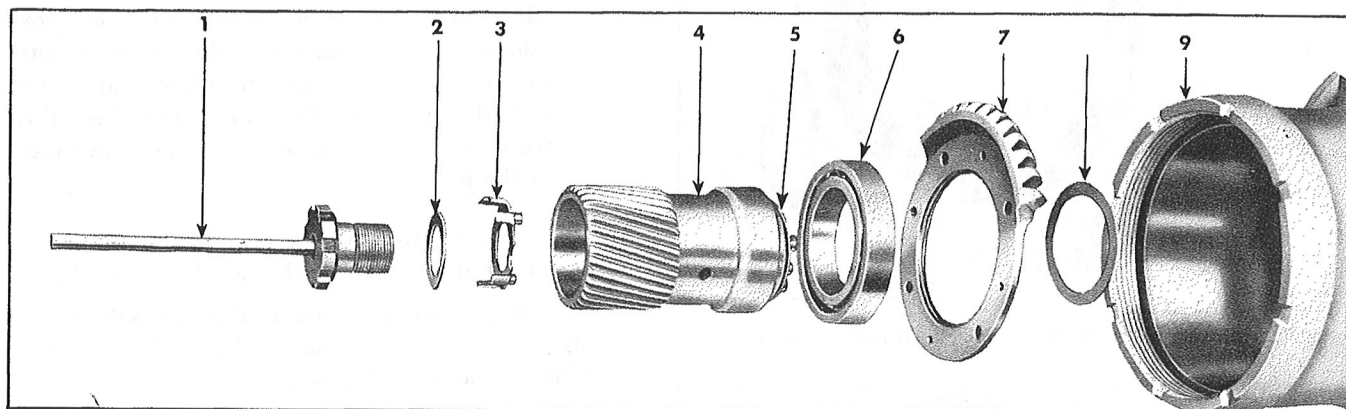


Figure 106B—Torque Unit Parts

- |                      |                     |               |
|----------------------|---------------------|---------------|
| 1. Fixed Spline Bolt | 4. Fixed Spline     | 7. Blade Gear |
| 2. Washer            | 5. Gasket           | 8. Shim       |
| 3. Lock              | 6. Pre-load Bearing | 9. Hub        |

d. TORQUE UNITS

(1) TOOLS AND EQUIPMENT FOR  
DISASSEMBLY AND REASSEMBLY  
OF TORQUE UNITS.

- |   |  |
|---|--|
| Torque Wrench to Measure 2200" lbs. or 183' lbs.      | Piston Ring Spreader                       |
| 10" Screwdriver                                       | Piston Ring Assembly Sleeve, Figure 66-6   |
| Fixed Spline Bolt Wrench, Figure 66-2                 | 2 Pieces of 1/4" Drill Rod with 10" length |
| 3/4" Square Socket Handle Indicator Tool, Figure 66-5 | Diagonal Cutters                           |
| Soft-faced Mallet                                     | A. A. F. Specification Y3587 Oil           |
|   | .032" Safety Wire                          |
|   | Duck-bill Pliers                           |

(2) PROCEDURE FOR DISASSEMBLY  
OF TORQUE UNITS.

Step 1.—Place the propeller on a bench and remove the master gear to facilitate turning of the blades to their maximum angle. Turn the propeller blades to their high blade angles. See Figure 107.

Step 2.—Remove the propeller blade. See Section VI 2b (2).

Step 3.—Using a 10" screwdriver, remove the four special head attaching screws that secure the blade cylinder to the blade gear. See Figure 108.

Step 4.—Withdraw the blade cylinder by pulling and shaking.

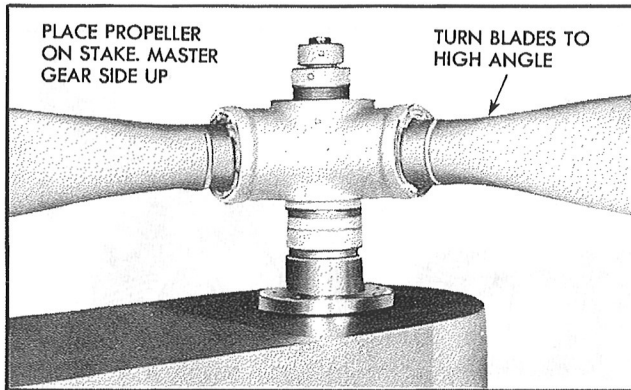


Figure 107—Turn Blade to Maximum Angle

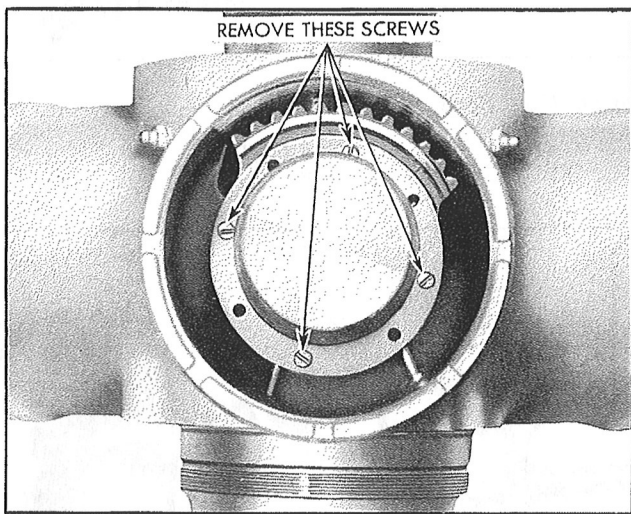


Figure 108—Removal of the Blade Cylinder

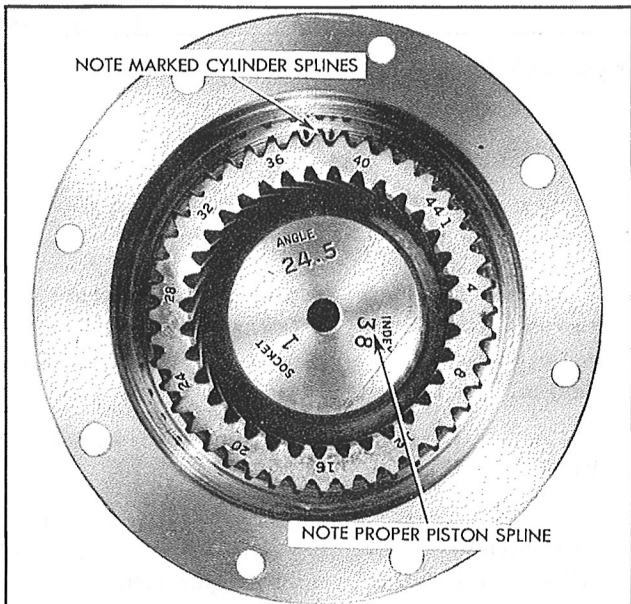


Figure 109—Note Indexing of the Piston in the Cylinder

**NOTE**

The piston, seal spacer ring, cylinder male ring, chevron seals, and the cylinder female ring should all withdraw with the blade cylinder. If they do not, reach hand in the hub socket and slide these parts off of the fixed spline. See Figure 106-A and -B.

**CAUTION**

One valley of the internal splines in the cylinder is marked, and the external splines of the piston are numbered. See Figure 109. The number of the external spline on the piston which meshes with the marked valley of the cylinder should be noted before removal, as it is by this means that the low blade angle is determined. On the inner face of the piston head is stamped the hub socket number, the tooth number which is to mate with the index valley of the cylinder and the minimum blade angle obtained by that combination. As an added precaution, it is suggested that the mechanic note the number of the piston spline that mates with the cylinder spline valley and check this with the numbers stamped on the inner face of the piston.

Step 5.—Remove the cylinder seal ring from the exterior of the blade cylinder, as shown in Figure 110.

Step 6.—Unlock the fixed spline bolt by straightening the ear of the star washer lock with a screwdriver, as shown in Figure 111.



Figure 110—Removal of the Blade Cylinder Seal

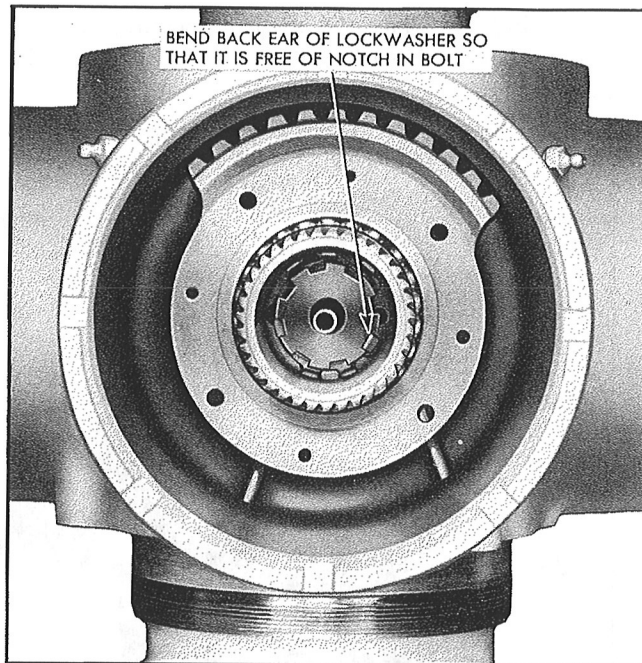


Figure 111—Removal of the Fixed Spline

*Step 7.*—Using the Fixed Spline Bolt Wrench, Figure 66-2 and a square socket handle, turn the fixed spline bolt counterclockwise until free, as shown in Figure 112. Withdraw the fixed spline bolt, steel washer and star washer lock shown in Figure 106-B.

*Step 8.*—Withdraw the fixed spline and gasket. To facilitate removal, insert a hammer handle in the fixed spline and shake.

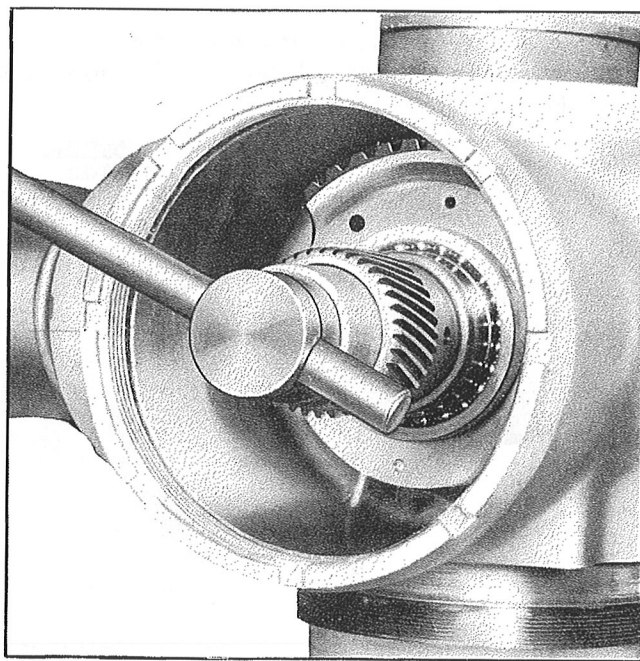


Figure 112—Removal of the Fixed Spline Bolt

#### NOTE

Do not remove the dowels or transfer tube from the fixed spline.

*Step 9.*—Withdraw the pre-load bearing. See Figure 106-B.

*Step 10.*—Withdraw the blade gear, as shown in Figure 106-B.

*Step 11.*—Withdraw the pre-load shim. See Figure 106-B.

#### CAUTION

Pre-load shims are used to space the blade gear so that it properly meshes with the master gear. Check the shim for socket number so that it may be returned to its proper location. The socket number of each piston, cylinder, fixed spline and blade gear may be identified by the etched marks on their exterior.

#### (3) PROCEDURE FOR REASSEMBLY OF THE TORQUE UNIT.

*Step 1.*—Clean and dry the hub socket and all parts.



Figure 113—Installation of the Pre-load Shim

*Step 2.*—Place the pre-load shim on the boss in the proper hub socket. See Figure 113.

#### NOTE

Whenever the pre-load shims are replaced and it is not possible to determine the proper thickness, use a new shim .033" thick.



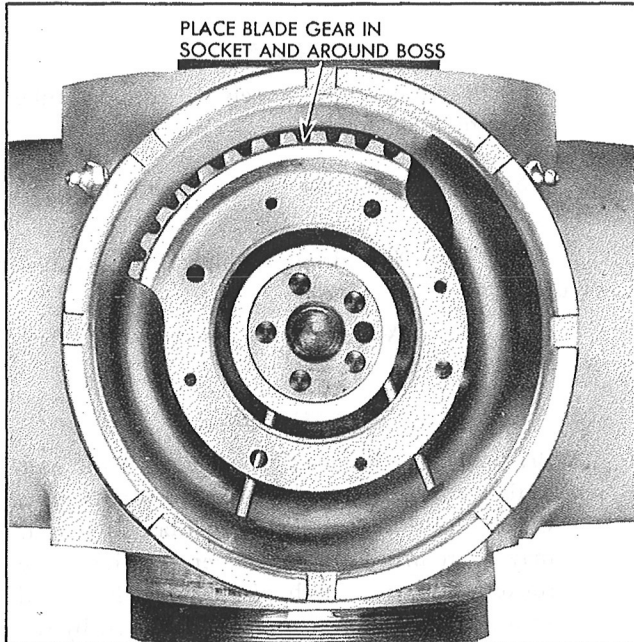


Figure 114—Installation of the Blade Gear

Step 3.—Place the blade gear over the hub boss, as shown in Figure 114.

**CAUTION**

Exercise care to avoid damaging the hub transfer tubes.

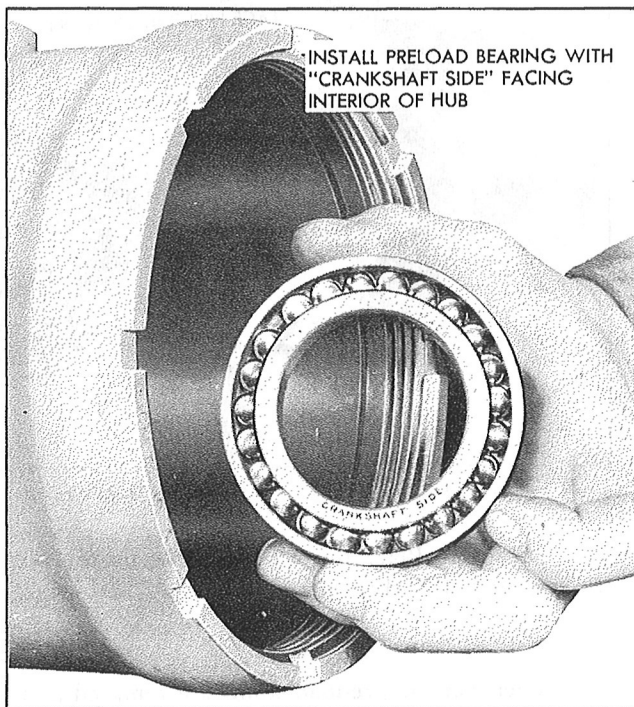


Figure 115—Installation of the Pre-load Bearing

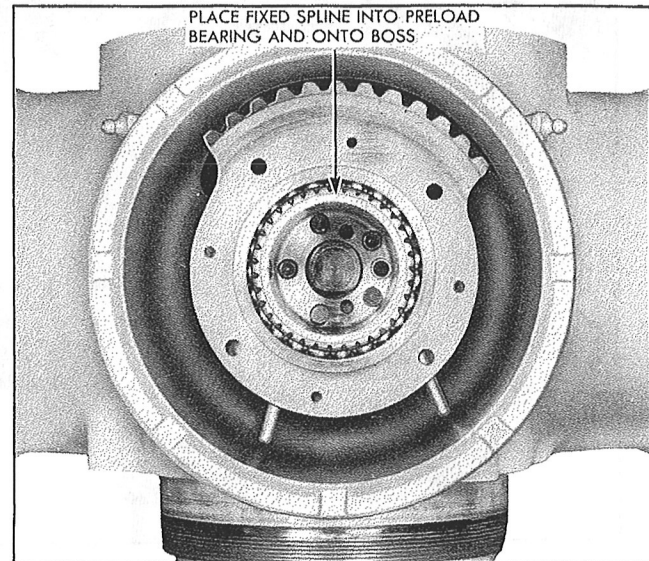


Figure 116—Installation of the Fixed Spline

Step 5.—Install a new gasket on the fixed spline and place the fixed spline on the boss in the hub socket. See Figure 116.

**NOTE**

Whenever a fixed spline, piston, or blade cylinder is replaced, the new part should be within 1/100 lb. of the weight of the original piece.

Step 6.—Insert the two lower dowels of a new star washer in the locking holes within the fixed spline. See Figure 117.

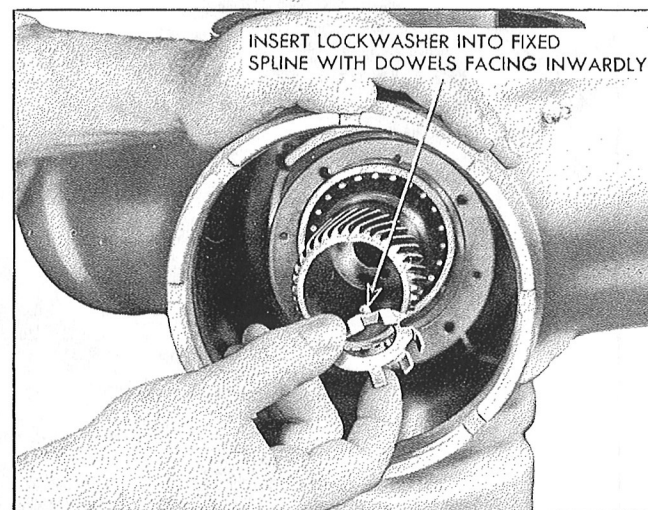


Figure 117—Installation of the Lock Washer

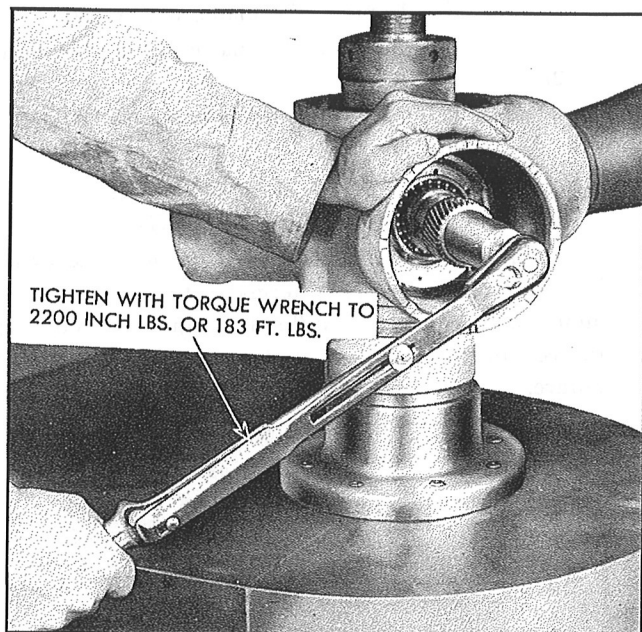


Figure 118—Installation of the Fixed Spline Bolt

**Step 7.**—Install the steel thrust washer on the fixed spline bolt and install the fixed spline bolt, using the Fixed Spline Bolt Wrench, Figure 66-2 and torque wrench. Draw up tight to 2200 inch lbs., or 183 foot lbs., as shown in Figure 118. Lock the ear of the star washer to one of the notches in the fixed spline bolt.

**Step 8.**—Install the cylinder seal ring in the groove on the outside of the blade cylinder. The lip of the seal must face the open end of the cylinder.

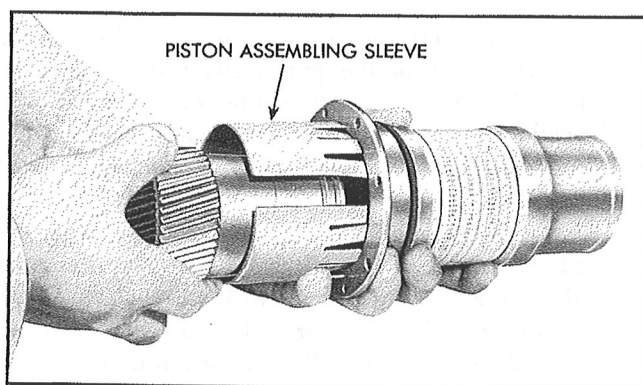


Figure 119—Installation of the Piston in the Cylinder

**Step 9.**—Insert the piston into the blade cylinder. See Figure 119, using the Piston Ring Assembly Sleeve, Figure 66-6. Mate the proper tooth of the piston with the marked valley of the cylinder. The number of the proper tooth is stamped within the piston.

#### NOTE

When a new fixed spline, piston, or blade cylinder is used, or whenever it is necessary to change the minimum blade angle for a different engine reduction gear ratio, see VI 2d (4) for proper indexing procedure.

**Step 10.**—Press the piston to the bottom of the blade cylinder.

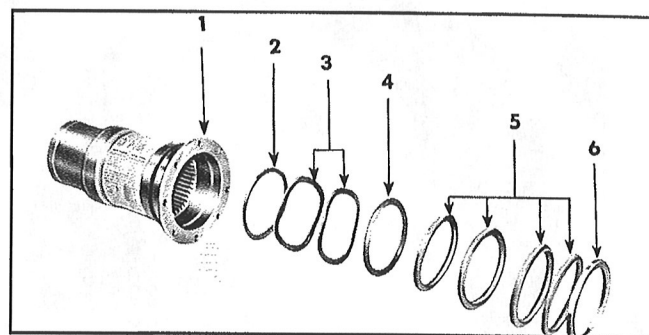


Figure 120—Installation of the Torque Unit Seals

- |                        |                                     |
|------------------------|-------------------------------------|
| 1. Blade Cylinder      | 5. Blade Cylinder Seals, 4 required |
| 2. Spacer Ring         | 6. Female Ring                      |
| 3. Springs, 2 required |                                     |
| 4. Male Ring           |                                     |

**Step 11.**—Place the seal spacer ring in the blade cylinder with the chamfered side of the ring facing the piston. See Figure 120.

**Step 12.**—Place the cylinder seal springs in the cylinder next to the seal spacer ring. See Figure 120.

**Step 13.**—Place the cylinder male ring in the cylinder with the flat side facing the seal springs, as shown in Figure 120.

**Step 14.**—Place the blade cylinder seals in the cylinder with the seal lips facing the cylinder male ring. See Figure 120.

**Step 15.**—Install the cylinder female ring with the groove side of the ring toward the blade cylinder seals.

**Step 16.**—Lubricate the fixed spline, using recommended propeller oil.

**Step 17.**—Place the Indicator Tool, Figure 66-5 on the castellation in the front of the hub socket. Align the end of the tool with the two index lines on the cylinder exterior. See Figure 121. Engage the splines and slide the cylinder and piston inward on the fixed spline until the cylinder contacts the blade gear.

**Step 18.**—Line up the dowel holes in the blade gear and the blade cylinder with  $\frac{1}{4}$ " drill rod guide pins and start the special head attaching screws

through the flange of the blade cylinder. Use a 10" screwdriver and tighten the screws snugly. See Figure 122.

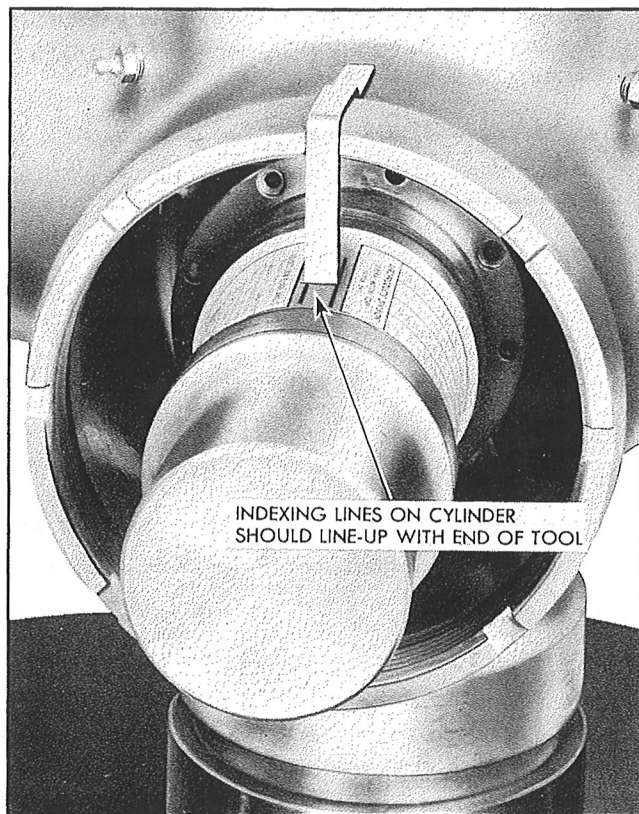


Figure 121—Assembly of the Torque Unit

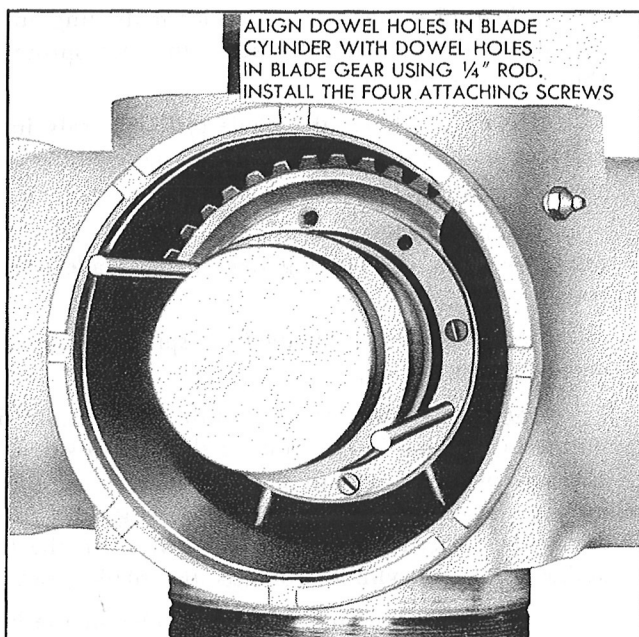


Figure 122—Assembly of the Torque Unit

Step 19.—Replace the blade. See Section VI 2b.  
Step 20.—Replace the master gear. See Section VI 2c.

Step 21.—Lubricate the hub as described under step 20, Section III 2c.

#### (4) PROCEDURE FOR INDEXING FOR BASIC BLADE ANGLE.

When a new fixed spline, piston, or blade cylinder is used, or whenever it is necessary to change the minimum blade angle for different engine reduction gear ratios, follow these steps for proper indexing procedure.

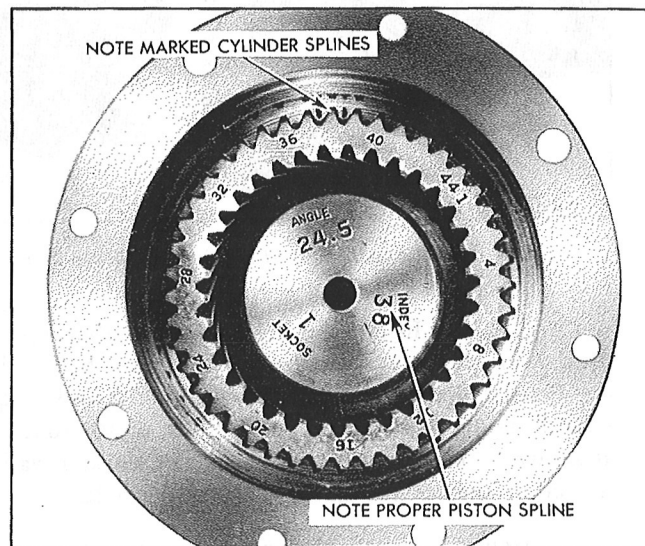


Figure 123—Indexing of the Piston with the Blade Cylinder

1. Insert the piston into the cylinder having tooth number 1 of the piston engaged in the marked index valley of the cylinder spline. Push the piston into the cylinder as far as it will go. The high pressure blade cylinder seals are omitted from the assembly at this time.

2. Engage the internal piston spline with the fixed spline so that the two index marks on the outside of the blade cylinder line up with the indicator tool in the castellation in the front end of the hub socket. See Figure 121. Push the cylinder and piston home.

3. Align the screw holes in the cylinder flange and the blade gear and put in at least two of the four special head screws.

4. Insert the blade assembly into the hub socket and engage the blade dowels with their respective holes in the cylinder flange and blade gear. Because of offset dowels and dowel holes, the blade will mount in only one way. Screw the blade retaining nut wrench tight.



5. Turn the blade to minimum angle.

6. Determine the difference between the measured and the desired low blade angle. If this angle falls within .2 of a degree of the desired blade angle, further indexing of the piston spline is not required. To correct for more than .2 of a degree blade angle, the piston is re-indexed to the *cylinder spline* and the following steps must be taken:

7. Record the difference between the low blade angle as measured and the desired blade angle. If the measured angle is greater than desired, call this difference "high." If less, call the difference "low."

8. Remove the blade assembly from the hub.

9. Remove the cylinder assembly and take out the piston.

10. Refer to Table IV for indexing information.

#### NOTE

This information is also attached as a decalcomania on the exterior of blade cylinders. From this table read off the number of the piston tooth to be engaged with the index valley of the cylinder corresponding to the angle error as recorded under 7 above, and stamp that blade indexing information in the piston, as shown in Figure 123.

11. Insert the piston with this number spline engaging the marked index valley of the cylinder splines. The assembly may now be completed in the normal manner, inserting the high pressure chevron seals, etc.

#### NOTE

As an example of the above method, let us assume that the desired angle is  $20^{\circ}$  and the measured angle is  $20.8^{\circ}$ . This will be recorded  $.8^{\circ}$  measured angle high. Looking in the "measured angle high" column of Table IV we find that the number of the piston external spline to engage the cylinder spline valley is 16. Therefore, we insert the piston into the cylinder having the piston tooth number 16 engaging the cylinder index valley. This will decrease the measured blade angle by  $.7^{\circ}$  thus bringing the low blade angle to  $20.1^{\circ}$  which is within the tolerance required.

TABLE IV

LOW PITCH ANGLE TABLE

Measured Angle High		Measured Angle Low	
Angle Difference	External Index Tooth of Piston	Angle Difference	External Index Tooth of Piston
.23	6	.23	40
.47	11	.47	35
.70	16	.70	30
.94	21	.94	25
1.17	26	1.17	20
1.40	31	1.40	15
1.64	36	1.64	10
1.87	41	1.87	5
2.10	2	2.10	44
2.34	7	2.34	39
2.57	12	2.57	34
2.81	17	2.81	29
3.04	22	3.04	24
3.27	27	3.27	19
3.51	32	3.51	14
3.74	37	3.74	9
3.97	42	3.97	4
4.21	3	4.21	43
4.44	8	4.44	38
4.68	13	4.68	33
4.91	18	4.91	28
5.14	23	5.14	23
5.38	28	5.38	18
5.61	33	5.61	13
5.85	38	5.85	8
6.08	43	6.08	3
6.31	4	6.31	42
6.55	9	6.55	37
6.78	14	6.78	32
7.01	19	7.01	27
7.25	24	7.25	22
7.48	29	7.48	17
7.71	34	7.71	12
7.95	39	7.95	7
8.18	44	8.18	2
8.42	5	8.42	41
8.65	10	8.65	36
8.88	15	8.88	31
9.12	20	9.12	26
9.35	25	9.35	21
9.58	30	9.58	16
9.82	35	9.82	11
10.05	40	10.05	6

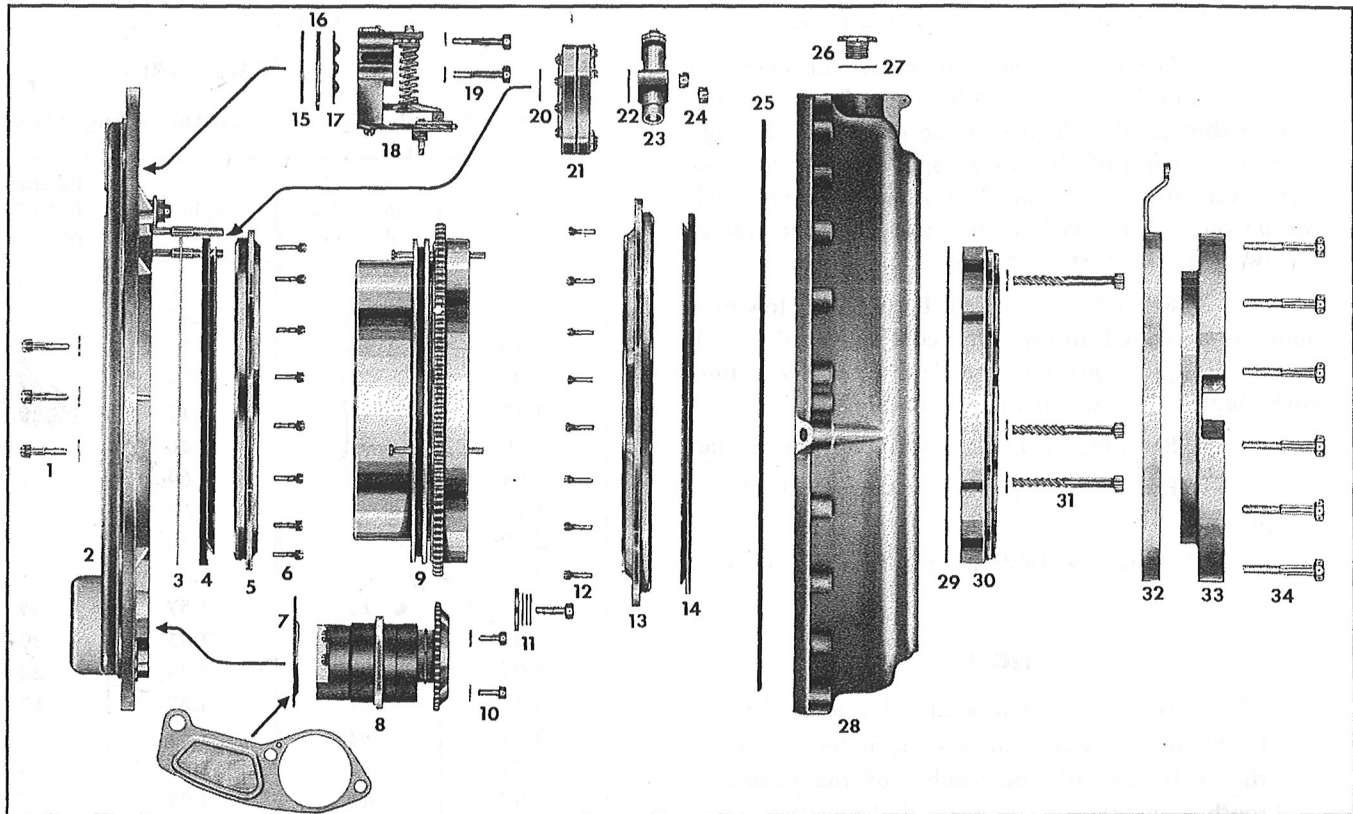


Figure 124—Exploded View of Regulator, Model A632S-C1

- |   |  |  |
|---|--|--|
| 1. Cover Attaching Screws and Washers—24 required       | 12. Cover Bearing Attaching Screws—8 required        | 24. Pressure Control Valve Attaching Nuts—2 required |
| 2. Regulator Housing                                    | 13. Cover Bearing                                    | 25. Cover Outer Seal                                 |
| 3. Regulator Washer                                     | 14. Cover Seal                                       | 26. Regulator Filler Plug                            |
| 4. Housing Seal   | 15. Governor Spacer Gasket                           | 27. Regulator Filler Plug Washer                     |
| 5. Housing Bearing                                      | 16. Governor Spacer Plate                            | 28. Regulator Cover                                  |
| 6. Housing Bearing Attaching Screws—8 required          | 17. Governor Filter Screen                           | 29. Adapter Gasket                                   |
| 7. Oil Pump Screen                                      | 18. Governor Assembly                                | 30. Adapter Ring Assembly                            |
| 8. Oil Pump   | 19. Governor Attaching Screws and Washers—4 required | 31. Control Screws and Thrust Washers, 3 required    |
| 9. Regulator Gear Assembly                              | 20. Pressure Control Valve Filter Gasket             | 32. Control Gear and Lever                           |
| 10. Oil Pump Attaching Screws and Washers—2 required    | 21. Pressure Control Valve Filter                    | 33. Adapter Plate                                    |
| 11. Oil Pump Screen Attaching Screw and Balance Washers | 22. Pressure Control Valve Gasket                    | 34. Adapter Plate Attaching Capscrews—6 required     |
|   | 23. Pressure Control Valve                           |  |

#### e. REGULATOR UNIT.

##### (1) TOOLS AND EQUIPMENT FOR DISASSEMBLY AND REASSEMBLY OF THE REGULATOR.

- |  |   |
|--|---|
| $\frac{7}{16}$ " Socket and Speed Handle | 10" Screwdriver                         |
| Soft-faced Mallet                        | Small Drift with $\frac{3}{32}$ " Point |
| $\frac{7}{16}$ " Open End Wrench         | .032" Brass Safety Wire                 |
| Diagonal Cutters                         | Regulator Oil, A. A. F.                 |
| $\frac{1}{2}$ " Open End Wrench          | Specification Y3587                     |
| Duck-bill Pliers                         |   |

##### (2) PROCEDURE FOR DISASSEMBLY OF THE REGULATOR UNIT.

*Step 1.*—Place the regulator on a clean bench with the spinner bulkhead side up.

*Step 2.*—Remove the spinner bulkhead by cutting the safety wire and withdrawing the cover screws and cover screw springs.

#### NOTE

No cover screw springs are used with Model A632S-C1.

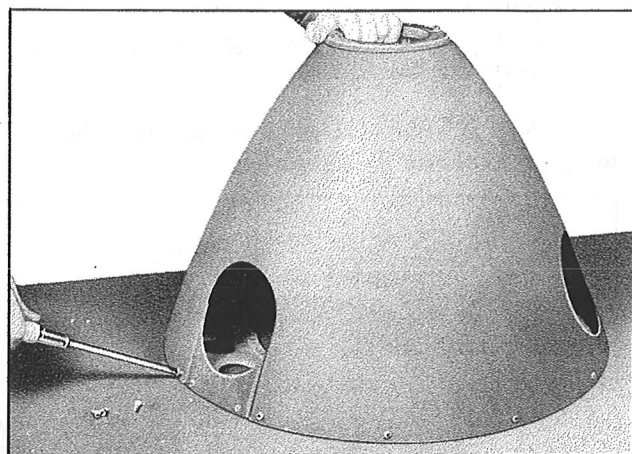


Figure 125—Assembly of Spinner Shell to the Bulkhead

**Step 3.**—To prevent mixup, assemble the spinner shell to the bulkhead, using the proper attaching screws, as shown in Figure 125.

**Step 4.**—Turn the regulator over so that the adapter plate, or control side, is up. Remove the safety wire from the  $\frac{1}{4}$ " x 28 cap screws.

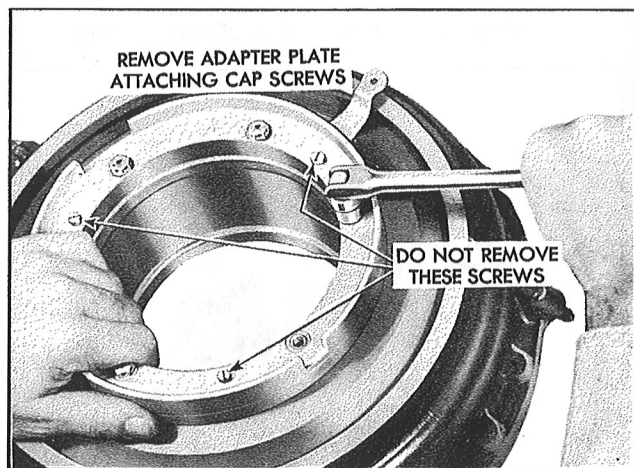


Figure 126—Removal of the Adapter Plate

**Step 5.**—Move the control lever to full travel clockwise and remove the  $\frac{1}{4}$ " x 28 adapter cap screws, using a  $\frac{7}{16}$ " speed wrench. See Figure 126.

#### NOTE

The 8 x 28 fillister head screws in the adapter plate act as guides for the safety wire and need not be removed.

**Step 6.**—Lift off the adapter plate as shown in Figure 127 and note the index marks on the control lever and adapter ring.

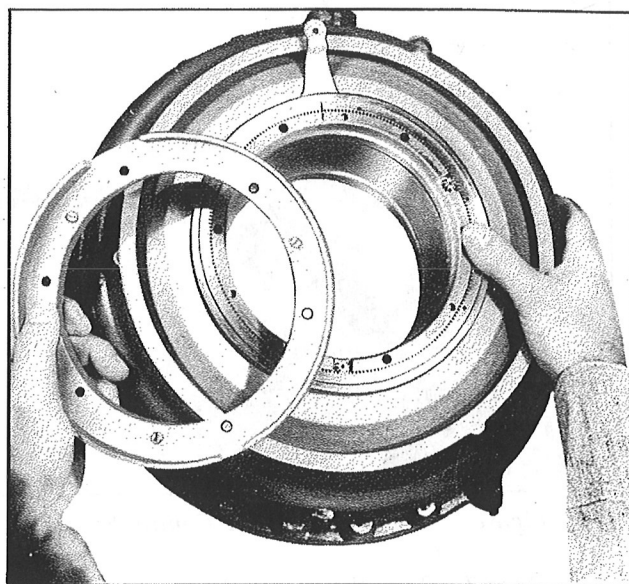


Figure 127—Control Lever Indexing, Model A632S-C1

#### NOTE

On Model A632S-C1, the No. 1 tooth of the control lever should coincide with the index mark on the adapter ring. Index marks on the adapter ring for Models A632S-B1 and -B5 should register with tooth No. 222 of the control lever. See Figures 127, 128. For Models A632S-A1, -A2, the index mark on the adapter ring should coincide with the index mark on the control lever.

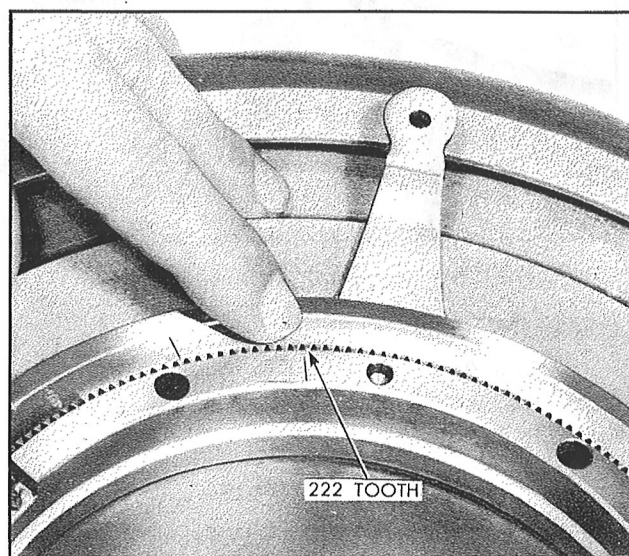


Figure 128—Control Lever Indexing, Models A632S-B1, -B5



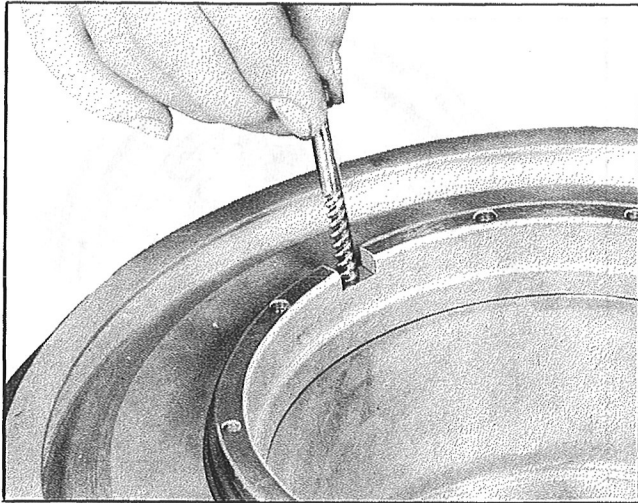


Figure 129—Removal of the Control Screws

*Step 7.*—Turn the control lever counterclockwise full travel, holding the control screws to prevent them from backing out. This is done to properly locate the governor shoe to facilitate removal of the regulator gear assembly.

*Step 8.*—Remove the control lever.

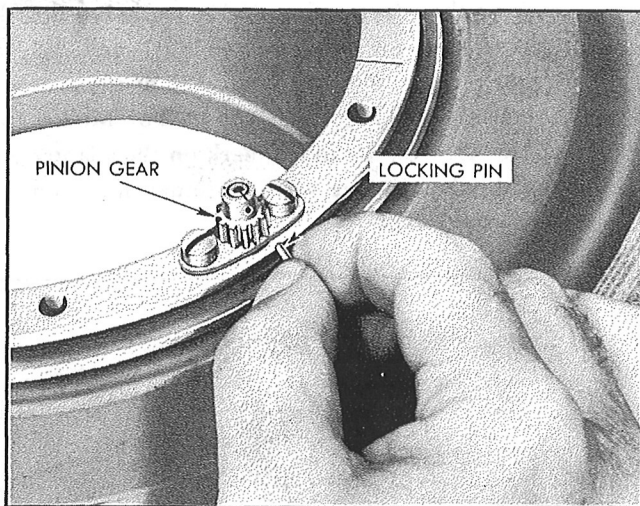


Figure 130—Removal of Control Screw Pinions, Models A632S-A1, -A2

*Step 9.*—Remove the three control screws and thrust washers, turning counterclockwise by hand, as shown in Figure 129.

**NOTE**

If Model A632S-A1, or -A2 regulators, use a small drift and drive the pin out of the control screw pinions, noting the mating marks on the ends of the pinion and the control screw. See

Figure 130. Remove the pinions only, as the screws remain with the regulator gear until further disassembly.

*Step 10.*—Lift the adapter ring from the regulator gear, as shown in Figure 131.

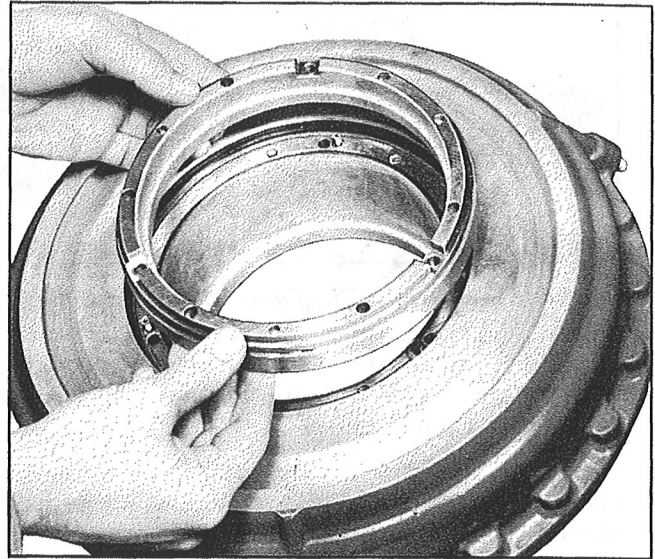


Figure 131—Removal of Adapter Ring

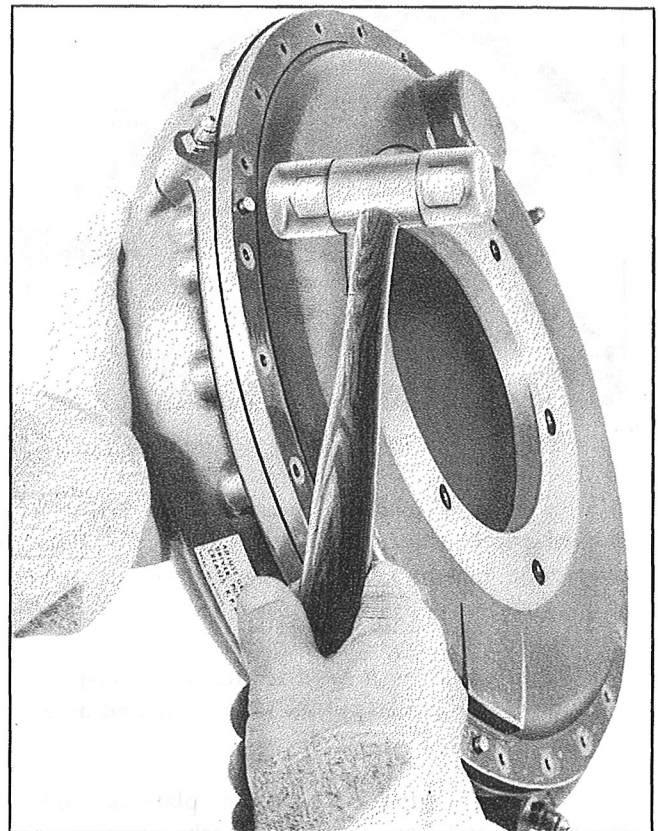


Figure 132—Removal of Regulator Cover

*Step 11.*—Remove the adapter gasket.

*Step 12.*—Turn the regulator over and tap the locating dowels in the housing with a soft-faced mallet as indicated in Figure 132 in order to loosen the cover from the housing. Lay the regulator on a bench with the cover side up. Lift the cover, tilting during removal to avoid interference with the oil pump drive gear.

**NOTE**

On Models A632S-C1, -B1, -B5, the regulator cover and housing seals are attached to the housing, whereas on Models A632S-A1, -A2, they are mounted on the regulator gear.

*Step 13.*—Cut the safety wire and remove the 8 x 24 fillister head capscrews holding the bronze regulator cover bearing to the cover.

**NOTE**

Models A632S-A1, -A2 have no bearings.

*Step 14.*—Lift out the regulator cover bearing, then remove the cover seal and spring. See Figure 133.

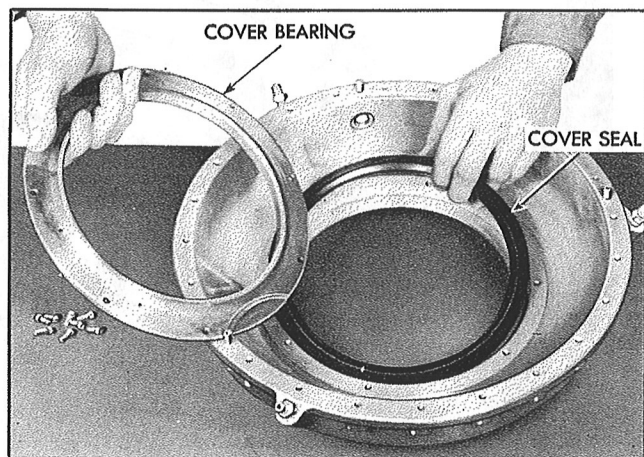


Figure 133—Removal of Cover Bearing and Seal

**NOTE**

On Models A632S-A1, -A2, remove the check valve and gasket from the cover, as shown in Figure 134, by removing attaching nuts from the studs, using a  $\frac{7}{16}$ " wrench.

*Step 15.*—Lift the regulator gear from the housing, as shown in Figure 135, until the regulator gear is out of mesh with the oil pump gear and is clear of the regulator housing. Then move the regulator gear sideways to disengage the control ring from the governor carriage shoe.

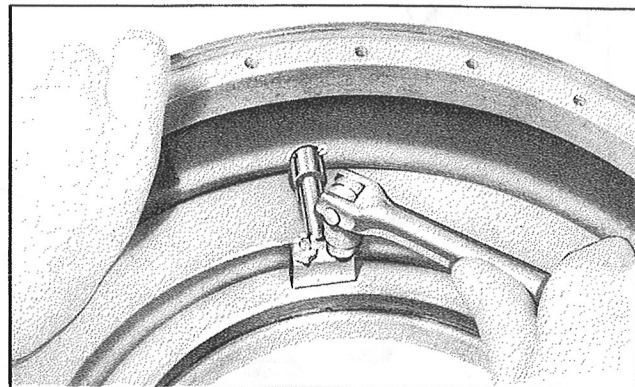


Figure 134—Removal of Check Valve, Models A632S-A1, -A2

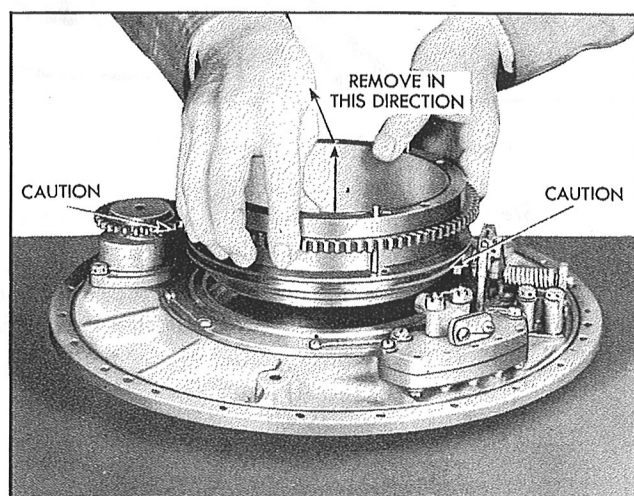


Figure 135—Removal of the Regulator Gear

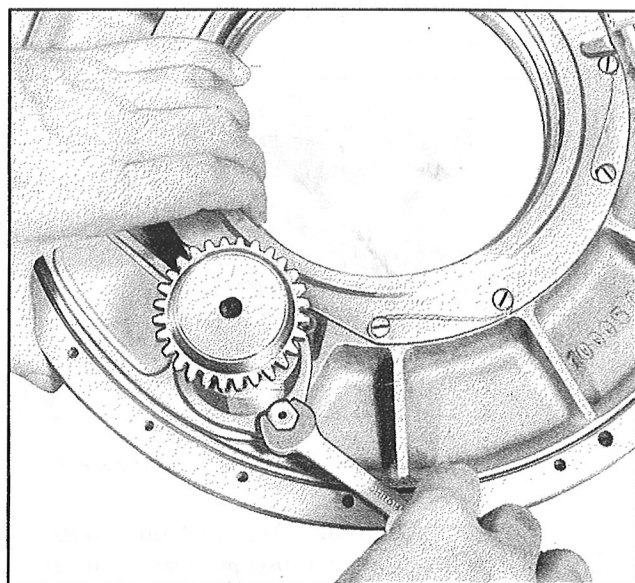


Figure 136—Removal of the Oil Pump

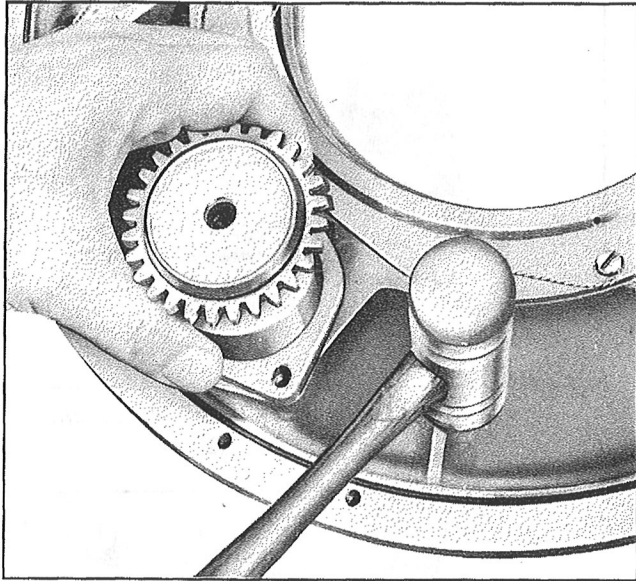


Figure 137—Removal of the Oil Pump

Step 16.—Remove the  $\frac{1}{4}$ " x 20 oil pump attaching capscrews and washers, as shown in Figure 136.

Withdraw the oil pump, tapping the regulator housing with a soft-faced mallet to facilitate removal. See Figure 137.

#### NOTE

The A632S-A1, -A2, -B1, -B5 models use studs instead of capscrews for mounting the oil pump. Whenever it is necessary to replace the oil pump studs in these models, bottom tap the stud hole with a  $\frac{1}{4}$ " x 20 tap and replace with capscrews.

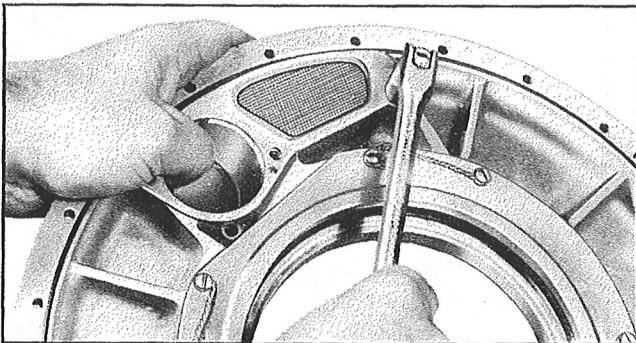


Figure 138—Removal of Oil Pump Screen

Step 17.—On Model A632S-C1 only, remove the  $\frac{5}{16}$ " x 18 balance washer capscrew nearest to the oil pump, as shown in Figure 138. This will allow the oil pump screen to be removed.

#### CAUTION

Keep the balance washers with this capscrew as they must be replaced on assembly to maintain regulator balance.

Step 18.—Remove the oil pump inlet screen on Model A632S-C1 only.

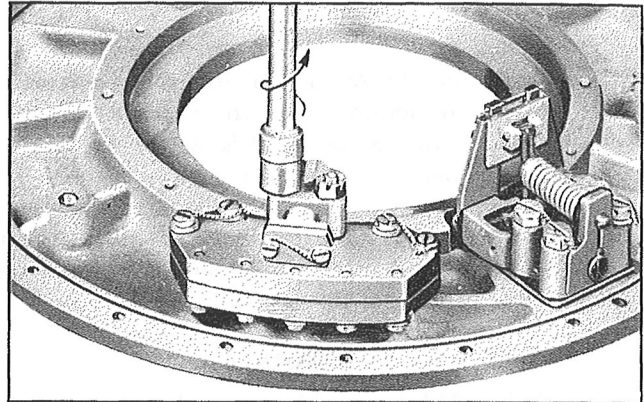


Figure 139—Removal of Pressure Control Valve Assembly

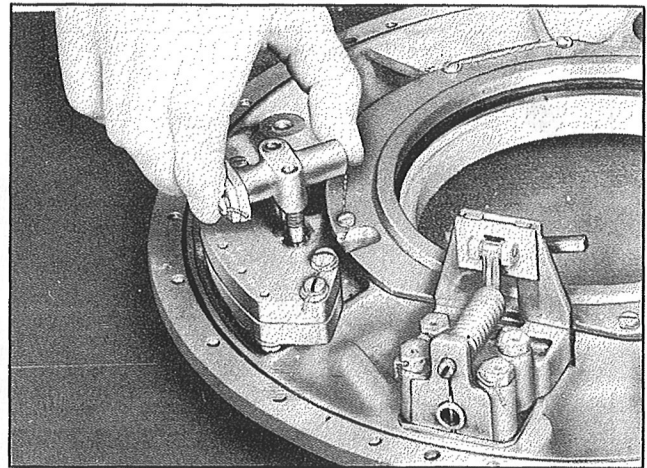


Figure 140—Removal of the Pressure Control Valve

Step 19.—Cut the safety wire and remove the attaching nuts from the pressure control valve, using a  $\frac{7}{16}$ " socket wrench. See Figure 139.

Remove the pressure control valve and gasket. See Figure 140.

Remove the pressure control valve filter and gasket. See Figure 141.

#### NOTE

The pressure control valve assemblies for models A632S-A1, -A2, -B1, -B5 are attached to the regulator housing by  $\frac{1}{4}$ " x 20 capscrews.



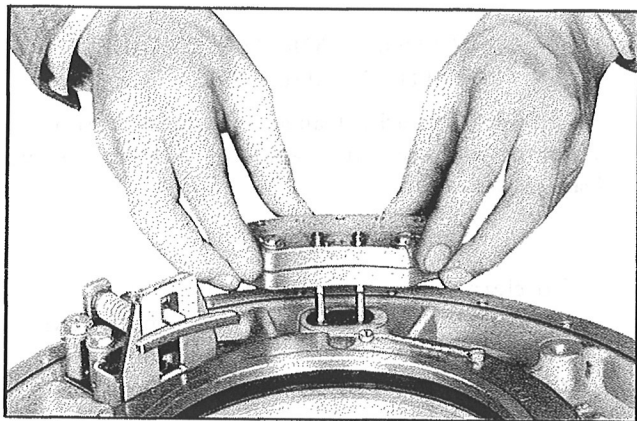


Figure 141—Removal of the Pressure Control Valve Filter

Step 20.—Remove the governor from the regulator housing, as shown in Figure 142, by cutting the safety wire and removing the  $\frac{1}{4}$ " x 28 capscrews and washers, using a  $\frac{7}{16}$ " socket wrench.

**NOTE**

Governors for Models A632S-A1, -A2, -B1, and -B5 are attached to the housing by studs.

Step 21.—Lift off the governor, filter gasket, spacer plate, and spacer plate gasket from the regulator, as shown in Figure 143.

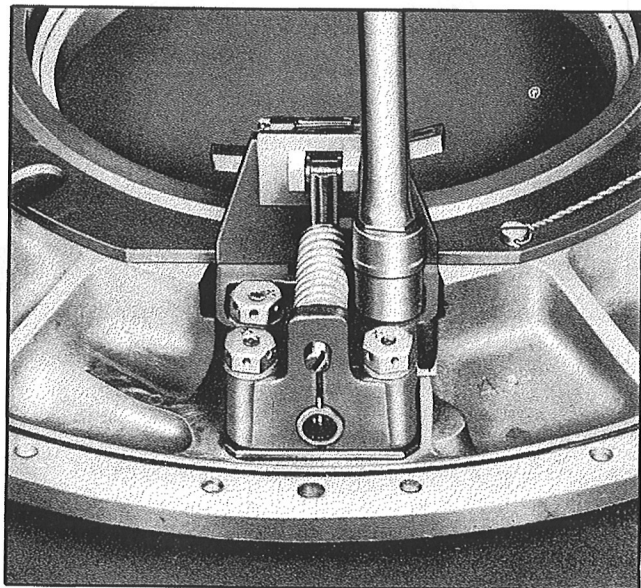


Figure 142—Removal of the Governor

**CAUTION**

Note that one side of the filter gasket is convex and that this convex side must go toward

the governor body ports. Note also that the oil holes in the filter gasket, spacer plate, and spacer plate gasket are slightly offset with relation to the capscrew holes. Care must be taken during reassembly to install these parts so that the capscrew holes in these parts and the oil passages mate properly with the corresponding holes in the governor pad. If improperly installed, the governor screen may be damaged and the oil flow restricted.

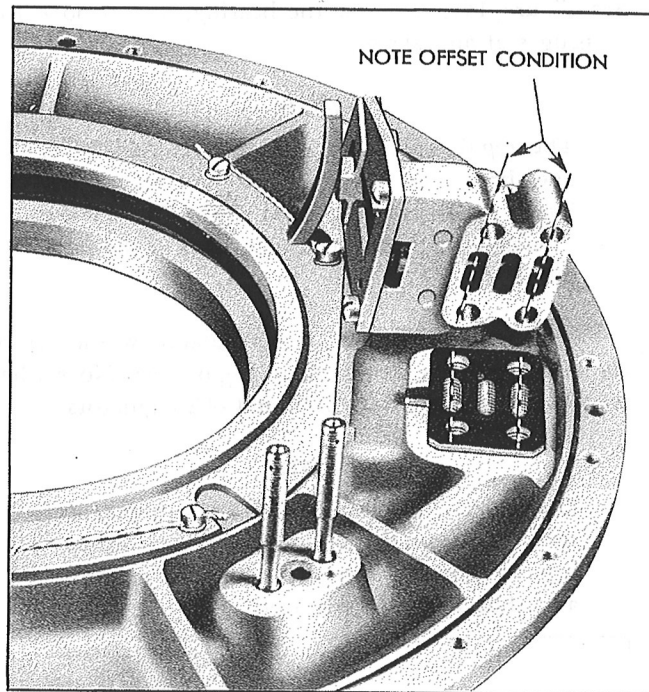


Figure 143—Removal of the Governor

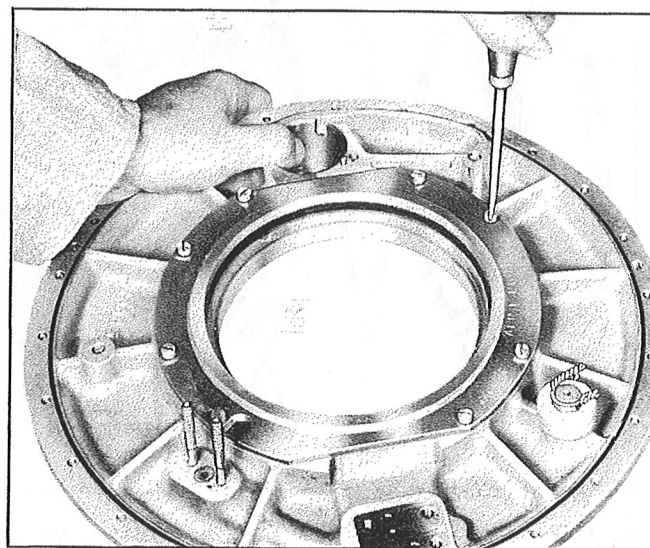


Figure 144—Removal of the Housing Bearing

**NOTE**

Governors for Models A632S-A1, -A2, -B1 and -B5 are attached to the regulator housing by studs and nuts, and do not use a spacer plate or a spacer plate gasket.

*Step 22.*—Remove the housing bearing on models A632S-C1, -B1, and -B5 by cutting the safety wire and withdrawing the fillister head capscrews that hold the bronze regulator housing bearing to the housing. See Figure 144. Lift out the bearing, and remove the housing seal and spring.

**NOTE**

The regulator bearings in models A632S-B1, and -B5 are *not* interchangeable between regulators, whereas those in model A632S-C1 are interchangeable between regulators of the same model.

*Step 23.*—Lift out the regulator washer from the housing recess, as shown in Figure 145. No washer is used with models A632S-A1 and -A2 regulators.

**NOTE**

On models A632S-A1 and -A2 regulators, seal races have been shrunk into the regulator housing and cover. These are not interchangeable and should not be removed.

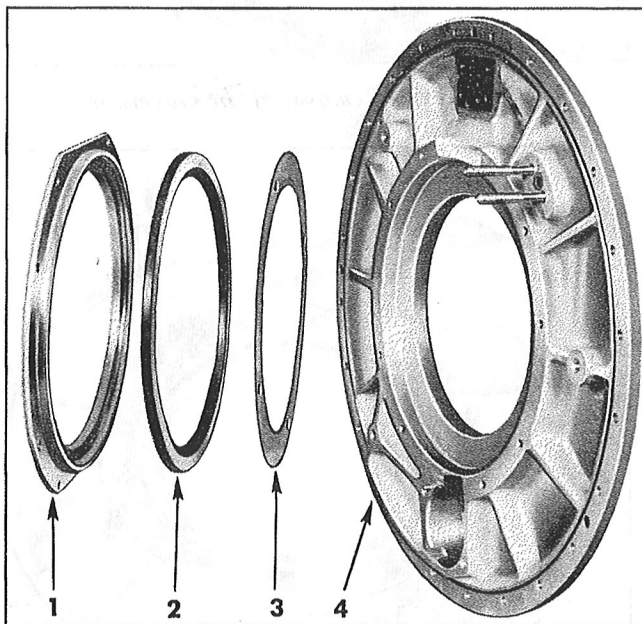


Figure 145—Bearing, Seal, Washer and Housing

- |            |            |
|------------|------------|
| 1. Bearing | 3. Washer  |
| 2. Seal    | 4. Housing |

**(3) PROCEDURE FOR REASSEMBLY OF THE REGULATOR.**

*Step 1.*—Wash, clean and dry all parts thoroughly, but do not wash the regulator seals in a solvent. Clean all screens.

**NOTE**

To clean the pressure control valve filter, remove the safety wire and the assembly screws. Separate the cap, screen and filter body. Clean the screen and reassemble the filter.

*Step 2.*—Place the regulator washer in the housing recess, on models A632S-C1, -B1, and -B5 only. See Figure 145.

*Step 3.*—Place the regulator housing seal and spring in the housing with the metal side of the seal against the housing part, on models A632S-C1, -B1, and -B5 only. See Figure 145.

**NOTE**

When installing springs in seals, as shown in Figure 146, use care not to damage the seal or the spring.

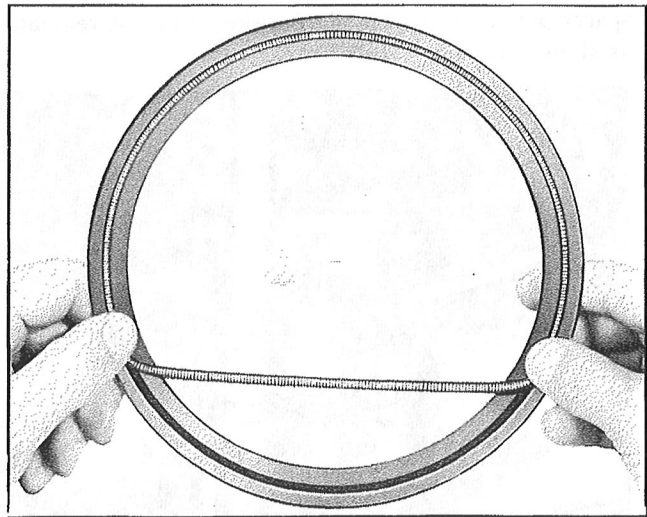


Figure 146—Installation of Seal Spring

*Step 4.*—Attach the regulator housing bearing to the housing, using the 8 x 24 fillister head screws. Tighten the opposite screws evenly and safety with .032" wire. See Figure 144.

**NOTE**

No bearings are used in Models A632S-A1 and -A2.

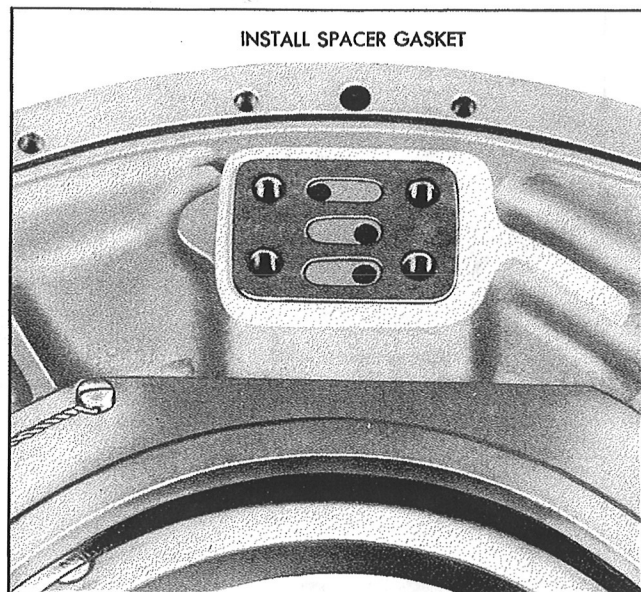


Figure 147—Installation of the Governor

Step 5.—Install the governor spacer gasket, as shown in Figure 147.

**NOTE**

The mounting holes of the gasket are offset with relation to the oil passage holes and care must be taken during installation to properly install the gasket in order to prevent restriction of the oil passage holes in the pad.

Step 6.—Install the governor spacer plate with the tang pointing toward the center of the regulator housing. See Figure 148.

**NOTE**

Models A632S-A1, -A2, -B1, and -B5 do not use a spacer plate or spacer plate gasket when attaching the governor to the housing.

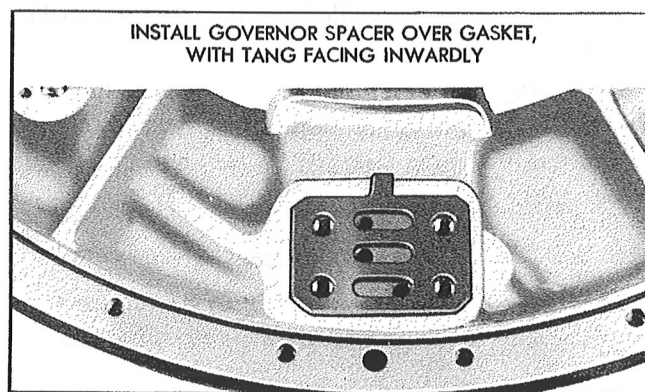


Figure 148—Installation of the Governor

Step 7.—Install the governor filter gasket. The filter gasket is convex and the convex screen fits into the governor ports. To avoid damaging the screen, make sure that the filter gasket is installed correctly so that the attaching screw holes and the oil passages in the gasket mate properly with the corresponding holes in the governor pad of the regulator. See Figure 143.

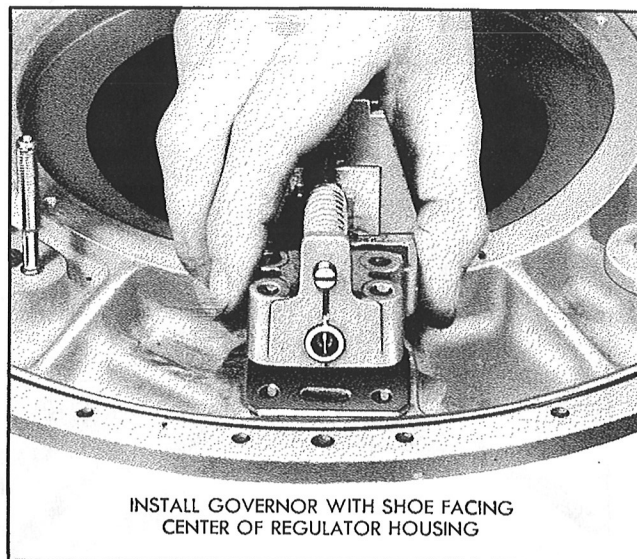


Figure 149—Installation of the Governor

Step 8.—Install the governor so that the governor shoe extends toward the center of the regulator housing. See Figure 149. Install the 1/4" x 28 capscrews and flat washers.

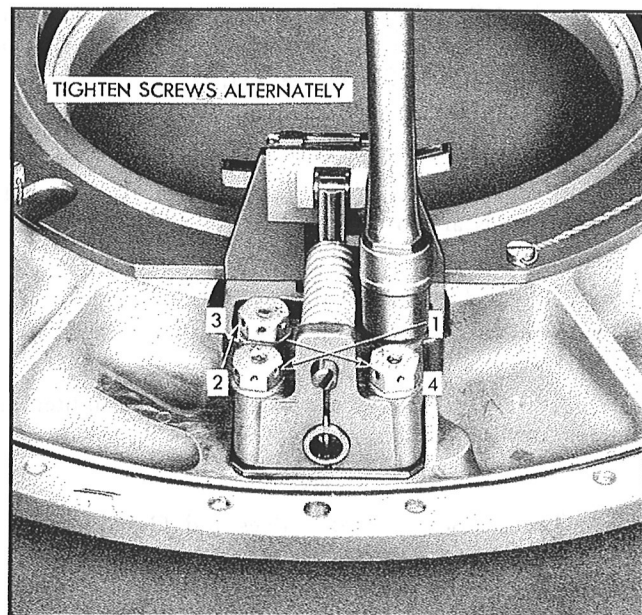


Figure 150—Installation of the Governor



Draw the governor down evenly by tightening the attaching capscrews diagonally with 90 to 100 inch-pounds torque. See Figure 150. Check the governor piston for freedom of movement after installation.

**NOTE**

Models A632S-A1, -A2, -B1, and -B5 use studs and nuts to mount the governor to the regulator housing.

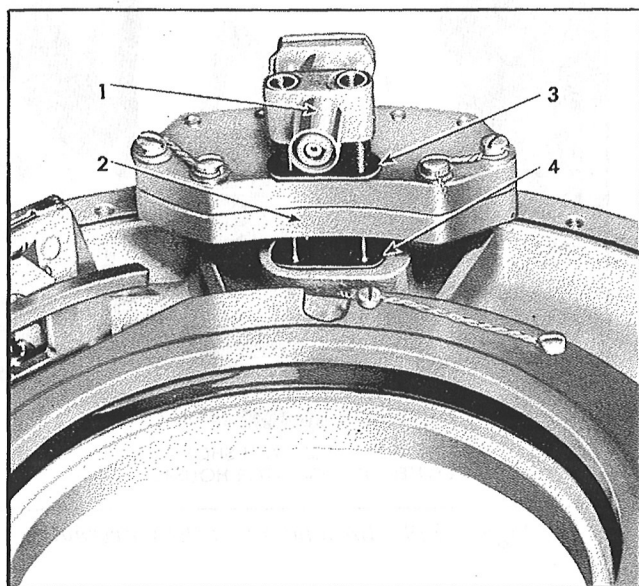


Figure 151—Installation of Pressure Control Valve and Filter

- |                                  |                  |
|----------------------------------|------------------|
| 1. Pressure Control Valve        | 3. Valve Gasket  |
| 2. Pressure Control Valve Filter | 4. Filter Gasket |

*Step 9.*—Mount the pressure control valve filter gasket over the studs in the regulator housing pressure control valve pad. See Figure 151.

*Step 10.*—Mount the pressure control valve filter assembly over the studs, as shown in Figure 151.

*Step 11.*—Install the pressure control valve gasket on the studs and over the pressure control valve filter. See Figure 151.

*Step 12.*—Mount the pressure control valve on the studs, entering the filter dowel into the pressure control valve body. See Figure 151.

*Step 13.*—Install the attaching nuts, tighten and safety with .032" wire.

**NOTE**

The pressure control valves and filter assemblies on models A632S-A1, -A2, -B1, and -B5 are attached to the regulator housing with 1/4" x 20 capscrews, which should be tightened with a torque of 90 to 100 inch-pounds.

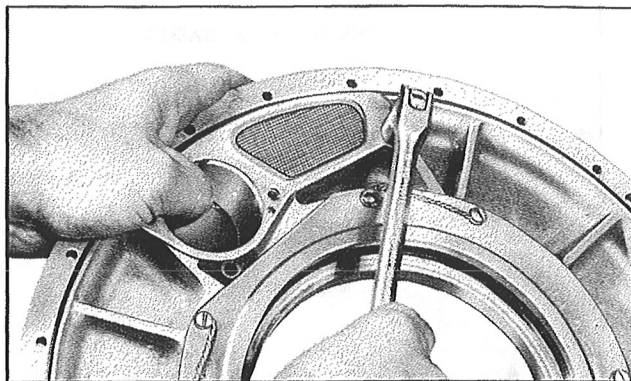


Figure 152—Installation of Oil Pump Screen

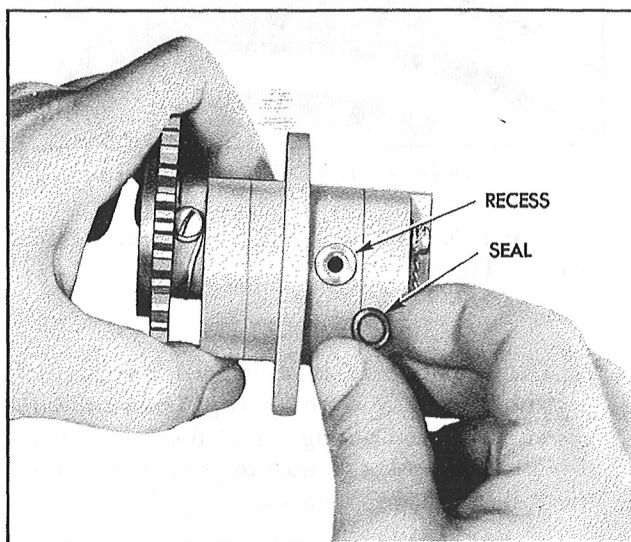


Figure 153—Installation of Oil Pump Seal

*Step 14.*—On Model A632S-C1 only, place the oil pump screen into position over the pump well in the regulator housing. Install the combination balance screw and attaching screw loosely. See Figure 152.

*Step 15.*—Place the oil pump seal in the pressure outlet recess provided for it, as shown in Figure 153.

*Step 16.*—Lubricate the oil pump well and press the oil pump into the housing so that the attaching flange of the pump mates with the locating dowel pin in the housing. See Figure 154.

**CAUTION**

Exercise care to prevent shearing off the oil pump seal during the installation of the pump.

Tighten the pump attaching capscrews evenly and safety with .032" wire.

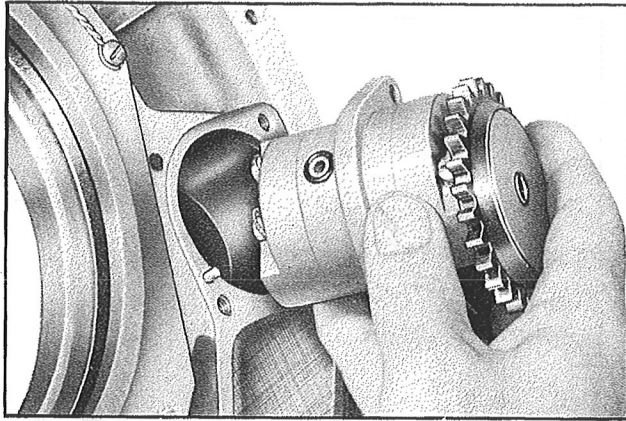


Figure 154—Installation of Oil Pump

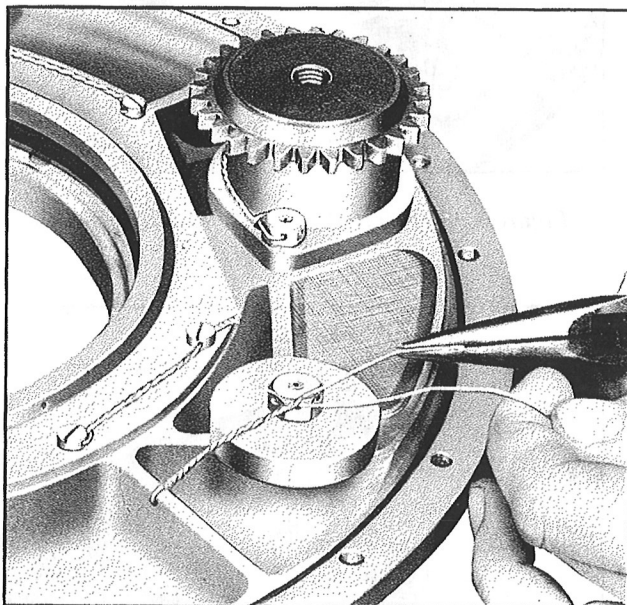


Figure 155—Installation of Oil Pump

**NOTE**

Oil pumps on models A632S-A1, -A2, -B1, and -B5 are attached to the regulator housing by means of studs and nuts.

*Step 17.*—Using a 1/2" socket wrench, tighten the balance capscrew and safety with .032" wire, as shown in Figure 155.

*Step 18.*—Slide the shoe of the governor as far as possible away from the regulator housing.

*Step 19.*—On models A632S-C1, -B1, -B5, lubricate the regulator housing with recommended propeller oil as indicated in Figure 156.

*Step 20.*—Install the regulator gear assembly into the housing. First slide the regulator control ring into

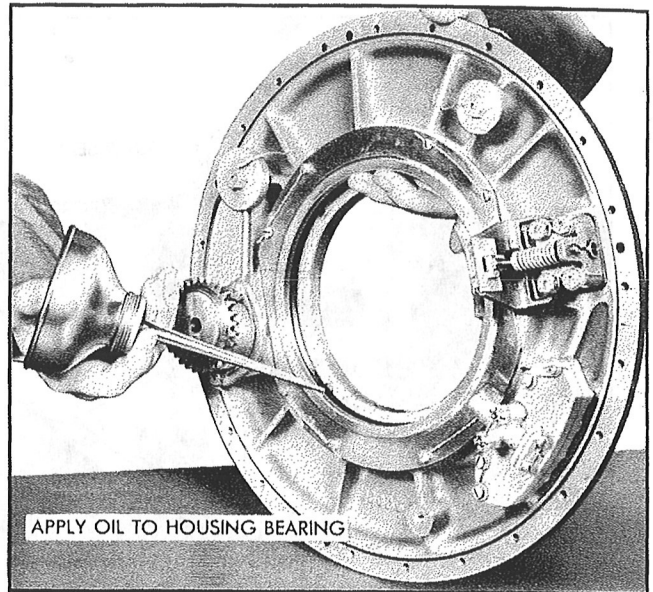


Figure 156—Installation of Regulator Gear Assembly

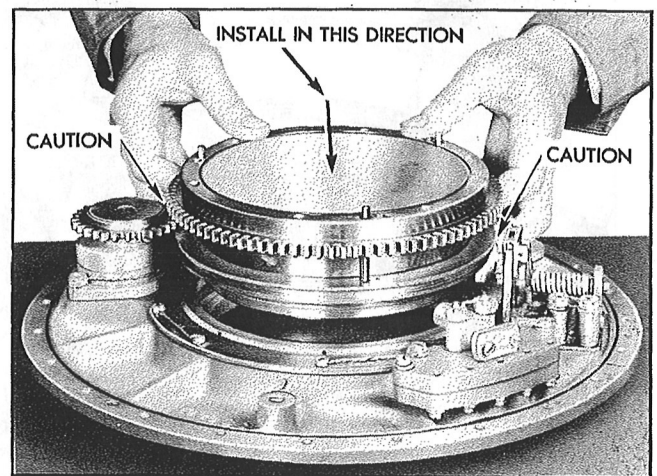


Figure 17—Assembly of Regulator Gear to the Housing

the shoe of the governor. Then swing the regulator gear until it is in line with the regulator housing bearing or seal race. See Figure 157. Lower the regulator gear into place, meshing the regulator gear with the oil pump drive gear.

**CAUTION**

Take care to avoid bending or damaging the oil pump gear or shaft.

*Step 21.*—Insert the regulator seal ring (cover outer seal) into the groove of the regulator housing, see Figure 158. Place the seal in the groove loosely, then cut the seal 3/8 of an inch oversize and assemble with a compression at the butt joint.

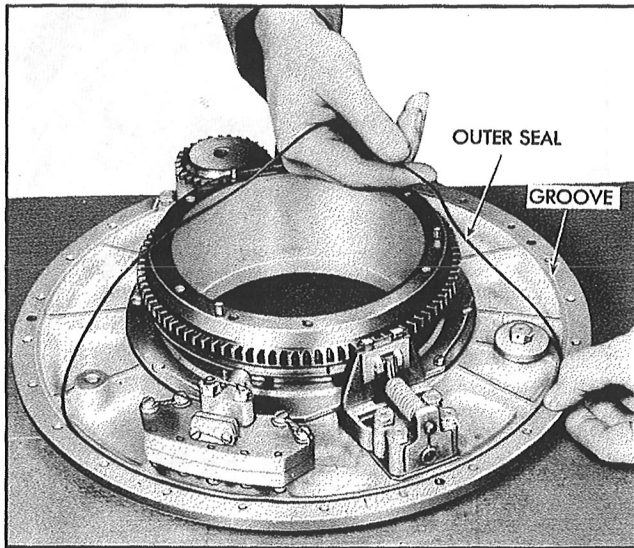


Figure 158—Installation of the Seal Ring

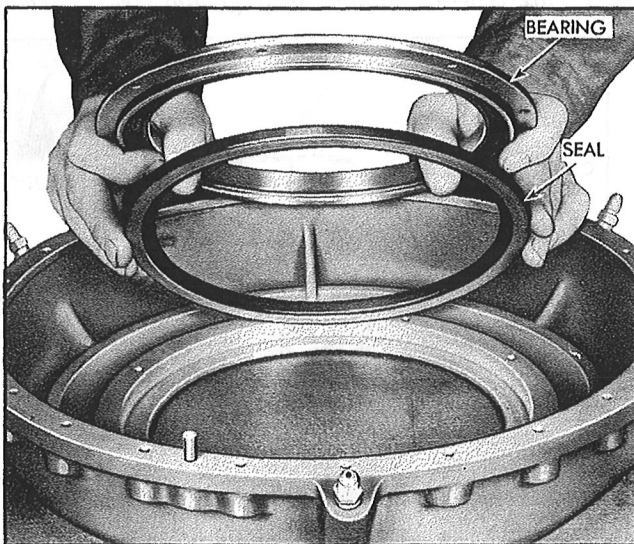


Figure 159—Assembly of the Regulator Cover

**NOTE**

In Models A632S-A1, -A2, -B1, -B5, a gasket is used in place of the outer seal ring.

*Step 22.*—Install the regulator cover seal and spring, as shown in Figure 159, with the metal side of the seal facing the regulator cover.

**NOTE**

In Models A632S-A1, -A2, the housing and cover seals are fixed onto the regulator gear and bear on seal races in the housing and in the cover.

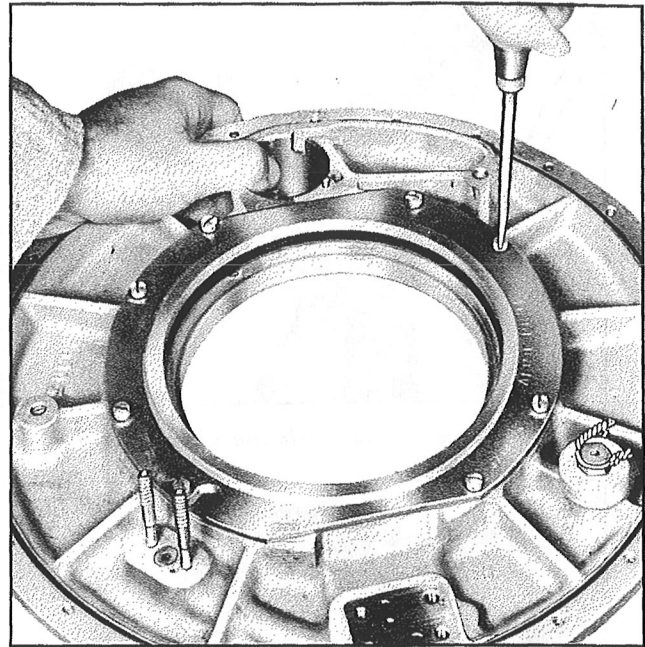


Figure 160—Installation of the Housing Seal and Bearing

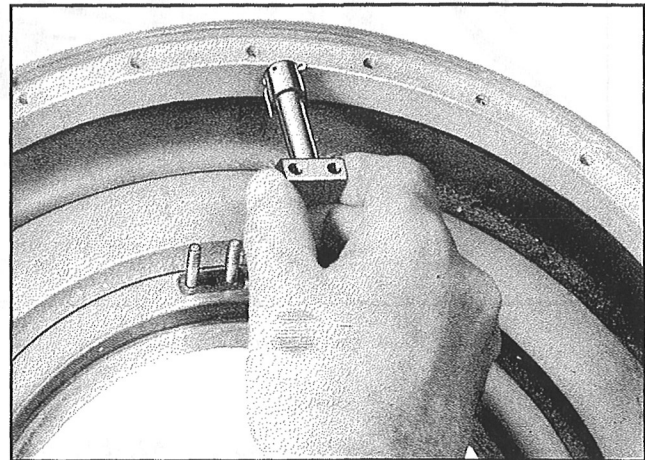


Figure 161—Installation of the Check Valve

*Step 23.*—Install the regulator cover bearing, tightening the 8 x 28 fillister head screws alternately and safety with .032" wire. See Figure 160. No bearings are used in Models A632S-A1, -A2.

**NOTE**

On Models A632S-A1, and -A2, install the check valve assembly, shown in Figure 161, onto the regulator cover, using a check valve gasket. Attach the check valve to the studs, using two nuts. Safety with .032" wire.



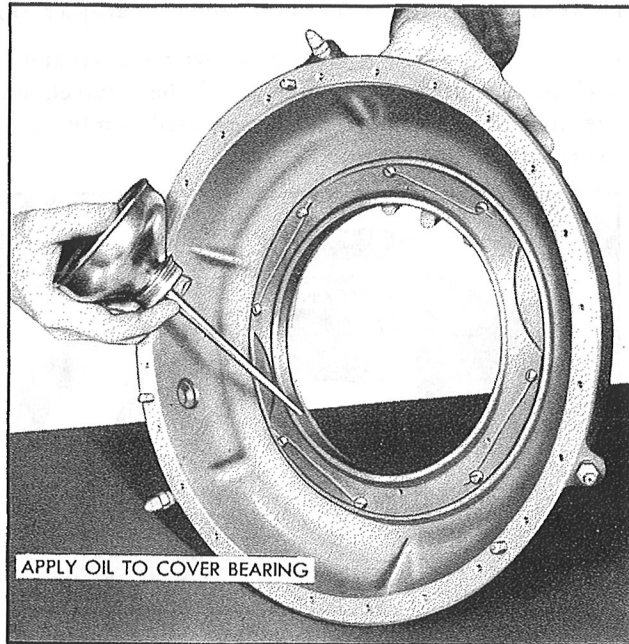


Figure 162—Installation of the Regulator Cover

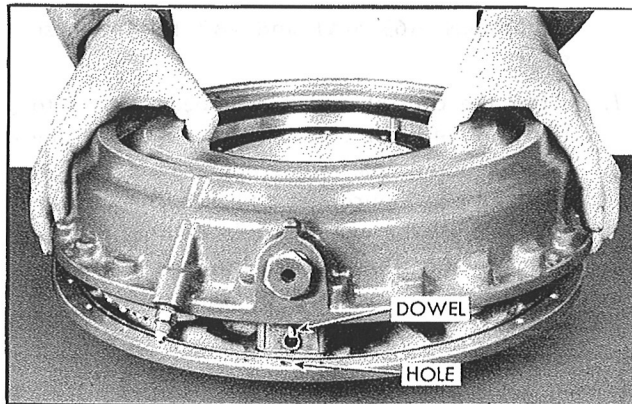


Figure 163—Assembly of the Regulator

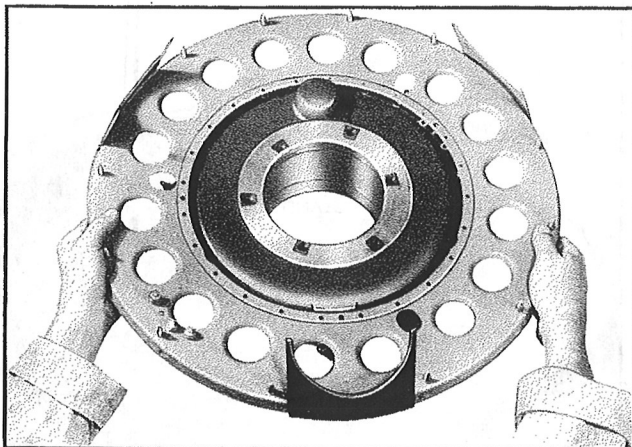


Figure 164—Installation of the Spinner Bulkhead

*Step 24.*—Using recommended propeller oil, lubricate the regulator cover bearing, as shown in Figure 162.

*Step 25.*—Place the regulator cover over the housing, align the dowels and take care to seat the cover seal properly. See Figure 163. Rap the cover into position, using hands only.

**NOTE**

As the dowels are offset the cover will mount in one position only.

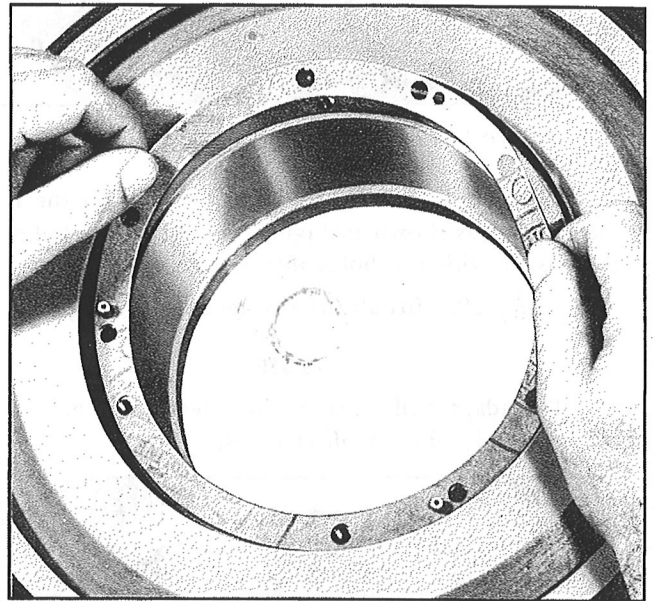


Figure 165—Installation of the Adapter Gasket

*Step 26.*—Install the spinner bulkhead on the regulator, aligning the offset dowels with the dowel holes. Bulkhead plates should face away from the regulator. See Figure 164.

*Step 27.*—Install and tighten alternately the 10 x 24 regulator cover screws and springs. Set the springs with the points toward the bulkhead. Tighten the regulator cover screws moving from one screw to another diametrically opposite, so that the regulator cover will be drawn down evenly. Tighten the screws a second time, moving progressively from one to another. Safety with .032" wire.

**NOTE**

No cover screw springs are used on Model A632S-C1 regulators.

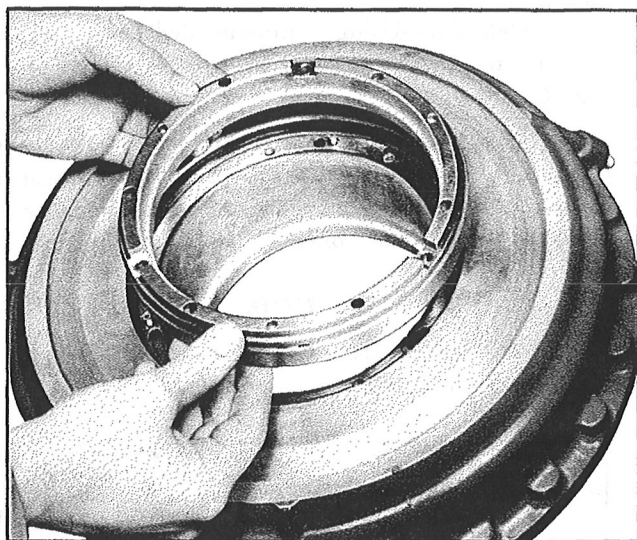


Figure 166—Installation of the Adapter Ring

Step 28.—Install the adapter gasket on the regulator gear, as shown in Figure 165. Align the holes in the gasket with the holes in the gear face.

Step 29.—Install the adapter ring. See Figure 166.

#### NOTE

The adapter ring may be installed in one position only, due to offset holes.

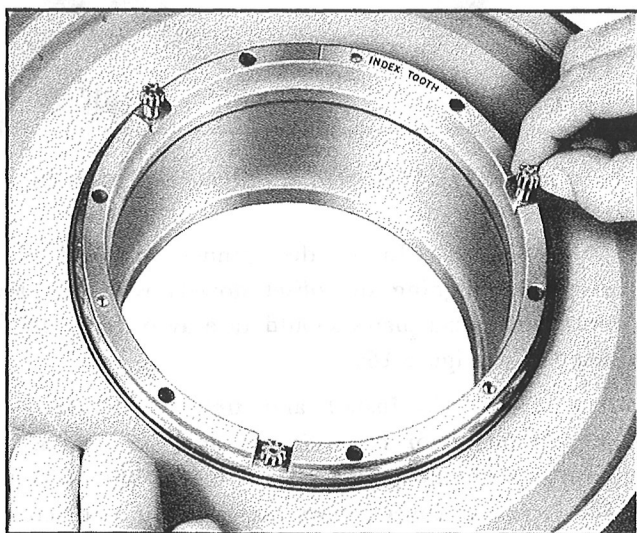


Figure 167—Installation of the Control Screws

Step 30.—Place one thrust washer on each control screw and install the control screw through the adapter ring, as shown in Figure 167, using caution to avoid damaging the control screw seals which are installed within the adapter ring. For free operation of the control lever, each control screw *must* have a thrust washer

between the control screw head and the adapter ring.

Step 31.—Turn all control screws alternately in a clockwise direction to the end of their travel, until the control ring is felt to have seated firmly against the regulator gear flange.

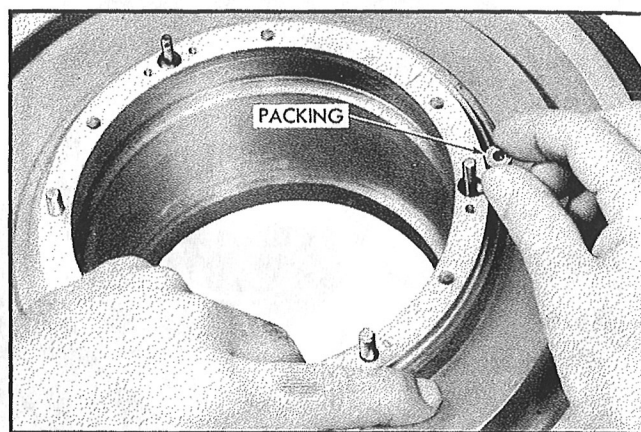


Figure 168—Installation of the Control Screw Packing

#### NOTE

In Models A632S-A1 and -A2 follow these steps:

1. After the control screws have been turned to the limit of their clockwise travel, place one control screw packing around each control screw shank, Figure 168, and push the packing down into the countersunk section of the adapter ring. Press firmly into place, but do not allow the packing to bind the control screw.

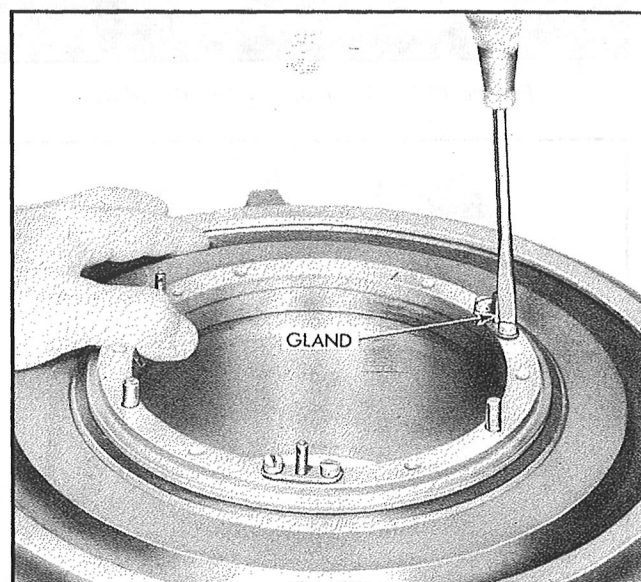


Figure 169—Installation of the Control Screw Glands

2. Install a control screw packing gland over each screw, as shown in Figure 169 and attach the gland to the adapter ring by means of two fillister head screws.
3. Install the pinion gears on the proper control screws. These may be identified by punch marks on the end of the control screw shank and the end of the control screw pinion. Align the marks on the end of the screw with the corresponding mark on the pinion. See Figure 170. The marks on the pinions should face

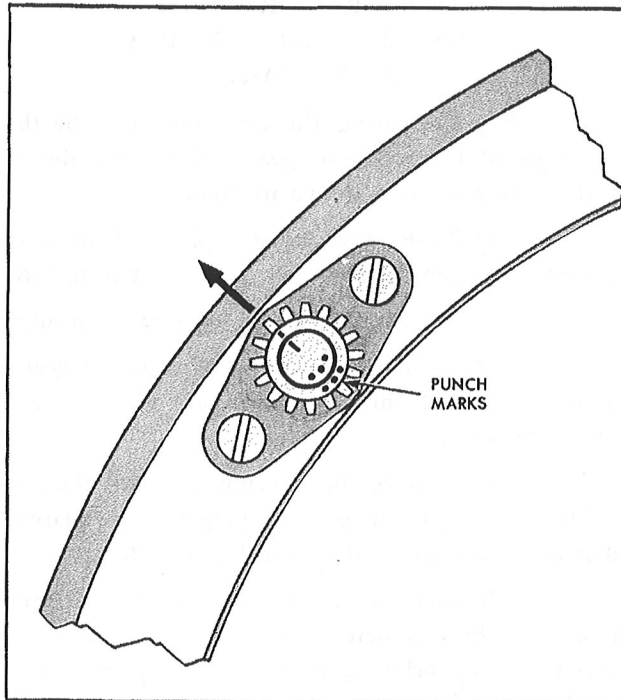


Figure 170—Installation of the Control Screw Pinions

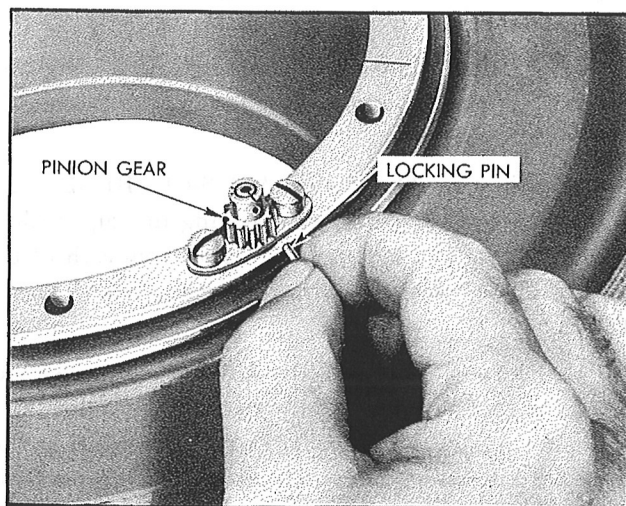


Figure 171—Installation of the Control Screw Pinions

outwardly from the center of the regulator. Lock the pinion gears in place by pressing the locking pin through the hole in the pinion gear shank and the control screw. Be sure that the ends of the pinion are flush with the outer diameter of the pinion gear shank. See Figure 171.

*Step 32.*—Line up the indexing marks in the adapter ring with the control lever. Press the lever down so that the teeth of the lever mate with the teeth of the pinion gears, as shown in Figure 172.

#### NOTE

On Models A632S-C1, -A1, and -A2, the index marks on the adapter ring should line up with No. 1 tooth of the control lever. See Figure 173.

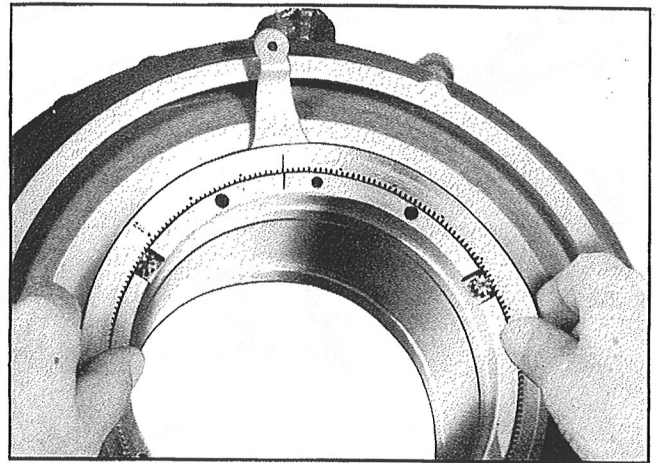


Figure 172—Installation of Control Gear and Lever, Model A632S-C1

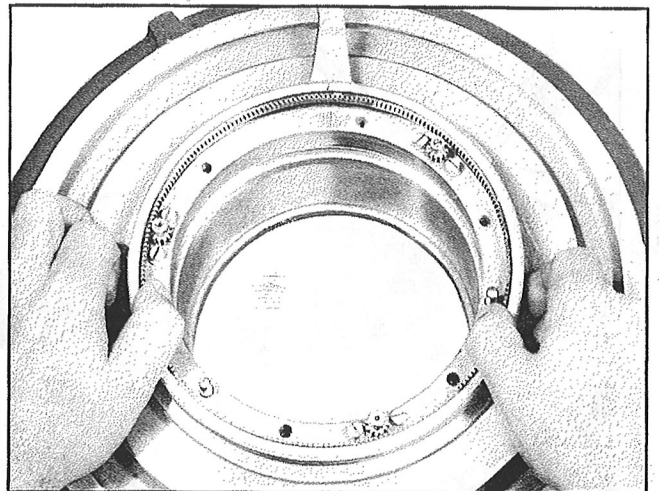


Figure 173—Installation of Control Gear and Lever, Models A632S-A1, -A2



For Models A632S-B1 and -B5, index the control lever on tooth No. 222, as shown in Figure 174.

*Step 33.*—Install the adapter plate and attach by  $\frac{1}{4}$ " x 28 capscrews, using a  $\frac{7}{16}$ " socket wrench. Tighten with 8 to 10 foot pounds and safety with .032" wire, as shown in Figure 175.

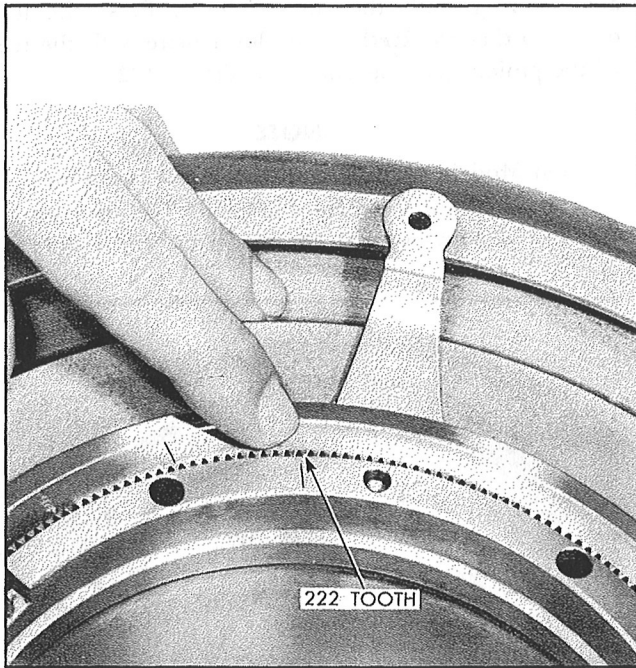


Figure 174—Control Lever Indexing, Models A632S-B1, -B5

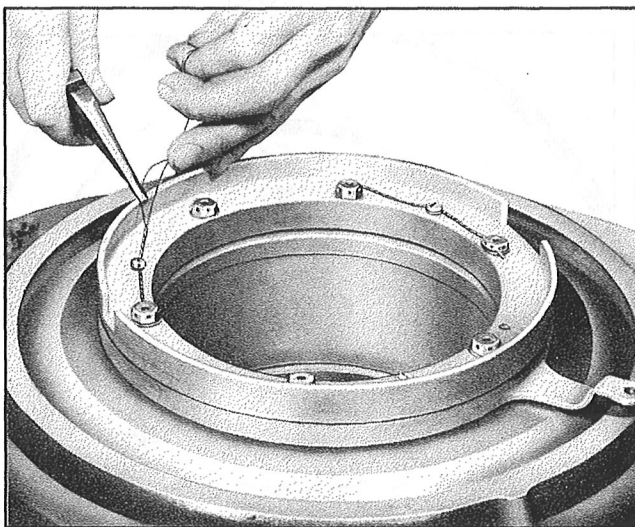


Figure 175—Installation of the Adapter Plate

#### f. REGULATOR SUB-ASSEMBLIES.

##### (1) REGULATOR GEAR AND ADAPTER PARTS.

##### (a) TOOLS AND EQUIPMENT FOR REGULATOR GEAR AND ADAPTER PARTS.

Duck-bill Pliers                      8" Screwdriver  
Soft-faced Mallet                      Drift with  $\frac{3}{32}$ " Point  
Square-end Fiber Drift

##### (b) PROCEDURE FOR DISASSEMBLY OF REGULATOR GEAR AND ADAPTER PARTS.

*Step 1.*—Facing the gear side, lift the three stop pins of the regulator gear and remove the "C" washers from each, as shown in Figure 177.

*Step 2.*—Remove the stop pins and the bronze control ring from the regulator gear. See Figure 176-A.

*Step 3.*—Clean and dry all parts thoroughly.

*Step 4.*—For disassembly of regulator gear on Models A632S-A1 and -A2, see Figure 176-B, and follow these steps:

a. Remove the housing seal and the cover seal from the regulator gear, tapping with a square-end fiber or brass drift, as shown in Figure 178.

b. Remove the control ring from the regulator gear by alternately rotating the three control screws counterclockwise, as shown in Figure 179.

c. Remove the three control screw retainer clips by unscrewing the attaching screws from each. See Figure 180.

d. Remove the control screws, noting that the control screws are numbered for particular holes in the regulator gear.

*Step 5.*—On Models A632S-C1, -B1, -B5, disassemble the adapter ring by removing the cup washer, spring, flat washer, and doughnut seal from each of the control screw holes, as shown in Figure 181 and Figure 176-A.

*Step 6.*—For Models A632S-A1 and -A2, remove the control screw glands from the regulator ring by removing the attaching screws from each. Pry out the control screw packing from each control screw hole by using a small punch. See Figure 182 and Figure 176-B.

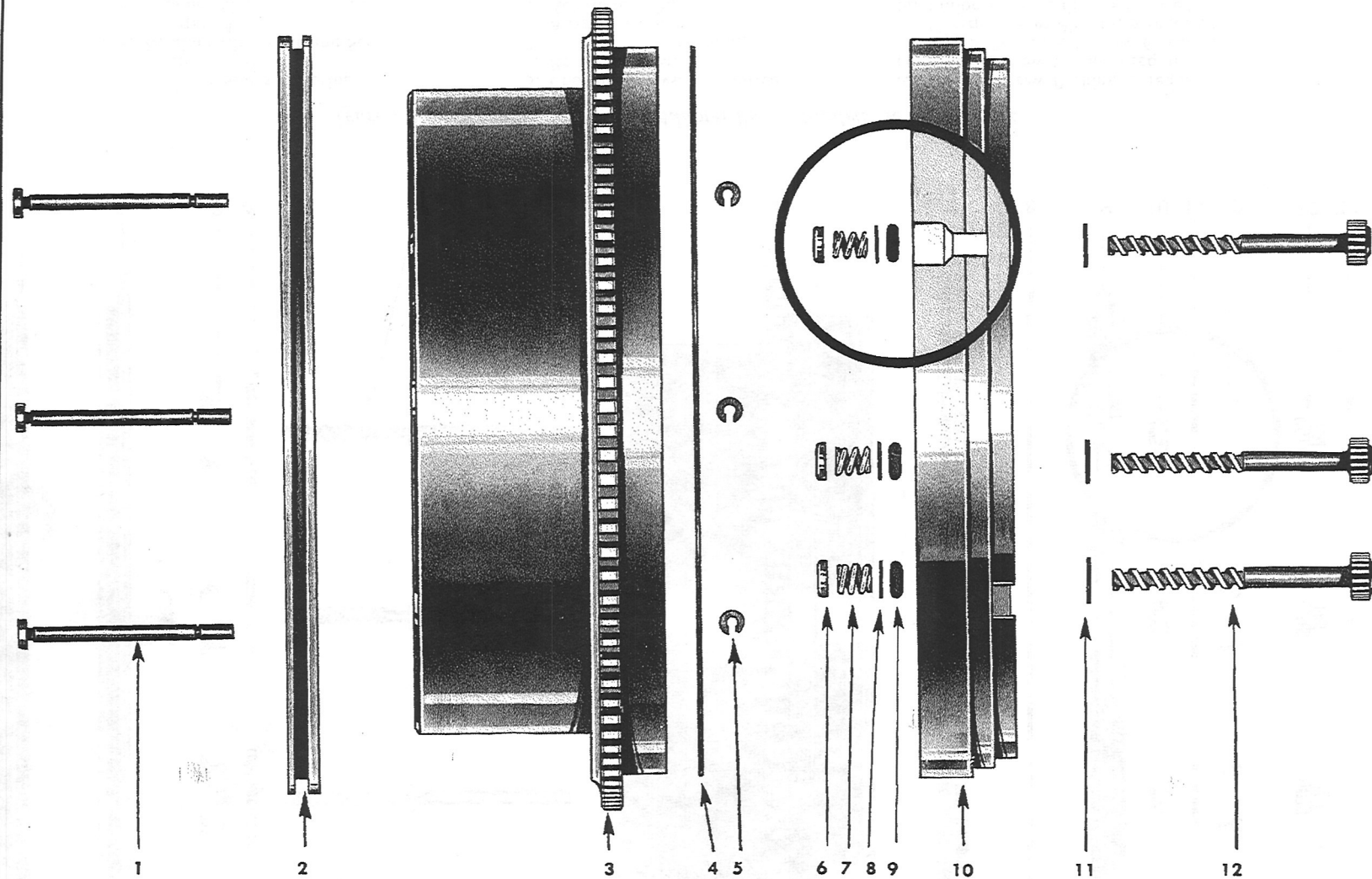


Figure 176A—Regulator Gear and Adapter Parts (Models A632S-C1, -B1, -B5)

- 1. Stop Pins, 3 required
- 2. Control Ring
- 3. Regulator Gear
- 4. Adapter Gasket

- 5. "C" Washers, 3 required
- 6. Cup Washers, 3 required
- 7. Springs, 3 required
- 8. Flat Washers, 3 required
- 9. Control Screw Seals, 3 required

- 10. Adapter Ring
- 11. Control Screw Thrust Washers, 3 required
- 12. Control Screws, 3 required

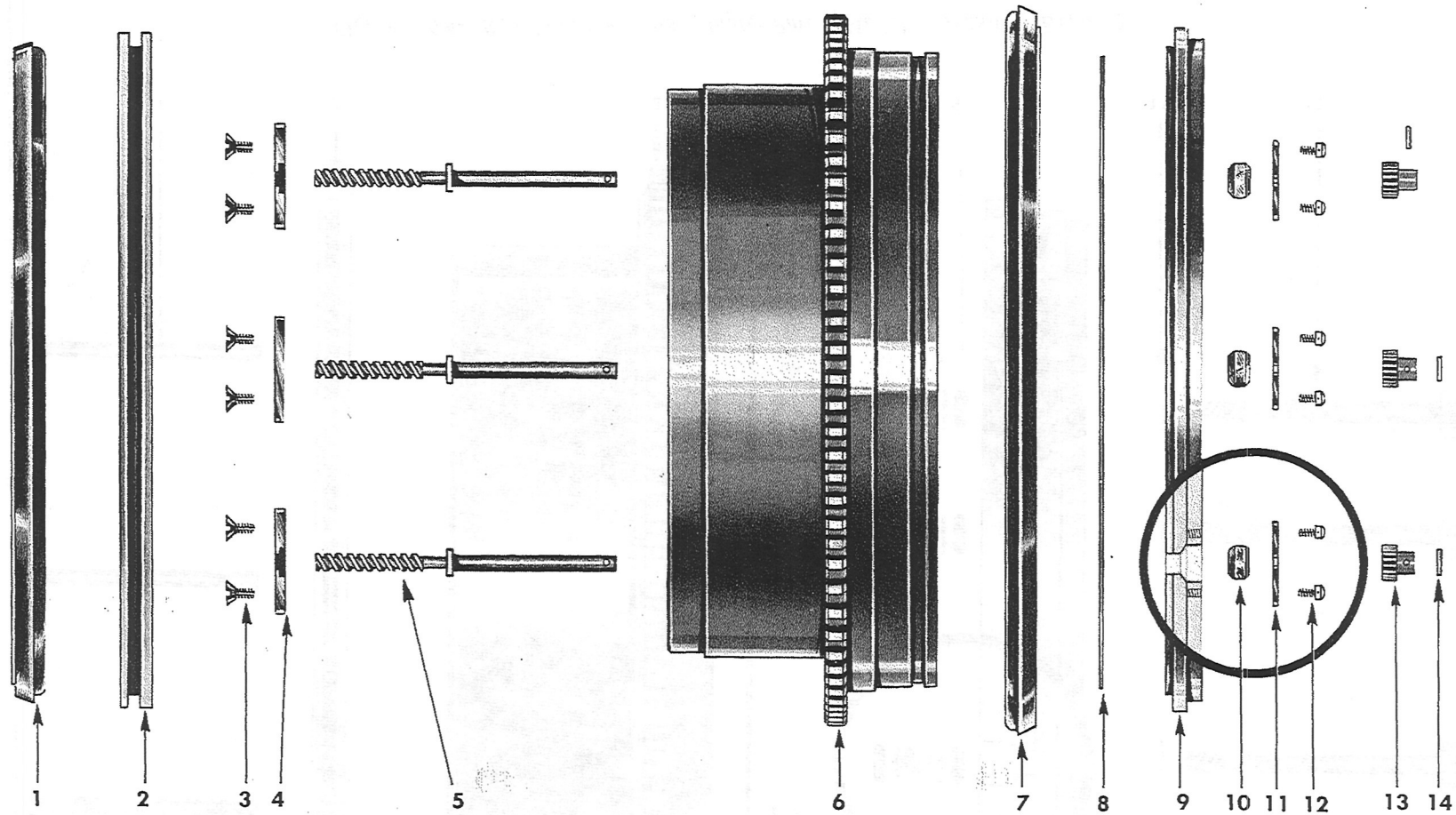


Figure 176B—Regulator Gear and Adapter Parts (Models A632S-A1, -A2)

- |  |                               |  |
|--|-------------------------------|--|
| 1. Housing Seal and Spring                       | 5. Control Screws, 3 required | 10. Control Screw Packing, 3 required  |
| 2. Control Ring                                  | 6. Regulator Gear             | 11. Control Screw Gland, 3 required    |
| 3. Retainer Clip Attaching Screws,<br>6 required | 7. Cover Seal and Spring      | 12. Gland Attaching Screws, 6 required |
| 4. Retainer Clips, 3 required                    | 8. Adapter Gasket             | 13. Control Screw Pinions, 3 required  |
|  | 9. Regulator Ring             | 14. Pinion Locking Pins, 3 required    |



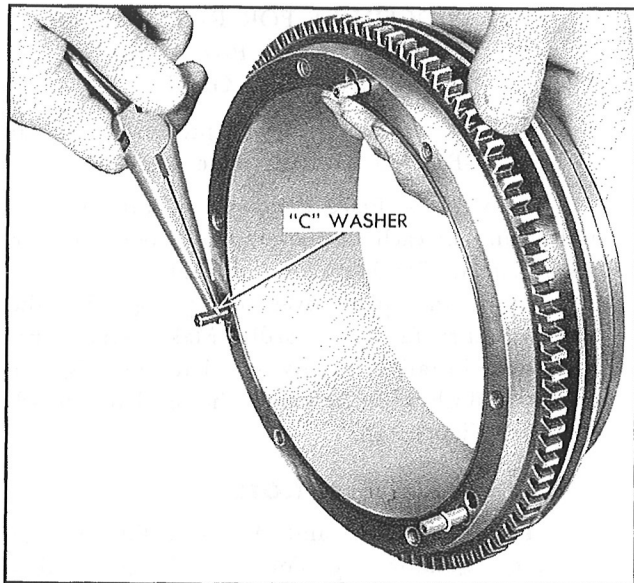


Figure 177—Disassembly of Regulator Gear, Models A632S-B1, -B5, and -C1

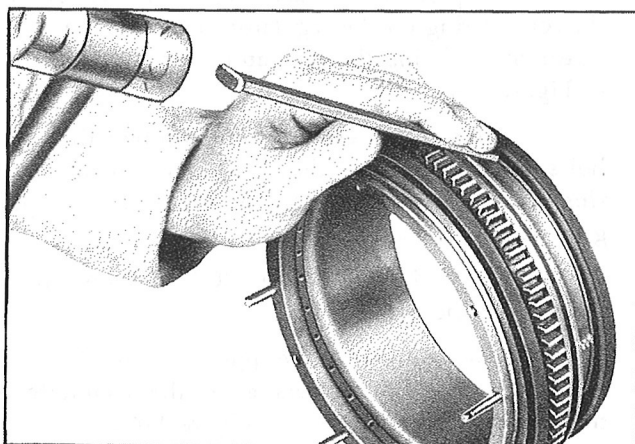


Figure 178—Removal of Seals from Regulator Gear, Models A632S-A1, -A2

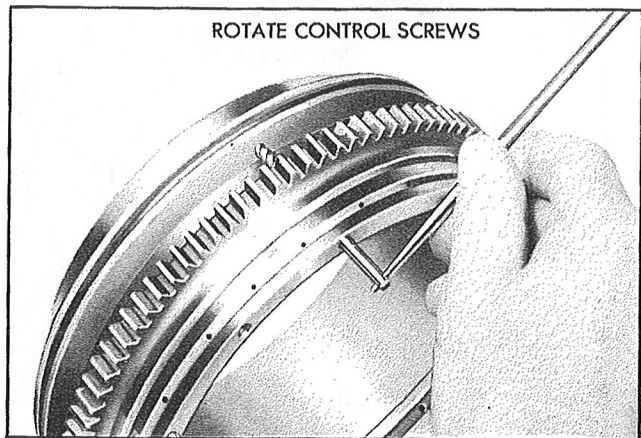


Figure 179—Removal of Control Ring, Model A632S-A1, -A2

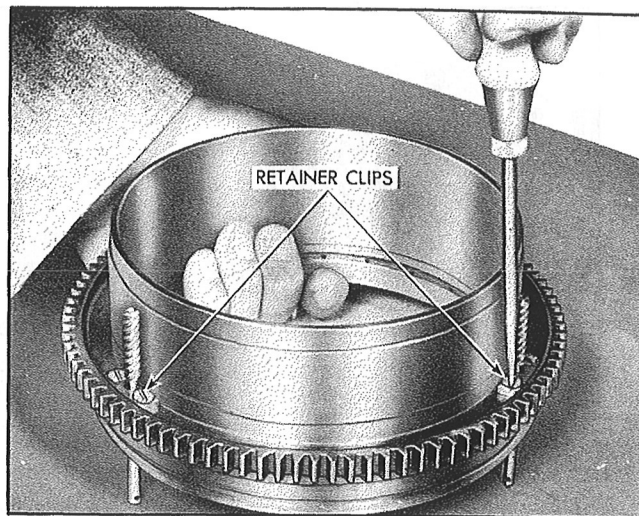


Figure 180—Removal of Control Screw Retainer Clips, Model A632S-A1, -A2

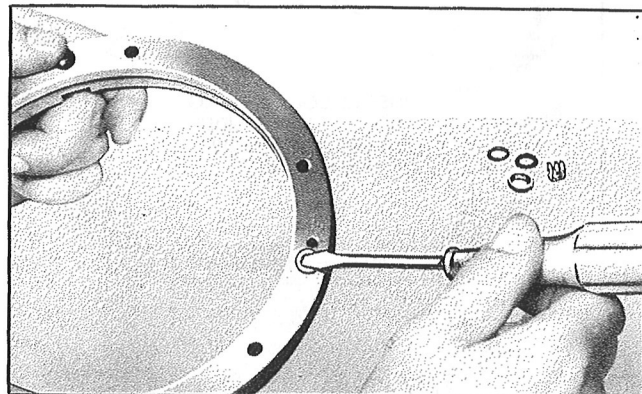


Figure 181—Removal of Control Screw Seals, Models A632S-C1, -B1, -B5

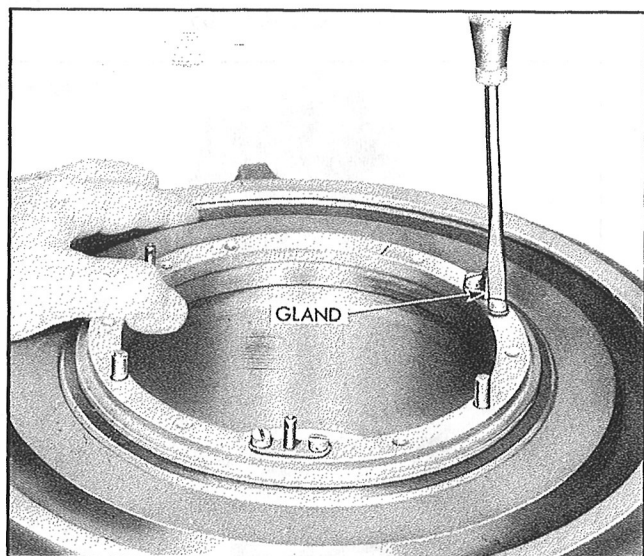


Figure 182—Removal of Control Screw Glands, Models A632S-A1, -A2

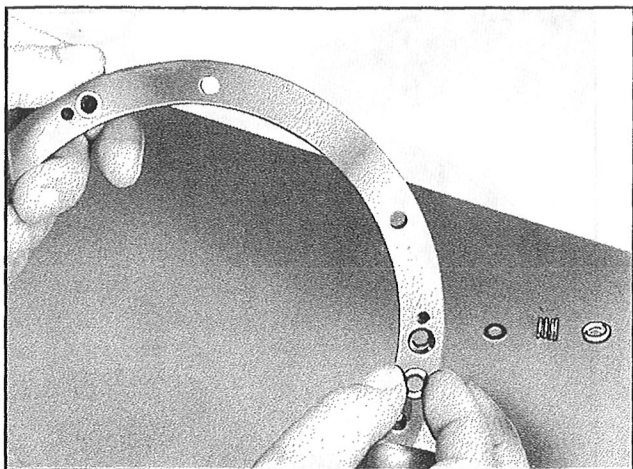


Figure 183—Installation of Seals in the Adapter Ring

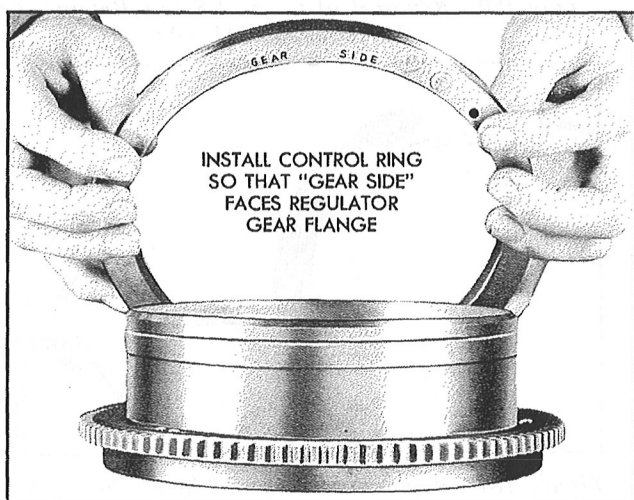


Figure 184—Assembly of the Regulator Gear, Models A632S-C1, -B1, -B5

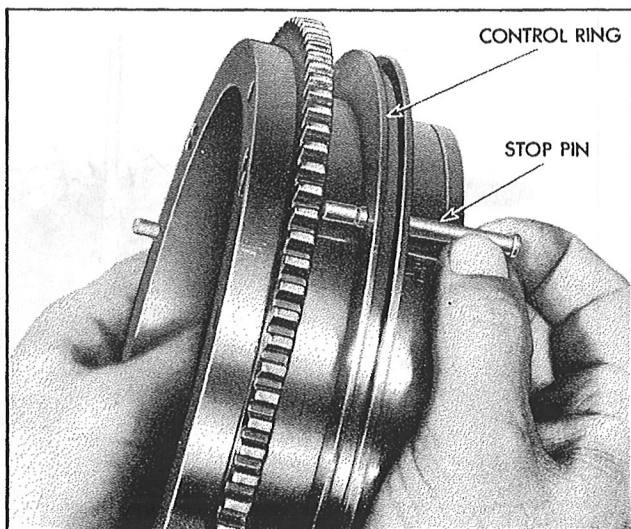


Figure 185—Installation of Stop Pins

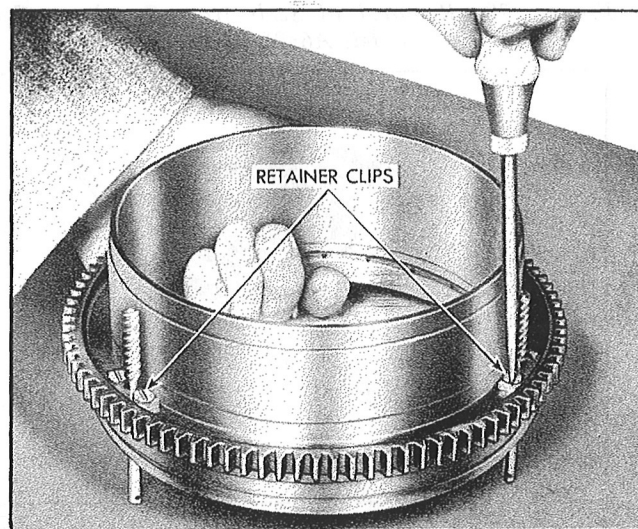


Figure 186—Installation of Retainer Clips

(c) PROCEDURE FOR REASSEMBLY  
OF ADAPTER PARTS AND  
REGULATOR GEAR.

*Step 1.*—Turn the adapter ring on Models A632S-C1, -B1, -B5 with the wide side up.

*Step 2.*—Place a doughnut seal, flat washer, and spring in each of the control screw holes in the order named. See Figure 176-A. Take the cup washer and tap it into place over the spring with the lip of the washer facing inwardly. Make certain that the washer is installed evenly so that the edge of the washer is flush with, or below the level of the adapter ring. See Figure 183.

**NOTE**

Models A632S-A1 and -A2 use a different seal and regulator ring. For assembly, see Section VI 2e (3), step 31.

*Step 3.*—On Models A632S-C1, -B1, -B5, place the control ring on the regulator gear with the notation "Gear Side" facing the regulator gear flange, as shown in Figure 184.

*Step 4.*—Insert the three stop pins through the holes adjacent to the threaded holes of the control ring. Push the pins through the holes in the regulator gear flange, as shown in Figure 185.

*Step 5.*—Force the "C" washers into the grooves of the stop pins.

*Step 6.*—Press the pins toward the control ring until the "C" washers enter the counterbore in the regulator gear flange. See Figure 176-A.

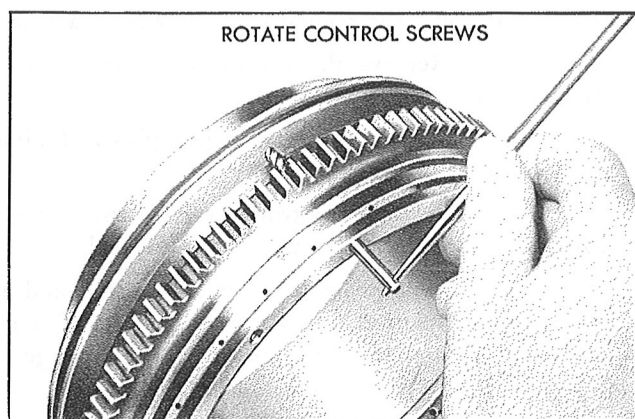


Figure 187—Installation of Control Ring, Models A632S-A1, -A2

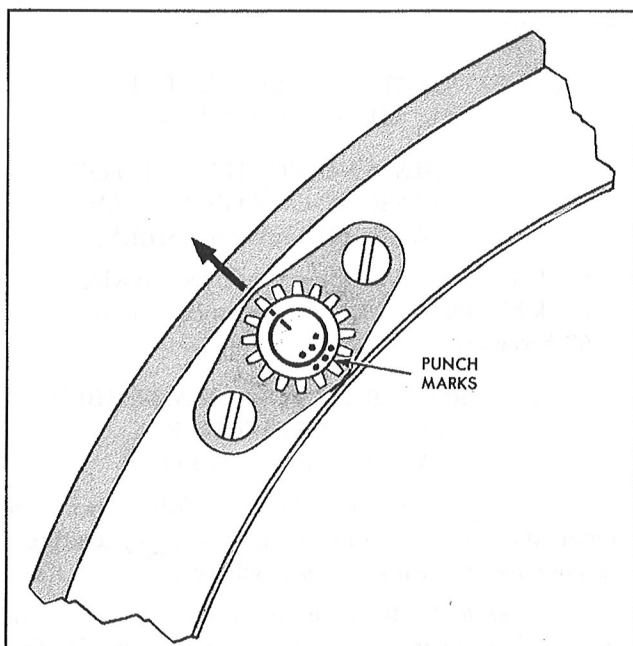


Figure 188—Installation of Control Screw Pinions

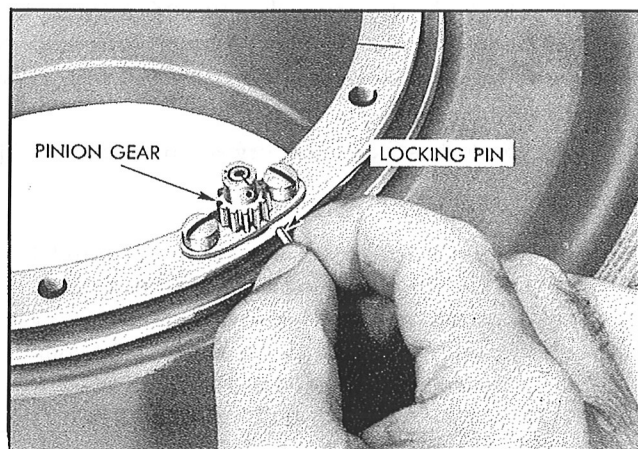


Figure 189—Installation of Pinion Gear Pins

*Step 7.*—For reassembly of the regulator gear on Models A632S-A1 and -A2, use the following steps:

a. Insert the control screws into the proper control screw holes of the regulator gear. Control screws are numbered 1-2-3 and should correspond with the number of holes in the regulator gear.

b. With the flange on the control screws firmly against the regulator gear flange, lock the control screws in place by placing a retainer clip around each control screw on the control ring side of the regulator gear flange. See Figure 176-B. Attach the clips to the regulator gear, using countersunk screws, as shown in Figure 186. Prick punch the edge of the screw heads to prevent the screws from loosening.

c. Run the brass control ring up on the control screws by alternately turning the control screws clockwise until the control ring seats firmly against the regulator gear flange. See Figure 187.

d. Place the regulator ring over the dowels and the control screws of the regulator gear, but omit the control screw packings and glands at this time.

e. Place the pinion gears on the proper control screws. Both the pinions and the screws have identification numbers. Turn the pinion gears on the screws so that the scribed mark on the end of the screw coincides with the mark on the pinion, as shown in Figure 188. Install the pinion gear pins through the gears and the control screws. See Figure 189.

f. With the control screws turned clockwise so that the control ring seats firmly against the regulator

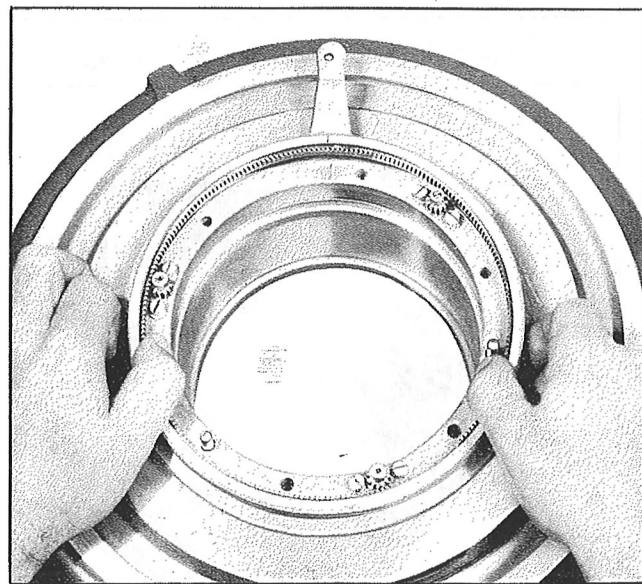


Figure 190—Control Lever Installation, Models A632S-A1, -A2



gear, the scribed mark on the end of the control screw and pinion should point outwards at right angles to the regulator ring, as shown in Figure 188. If the scribed mark points in any other direction, the control ring must be removed and the control screw which is incorrectly set must be re-engaged in the control ring hole on a different thread. There are three separate threads on the control screws, making it possible to correctly set the screw with relation to the control ring.

g. After the control screws are correctly set in accordance with the above steps and the control ring is held firmly against the regulator gear flange, check by installing the control lever over the pinion gears so that the index tooth of the control lever coincides with the index mark on the adapter ring. See Figure 190. If the teeth of the control lever mesh freely with the

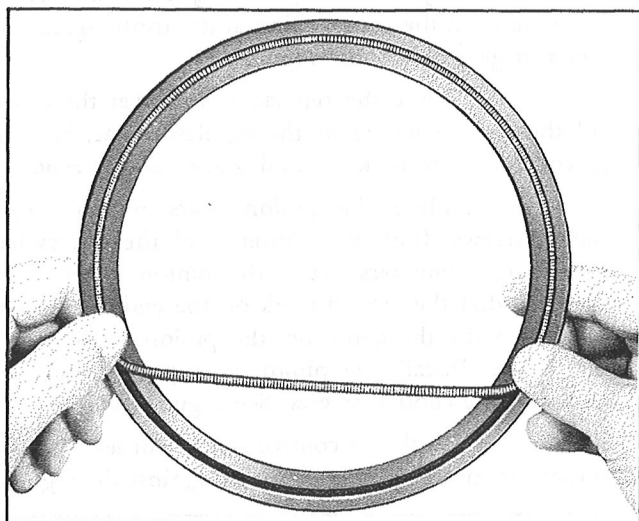


Figure 191—Installation of Seal Spring

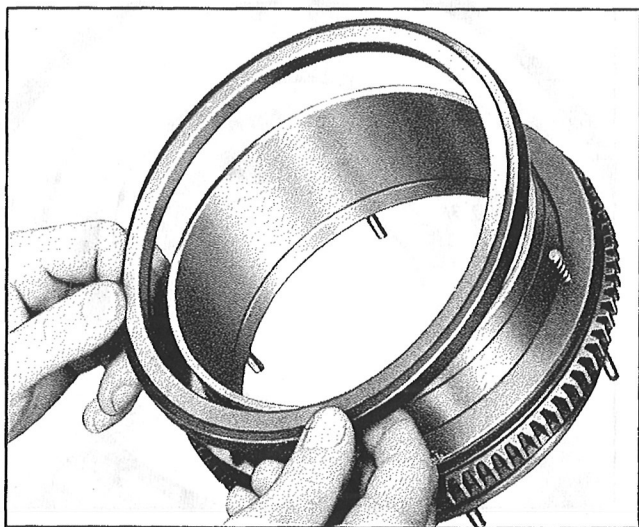


Figure 192—Installation of Seals on Regulator Gear

pinion gear teeth, the regulator is ready for reassembly.

h. Remove the control lever, as shown in Figure 176-B.

i. Remove the pinion gear pins and pinion gears, as shown in Figure 176-B.

j. Turn the control screws so that the control ring is approximately midway in its travel.

k. Install the housing seal spring and the cover seal spring into a new housing seal and a new cover seal, taking care not to stretch or damage the springs or seals. See Figure 191.

l. Press a new housing seal assembly and a new cover seal assembly on the regulator gear so that the lips of the seals face inwardly toward each other. See Figure 192.

## (2) PRESSURE CONTROL VALVE AND FILTER ASSEMBLY.

### (a) TOOLS AND EQUIPMENT FOR PRESSURE CONTROL VALVE AND FILTER ASSEMBLY.

Small Diagonal Cutters     .032" Safetywire  
Duck-bill Pliers             Cleaning Fluid  
6" Screwdriver

### (b) PROCEDURE FOR DISASSEMBLY OF PRESSURE CONTROL VALVE AND FILTER.

*Step 1.*—Remove the 8 x 32 fillister head screws from the pressure control valve cap by cutting the safety wire and using a 6" screwdriver.

*Step 2.*—Remove the pressure control valve cap, gasket, piston, and spring, as shown in Figure 193-A.

*Step 3.*—Remove the 10 x 24 fillister head screws from the pressure control valve filter and disassemble the cap, screen, and body, as shown in Figure 193-B.

*Step 4.*—Clean and dry all parts thoroughly.

### NOTE

Pressure control valve springs for the Model A632S-C1 are of a heavier type than those used on other models. Loads for the heavy spring equal 35.25 to 36.25 lbs. for 1 1/8" compressed length. Springs for valves on Models A632S-A1, -A2, -B1, and -B5 should have a load of 27.5 to 26.5 lbs. at 1 1/8" compressed length.

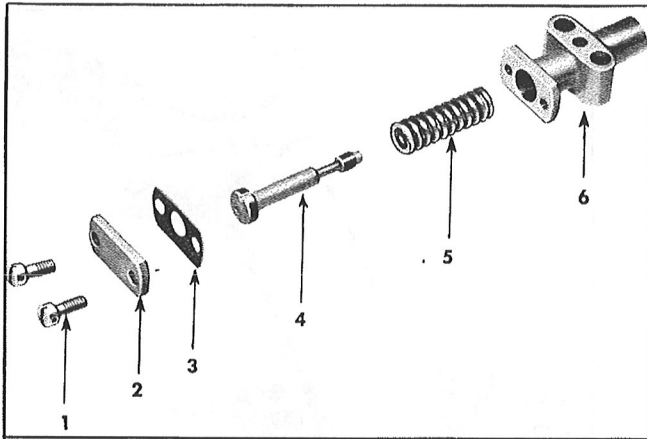


Figure 193A—Pressure Control Valve

- |                          |           |
|--------------------------|-----------|
| 1. Capscrews, 2 required | 4. Piston |
| 2. Cap                   | 5. Spring |
| 3. Gasket                | 6. Body   |

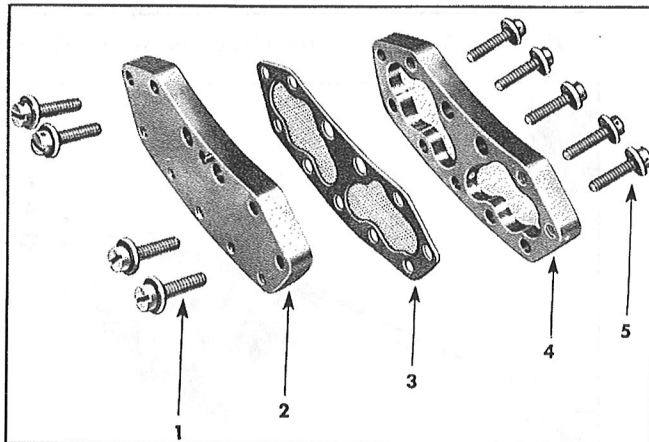


Figure 193B—Pressure Control Valve Filter

- |                                    |                                    |
|------------------------------------|------------------------------------|
| 1. Attaching Screws,<br>4 required | 4. Body                            |
| 2. Cap                             | 5. Attaching Screws,<br>5 required |
| 3. Screen and Gaskets              |                                    |

(c) PROCEDURE FOR REASSEMBLY  
OF PRESSURE CONTROL  
VALVE AND FILTER.

*Step 1.*—Using new gaskets, replace the screen in the filter body and install the cap, using the 10 x 24 fillister head screws, as shown in Figure 193-B. Tighten the screws evenly and snugly, and safety with .032" wire.

*Step 2.*—Insert the spring and the piston in the pressure control valve body and assemble the cap and new gasket to the body, using the 8 x 32 fillister head screws, as shown in Figure 193-A. Tighten and safety with .032" wire.

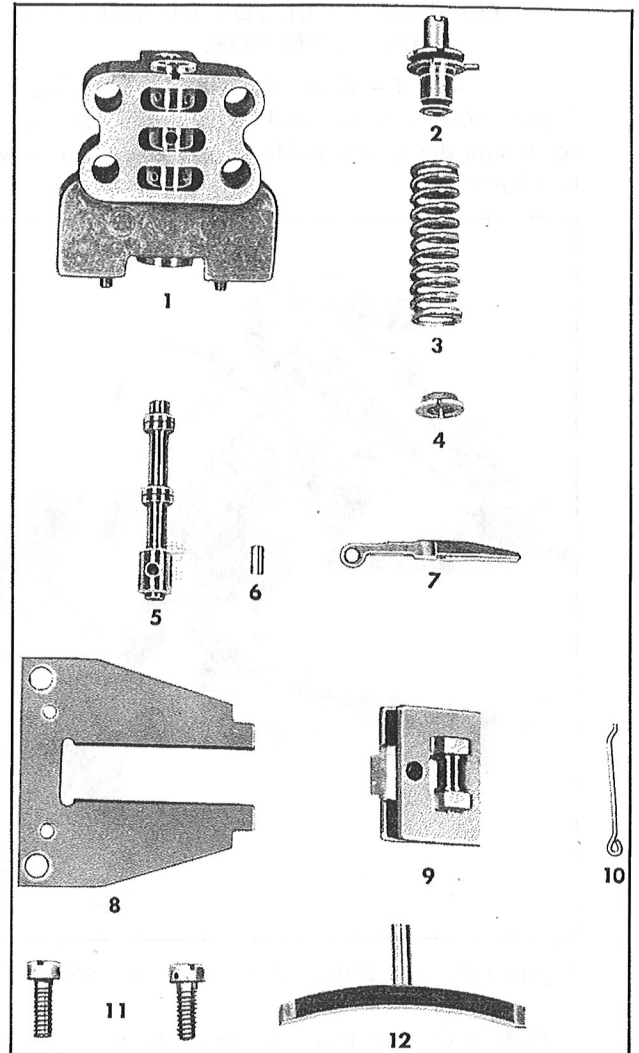


Figure 194—Exploded View of Governor

- |                           |  |
|---------------------------|--|
| 1. Governor Body          | 8. Ways Plate                                  |
| 2. Spring Adjusting Screw | 9. Carriage                                    |
| 3. Spring                 | 10. Stop Pin                                   |
| 4. Spring Guide           | 11. Ways Plate Attaching<br>Screws, 2 required |
| 5. Piston                 | 12. Shoe                                       |
| 6. Piston Pin             |  |
| 7. Lever                  |  |

(3) GOVERNOR

(a) TOOLS AND EQUIPMENT  
FOR DISASSEMBLY AND  
REASSEMBLY OF GOVERNOR.

- |                                 |                    |
|---------------------------------|--------------------|
| Diagonal Cutters                | 6" Screwdriver     |
| Duck-bill Pliers                | Governor Spring    |
| Soft-faced Hammer               | Clamp, Figure 66-7 |
| $\frac{3}{16}$ " Straight Punch | .032" Safetywire   |
| Cleaning Fluid                  |                    |

(b) PROCEDURE FOR DISASSEMBLY  
OF GOVERNOR.

*Step 1.*—Place the Governor Spring Clamp, Figure 66-7 over the end of the governor adjusting screw and the spring guide on the lever arm, as shown in Figure 195.

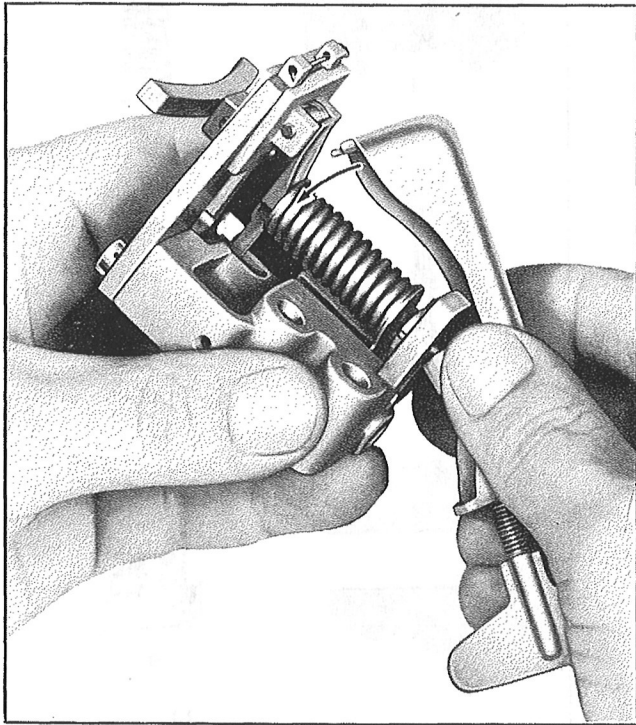


Figure 195—Installation of the Governor Spring Clamp

Tighten the clamp sufficiently to withdraw the spring guide pilot from the lever arm, as shown in Figure 196.

*Step 2.*—Remove the safetywire and the 10 x 24 fillister head screws from the ways plate, as shown in Figure 197. Remove the ways plate, using caution to avoid bending the ways plate dowels. Remove the piston and lever arm.

*Step 3.*—Release the spring clamp and remove the spring, spring guide and adjusting screw assembly. See Figure 194.

*Step 4.*—Remove the piston pin from the governor piston, using fingers only, as shown in Figure 198. Withdraw the lever.

*Step 5.*—Remove the carriage stop pin from the ways plate and slide the carriage off the ways, as shown in Figure 199.

*Step 6.*—Remove the governor shoe cotter key and withdraw the shoe from the carriage. See Figure 200.

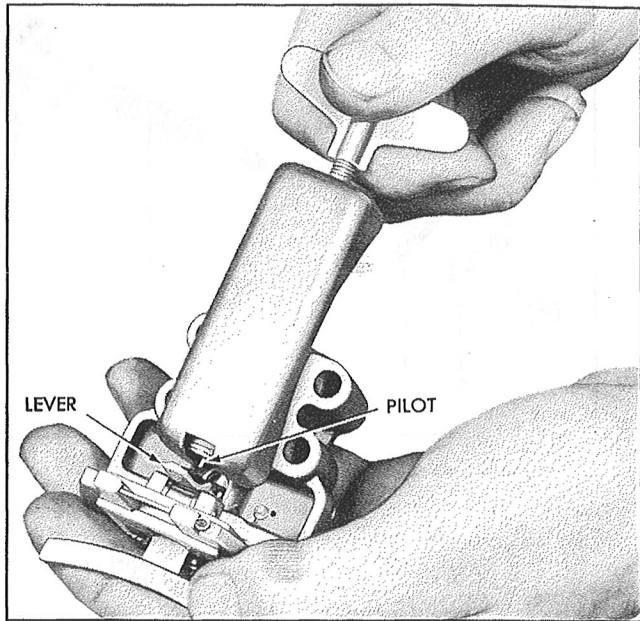


Figure 196—Tighten the Governor Spring Clamp

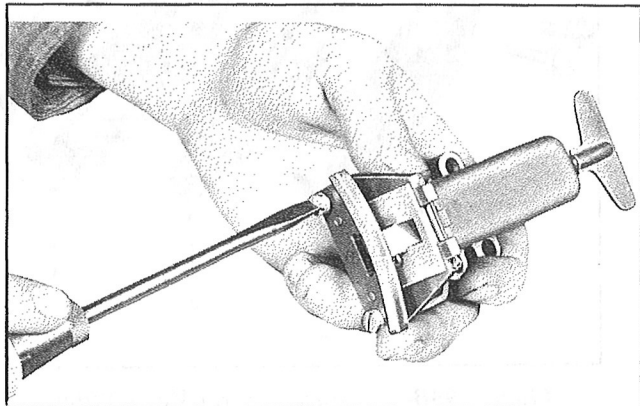


Figure 197—Removal of the Governor Ways Plate

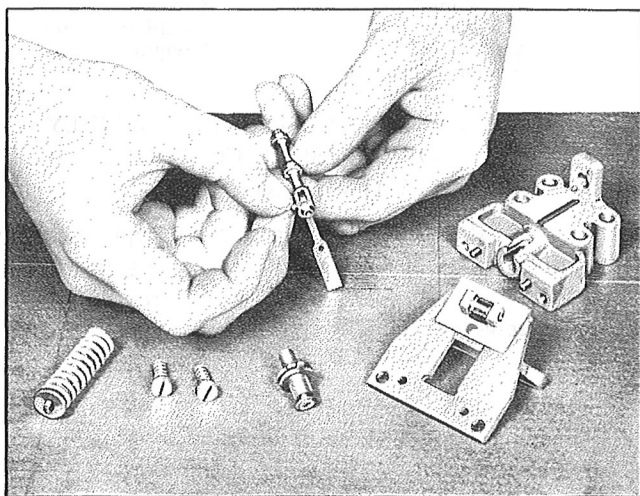


Figure 198—Removal of the Governor Piston Pin



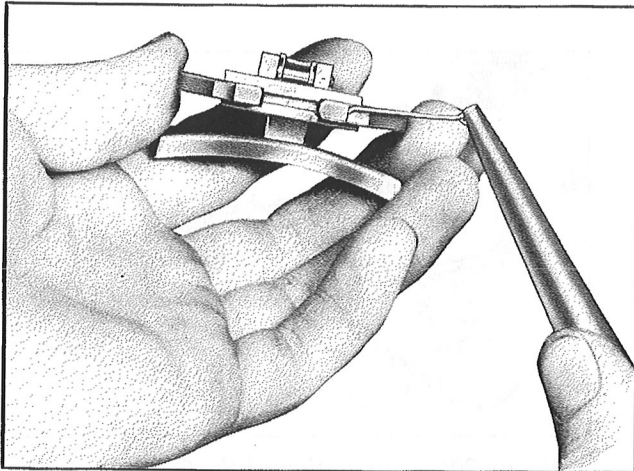


Figure 199—Removal of the Carriage Stop Pin

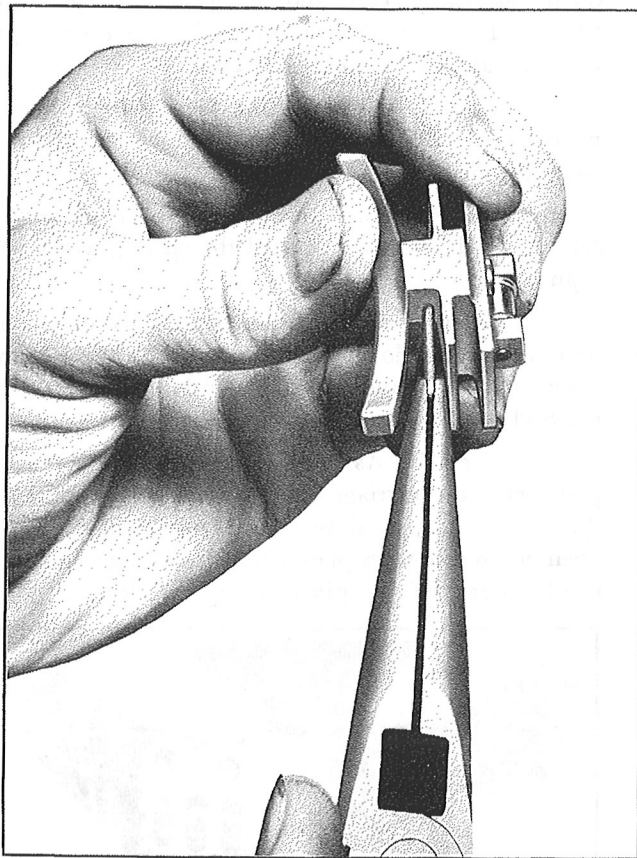


Figure 200—Removal of the Governor Shoe

**NOTE**

The carriage roller or pin may be removed for replacement by using a  $\frac{3}{16}$ " punch on the roller shaft lock pin.

Step 7.—Clean and dry all parts thoroughly.

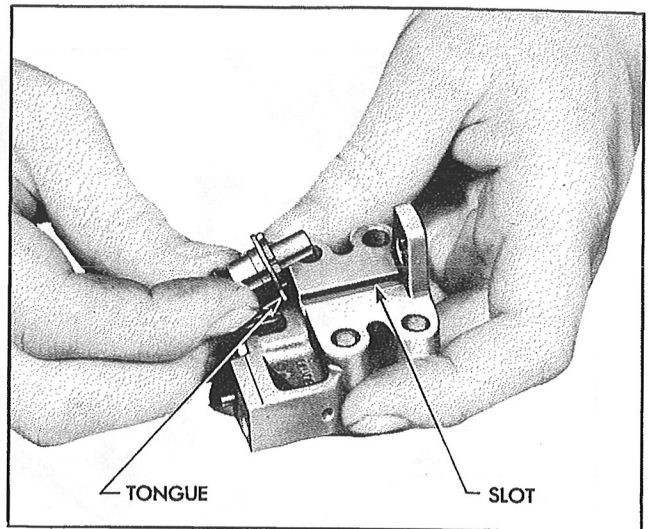


Figure 201—Installation of Adjusting Screw Assembly

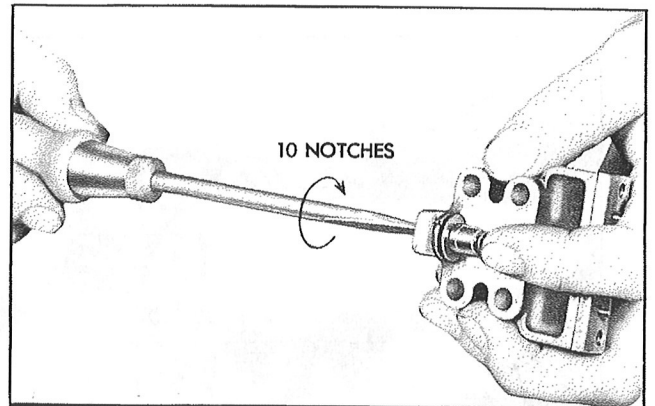


Figure 202—Adjustment of the Governor Screw

(c) PROCEDURE FOR REASSEMBLY OF GOVERNOR.

Step 1.—Reset the governor spring adjusting screw by turning it clockwise until the adjusting stop is against the notched shoulder.

Insert the governor adjusting screw in the governor body with its tongue in the guiding groove and the locking notches over the dowel pins in the governor body, as shown in Figure 201.

Step 2.—Using a screwdriver or fingers, turn the governor spring adjusting screw counterclockwise ten notches and again set the locking notches over the pins. See Figure 202.

**NOTE**

While final governor adjustment is determined by ground run-up and flight tests, this position should be close to correct.

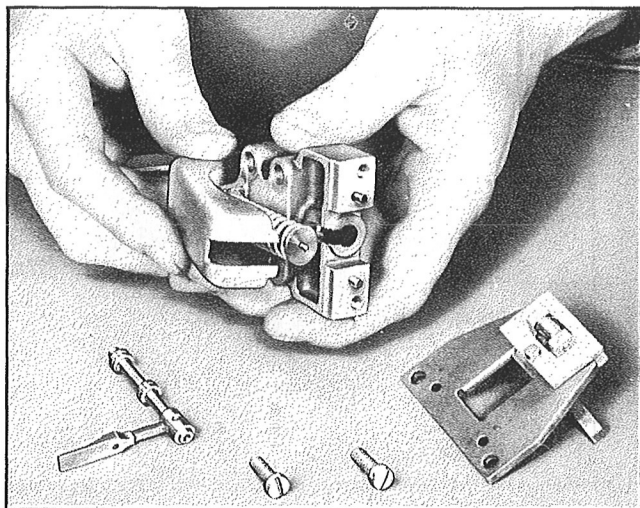


Figure 203—Installation of the Governor Spring

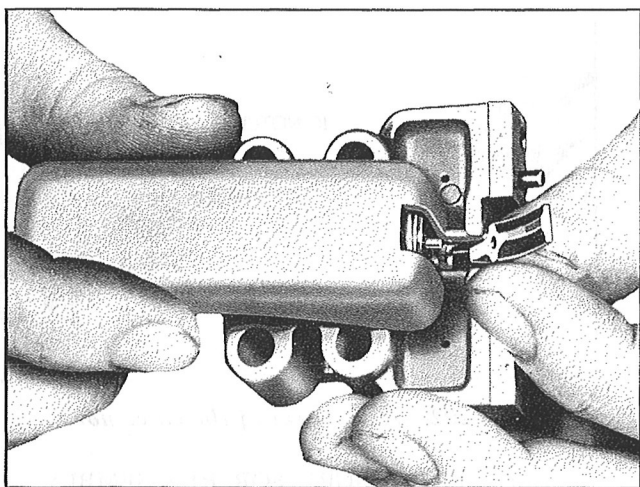


Figure 204—Assembly of the Governor

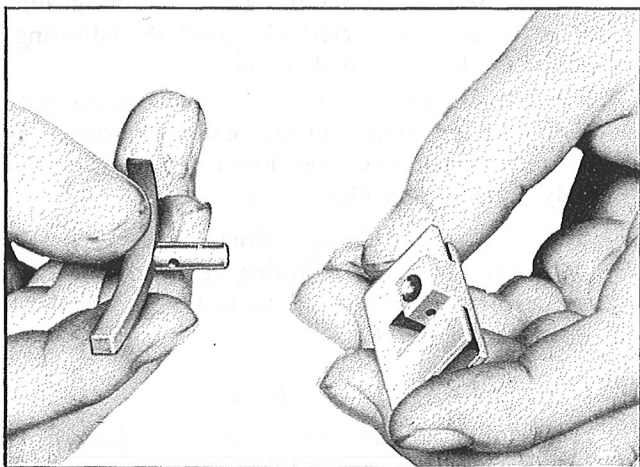


Figure 205—Installation of the Governor Shoe

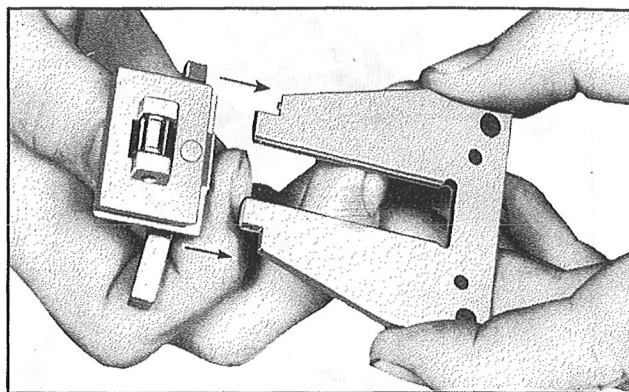


Figure 206—Installation of the Governor Carriage

*Step 3.*—Install the spring and spring guide on the adjusting screw and, using the Governor Spring Clamp, Figure 66-7, compress the governor spring approximately  $\frac{1}{2}$ ". See Figure 203.

*Step 4.*—Assemble the lever arm, piston and piston pin with the flat side of the lever arm away from the piston.

Insert the piston and lever assembly in the governor cylinder with the lever toward the spring, as shown in Figure 204.

*Step 5.*—Hold the carriage in the left hand with the roller down so as to face the carriage boss. Insert the shoe and safety it with a  $\frac{1}{16}$ " cotter key inserted from right to left. See Figure 205.

*Step 6.*—Assemble the carriage on the ways plate with the carriage shoe toward the closed end of the ways plate, as shown in Figure 206. Facing the open end of the ways plate with the carriage shoe underneath, insert the stop pin from right to left.

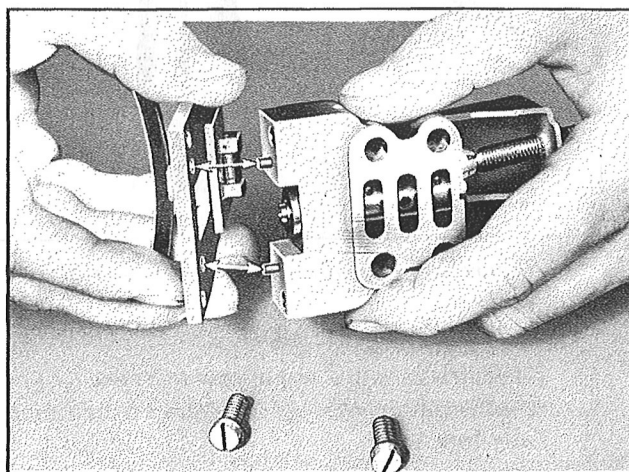


Figure 207—Assembly of the Governor

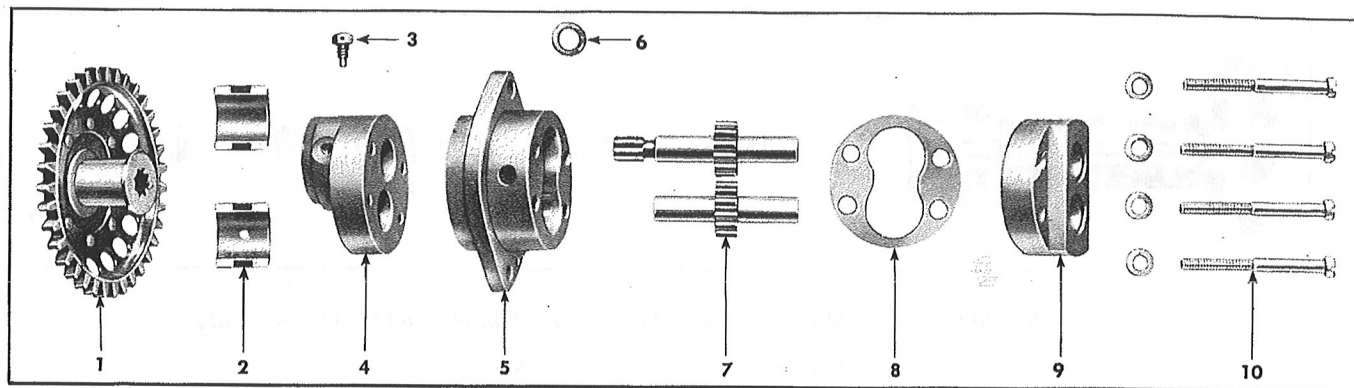


Figure 208—Exploded View of the Oil Pump

- |                                 |                     |  |
|---------------------------------|---------------------|--|
| 1. Pump Drive Gear and Coupling | 5. Body             | 8. Laminated Shim                              |
| 2. Split Bushing                | 6. Pump Outlet Seal | 9. Front Cover                                 |
| 3. Bushing Set Screw            | 7. Pump Gears       | 10. Assembly Screws and Washers,<br>4 required |
| 4. Rear Cover                   |                     |  |

**NOTE**

Stop pins and cotter keys must be so installed that the eye of the pin leads in the direction of rotation.

*Step 7.*—Install the ways plate on the dowels in the governor body with the roller to the piston lever, and secure with the 10 x 24 fillister head screws. See Figure 207. Tighten the screws and safety with .032" wire.

*Step 8.*—Release the spring clamp, inserting the spring guide pilot in the lever arm and locating the lever arm between the shoulders of the roller. Remove the spring clamp.

**NOTE**

Because of the different reduction gear ratios between the P-39F, P-39K, and P-39N model airplanes, and the consequent different rotative speeds of the propellers, a particular tension governor spring is necessary for each reduction gear ratio.

These are as follows:

**TABLE V**

Propeller Model	Spring Identification	Spring Tension
A632S-A1, -A2, -B1	Unplated	29.5 to 30.5 lbs. at 1 3/16" compressed length
A632S-B5	Half-plated	24.5 to 25.5 lbs. at 1 3/16" compressed length
A632S-C1	All plated	18 to 19 lbs. at 1 3/16" compressed length

**(4) OIL PUMP.**

**(a) GENERAL.**

1. The oil pump of the Aeroprop is a standard Pesco pump, Model No. 519-B. Tolerances and clearances are held to a close degree of accuracy and arrangements for repair should be made directly with the pump manufacturer.

2. For information only, therefore, an exploded view of the pump parts is shown above. See Figure 208.

**NOTE**

Whenever a pump drive gear is assembled to a pump unit, exercise caution to make certain that the set screw hole in the bushing is aligned with the set screw hole in the pump rear cover. Otherwise, installation of the set screw might warp the split bushing and cause a pump failure.

**(5) CHECK VALVE.**

**NOTE**

A check valve is used only on Models A632S-A1 and -A2.

**(a) TOOLS AND EQUIPMENT FOR DISASSEMBLY AND REASSEMBLY OF CHECK VALVE.**

- |                   |                |
|-------------------|----------------|
| Long-nosed Pliers | 6" Screwdriver |
| .032" Safetywire  | Cleaning Fluid |



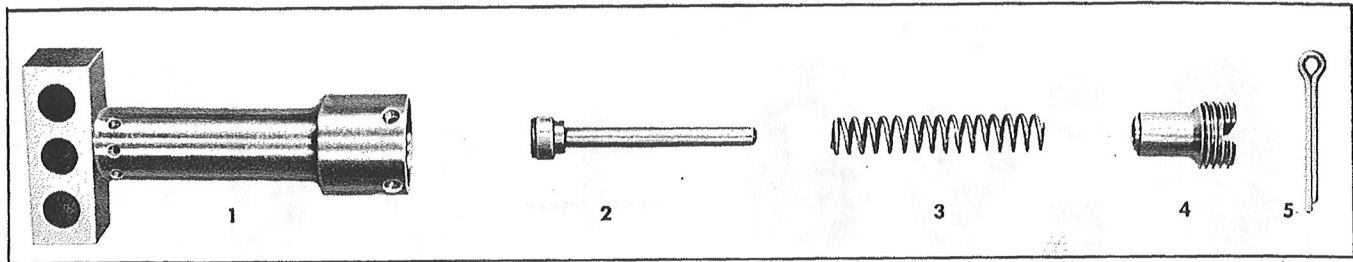


Figure 209—Exploded View of the Check Valve, Models A632S-A1, -A2 Only

- |               |               |
|---------------|---------------|
| 1. Body       | 3. Spring     |
| 2. Valve Stem | 4. Valve Seat |

(b) PROCEDURE FOR DISASSEMBLY OF  
THE CHECK VALVE—(See Figure 209.)

*Step 1.*—Remove the cotter pin from the end of the check valve body.

*Step 2.*—Unscrew the check valve seat.

*Step 3.*—Remove the spring and the valve stem from the body.

*Step 4.*—Clean all parts thoroughly.

(c) PROCEDURE FOR REASSEMBLY OF  
THE CHECK VALVE—(See Figure 209.)

*Step 1.*—Insert the stem assembly into the body.

*Step 2.*—Install the spring over the stem and inside the body.

*Step 3.*—Screw in the check valve seat.

*Step 4.*—Adjust by turning the valve seat until the valve opens at 20 lbs. per square inch and closes at 12 lbs. per square inch static test.

*Step 5.*—After adjustment is made, lock the valve seat with a new cotter key so that the key mates with the slot in the screw.

## SECTION VII

## INSPECTION AND TEST PROCEDURES

## 1. GENERAL.

At the overhaul period, the Aeroprop will be completely disassembled and all parts inspected in accordance with the following general procedure.

(1) All gaskets, seals, and filter gaskets are to be replaced with new parts.

**NOTE**

When replacing the cover or housing seals, remove the spring from the old seal and install in the new seal if the spring is undamaged. Exercise care not to stretch the spring or damage the seal.

(2) All steel parts must be magnetically inspected for cracks or other flaws.

**CAUTION**

Whenever magnetically inspecting moving parts, attach the terminals to the part in such a way that in case of arcing, polished or ground surfaces will not be damaged.

(3) All parts must be given a close visual inspection for corrosion, burrs, galls or other damage. Before reassembly, all such parts must be repaired or replaced.

(4) Wherever hydraulic bench test equipment is available, the following assemblies should be given functional and leakage tests in accordance with the procedure outlined below:

(a) *Pressure Control Valve*—The valve should open at 750-820 lbs. per square inch for all models except A632S-C1. This model should have a valve that opens at approximately 1000 lbs. per square inch.

(b) *Hub*—Paint the transfer tubes within the hub with whiting and alcohol. Pressure check the tubes at 100 lbs. stages up to 1500 lbs. per square inch. Evidence of any leakage is cause for repair.

(c) *Blade Cylinder*—Paint the split line between the cap and the spline section of the cylinder with whiting and alcohol. Pressure check the cylinder at 100 lbs. intervals up to 1500 lbs. per square inch. Evidence of leakage is cause for rejection.

(5) The regulator assembly and the hub assembly are balanced as two completely independent units before

assembly. Whenever a part is changed in either of these units, that unit should be rebalanced as outlined in the following pages.

**NOTE**

Certain non-rotating parts are incorporated in the regulator. When balancing the regulator, therefore, these parts must be removed.

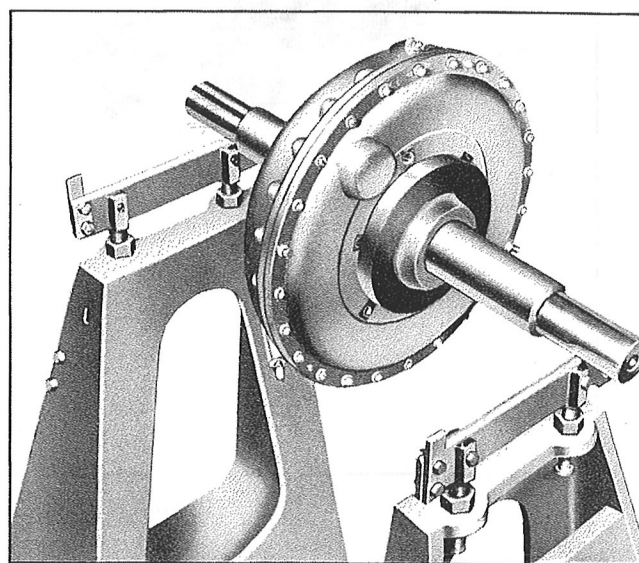


Figure 210—Regulator Balancing

## 2. BALANCING THE REGULATOR.

## a. TOOLS AND EQUIPMENT FOR REGULATOR BALANCE.

Balance Stand	8" Screwdriver
Balancing Arbor and Adapter	$\frac{3}{16}$ " Socket and Speed Handle

## b. PROCEDURE FOR BALANCING THE REGULATOR ASSEMBLY.

**NOTE**

Balance of the regulator may be destroyed if any component part is replaced by a part of different weight. Regulator balance, therefore, should be checked at every overhaul.

*Step 1.*—Disassemble the regulator. Clean and dry all parts thoroughly. See Section VI 2e (2).

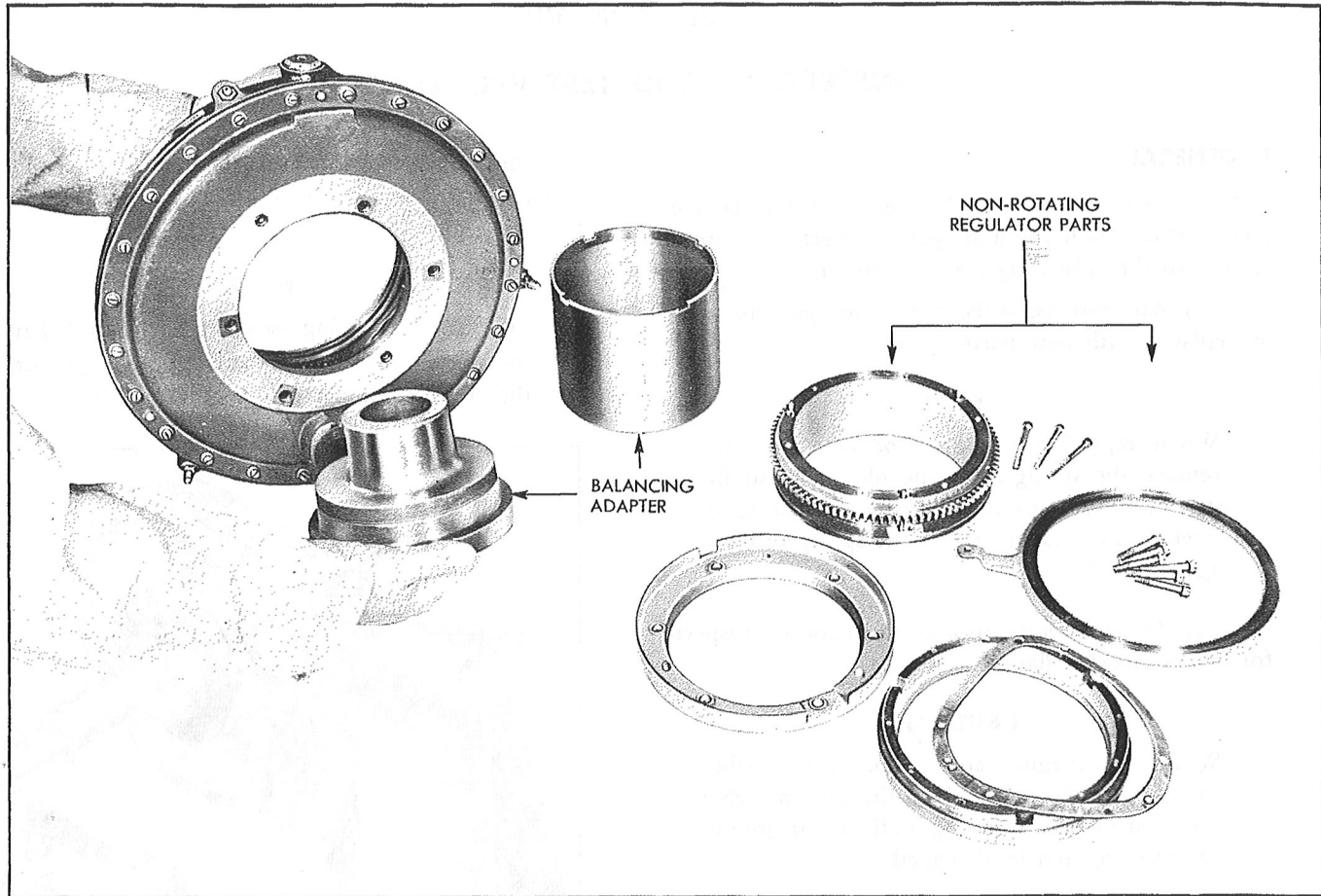


Figure 211—Installation of the Balancing Adapter

*Step 2.*—Mark on the exterior of the housing the position of the balance screws on which the balance washers are placed.

*Step 3.*—Assemble the regulator without the non-rotating parts (regulator gear and adapter). Safety all studs and screws.

*Step 4.*—Assemble the balancing adapter to the regulator, as shown in Figure 211. Install the regulator balancing arbor, as shown in Figure 212.

*Step 5.*—Place the assembly on the balance stand and square up the arbor on the balance ways. See Figure 210.

*Step 6.*—Rotate the arbor to the center of the balance ways and check the regulator for balance in all positions. If the regulator tends to rotate on the stand, it is unbalanced.

*Step 7.*—Place modeling clay on the outside of the regulator housing at the position of the balance screws within the regulator until the regulator shows no

tendency to rotate, and accurate balance is obtained. See Figure 213.

*Step 8.*—Weigh the clay necessary to obtain the balance and install balance washers equal to the weight of the clay on the respective balancing capscrews in the regulator housing.

*Step 9.*—Recheck the balance of the regulator on the balance stand. If perfect balance is not obtained, repeat steps 6, 7, and 8 above until perfect balance is obtained.

*Step 10.*—Remove the balancing adapter and arbor from the regulator. Safety all balance capscrews with .032" safetywire.

*Step 11.*—Complete the assembly of the regulator, installing the regulator gear and adapter parts. See Section VI 2e (3). Safety all the studs and capscrews.

#### NOTE

The regulator cannot be balanced with the adapter parts installed.



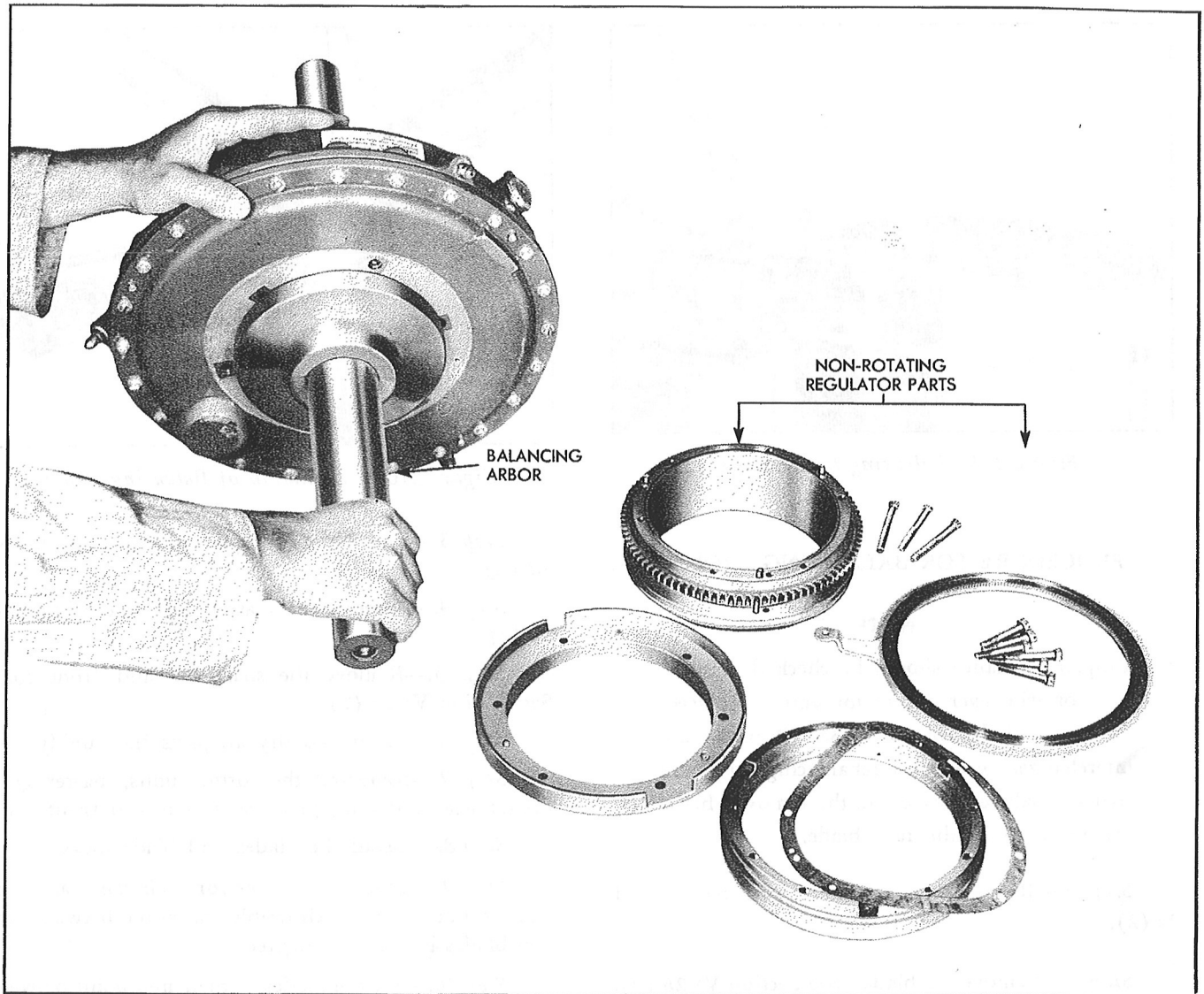


Figure 212—Installation of the Balancing Arbor

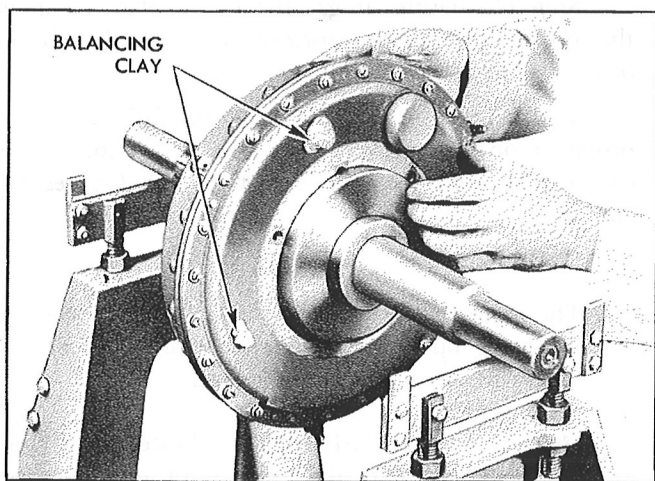


Figure 213—Regulator Balancing

**3. BALANCING THE PROPELLER.**

**a. TOOLS AND EQUIPMENT FOR BALANCING THE PROPELLER.**

- |   |   |
|---|---|
| Propeller Surface Table                 | 8" Screwdriver  |
| Balancing Stand                         | $\frac{7}{16}$ " Socket with Speed Handle and Extension |
| Balancing Arbor and Adapter             | Regulator Nut Wrench, Figure 66-3                       |
| Blade Angle Protractor                  | $\frac{1}{2}$ " Socket                                  |
| Hoist and Sling                         | 2' Bar  |
| Blade Retaining Nut Wrench, Figure 66-4 |   |

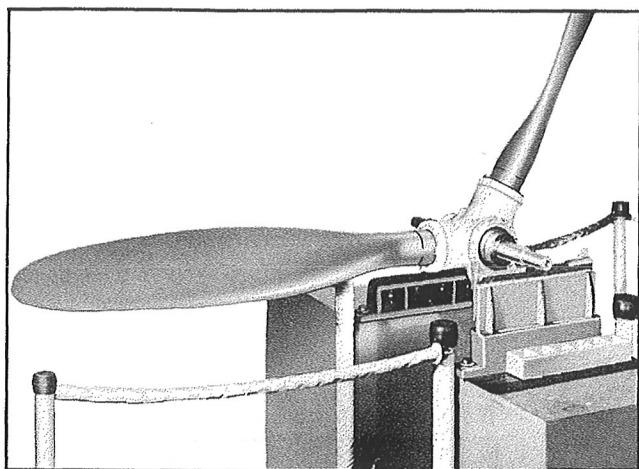


Figure 214—Balancing the Propeller

#### b. PROCEDURE FOR BALANCING PROPELLER.

##### NOTE

Propeller balance should be checked at overhaul or whenever any major unit is replaced. However, blades for the A632S-C1 model are interchangeable without rebalancing, provided that the balance washers in the removed blade are installed in the new blade.

*Step 1.*—Remove the regulator. See Section VI 2a (2).

*Step 2.*—Remove the blades, See Section VI 2b (2).

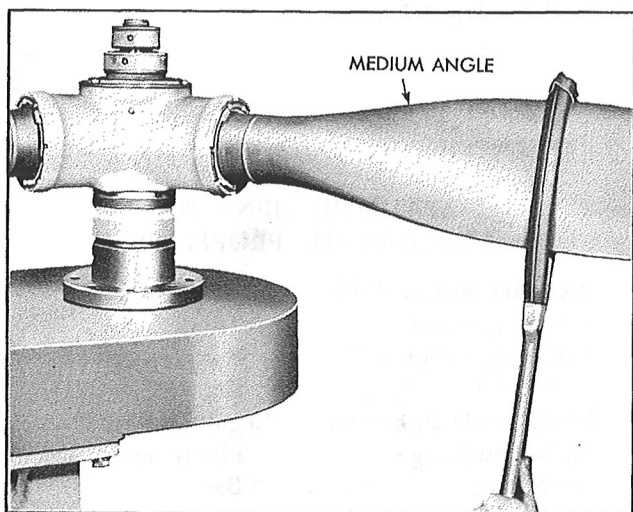


Figure 215—Turn Blades to Medium Angle

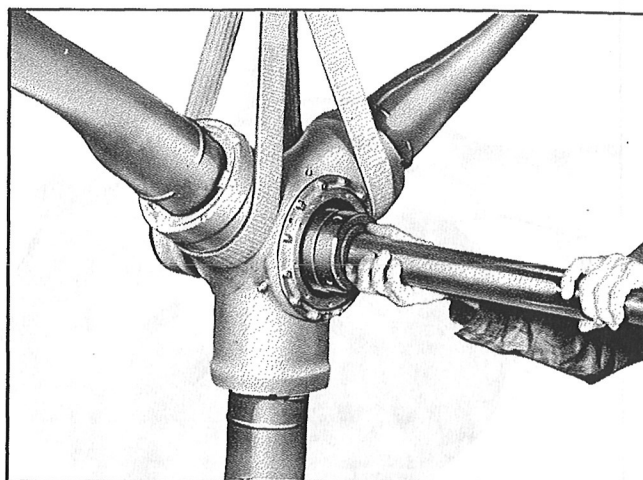


Figure 216—Installation of Balancing Arbor

*Step 3.*—Remove the torque units. See Section VI 2d (2).

*Step 4.*—Remove the master gear. See Section VI 2c (2).

*Step 5.*—Remove the shaft nut and front cone. See Section VI 2c (2).

*Step 6.*—Clean and dry all parts thoroughly.

*Step 7.*—Re-install the torque units, master gear, master gear retaining plate, shaft nut and front cone.

*Step 8.*—Install the blades and blade locks.

*Step 9.*—Check the blades for their basic angle to  $\pm 2$  of one degree. Allowable variation between any two blades is .2 of one degree.

*Step 10.*—Set the blades at their mid-point between minimum and maximum blade angles. See Figure 215.

*Step 11.*—Using slings on the two blades, remove the propeller from the surface table and install the balancing adapter hand tight.

*Step 12.*—Insert the arbor and carefully lower the propeller on the balancing ways, using caution not to damage the knife edges or the arbor. See Figures 216 and 217.

##### NOTE

The regulator must be removed before the balancing operation, and the knife edges of the ways must be perfectly level.

*Step 13.*—Set the arbor on the knife edges close to the stops and rotate the arbor until it is squarely against the stops, as shown in Figure 218.

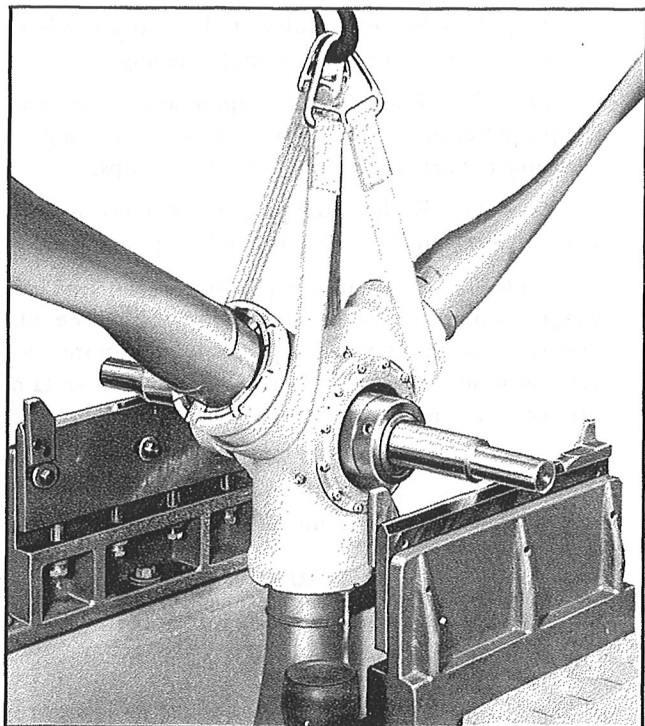


Figure 217—Lower Propeller to the Balancing Ways

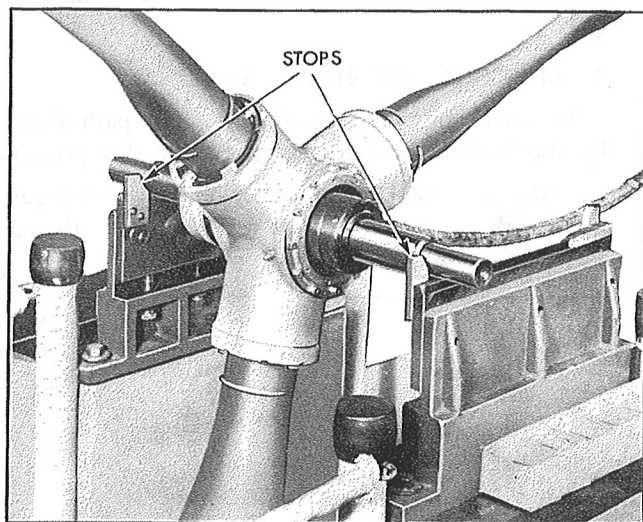


Figure 218—Align the Propeller with the Ways

*Step 14.*—Rotate the arbor until it reaches the center of the knife edges, as shown in Figure 219.

*Step 15.*—Holding the arbor, rotate the propeller until any one blade is horizontal. Note the movement of the propeller, as the lightest blade will seek the highest point.

*Step 16.*—One at a time, place the remaining blades in a horizontal position, noting the movement of the propeller to determine the light or heavy blades.

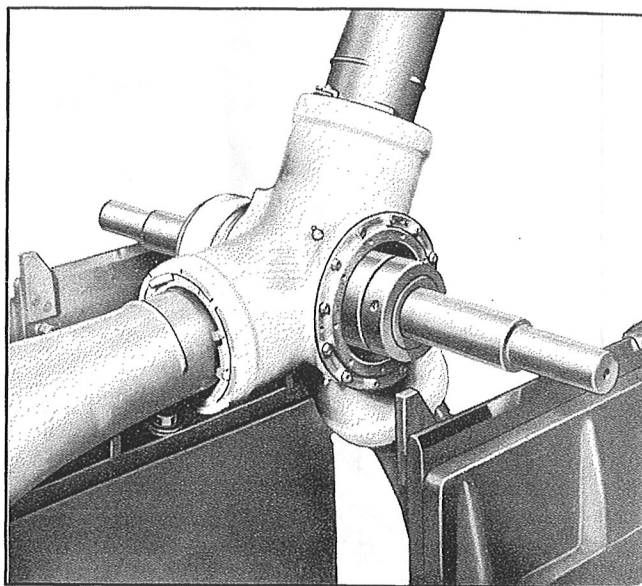


Figure 219—Balancing the Propeller Horizontally

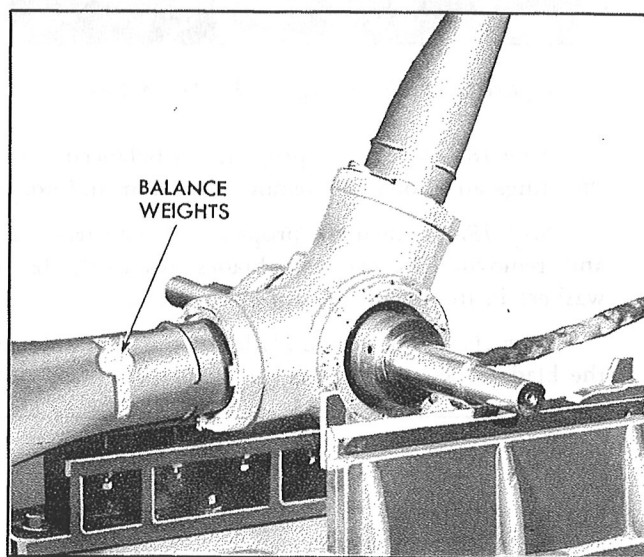


Figure 220—Balancing the Propeller Horizontally

*Step 17.*—Using masking or other light tape, attach sufficient blade balance washers to the light blade or blades at a point four inches out from the cuff ring until the propeller shows little tendency to rotate. See Figure 220.

#### NOTE

When the amount of unbalance is less than can be corrected by one washer, small balance weights are attached to the castellations in the blade retaining nut for final balance, as stated under step 24 of this section.



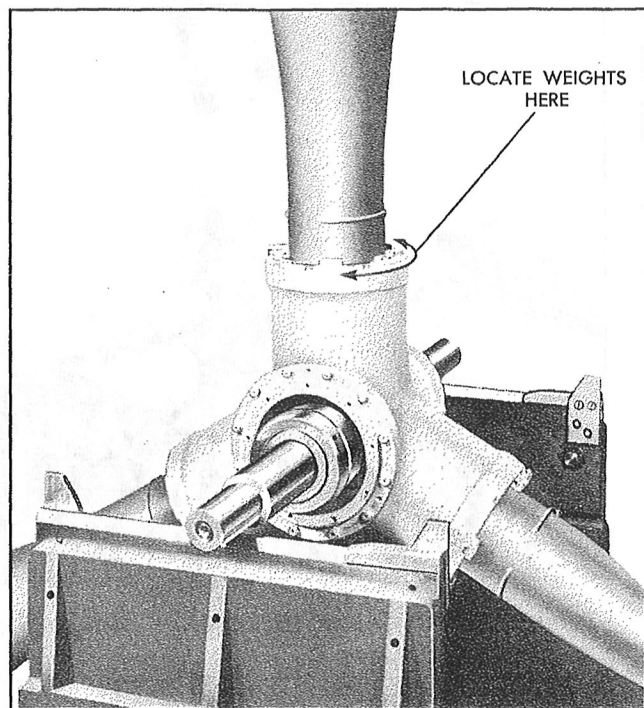


Figure 221—Balancing the Propeller Vertically

*Step 18.*—When the propeller is balanced, replace the slings and hoist and remove the arbor and adapter.

*Step 19.*—Return the propeller to the surface table and, removing the necessary blades, install the balance washers in the balancing cup as required.

*Step 20.*—Replace the blades in the hub and install the blade locks in the same position.

*Step 21.*—Set the blades at the mid-point between the minimum and the maximum blade angles.

*Step 22.*—Replace the adapter and arbor and set the propeller again on the ways of the balancing stand, squaring the arbor with the knife edge stops.

*Step 23.*—Recheck the propeller balance as stated in steps 14 to 16 until perfect horizontal balance is obtained.

*Step 24.*—To locate the position of the final balance weights on the blade retaining nut, place the blades, one at a time, in a vertical position and locate the balance weights on the blade retaining nut to obtain the proper location for vertical balance, as shown in Figure 221.

*Step 25.*—Tighten and safety the balance weights and the blade retaining nut locks with .032" safetywire.

#### CAUTION

Provide .003" minimum clearance between the balance weights and the blade shank.

*Step 26.*—Lubricate the hub, using the proper specification grease as outlined under step 20, Section III 2c.

*Step 27.*—Install the regulator. See Section VI 2a (3).

#### 4. CHECKING THE BLADE TRACK.

To check the blade track (i.e., the path followed by the blades when rotating), follow this procedure:

*Step 1.*—Place the propeller on an accurate surface table with the center line of the blade over the center line of the table.

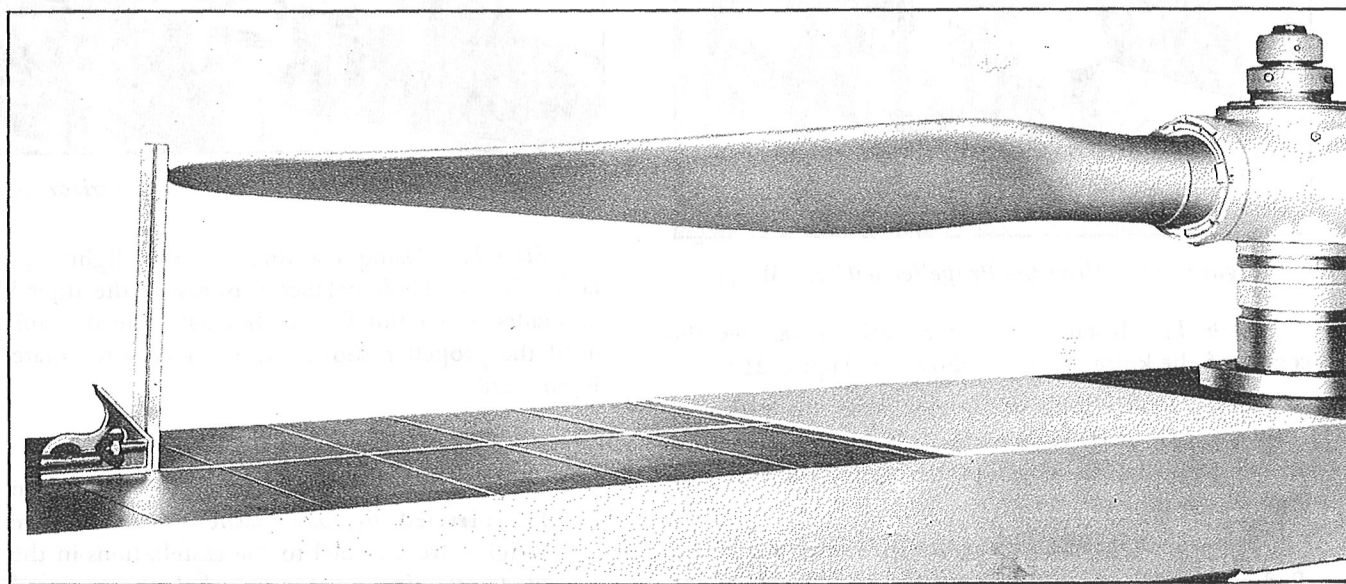


Figure 222—Checking the Blade Track

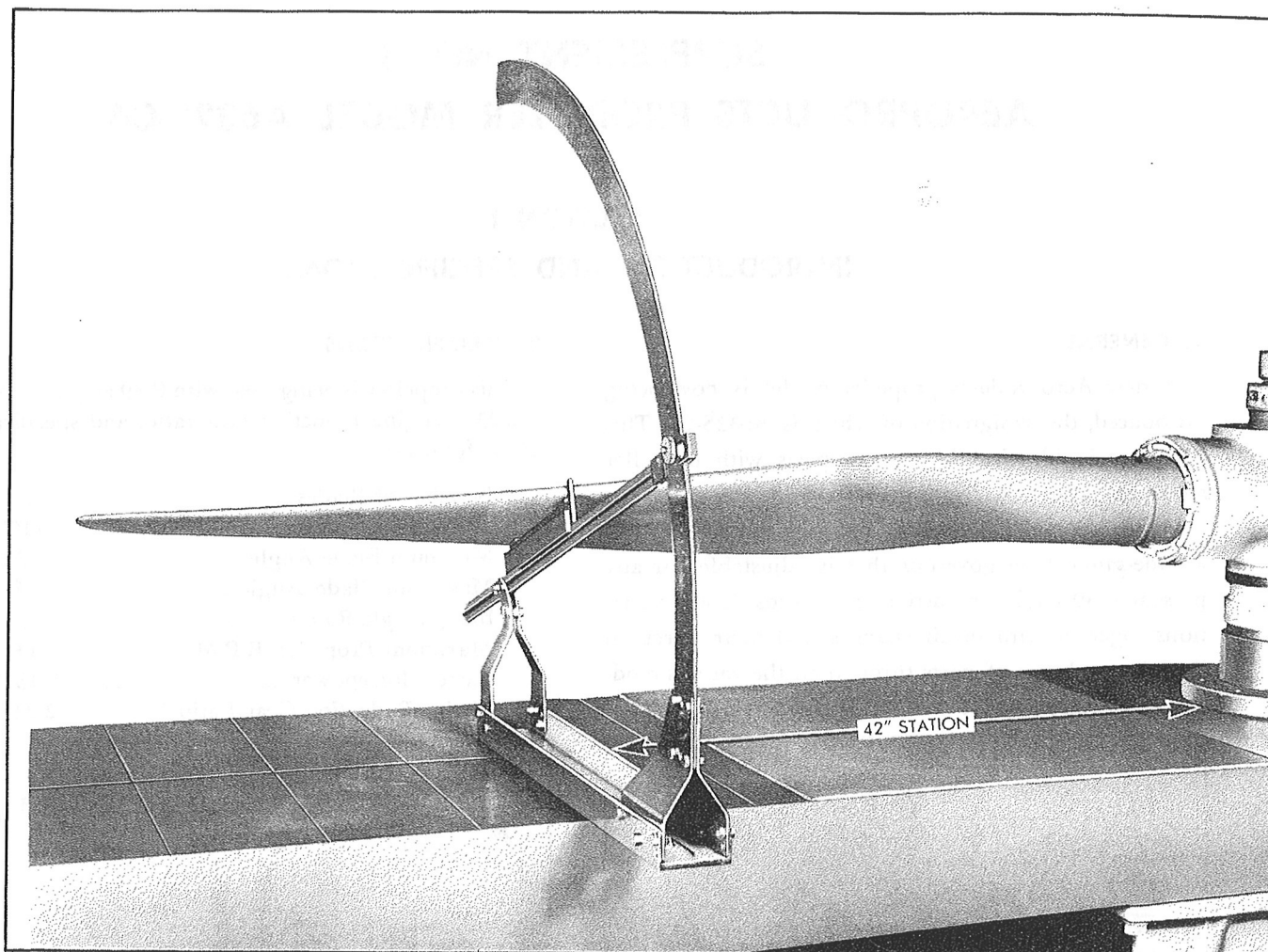


Figure 223—Checking Minimum Blade Angle

*Step 2.*—Turn the blades to their minimum blade angle.

*Step 3.*—Measure the distance from the table to the center line of each blade tip, as shown in Figure 222.

**NOTE**

Permissible variation of the blades is  $\pm \frac{1}{16}$ " from perfect track. For checking the blade track while installed on the plane, see Section IV 1a (4) (b).

**5. CHECKING THE BLADE ANGLE.**

To check the blade angle, follow this procedure:

*Step 1.*—Place the propeller on a surface table with the thrust face of the propeller blade toward the table

and the center line of the blade over the center line of the table.

*Step 2.*—Turn the blade to low or high angle, as desired.

*Step 3.*—Mark off the 42" station on the blade (42" out from the center line of the propeller shaft).

*Step 4.*—Using a blade angle protractor, measure the angle between the thrust face of the blades and the surface table at the 42" station, as shown in Figure 223.

**NOTE**

Angles for the blades in any one hub should not be varied more than  $\pm .2$  of a degree from the desired basic angle and the allowable angle variation between any two blades in a given hub is .2 of a degree. For proper indexing procedure to arrive at specified minimum blade angles, see Section VI 2d(4).

# SUPPLEMENT NO. 1

## AEROPRODUCTS PROPELLER MODEL A632S-C4

### SECTION I

#### INTRODUCTION AND SPECIFICATIONS

**1. GENERAL.**

A new Aeroproducts propeller model is now being introduced, the designation of which is A632S-C4. This propeller is identical in most respects with propeller model A632S-C1. An improved design, however, results from the use of an externally removable oil filter, and a wide-range type governor that is adjustable for any present P-39 engine reduction gear ratios. These variations together with detail changes and their effect on interchangeability of parts throughout the various models are discussed in the following pages.

**2. SPECIFICATIONS.**

This propeller is being used with P-39 airplanes having a 2.23:1 engine reduction gear ratio, and specifications are as follows:

Number of Blades .....	3
Over-all Diameter .....	11'7"
Minimum Blade Angle .....	28°
Maximum Blade Angle .....	63°
Blade Angle Range .....	35°
Maximum Propeller R.P.M. ....	1345
Rated Horsepower .....	1325
Engine Reduction Gear Ratio .....	2.23:1

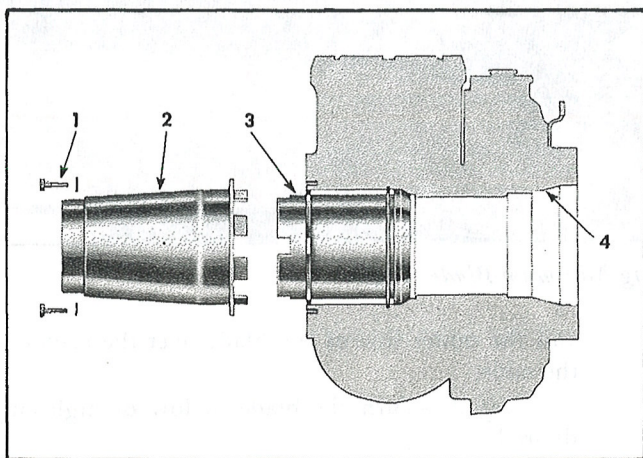


Figure 224—Locking of Propeller Shaft Nut, A632S-C4

- |  |                                |
|--|--------------------------------|
| 1. Adapter Attaching<br>Screws and Washers—9<br>required | 3. Shaft Nut and<br>Front Cone |
| 2. Spinner Adapter                                       | 4. Rear Cone Hub<br>Taper      |

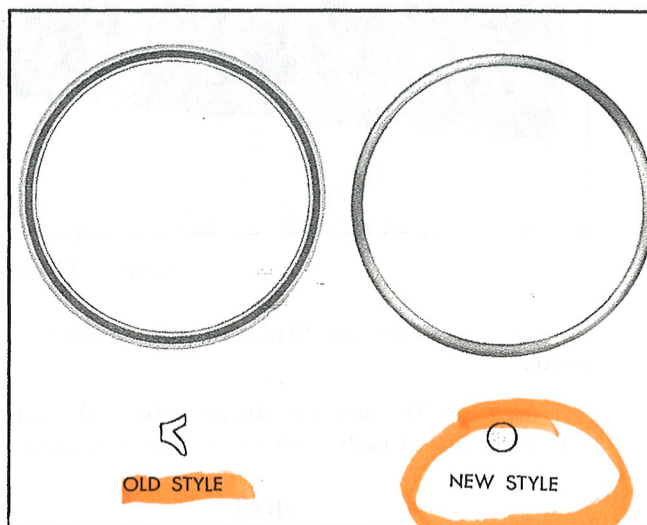


Figure 225—Blade Cylinder Outer Seal



## SECTION II DESIGN VARIATION

### 1. HUB DESCRIPTION.

a. The removal and installation of the model A632S-C4 propeller is accomplished in exactly the same manner as discussed in Section III of this manual with one exception. This is the use of a *shaft nut* with an integral extension that replaces the shaft nut locking sleeve used in previous propellers. For comparison purposes, see Figure 19 of the manual (T.O. 03-20E-2) and Figure 224 in this supplement.

b. The hub assembly on model A632S-C4 propellers is identical with that used on models A632S-C1, -A1, -A2, -B1, and -B5, except for the *outer seal ring* on the torque unit blade cylinders. This seal is an improved design with an "O" cross section and is interchangeable with the lip type used on the preceding models. See Figure 225.

### 2. REGULATOR DESCRIPTION.

The regulator assembly for the model A632S-C4 differs as follows from those previously used:

a. An externally removable *oil filter* is used in place of the pressure control valve filter.

b. The *governor* is of a type that is adjustable for maximum propeller R.P.M. over a *wide range*. Having

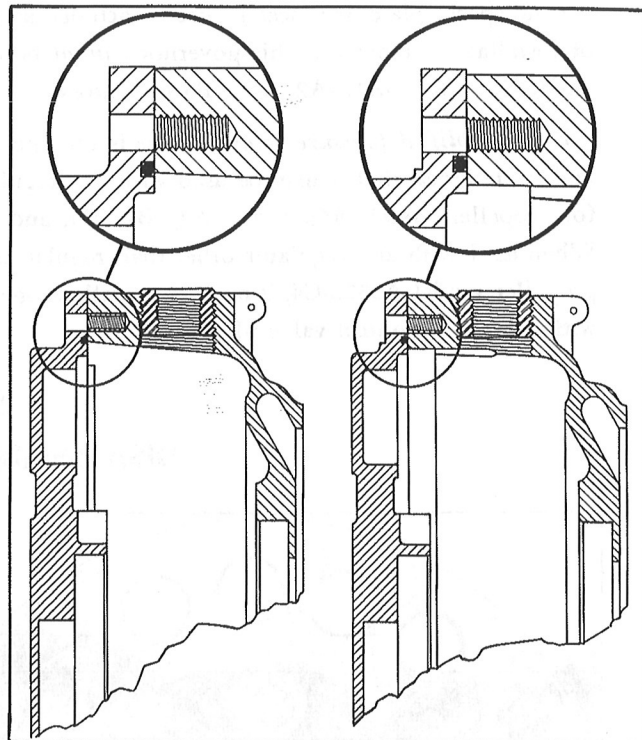


Figure 226—Comparison of Regulator Housings

- |   |   |
|---|---|
| 1. Model A632S-C1<br>Cover with Model<br>A632S-C4 Housing<br>—incorrect sealing | 2. Model A632S-C4<br>Cover with Model<br>A632S-C1 Housing<br>—correct sealing |
|---|---|

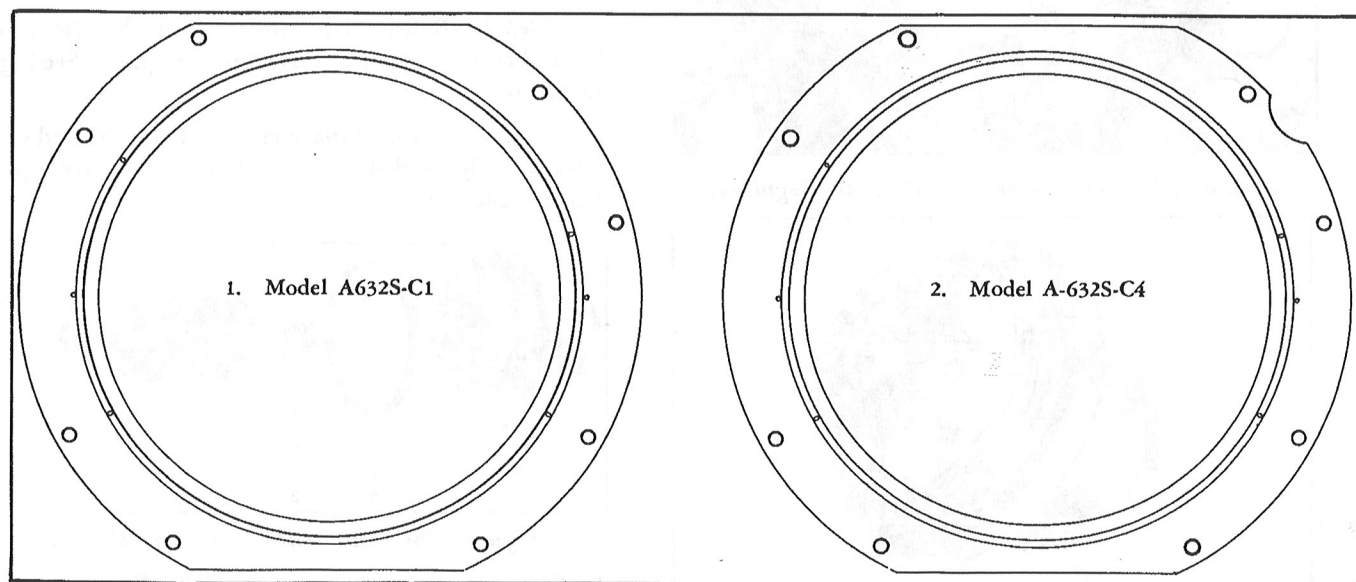


Figure 227—Comparison of Regulator Housing Bearings

the same principle of operation, it differs in detail parts and dimensions. This new governor may be interchanged with that used on propeller model A632S-C1, provided that no spacer plate or spacer gasket is included at time of installation. However, this governor *cannot* be used on models A632S-A1, -A2, -B1, -B5 regulators.

c. A *simplified pressure control valve* is incorporated and so designed that it may be used with any regulator for propeller models A632S-A1, -A2, -B1, -B5, and -C1. When used with any regulator other than regulators on propeller model A632S-C4, it must be installed together with a pressure control valve filter assembly.

d. Due to the dimensions of the *regulator housing*, regulator covers for model A632S-C4 may be used on regulator housings for model A632S-C1. However, regulator covers for model A632S-C1 may *not* be used in conjunction with regulator housings for model A632S-C4 because of dimensional differences. See Figure 226.

e. The *regulator housing bearing* for model A632S-C4 has been machined to provide clearance for the pressure control valve body inasmuch as there is no pressure control valve filter assembly on this model. See Figure 227. Therefore, the housing bearing on model A632S-C4 may be used on model A632S-C1 regulators, but the housing bearing on model A632S-C1 regulators may *not* be used on model A632S-C4 regulator housings.

### SECTION III DISASSEMBLY AND REASSEMBLY

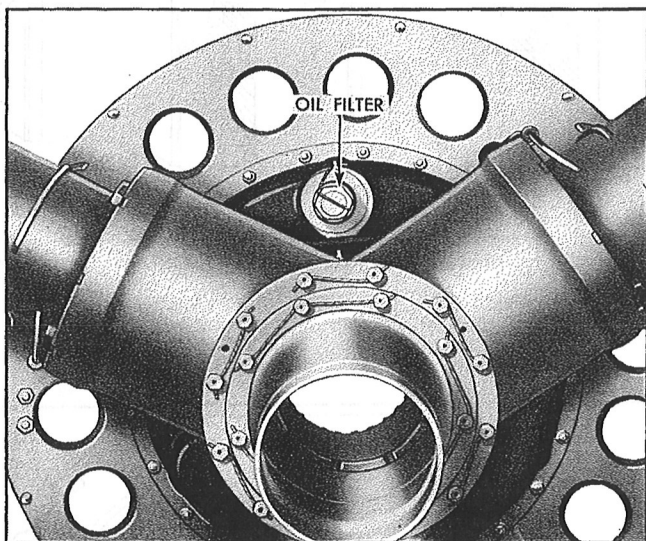


Figure 228A—Oil Filter Assembled to Regulator

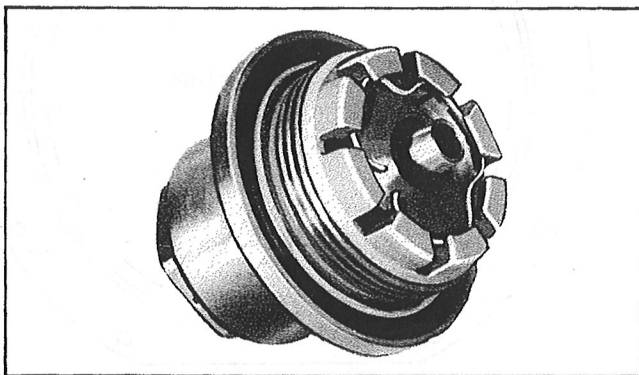


Figure 228B—Oil Filter Assembly

#### 1. OIL FILTER.

##### a. TOOLS FOR DISASSEMBLY AND REASSEMBLY OF THE OIL FILTER.

Duck-bill Pliers	.032" Brass Safetywire
Diagonal Cutters	1" Socket Wrench

##### b. PROCEDURE FOR THE DISASSEMBLY OF THE OIL FILTER.

*Step 1.*—Cut the safetywire and remove the filter assembly, turning counter-clockwise using a 1" socket wrench. See Figures 228A and 228B.

*Step 2.*—Release the snap ring from the filter assembly and remove the filter cartridge and spring. See Figure 228C—6.

*Step 3.*—Remove the small seal from the end of the filter cartridge and the large seal from the filter cap. See Figure 228C—2, 5.

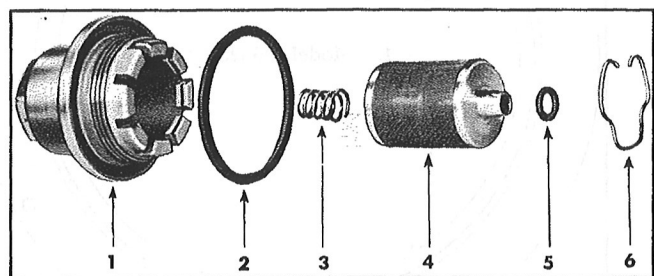


Figure 228C—Exploded View of Oil Filter

- |           |                     |
|-----------|---------------------|
| 1. Cap    | 4. Filter Cartridge |
| 2. Seal   | 5. Seal             |
| 3. Spring | 6. Lock Ring        |

### c. PROCEDURE FOR REASSEMBLY OF THE OIL FILTER.

*Step 1.*—Clean all parts thoroughly, paying particular attention to the filter cartridge, the regulator filter well, and the interior of the filter cap.

*Step 2.*—Place a new seal in the groove of the face of the filter cap. See Figure 228C—1, 2.

*Step 3.*—Place a new seal on the extension at the end of the filter cartridge and insert the spring in the other end of the cartridge, entering the large end of the spring into the cartridge. See Figure 228C—3, 4, 5.

*Step 4.*—Place the filter cartridge in the cap with the spring end of the cartridge facing inwardly. Press the cartridge down into the cap and install the snap ring. Release the pressure and allow the cartridge to seat against the snap ring, taking care to avoid cocking of the cartridge.

*Step 5.*—Install the oil filter into the regulator housing. Tighten the filter using a 1" socket wrench, and secure with .032" safetywire.

#### NOTE

The external oil filter should be inspected five hours after the installation of a new or an overhauled propeller, and at twenty-five hour intervals thereafter.

## 2. GOVERNOR.

### a. TOOLS FOR DISASSEMBLY AND REASSEMBLY OF THE GOVERNOR.

Diagonal Cutters                      6" Screwdriver  
Duck-bill Pliers                      .032" Safetywire

### b. PROCEDURE FOR DISASSEMBLY OF THE GOVERNOR.

#### NOTE

No governor spring clamp is required with this governor provided that the adjusting screw is turned *full travel* clockwise before disassembly.

*Step 1.*—Remove the attaching dowel screw from the governor spring support, as shown in Figure 230.

Remove the governor spring support and the governor spring from the assembly. Remove the adjusting screw and the spring guide from the ends of the governor spring. See Figure 231.

*Step 2.*—Withdraw the lever from the governor

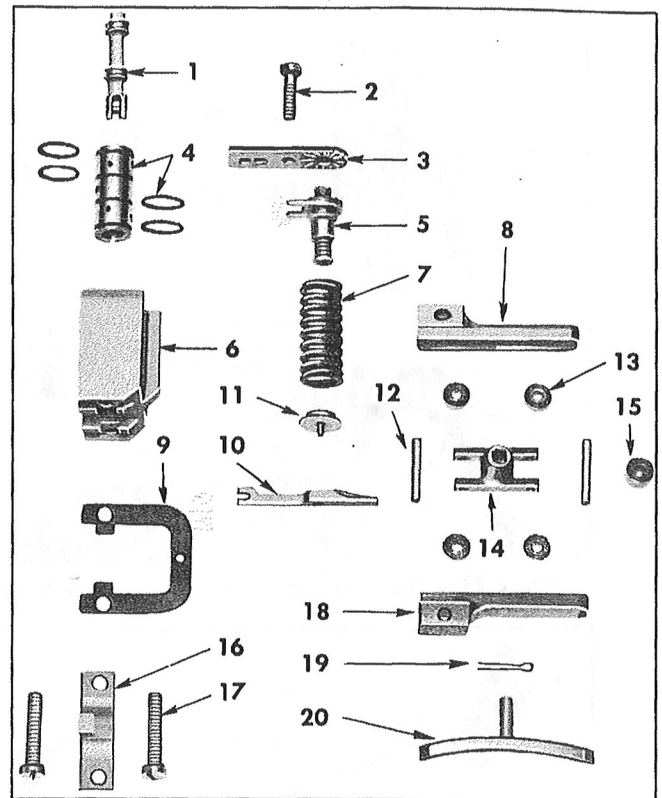


Figure 229—Exploded View of Governor

- |                                  |                                |
|----------------------------------|--------------------------------|
| 1. Piston                        | 11. Spring Guide               |
| 2. Spring Support Dowel Screw    | 12. Roller Pin—2 required      |
| 3. Spring Support                | 13. Carriage Roller—4 required |
| 4. Cylinder and Seals—4 required | 14. Carriage                   |
| 5. Adjusting Screw Assembly      | 15. Lever Roller               |
| 6. Housing                       | 16. Piston Stop                |
| 7. Spring                        | 17. Ways Screw—2 required      |
| 8. Left-hand Ways                | 18. Right-hand Ways            |
| 9. Lever Locating Spring         | 19. Cotter Key                 |
| 10. Lever                        | 20. Shoe                       |

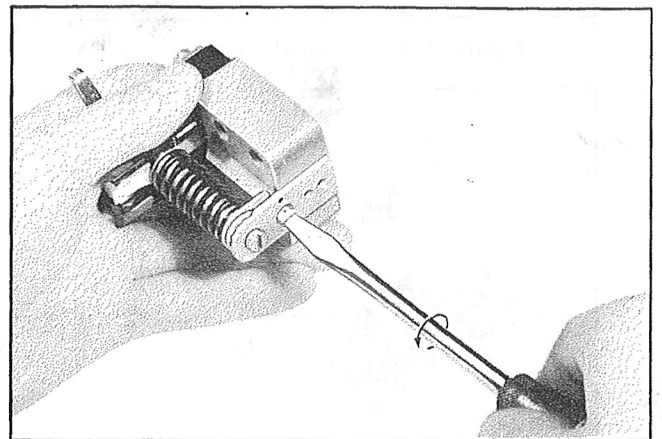


Figure 230—Removal of Spring Support Attaching Screw



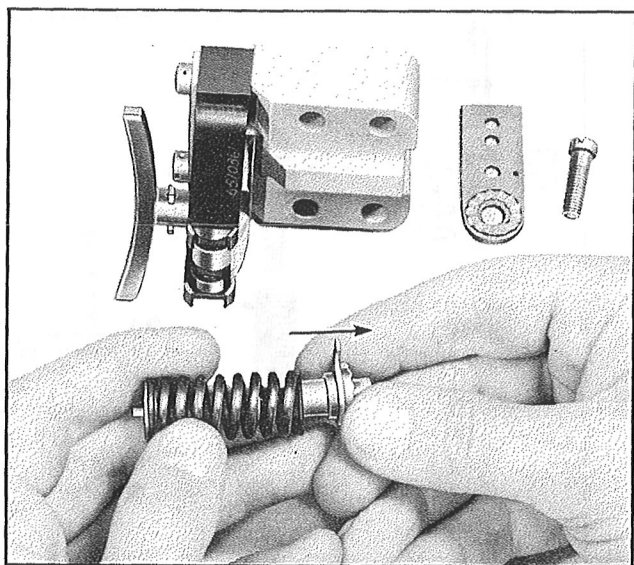
Section III  
Par. 2c

Figure 231—Remove Adjusting Screw from Spring

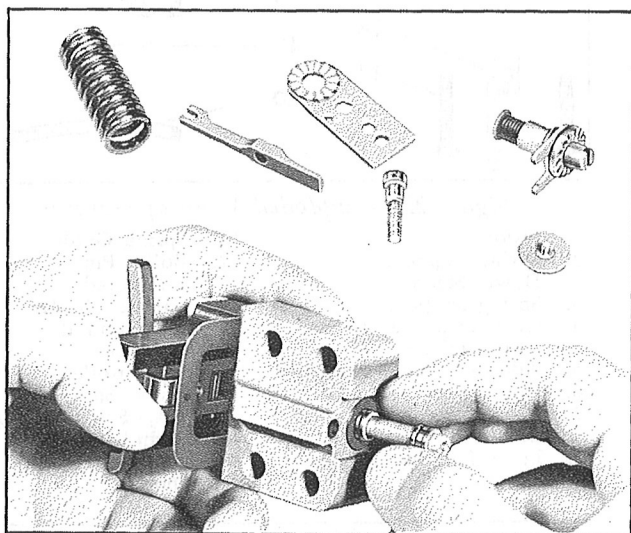


Figure 232—Removal of Governor Piston

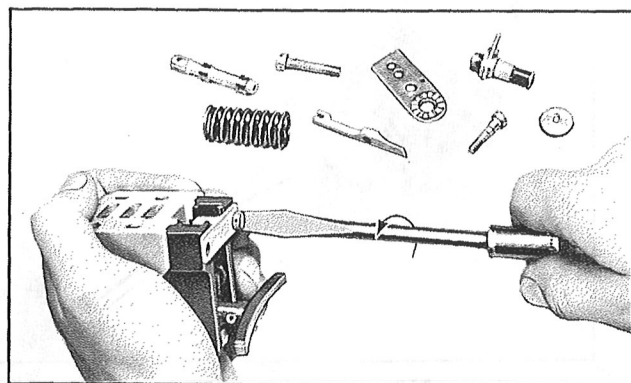


Figure 233—Removal of Governor Ways

ways and the piston from the governor body, as shown in Figure 232.

*Step 3.*—Remove the 10 x 32 attaching screws from the governor piston stop, using a 6" screwdriver. Remove the governor piston stop, the carriage ways and the lever locating spring. See Figure 233. Disassemble the governor carriage by withdrawing the pins and removing the carriage rollers and the lever roller.

*Step 4.*—Remove the cotter key from the governor carriage and withdraw the shoe.

**NOTE**

To remove the governor cylinder from the governor housing, press out with fingers. Before reinstallation, replace the cylinder seals in the lands of the cylinder. See Figure 229—4.

**c. PROCEDURE FOR REASSEMBLY OF THE GOVERNOR.**

*Step 1.*—Using recommended cleaning fluid, thor-

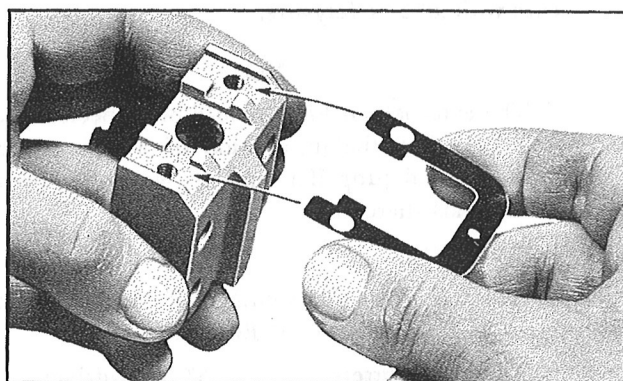


Figure 234—Installation of Lever Locating Spring

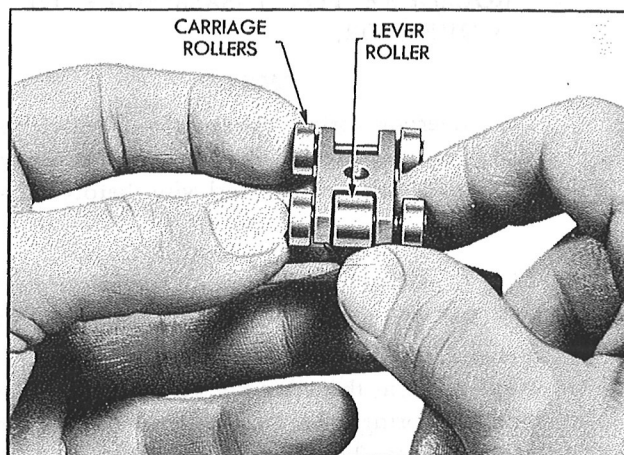


Figure 235—Assembly of Rollers to Carriage

oroughly clean the governor parts and dry with compressed air.

*Step 2.*—Holding the governor carriage with the shoe boss facing the mechanic, insert the governor shoe into the carriage. Lock with a cotter key so that the eye of the key will lead in the direction of rotation.

*Step 3.*—Place the flat lever locating spring on the governor housing so that the open side of the spring faces in the direction of the mounting face of the governor body, as shown in Figure 234. Press the spring firmly into place.

*Step 4.*—Assemble the carriage rollers and the lever roller to the governor carriage using the roller pins, as shown in Figure 235.

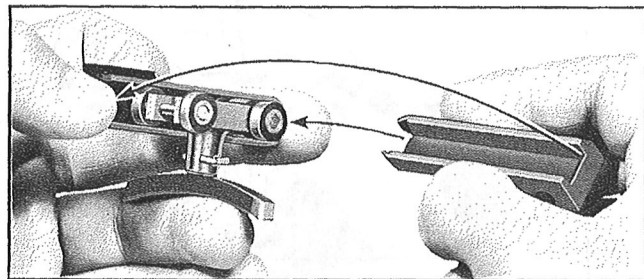


Figure 236—Assembly of Carriage to Ways

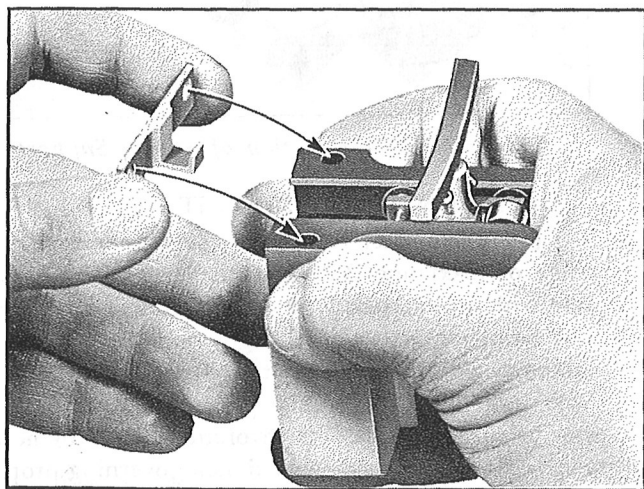


Figure 237—Assembly of Piston Stop to Governor

Assemble the carriage to the ways so that the carriage rollers engage the channels of the ways, and the lever roller is toward the closed end of the ways. See Figure 236.

*Step 5.*—Holding the carriage to prevent it from coming apart, place the open ends of the ways over the lever locating spring on the governor housing so that the carriage extends away from the mounting face of

the governor. Install the piston stop over the ways and, using the 10 x 32 fillister head screws, firmly attach the ways to the housing and safety with .032" safetywire. See Figure 237.

*Step 6.*—Insert the governor piston into the cylinder, entering the piston in the upper side of the governor housing so that the slotted end of the piston contacts the piston stop beneath. See Figure 238.

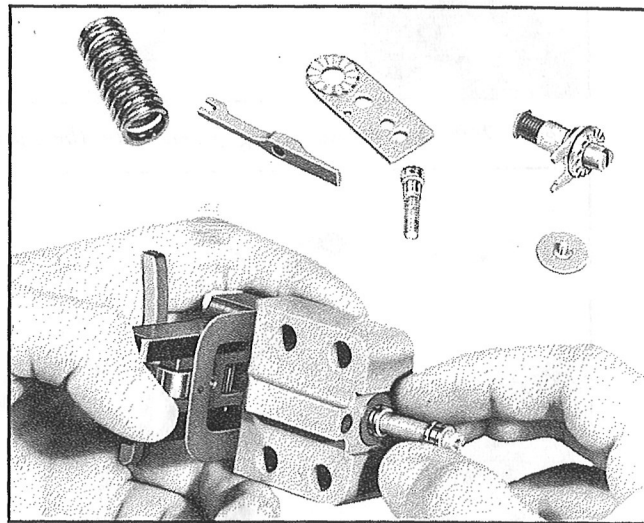


Figure 238—Installation of Governor Piston

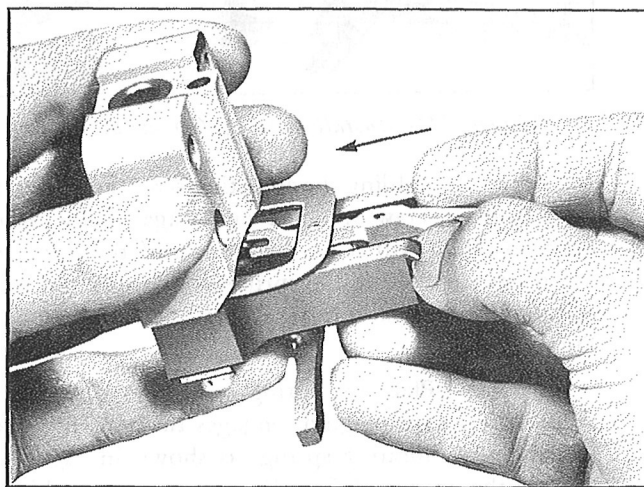


Figure 239—Installation of the Lever

*Step 7.*—Taking the lever part, insert it between the lever roller of the carriage and the lever locating spring. Install in such a way that the flat side of the lever faces the roller, and the slotted end of the lever engages the pin in the piston slot. Move the lever slightly until the hole in the lever is in line with the hole in the locating spring, as shown in Figure 239.

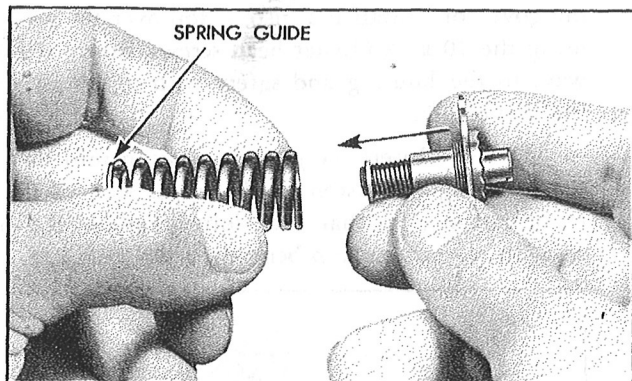


Figure 240—Insert Adjusting Screw into the Spring

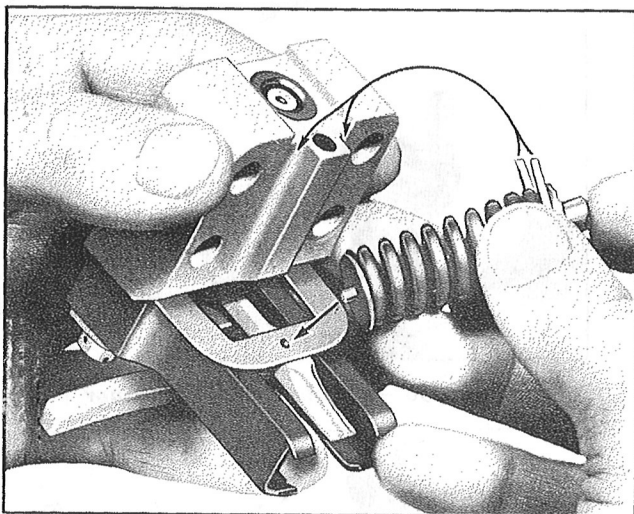


Figure 241—Installation of Governor Spring

*Step 8.*—Holding the adjusting screw assembly, turn the adjusting screw until the nut is against the head of the screw. This will relax the tension of the spring during reassembly. Place the spring adjusting screw in one end of the spring and the spring guide in the other. See Figure 240.

*Step 9.*—Place the spring on the governor so that the pin on the spring guide engages the hole in the lever and the lever locating spring, as shown in Figure 241. Engage the prongs of the adjusting screw assembly with the guide on the governor body.

*Step 10.*—Place the governor spring support over the head of the adjusting screw so that the serrations on the support face the serrations of the adjusting screw. See Figure 242. Place the other end of the support on the governor body and attach with the special 8 x 32 dowel screw (as illustrated in Figure 230). Tighten the screw firmly and safety with .032" safetywire.

#### NOTE

Governors for model A632S-C4 propellers are interchangeable with the governors used on model A632S-C1 propellers. Whenever installing the new type governor, do *not* use the governor spacer plate or spacer plate gasket between the governor and the regulator housing, but *do* use the filter gasket. See Figure 142 of the manual (T.O. 03-20E-2). The spring for this governor should have the following tension:

9-10 lbs. load at  $1\frac{5}{16}$ " compressed length  
26-27 lbs. load at  $1\frac{1}{8}$ " compressed length

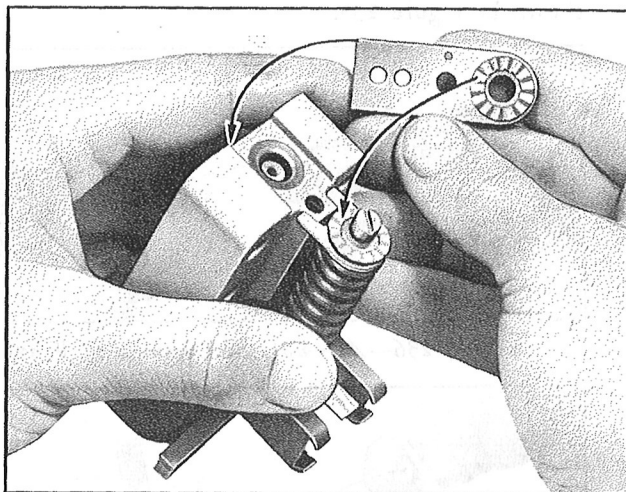


Figure 242—Installation of Spring Support

#### d. GOVERNOR ADJUSTMENT.

(1) The model A632S-C4 governor with its wide range of maximum R.P.M. adjustment may be readily used with any present P-39 engine reduction gear ratio. The adjusting screw on this governor may be set for maximum governing speed at any point between 900 to 1700 propeller R.P.M. The governor adjusting screw may be turned 8 complete revolutions, with 14 notches per turn. Inasmuch as the maximum governing propeller speed is varied 7 R.P.M. per notch, one complete turn of the adjusting screw will make a change of 98 to 100 R.P.M., and 8 complete turns will vary the propeller governing speed approximately 800 R.P.M.

(2) The governor adjusting screw for model A632S-C4 propellers is readily accessible through the filler plug hole in the regulator, and adjustment is accomplished in the same manner as for previous models. See Figure 62 of the manual (T.O. 03-20E-2). Turning the screw counter-clockwise will *increase* the maximum governing



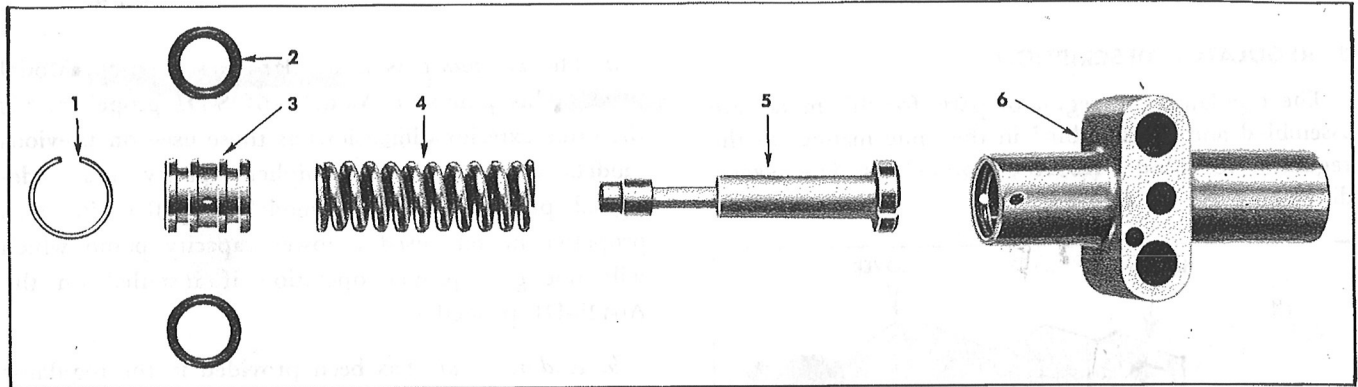


Figure 243—Pressure Control Valve, Exploded View

- |                                |           |           |
|--------------------------------|-----------|-----------|
| 1. Lock Ring                   | 3. Insert | 5. Piston |
| 2. Packing Ring—<br>2 required | 4. Spring | 6. Body   |

R.P.M., and turning it clockwise will *decrease* the maximum governing R.P.M.

(3) As an example, if the A632S-C4 propeller is installed on an airplane having an engine rated at 3000 R.P.M. and a reduction gear ratio of 2.23:1, it is obvious that when the engine is turning 3000 R.P.M., the propeller will be rotating at 1345 R.P.M. Therefore, starting with the governor adjusting screw at full travel clockwise, the mechanic must turn the adjusting screw counter-clockwise  $4\frac{1}{2}$  turns (64 notches) in order to obtain a maximum *governing* speed of 3000 engine R.P.M. (1345 propeller R.P.M.). For reduction gear ratios of less than 2.23:1, the governor adjusting screw must be turned more than 64 notches, and for higher reduction gear ratios, the screw must be turned less notches. For ground run-up and flight test information, see Section III—3 of the manual (T.O. 03-20E-2).

### 3. PRESSURE CONTROL VALVE.

#### a. TOOLS FOR DISASSEMBLY AND REASSEMBLY OF THE PRESSURE CONTROL VALVE.

Tapered Point Punch      Cleaning Materials  
 $\frac{5}{16}$ " Round Drift

#### b. PROCEDURE FOR DISASSEMBLY OF THE PRESSURE CONTROL VALVE.

*Step 1.*—Holding the pressure control valve with the open end up, press down against the insert using the  $\frac{5}{16}$ " round drift. Insert the tapered point punch through one of the small lock ring holes in the end of the valve body, and remove the lock ring. See Figure 244.

*Step 2.*—Remove the insert, spring, and piston from the valve body.

#### NOTE

If difficulty is encountered during the removal of these parts from the body, insert a small screwdriver through the oil hole in the mounting face of the valve and pry down against the spring, taking care to avoid damaging the mounting face, the spring, or the piston.

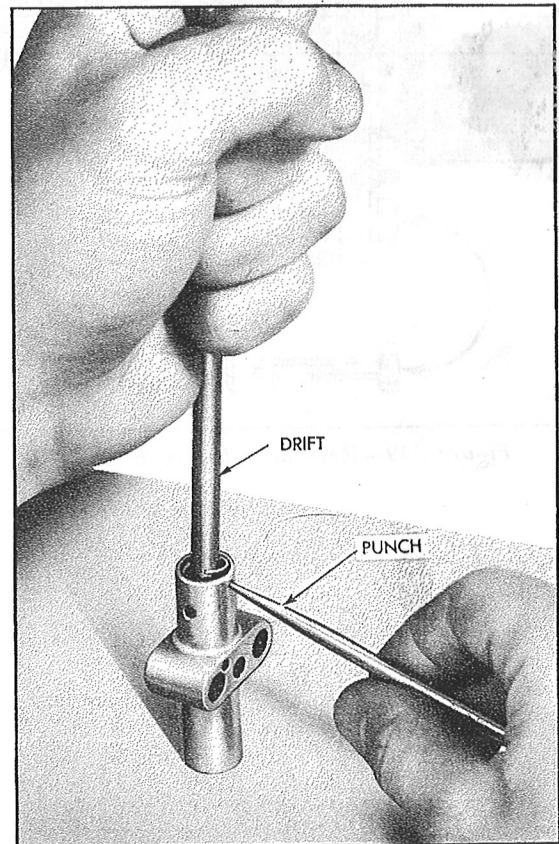


Figure 244—Removal of Lock Ring



Section II  
Par. 2a, b, c, d

## 2. REGULATOR DESCRIPTION.

The regulator and regulator parts for this model are assembled and disassembled in the same manner as the regulator for Model A632S-C4 propellers. The several differences are as follows:

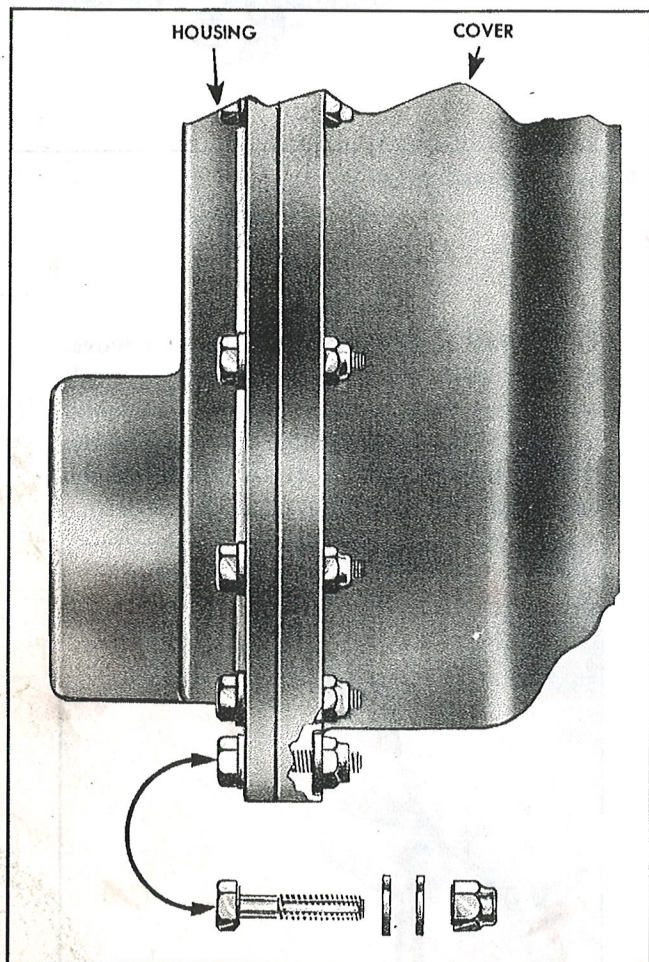


Figure 249—Regulator Through Bolts

a. The *oil pump* is a standard Pesco pump, Model 519-C. This pump on Model A642S-D1 propellers has the same exterior dimensions as those used on previous models. However, it is of higher capacity, and is designed primarily for this model propeller. Previous propeller models used a lower capacity pump which will not give proper operation if installed on the A642S-D1 propeller.

b. A *dowel hole* has been provided in the regulator mounting face of the hub and mates with the driving dowel installed in the regulator. The regulator, therefore, can be mounted in one position only so that the filler plug is located at the No. 1 socket.

c. The *housing* and the *cover* of this regulator are assembled by twenty-four  $\frac{1}{4}$ " x 28" through bolts, washers, and self-locking nuts. See Figure 249. Possible damage to the cover or housing during assembly has been minimized inasmuch as these bolts do not screw into either part. Because of the use of self-locking nuts, no safety wire is required on these bolts.

d. The *control gear* and *lever* is assembled to the regulator with tooth No. 32 in line with the index mark on the adapter ring, in contrast to the previous models.

All torque unit parts, blades and blade retention parts, and all the internal parts of the regulator, with the exception of the oil pump, and housing and cover bearings, may be interchanged between propeller models A642S-D1 and A632S-C4. Because of transfer ports for four blades instead of three, the regulator housing and cover for the Model A642S-D1 propeller may be used only on that model.