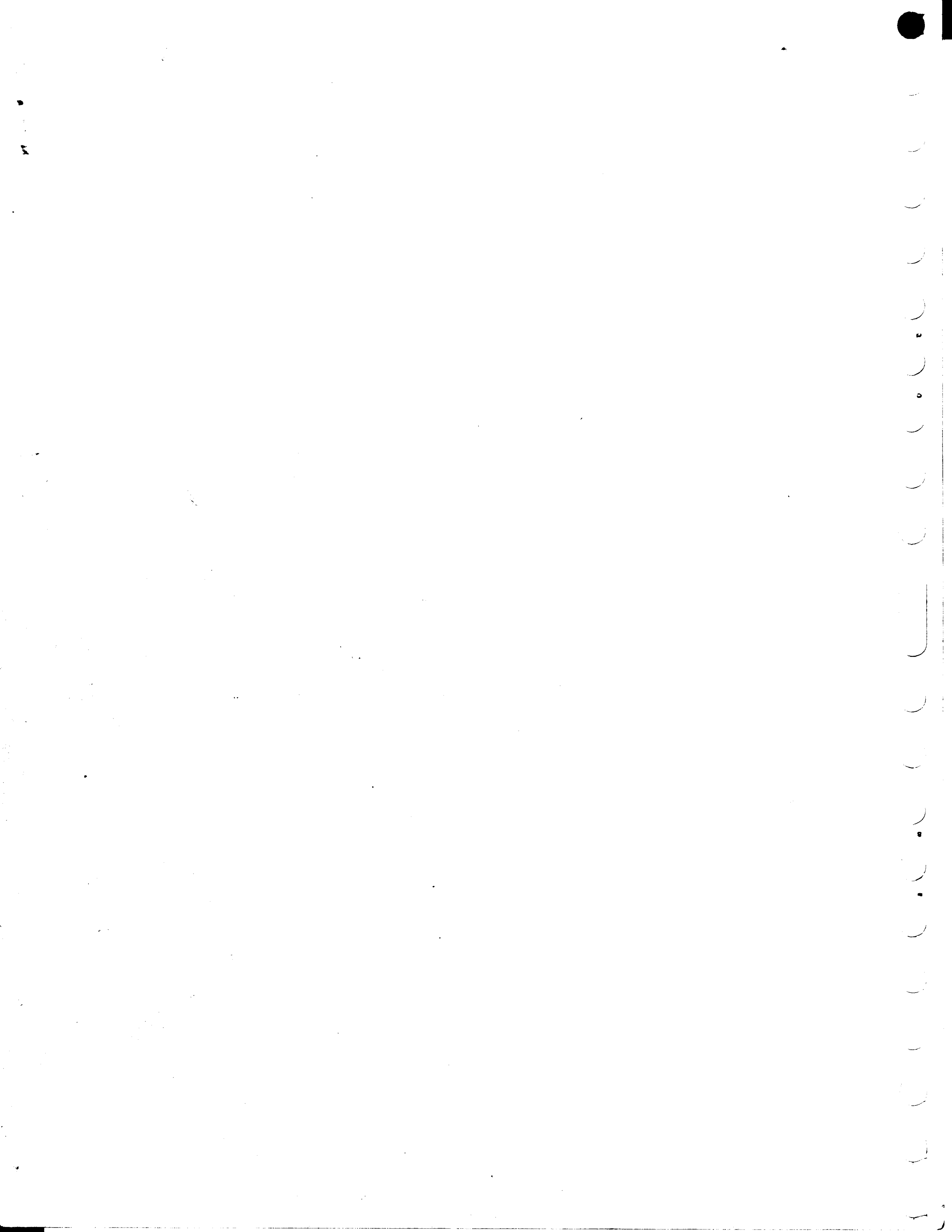


**IBM** Customer Engineering  
Reference Manual

**IBM** *Selectric*  
Universal I/O Keyboard Printer



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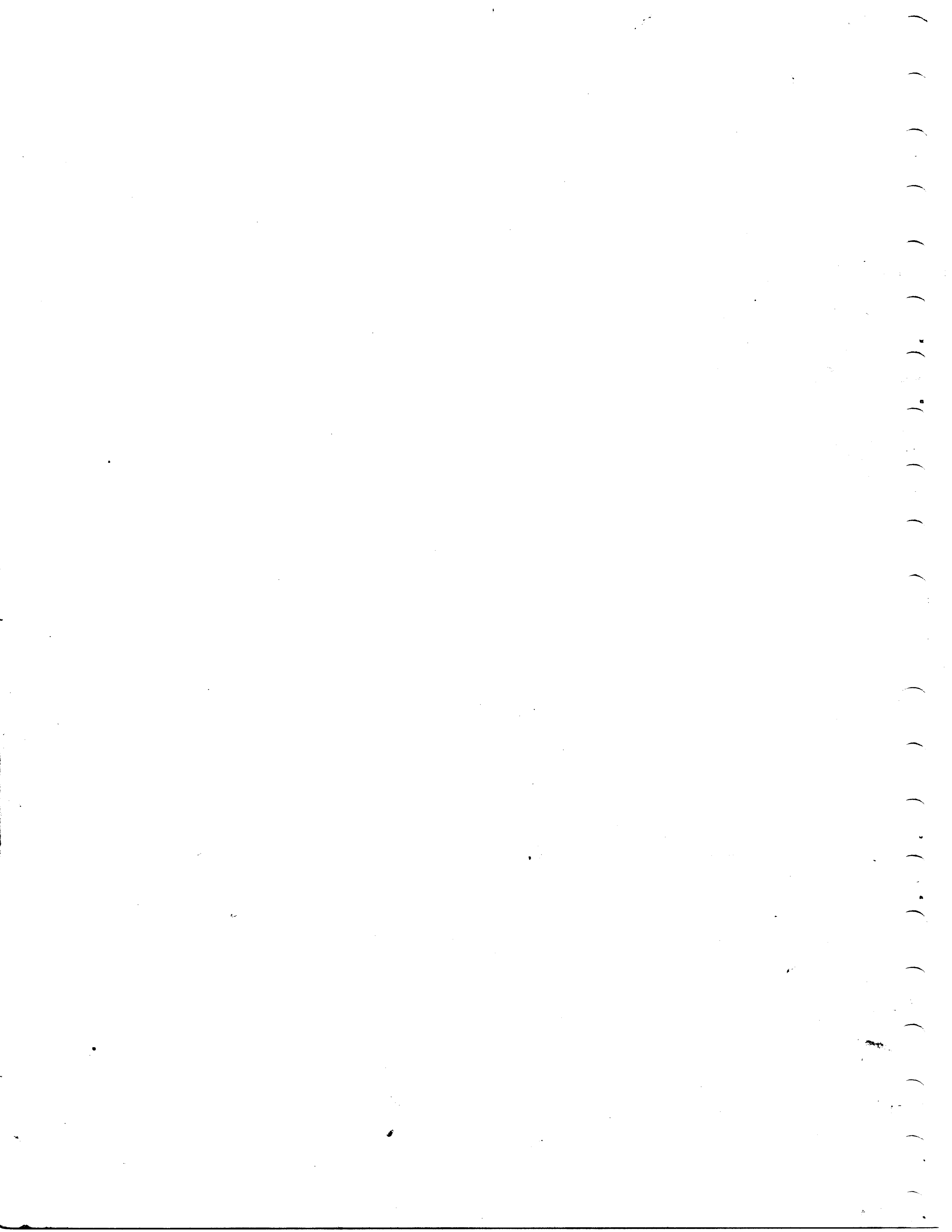
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## MOTOR AND DRIVE

1. Belt Tension - Adjust for minimum noise during idling and powered operation.
2. Motor Pulley - Position the motor clutch hub so that the belt centers on both pulleys. Adjust the retaining clip for .005" to .015" end play.
3. Motor Clutch Pawl Stops (Fig. 1) - Form for a clearance of .010" to .020" between the clutch pawl tip and pulley ratchet when the pulley is manually rotated.

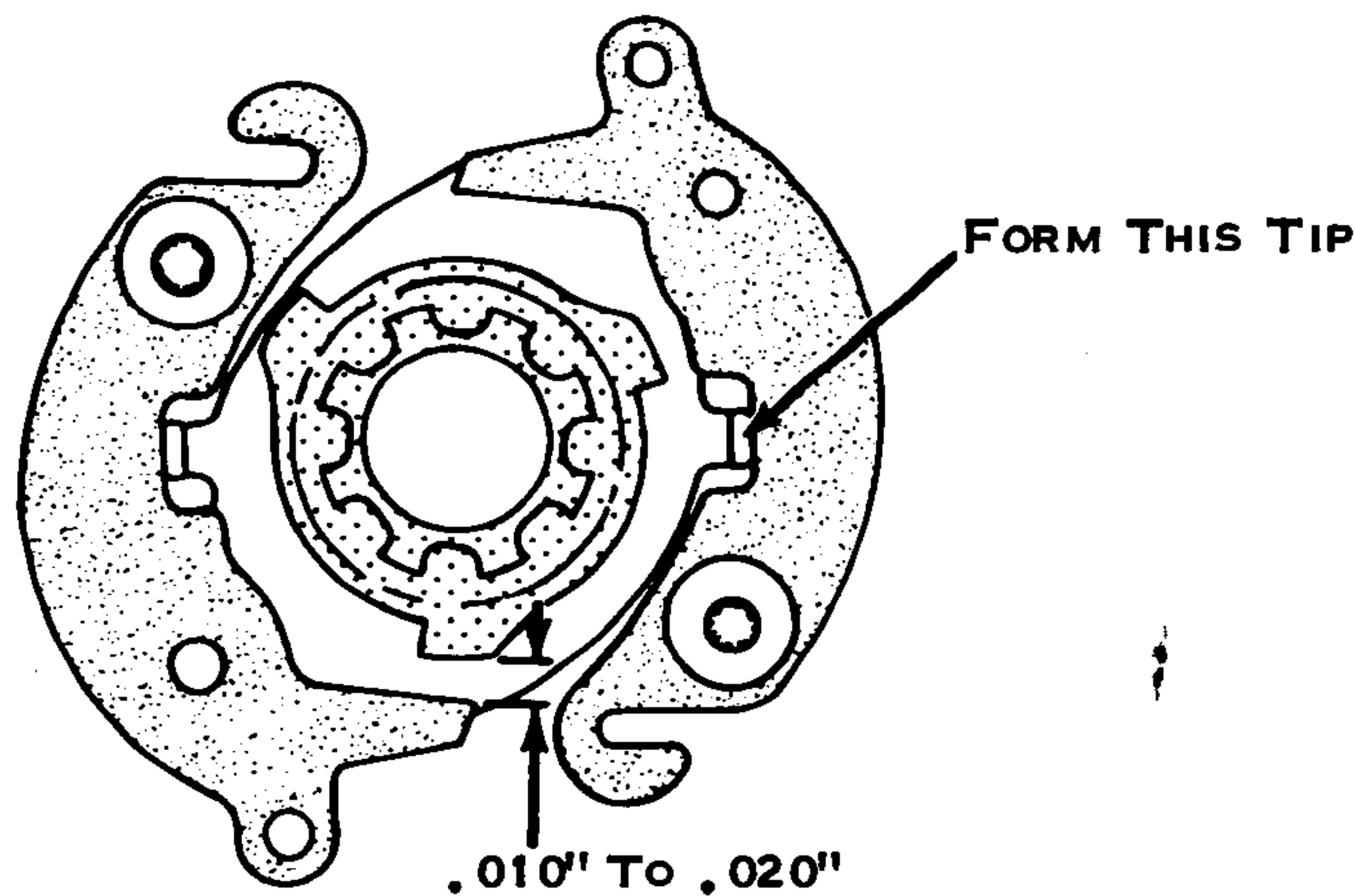


Figure 1. Motor Clutch Pawls

4. Idler Gears - The idler gear studs should be adjusted so that a minimum backlash is present between mating gears. The gears must be free of binds throughout 360° of rotation. CAUTION - The lower idler gear must be adjusted first, because the upper idler gear is adjusted to the final position of the lower gear. After any removal and replacement of the left hand cycle shaft bearing, the mesh of the lower idler gear must be checked.

## CYCLE CLUTCH MECHANISM

1. Cycle Cam Shaft - Shim to obtain .001" to .003" end play. The shims are placed between the left hand bearing and the check ratchet. Note; With end play removed to the right, maintain .002" clearance between the cycle shaft gear and LH bearing.
2. Cycle Clutch Latch Bracket (Fig. 2) - Position vertically so that the Hoovermeter spans the distance between the print shaft and the latch pivot pin. The Hoovermeter head must be set on the #3 scribe line with the handle centered on the latch pivot pin.

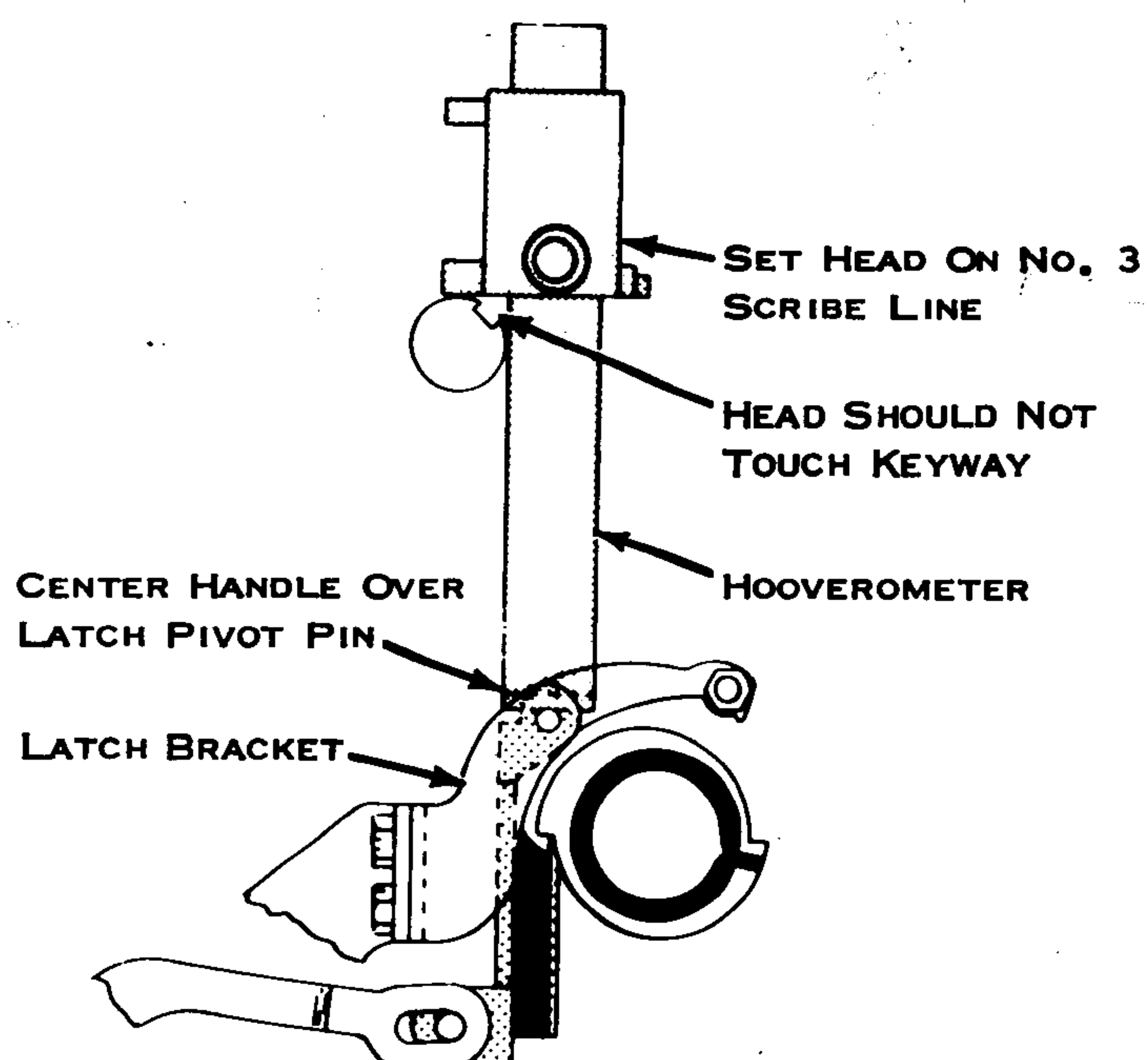


Figure 2. Cycle Clutch Latch Bracket

- Note;
- a. The steps of the cycle clutch sleeve must be horizontal when the sleeve is stopped by the latch.
  - b. The latch bracket must not be tilted so that only one corner of the latch plate is holding the sleeve.

3. Two styles of cycle clutch mechanisms have been manufactured. Both old and new styles may be adjusted to the same specifications. See Figure 3 for adjusting screws on the old style mechanism.

Cycle Clutch Spring (Fig. 4) - With the cycle shaft end play held to the right, position the cycle clutch spring (left to right) to clear the pulley hub by .004" to .012". The collar adjusting screw must be loosened in order to position the spring.

Note; The low end of the tolerance is desirable.

4. Cycle Clutch Collar (Fig. 4) - Position as follows:

- a. Laterally - so that the cycle clutch sleeve has .010" to .015" end play.

Note; Recheck adjustment 3 to insure that the specified clearance between the spring and pulley hub has not been changed.

- b. Radially - so that during a hand cycled -5 rotate, 0 tilt selection, the cam shaft fails to reach the detented position by 1/16" to 3/32" on the check ratchet surface. 3/32" is the equivalent of 3/4 tooth rotation of the print shaft gear or approximately 5° on the degree wheel.

5. Cycle Clutch Stop (Fig. 5) - Position the nylon stop to clear the sleeve by .007" to .015" with the cam shaft detented. Check Figure 3 for adjusting screws, old-style.

Note; Check to insure that this clearance does not exceed .015" with the latch holding on either step of the sleeve.

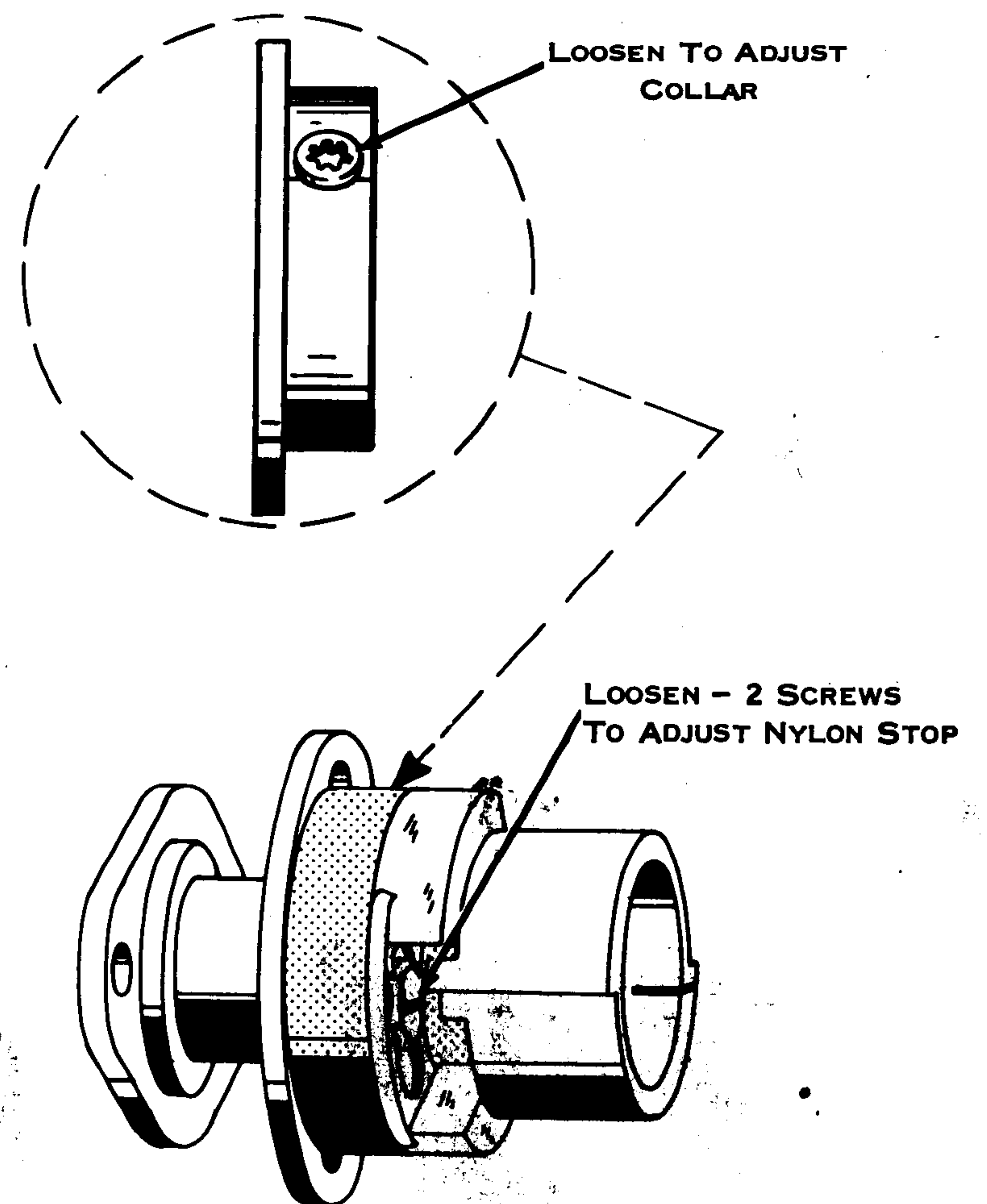


Figure 3. Cycle Clutch, Old Style



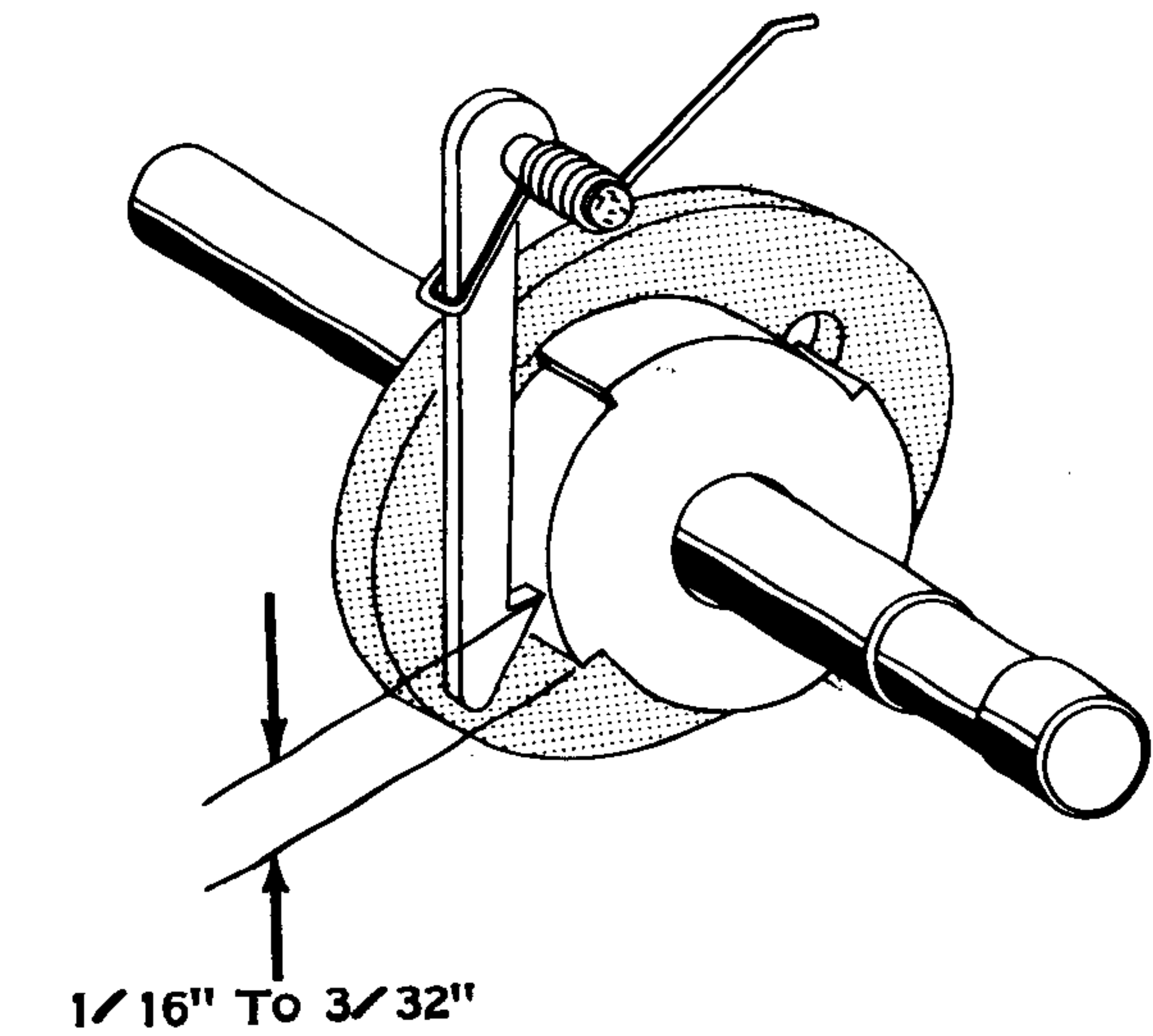
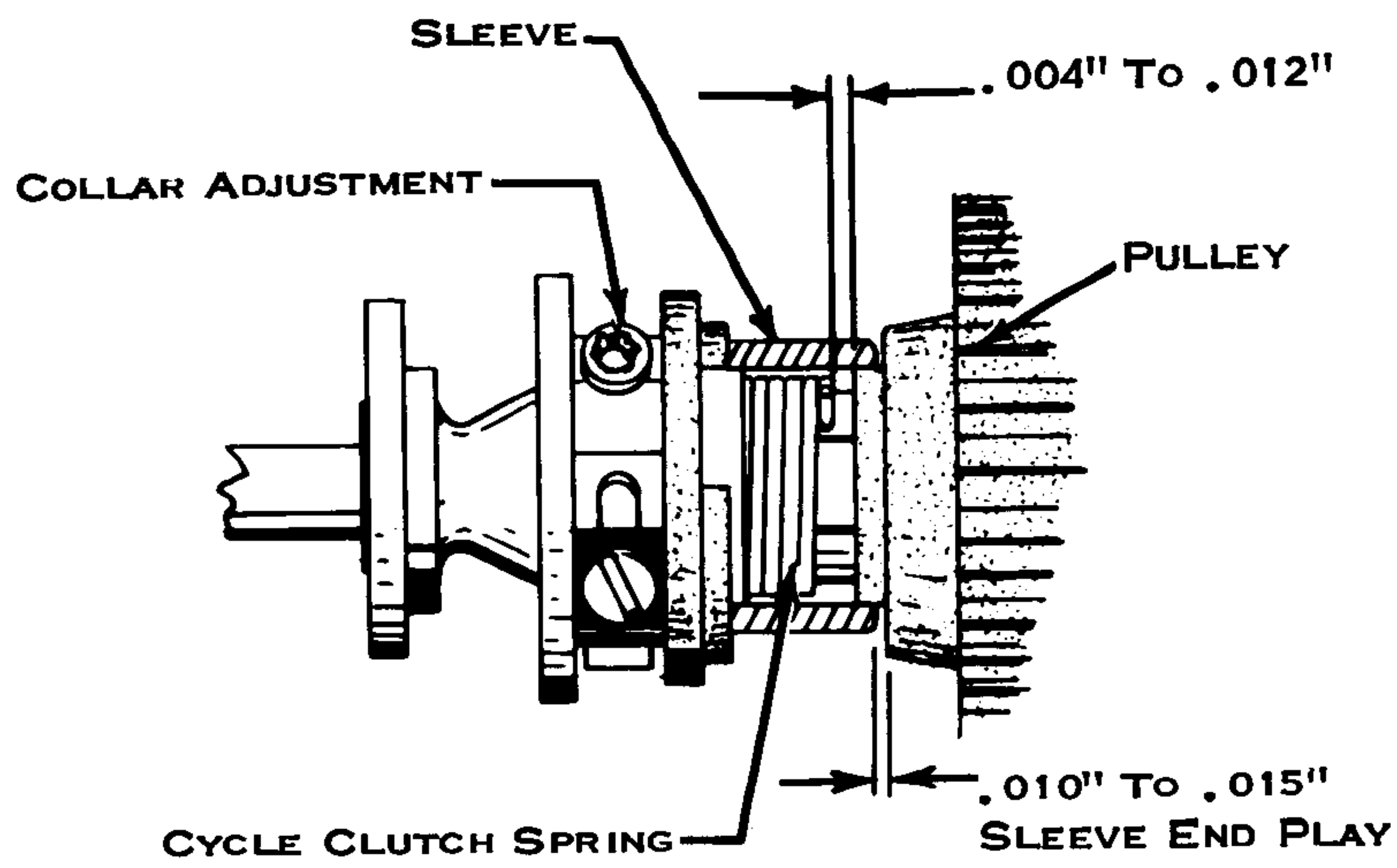


Figure 4. Cycle Clutch Collar Adjustment

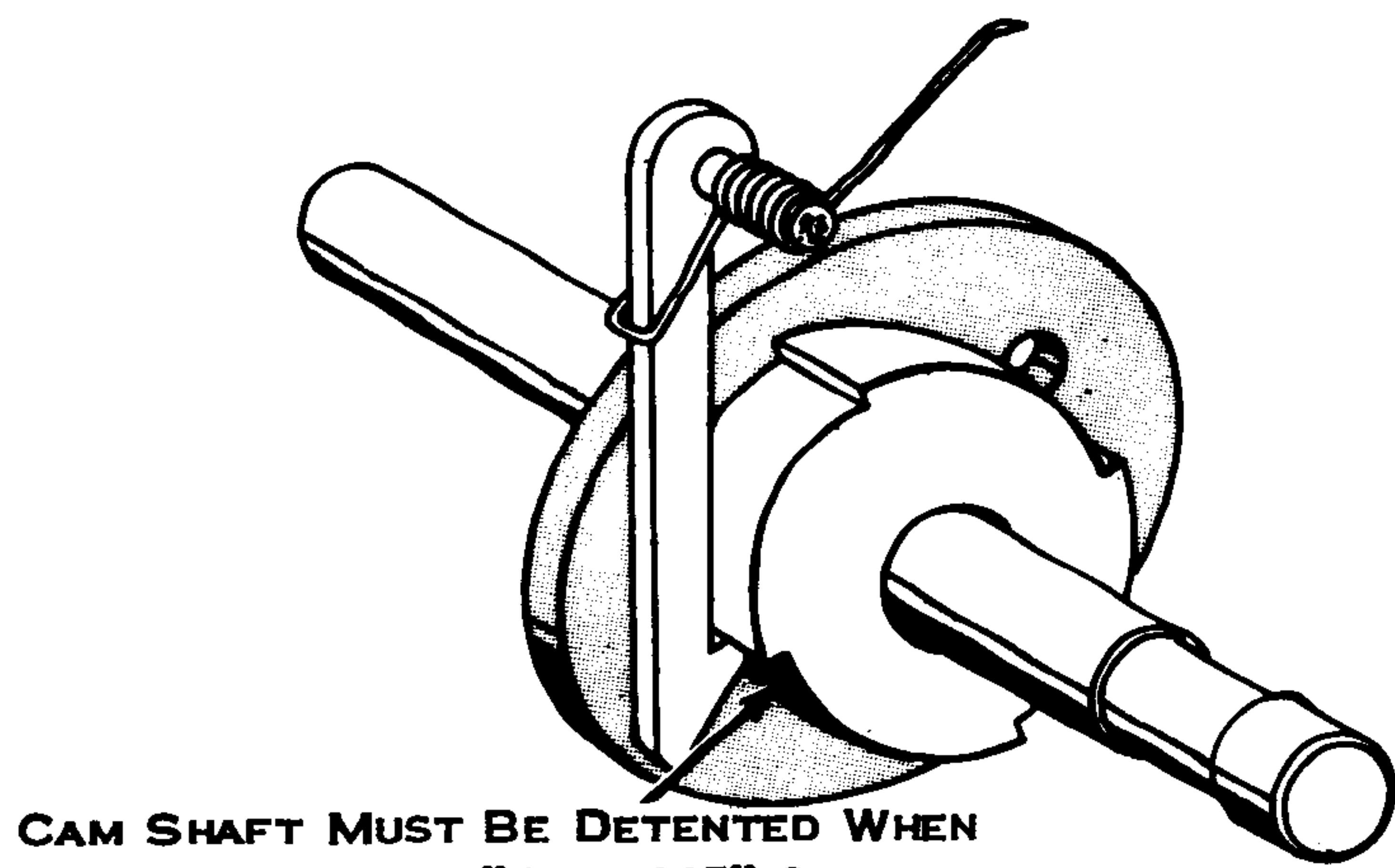
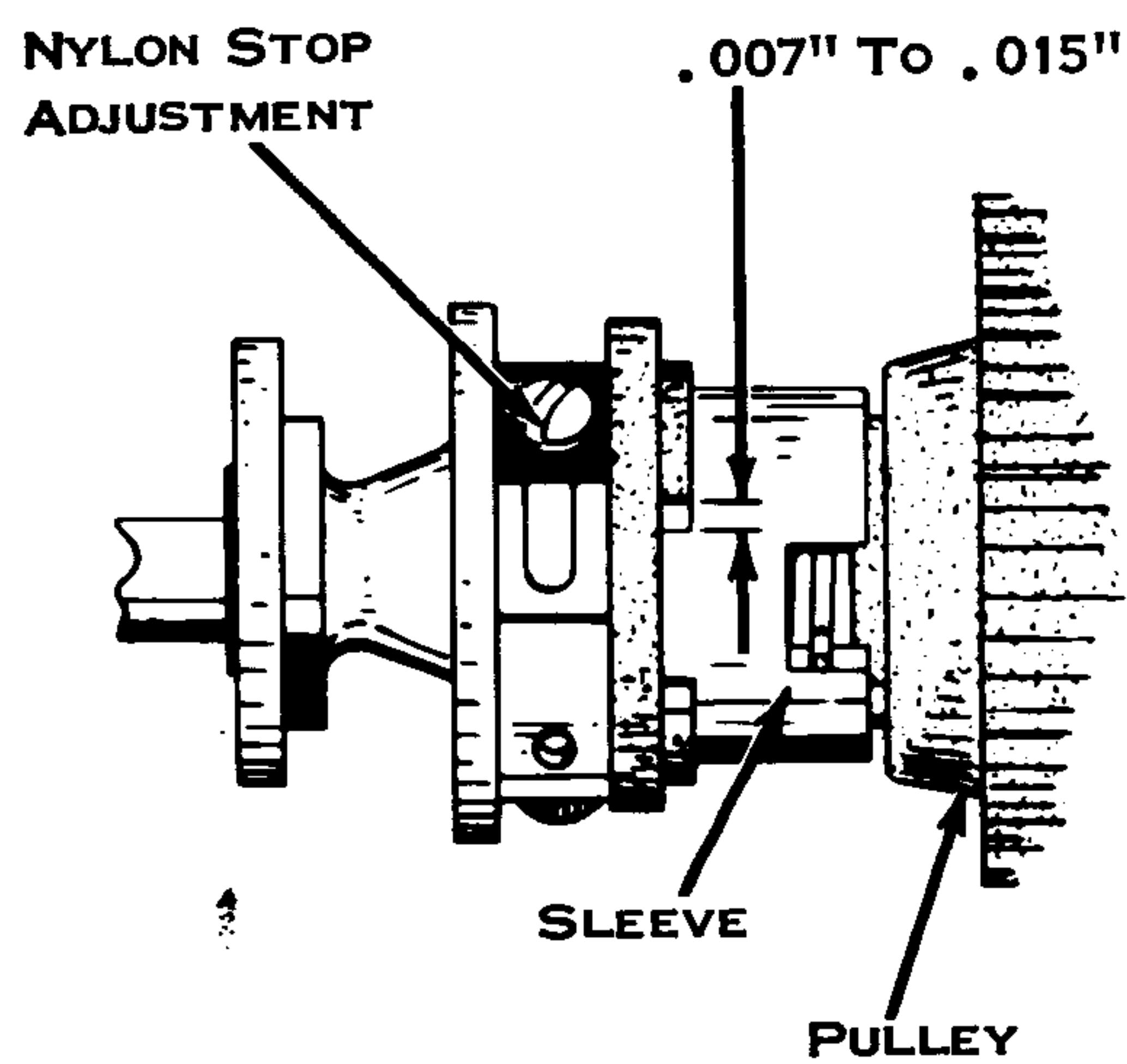
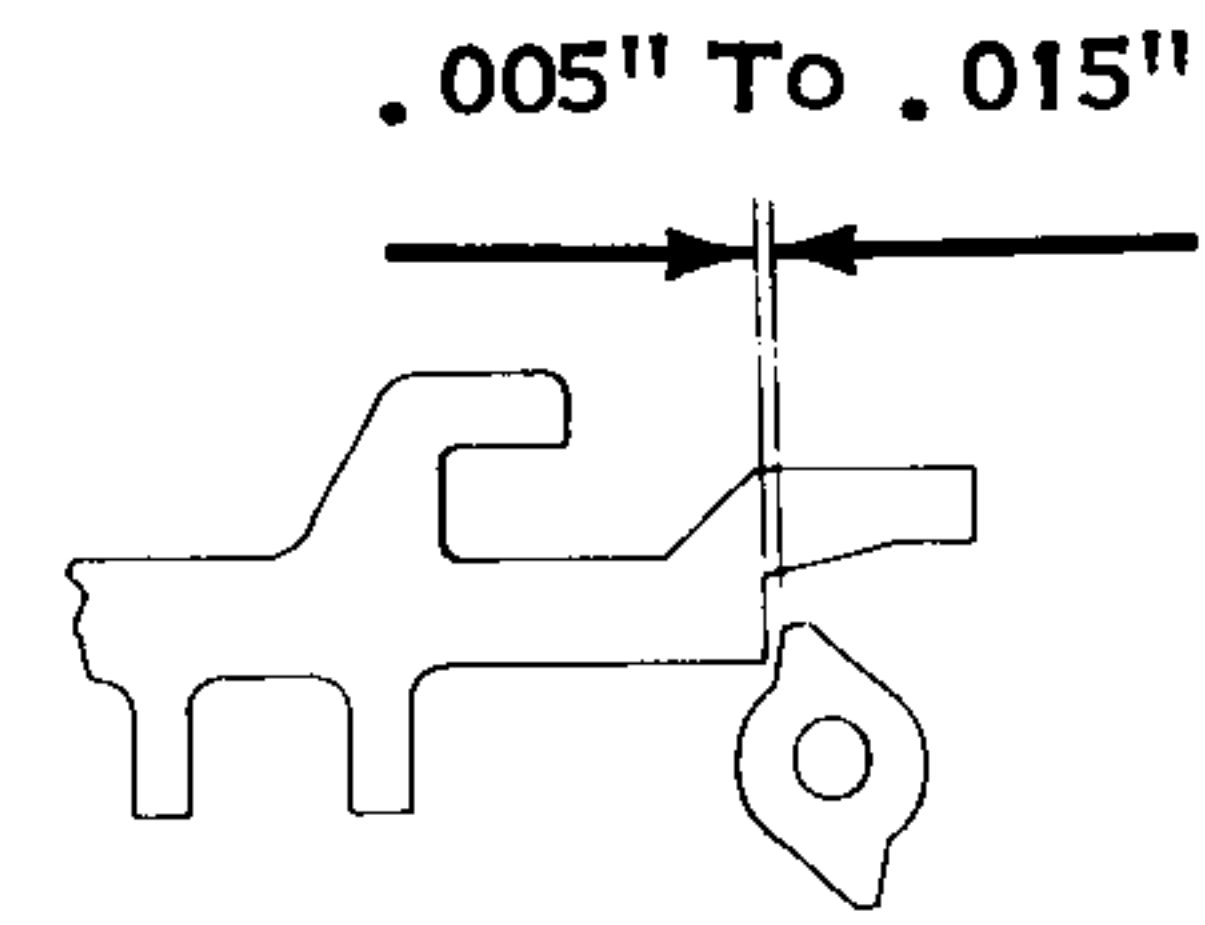


Figure 5. Nylon Stop Adjustment

#### KEYBOARD SELECTION

1. Filter Shaft Timing (Fig. 6) - With the cycle cam shaft at rest, position the filter shaft (relative to its drive gear) to clear a depressed interposer by .005" to .015". When making this adjustment, all the backlash of the gear train should be taken out clockwise (from left side of printer).

Note; Maintain .002" to .004" end play in filter shaft.



ADJUST FILTER SHAFT GEAR TO OBTAIN .005" TO .015"

Figure 6. Filter Shaft Timing

2. Rear Interposer Guide (Fig. 7) - Adjust vertically to obtain .020" to .030" clearance between the filter shaft blade and the interposer. This adjustment determines the point to which other keylever and interposer adjustments must be made. CAUTION - This clearance should be checked at several points along the filter shaft.

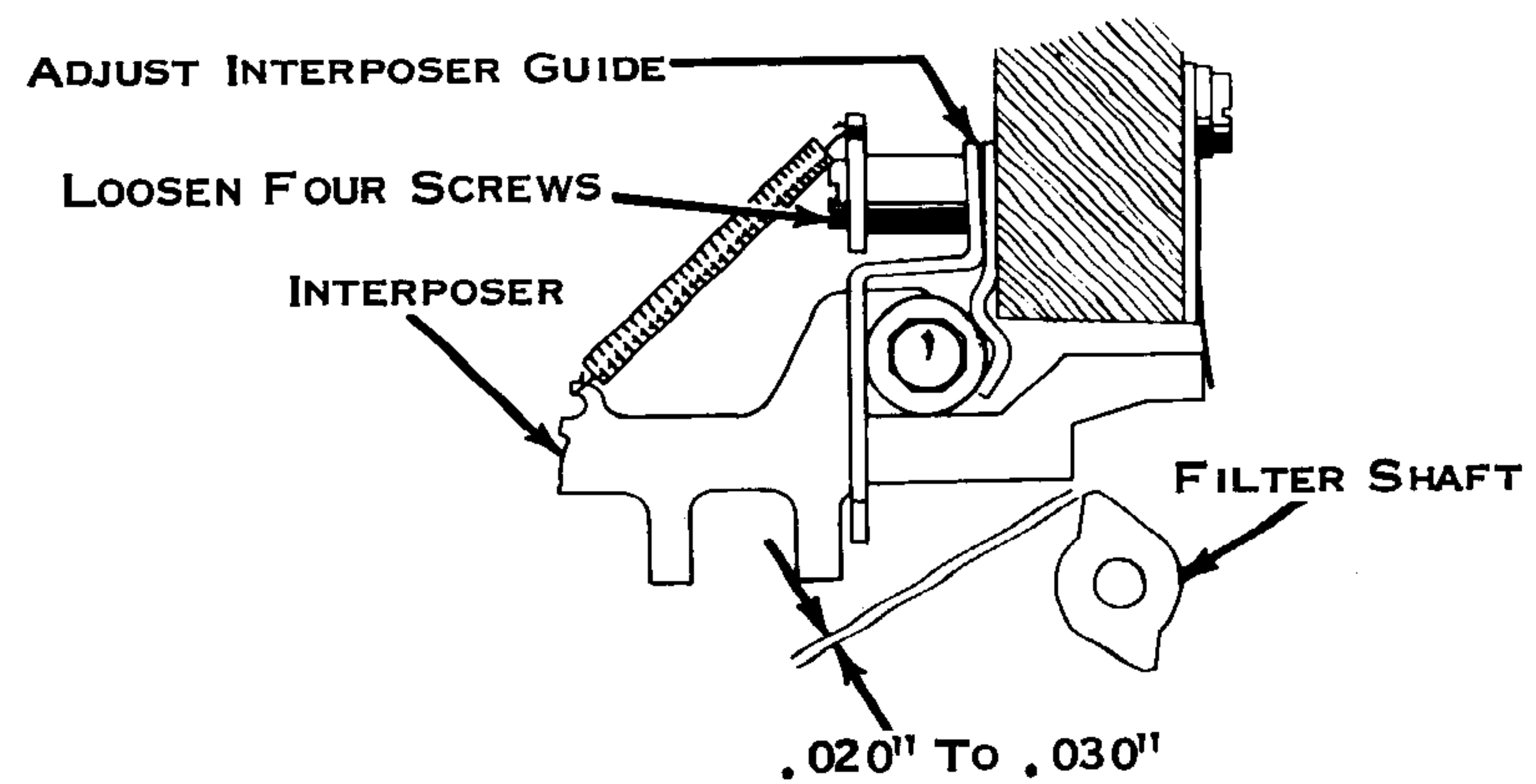


Figure 7. Rear Interposer Guide

3. LH Bail Plate - Position as follows:
  - a. Horizontally - to parallel the selector bails with the interposer lugs.
  - b. Vertically - to parallel the cycle clutch release bail with the interposers.
4. Interposer Latch Spring Adjustment, Preliminary (Fig. 8) - With the H interposer latched, position the latch spring so that approximately .015" travel remains before the interposer bottoms in the guide slot.

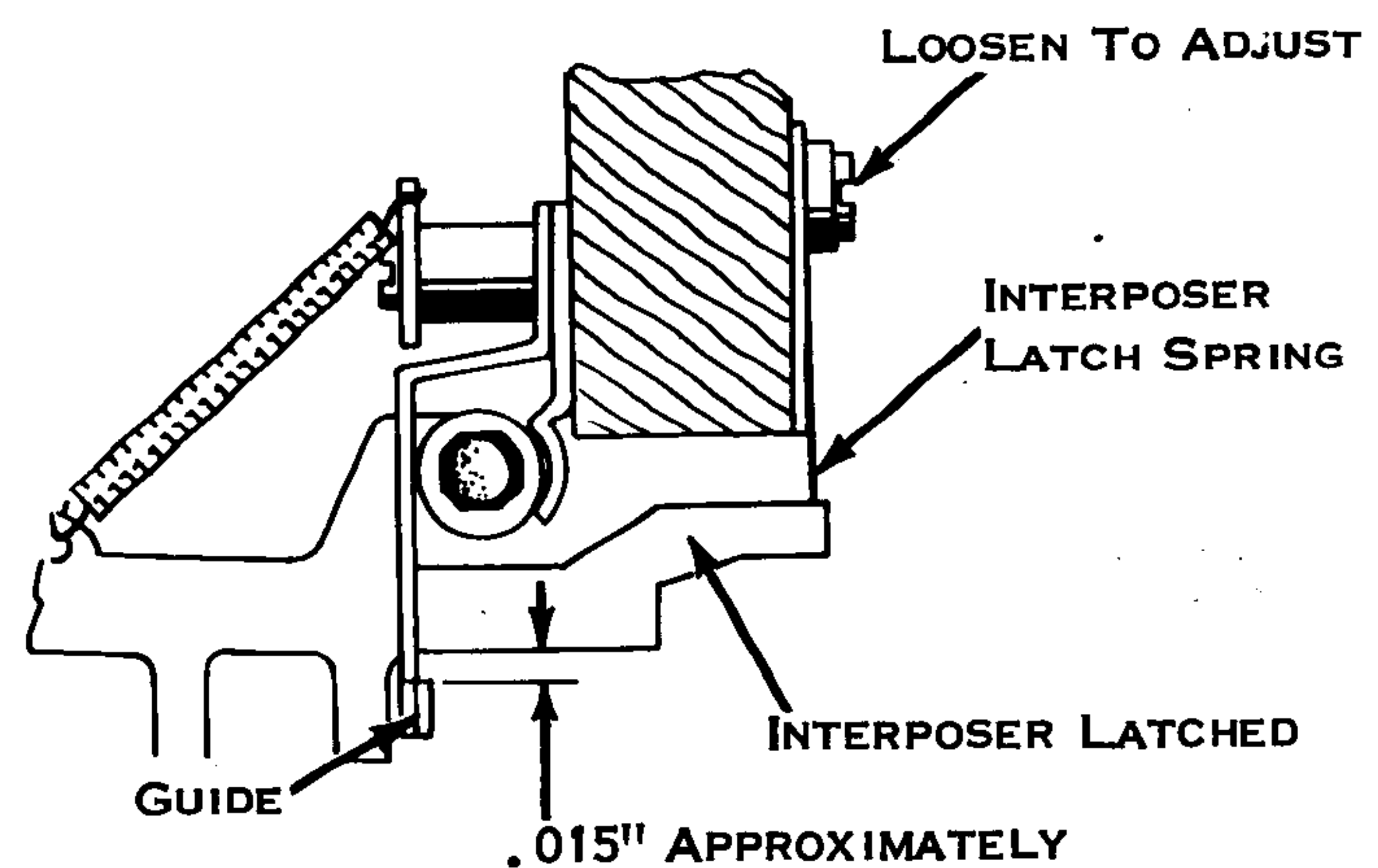


Figure 8. Interposer Latch Spring Adjustment, Preliminary



5. Cycle Clutch Latch Keeper Bracket (Latch Bite) - Position, front or rear, so that the cycle clutch latch engages the sleeve step by the thickness of the latch plate (Fig. 9).

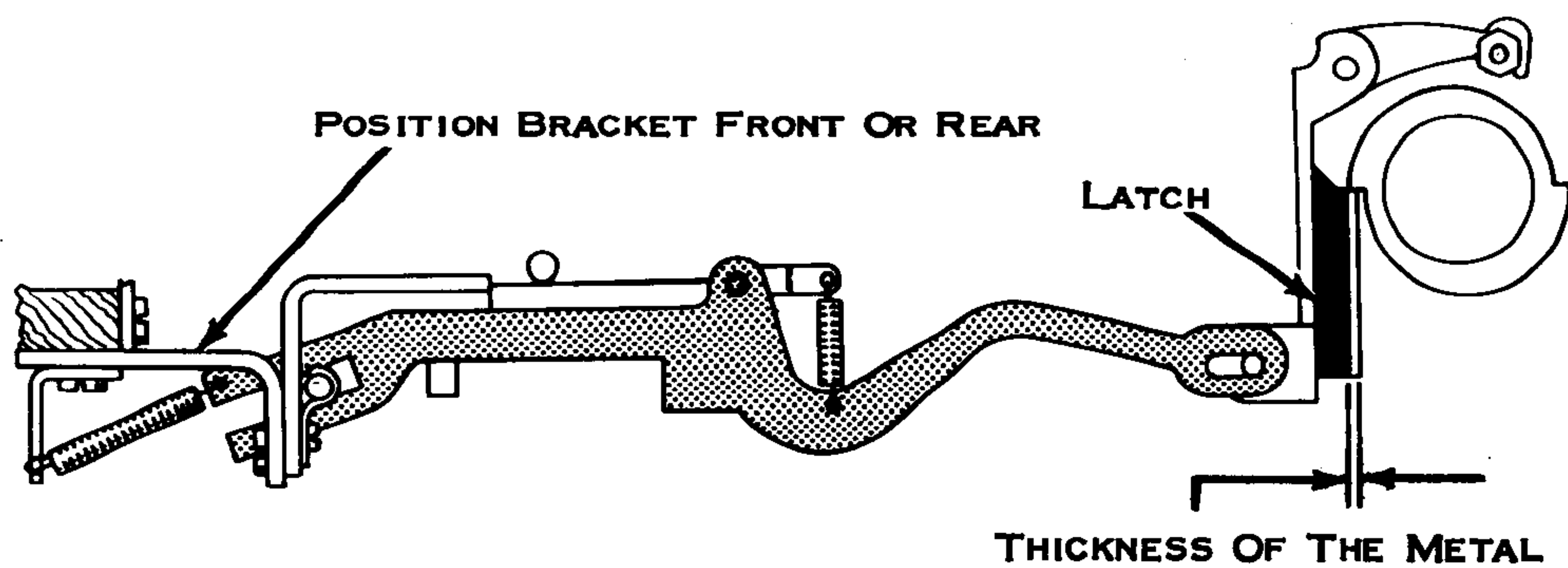


Figure 9. Cycle Clutch Latch Keeper Bracket

6. Cycle Clutch Latch Restoring -

- a. New Style - Position the restoring roller so that the latch pawl overthrows the keeper by  $.020''$  to  $.025''$  with the restoring cam on its high point. The overthrow must not force the latch against the sleeve (Fig. 10).

Note; Check on both restoring cam lobes and adjust on the lobe providing the least motion.

- b. Old Style - Adjust the restoring lever so that the latch pawl overthrows the keeper by  $.030''$  to  $.045''$ . The overthrow must not force the latch against the sleeve (Fig. 11).

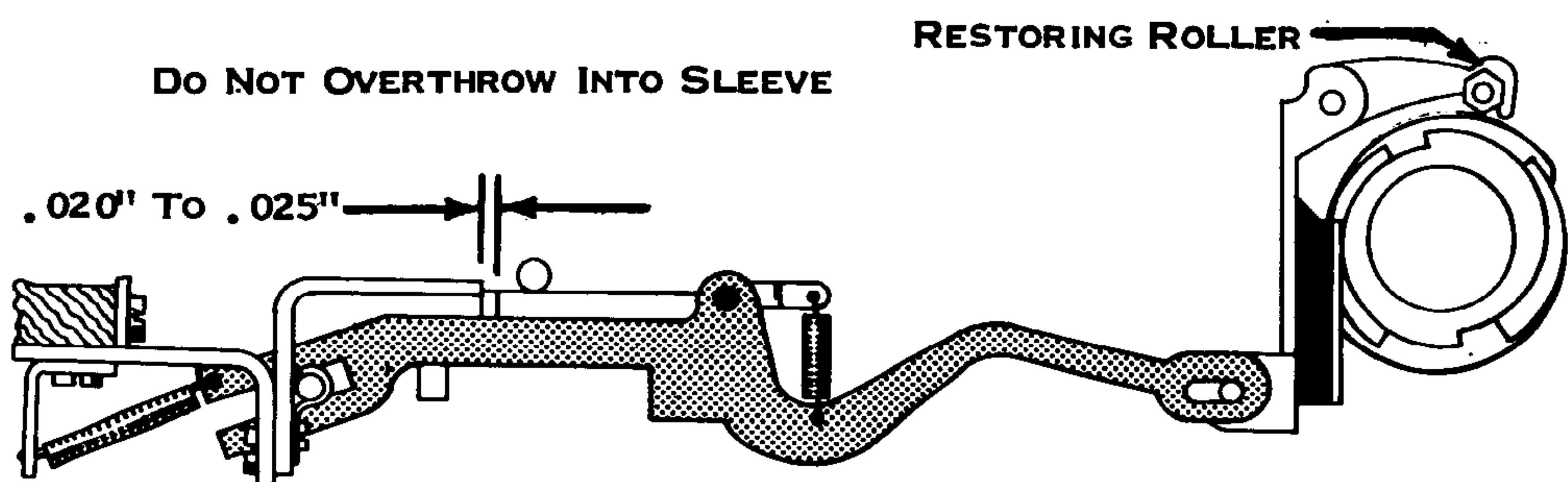


Figure 10. Cycle Clutch Latch Restoring, New Style

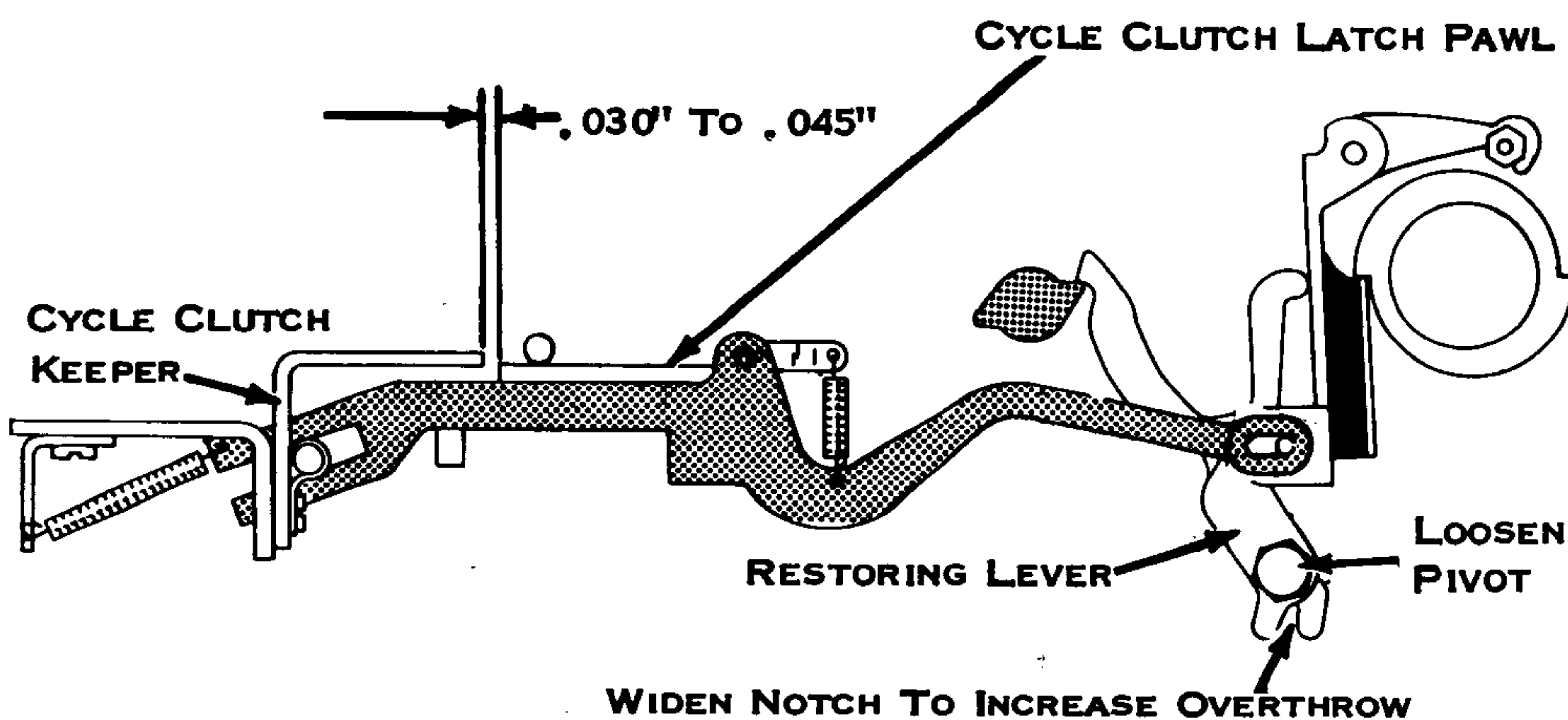


Figure 11. Cycle Clutch Latch Restoring, Old Style

7. Cycle Clutch Latch Keeper, "Release Point" (Fig. 12) - Position ("H" interposer latched down) so that the latch pawl clears the keeper by  $.002''$  to  $.008''$  at the unlatching point.

8. Interposer Latch Spring Adjustment, Final (Fig. 12, Ref. Fig. 8) - Position the left and right interposer latch spring banks so that the  $.002''$  to  $.008''$  latch pawl to keeper clearance is maintained with various interposers latched down.

9. Cycle Bail Upstop (Fig. 13) - Position so that the latch pawl overlaps the keeper by  $1/2$  the keeper thickness.

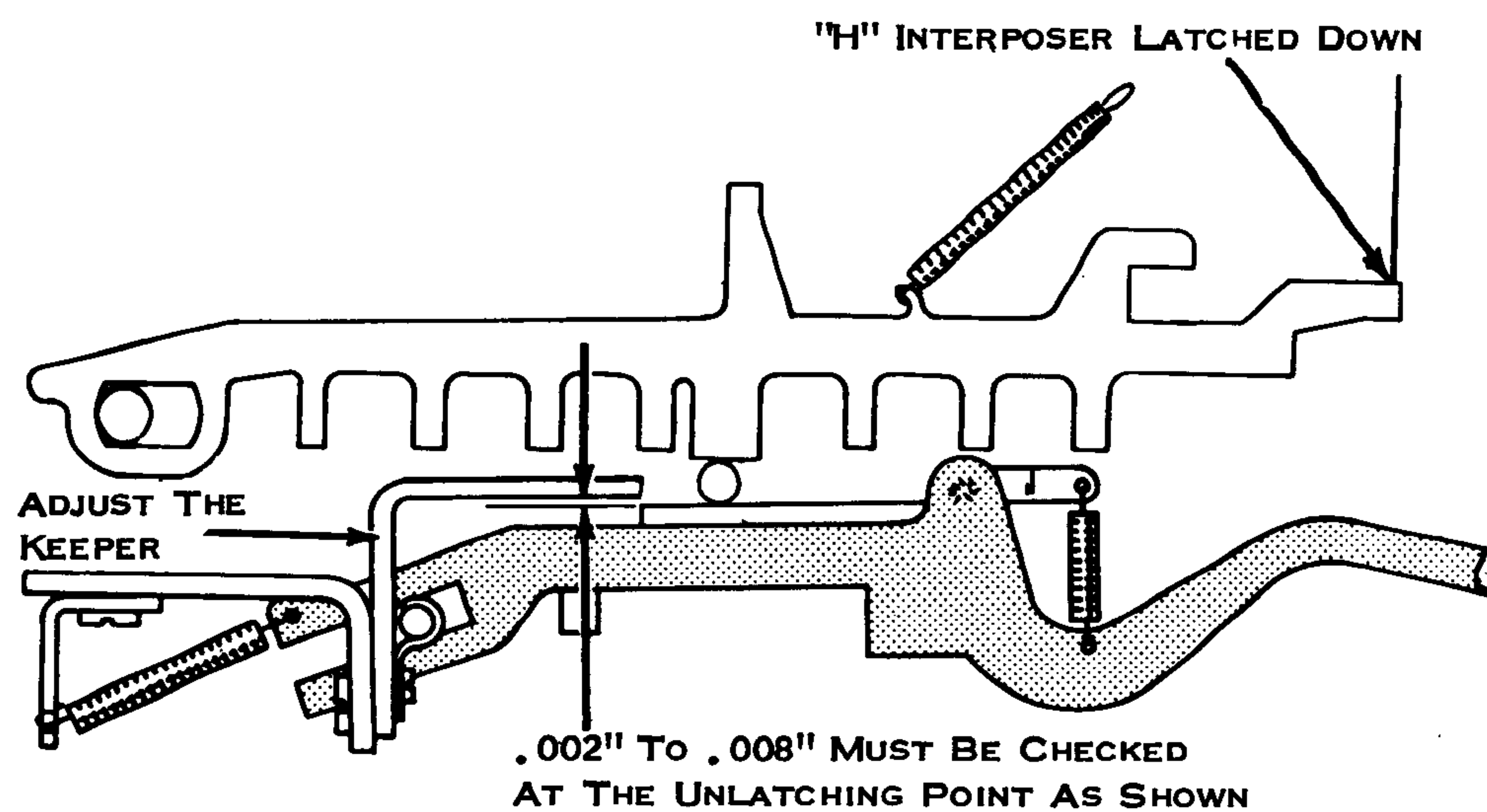


Figure 12. Cycle Clutch Release Point

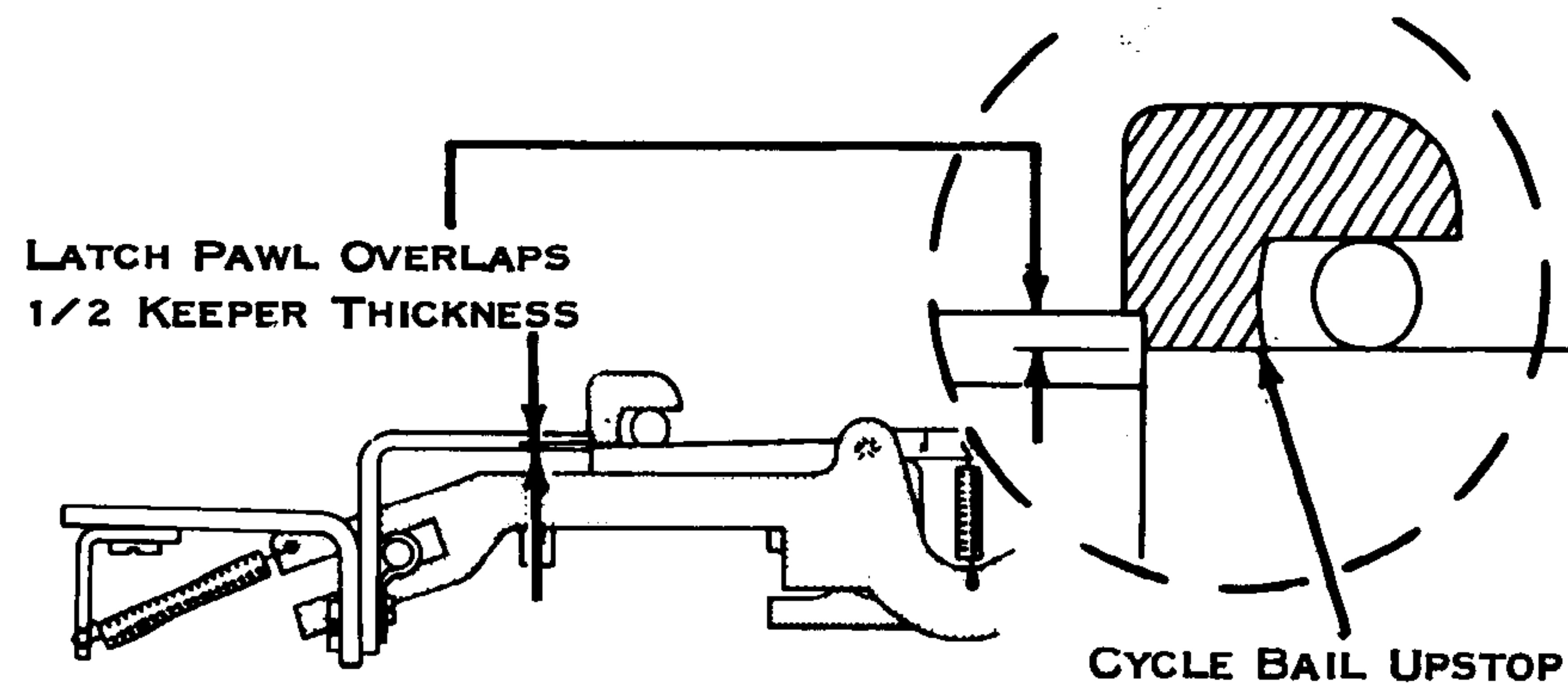


Figure 13. Cycle Bail Upstop Adjustment

10. Front Keylever Guide Comb (Fig. 14) - Position vertically to allow  $1/32''$  keylever travel after the keylever pawl resets.

Note; Form the keylever horseshoe for individual keylever adjustment. Movement of the front keylever guide comb will affect adjustment of operational keylevers.

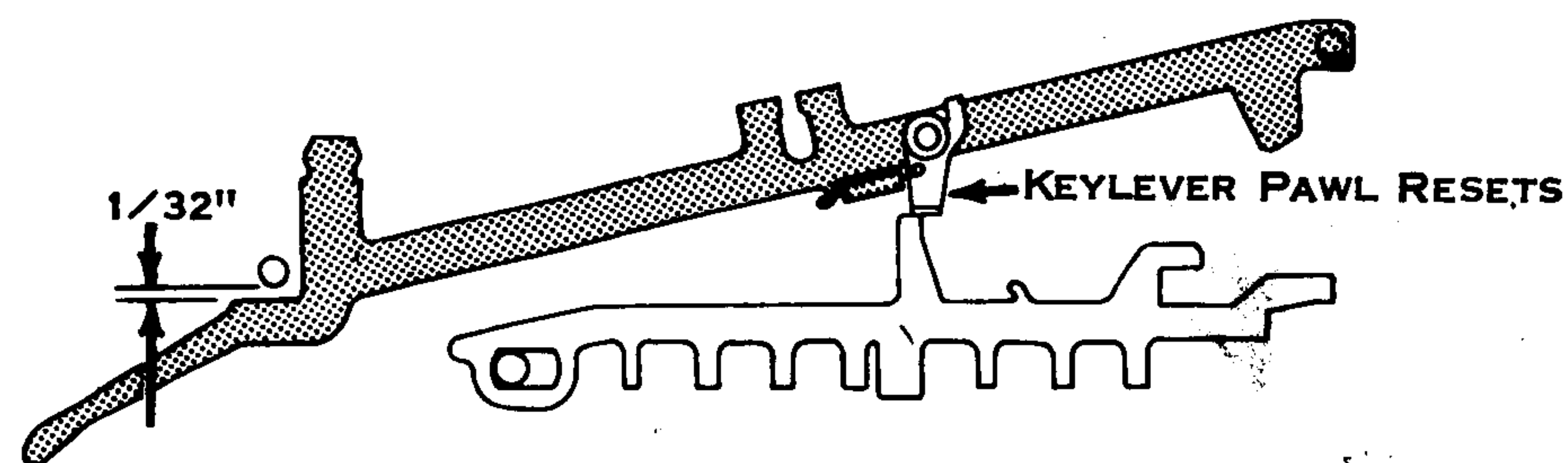


Figure 14. Front Keylever Guide Comb.

Note; Downward pressure applied to the keylever may result in breaking its keylever pawl if its interposer is allowed to block this pressure from below.

11. Selector Compensator - Adjust as follows:

- a. New Style (Fig. 15)
- (1) Loosen locking set screws in LH and RH nylon blocks.
  - (2) Latch extreme RH interposer down.
  - (3) Tighten RH adjusting plug so that the balls hold the interposer in the latched position when the interposer latch is disengaged.
  - (4) While holding the latch spring out of position, back out adjusting plug until interposer restores freely - then back.



- out 1/6 turn more (one flat on the hexagon nut is 1/6).
- (5) Repeat the same procedure on the LH side.
  - (6) Tighten locking set screws in the nylon blocks.

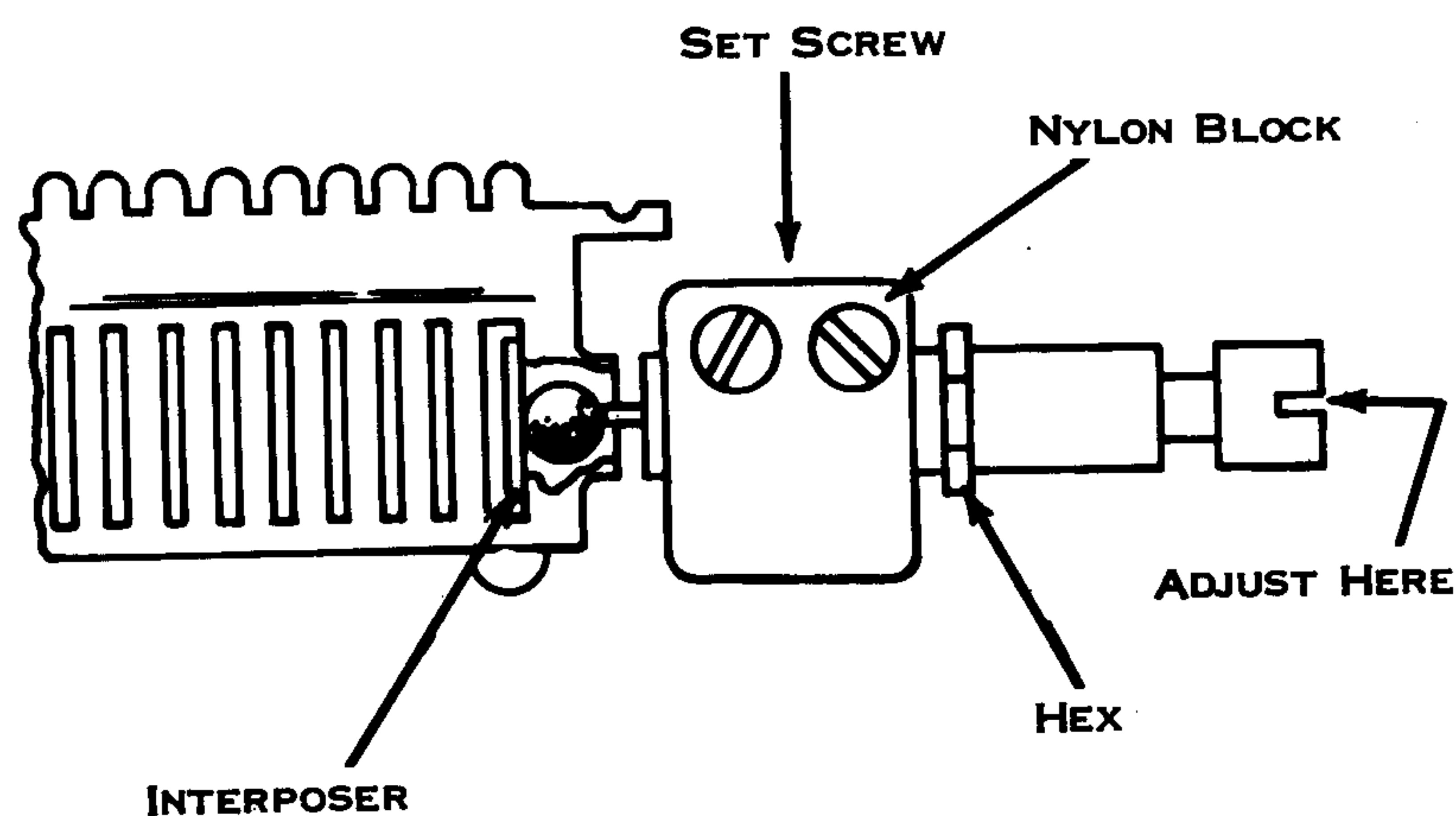
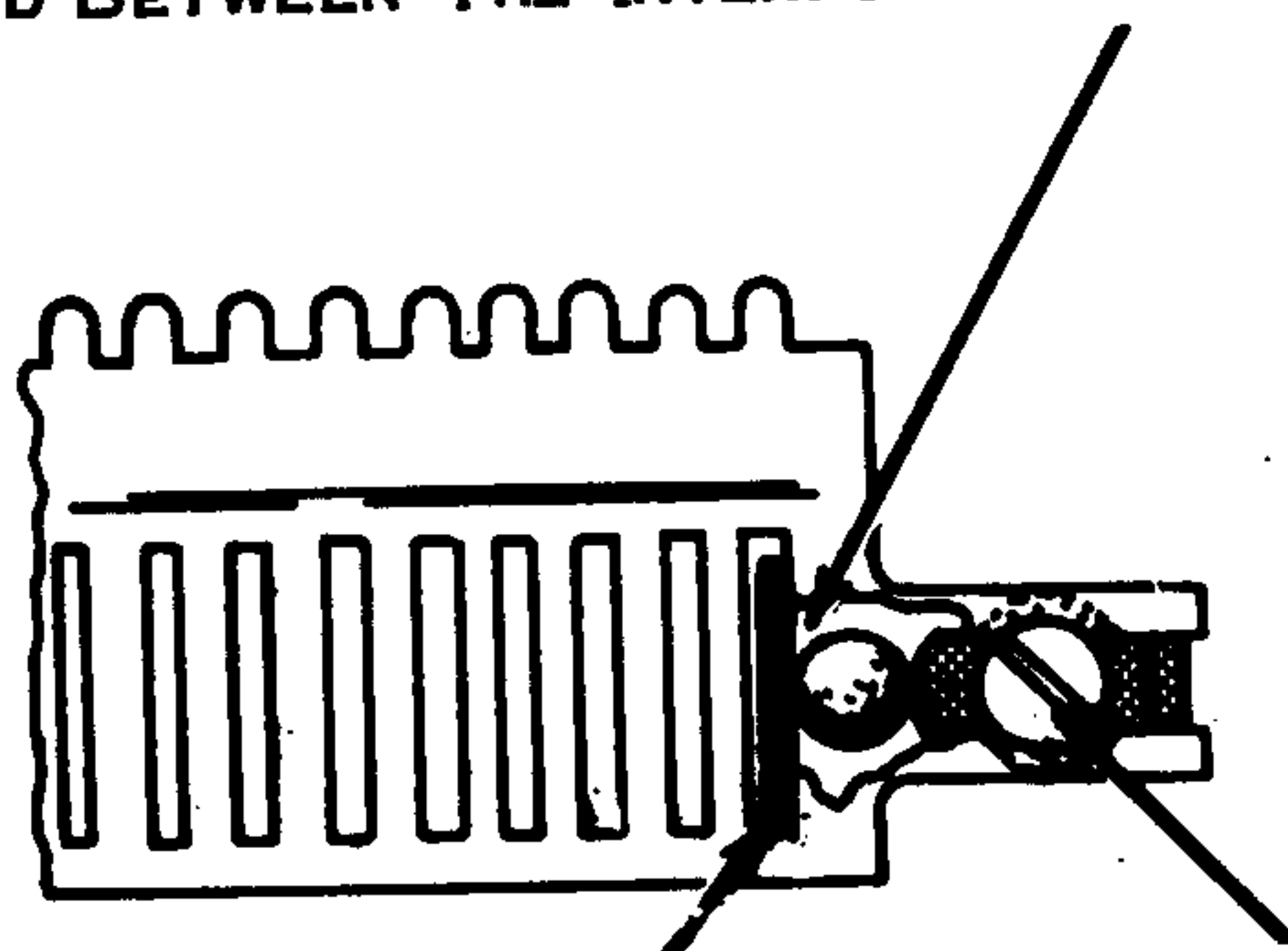


Figure 15. Compensator Adjustment, New Style

b. Old Style (Fig. 16)

With the extreme right interposer latched down and held against the right side of its guide slot, adjust the extreme right ball until it is trapped between the interposer and adjusting screw. The same adjustment procedure is followed for the left side using the extreme left interposer. The extreme left interposer must be latched down and held against the left side of its guide slot; then adjust the extreme left ball until it is trapped between the interposer and the adjusting screw.

BALL TRAPPED BETWEEN THE INTERPOSER AND ADJUSTING SCREW



INTERPOSER HELD AGAINST RIGHT SIDE OF ITS GUIDE SLOT

Figure 16. Compensator Adjustment, Old Style

LATCH PUSHER ASSEMBLY

NOTE:

- a. Do not remove pusher plate unless replacement of the plate is required.
  - b. The selector latch link adjustments Figure #'s 55, 56, & 57, must be correct before making any pusher to latch extension adjustments.
  - c. When removal of the Latch Pusher Assembly is required, scribe (for reinstallation reference) the pusher plate to power frame relationship. If the original relationship can be maintained, the adjustments will not have been destroyed by removal. In case of loss of relationship, position the pusher plate as nearly as possible for the prescribed latch to pusher clearances (Fig. 18) and proceed with the following adjustments.
1. Pusher Bail Eccentrics (Fig. 17) - Adjust so that the top edge of the follower arms are flush with the pusher bail.
  2. Latch Pushers T2, T1, R2, R1, & R5 (Fig. 18) - Form to clear their respective latch extensions by .025" to .035".
  3. Latch Pusher, R2A (Fig. 18) - Form to clear latch extension by .040" to .050".

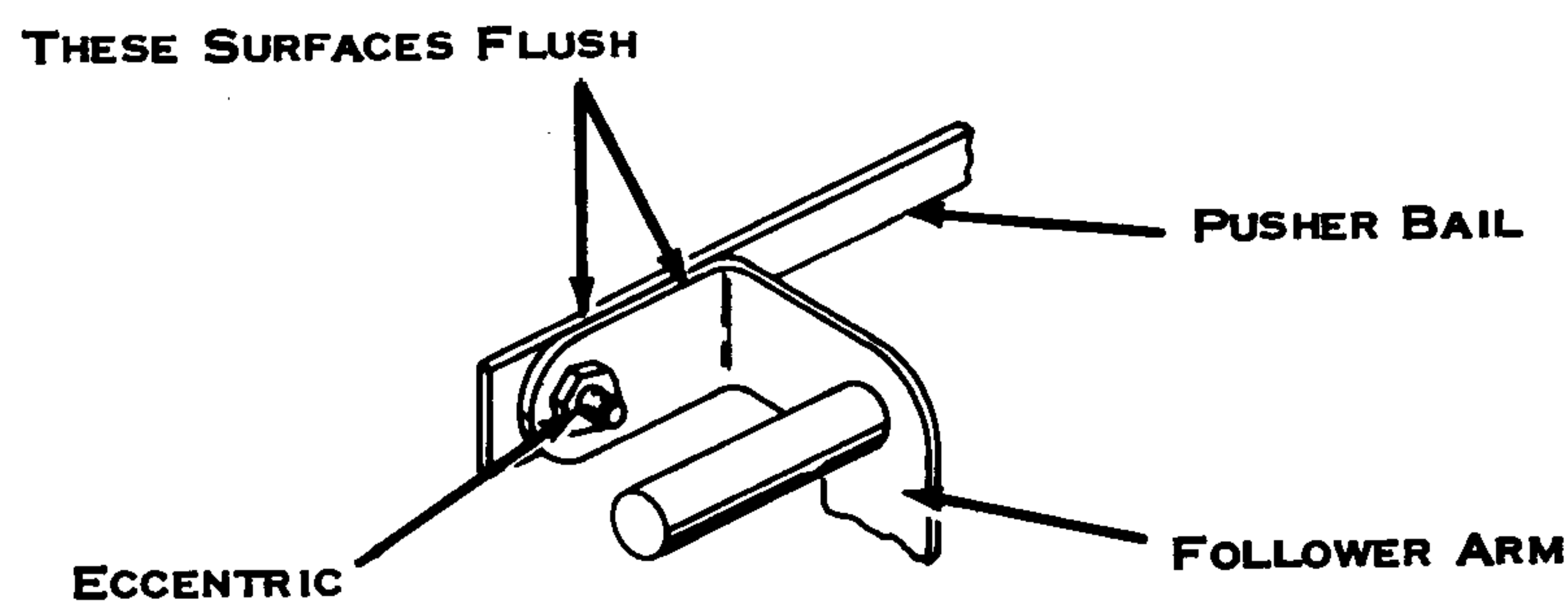


Figure 17. Pusher Bail

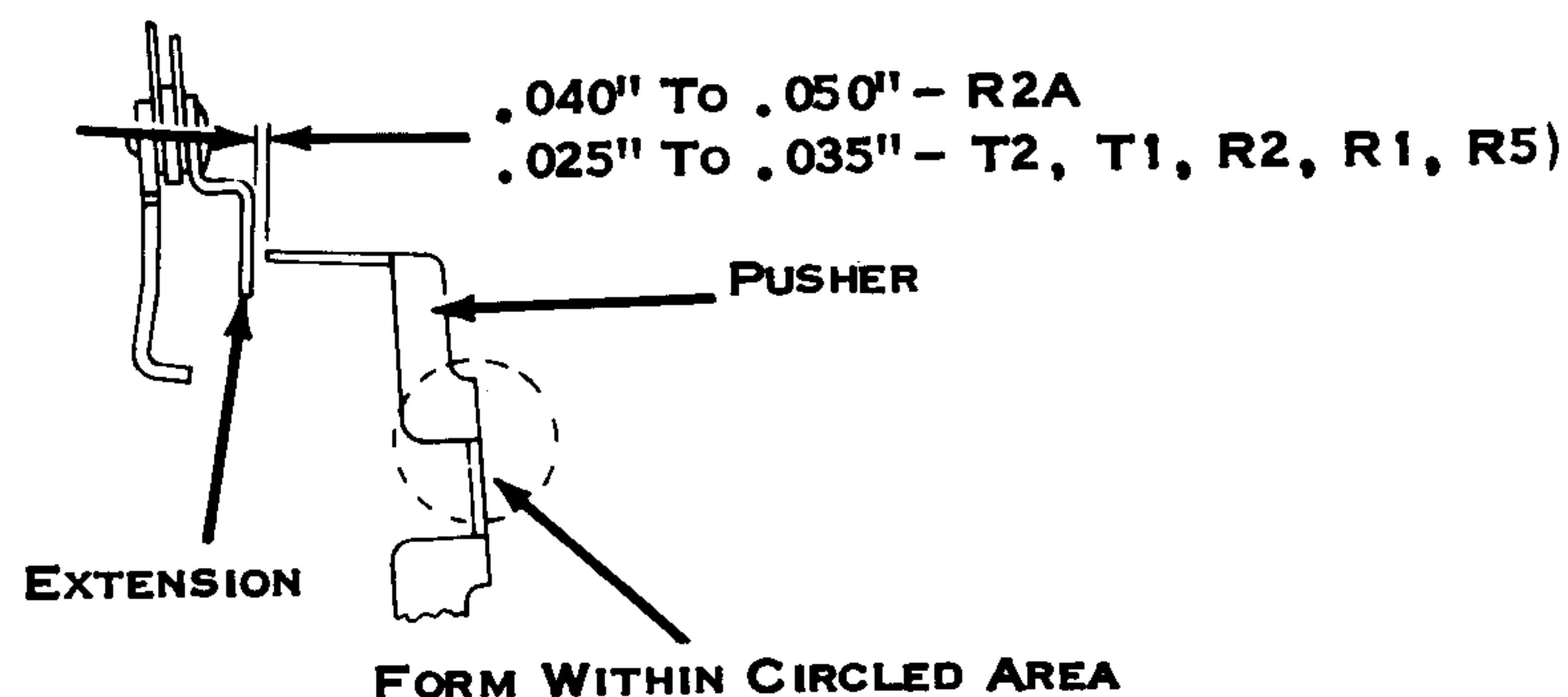


Figure 18. Latch Pushers

4. Check Latch Pusher (Fig. 19) - Form so that the check latch clears the selection bail by .020" to .030". This clearance must be observed with the selection bail lowered slightly.

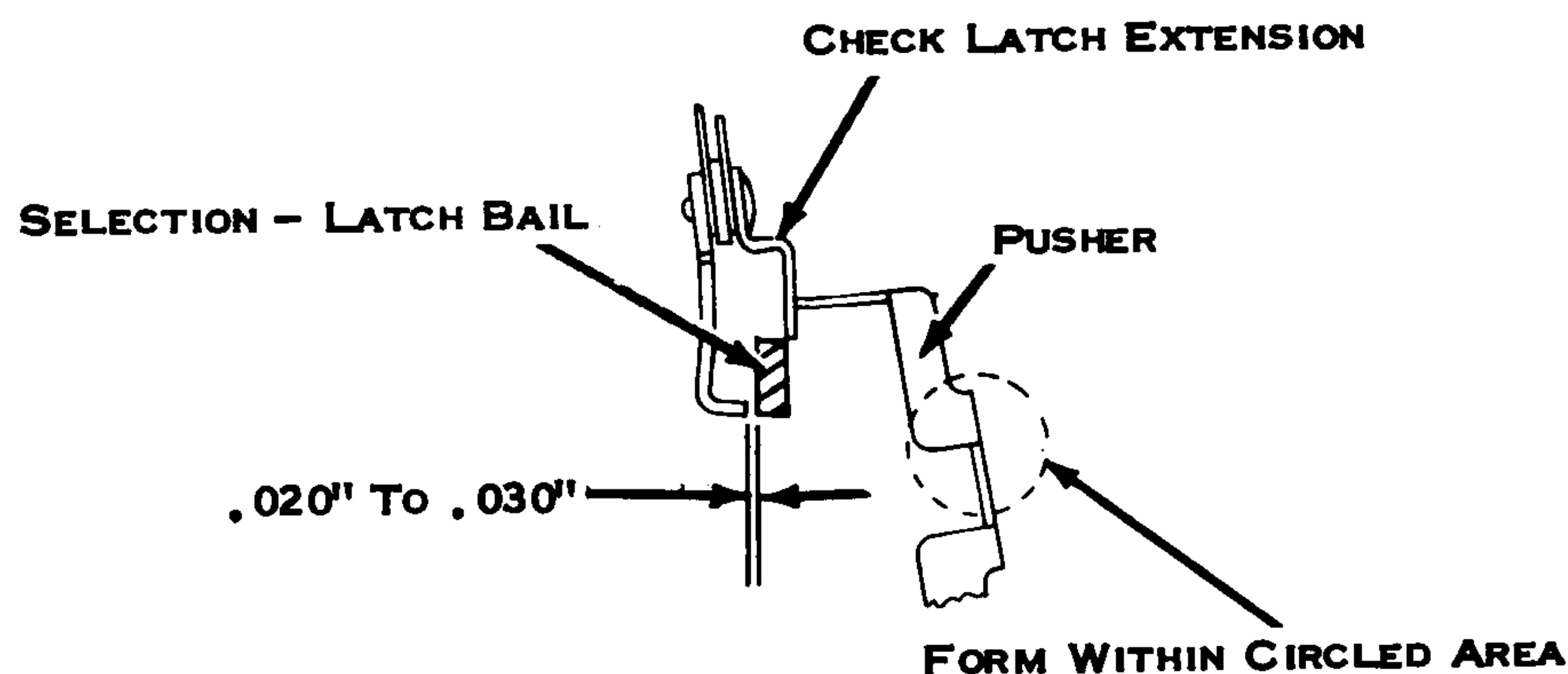


Figure 19. Check Latch Pusher

PRINT SELECTION MAGNET ASSEMBLY

NOTE:

For complete adjustment, the magnet unit should be removed. To prevent interference from the trip bail, turn the high points of the pivot eccentrics to the top.

1. Pivot Plate (Fig. 20) - Adjust for a clearance of .001" to .006" between the yoke and armatures with the armatures manually attracted. Measure clearances at the outside armatures (T2 & R5).
2. Guide Plate (Fig. 20) - Position as follows:
  - a. Vertically - to provide equal spring tension on all armature springs.
  - b. Horizontally - so that all armatures are centered in the guide slots.
3. Armature Stop - With the armature manually attracted, adjust for a clearance of .004" to .008" between the armatures and yokes (Fig. 22 - see Fig. 21 for assembly end view). Measure clearances at the outside armatures (T2 & R5).
4. Armature Guide - Position horizontally so that the armatures are centered in the guide slots (Ref. Fig. 21).



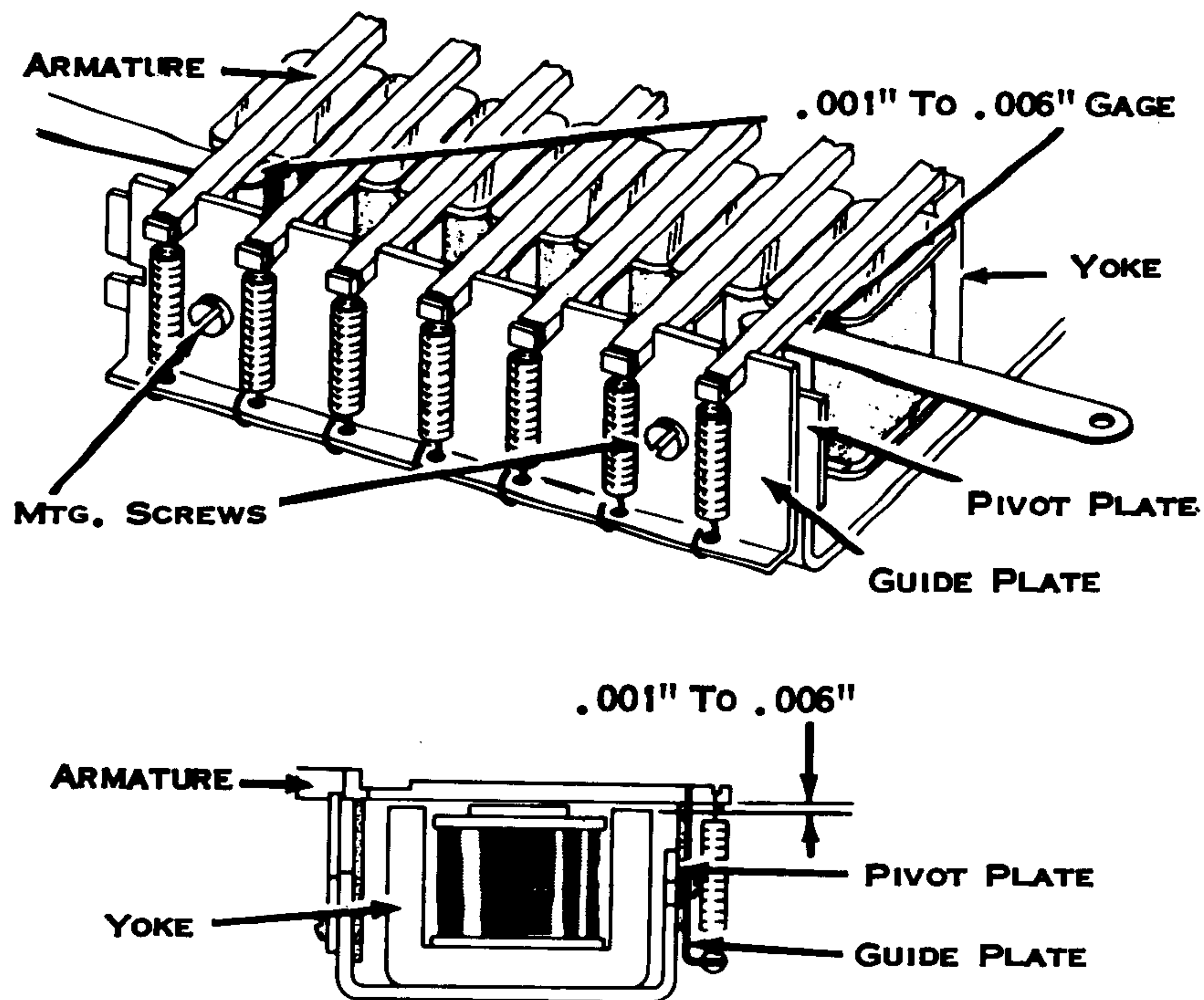


Figure 20. Pivot Plate

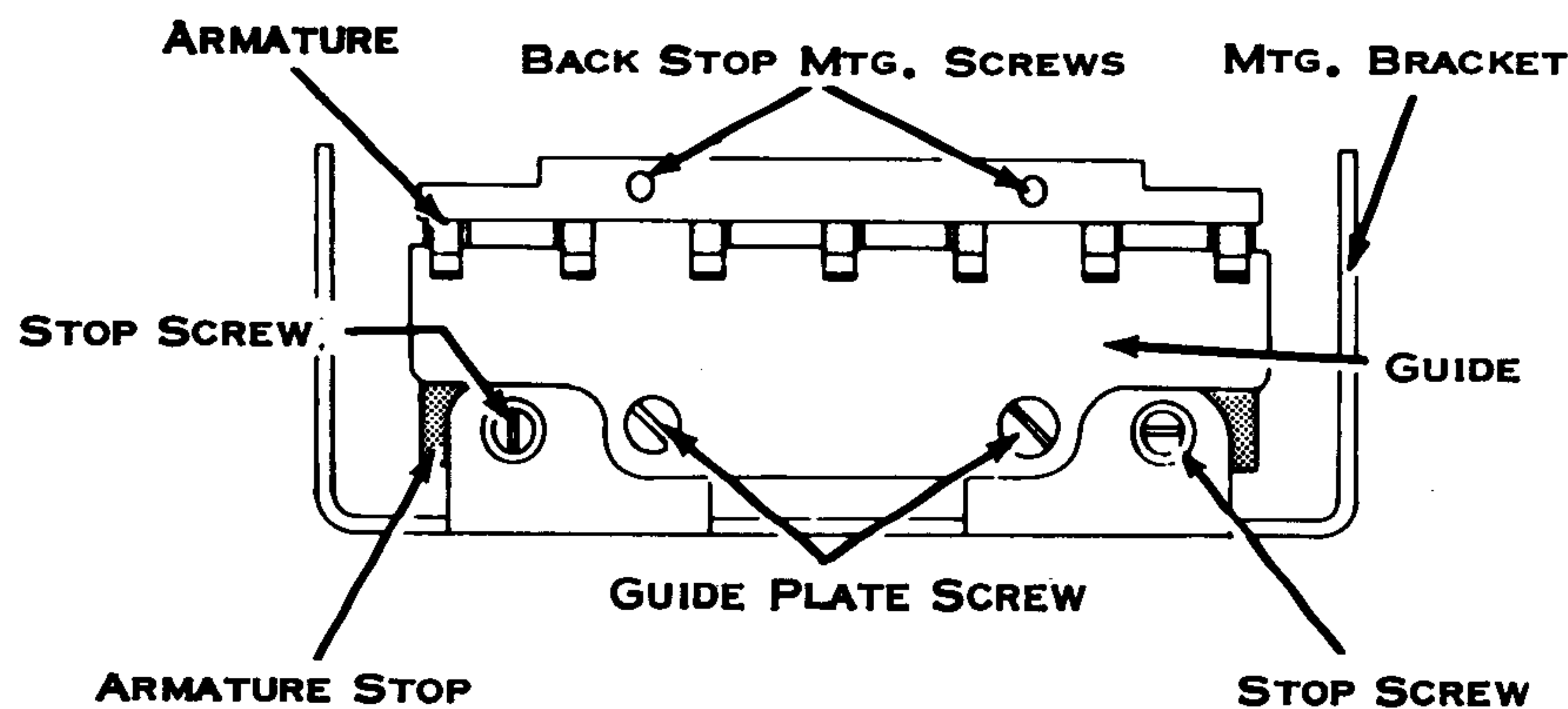


Figure 21. Armature Stop

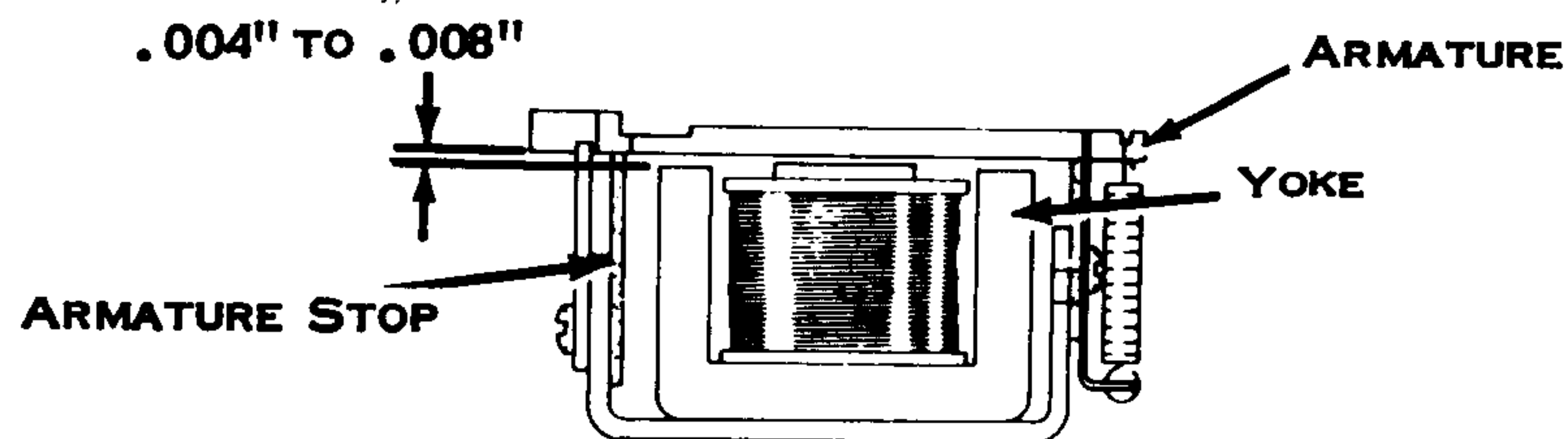


Figure 22. Armature Stop

5. Back Stop (Fig. 23) - Position vertically (with armatures at rest) for a clearance of .041" to .044" between the armature stop and armatures. Measure clearance at the outside armatures (T2 & R5).

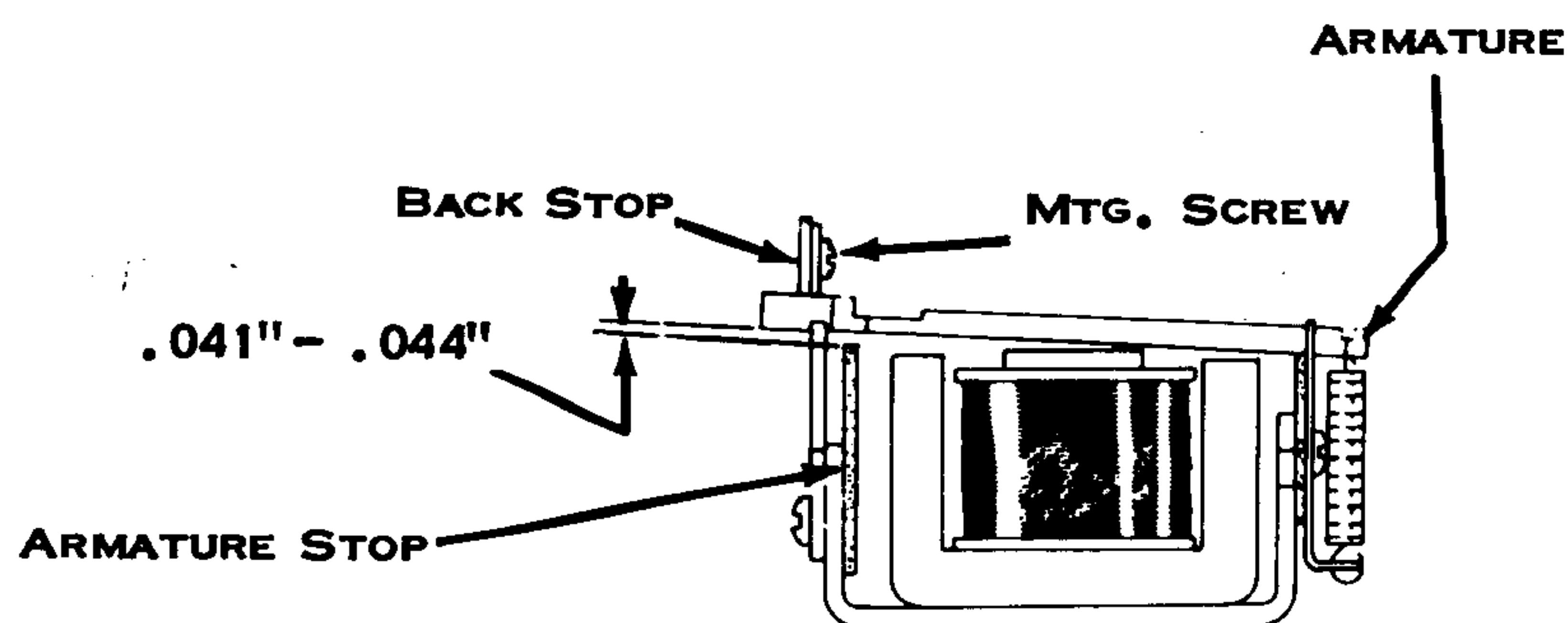


Figure 23. Armature Backstop

6. Pivot Eccentrics (Fig. 24) - Adjust so that the cycle clutch trip bail just touches the armatures (at rest). Apply slight pressure to the knock off extension to hold the bail in contact with the armatures. The adjustment must be obtained with the high point of the eccentric toward the top of the machine. Both eccentrics must be adjusted to insure contacting all armatures evenly.

NOTE:

Item 6 is a preliminary adjustment. For final adjustment, see note under Item 3 of cycle clutch trip mechanism.

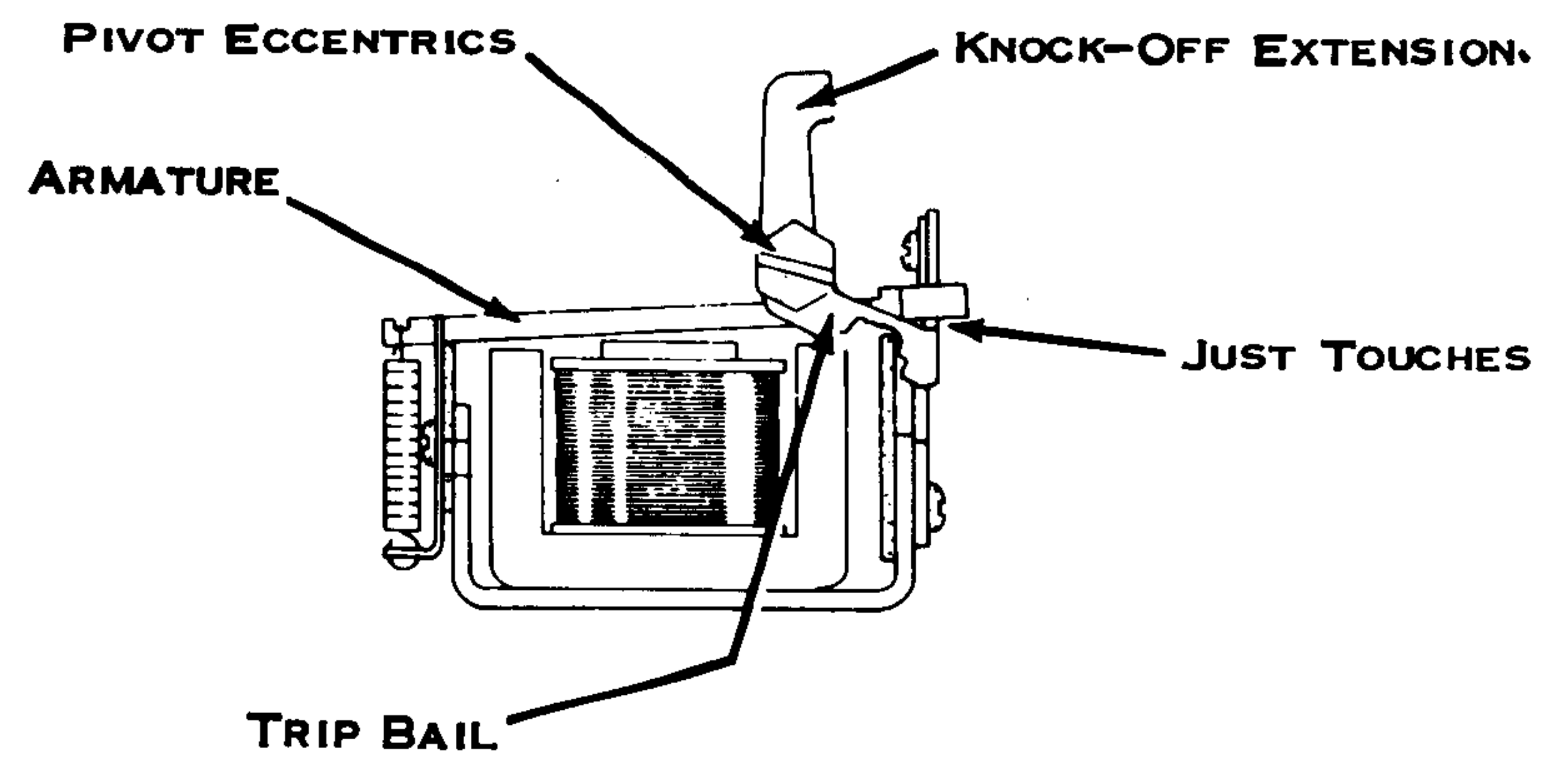


Figure 24. Pivot Eccentrics

7. Magnet Unit (Fig. 25) - Position under its two mounting screws for .005" to .010" clearance between the pusher tails and armature latching surfaces (armatures at rest).

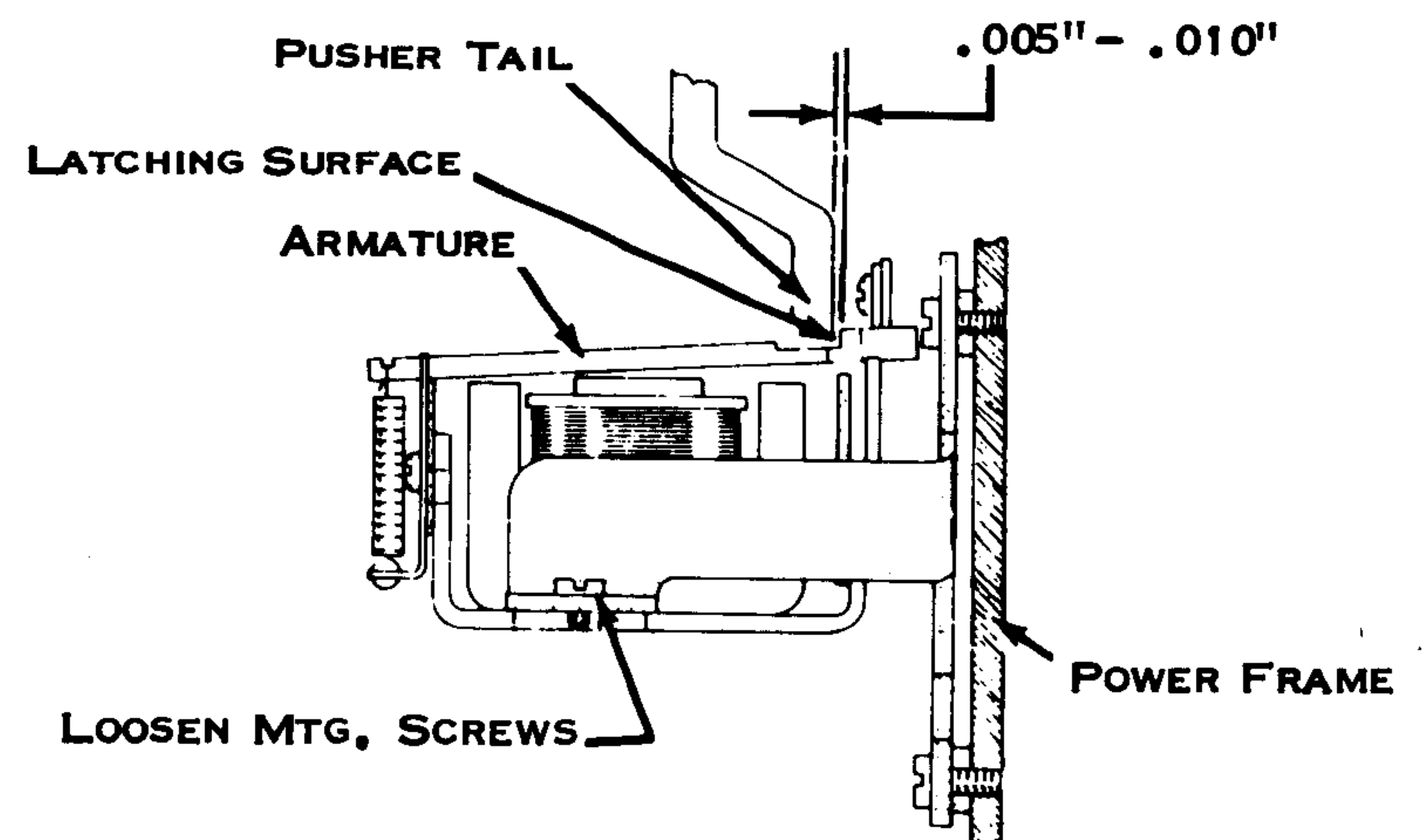


Figure 25. Magnet Unit Position

8. Mounting Bracket (Fig. 26) - Position under its four mounting screws for .001" to .010" clearance between the pusher tails and armatures.

NOTE:

Adjustments 7 & 8 are interacting - both requirements must be satisfied.

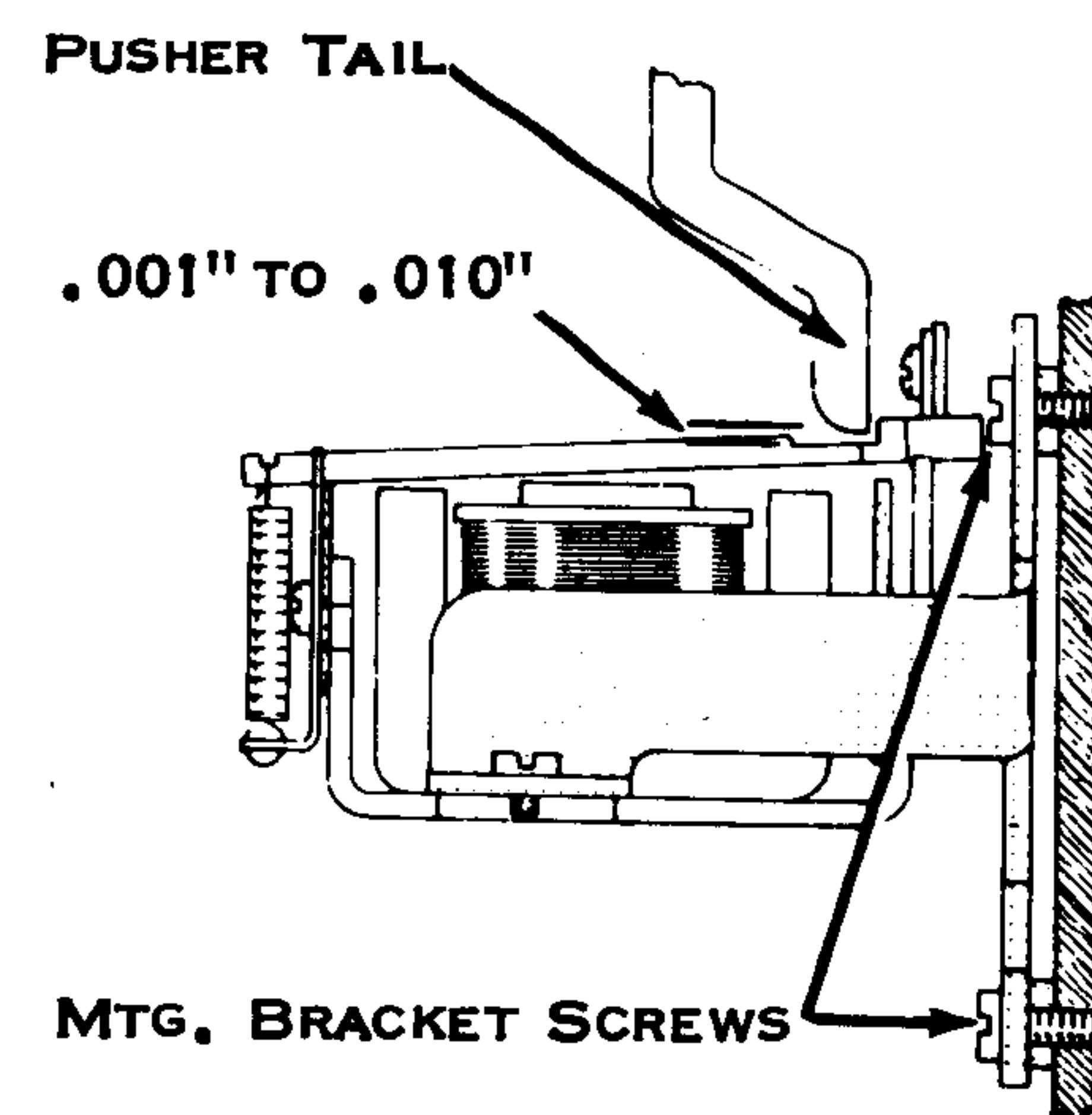


Figure 26. Mounting Bracket Position

9. Knock Off Eccentrics (Fig. 27) - Adjust (T2 and R5 armatures manually attracted) to clear the trip bail extensions by .003" to .008".



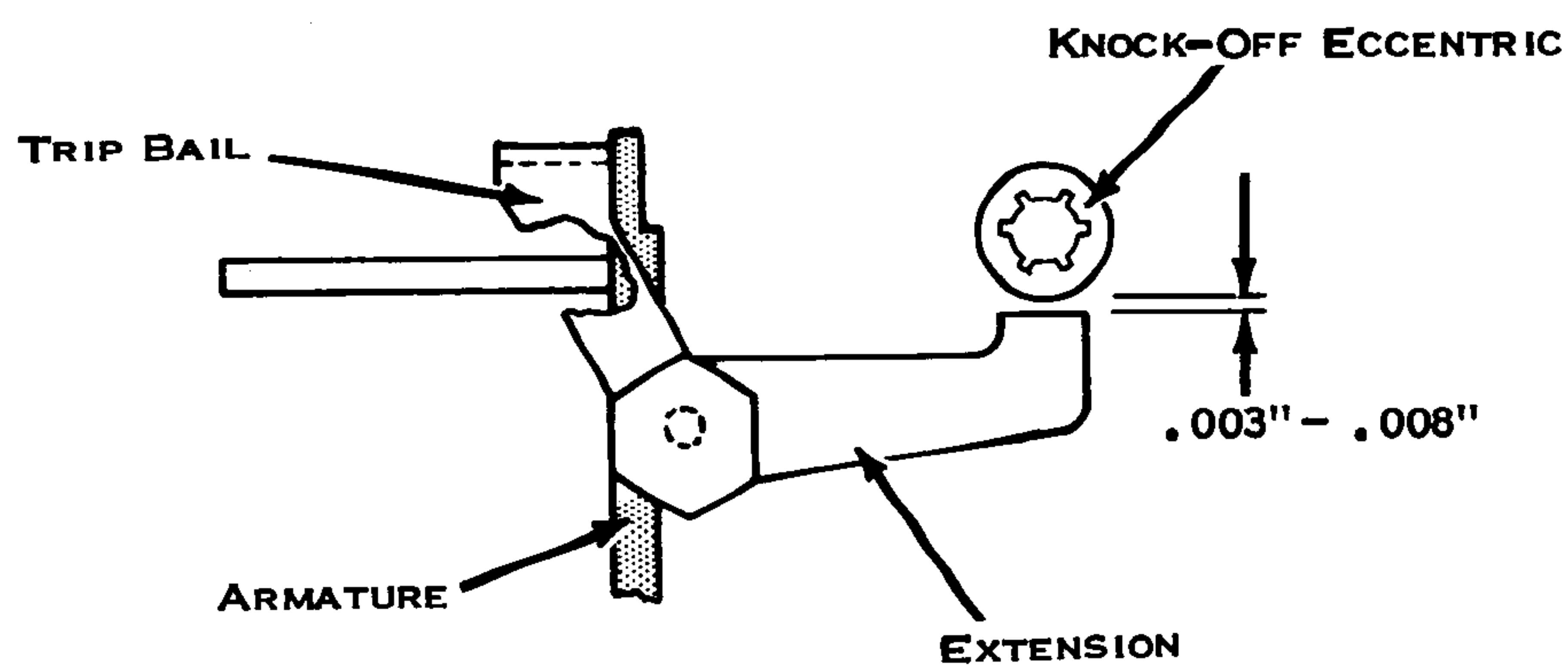


Figure 27. Knock Off Eccentrics

**CYCLE CLUTCH TRIP MECHANISM, NEW**

1. Latch Stop (Fig. 28) - Position so that the latch lever overlaps the trip lever lug by .028" to .033".

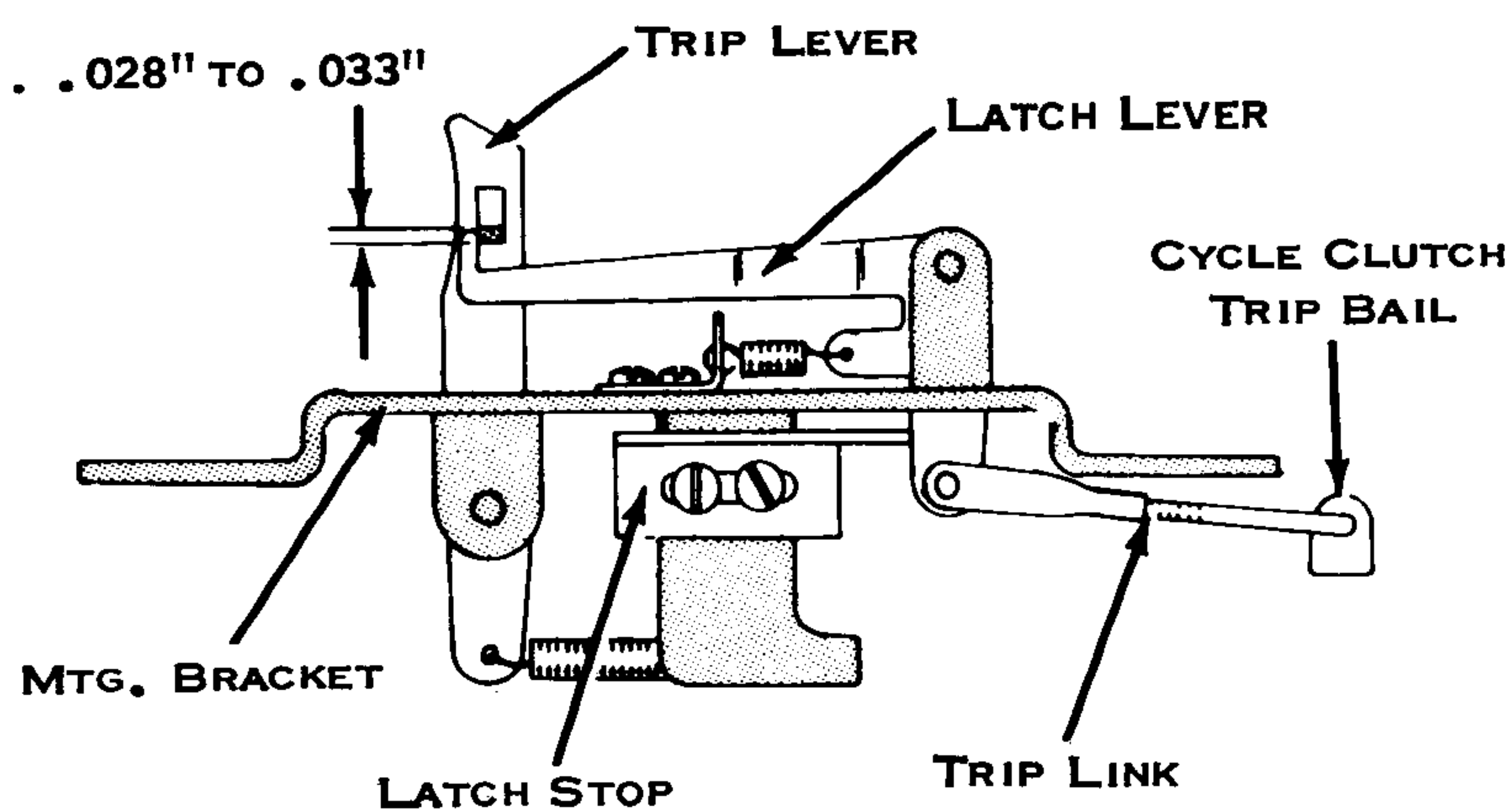


Figure 28. Latch Lever

2. Mounting Bracket (Fig. 30) - Position front to rear so that the trip lever clears the cycle clutch latch by .003" to .010".
3. Trip Link Clevis (Fig. 29) - With either the T2 or R5 armature manually attracted, adjust the clevis so that the latch lever overthrows the trip lever lug by .005" to .020" (Ref. Fig. 28).

**NOTE:**

If necessary, refine the pivot eccentric adjustment to obtain equal latch lever overthrow from the T2 and R5 armatures (Ref. Fig. 24).

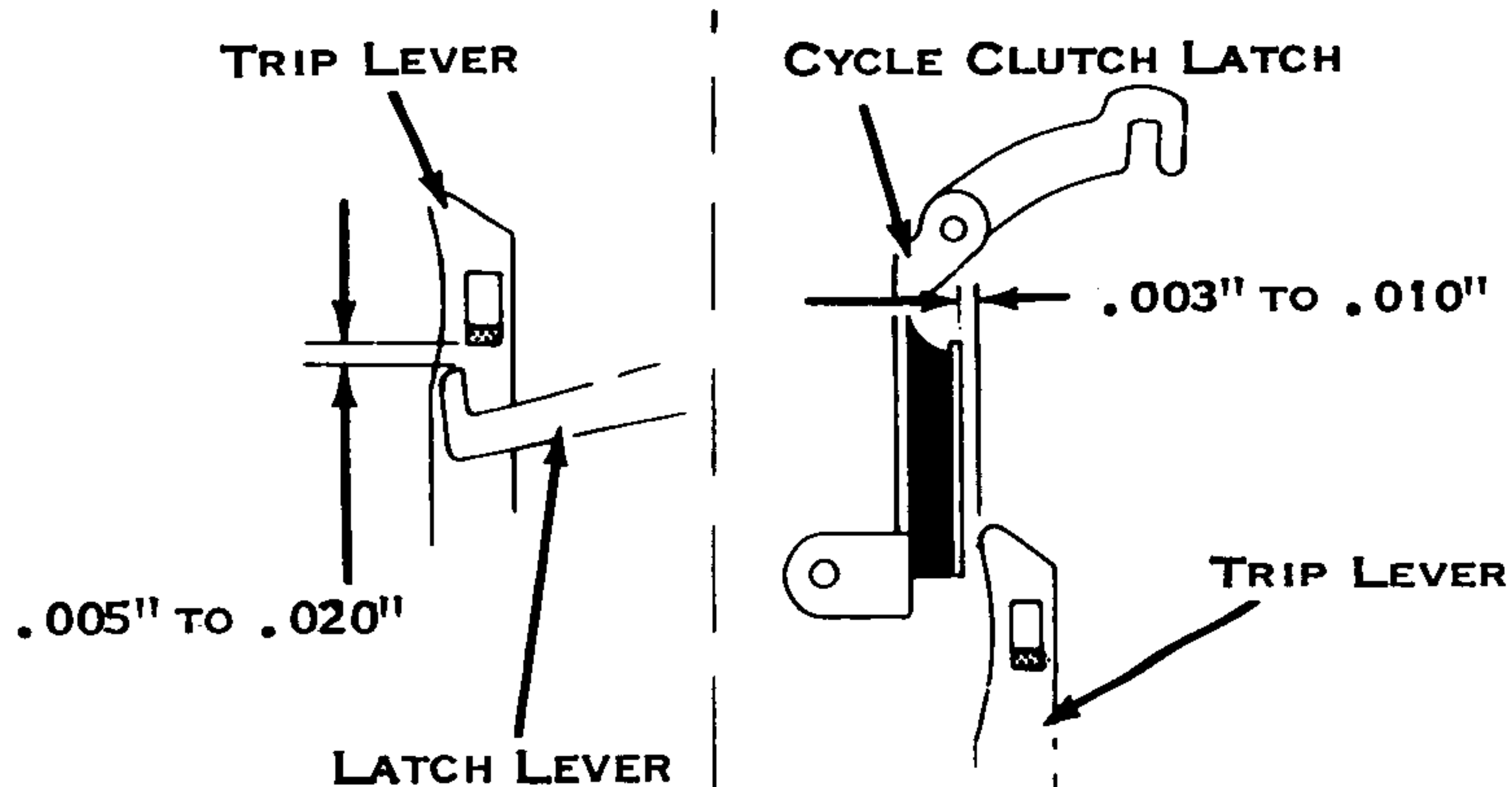


Figure 29. Trip Link Adjustment

Figure 30. Mounting Bracket Position

**CYCLE CLUTCH TRIP MECHANISM, OLD**

1. Trip Link (Fig. 31) - Hold a print magnet armature attracted and adjust the cycle clutch trip link clevis to move the cycle clutch latch .002" to .007" away from the clutch sleeve.

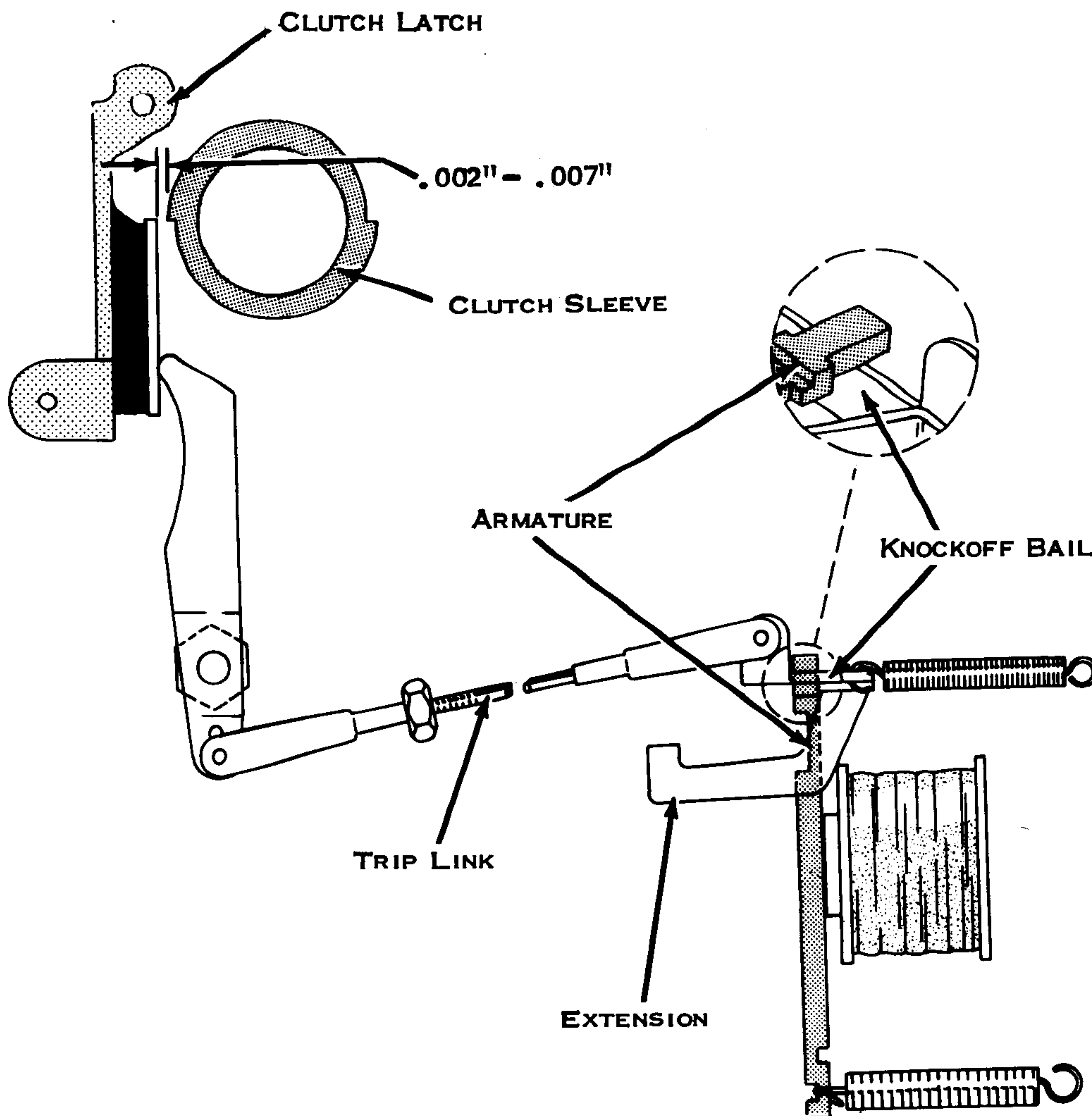


Figure 31. Old-Style Cycle-Clutch Trip-Link Adjustment

**PRINT SELECTION CONTACT ASSEMBLY**

1. Contact Stacks (Fig. 32) - Align so that the strap edges are parallel. Loosen mounting screws and shift contact blocks for adjustment.

**NOTE:**

The contact assembly should be removed for complete adjustment.

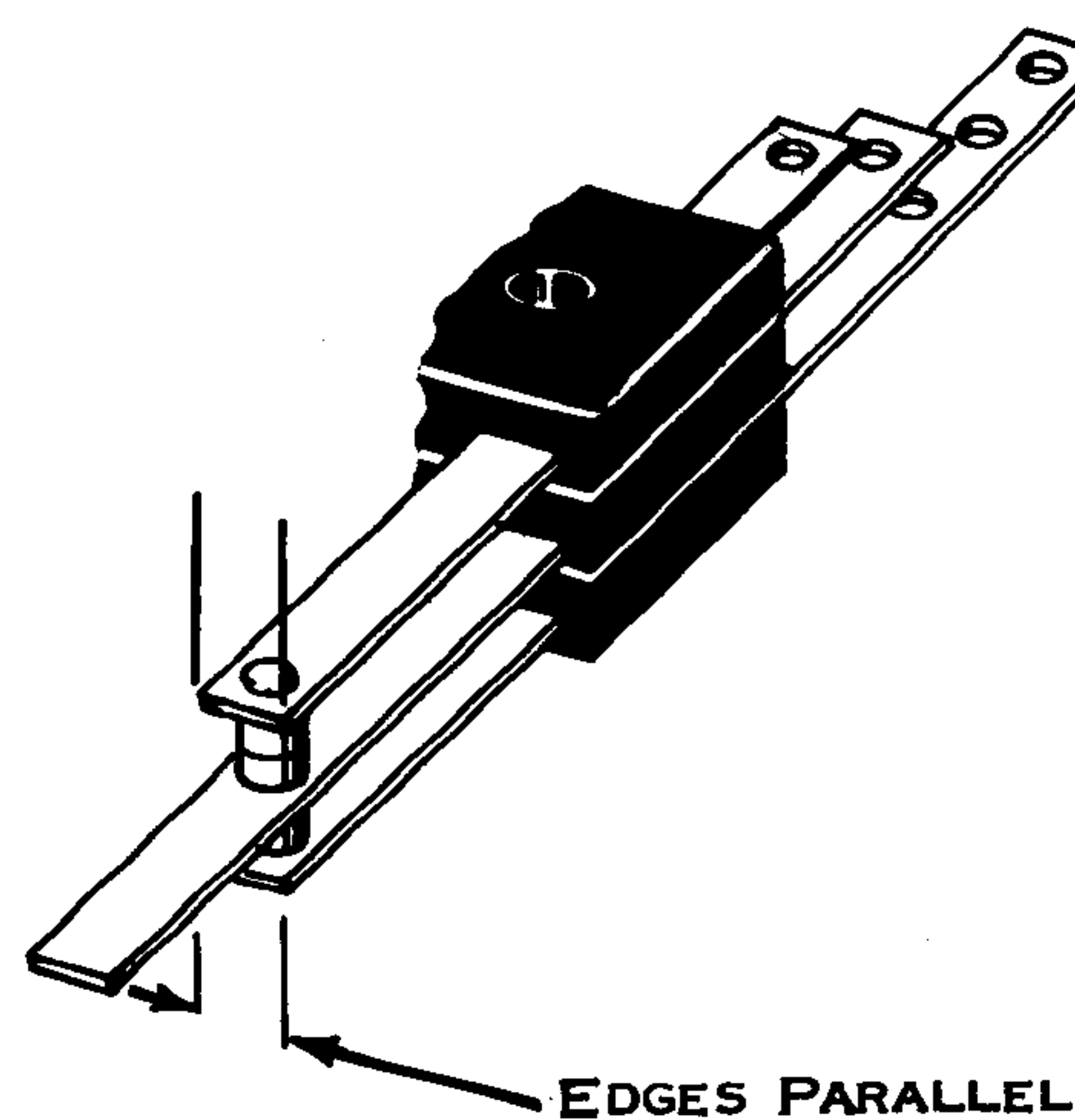


Figure 32. Contact Stacks

2. Actuator Guides (Fig. 33) - Mount squarely against the rear edge of the contact mounting plate with the actuators centered between the contact operating straps. The actuator guide and contact mounting screws must both be loosened for this inter-related adjustment.



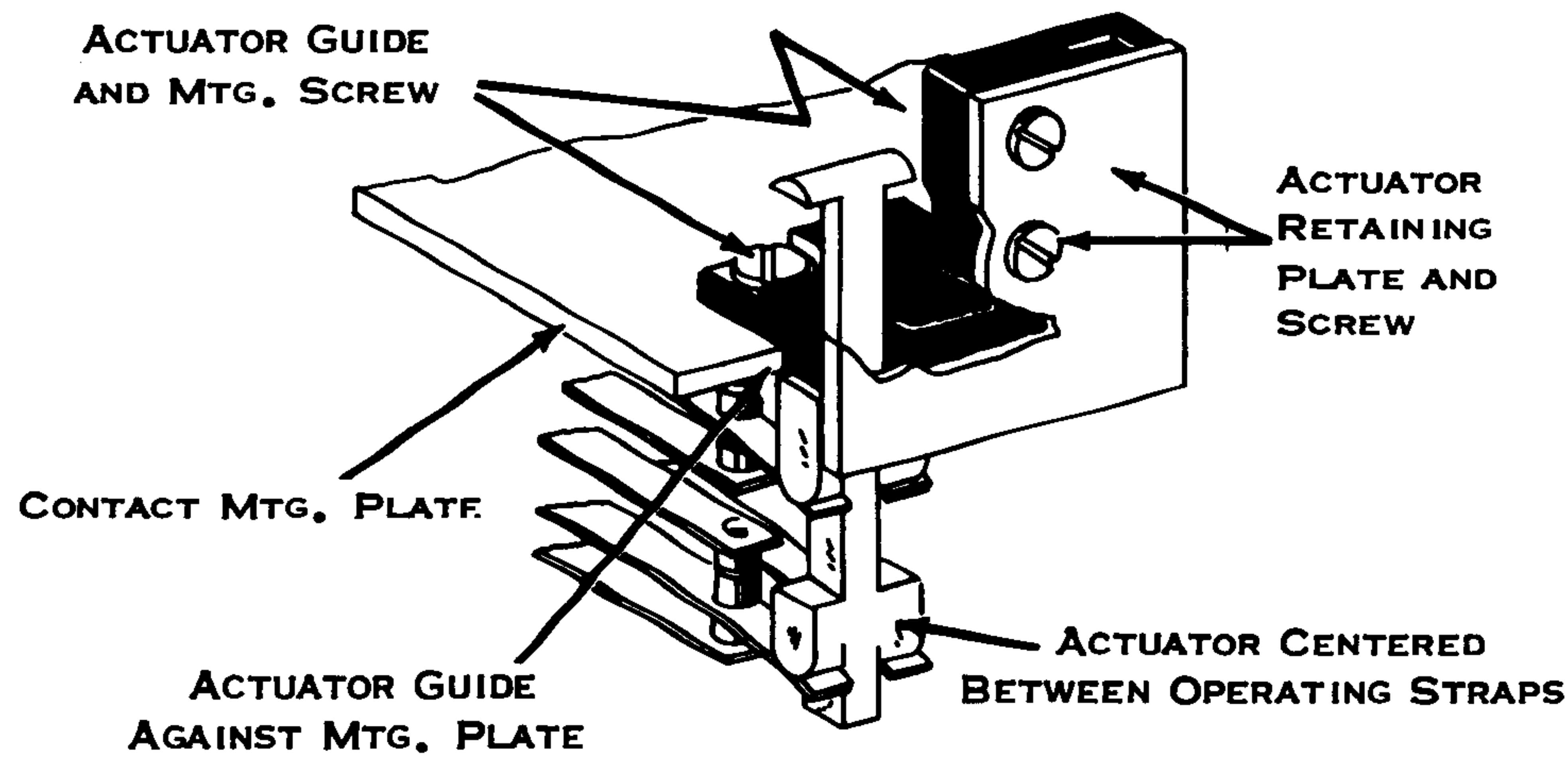


Figure 33. Actuator Guides

3. Contact Straps (Fig. 34) - Form (actuators at rest) as required to satisfy the following conditions.

- The O/S should just touch the actuator camming surface.
- The O/S should produce a slight rise of the N/C straps.
- The N/O to O/S clearance should be .020" to .030". The low end of the tolerance is preferable.

4. Contact Asm. Mounting Plate - Position for the following conditions.

- To the rear so that the actuator retaining plates contact the differential plate.
- To the left so that the actuator clears the R5 bail.

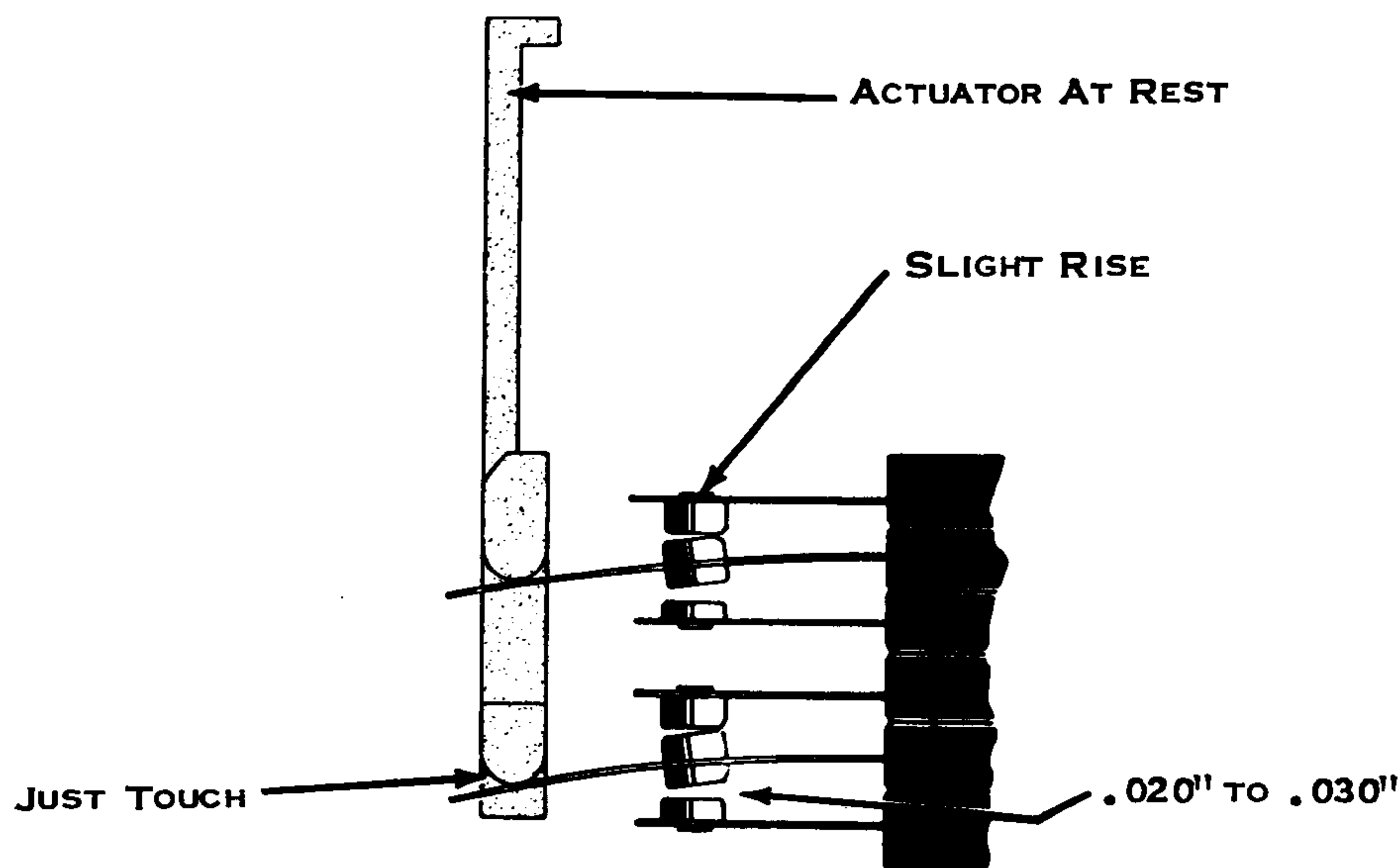


Figure 34. Contact Straps

#### PRINT FEEDBACK CONTACT ASSEMBLY, C1 and C2

On present production machines, C2 is nearest the power frame with C1 on the outside. Some low serial number Printers have this arrangement reversed. The longer (C2) and shorter (C1) duration can easily be distinguished by inspection since the cam land is widest on the longest duration (C2) cam.

- Form the N/C supports so that the O/S's lift the N/C contacts .002" to .005" from the N/C supports (Fig. 35).
- Form the N/O supports for .030" to .040" air gap between the O/S's and N/O contacts (Fig. 35).
- Position the contact mounting bracket so that the O/S's clear the cam (at the low point) .002" to .010" (Fig. 35).

#### NOTE:

Print feedback contacts #1 and #2 are mounted on different tabs to permit equalization of the O/S to cam clearance (Fig. 36).

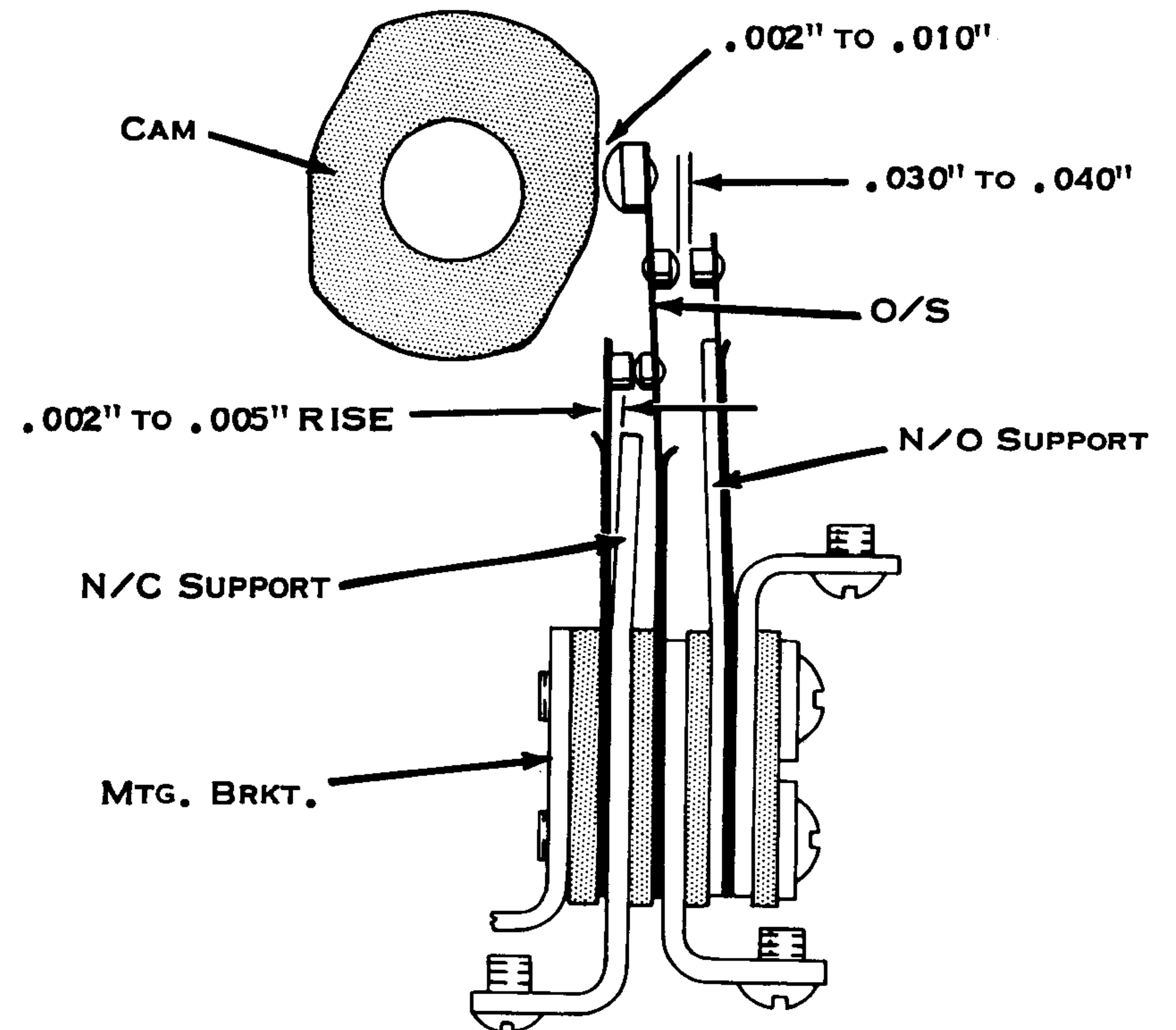


Figure 35. Print Feedback Contacts

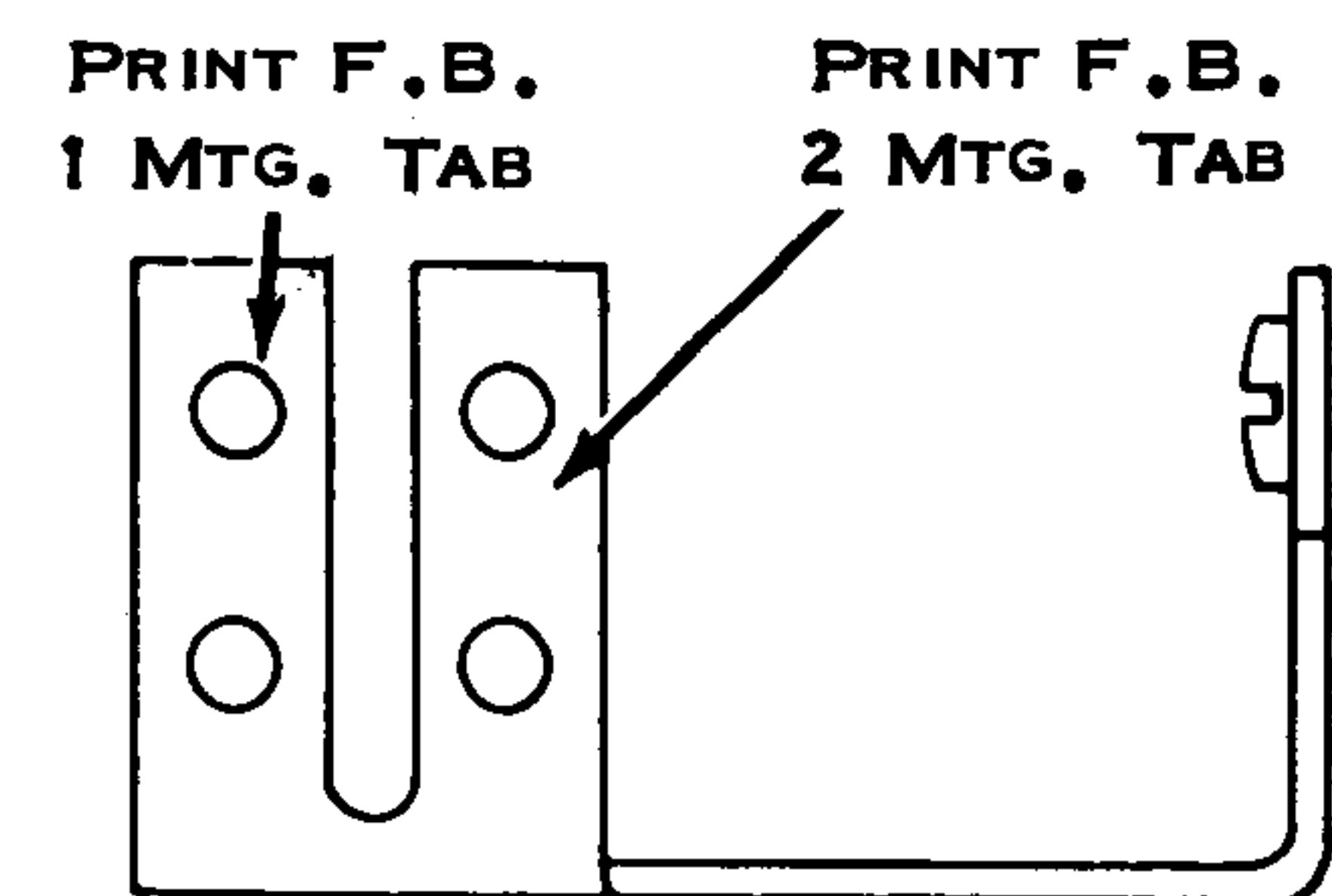


Figure 36. Print Feedback Contacts

#### KEYLEVER CONTACTS

#### NOTE:

The contact assembly should be removed from the contact and stop screw mounting bracket for adjustments 1 & 2.

1. Stop Screw (Fig. 37) -

- Position the mounting bracket (left or right) so that the stop screws are directly under the keylever.
- Adjust the keylever stop screws so that the keylevers do not go further down than the tab keylever.

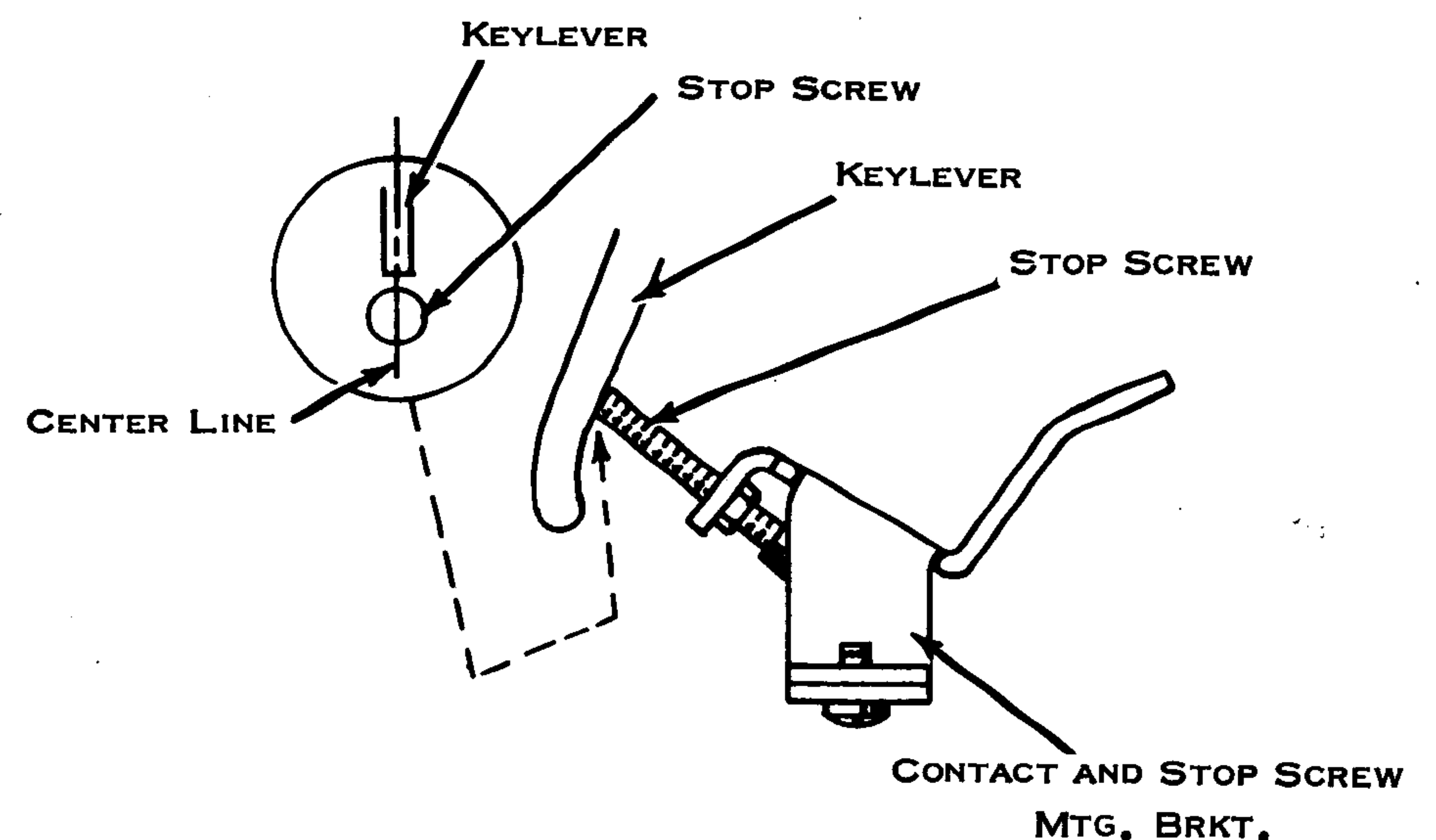


Figure 37. Stop Screw



2. Contact Position (Fig. 38) -

- Position the contacting actuating springs relative to the O/S's for vertical alignment.
- Form the N/C contact so that the O/S (at rest) lifts the N/C contact adequately. In this condition, check for sufficient O/S to N/O contact air gap. The N/C contact must break before the N/O contact makes.

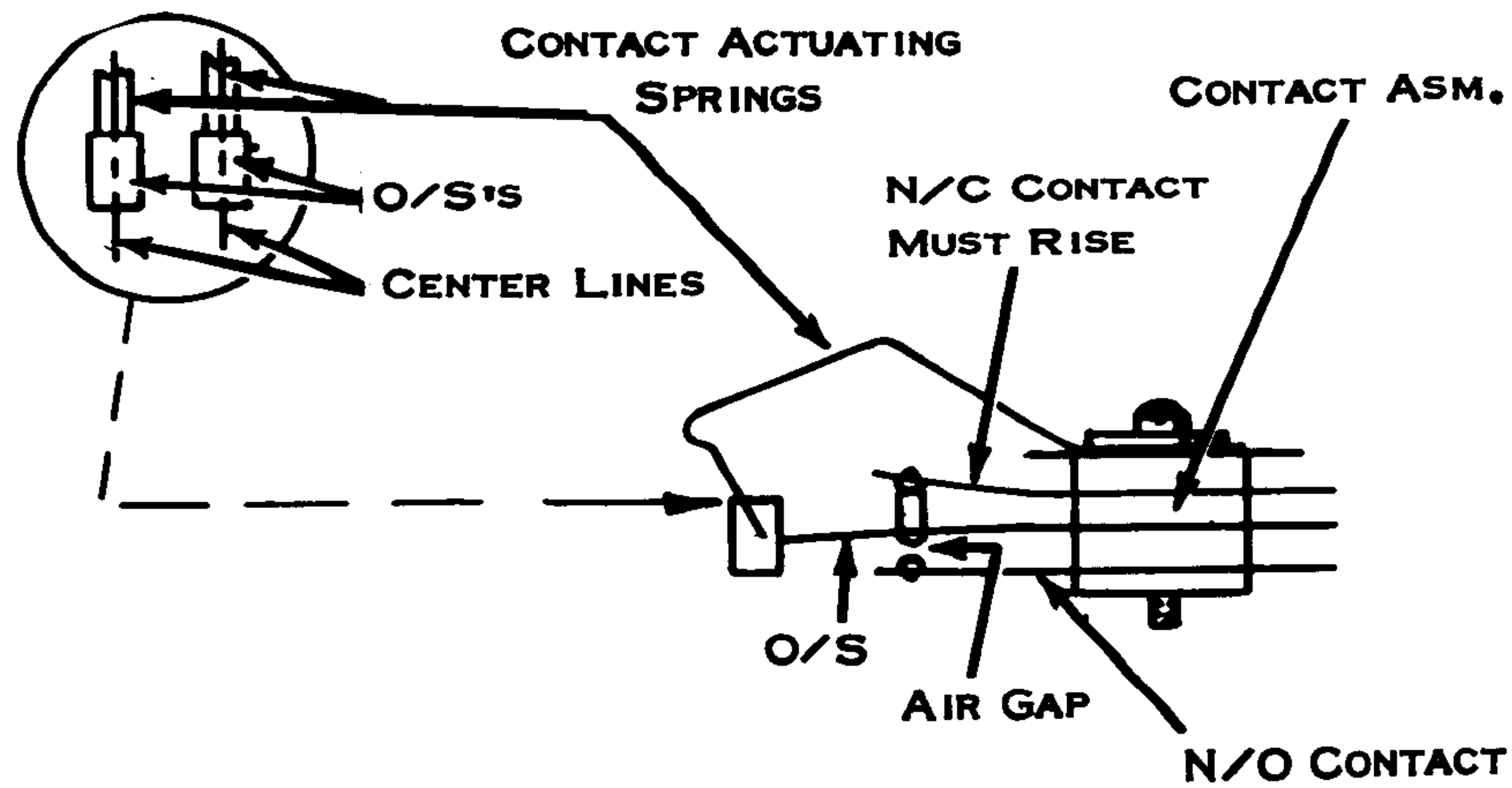


Figure 38. Contact Position & Air Gap

NOTE:

Contact assembly must be installed for adjustments.

3. Contact Assembly Position, unit installed (Fig. 39) -

- Position the contact assembly (left or right) on the mounting bracket so that the keylevers are centered on their contact actuating springs.
- With the keylevers held against their stop screws, position the mounting bracket (front to rear) for adequate rise of the N/O contacts.

Check the following conditions:

- The N/C contact must open.
- Overthrow after the N/O contact makes must not be great enough to damage the contact straps.

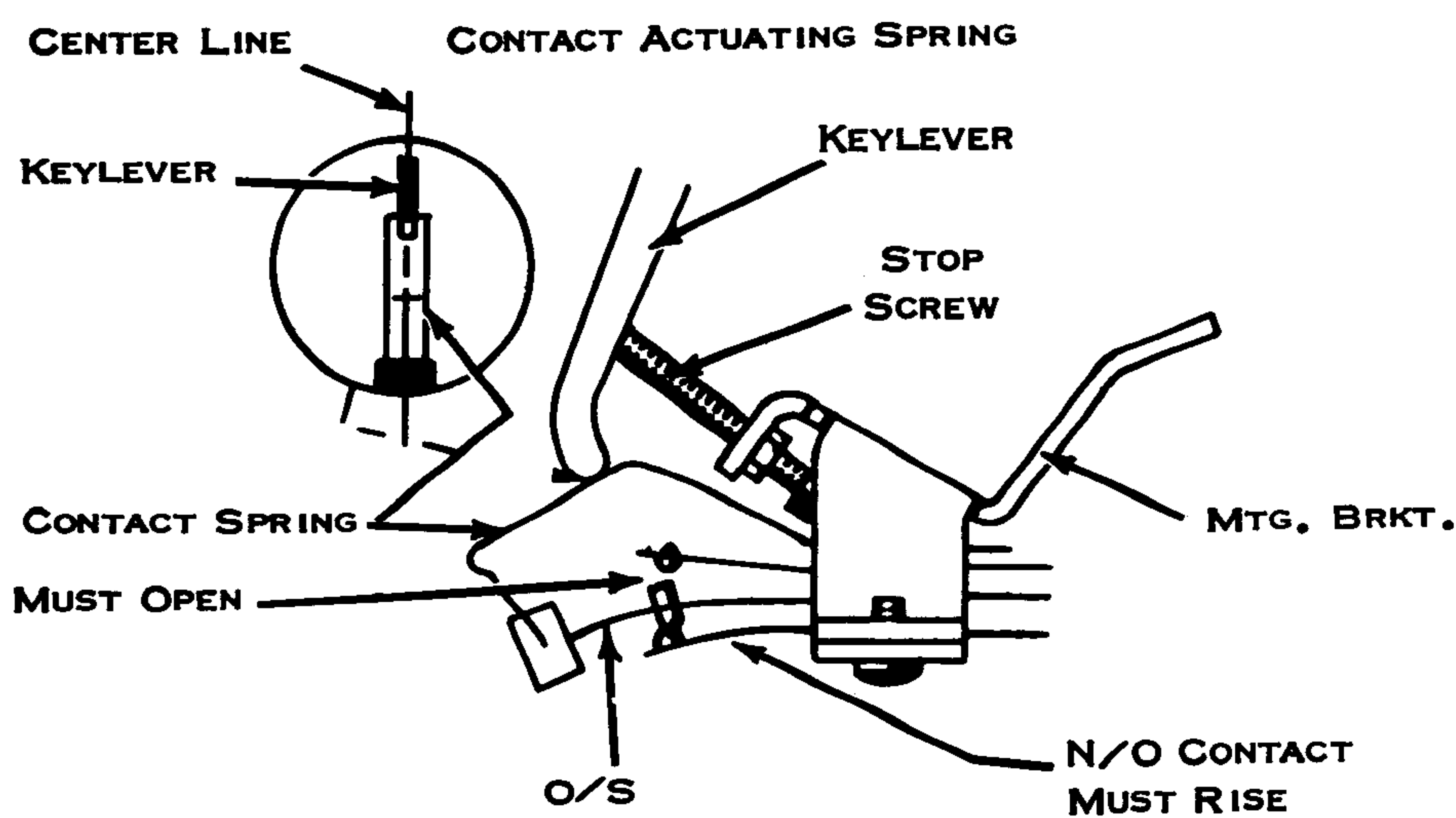


Figure 39. Keylever Contact Adjustment

4. Index Keylever Contacts - Position the contact bracket so that the O/S just touches the index keylever.

KEYBOARD LOCK MECHANISM

1. Solenoid (Fig. 40) - Adjust as follows:

- Screw plunger spring on plunger to cover all threads.
- With the plunger engaged, screw adjustable core "in" until the

plunger shoulder begins to lift off the plunger guide, then back off 1/2 turn (Fig. 40).

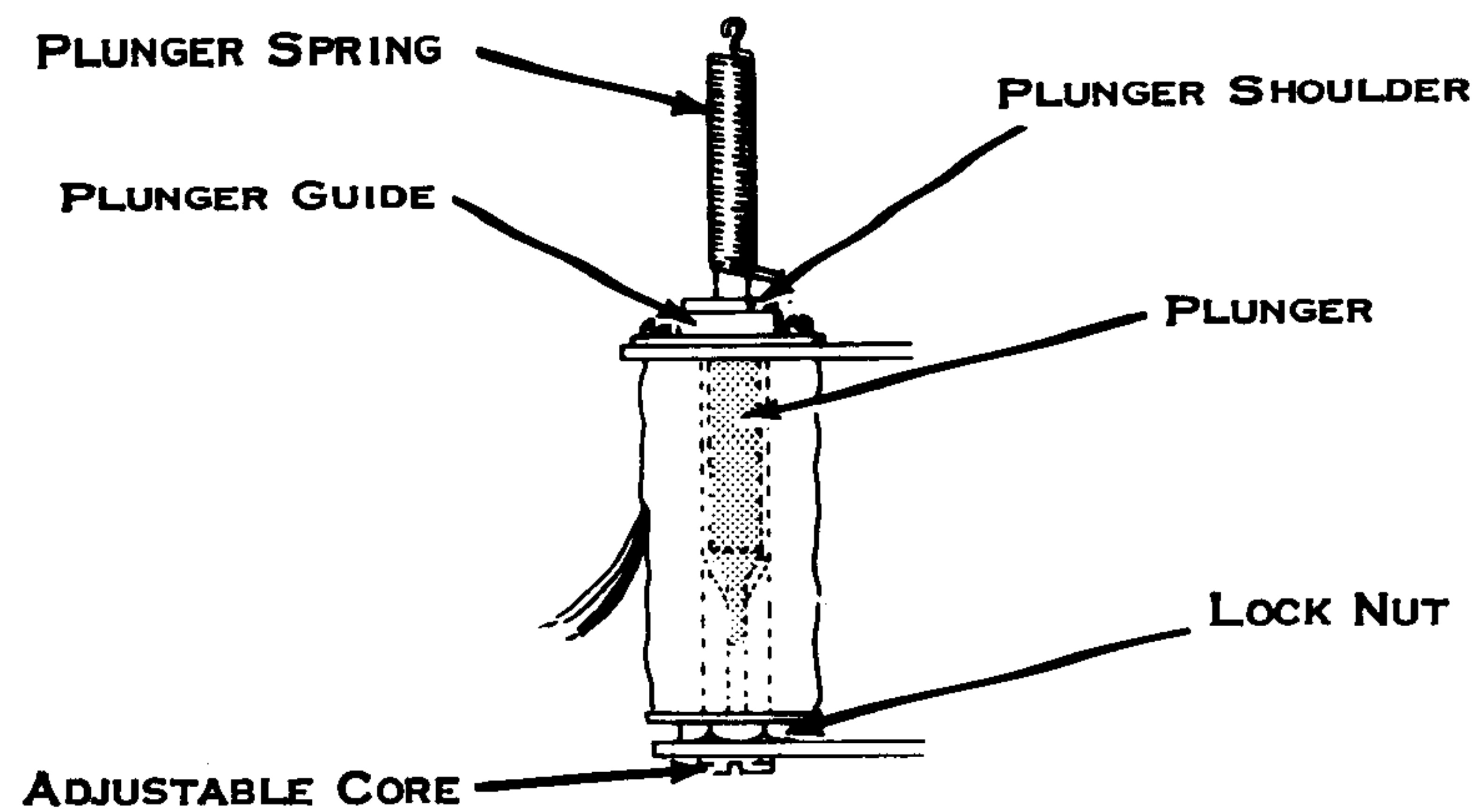


Figure 40. Solenoid

c. Position the solenoid directly beneath the lockout lever (Fig. 41).

- Eccentric Stop (Fig. 41) - Adjust (lockout lever resting against the eccentric stop) so that the plunger shoulder clears the plunger guide by .078" to .110".

NOTE:

The adjustment of the plunger spring to the plunger may require refinement so that adjustment #2 falls within the range of the eccentric.

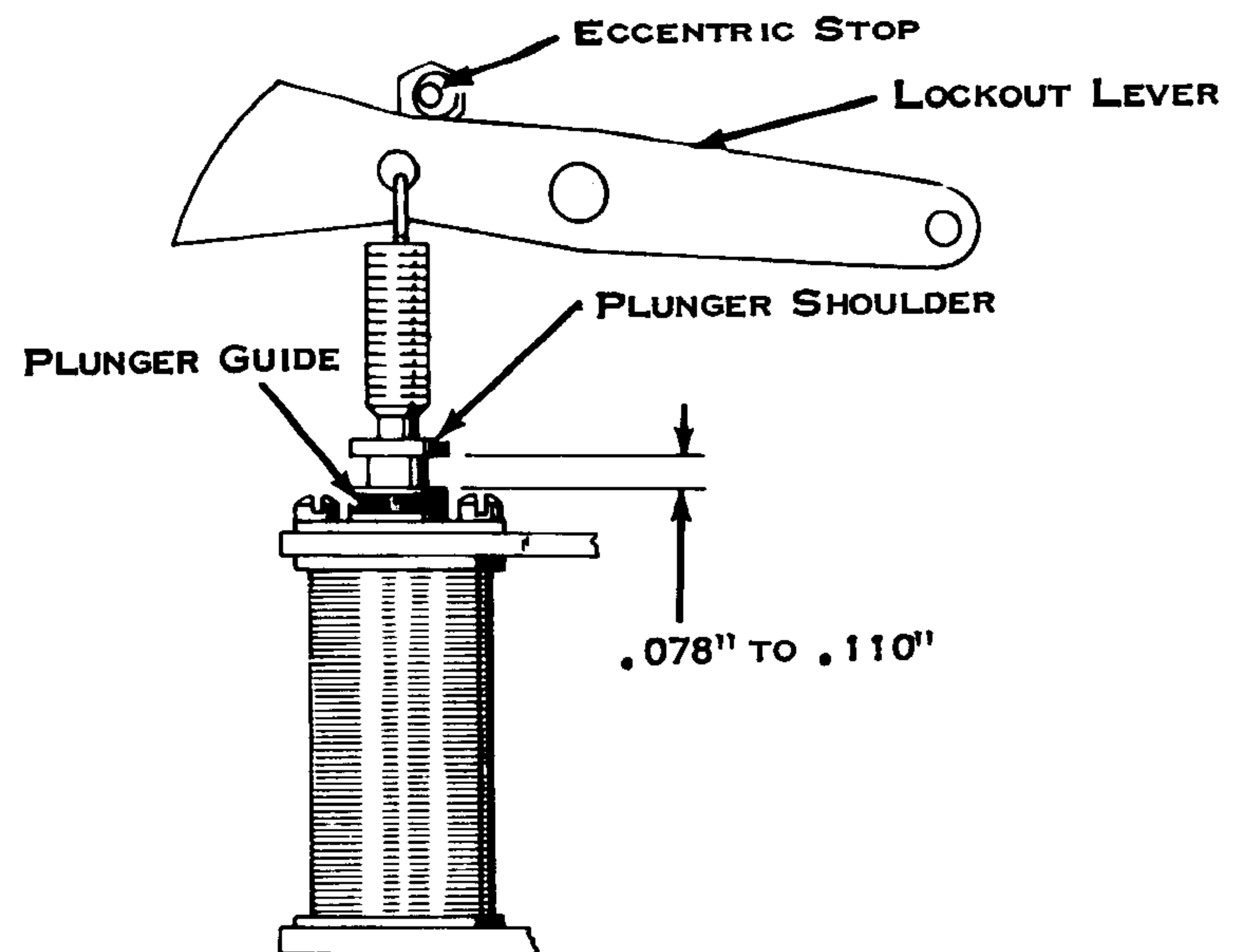


Figure 41. Eccentric Stop

- With the keyboard unlocked, adjust the keyboard lock link clevis so that the operational keylevers clear the lockout adjusting comb by .005" to .015" (Fig. 42).

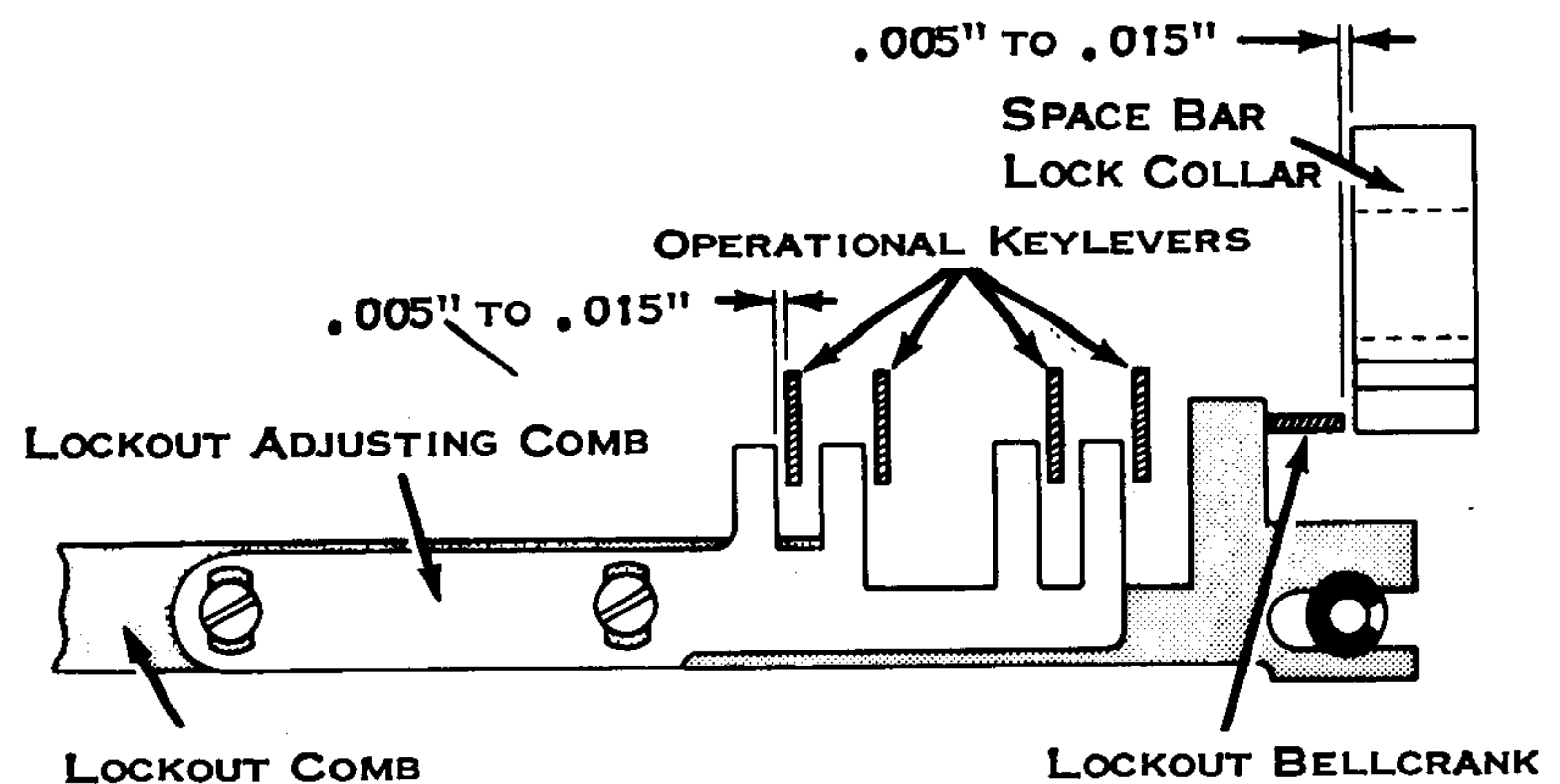


Figure 42. Adjusting Comb, Keyboard Unlocked



4. Position the spacebar lock collar:
  - a. Left or right to clear the lockout bellcrank by .005" to .015" with the keyboard unlocked (Fig. 42).
  - b. Radially, so that the leading edge on the step of the collar clears the lockout bellcrank by .005" to .015" with the keyboard locked (Fig. 43).
5. Position (up or down) the lockout adjusting comb to clear the bottom of the operational keylevers by .010" to .025" with the keyboard locked (Fig. 43).

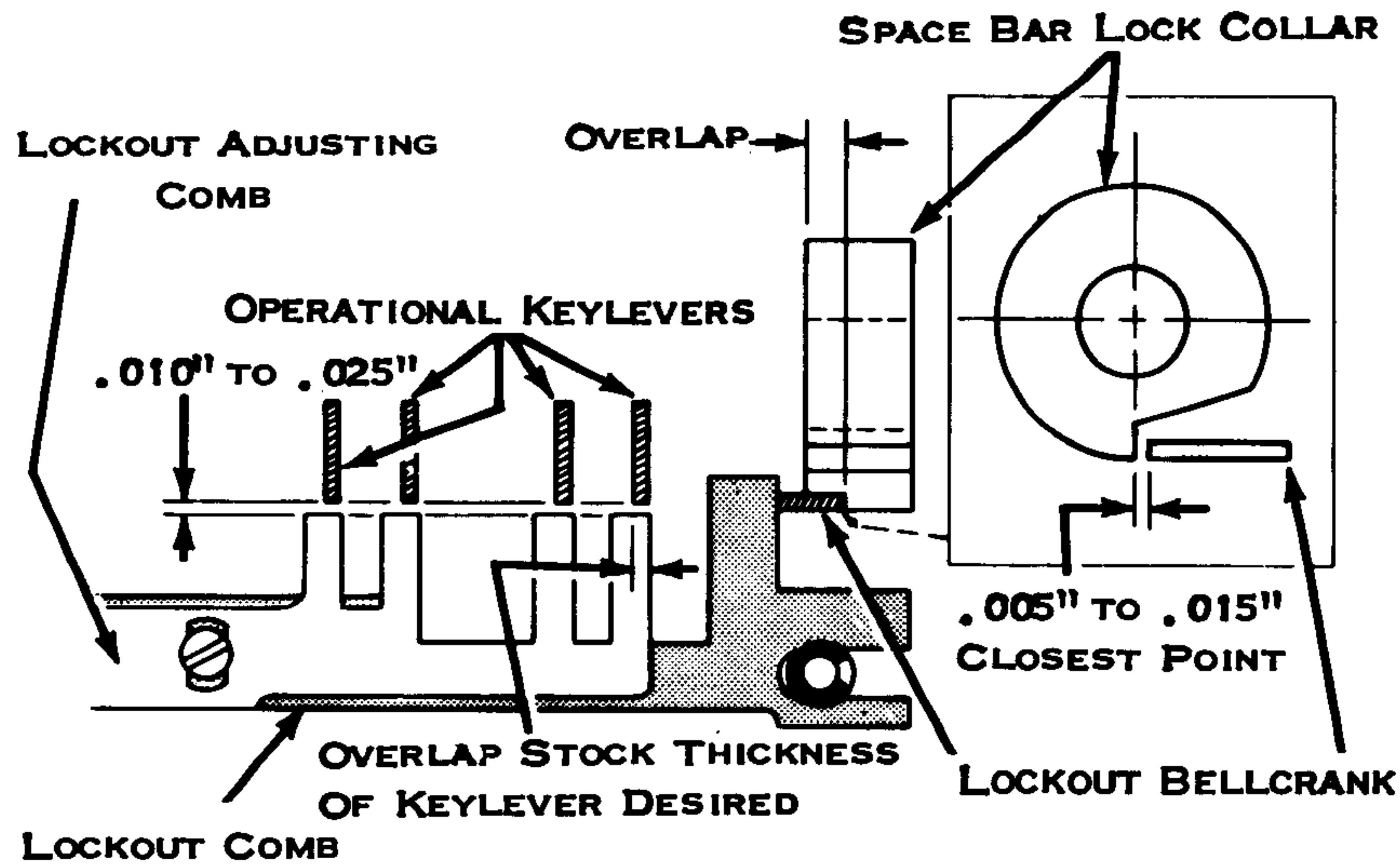


Figure 43. Adjusting Comb, Keyboard Locked

6. Character Keyboard Lock Link - Adjust the clevis so that the link will move the line lock interposer to reliably lock and unlock the character interposers.
7. Shift Lock Link - Adjust the clevis to reliably unlatch the shift lock.

NOTE:

Check to insure that the shift lock can be latched with the keyboard lock de-activated.

8. Keyboard Interposer Lock Assembly -

- a. Adjust the keyboard interposer lock assembly by loosening the four mounting screws and moving the assembly up or down for .003" to .015" clearance between the bottom of the interposer and the keyboard interposer lock assembly when the keyboard interlock assembly is activated (Fig. 44).

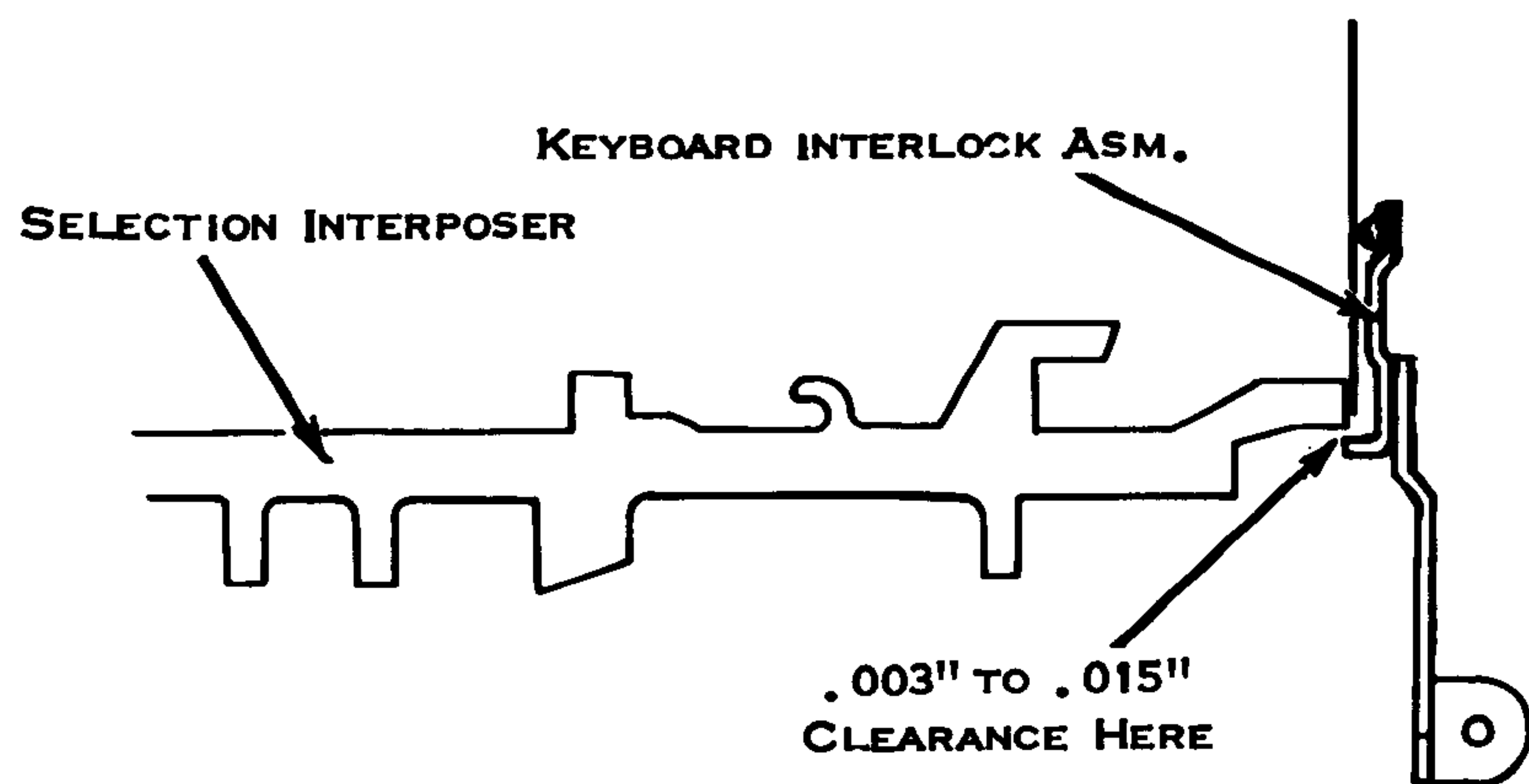


Figure 44. Keyboard Interposer Lock Assembly

- b. Adjust the keyboard interposer lock link so there is .010" to .020" clearance between the interposer and the interposer lock assembly with everything in the unlocked position (Fig. 45).

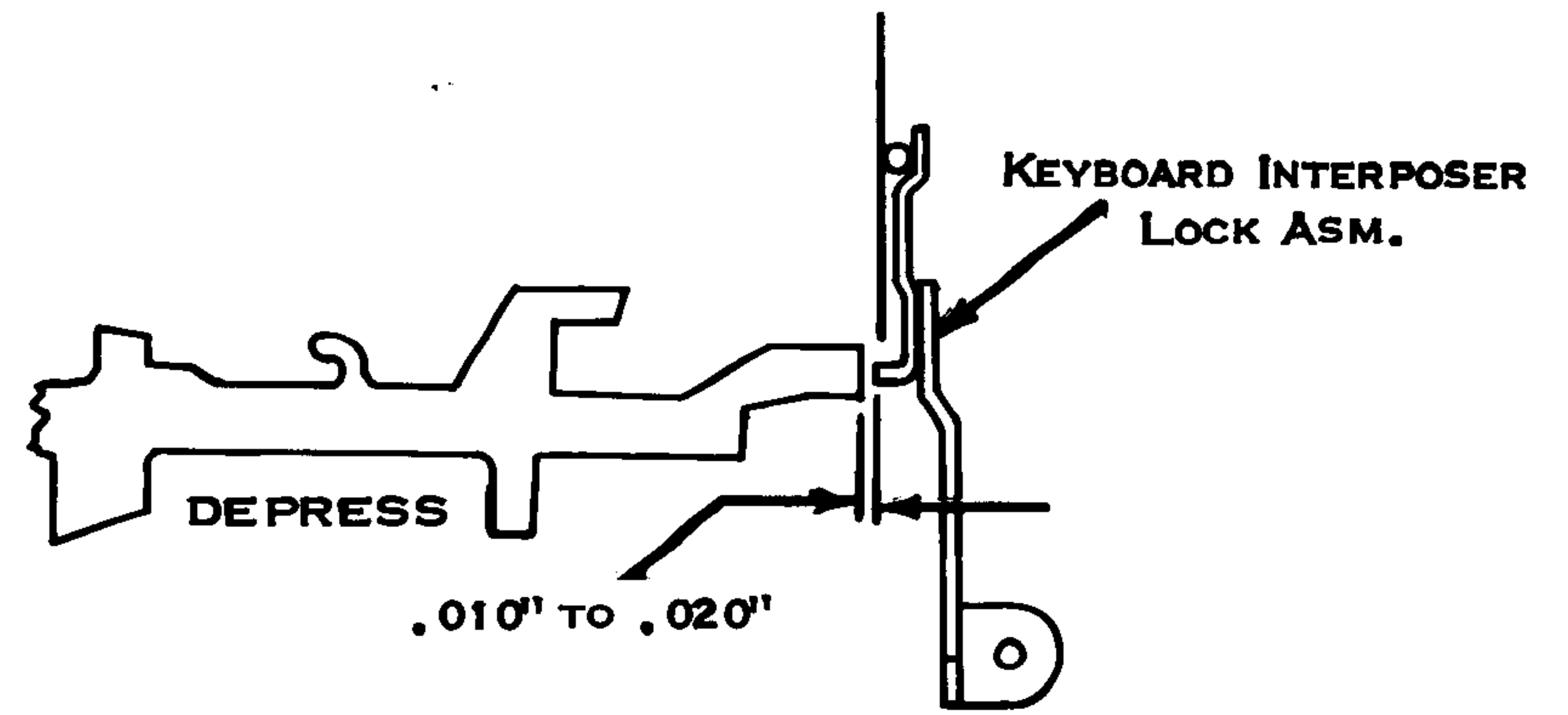


Figure 45. Keyboard Interposer Lock Link

9. Cycle Clutch Pawl Stop (Fig. 46) - Adjust the pawl stop mounting bracket so that the cycle clutch pawl stop clears the cycle clutch pawl by .010" to .020" with keyboard locked. Best results are obtained on the high side of the adjustment (Fig. 46).
10. Pawl Stop Link (Fig. 46) -
  - a. Adjust the pawl stop link so that there is .030" to .060" overlap of the cycle clutch pawl stop to the cycle clutch pawl with the keyboard lock mechanism in the lock position.
  - b. With the lockout link clevis positioned approximately half way on the lockout link threads, position the lockout bail relative to its clamp so that the cycle clutch pawl stop overlaps the cycle clutch pawl by .030" to .060" when the lockout mechanism is activated by the On/Off switch.

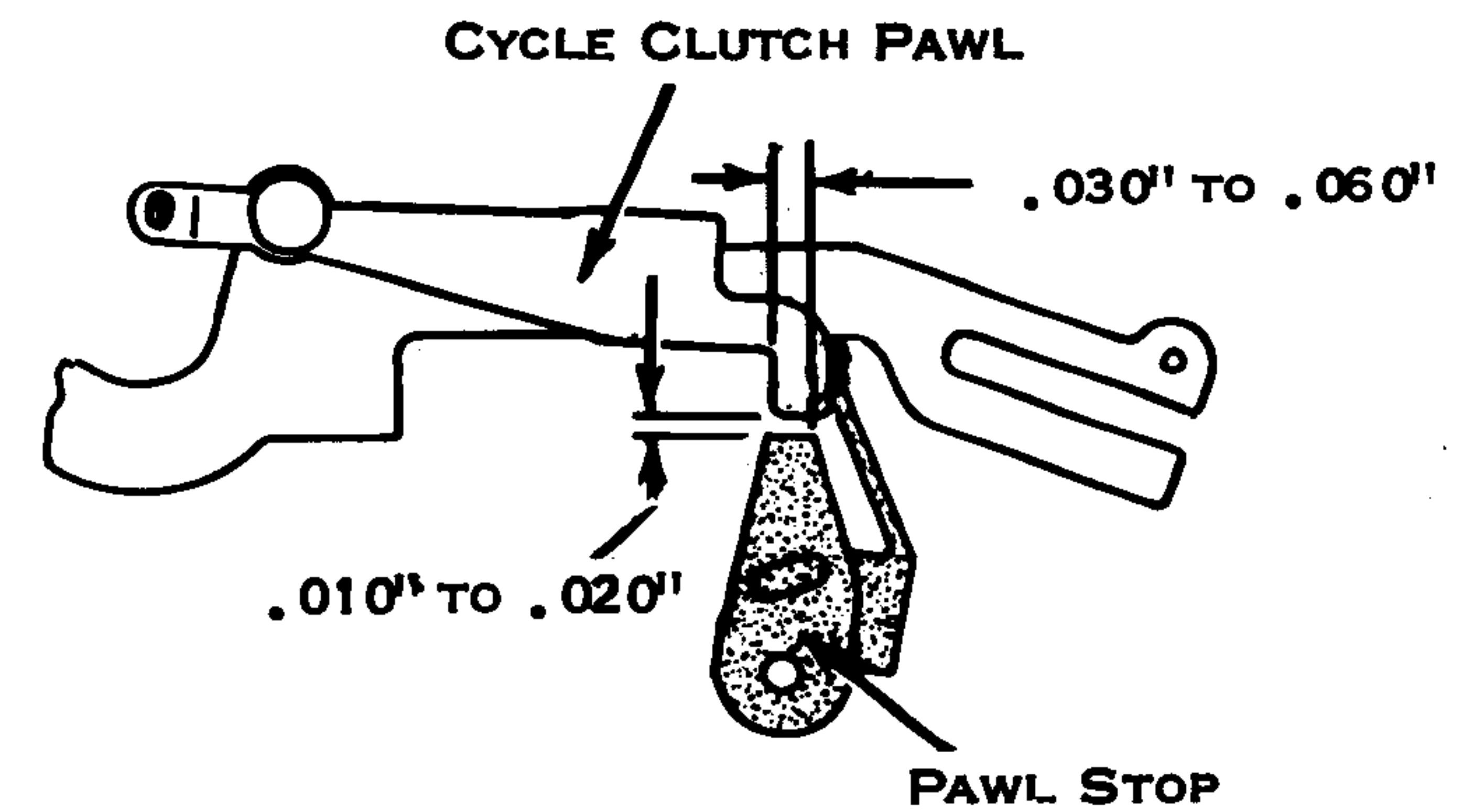


Figure 46. Cycle Clutch Pawl Stop

11. Keyboard Mode Contacts - Form the N/C support so that the O/S lifts the N/C contact by .002" to .005" (Fig. 47).

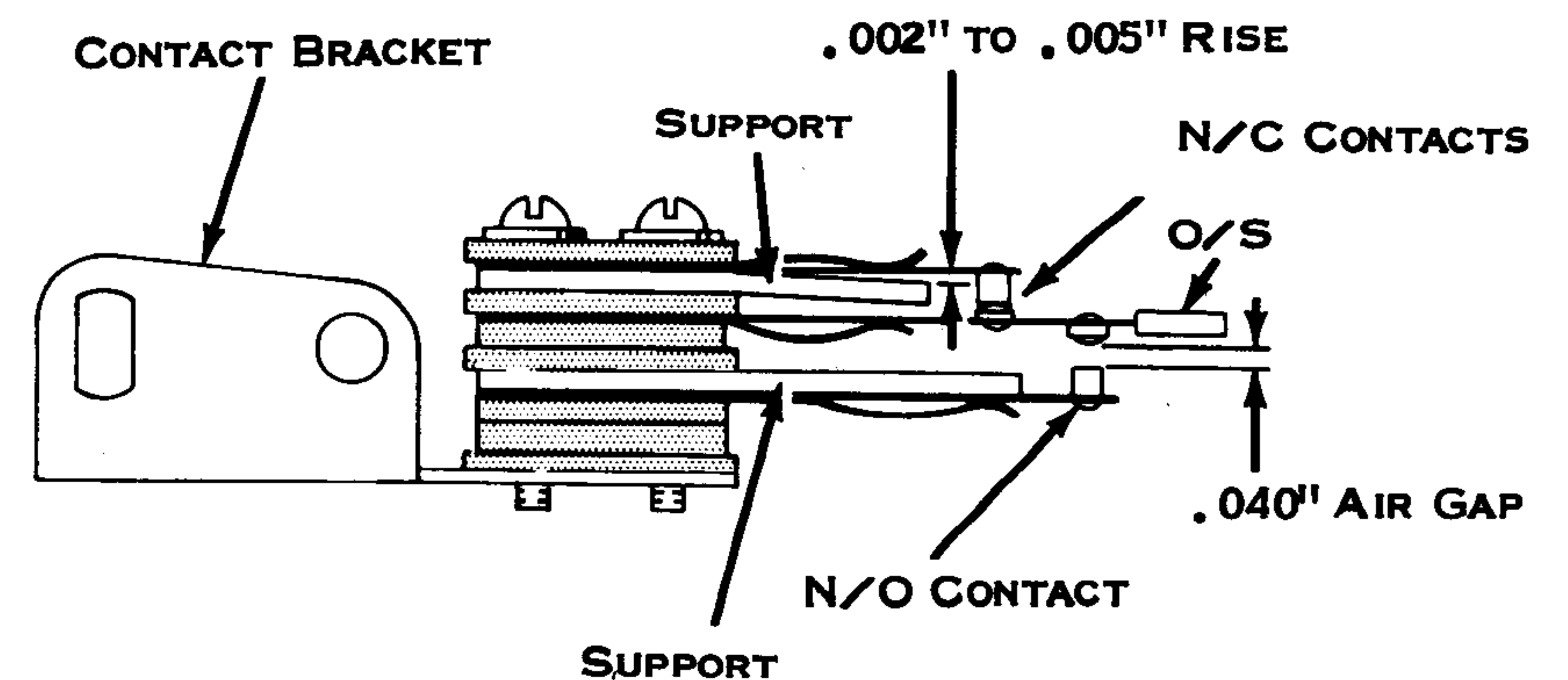


Figure 47. Mode Contact

12. Form the N/O support so that the N/O contact clears the O/S by .040" (Fig. 47).



13. Position the contact bracket for a clearance of  $.003''$  to  $.007''$  between the operating strap and actuating lever (Fig. 48).

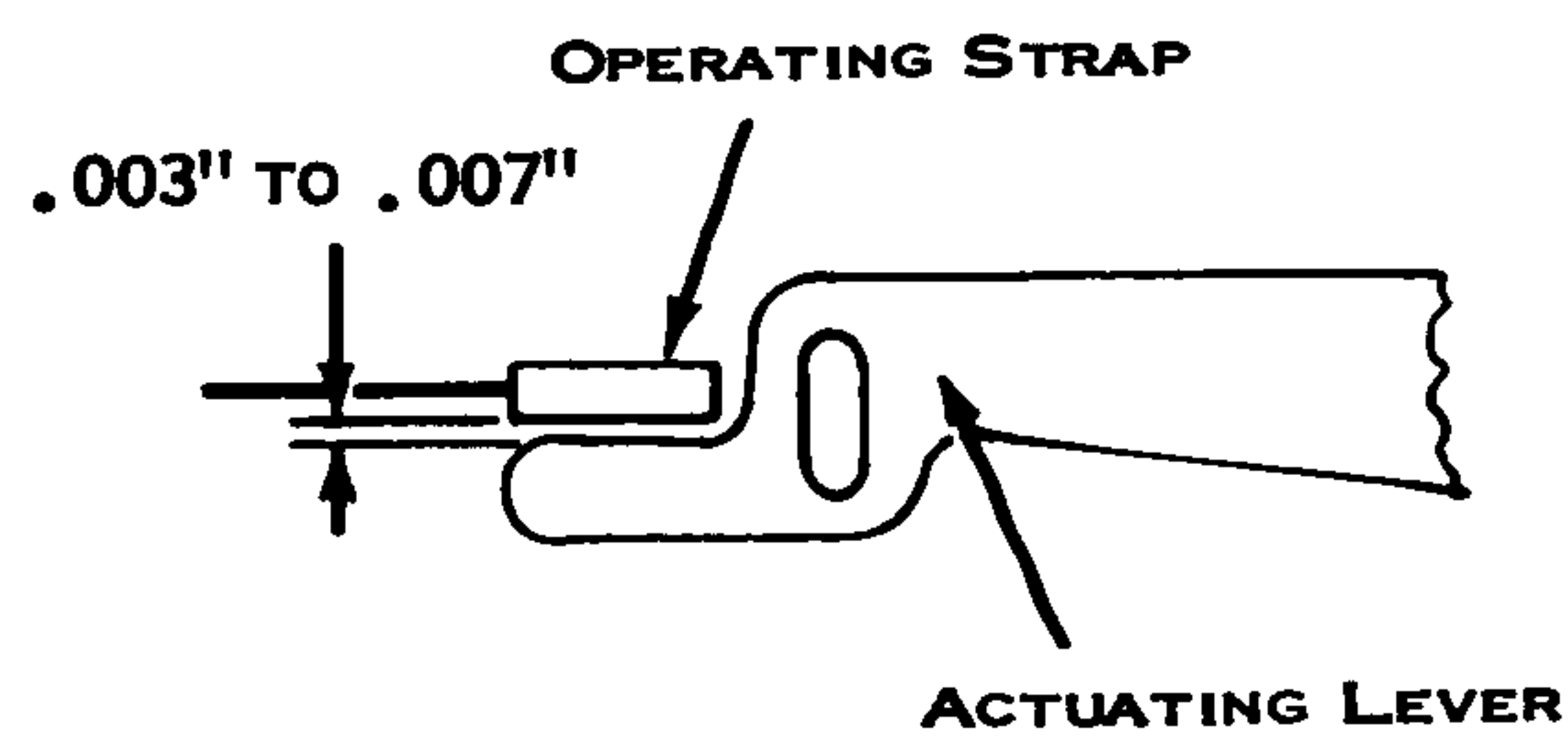


Figure 48. Mode Contact Actuating Lever

### SELECTION MECHANISM

1. Latch Bail Shaft - The plate that supports the right end of the bail shaft should be adjusted so that the bail shaft is parallel to the cycle shaft. Because the left end of the bail shaft is fixed, the right end may be adjusted by comparing its position to that of the left end with the use of the Hooverometer. The distance is gaged between the anvil and the bail shaft for height and between the cycle shaft and the bail shaft for front to rear. The positions of the Hooverometer are pointed out in Fig. 49. CAUTION - Both of these adjustments are made by the same plate; therefore, they must be considered together. They should be checked and refined alternately until both are correct. In addition, the cycle bail up-stop and the character interrupter must be readjusted after any change in the position of the bail shaft plate.
2. Selector Latch Guide (Fig. 50) - Adjust left to right so that the vertical links of the differential mechanism hang in a true vertical position.

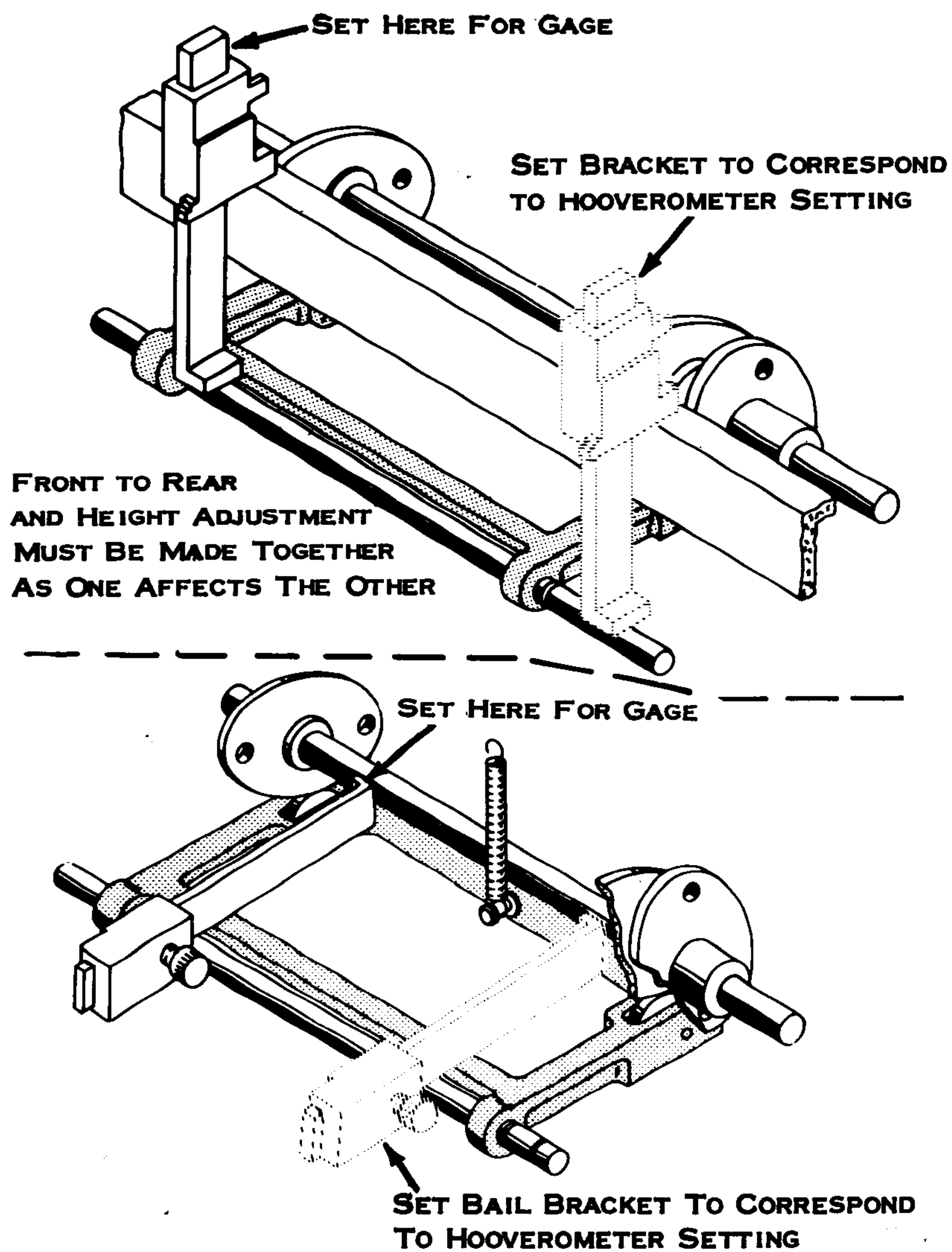


Figure 49. Latch Bail Shaft

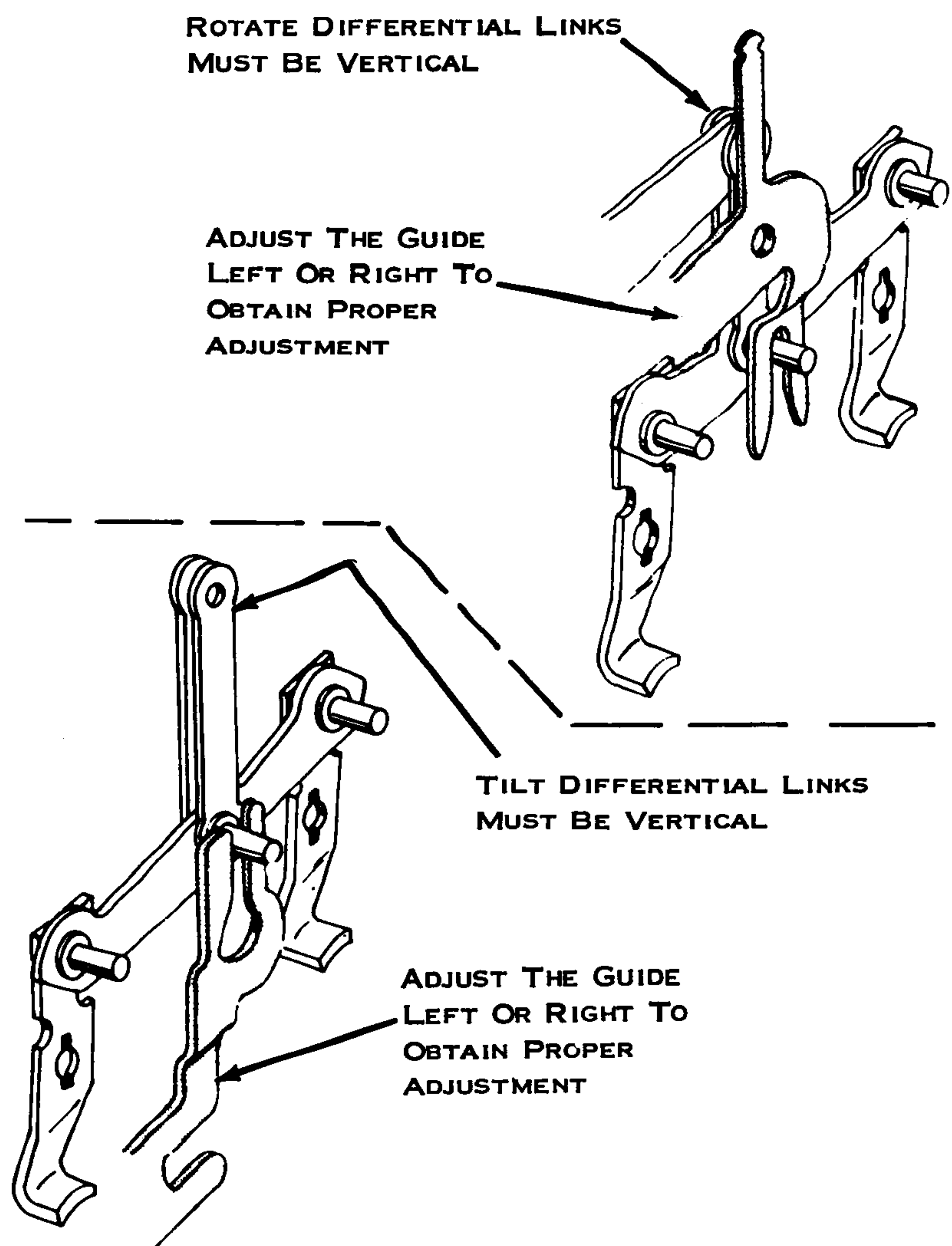


Figure 50. Selector Latch Guides

3. Latch Bail Guide - Adjust left or right so that all selector latches hang vertically (Fig. 51).

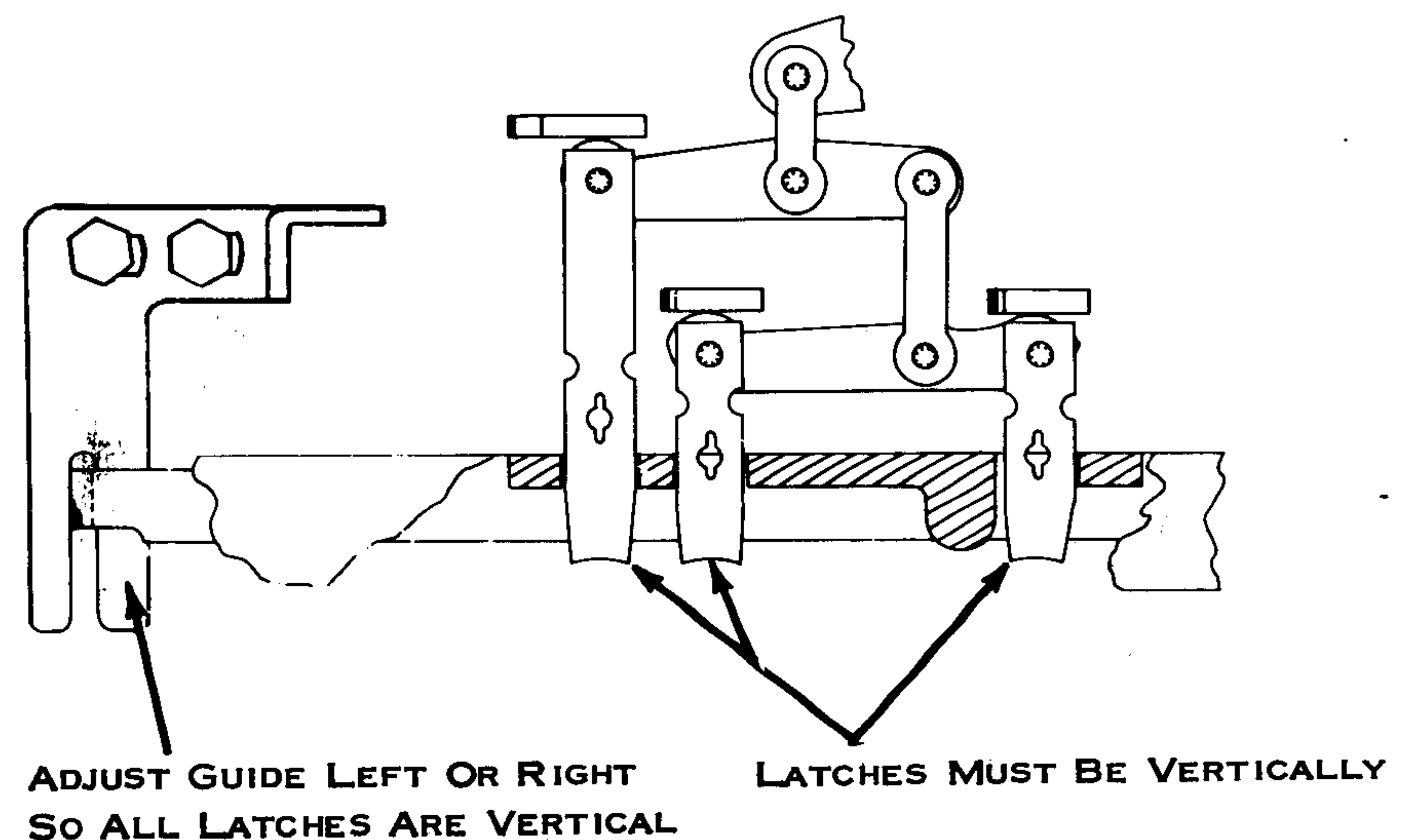


Figure 51. Latch Bail Guide

4. Check Latch -
  - a. Upstop (Fig. 52) - With the selector cams at the low point, form the upstop so that the latch clears the bail by  $.020''$  to  $.025''$ .
  - b. Spring Return Arm (Fig. 53) - Position to hold the pivot arm against the upstop.
5. Latch Interposer Stop (Fig. 54) - Form to obtain  $.001''$  to  $.005''$  clearance between each latch interposer and its respective interposer bail.



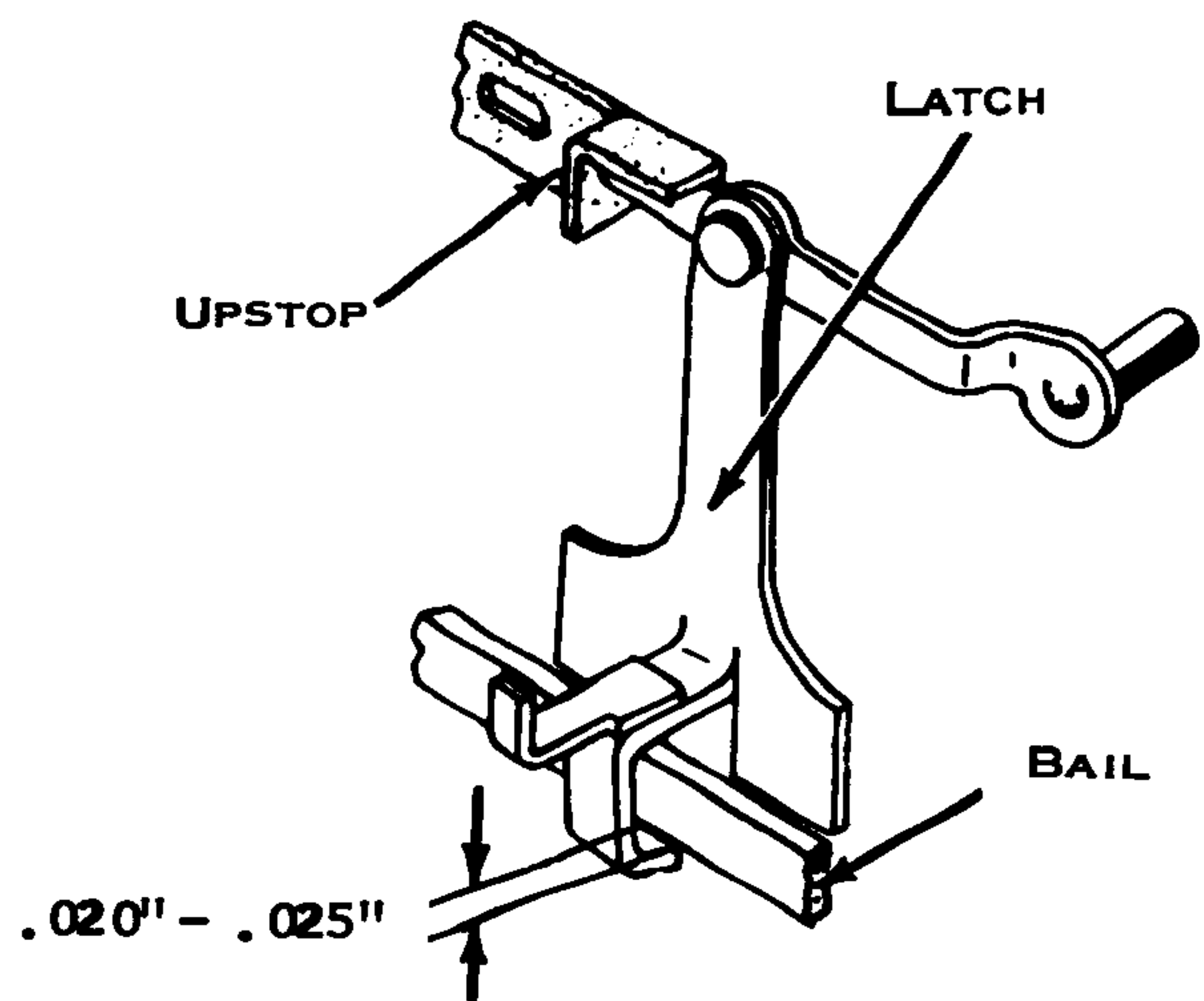


Figure 52. Check Latch Upstop

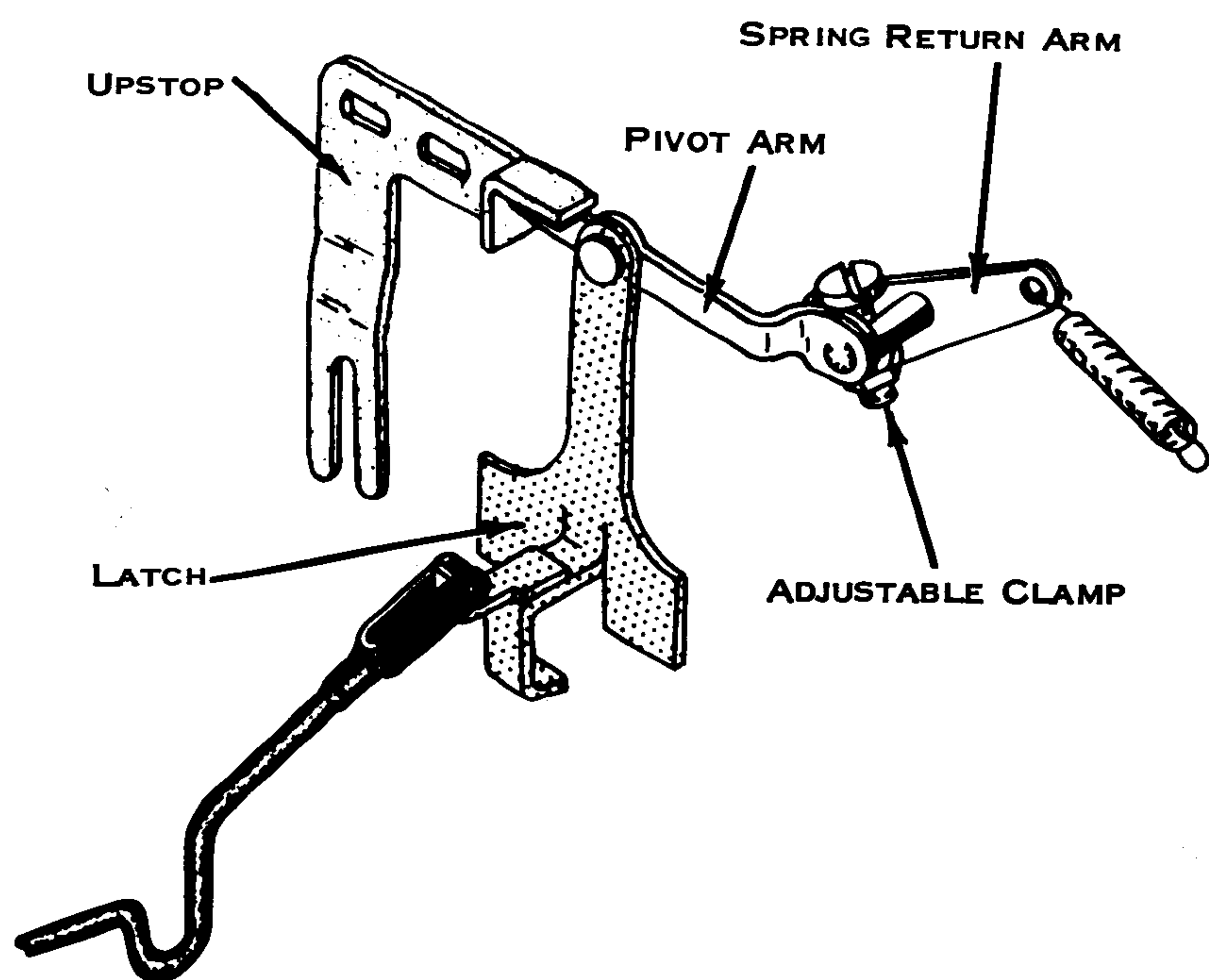


Figure 53. Check Latch Spring Return Arm

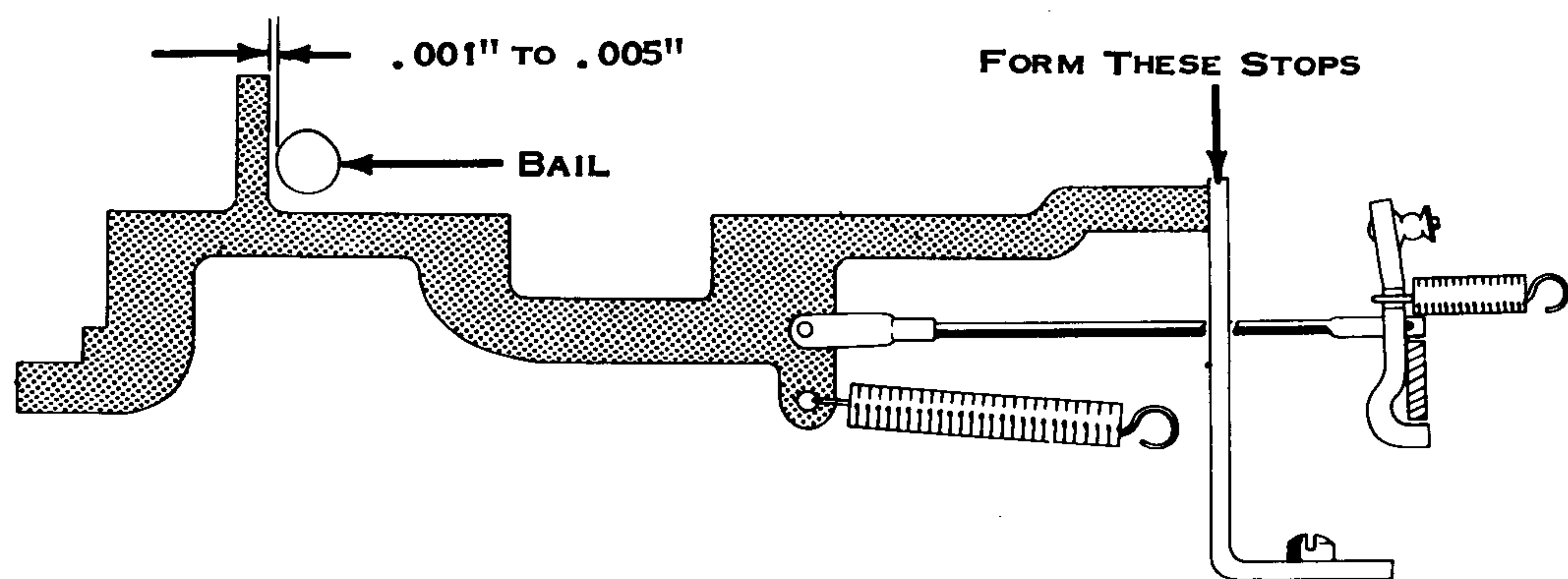


Figure 54. Latch Interposer Stop

6. Selector Latch Links - Adjust clevis as follows:

- a. Check Latch - Latch clears bail by .001" to .010" (Fig. 55).
- b. Negative Five - Latch overlaps stop screw head .050" to .060" (Fig. 56).
- c. All Others - Latches overlap bail flush to .010" overhang (Fig. 57).

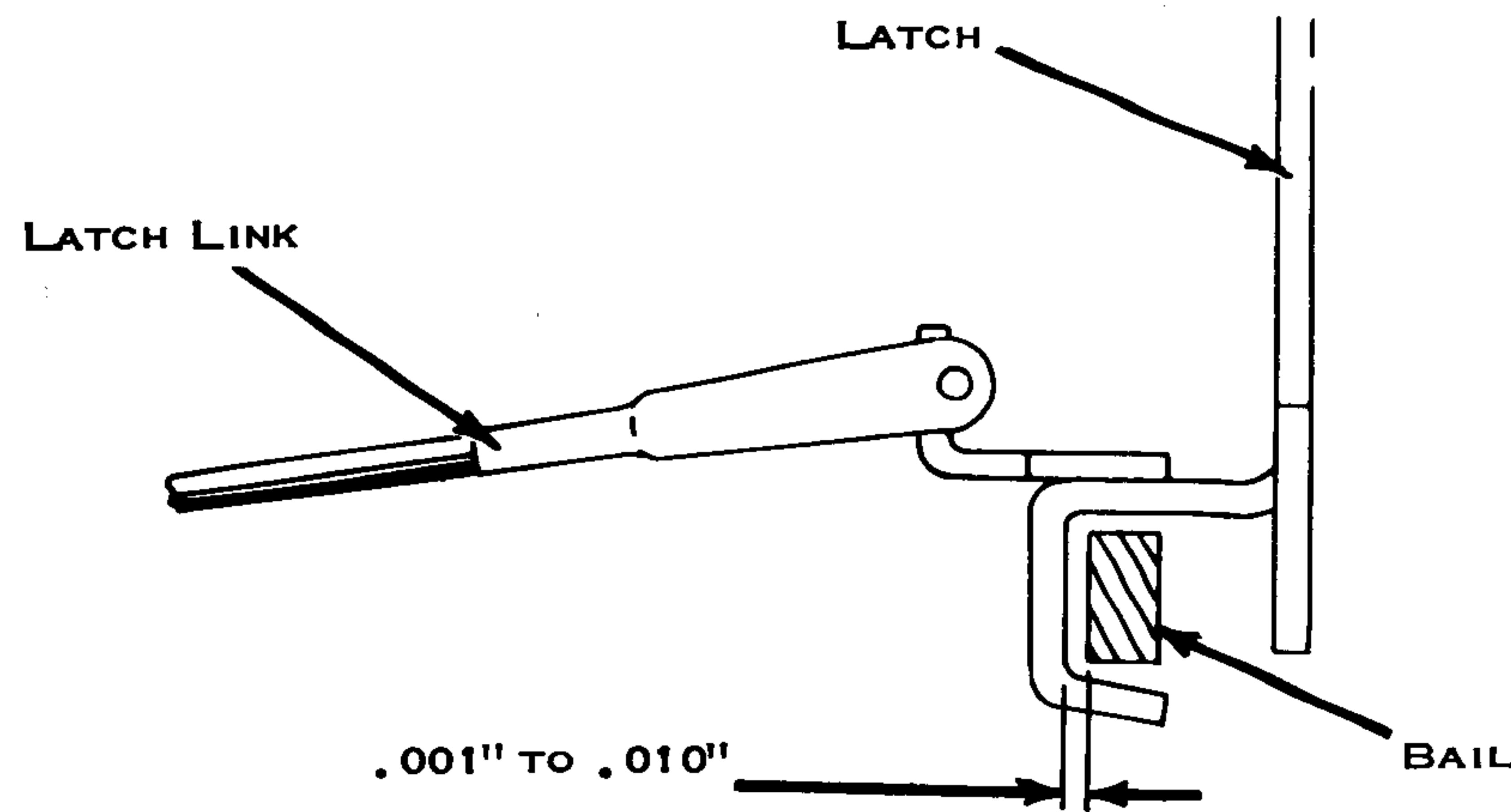


Figure 55. Check Latch Link

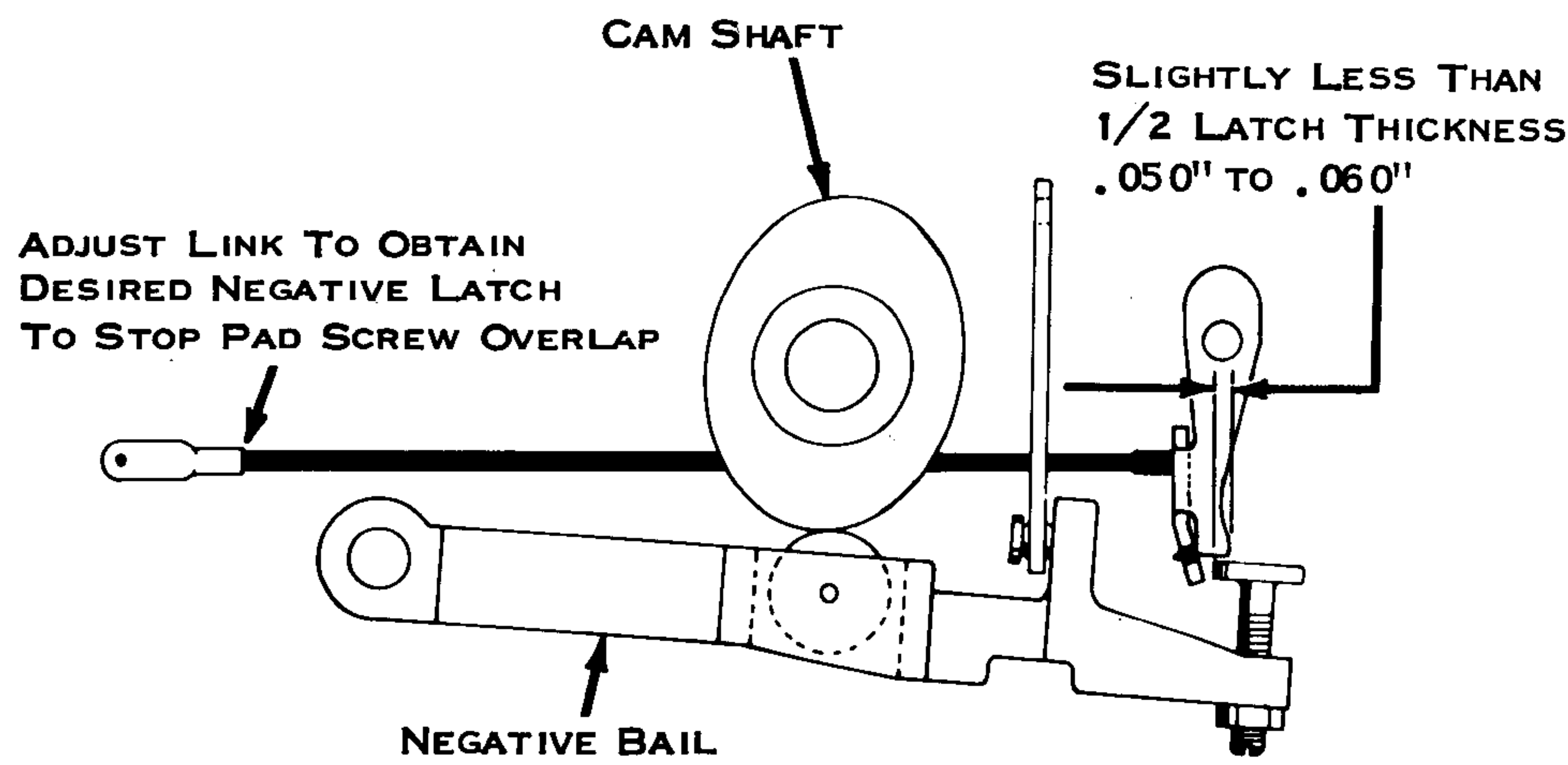


Figure 56. Negative Latch Link

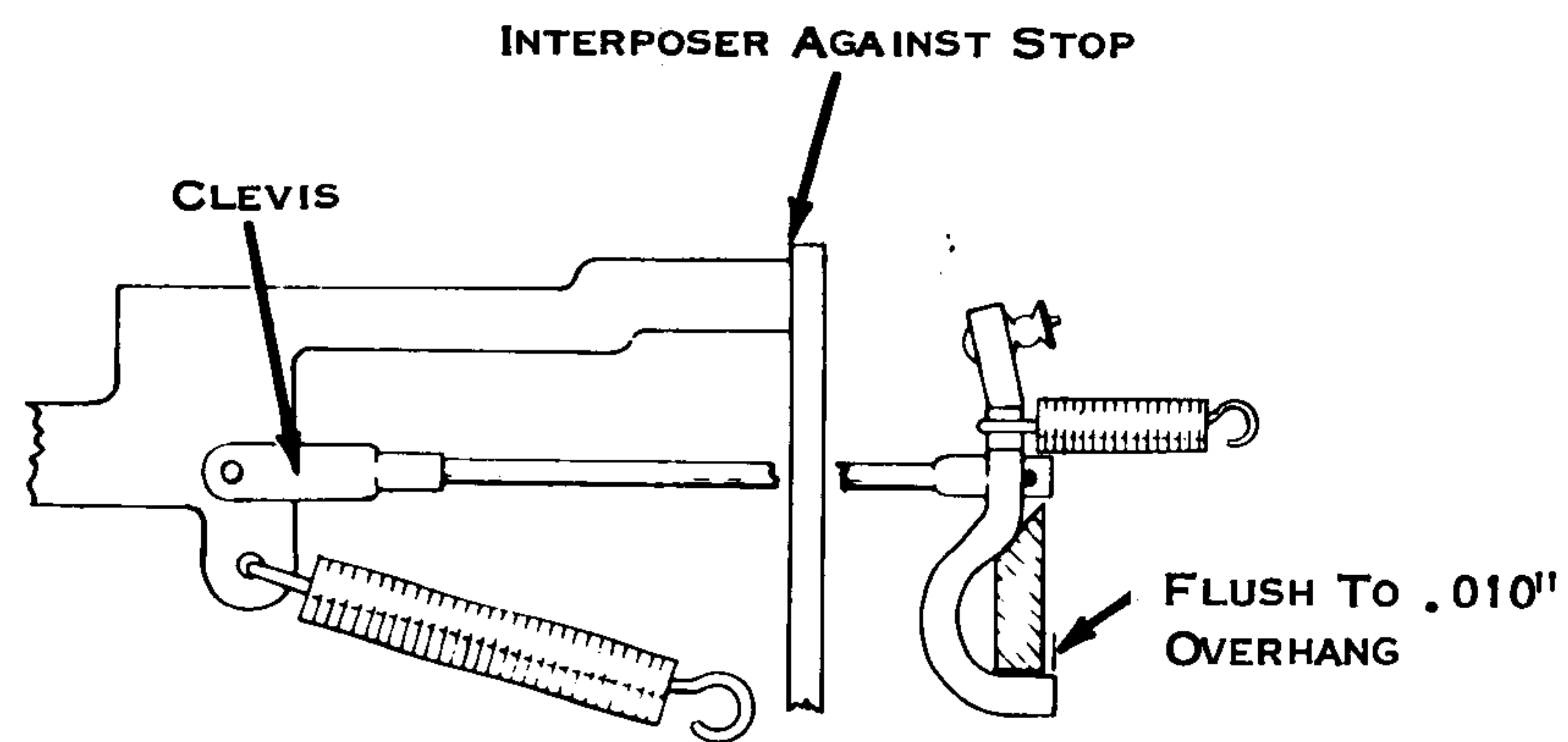


Figure 57. Positive Latch Links

7. Latch Bail Overthrow Stop (Fig. 58) - Position to clear the latch bail by .005" to .015" when the latch bail is on the high point of the cams.

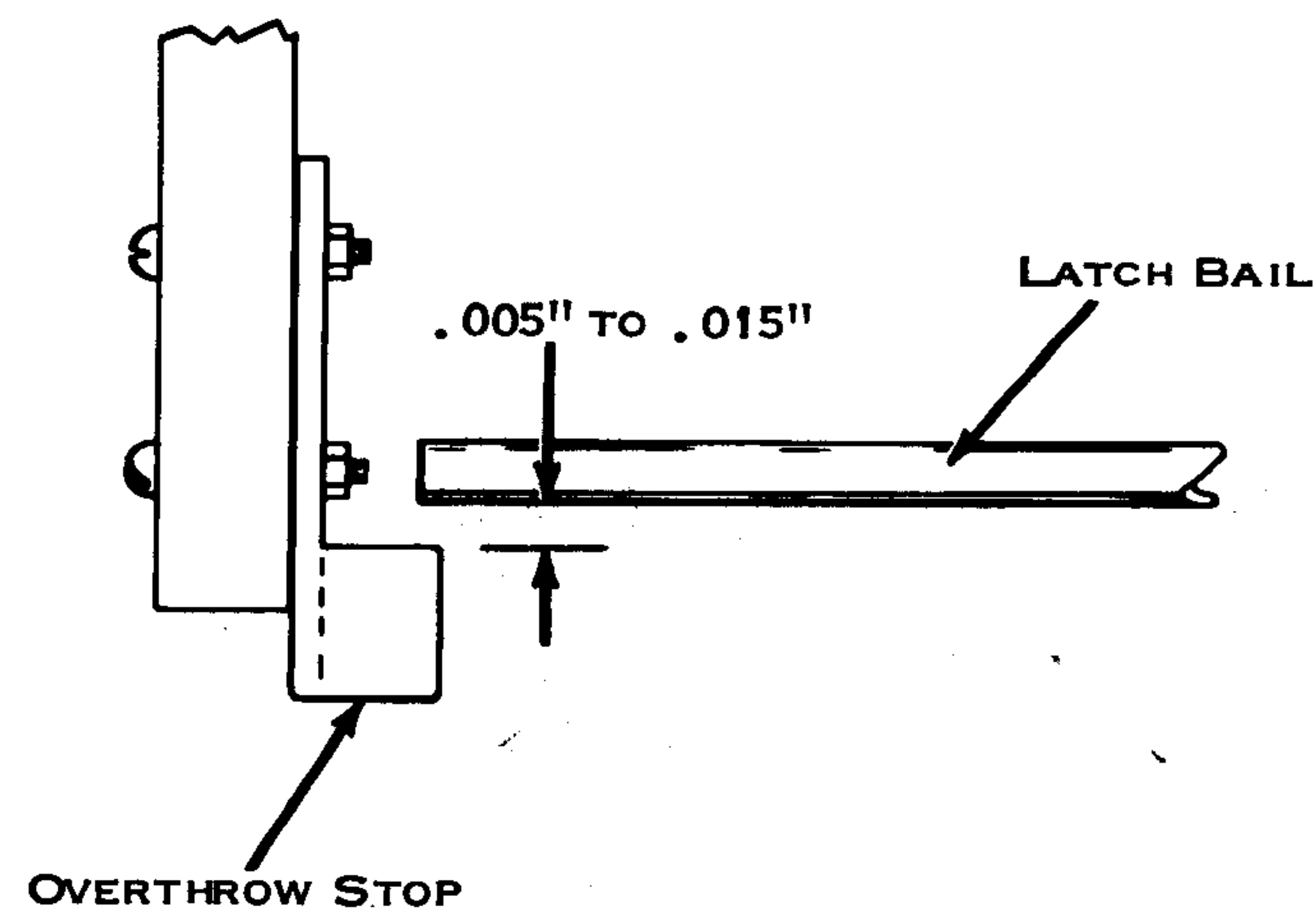


Figure 58. Latch Bail Overthrow Stop

## CARRIER & ROCKER MECHANISM

1. Tilt Tube End Play Prior To Gearless Tilt (Fig. 59) - The tilt pulley should be adjusted up or down on the tilt tube so that .002" to .004" end play exists in the tilt tube. CAUTION - If, for any reason, the tilt tube is removed, the shims must be replaced.

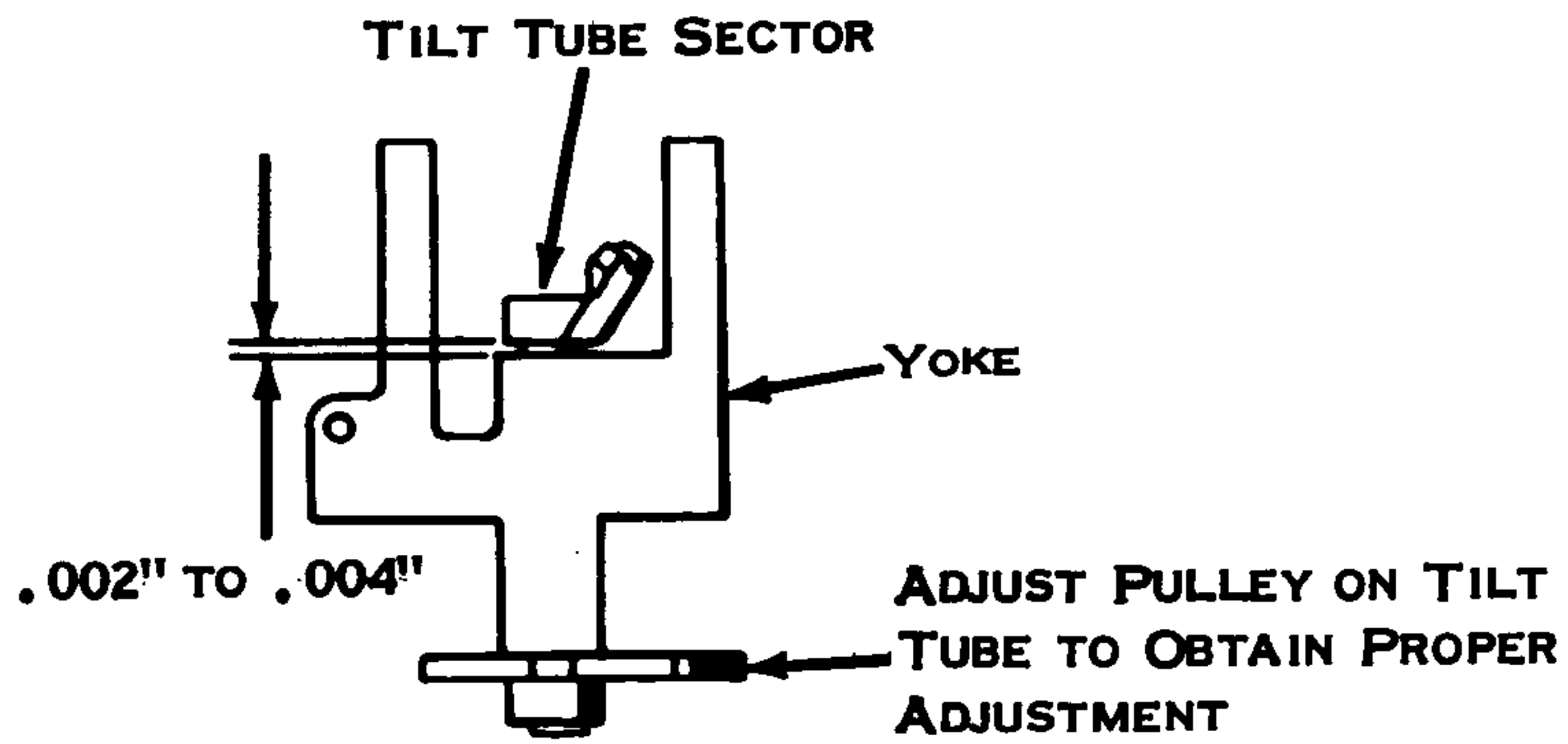


Figure 59. Tilt Tube End Play

2. Rotate Shaft End Play (Fig. 60) - The rotate pulley must be adjusted up or down on the rotate shaft to obtain .002" to .004" end play. CAUTION - If the rotate shaft is removed for any reason, the shims must be replaced.

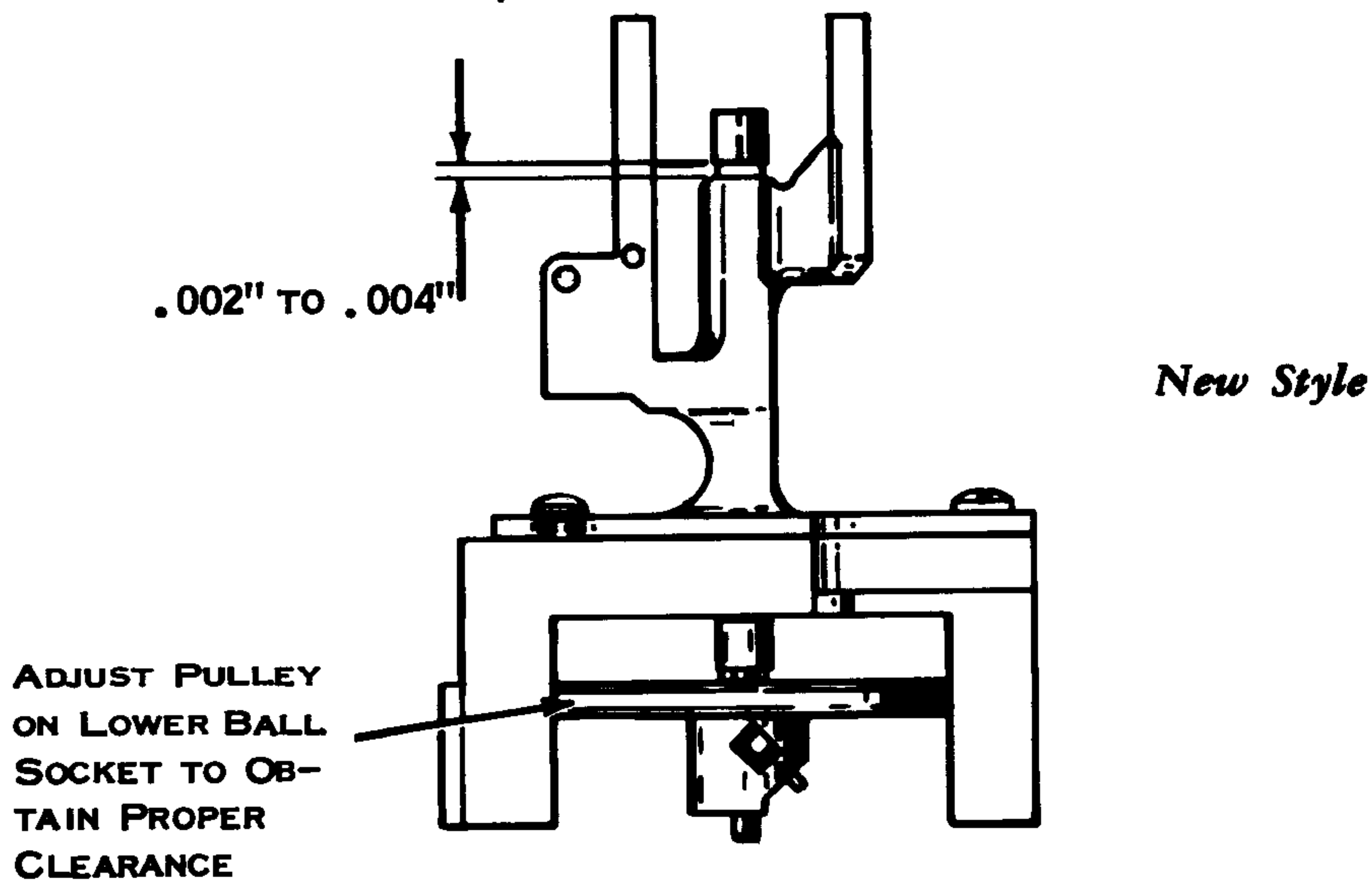


Figure 60. Rotate Shaft End Play

3. Upper Ball Socket (Fig. 61) - Shim so that it rotates freely with no binds and with as little up and down play as possible. The up and down play should be limited to .0005". CAUTION - If the tilt ring spacer is loosened, it must be properly repositioned. This may be done by gaging the space around the upper ball socket with the bristo wrench that fits the print shaft gear. Another method is to replace the head with the spacer screws slightly loosened and manually move the shift arm back and forth. Carefully remove the head and tighten.

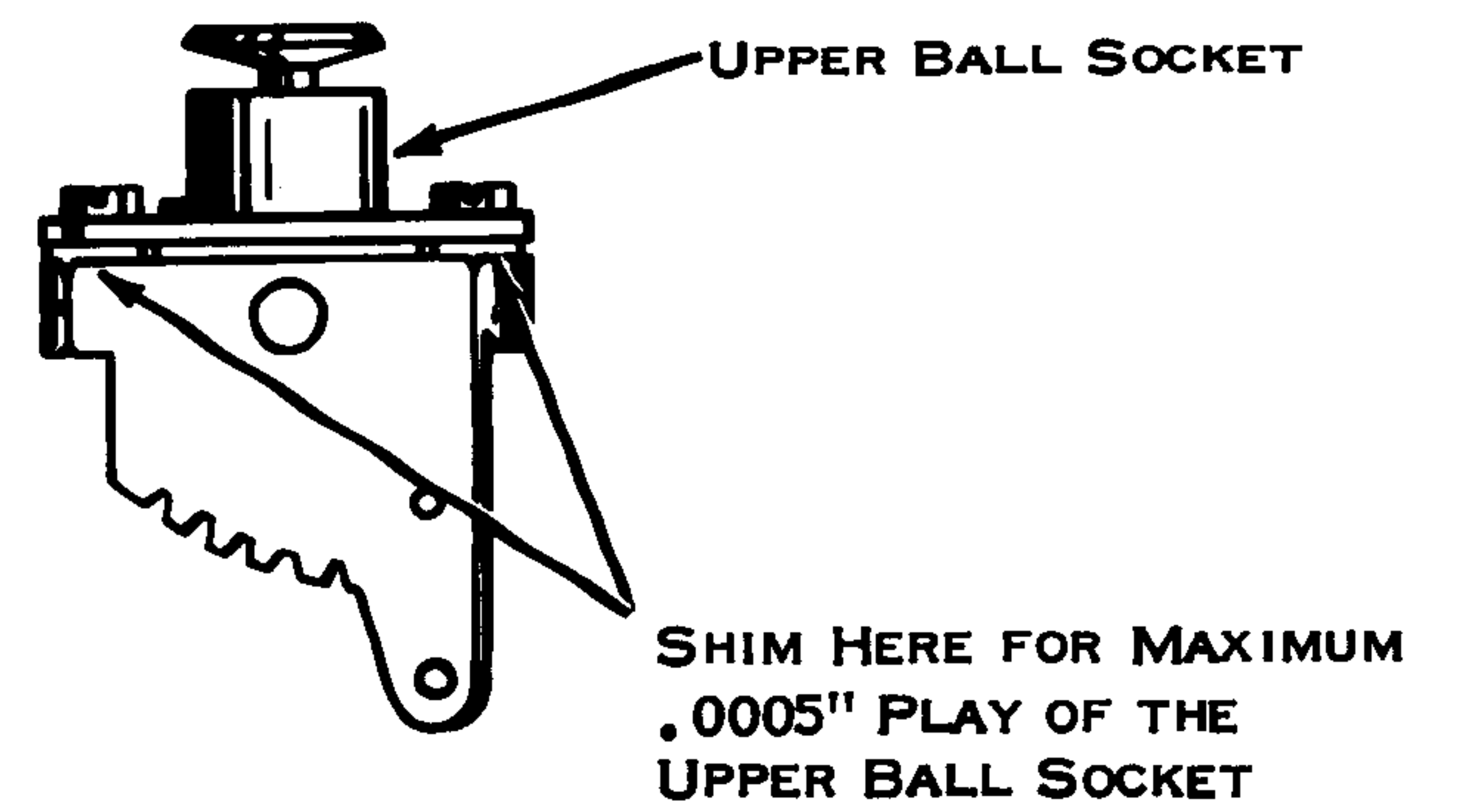


Figure 61. Upper Ball Socket

### NOTE:

If tilt ring removal and replacement is necessary, before removing, notice the relative lateral position and replace as near as possible, making sure no end play exists between the tilt ring and its pivots.

4. Rotate Detent Guides (Fig. 62) - Adjust front and rear guides left or right so that as little sideplay as possible exists without binding the detent.

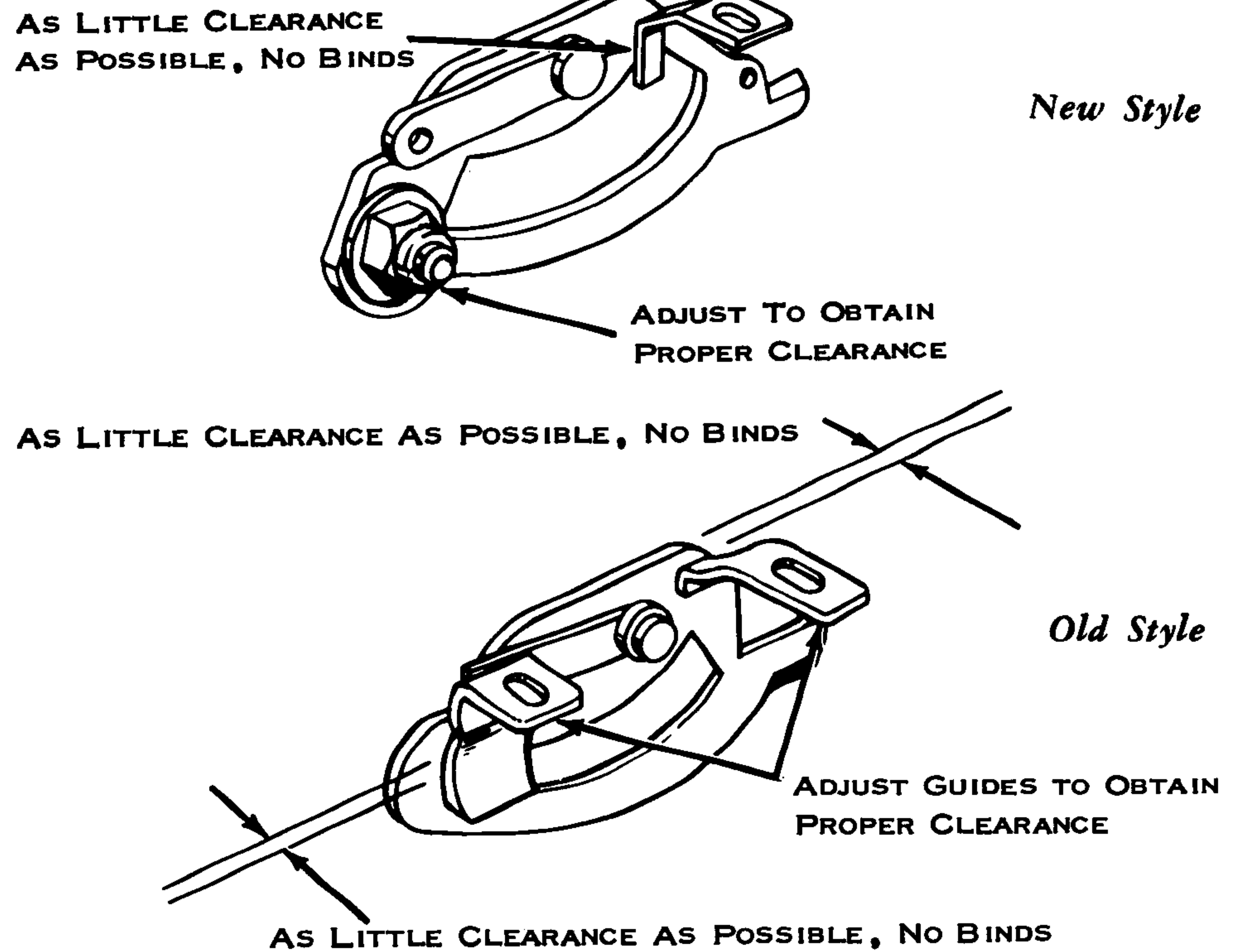


Figure 62. Rotate Detent Guide

5. Tilt Detent (Fig. 63) - Adjust the guide and pivot screws so that the tilt detent operates freely with minimum of front to rear play.

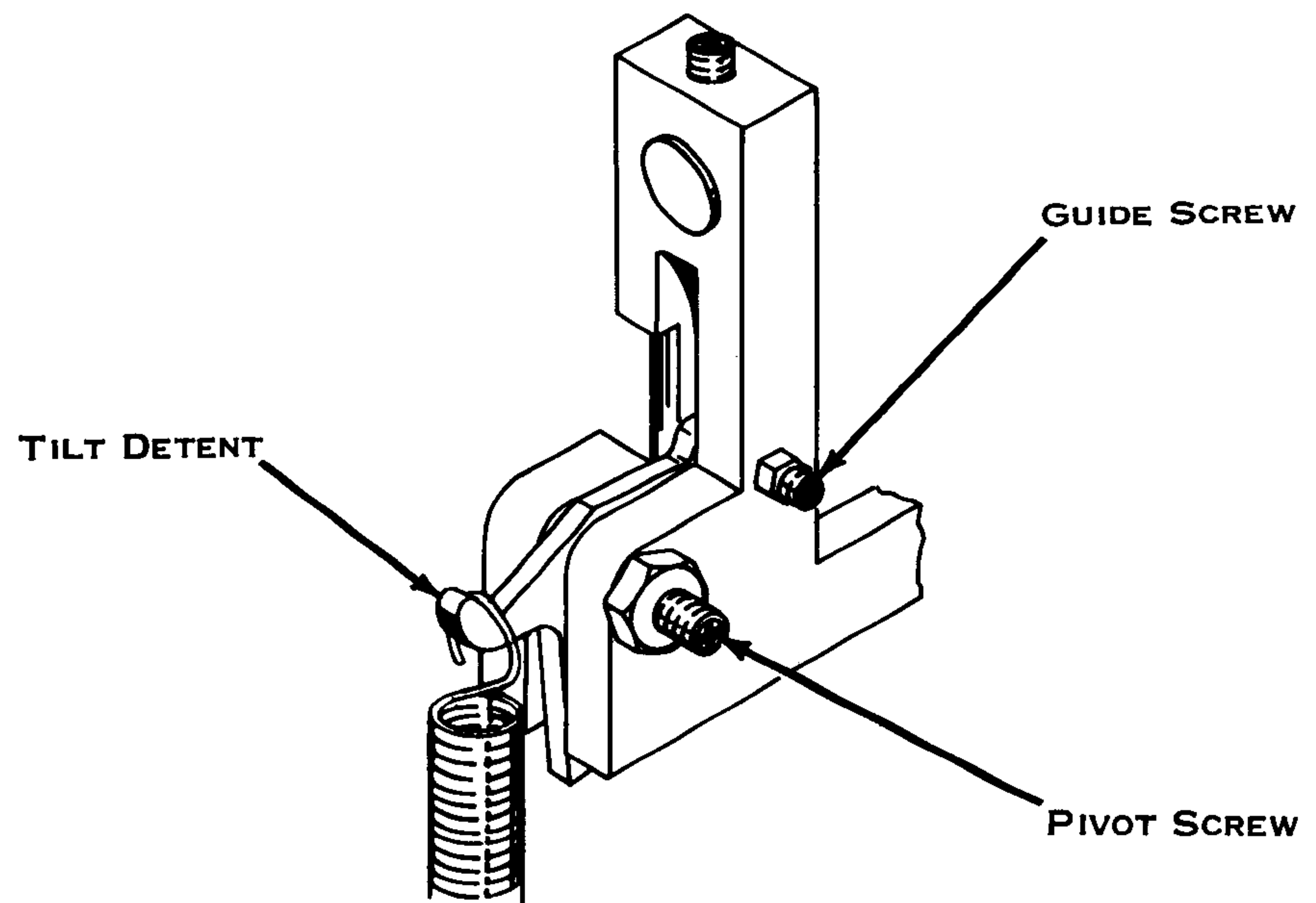


Figure 63. Tilt Detent Adjustment



6. Rocker Shaft (Fig. 64) - The rocker shaft should be positioned left or right to obtain .002" to .004" side play in the rocker.

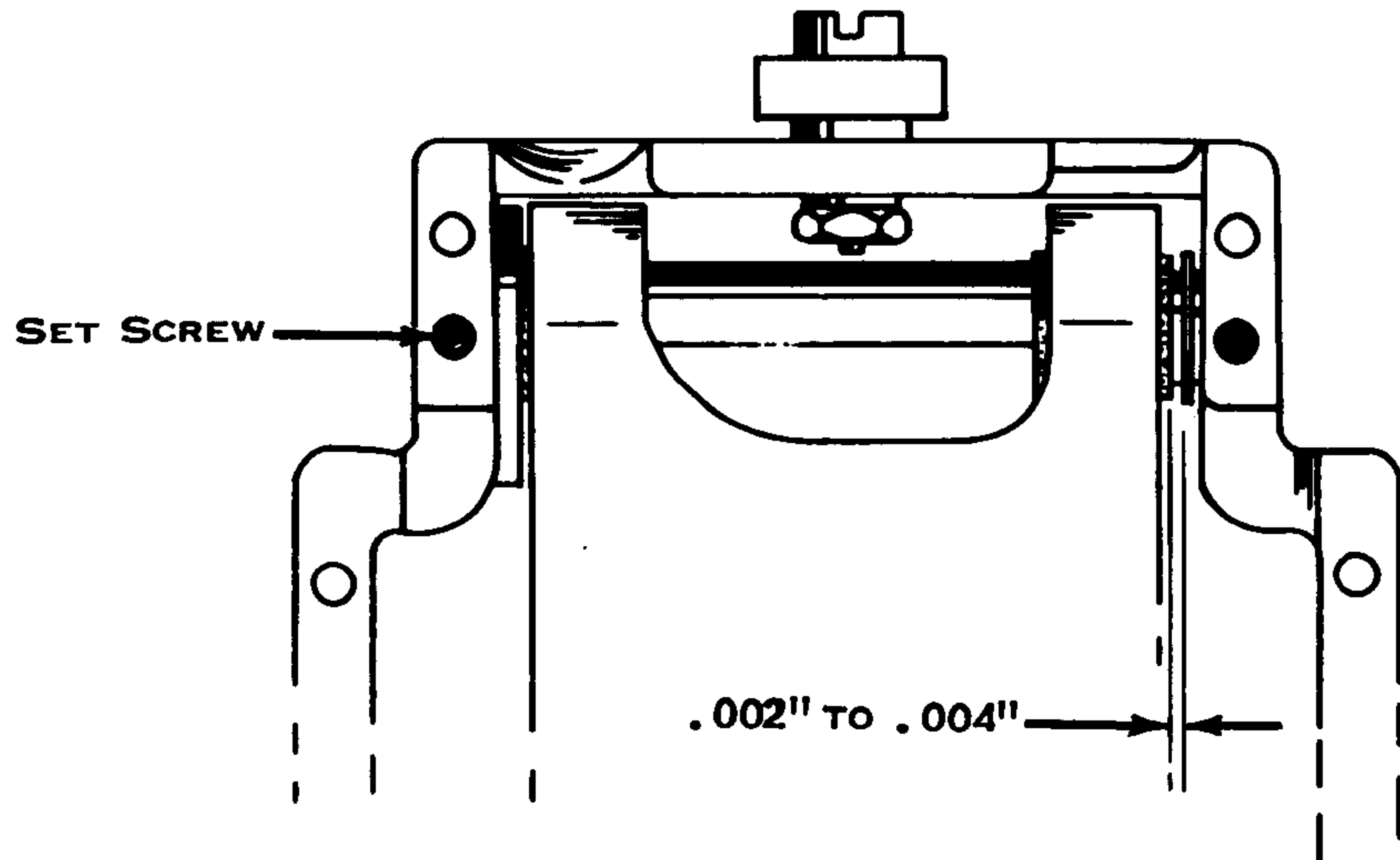


Figure 64. Rocker Shaft Adjustment

7. Print Sleeve End Play (Fig. 65) - Adjust for .002" to .004" end play by positioning the print cam. NOTE: The center punch mark on the ribbon lift cam should be in line with the keyway on the cam sleeve.

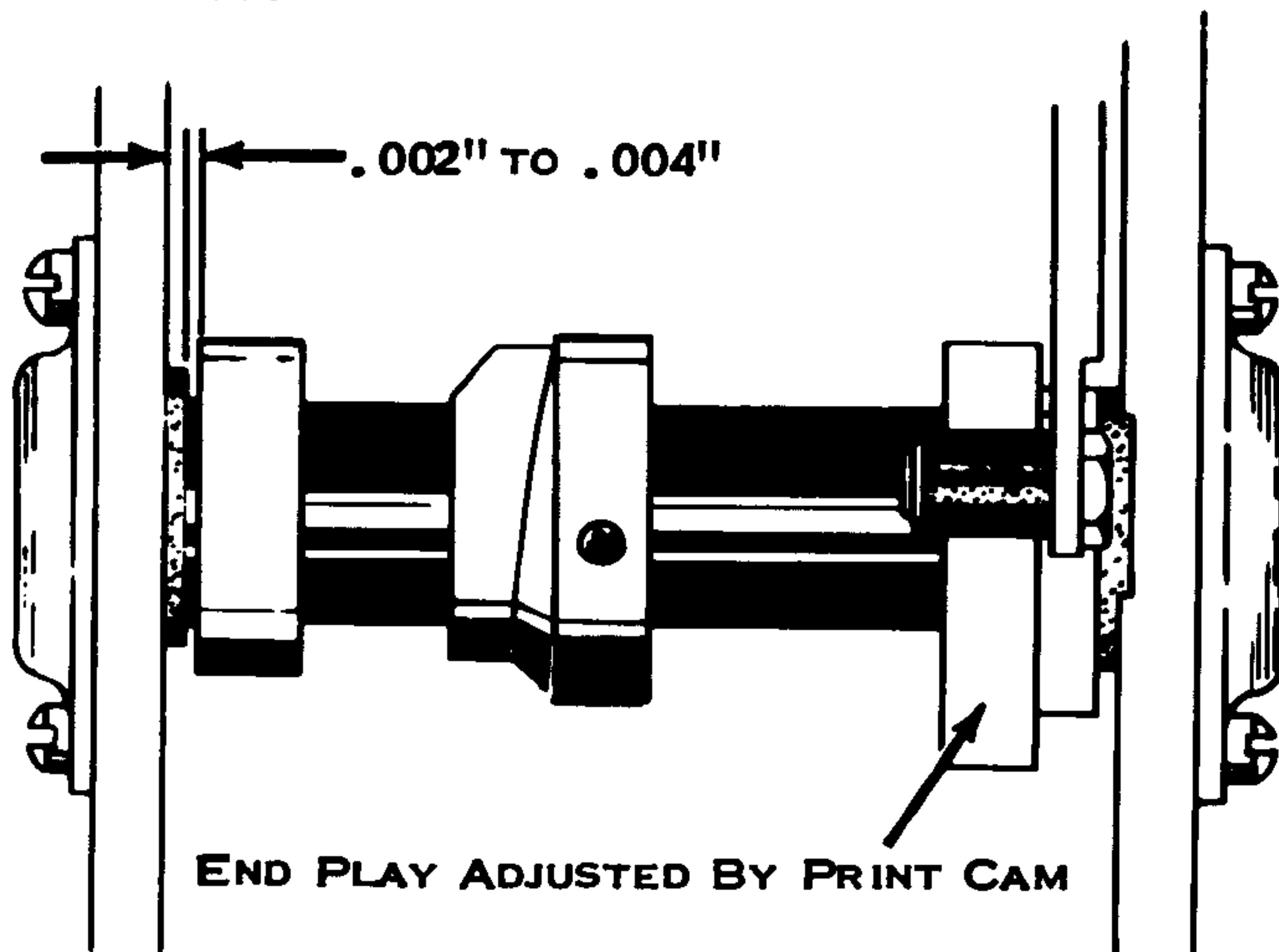


Figure 65. Print Sleeve End Play

ADJUSTMENTS 8 & 9 ARE FOR MACHINES PRIOR TO GEARLESS TILT.

ADJUSTMENTS 10 & 11 ARE FOR GEARLESS TILT MECHANISMS.

8. Ribbon Feed Cam Prior To Gearless Tilt (Fig. 66) - Position (left or right) so that the left hand edge of the ribbon feed cam follower is in line with the inside rib of the cam. On split cam type, position detent cam flush against ribbon feed cam.

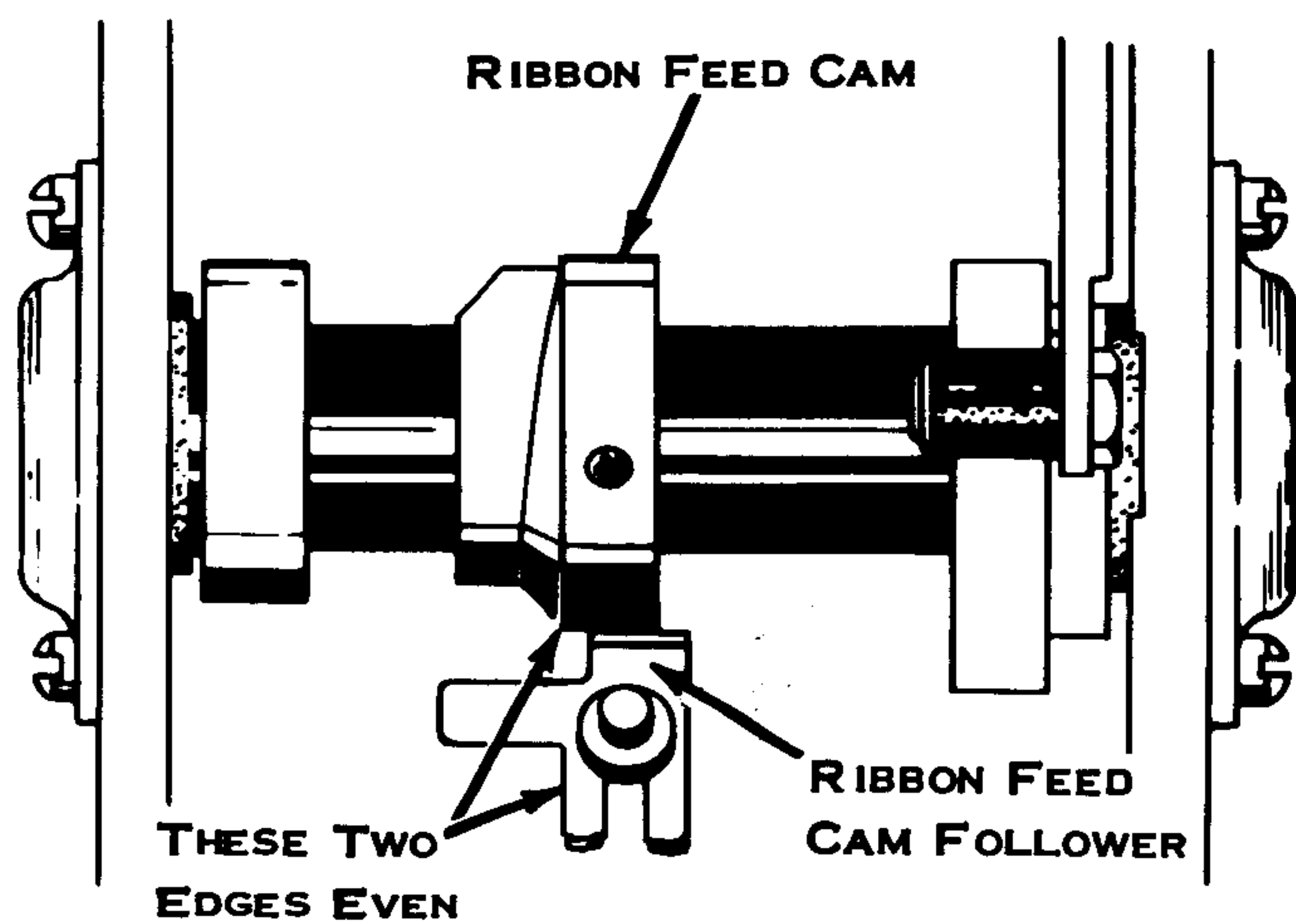


Figure 66. Ribbon Feed Cam (New)

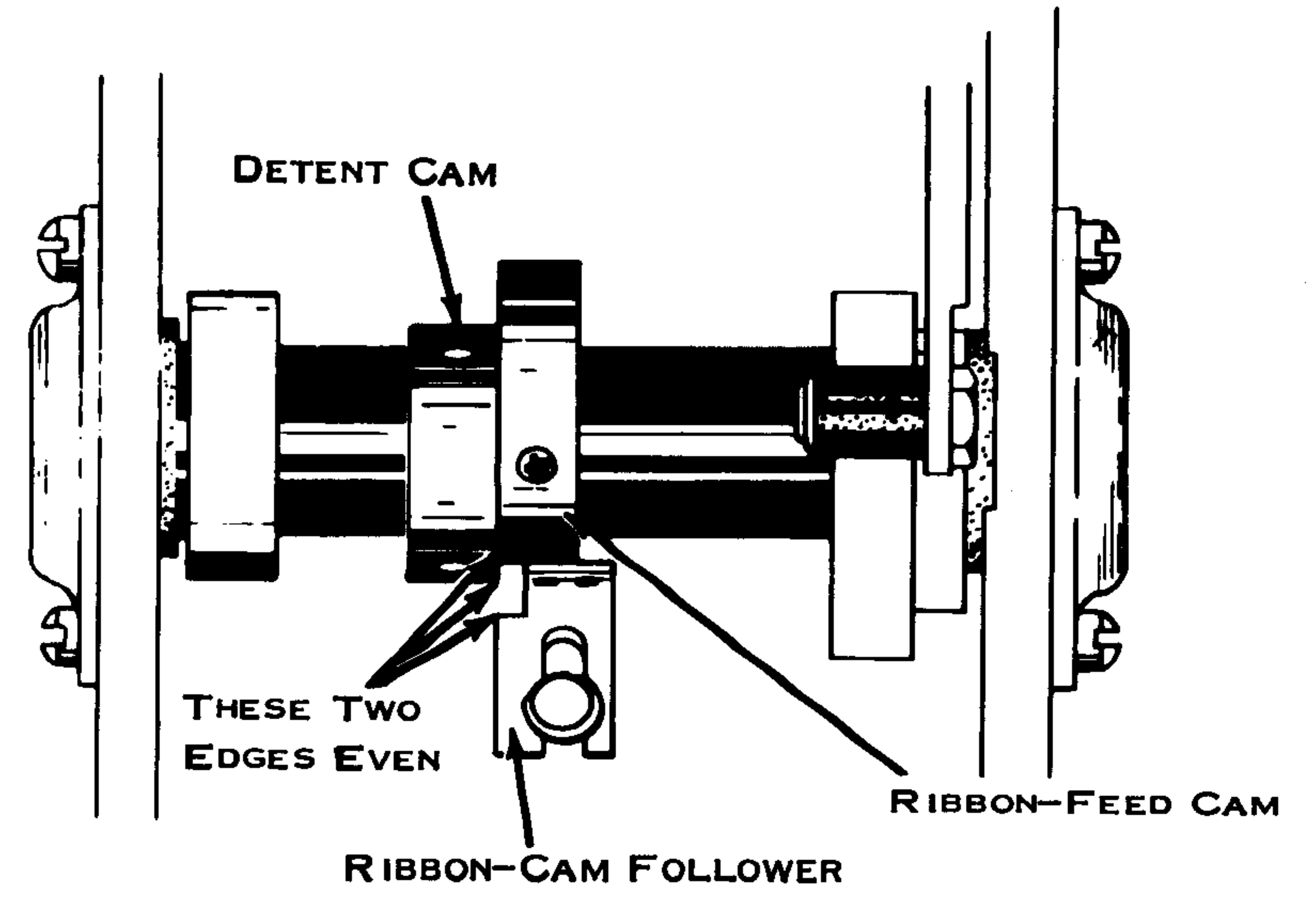


Figure 66. Ribbon Feed Cam (Old)

9. Detent Lever Support Prior To Gearless Tilt (Fig. 67) - Loosen locking screw and adjust as follows:
- Front To Rear - so that rotate detent clears typehead skirt by .025" to .035" in a tilt two position. NOTE: Positioning to rear will increase skirt clearance.
  - Rotary - for .001" minimum clearance between the detent lever and the detent cam follower roller in all tilt positions. NOTE: Rotating the detent support clockwise will increase the lever to roller clearance.

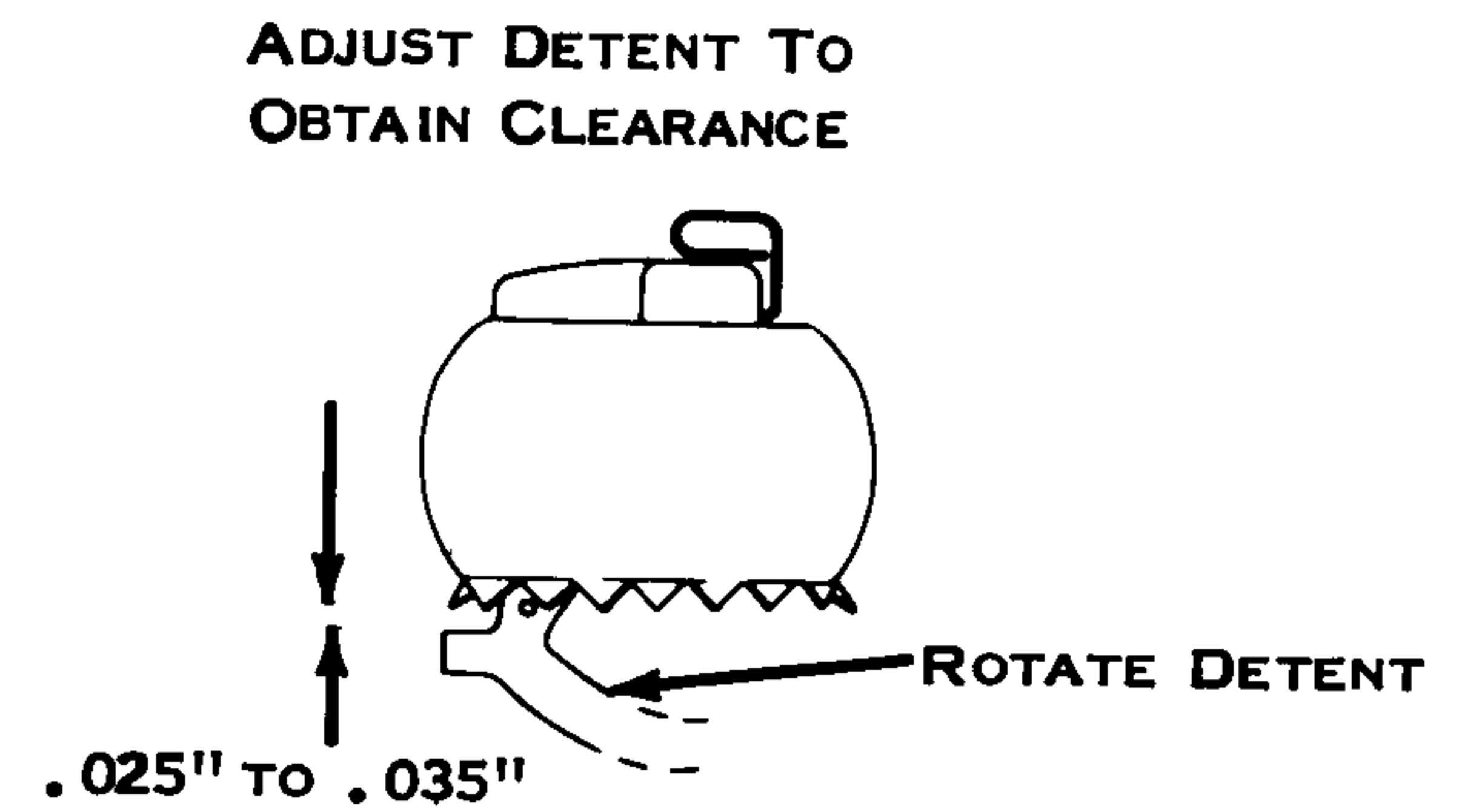


Figure 67. Detent Lever Support

10. Ribbon Feed And Detent Cam Gearless Tilt (Fig. 68) - Position left or right for .025" to .035" clearance between the detent and typehead skirt in a tilt two position.

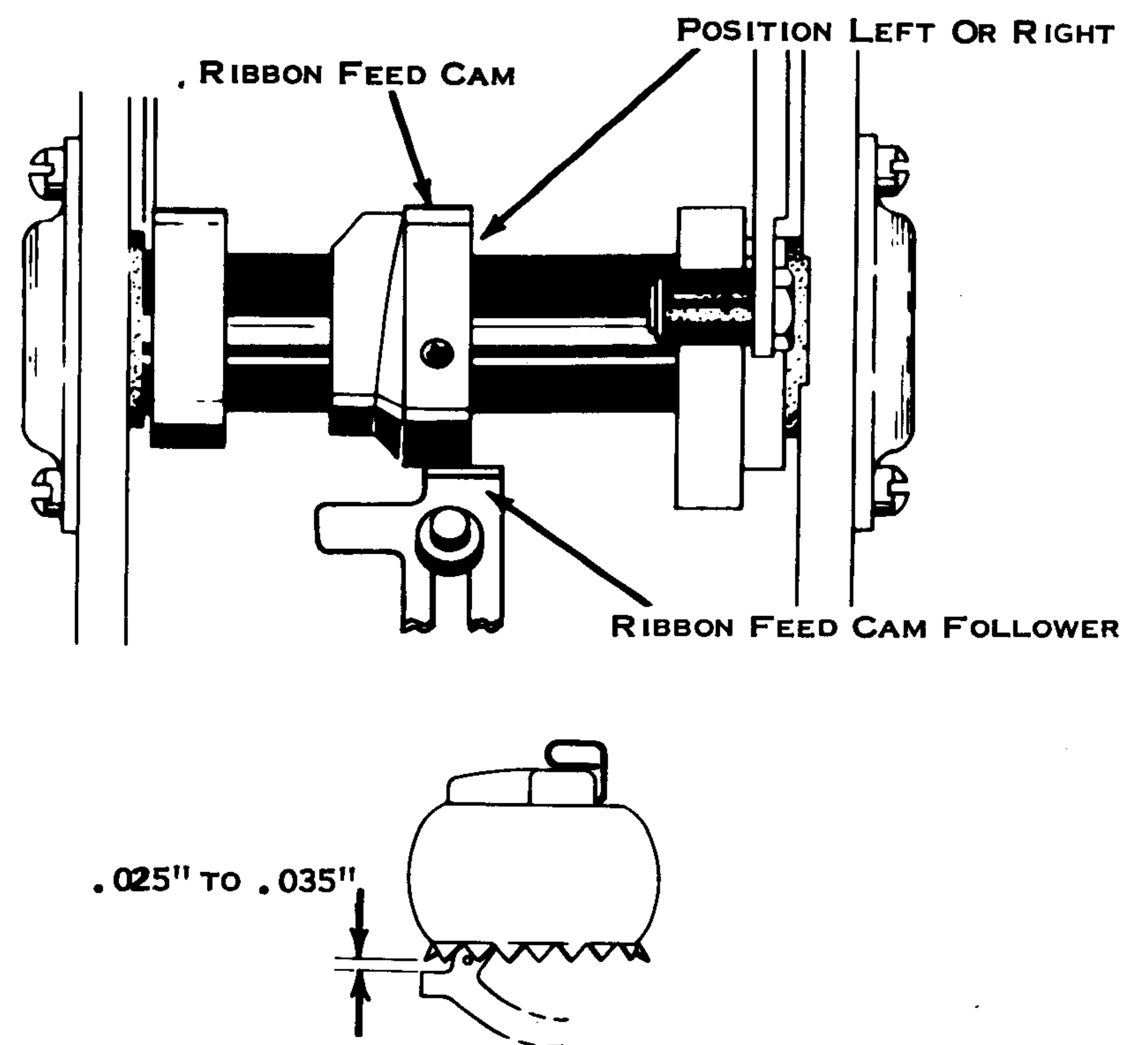


Figure 68. Detent Cam Adjustment



11. Detent Lever Support, Gearless Tilt (Fig. 69) - Loosen locknut and adjust bristo screw up or down so that a .001" minimum clearance exists between the detent cam follower and the detent lever in all tilt positions. NOTE: Adjusting the screw down will reduce the clearance.

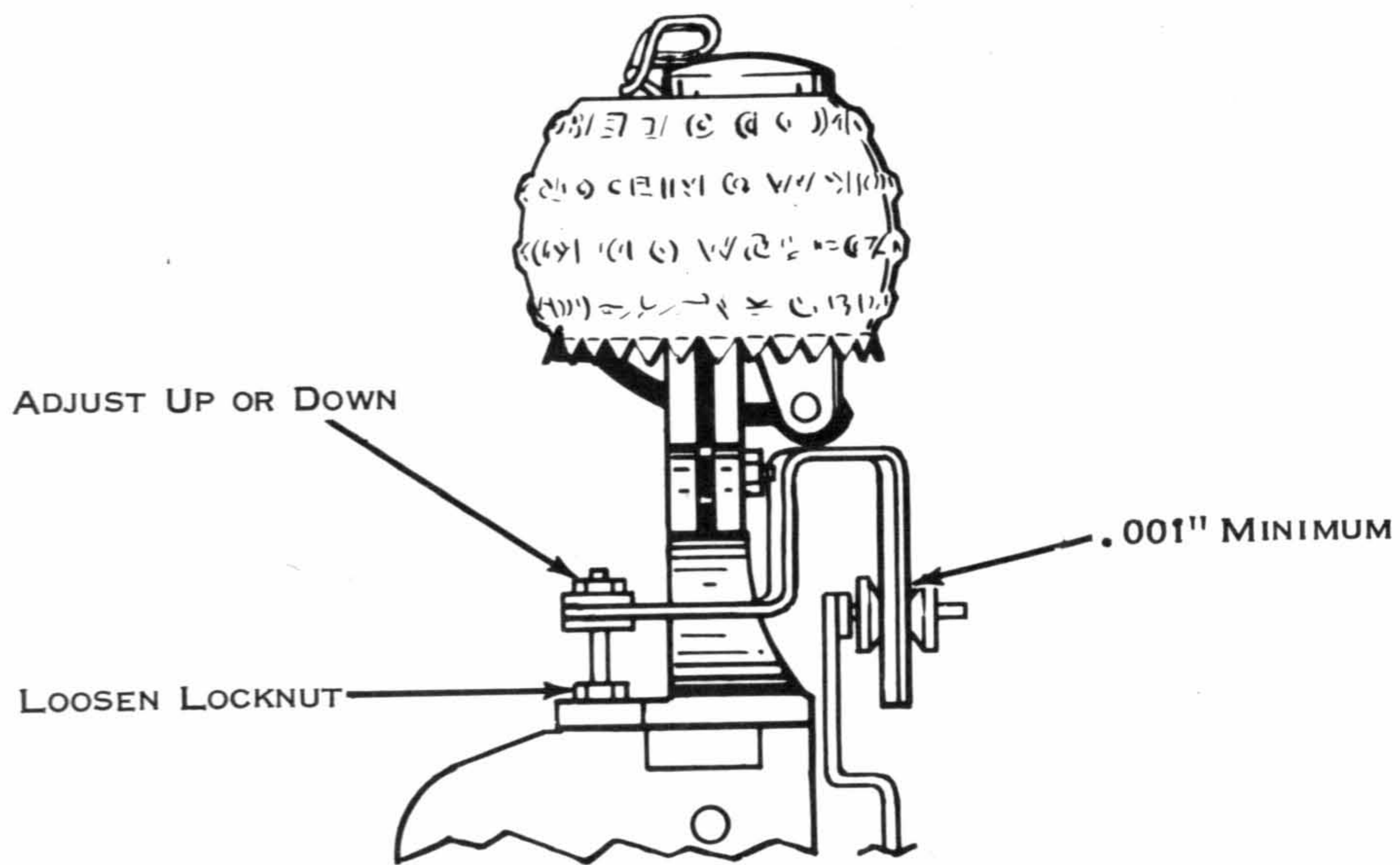


Figure 69. Detent Lever Support

### TILT MECHANISM

1. Tilt Latch Clearance (Fig. 70) - Both tilt latches must reset simultaneously just as the cycle clutch check latch drops into the notch of the check ratchet. Form the stops up or down so that this condition exists.
2. Right Hand Tilt Pulley (Fig. 72, Ref. Fig. 71) - Position so that when a zero tilt, zero rotate character is half cycled, the tilt detent enters just to the rear of the center of the notch with the backlash held lightly to the rear. NOTE: With the backlash removed in the opposite direction, the detent should not strike the tip of a tooth and snap into place. The locknut must be tight each time this adjustment is checked. NOTE: Adjustments 2 & 3 are inter-acting.
3. Tilt Arm - Adjust the tilt link (up or down) so that the same detent entry is obtained with a half cycled tilt three character as with a half cycled tilt zero character.

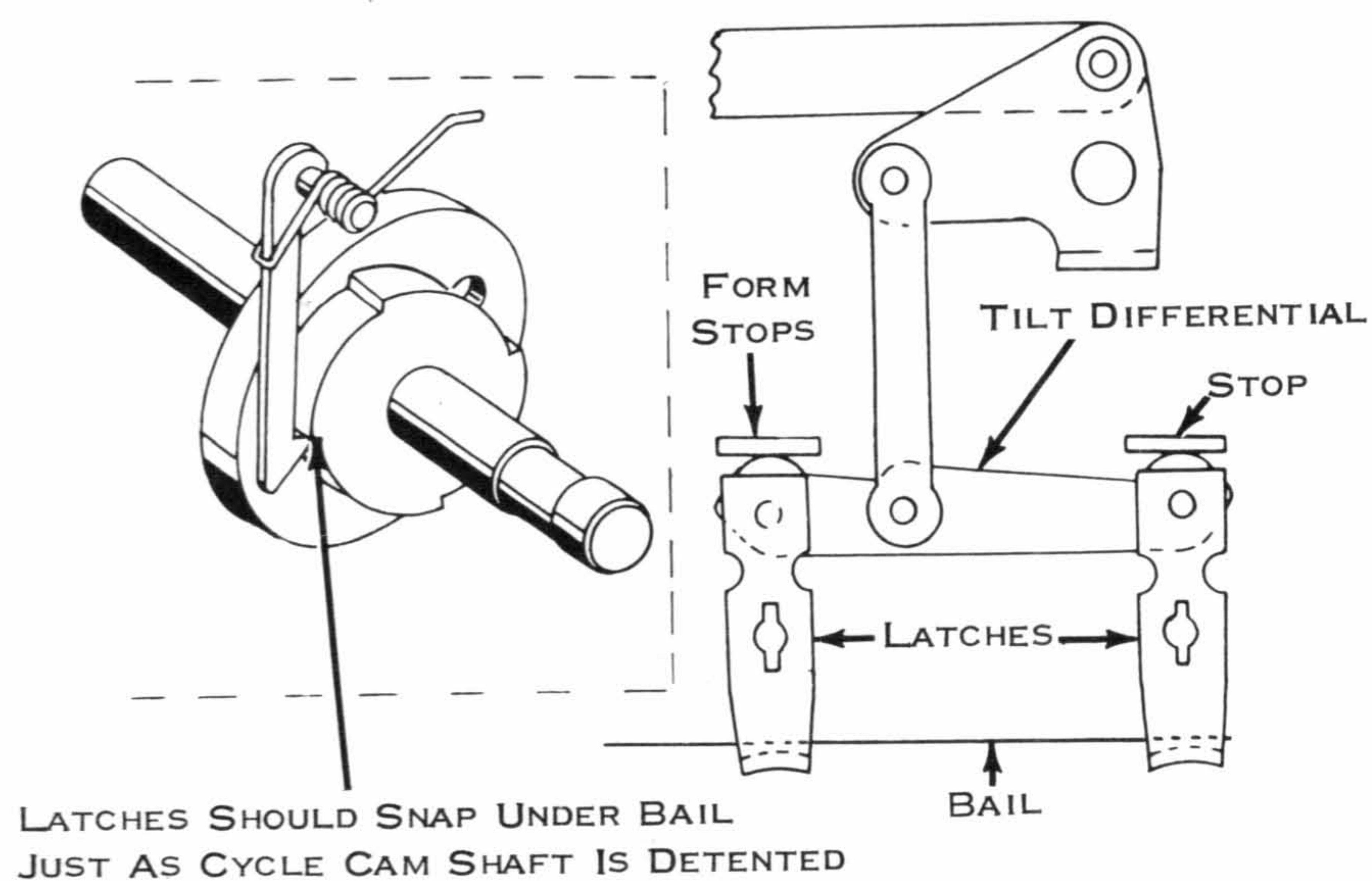


Figure 70. Tilt Latch Stop Pad

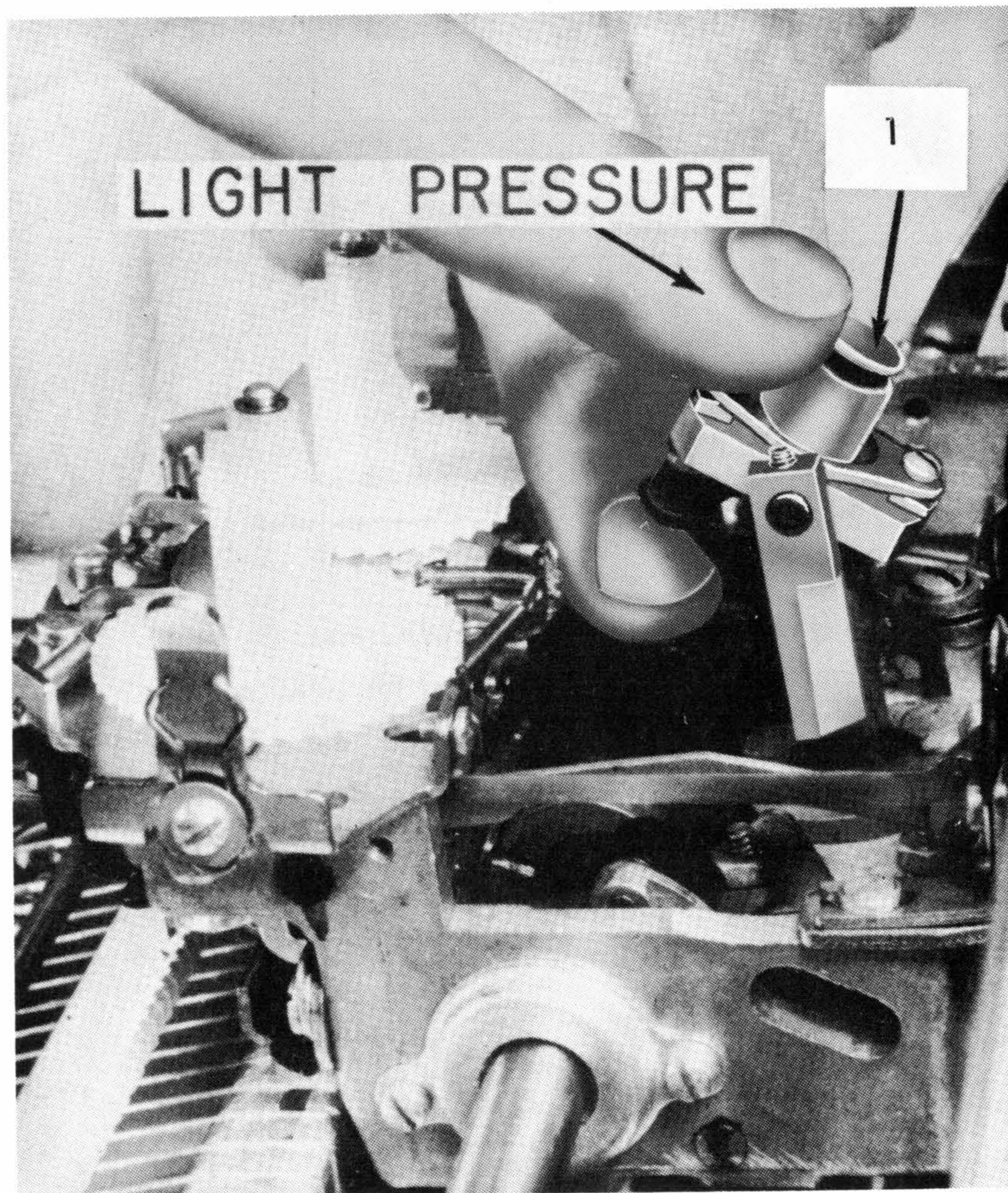


Figure 71. Tilt Detent

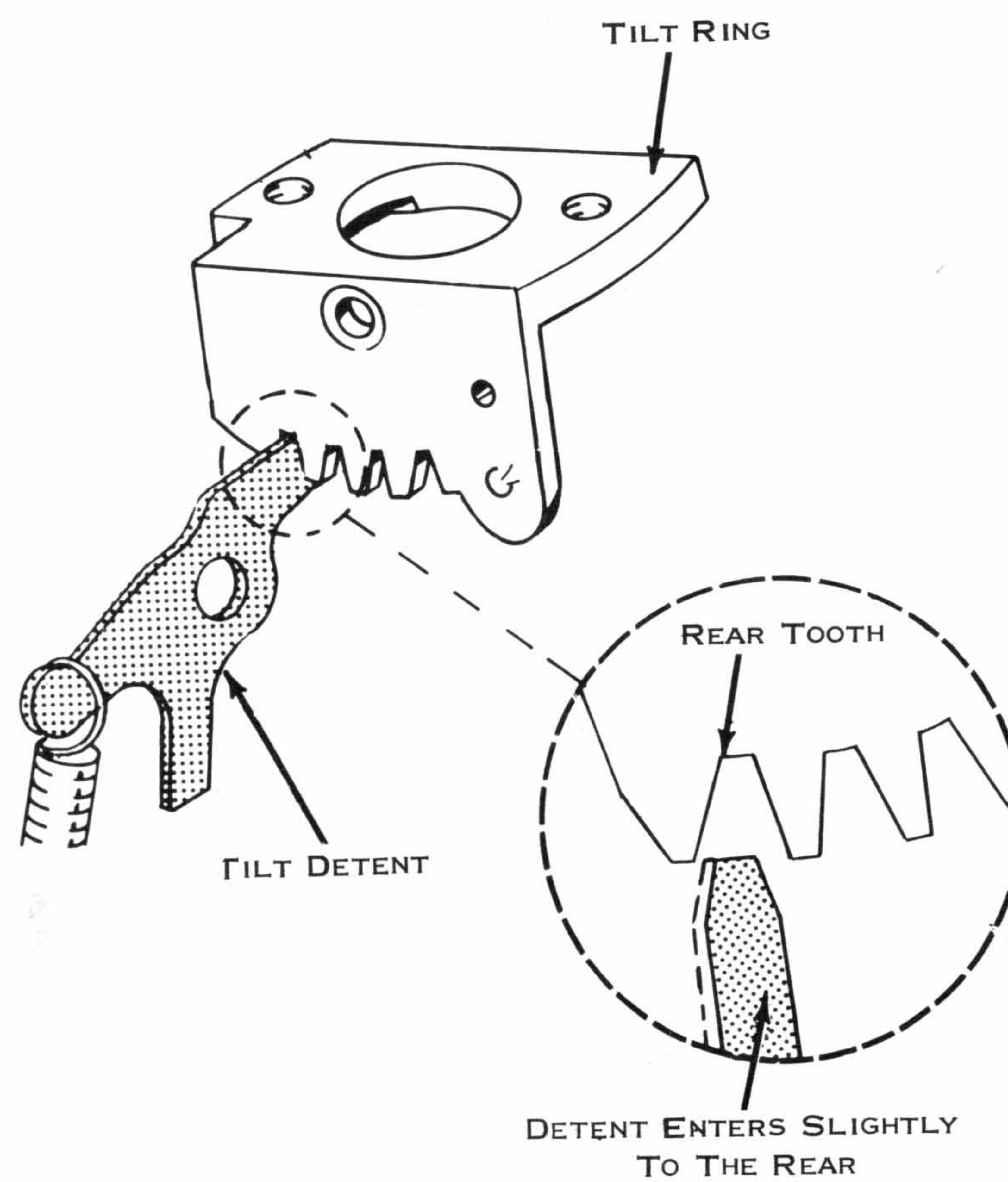
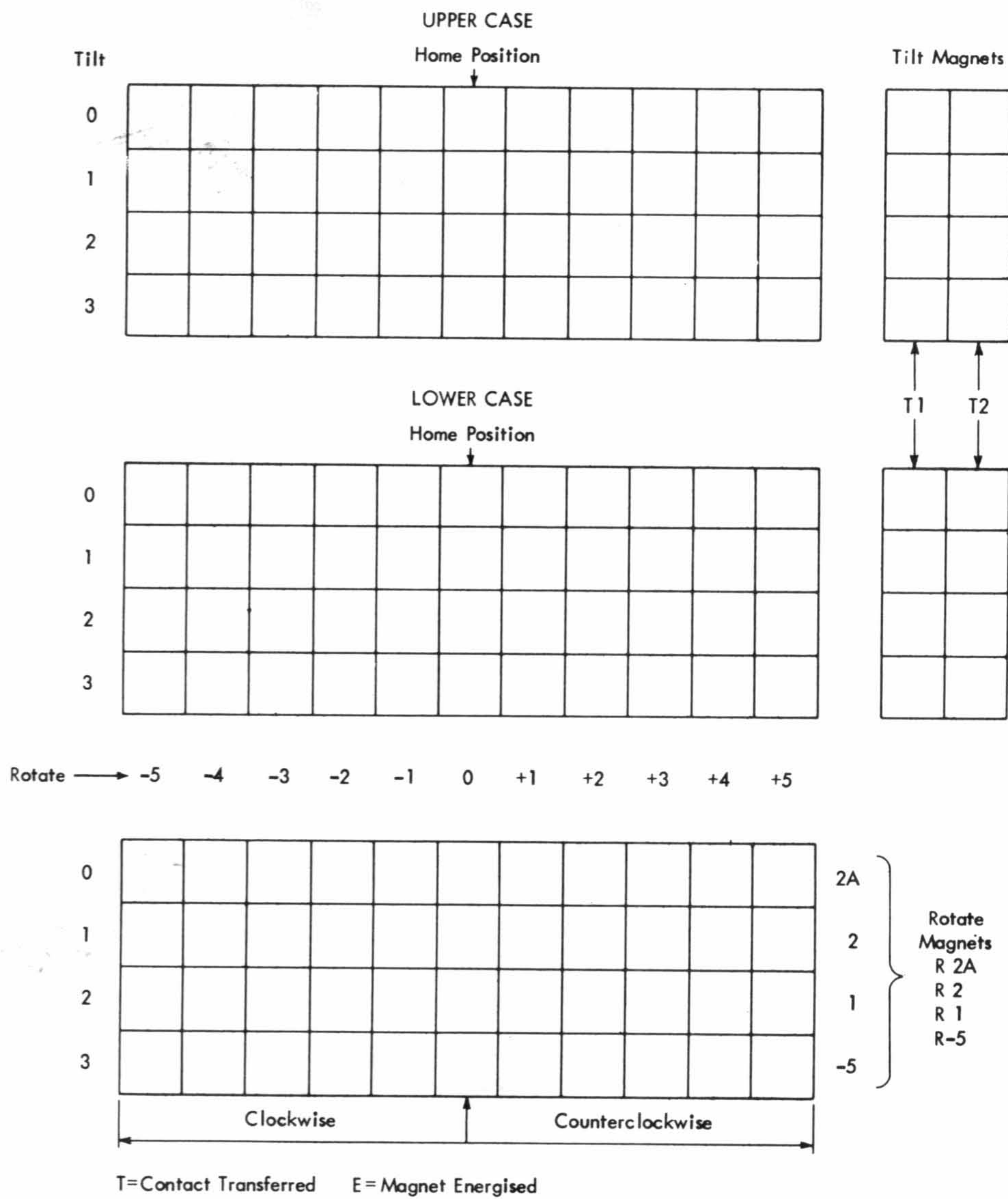


Figure 72. Tilt Detent Adjustment





NOTE IF POSSIBLE CE SHOULD NOTE WHAT CHARACTERS ARE I/O HOME AND WHICH ARE LATCH HOME

Figure 73. Charts For Head Plots

### ROTATE MECHANISM

Preliminary Timing (Fig. 74) - Position the print shaft so that the keyway is in line with the screw used as the ribbon lift cam follower pivot.

#### NOTE:

Typehead skirt clearance must be correct before proceeding with adjustment sequence. Whenever any adjustment is made, machine should be re-half cycled.

1. Rotate Spring Tension (Fig. 75) - The rotate spring should be adjusted in the rocker so that it will have 2 pounds tension when the machine is half cycled to a lower case (machines which are locked in upper case use upper case -5 character) negative 5 position. Measure the tension with a spring scale hooked over the shift arm adjacent to pulley. If a spring scale is not available, the tension may be obtained in the following manner. With the machine half-cycled at a negative five lower case (machines which are locked in upper case use upper case -5 character) position and the type head removed, insert a large spring hook around the lower compensator arm. Pull so that the rotate arm eccentric just clears the damper spring and release it. The tension of the rotate spring should be enough to completely collapse the damper spring against the power frame with the damper spring stop adjusted at the bottom of the spring.

With the damper spring stop all the way up, the damper spring should not be completely collapsed. Check and adjust the rotate spring to satisfy both conditions.

#### NOTE:

Lower damper spring stop to bottom before proceeding with sequence. CAUTION - The damper spring method is only useable when it is impossible to obtain a spring scale.

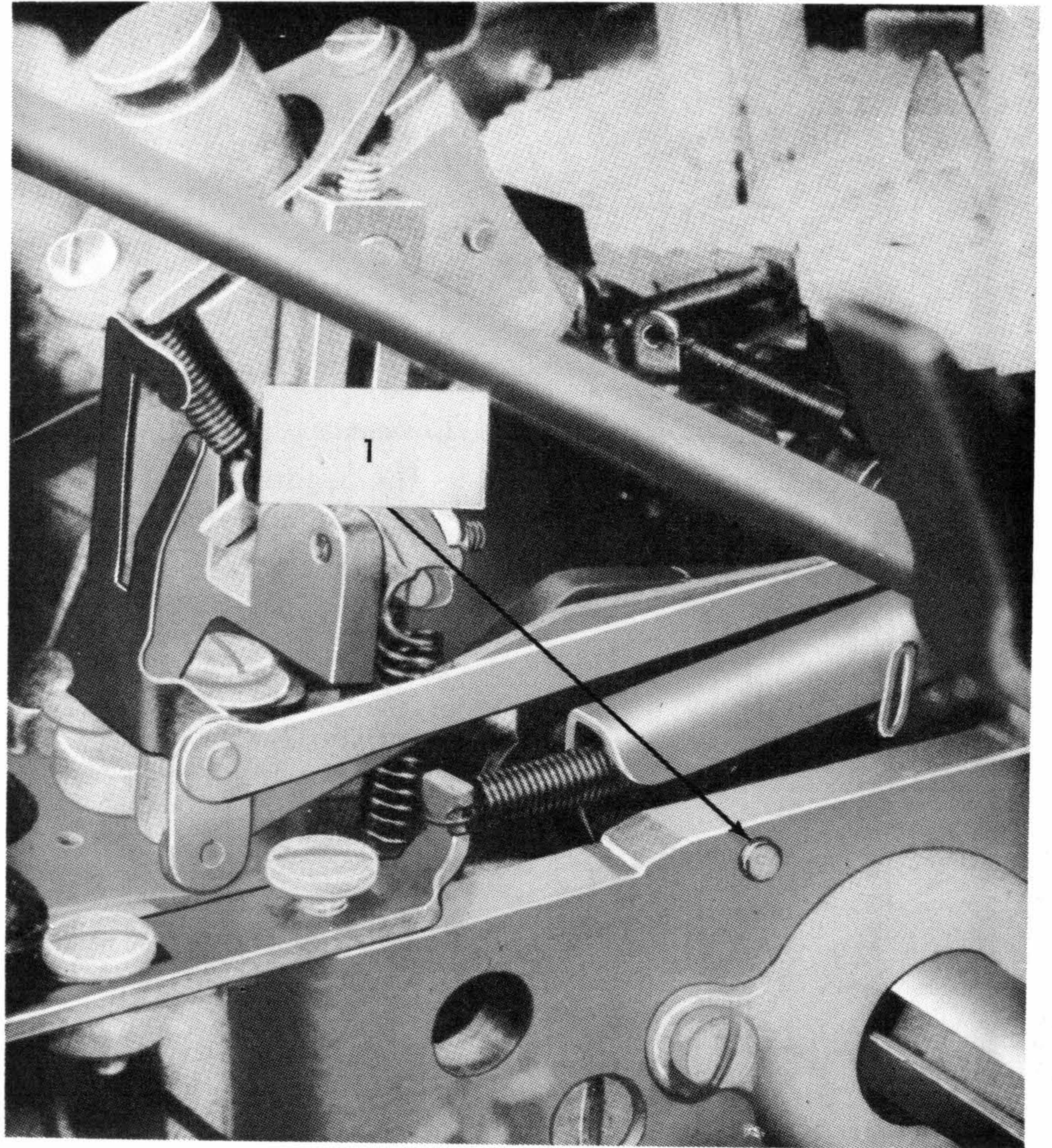


Figure 74. Preliminary Timing

MACHINE HALF CYCLED TO A NEGATIVE 5 LOWER CASE CHARACTER

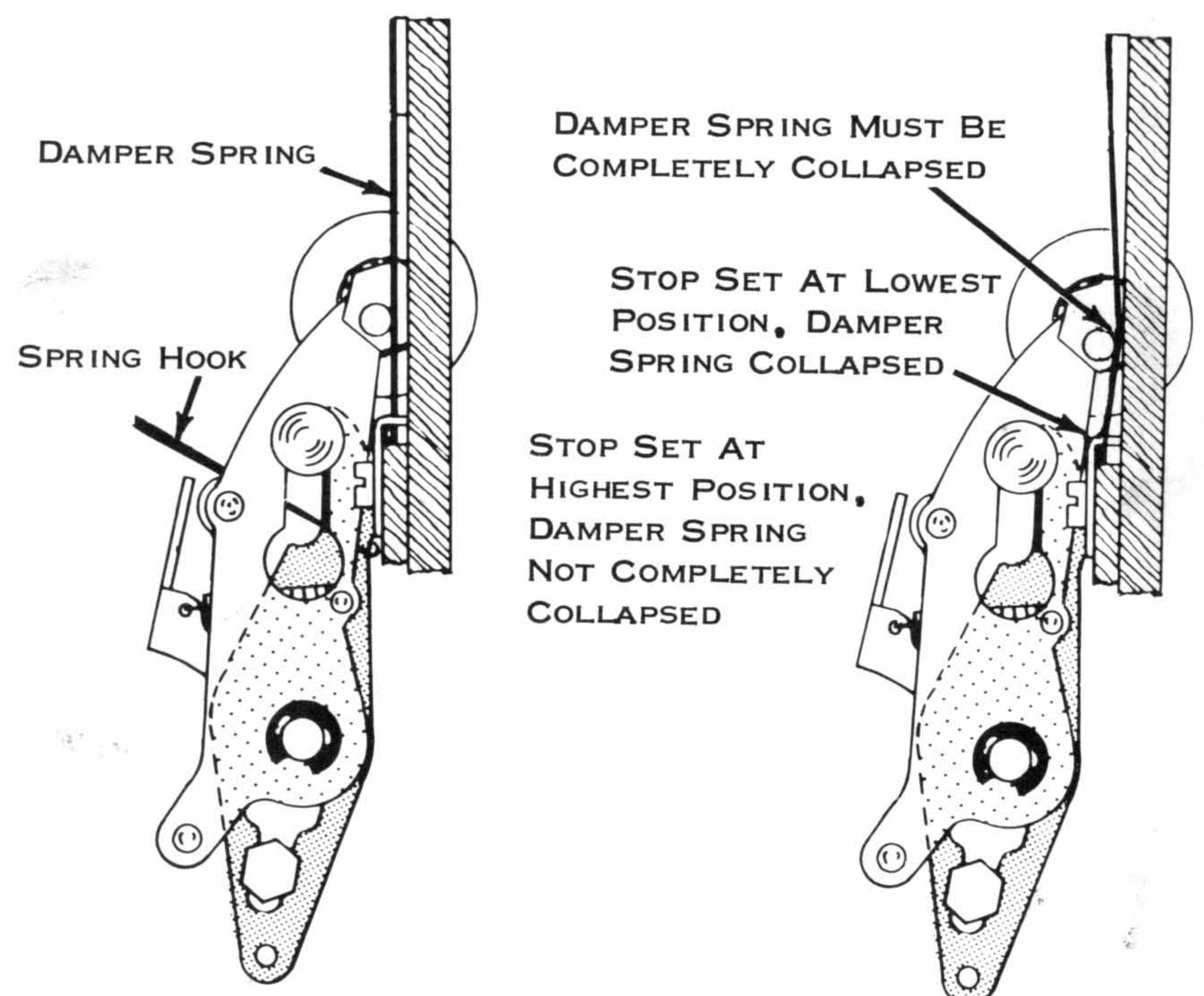


Figure 75. Rotate Spring Tension



**NOTE:**

REMOVAL OF THE PRINT SELECTION CONTACT ASSEMBLY IS NECESSARY FOR ADJUSTMENTS 2, 3, 4, and 5.

- 2 Positive Rotate Latches (Fig. 76) - The stops of the positive rotate latches should be formed so that the positive rotate latches will reset simultaneously just as the cycle clutch check pawl drops into the tooth of the check ratchet at the rest position.

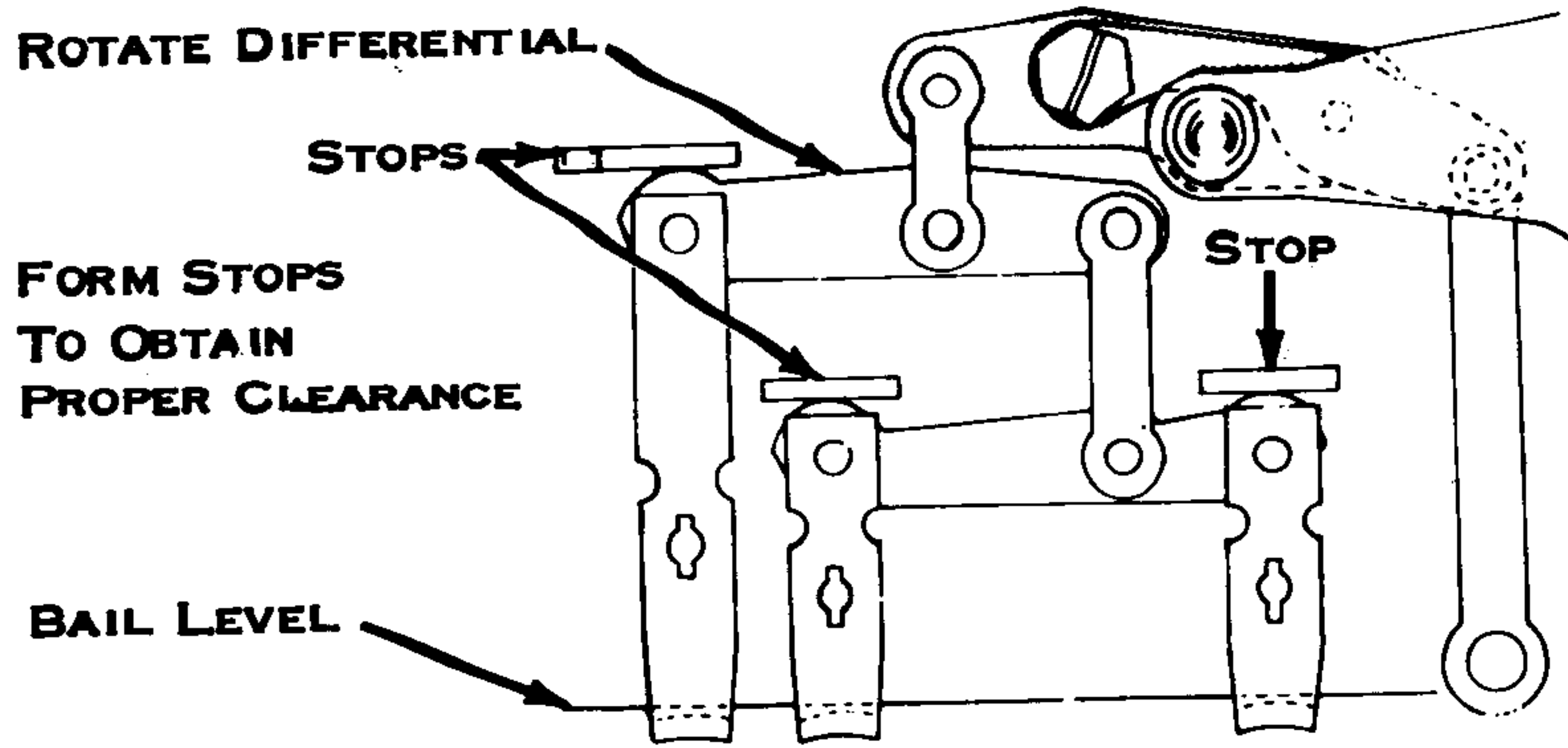


Figure 76. Rotate Latch Clearance

3. Negative Latch Clearance (Fig. 77) - The negative five stop pad screw should be adjusted so that the negative latch resets at the same time as the positive latches.

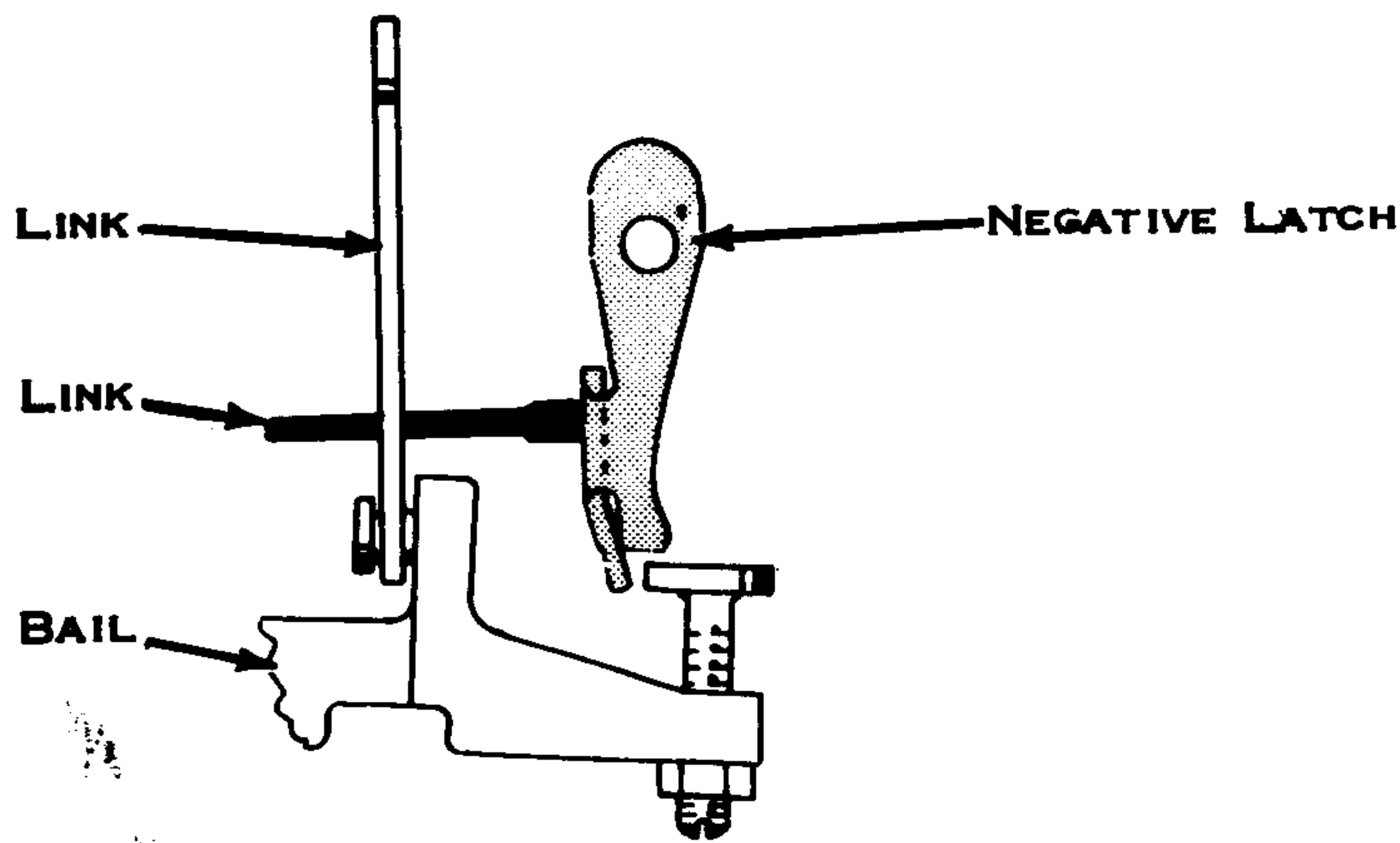


Figure 77. Negative Latch Clearance

4. Rotate Link (Fig. 78) - With the type head removed, adjust the rotate link (with the machine half cycled to an upper case zero rotate character) so that the rotate arm is .469" from the power frame. The number 1 scribe line on the Hoovermeter handle can be used to give the proper dimensions. The compensator roller should be positioned 1/32" to 1/16" from the top of its slot. **NOTE:** Zero rotate selection defined under adjustment 6.

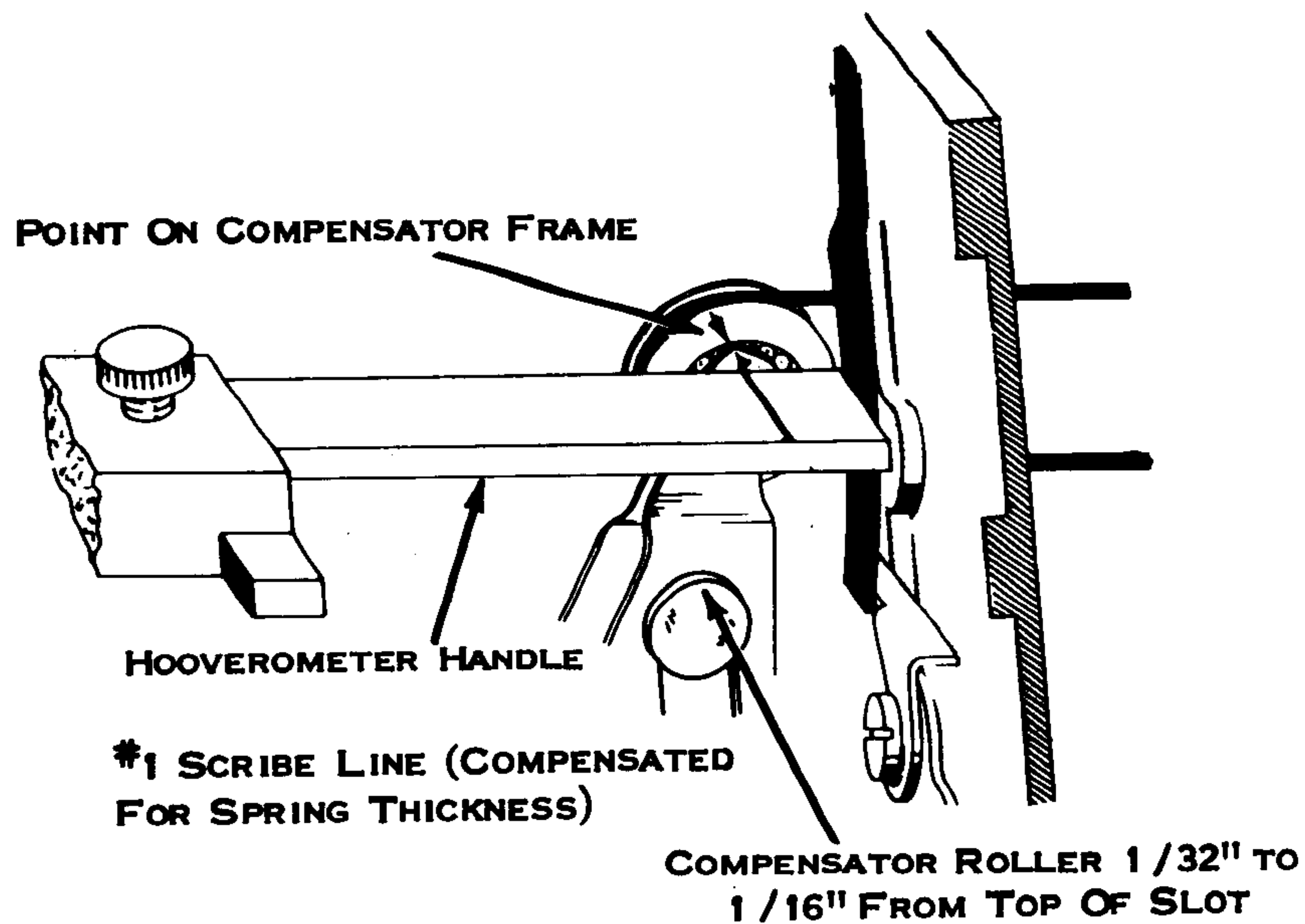


Figure 78. Rotate Link

5. Typehead Homing (Fig. 79) - With the carrier positioned to the left and an upper case tilt 1, zero rotate character half cycled, loosen the set screw in the bottom of the rotate pulley and slip the typehead for .010" to .020" clockwise motion of the head when the

detent is manually withdrawn. **NOTE:** Zero rotate selection defined under Adjustment 6.

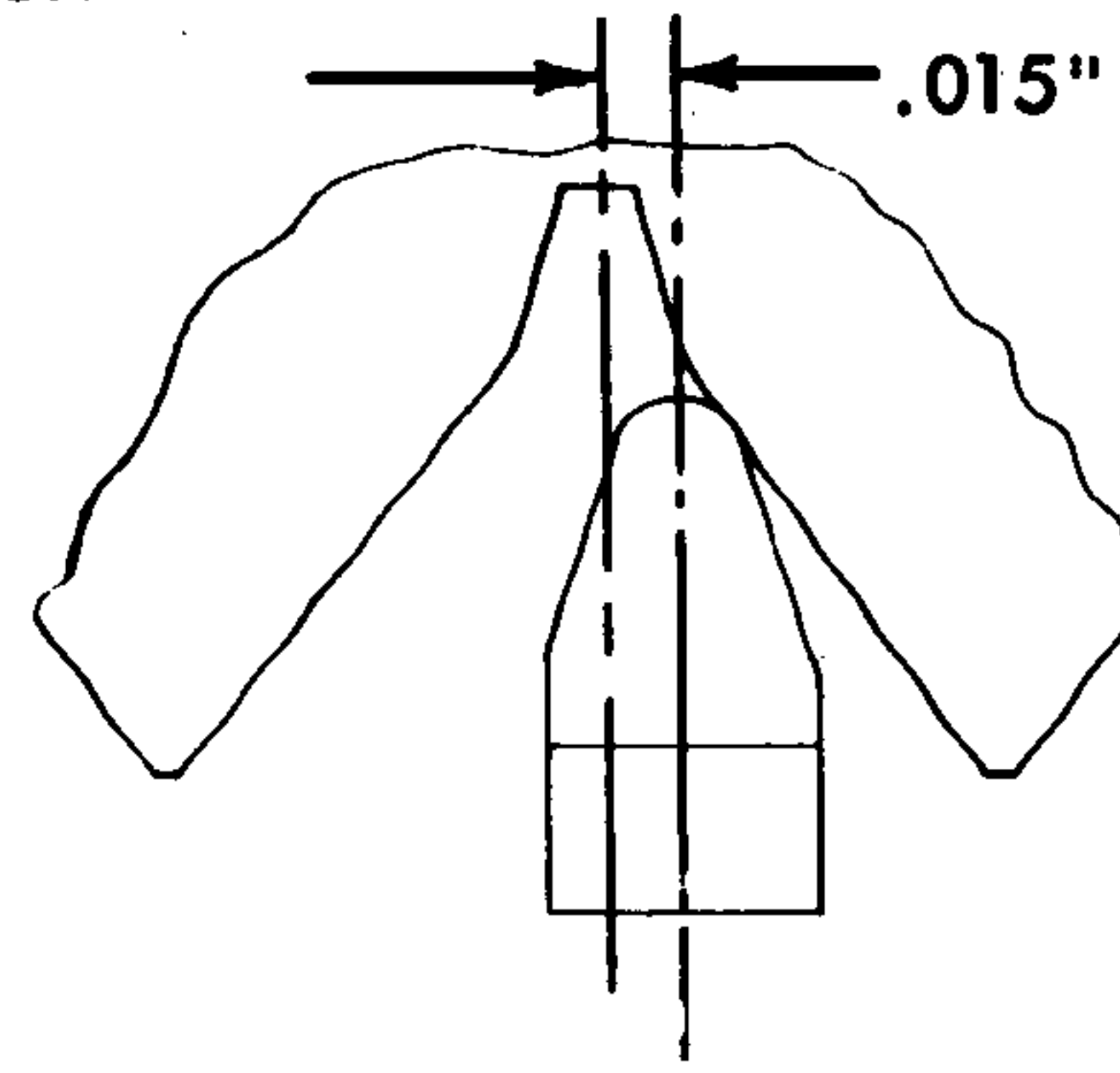


Figure 79. Typehead Homing

**NOTE:**

Machines locked in upper case can sometimes be adjusted by the stud in the shift arm.

6. Balance Arm (Fig. 80) - Position (left or right) until a half cycled upper case +5/-5 combination detents the same as a half cycled zero rotate character. Select combinations as follows:

+5/-5 (I/O home) ---- Negative latch not over its bail.  
Zero Rotate Character (latched home) ---- Positive latches not under selector bail.

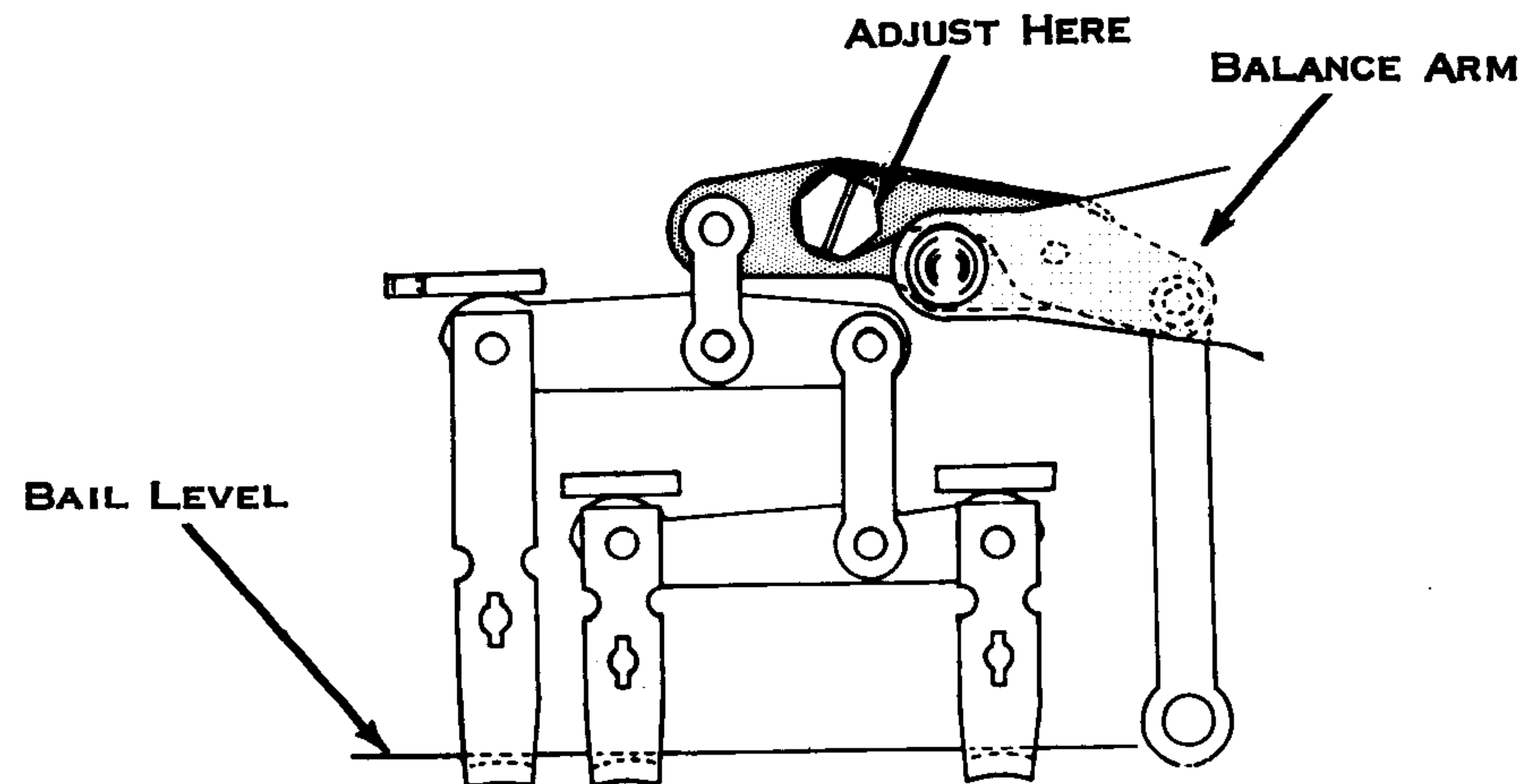


Figure 80. Balance Arm

7. Rotate Arm Movement (Fig. 81) - The lower adjustable portion of the rotate arm should be moved up or down so that the upper case +5 character and upper case -3 character detent the same as the home character. A slight difference in detenting is acceptable provided that the -3 character detents more negative than the +5 character.

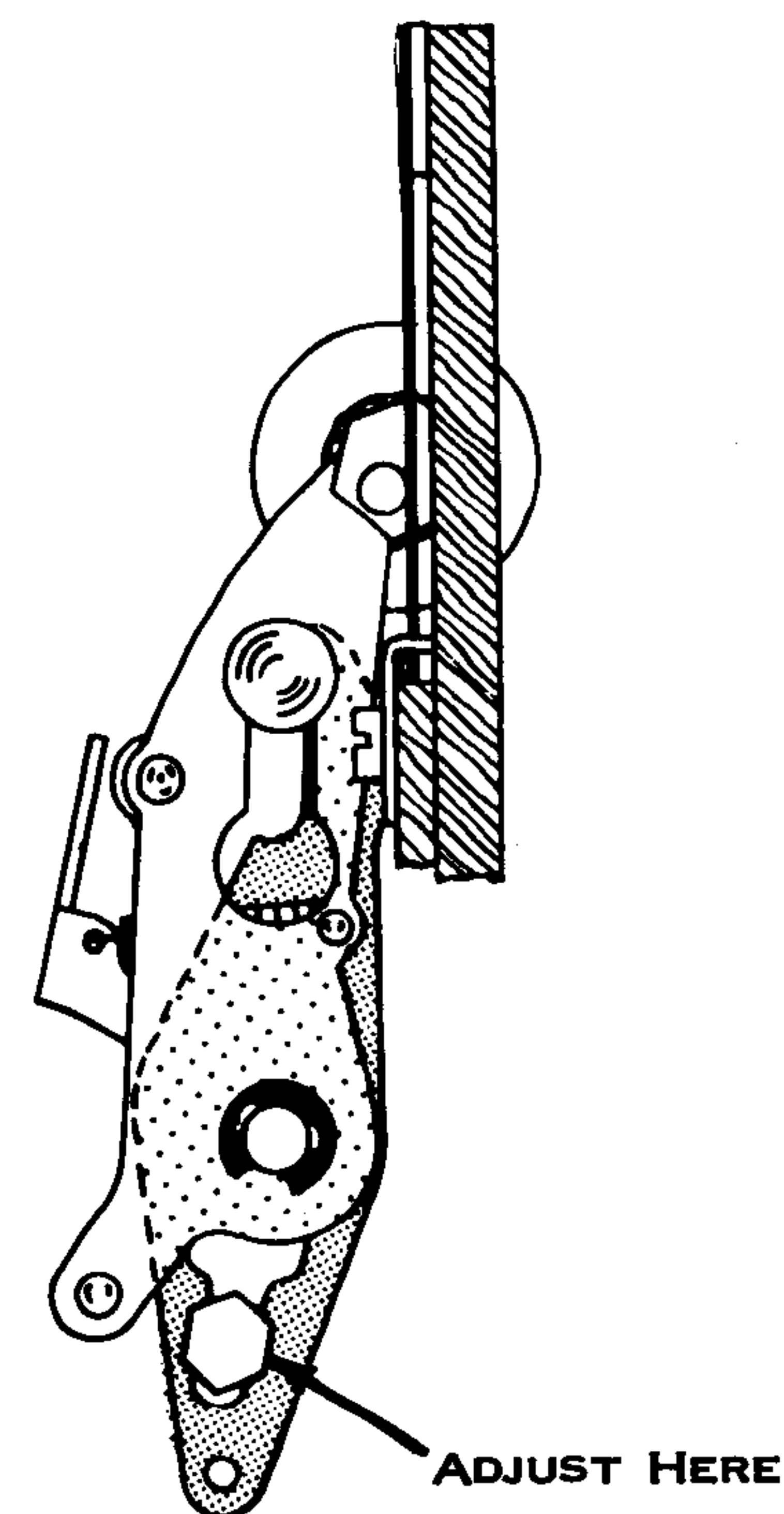


Figure 81. Rotate Arm Movement



8. Rotate Eccentric Arm (Fig. 82) - With the type head removed and the machine half cycled using an upper case negative four selection, form the rotate eccentric arm paddle to clear the rotate arm barrel by .001" to .005".

Observe the detenting for an upper case -3 and an upper case -4 character. It may be necessary to increase or decrease the clearance slightly to make them the same. Recheck adjustment number 4 and 5.

MACHINE HALF CYCLED  
NEGATIVE 4 CHARACTER

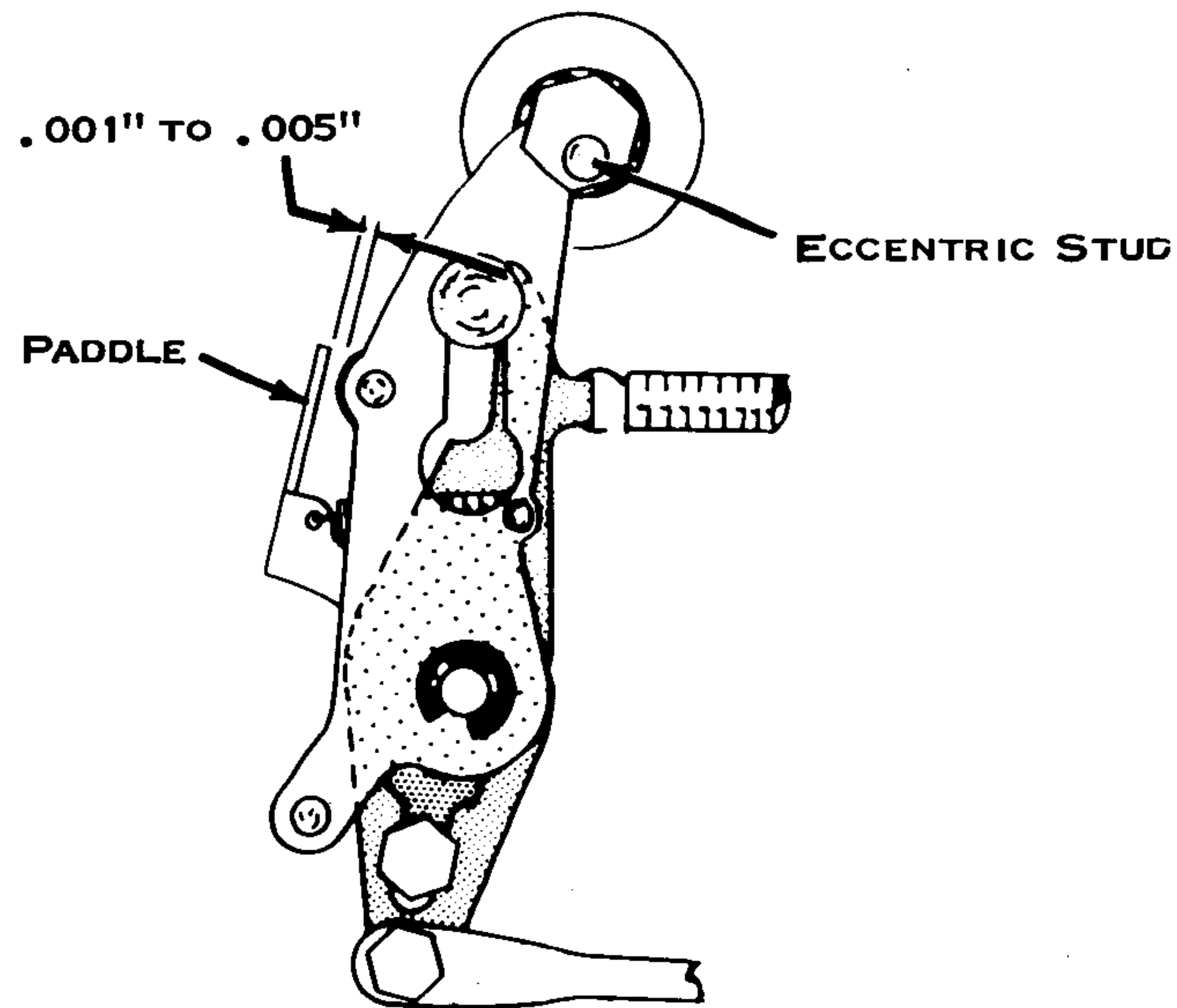


Figure 82. Rotate Eccentric Arm

9. Rotate Arm Eccentric Stud (Fig. 83, Ref. Fig. 82) - With the machine half cycled under power and using an upper case -5 character, manually withdraw the detent and remove the head play by rotating the type head lightly in a clockwise direction. Allow the detent to re-enter slowly. The detent should re-enter .010" to .020" from center of the notch. This adjustment is made with the eccentric stud at the top of the rotate arm. The compensator damper spring must be fully compressed against the power frame when checking the adjustment. Reseat the compensator roller after each adjustment of the eccentric. NOTE: The compensator roller should be 1/32" to 1/16" from the top of the slot when the adjustment is completed. Eccentric must be kept in lower RH quadrant.

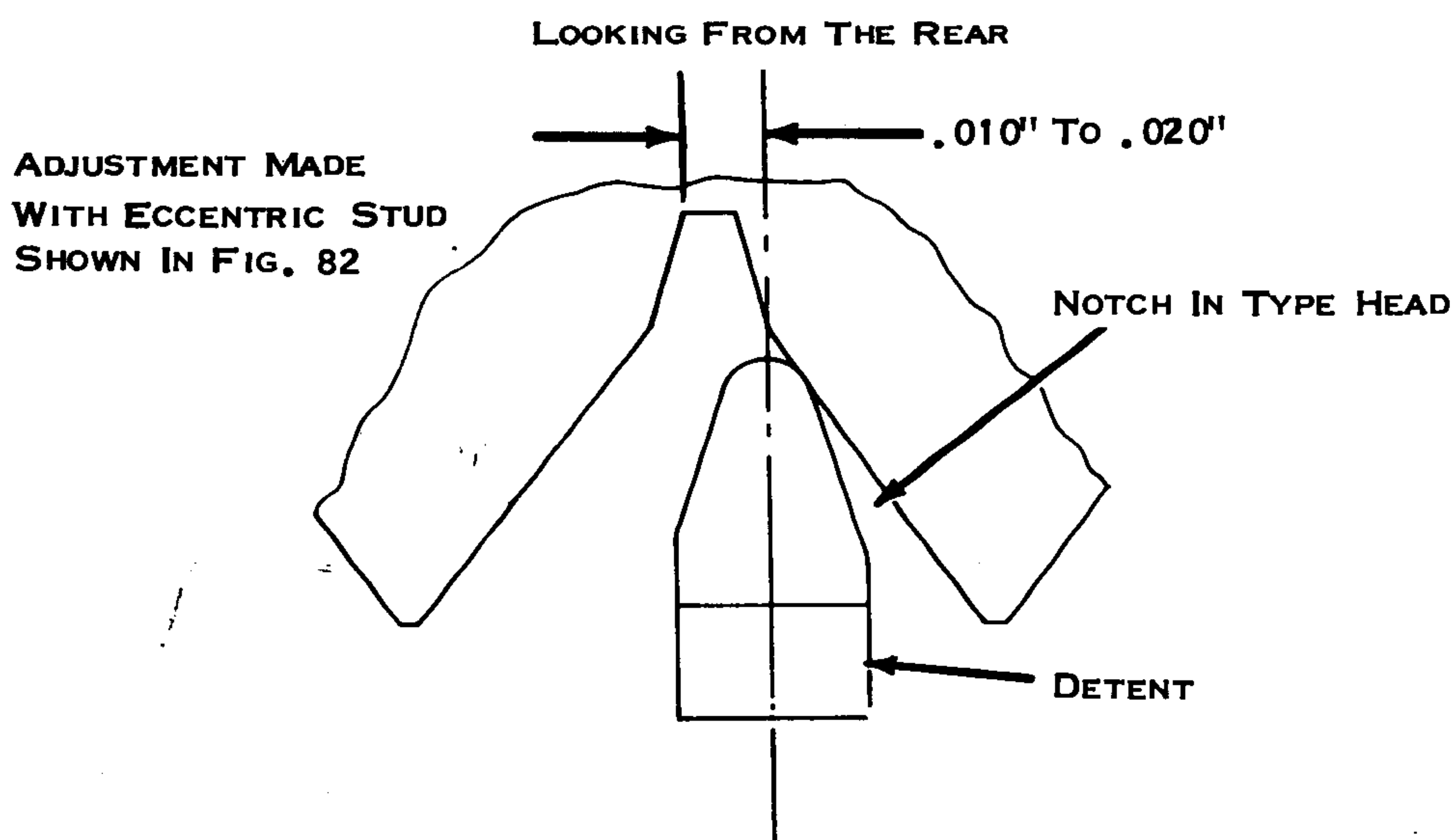
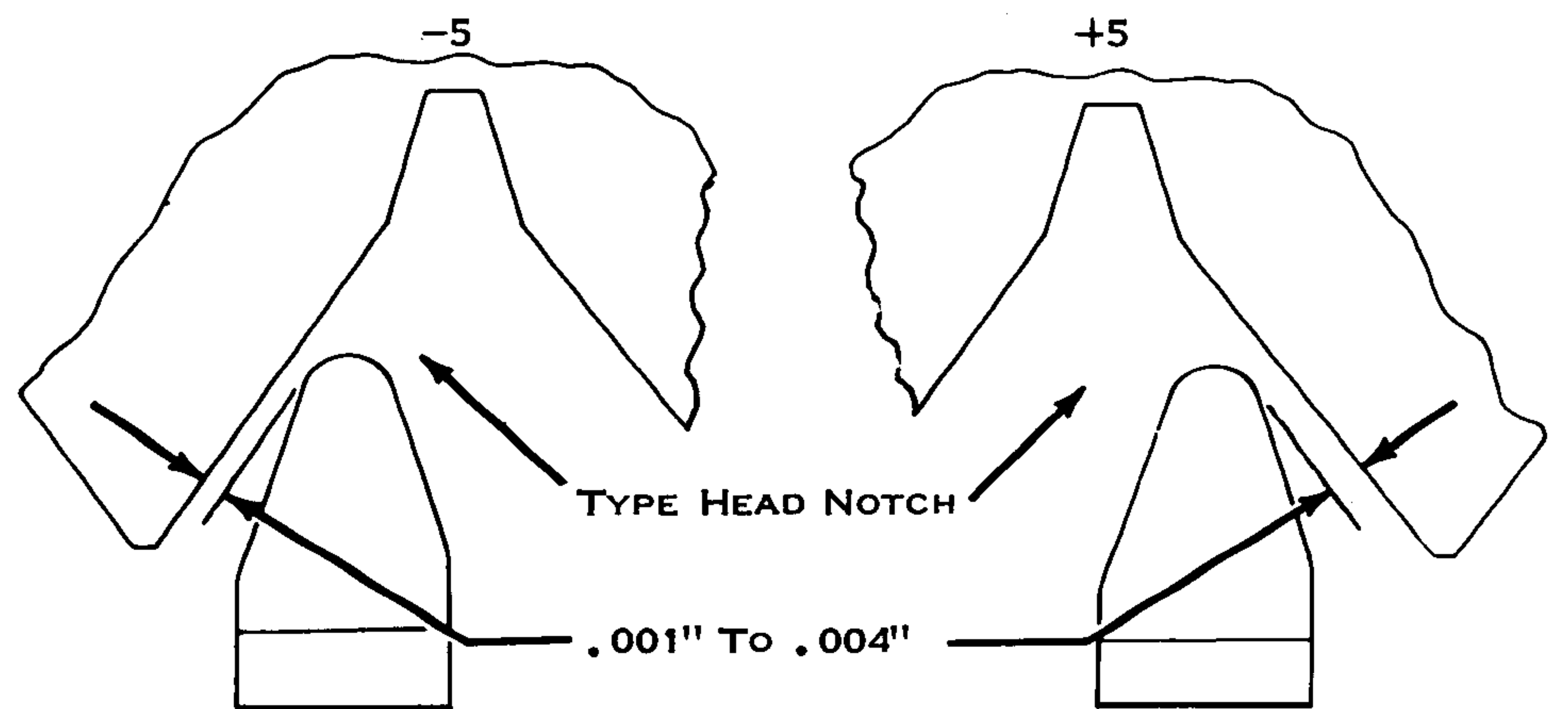


Figure 83. Rotate Arm Eccentric Stud

10. Print Shaft Timing Final (Fig. 84) - The print shaft gear should be adjusted by rotating it on the shaft so that the rotate detent starts to withdraw by .001" to .004" before the type head starts to move in the restoring direction. The timing adjustment should be observed in both upper case positive and negative five positions. NOTE: The head play at the detent should be .053" to .067".



UNDER MANUAL OPERATION THE DETENT SHOULD START TO WITHDRAW  
.001" TO .004" BEFORE TYPE HEAD ROTATION

Figure 84. Print Shaft Timing (Final)

11. Shift Motion - The shift arm adjusting screw should be adjusted in or out to obtain 180° rotation of the type head during a shift operation. CAUTION - Be sure the shift cam is detented in each position during the check and that the cycle shaft is properly latched at the half cycle position. Check lower case home character detenting against upper case home character detenting.
12. Damper Spring - Position damper spring stop so that with the type-head removed, the eccentric stud properly adjusted, and lower case negative five character half cycled, the damper spring will just collapse against the frame.
13. Band Width - Check 0 rotate compared to +5, -1, -3, -4, -5. None of these selections should detent more than .030" in a clockwise direction.

#### SHIFT MECHANISM

1. Shift Cam Back-Up Roller (Fig. 85) - The back-up roller eccentric should be adjusted left or right so that .001" to .003" of the cam bearing extends beyond the cam. CAUTION - Any change in the position of the back-up roller has a direct effect on the adjustment of the typehead homing and the shift motion adjustment.

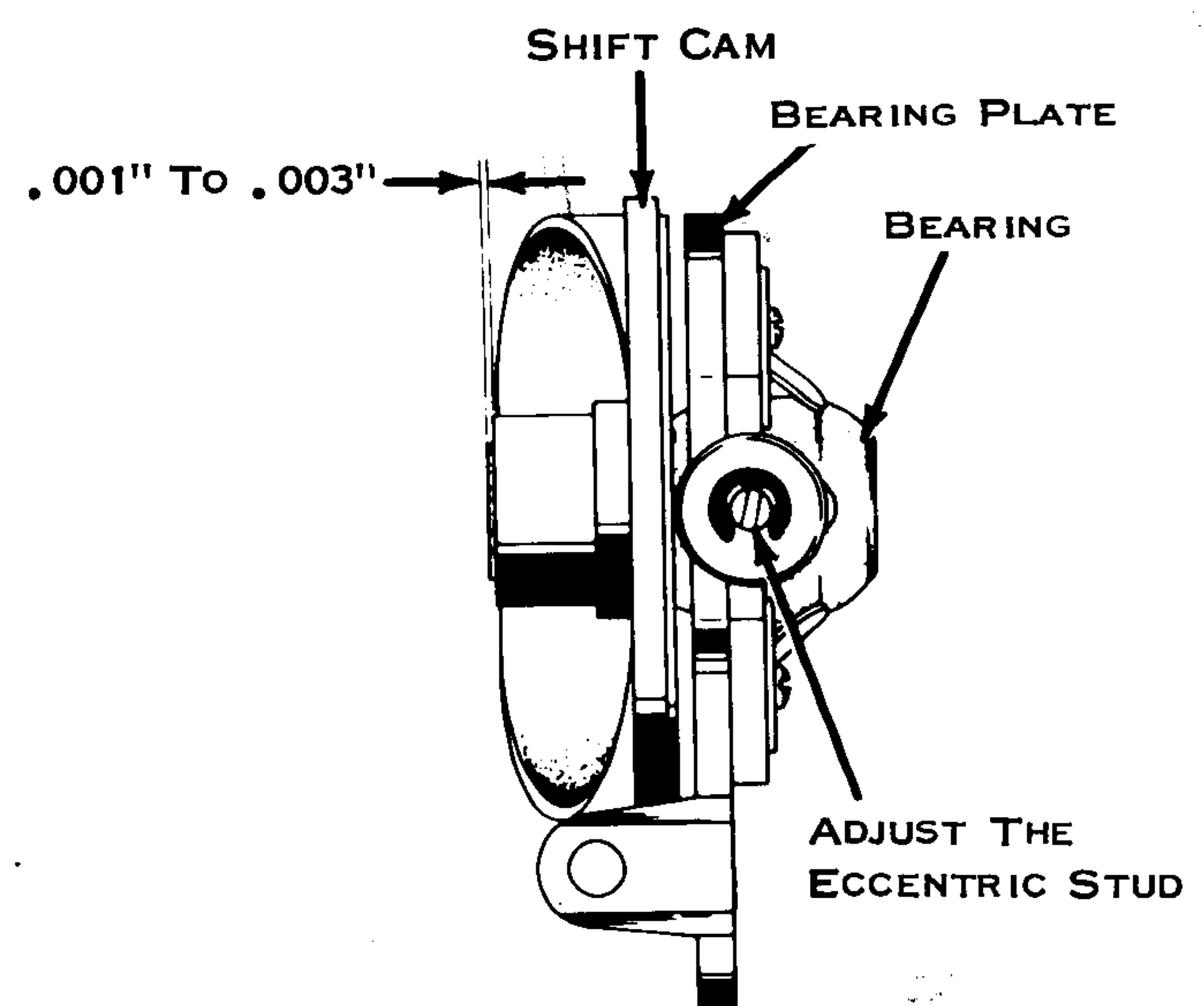


Figure 85. Shift Cam Back-Up Roller

2. Shift Clutch Spring Retaining Plate (Fig. 86) - With the machine turned off and the shift cam detented, adjust the retaining plate so that the shift clutch ratchet will rotate 1/16" to 3/32" when the shift release arm releases the ratchet. NOTE: The distance from the center of one ratchet tooth to the next is 3/32". The right end of the clutch spring may be placed in another hole if the adjustment cannot be made.



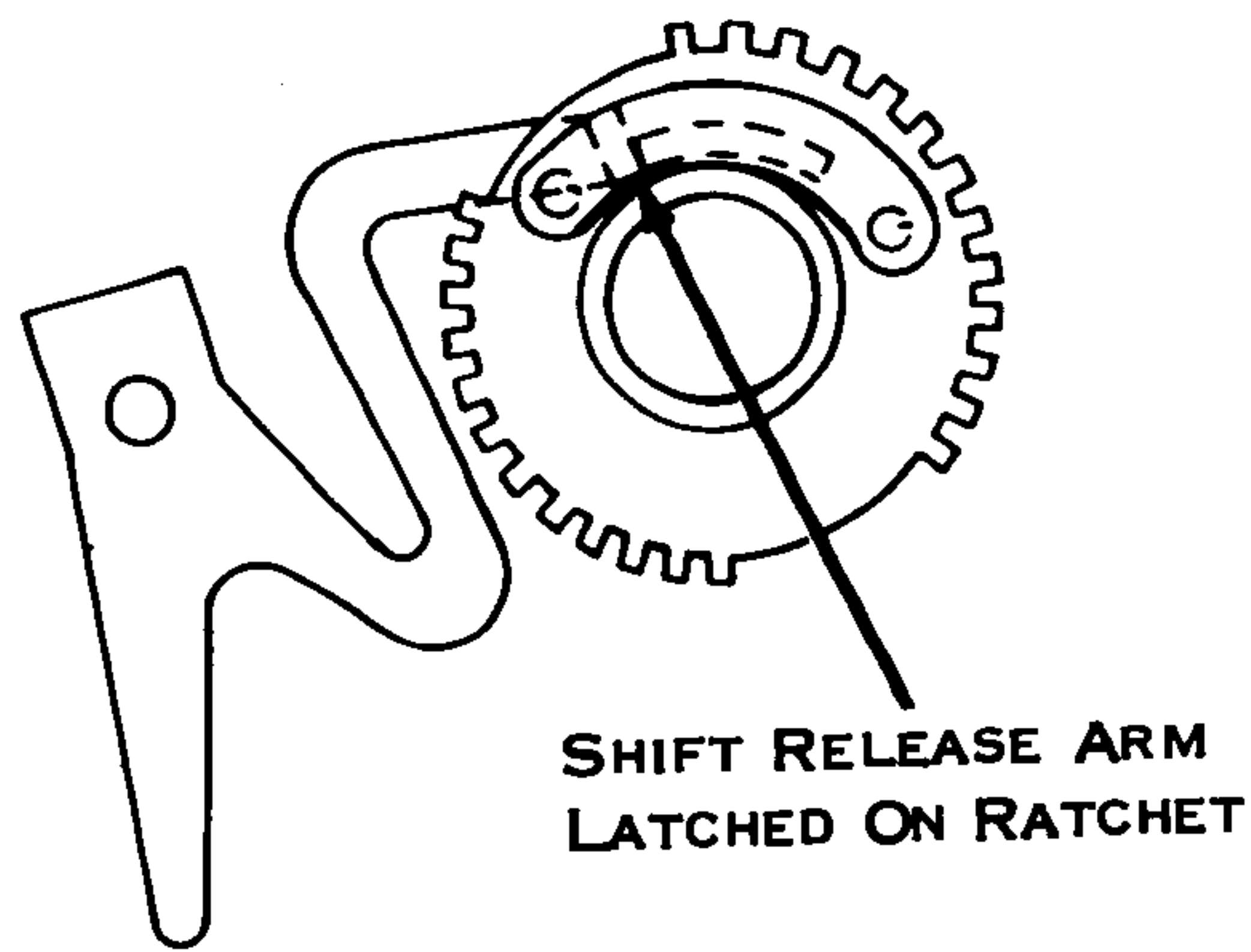
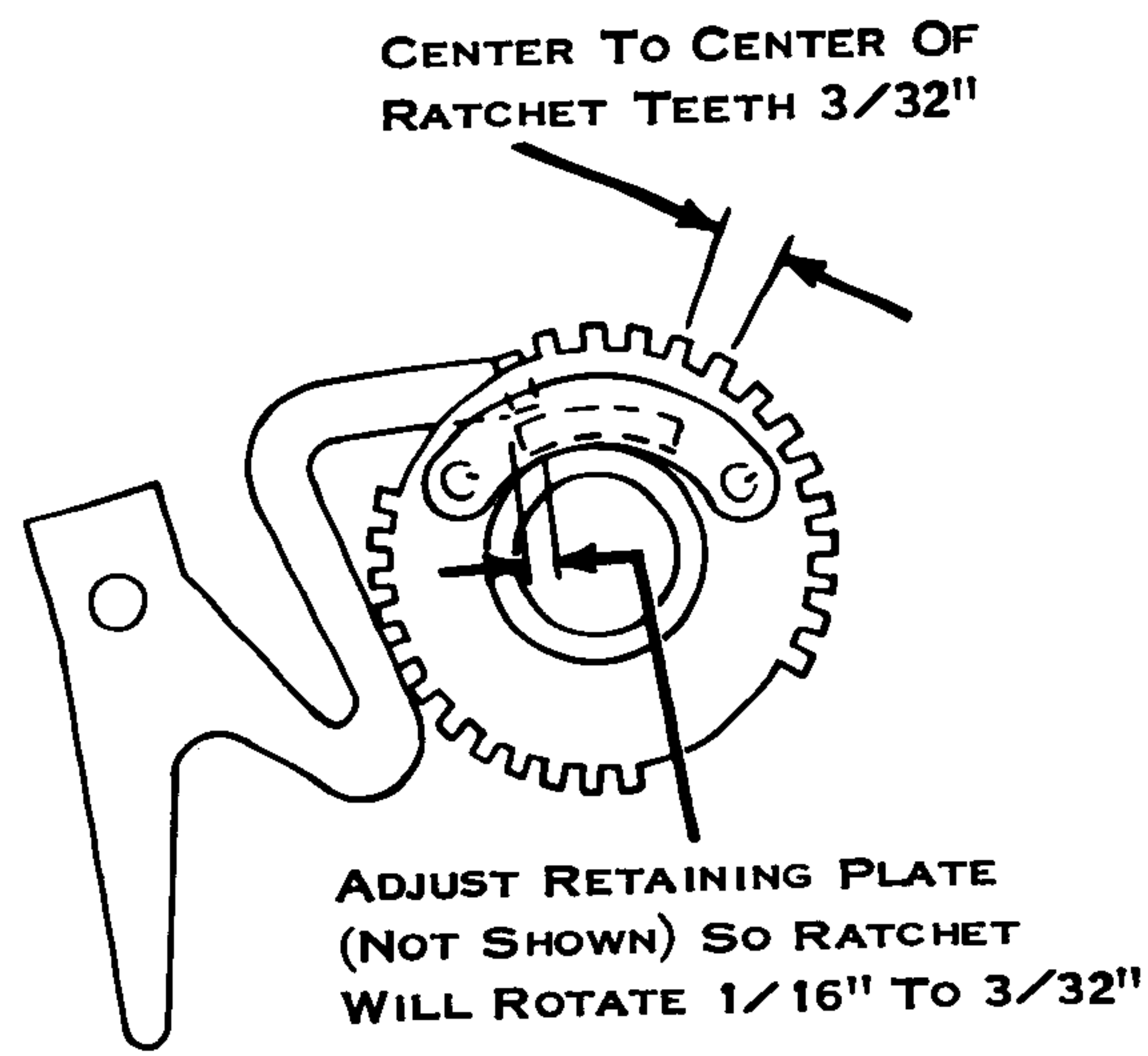


Figure 86. Shift Clutch Spring Retaining Plate

3. Shift Cam Stop (Fig. 87) - Adjust so that the shift clutch ratchet has  $.005''$  to  $.010''$  rotary motion between the shift cam stop and the shift release arm with the mechanism at rest. CAUTION - Be sure the cam is detented at the time the stop adjustment is checked.

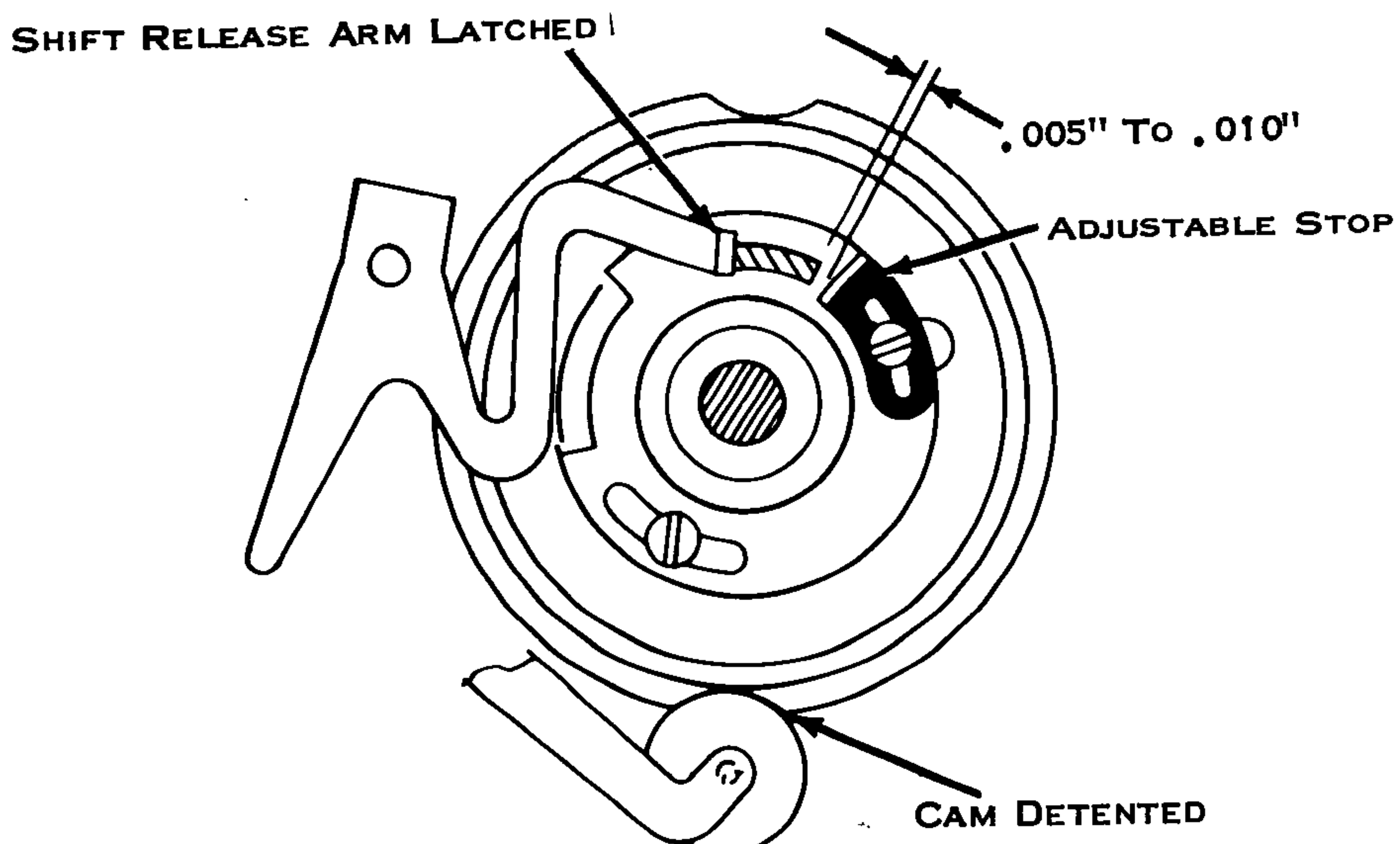


Figure 87. Shift Cam Stop

4. Shift Cam Brake (Fig. 88) - The shift cam brake should be adjusted to have  $.045''$  to  $.050''$  bite on the braking rib of the cam. That is approximately one half the thickness of the rib.

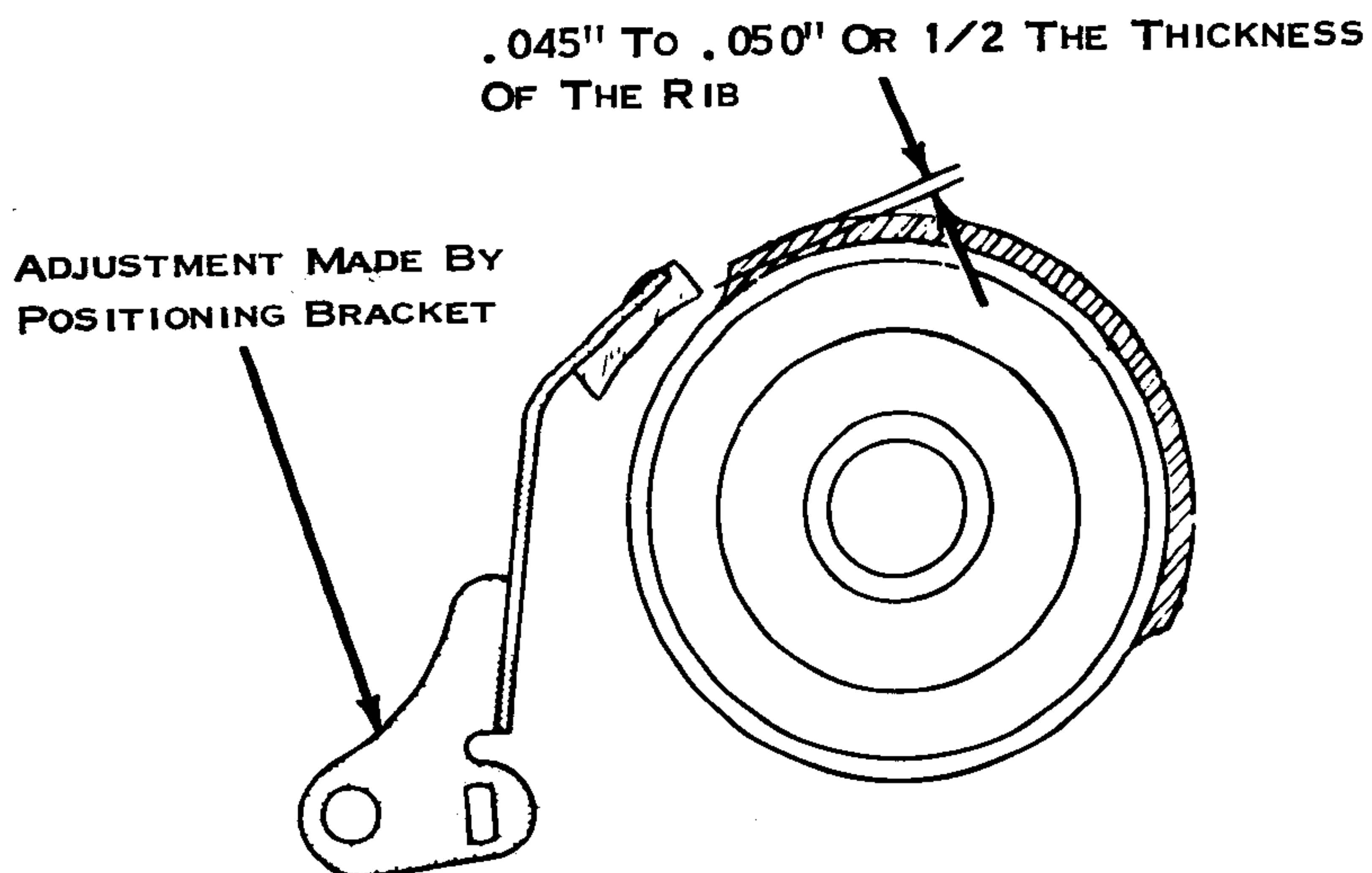


Figure 88. Shift Cam Brake

5. Shift Bail Crank - Position on the bail to operate with the same overcenter travel in both directions.
6. Shift Release Link - Adjust so the release occurs when the keylever has been depressed two thirds of its full travel. If the keylever is allowed to restore from the fully depressed position, the shift should again operate when two thirds of the travel of the keylever has been reached.
7. Shift Lock - The shift lock bracket should be adjusted up or down so that the shift lock engages just as the shift release occurs or slightly afterward. Keep the lock bracket vertical during adjustment.
8. Shift Interlock (Fig. 89) - With the shift interlock on the high point of the cam, form the spring portion of the interlock so that the tip just bottoms in the shift clutch ratchet. On 15" machines, make adjustment with adjusting screw.

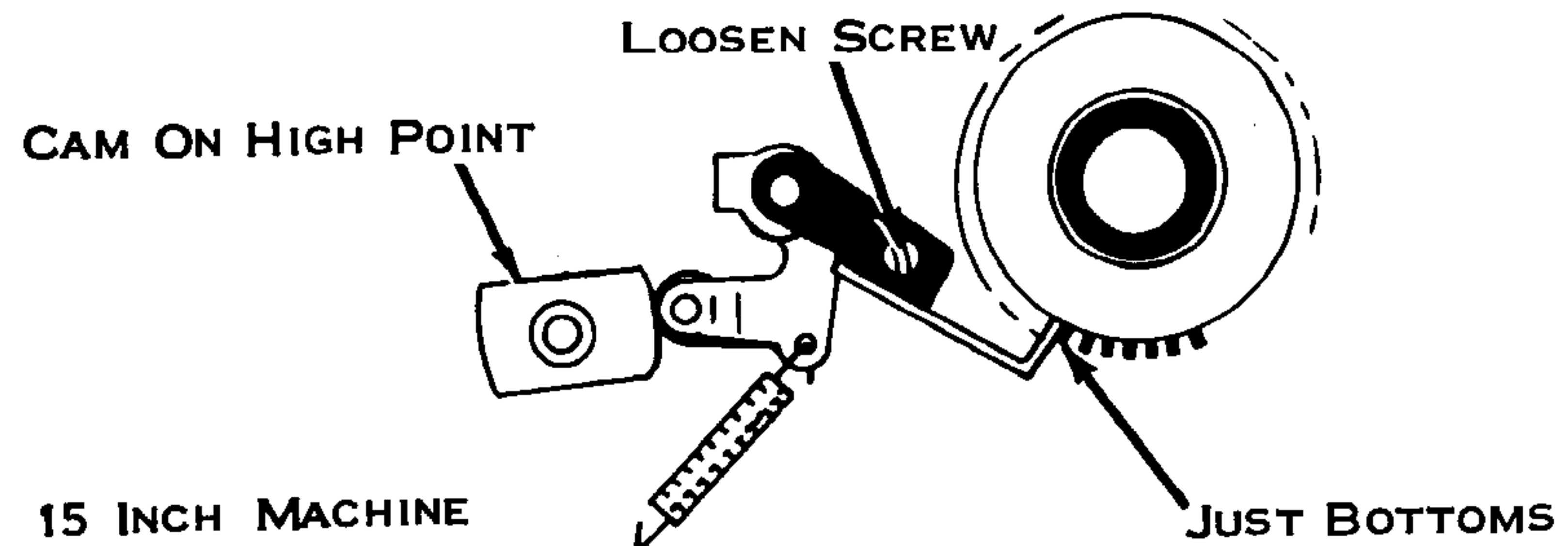
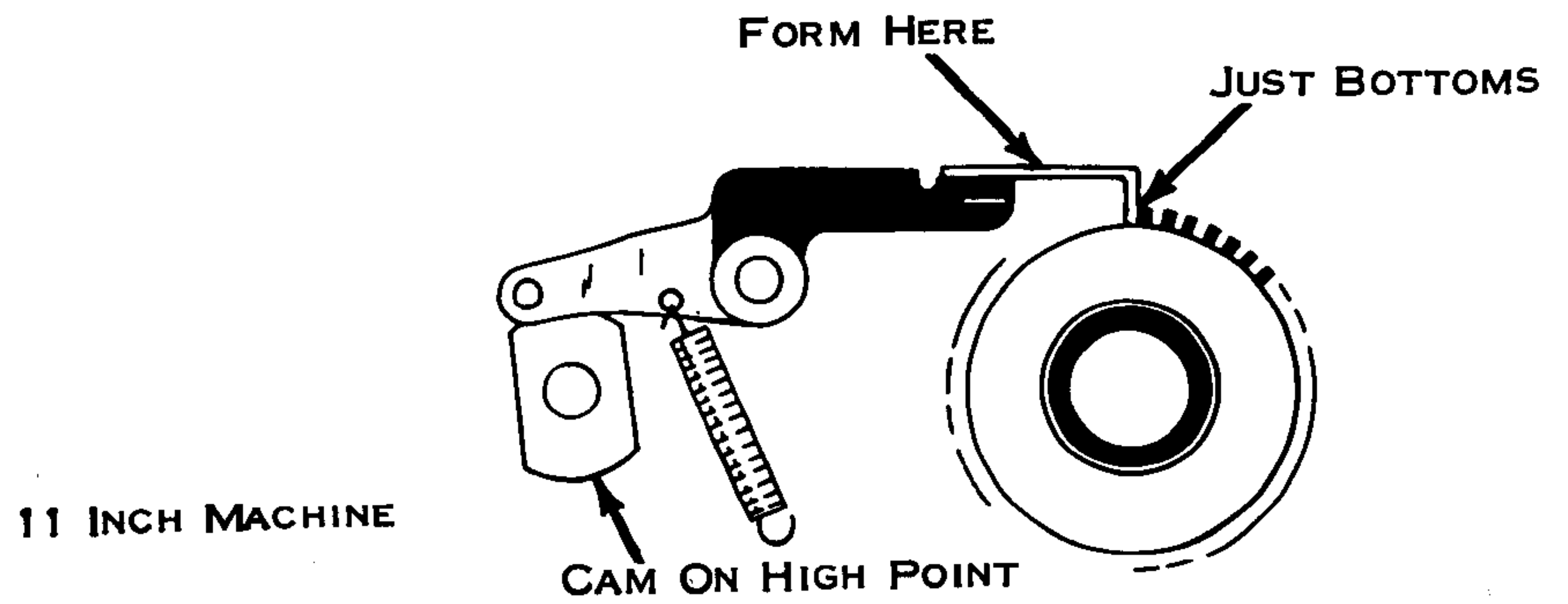


Figure 89. Shift Interlock

9. Shift Interlock Cam (Fig. 90) - With the cycle shaft latched and the filter shaft at rest, advance the interlock cam until a clearance of  $.040''$  to  $.060''$  exists between the tip of the interlock and the shift clutch ratchet.

NOTE: Remove filter shaft backlash clockwise.

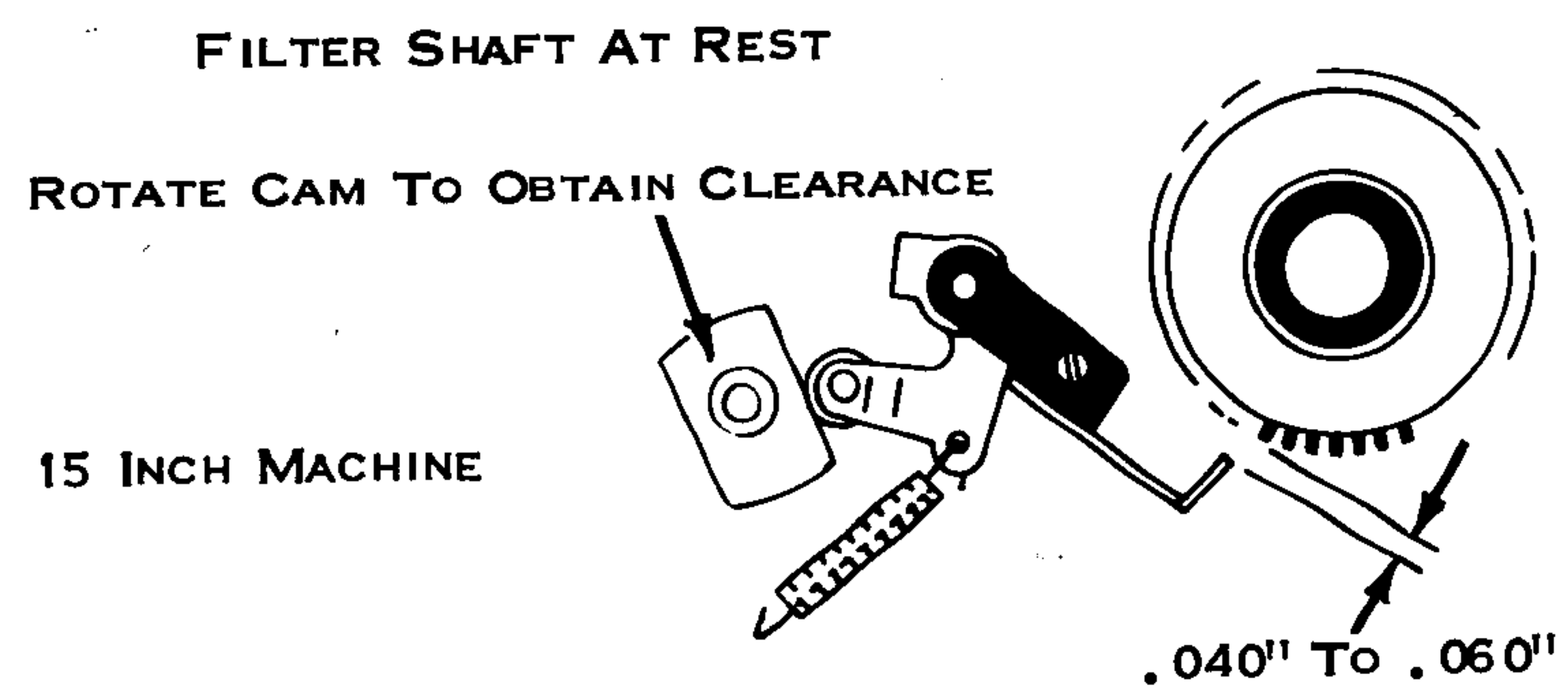
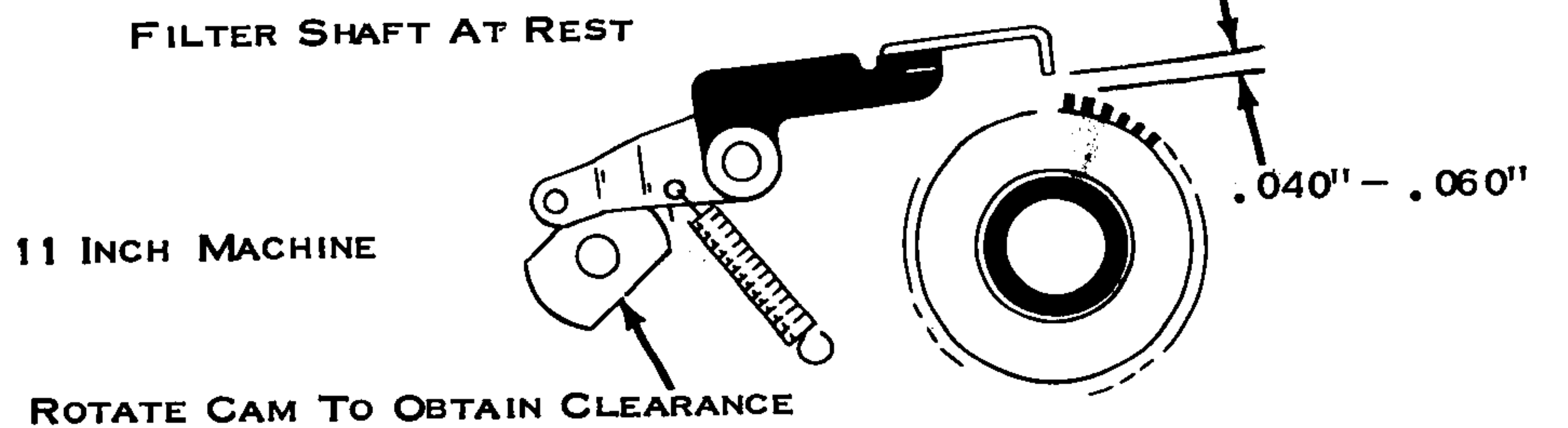
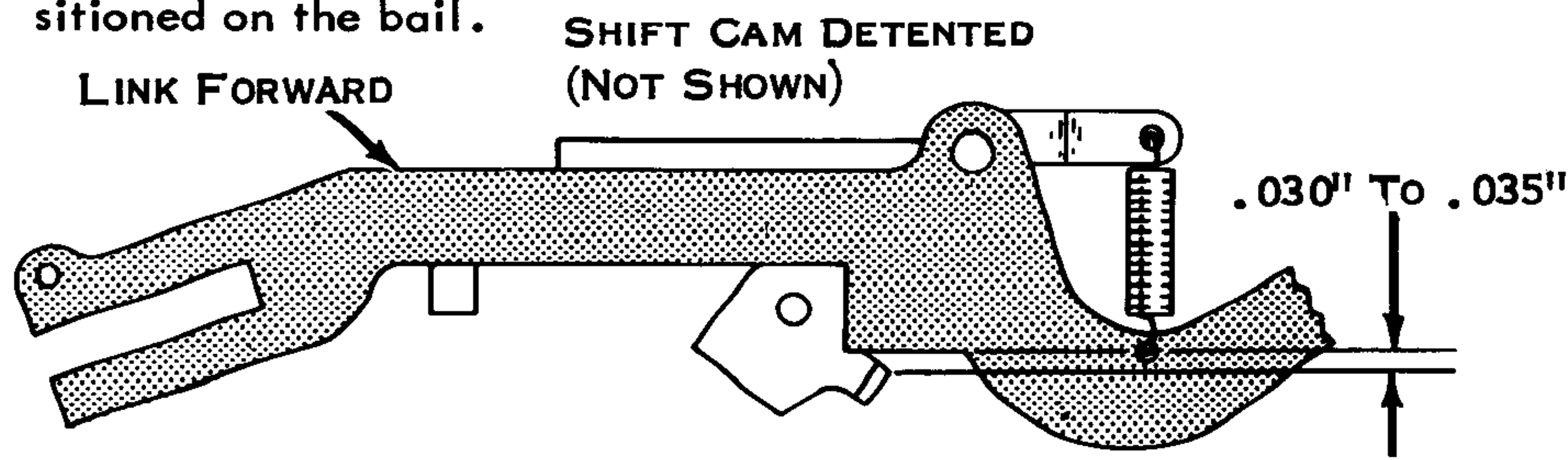


Figure 90. Shift Interlock

10. Character Interrupter - With the shift cam detented in lower case and the cycle clutch latch link in the released position, the character interrupter pawl should clear the bottom of the link by  $.030''$  to  $.035''$  (Fig. 91). Next, with the shift cam undetented and the cycle clutch latched to the rear, the character interrupter pawl



should clear the front of the cycle clutch latch link by .015" to .020" (Fig. 92). Both of the above adjustments are made with the interrupter bail plate after the interrupter latch has been initially positioned on the bail.



POSITION BY ROTATING LATCH SPRING ANCHOR ON BAIL CRANK OR BAIL ANCHOR PLATE (NOT SHOWN)

Figure 91. Character Interrupter (Inactive)

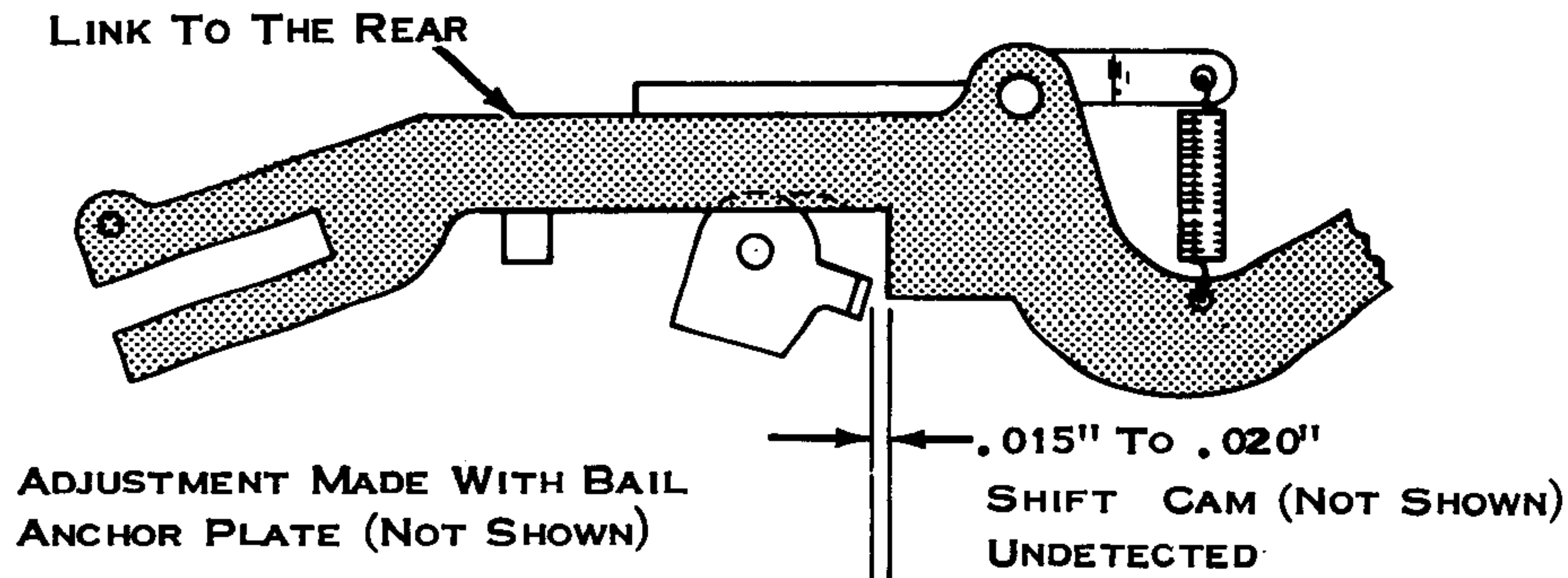


Figure 92. Character Interrupter (Active)

#### SHIFT MAGNET ASSEMBLY

NOTE: Shift mechanism adjustments must be correct before the following adjustments are attempted.

1. Hinge Plates (Fig. 93) - Position (magnets energized) so that the armatures clear the yokes by .001" to .003".

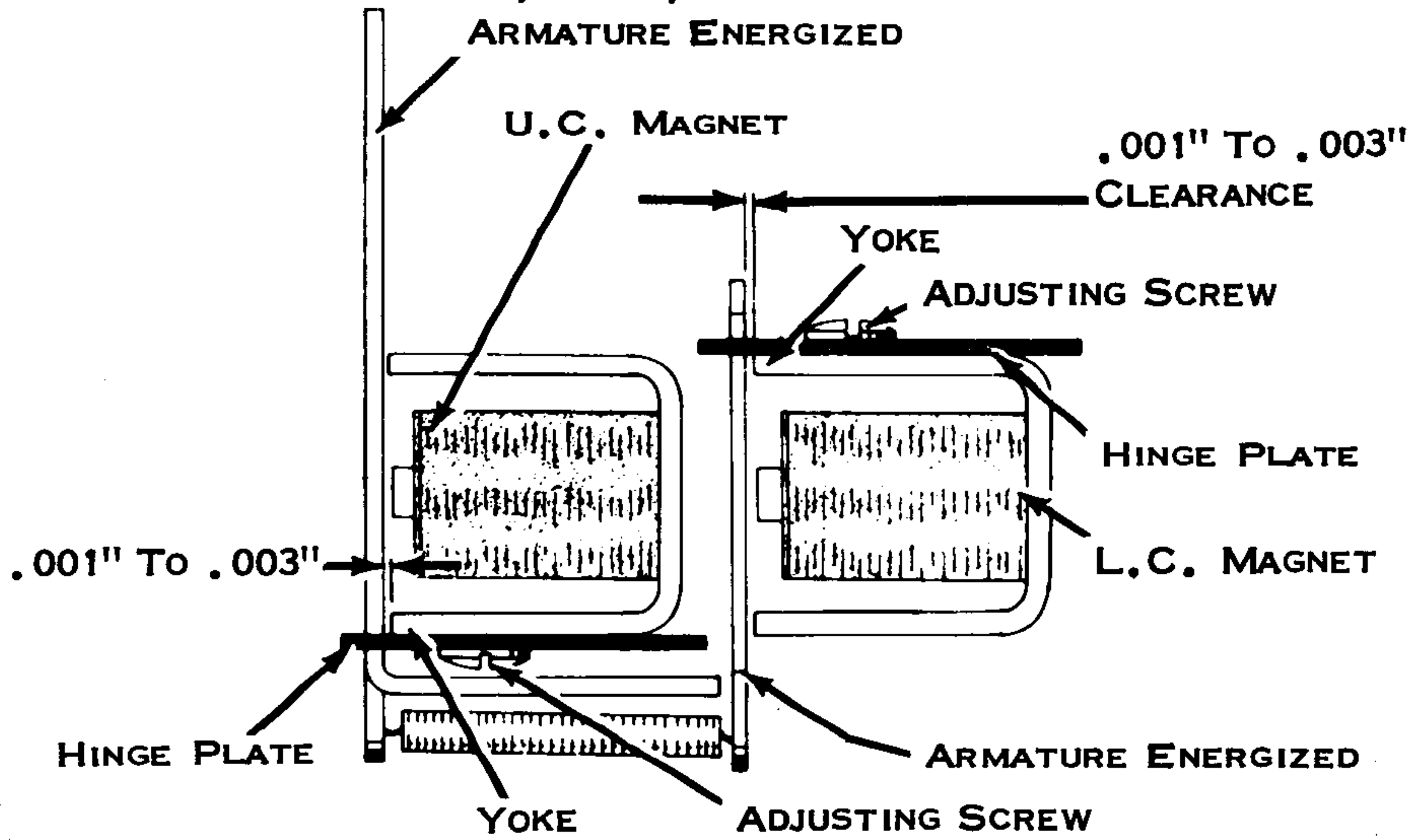


Figure 93. Hinge Plates

2. Armature Stops (Fig. 94) - Position (magnets energized) so that the armatures clear their yokes by .003" to .007".

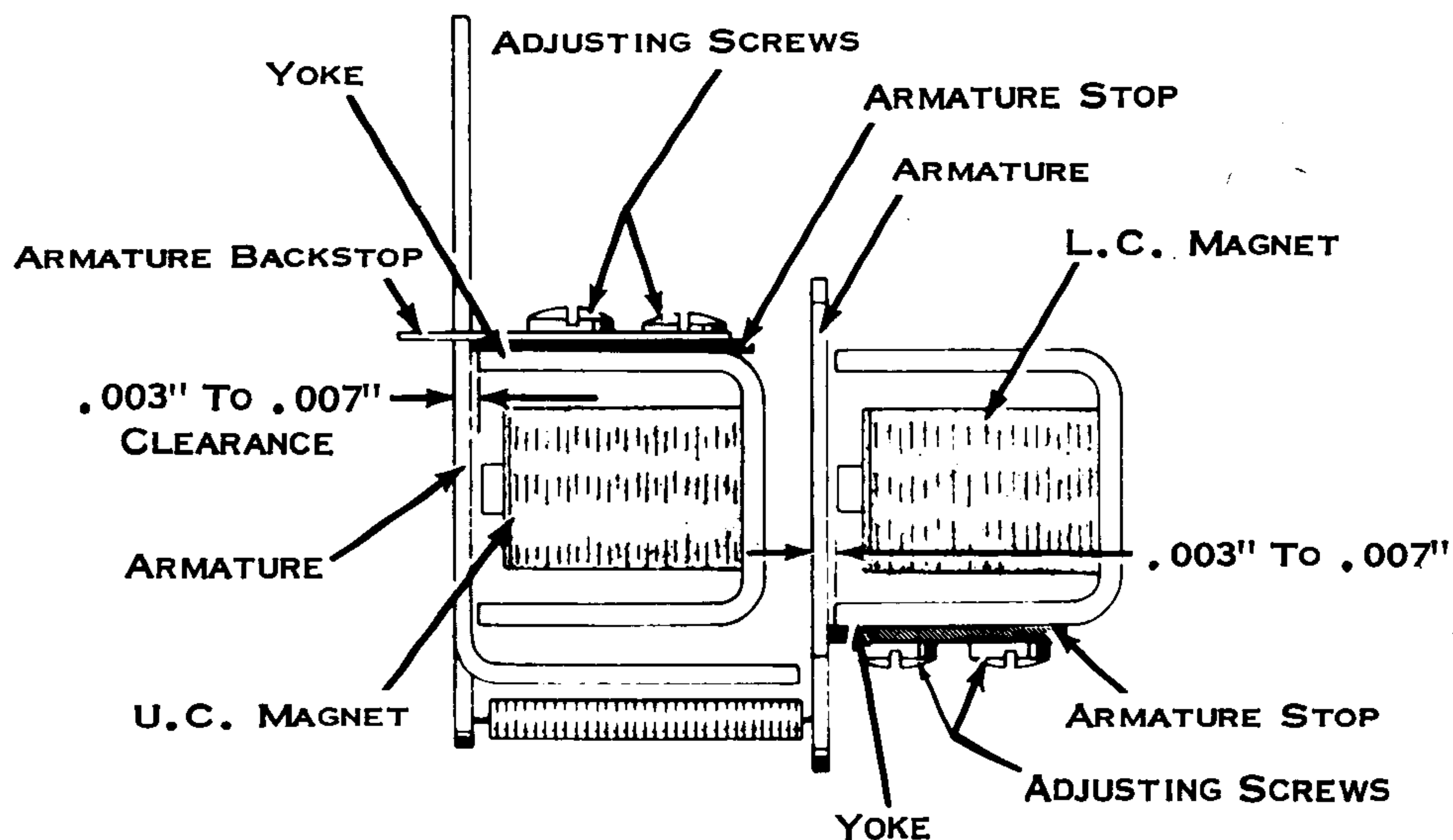


Figure 94. Armature Stops

3. Armature Backstop, 11" Machine (Fig. 95) - Adjust the armature backstop (UC magnet - armature at rest) so that the armature clears the core by .028".

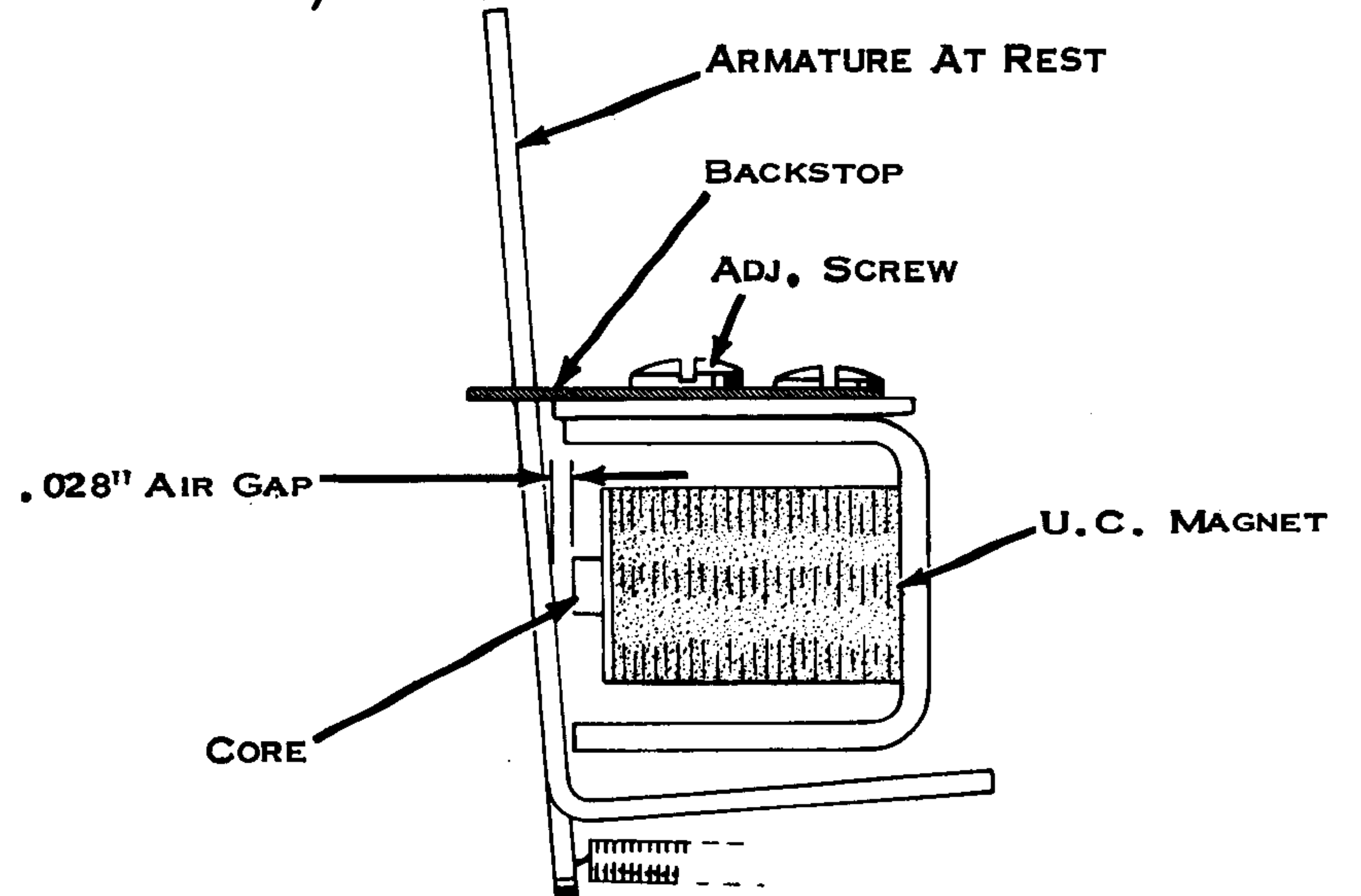


Figure 95. Armature Backstop, 11 Inch Machine

4. UC Magnet Assembly - Position so that its mounting screws are centered in the elongated holes with the hinge plates parallel with the assembly mounting plate.

5. LC Magnet Assembly - Position as follows:

- a. Front to Rear - LC armature (energized) clears the UC armature (at rest) by .010" (Fig. 96).

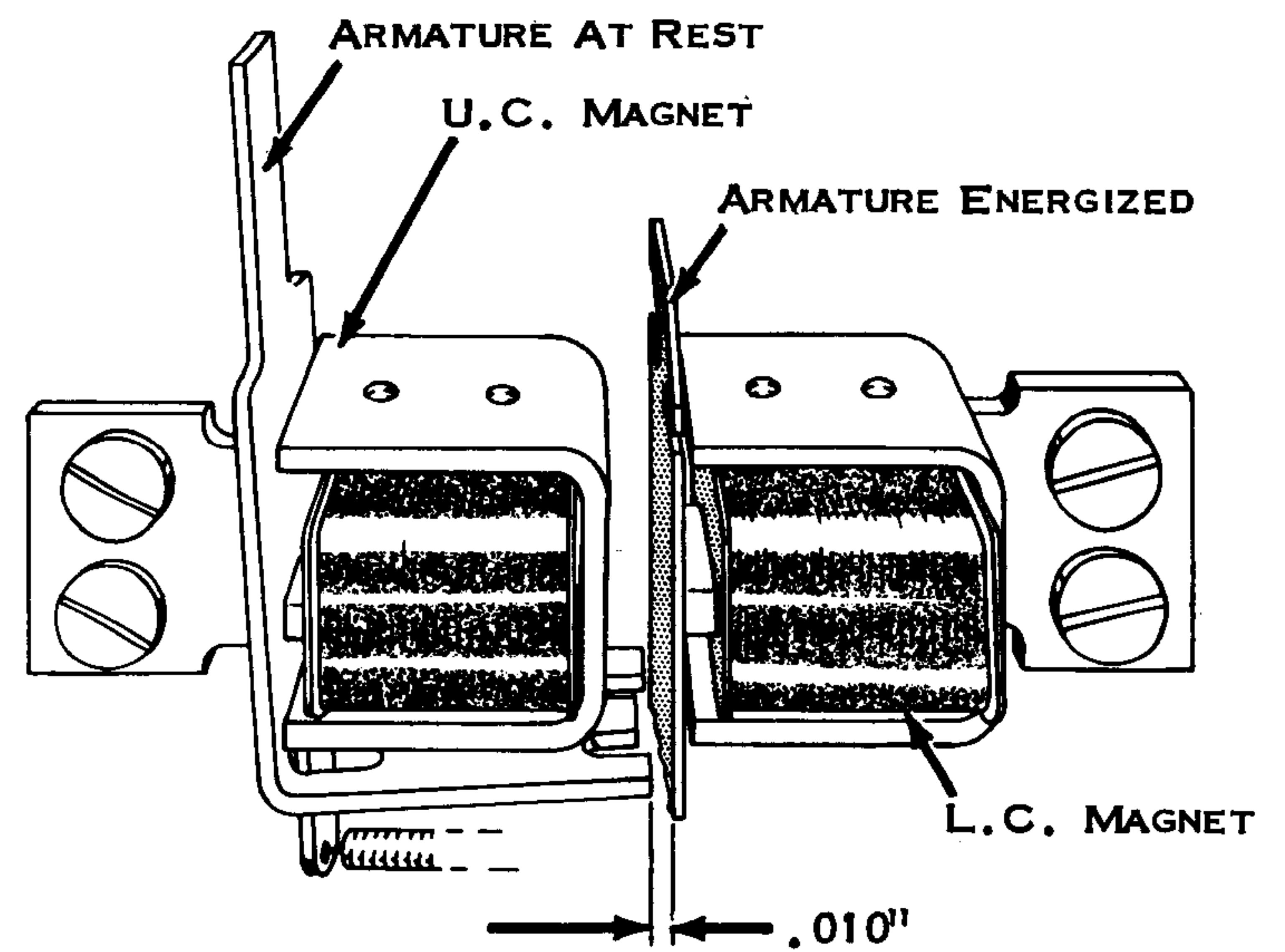


Figure 96. LC Magnet Assembly (Front to Rear)

- b. Up or Down - UC armature (energized) clears the LC armature (at rest) by .003" to .006" (Fig. 97).

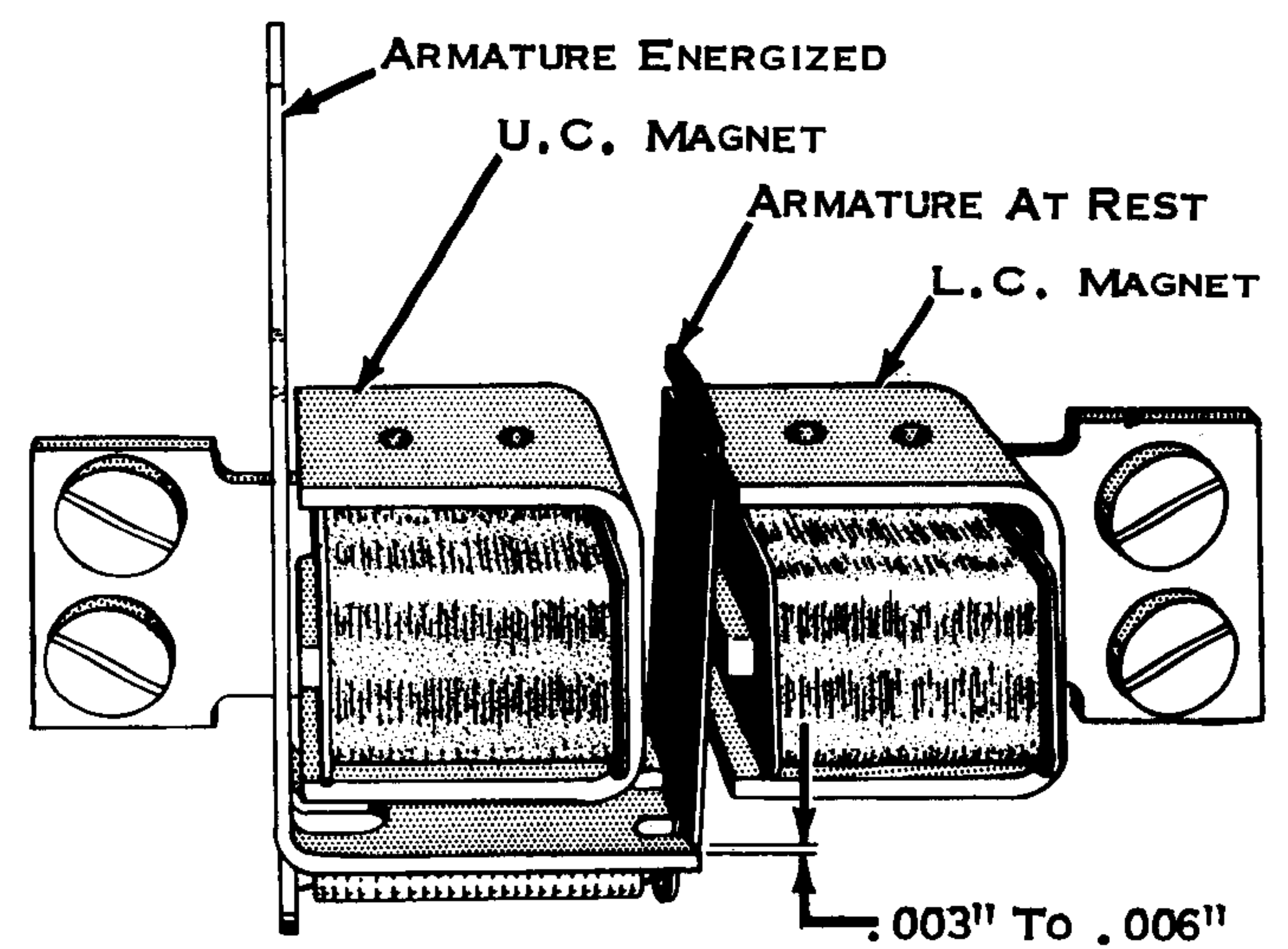


Figure 97. LC Magnet Assembly (Up or Down)



6. Magnet Assembly Mounting Bracket

- a. 11 Inch Machine (Fig. 98) - Position the magnet assembly mounting plate (front to rear) so that the UC armature (at rest) clears the release arm pin by .002" to .008".

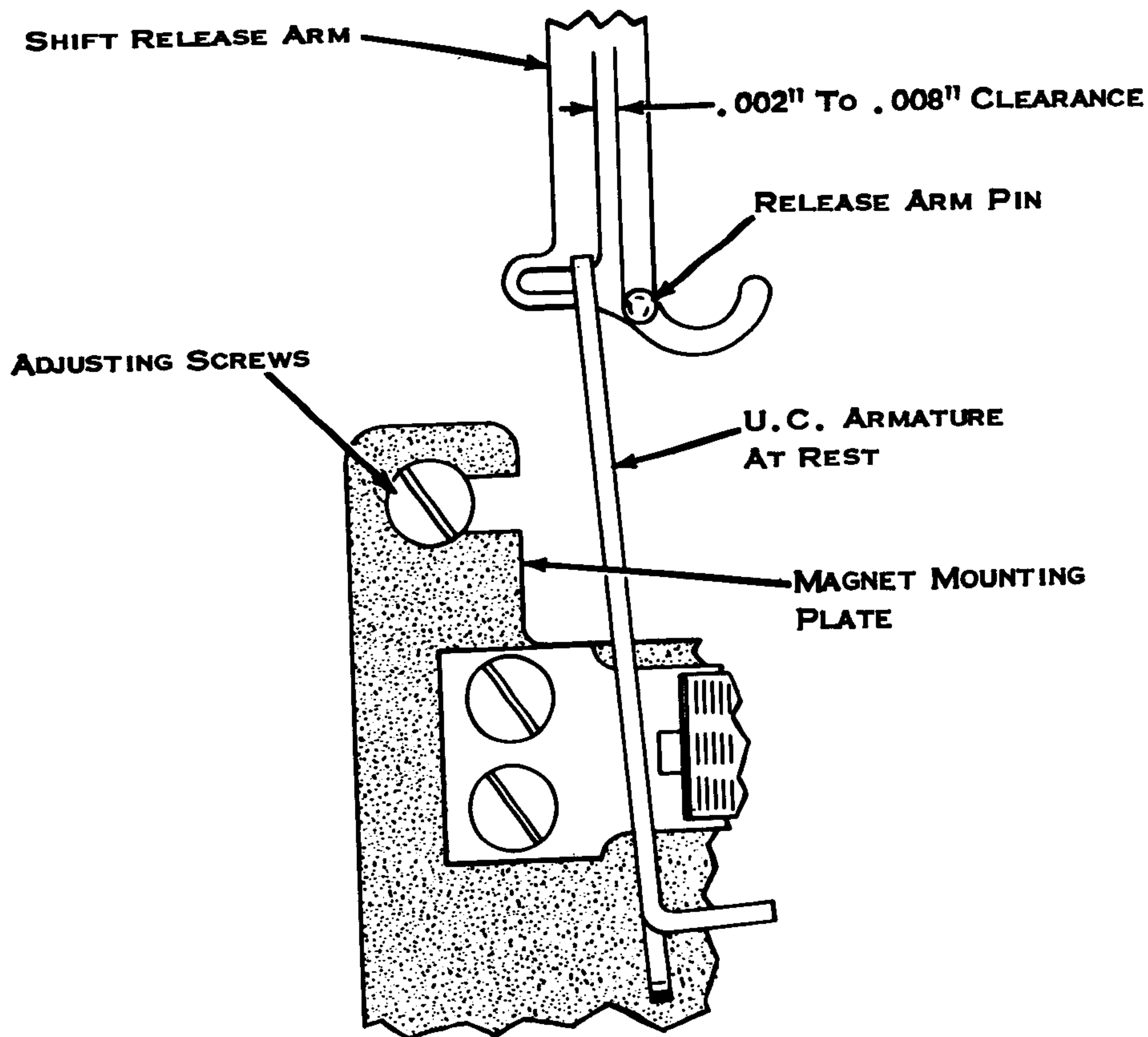


Figure 98. Magnet Assembly Mounting Bracket

- b. 15 Inch Machine (Fig. 99) - Position the magnet assembly mounting plate (UC armature energized) so that the release arm clears the shift ratchet lug by .005" to .015".

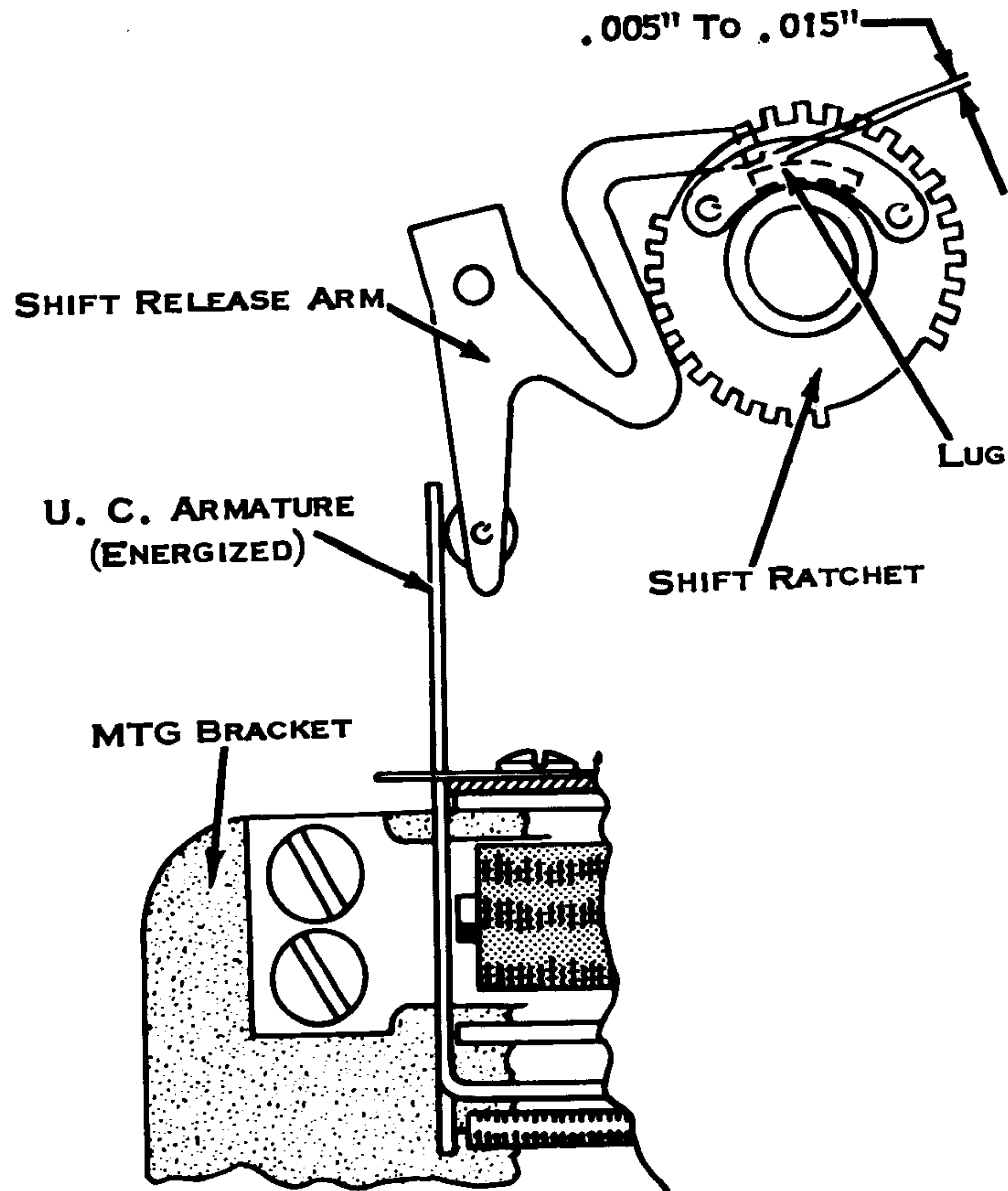


Figure 99. Magnet Assembly Mounting Bracket

7. UC Armature Backstop, 15" Machine (Fig. 100) - Position (armature at rest) so that the UC armature clears the release arm roller by .002" to .008".

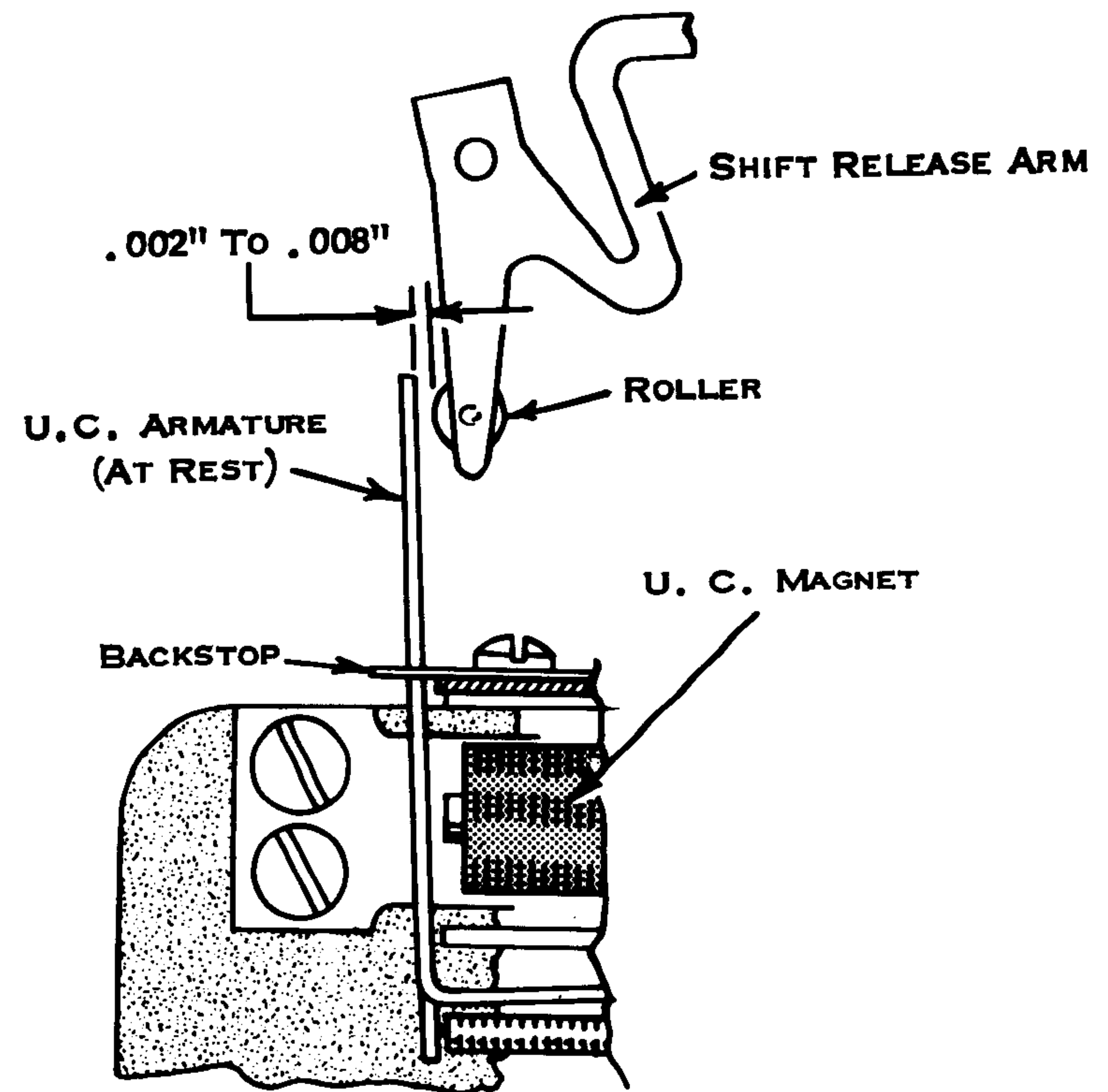


Figure 100. U.C. Armature Backstop

SHIFT CONTACT ASSEMBLY

1. Contact Mounting Plate (Fig. 101) - Position vertically so that the cam follower roller is centered on the shift cam surface.

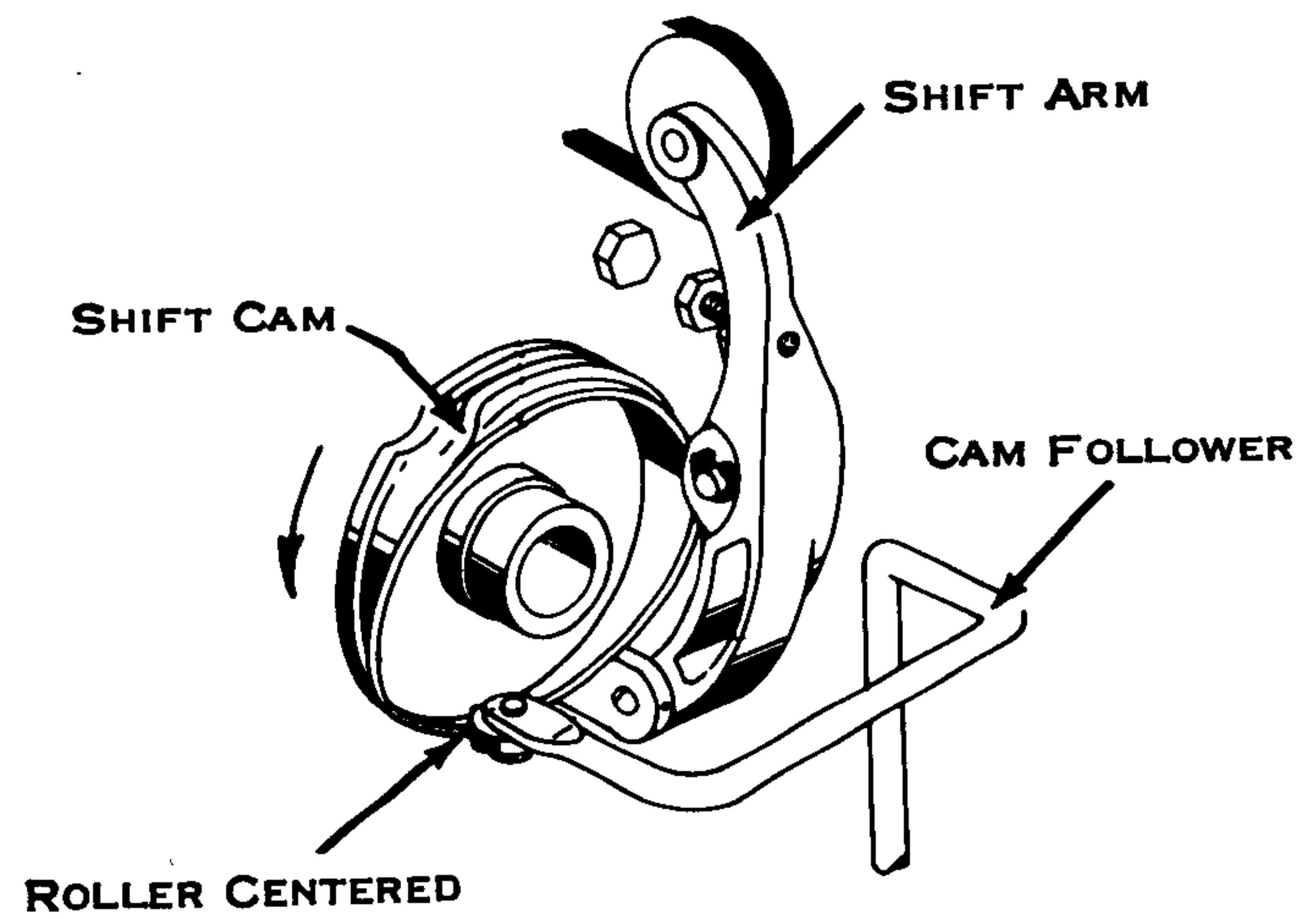


Figure 101. Contact Mounting Plate

2. Contact Positioning (Fig. 102) - Position the feedback and transmitting assemblies under their mounting screws for the following conditions:

- a. Operating straps centered on actuating tabs.  
b. All contact points (or straps) in stack aligned.

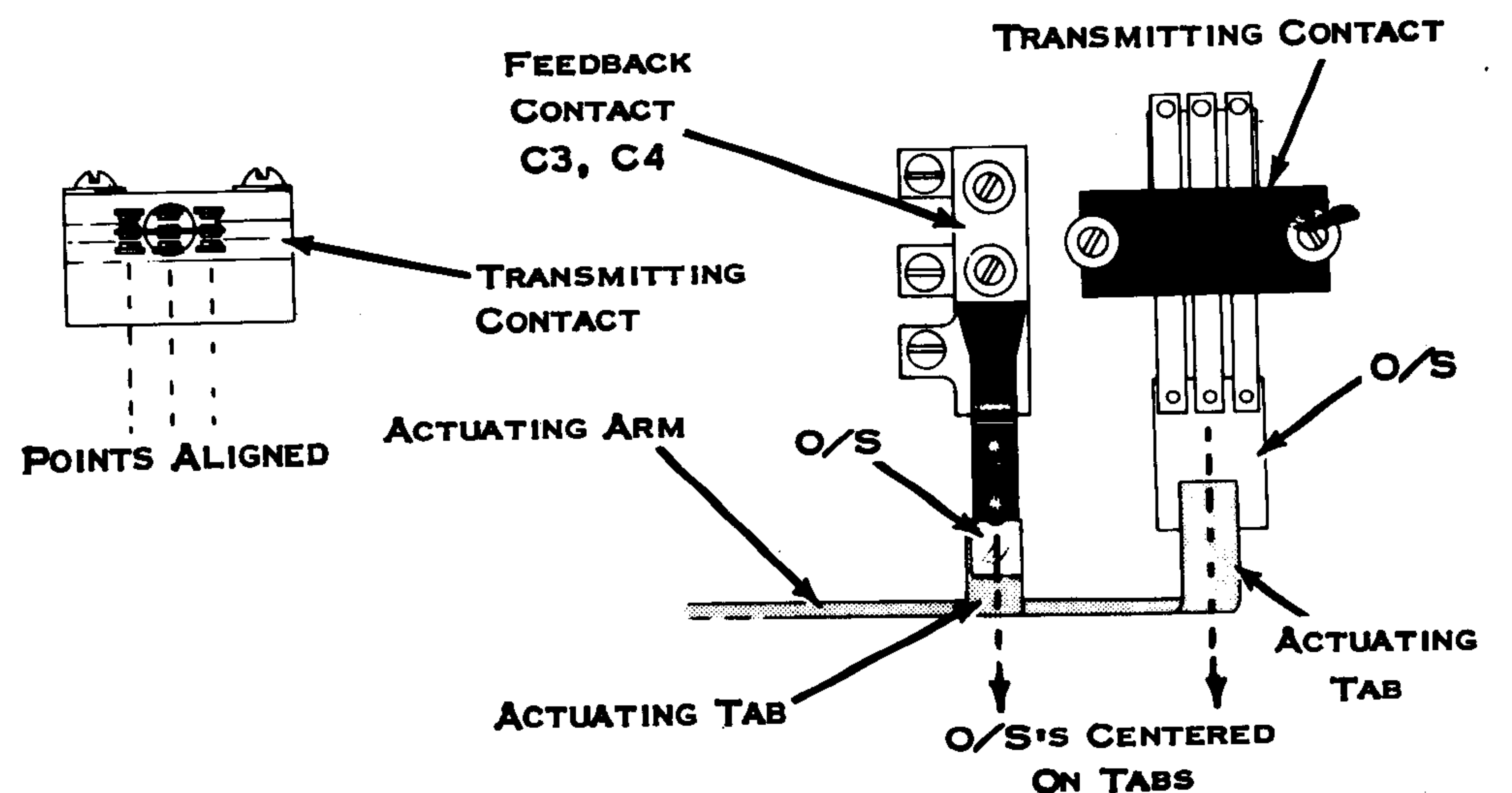


Figure 102. Contact Positioning



- Contact Actuating Arm (Fig. 103) - Position (with the cam follower roller held against the detented shift cam) so that the O/S ball is centered between the actuating arm tabs.

NOTE: If a starting reference is required, form the O/S so that the center of the O/S ball is  $9/16"$  from the contact mounting plate.

- Transmitting Contacts Air Gap (Fig. 103) - Form the N/O contacts to clear the O/S's by  $.040"$ .

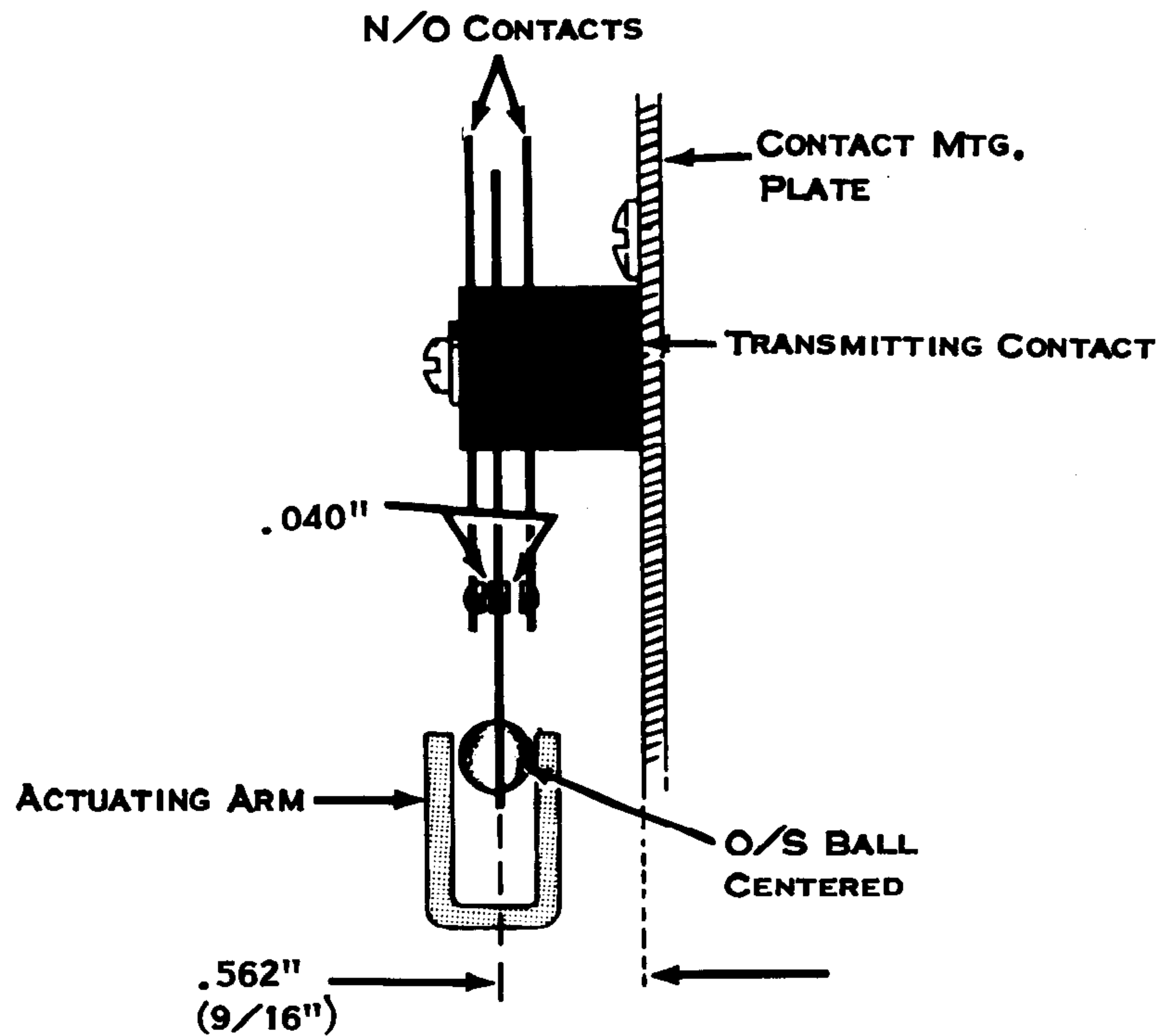


Figure 103. Contact Actuating Arm

- Feedback or Mode Contact Rise and Air Gap (Fig. 104) -

- Form the N/C contact supports so that the O/S's lift the N/C contact straps  $.002"$  to  $.005"$ .
- Form the N/O contact supports so that the N/O contacts clear the O/S's by  $.040"$ .

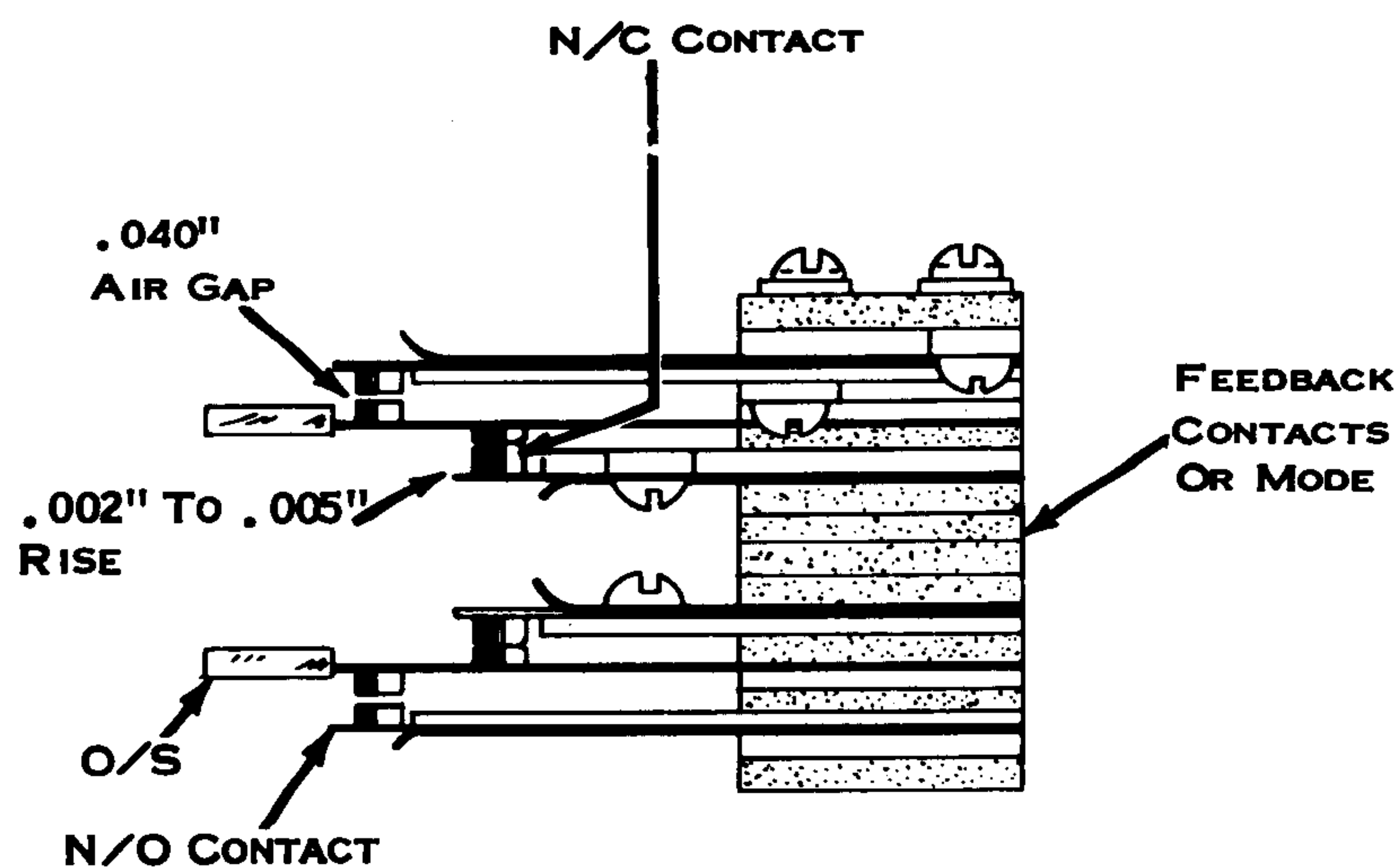


Figure 104. Contact Rise and Air Gap

- Actuator Tabs (Fig. 105) - Form so both N/O contacts receive equal motion as the shift cam rotates through  $360^\circ$ .

NOTE: If necessary, the actuator tabs may be formed to achieve timing requirements - see the timing charts for specifications.

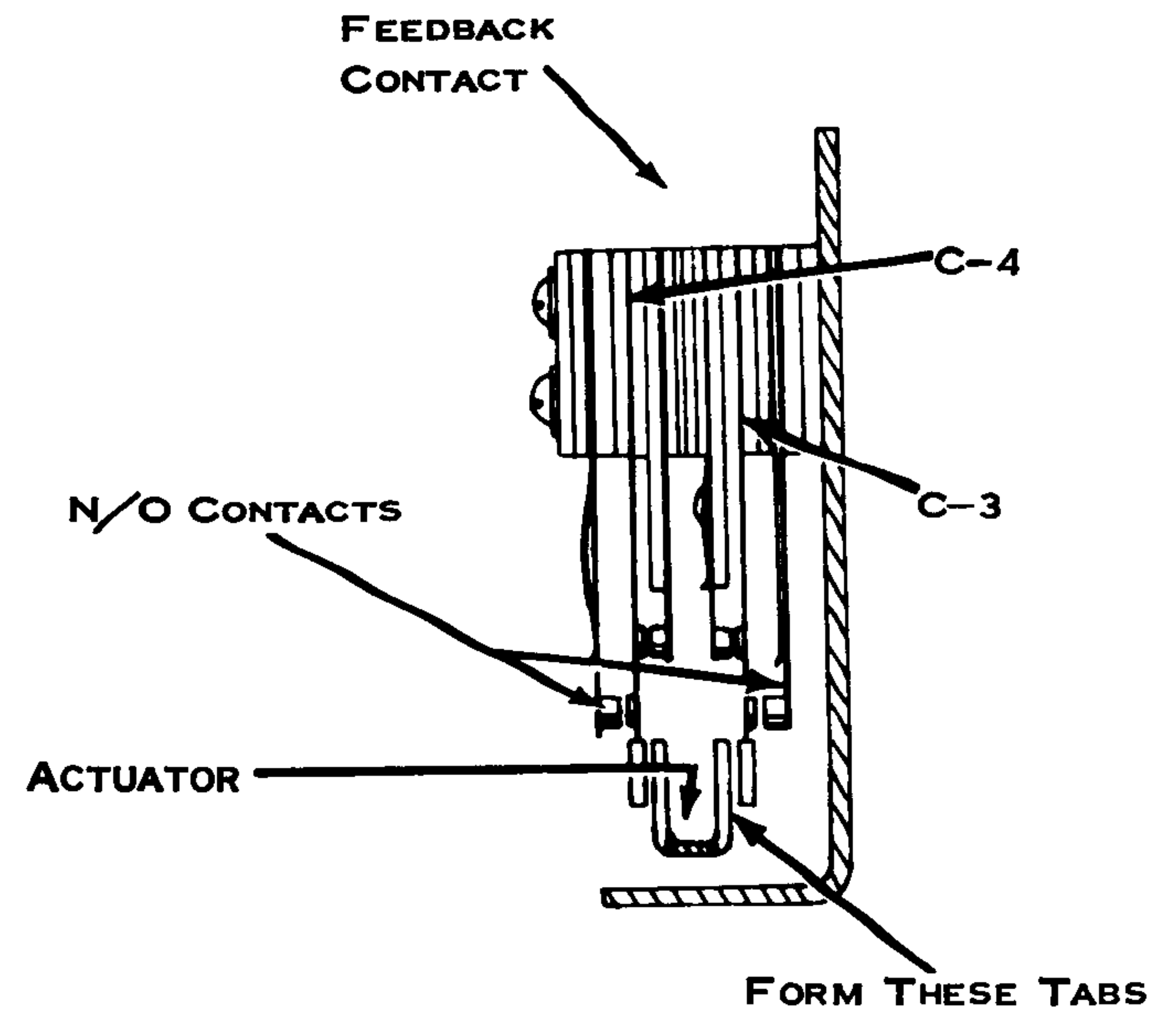


Figure 105. Actuator Tabs

- Mode Contact Actuating Arm - With the shift ratchet released, hand cycle from lower to upper case and adjust as follows (Fig. 106).

- Position the actuating arm so that the UC-1 contact closes at  $80^\circ$  of shift cam rotation.
- Form the actuating tab so that the UC-2 contact closes at  $130^\circ$  of shift cam rotation.

NOTE: The shift ratchet teeth are spaced  $10^\circ$  apart and may be used as a timing indicator.

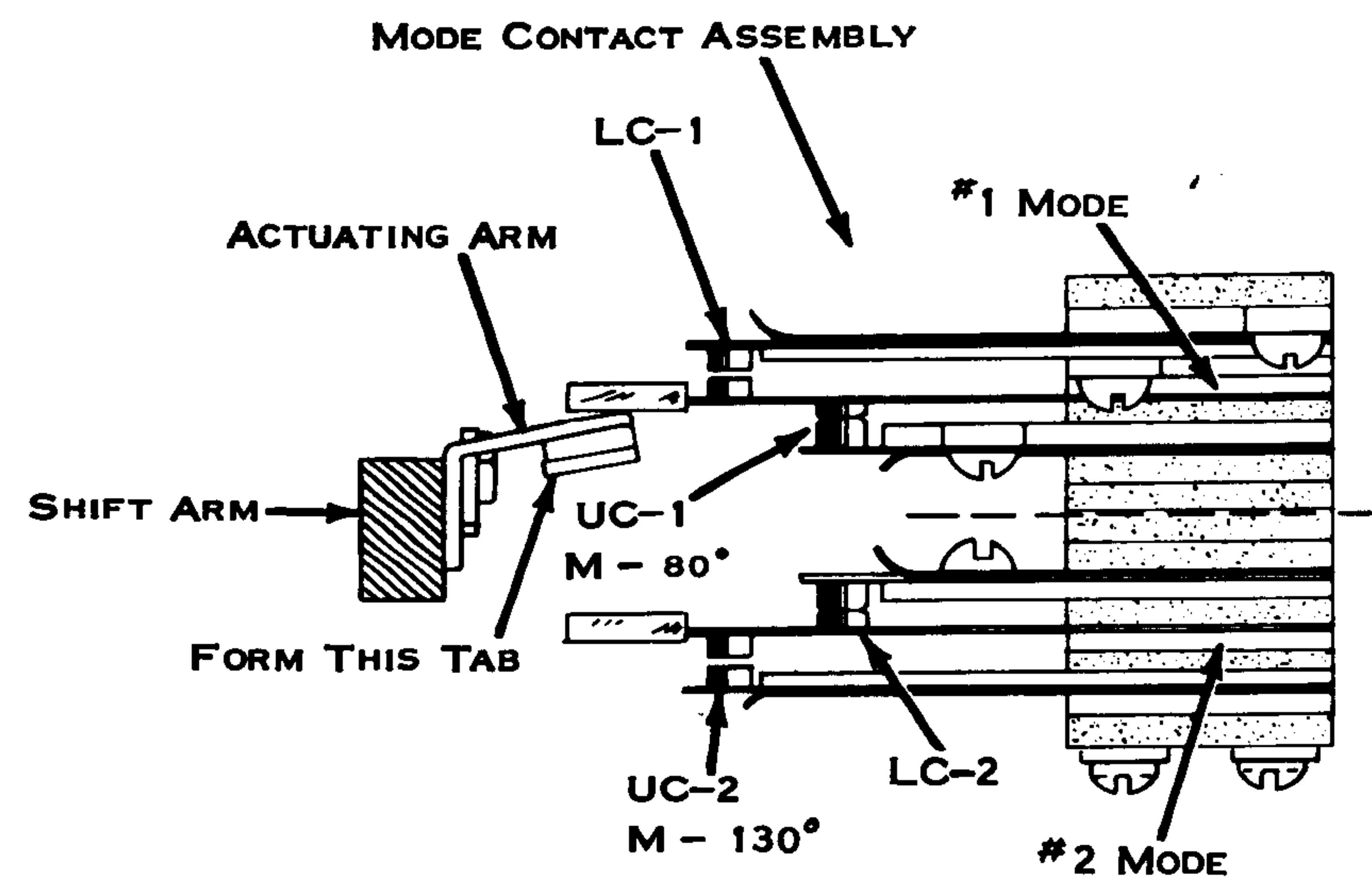


Figure 106. Mode Contact Actuating Arm

#### PRINT MECHANISM

- Copy Control Eccentric (Fig. 107) - Position (copy control lever detented in the forward position) the high points up.
- Eccentric Retaining Plate (Fig. 107) - Position the plate on each side of the machine so that no front to rear play exists between the eccentric and its retaining plate.
- Stop Ears (Fig. 107) - Form to provide positive detenting in both front and rear positions of the copy control lever.
- Platen Latch Eccentrics (Fig. 107) - Adjust (high points down) to hold the platen firmly, both vertically and horizontally.



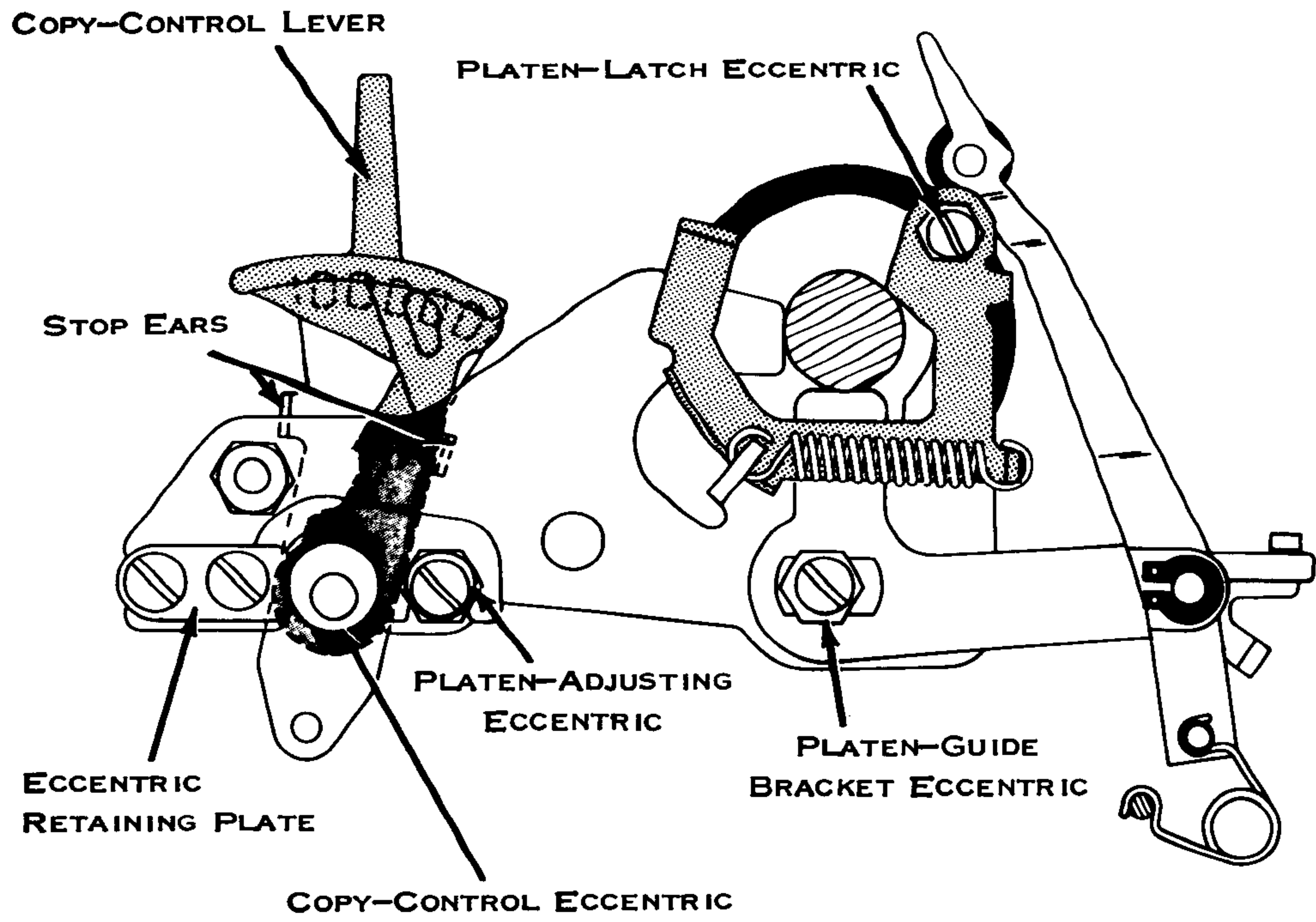


Figure 107. Print Mechanism

5. Platen Height (Fig. 108) - Adjust the platen guide bracket eccentrics (See Fig. 107 for eccentrics) so that the Hoovermeter spans the distance between the escapement rack and platen. The Hoovermeter head should be set on the #4 scribe line.

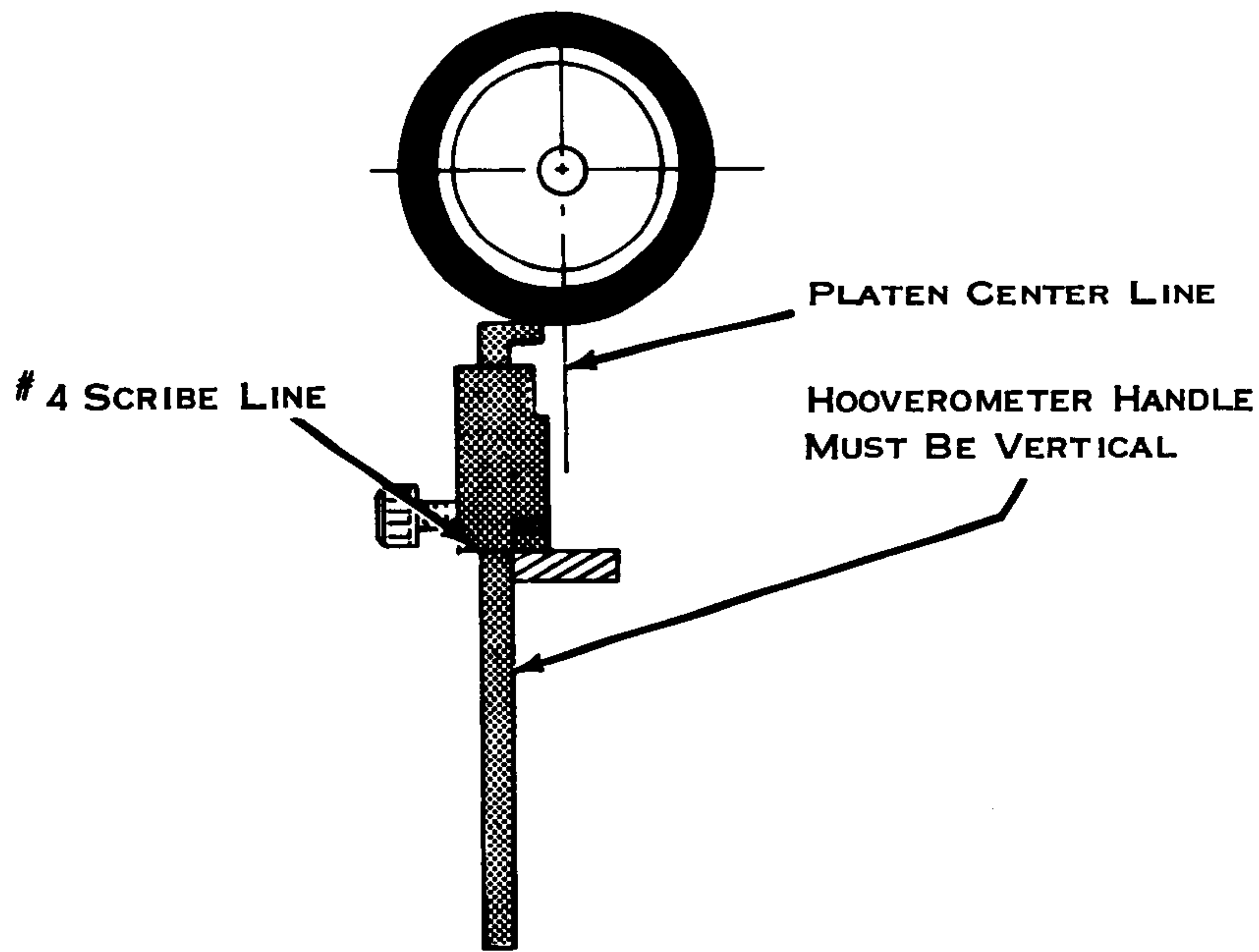


Figure 108. Platen Height Adjustment

- NOTE: Platen height must be checked at both ends of the platen (Fig. 109). Keep the high part of the platen guide eccentric to the rear during adjustment. This adjustment will effect the platen front to rear adjustment.

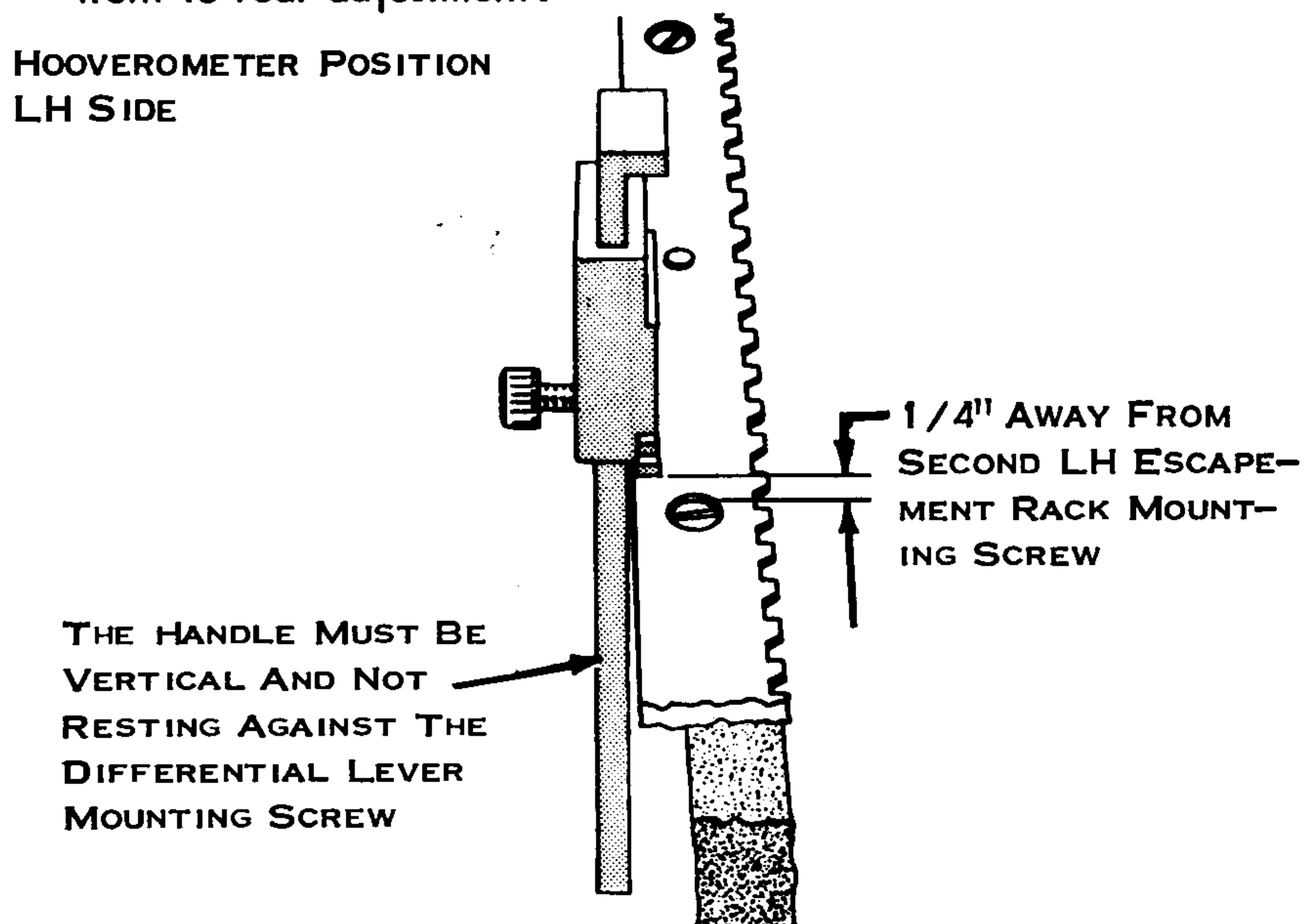


Figure 109 A. Platen Height Adjustment

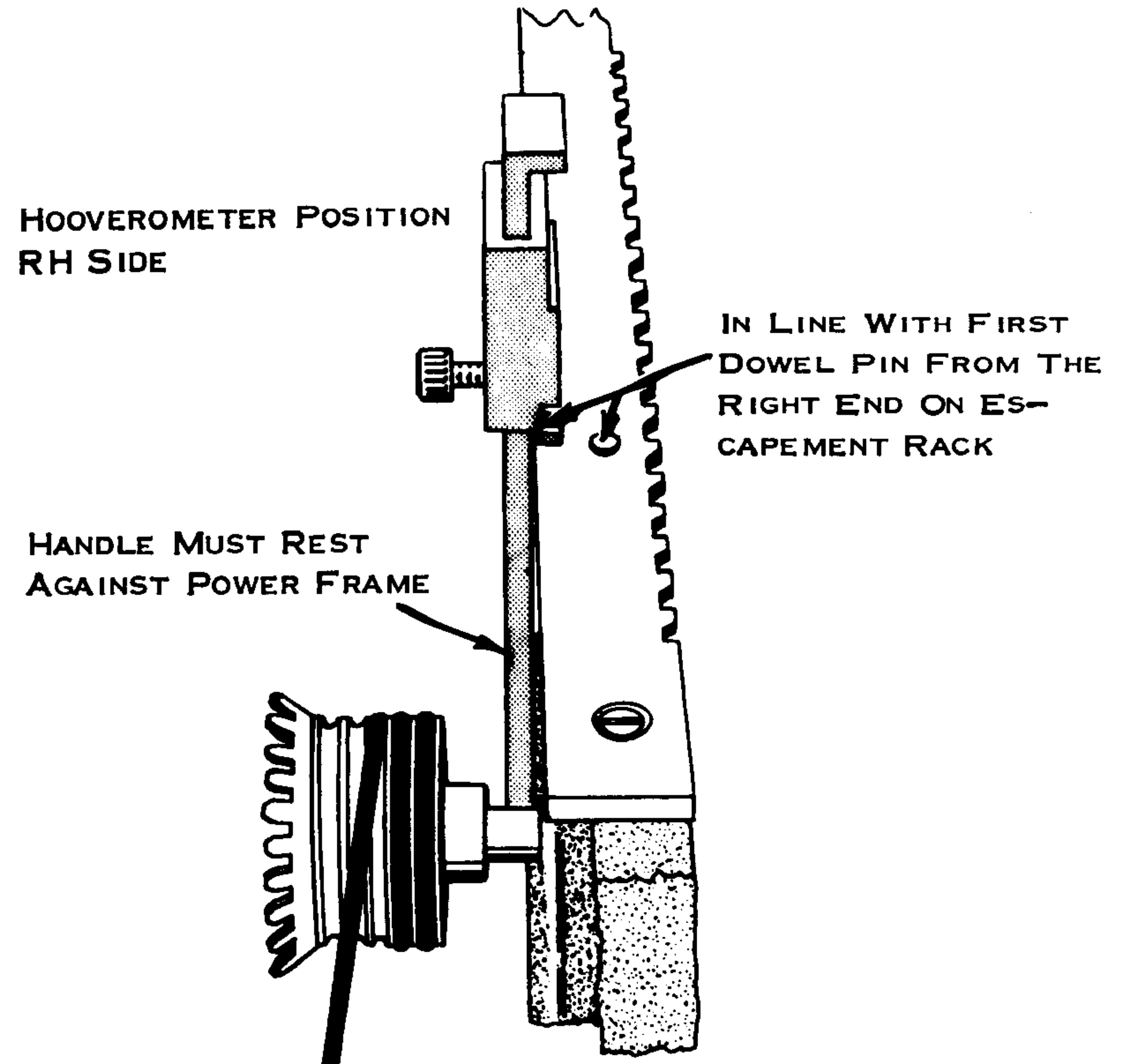


Figure 109 B. Platen Height Adjustment

6. Platen Adjusting Eccentrics, Front To Rear Adjustment (Fig. 110, Ref. Fig. 107) - With the head of the Hoovermeter set at the number 2 scribe line, the tool should span the distance between the platen and the print shaft. Adjust the platen adjusting eccentrics at each end simultaneously to obtain the proper adjustment. CAUTION - Be sure the Hoovermeter does not rest on the print shaft keyway and that the upper corner of the Hoovermeter handle, not the lower, is used for checking. The handle should be kept perpendicular to the platen to avoid an erroneous measurement. Changing the platen position at either end will slightly effect the other end. Be sure to recheck each adjustment.

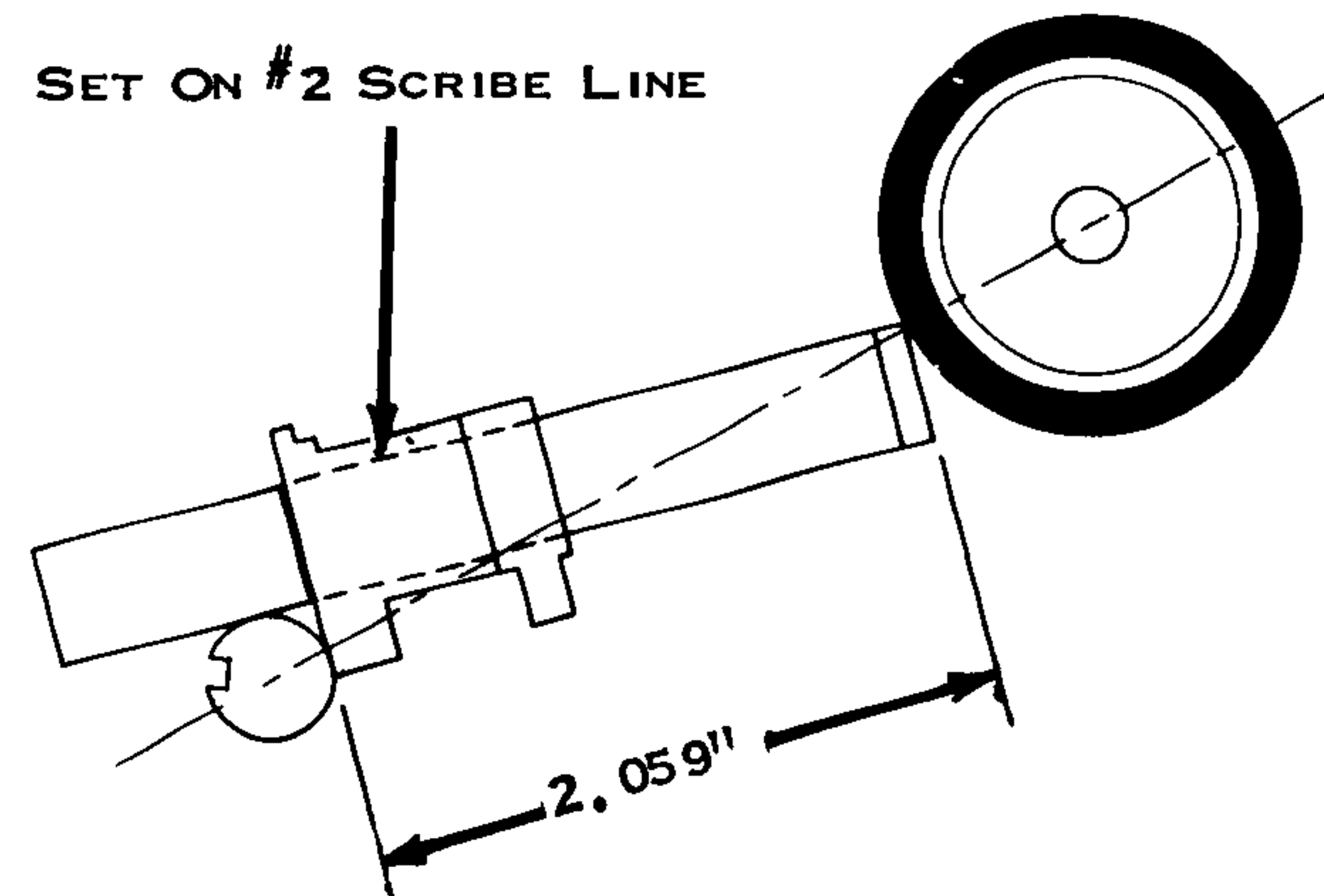


Figure 110. Front to Rear

7. Carrier Shoe (Fig. 111) - The upper carrier shoe eccentric mounting stud should be adjusted to provide .001" to .004" up and down play at the rear of the carrier. This clearance should be checked in several places along the length of the writing line.

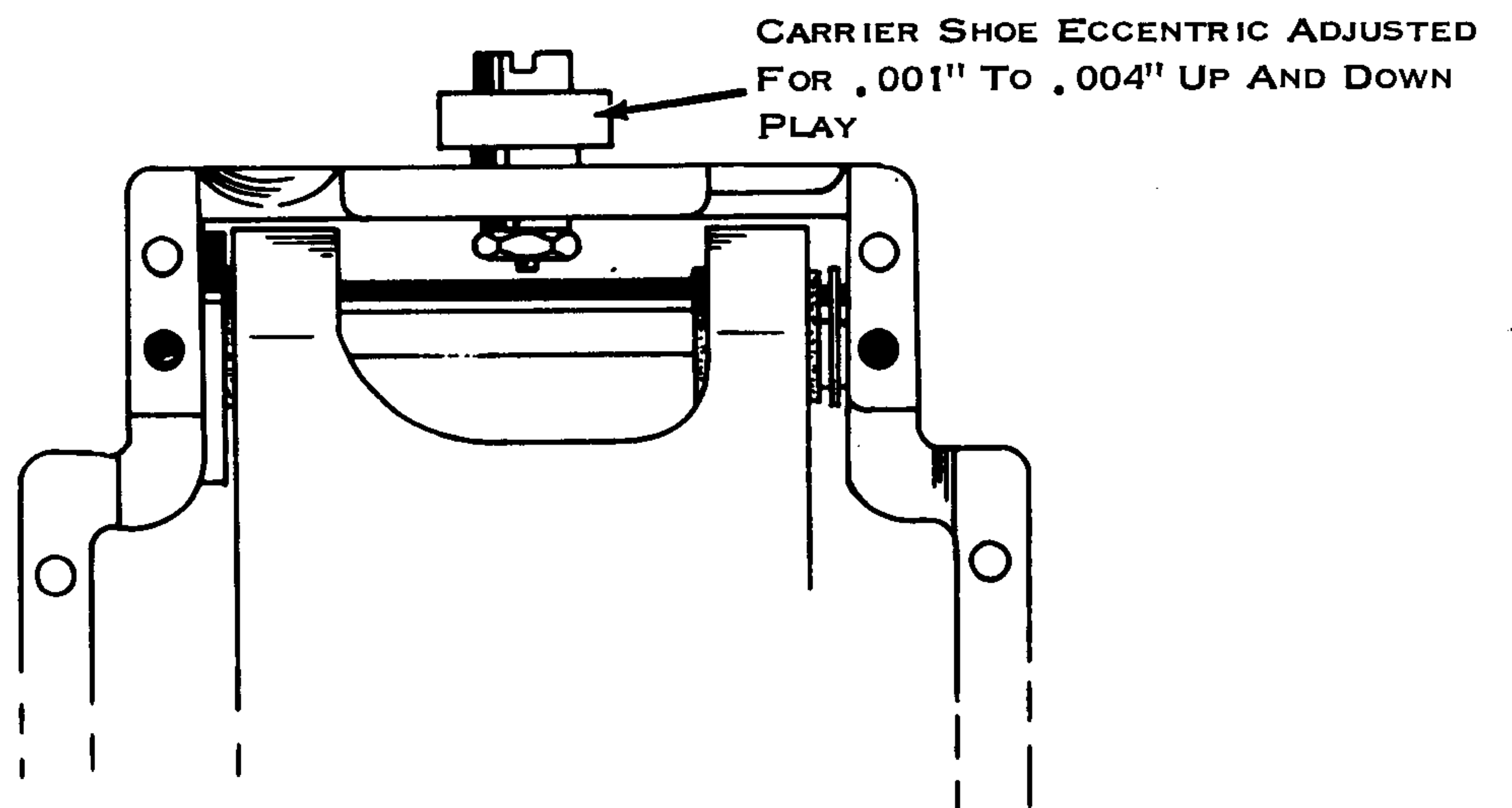


Figure 111. Carrier Shoe



8. **Print Cam Follower** - The print cam follower stud (held by set screw under carrier) should be adjusted left or right so that the rubber roller on the follower is centered in the surface of the restoring cam. The restoring cam follower eccentric should be adjusted (high point forward) so that the rubber roller contacts the surface of the restoring cam throughout the cycle except during free flight of the rocker. **CAUTION** - Cycle the machine slowly by hand; be sure that the mechanism does not bind through any part of the cycle.

9. **Velocity Control Plate** - The velocity control plate pin should be adjusted front to rear to obtain a clearance of .260" to .270" between the platen and the center of the home character with the rocker at rest. Use the Hoovermeter base as a gage with two or three data cards around the platen (Fig. 112). With the type head in the print position and held lightly toward the front of the machine, adjust the velocity control plate eccentric to obtain .020" to .030" clearance between the platen and the center of the home character (Fig. 113).

Each adjustment effects the other, thus they must be adjusted alternately until both are correct. The adjustments can be made easily if the following procedure is observed.

- Raise the anvil adjusting eccentric if necessary to prevent any interference. These adjustments may be accomplished easier if the ribbon feed plate assembly is removed.
- If the plate is loose or completely out of alignment, set the high part of the eccentric forward and tighten in place. Adjust the plate so that about 1/32" of the adjusting slot is visible above the binding screw and tighten the screw friction tight. These settings provide a good starting point.
- Hand cycle the machine (use tilt 3, full size character) until the type head has been powered to the rear as far as it will go. Do not hold the type head to the rear. With the mechanism in this position, adjust the velocity control plate eccentric until a definite drag is felt on 4 or 5 data cards inserted between the type head and the platen. No drag should be felt on 3 cards. You should not be able to insert five cards. This will give the required .020" to .030" clearance in the active position.
- Return the type head to the rest position (be sure the cycle shaft is latched). Adjust the velocity control plate pin forward or back to obtain .260" to .270" between the center of the home character and the platen.
- Recheck and refine the eccentric adjustment, then recheck and refine the rest position adjustment. Both screws should be tightened firmly when the adjustment is complete. Check the eccentric adjustment without ribbon and with no paper around the platen.

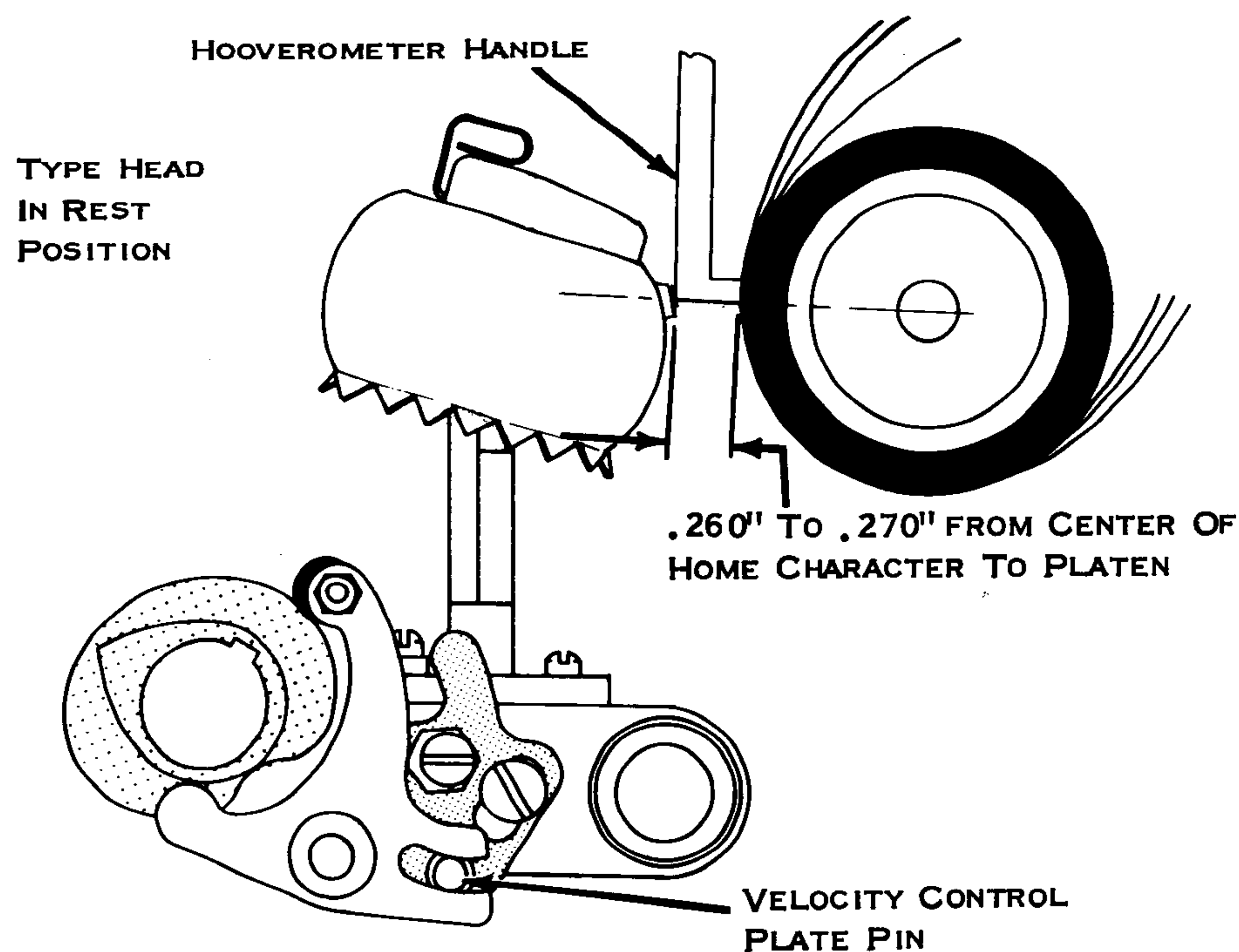


Figure 112. Adjusting Slot

TYPE HEAD POWERED TO THE REAR  
A DEFINITE DRAG ON FOUR OR FIVE  
TAB CARDS

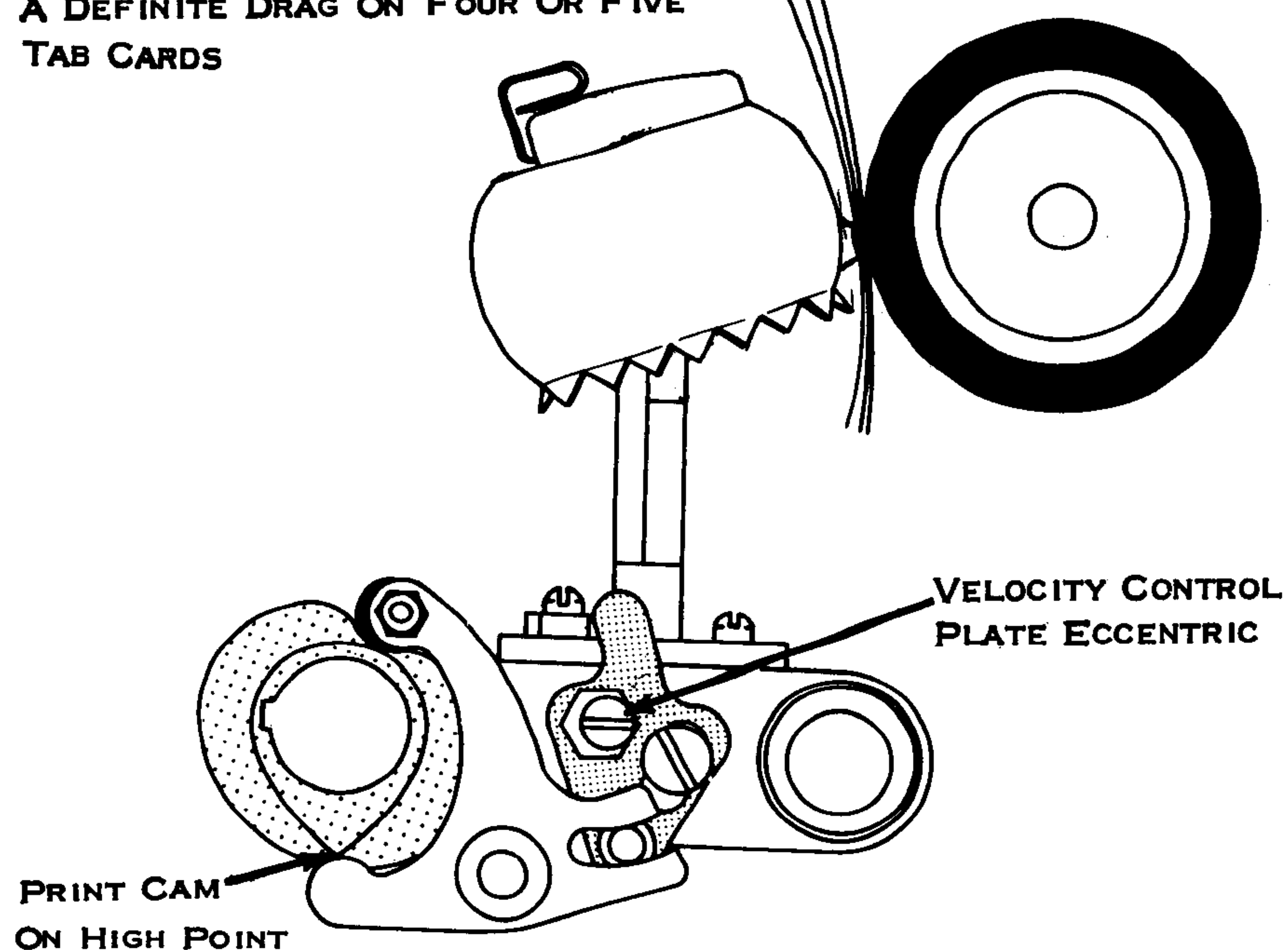


Figure 113. Adjust Eccentric

10. **Anvil** (Fig. 114) - With the high part of the anvil eccentrics out, adjust the anvil so that there is a clearance of .005" to .007" between the platen and the typehead with the striker on the rocker held against the anvil. **CAUTION** - Raising or lowering either end of the anvil will slightly effect the adjustment of the other end. Be sure to recheck each adjustment. The adjustment should be made without the use of the ribbon and with no paper around the platen. **NOTE:** The carrier buffers (15" machine only) should be adjusted for .002" to .004" between the buffer and the anvil. Buffers should be checked on both ends of the carriage.

COPY-CONTROL LEVER  
IN THE MIDDLE POSITION

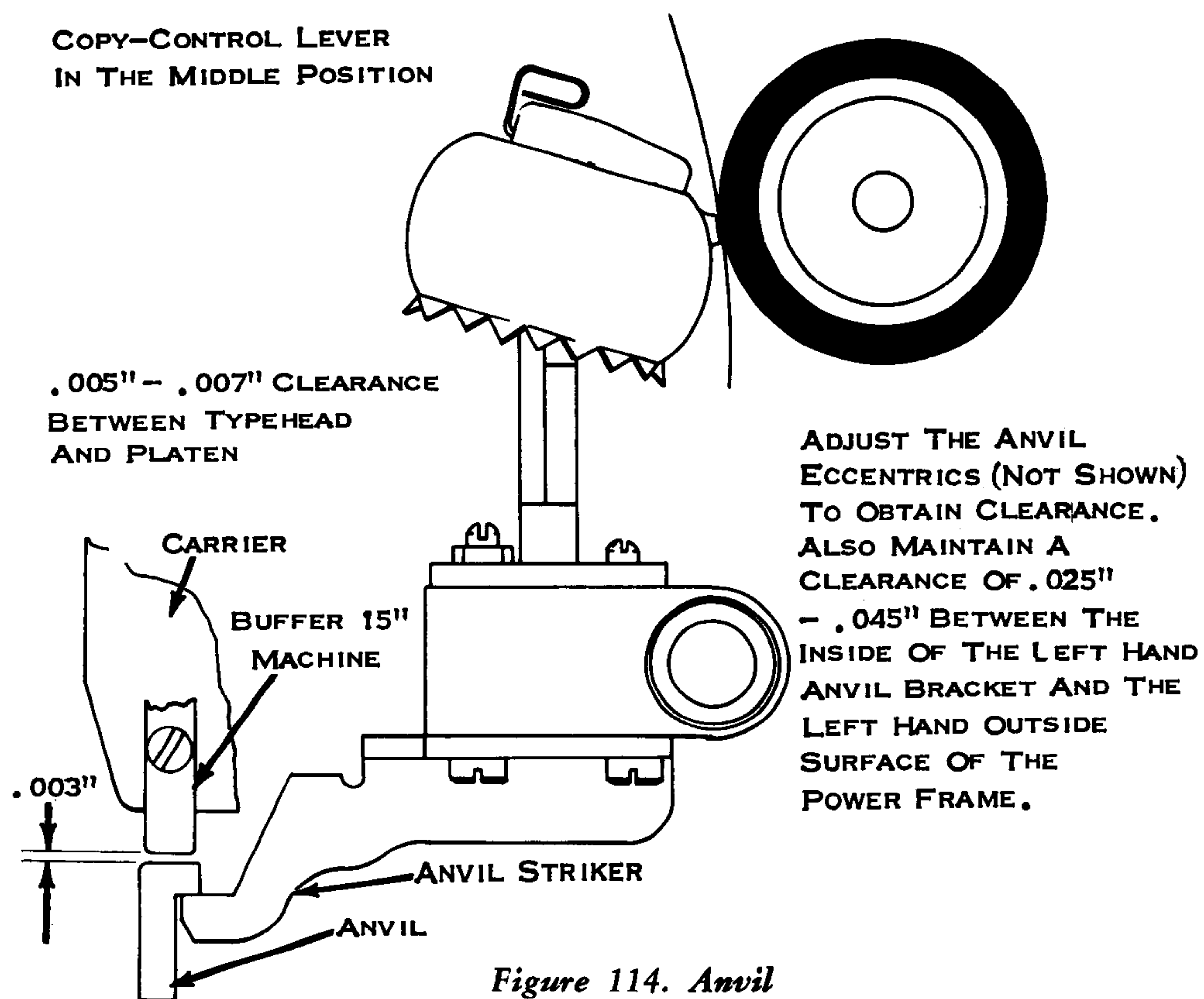


Figure 114. Anvil

11. **Even Printing** - Position the yoke under its mounting screw so that the density of the left and right sides of the character will be as uniform as possible. **CAUTION** - This adjustment changes the left to right position of the character; rotate and tilt alignment adjustments must be checked.

#### MAINSRING AND CORDS

1. **Gear Mesh** (Fig. 115) - The operational shaft must be adjusted laterally so that the crown surface of the escapement cord drum and the carrier return pinion are even. The position of the shaft is controlled by the operational cam ratchet and the shift clutch arbor on 11" machines. On 15" machines the shaft is controlled by a collar on the R.H. side. **BE SURE** to maintain .002" to .004" end play in the operational shaft when making this adjustment. The escapement



drum cord gear should be adjusted forward or back to obtain .002" to .004" backlash at the point of tightest mesh with the carrier return pinion. **CAUTION** - The mainspring tension and cord tension should be relaxed before the escapement cord drum gear is loosened.

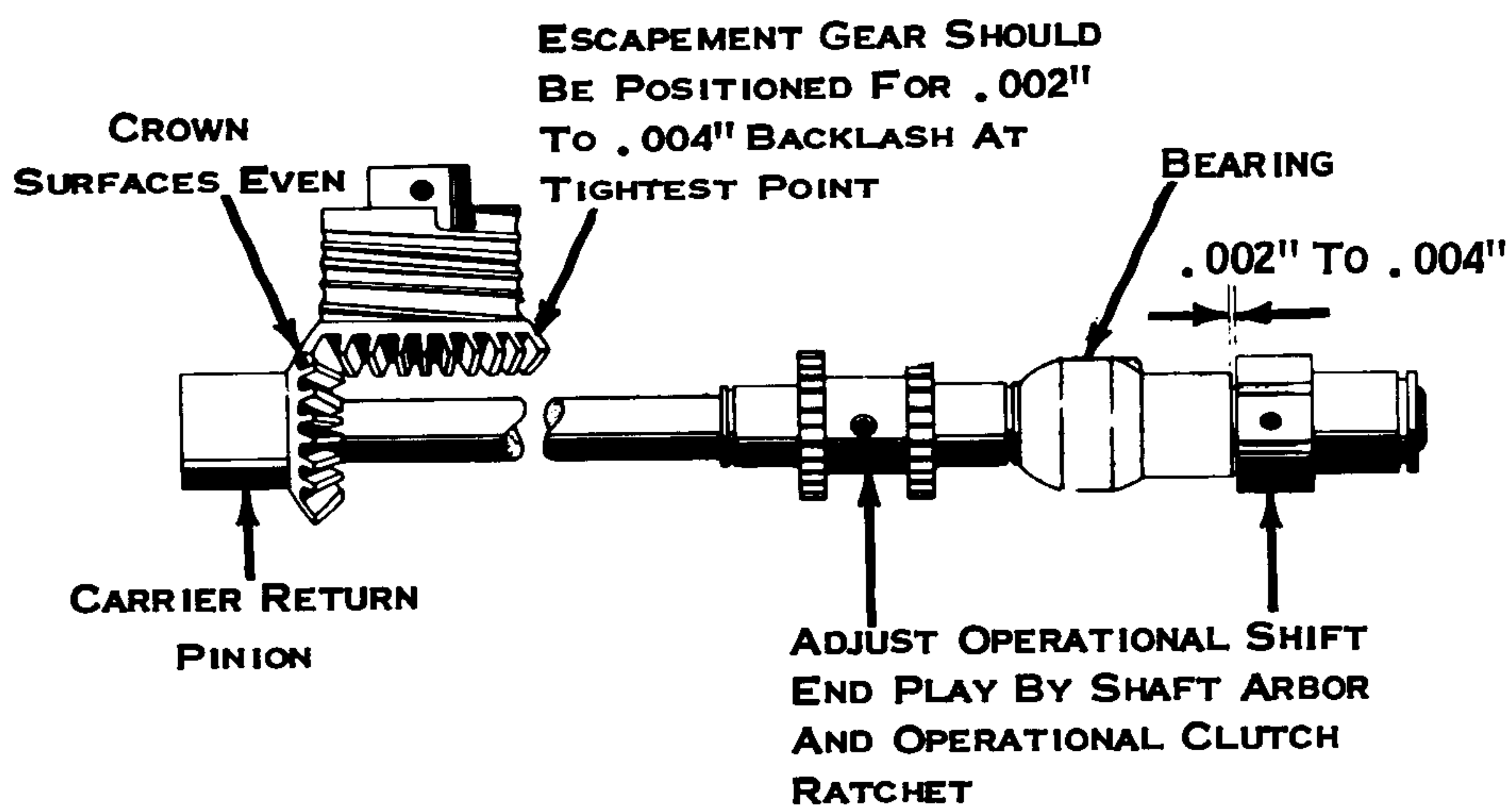


Figure 115. Gear Mesh

2. Tab Governor Pinion (Fig. 116) - The tab governor collar should be positioned so that the tab governor pinion will have .002" to .004" backlash at the point of closest mesh with the escapement cord drum gear.

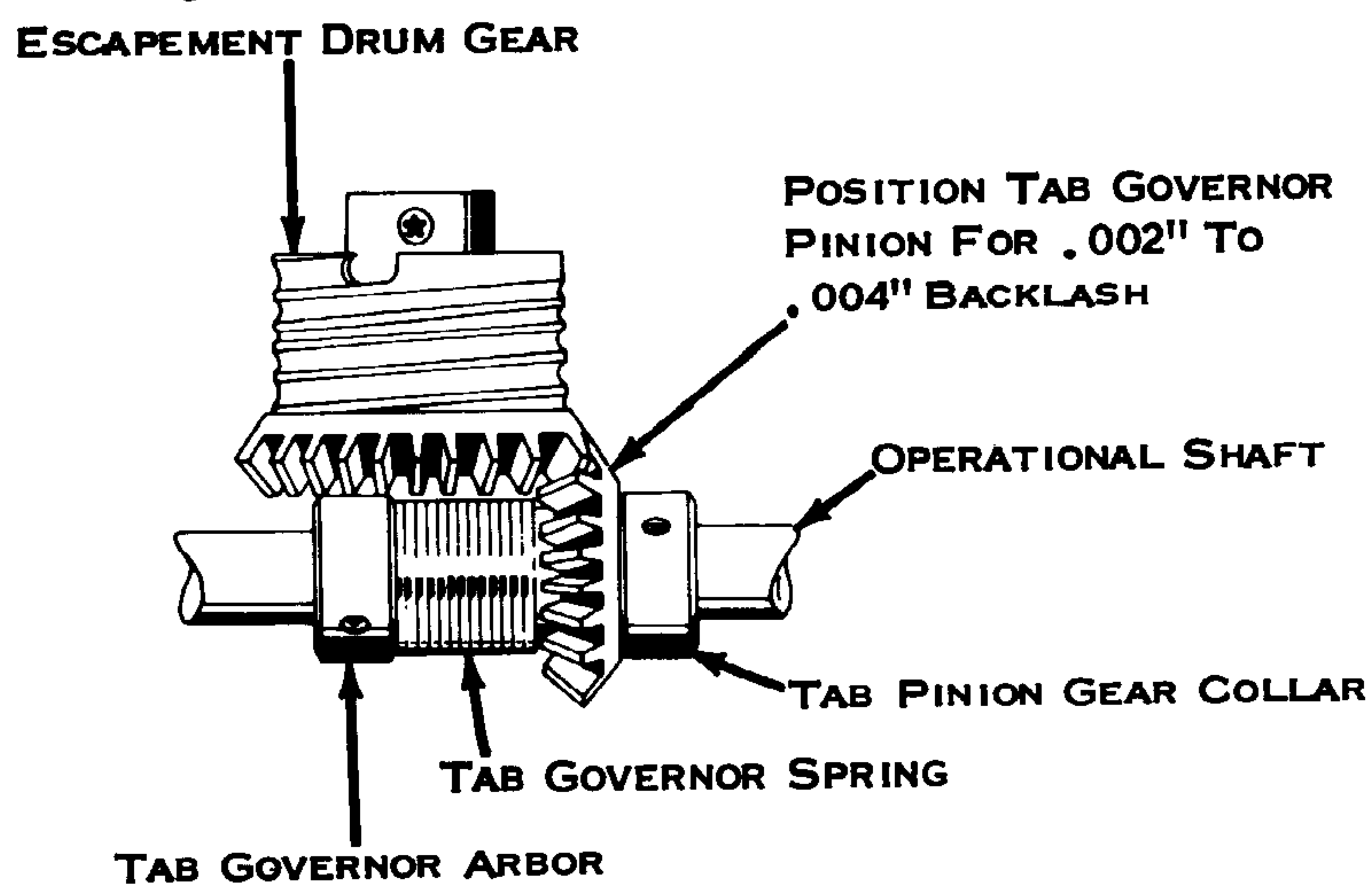


Figure 116. Tab Governor Pinion

3. Cord Tension (Fig. 117) - The carrier return cord drum should be adjusted so that the inner flange of the cord tension pulley is 3/16" to 1/4" from the power frame.

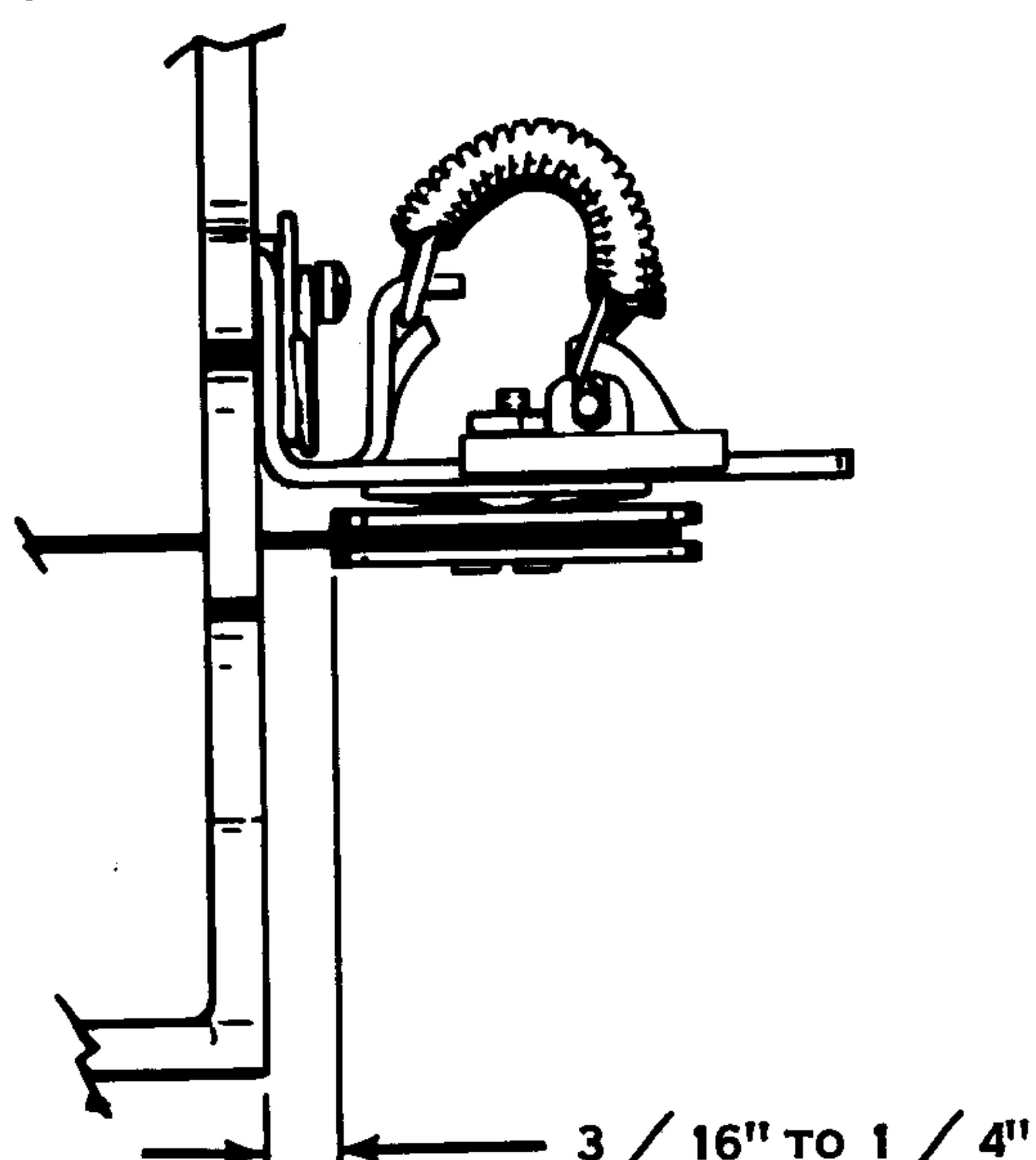


Figure 117. Cord Tension

4. Idler Pulley Mounting Stud - The front idler pulley mounting stud should be set so that the pin is horizontal and above the center on the eccentric.
5. Mainspring Tension - By adjusting the mainspring cage approximately five full turns, 1/2 to 3/4 pounds of tension will be placed on the

carrier as it escapes through the line lock load at the extreme right hand margin. **CAUTION** - WHEN THE MAINSPRING TENSION IS BEING INCREASED OR DECREASED, IT SHOULD BE HANDLED CAREFULLY TO PREVENT IT FROM SLIPPING AND CAUSING INJURY.

#### OPERATIONAL CONTROL MECHANISM

1. Keylever Pawl To Interposer Clearance (Fig. 118) - Position the keylever pawl guide bracket up or down so that a clearance of .020" to .025" is obtained between the index keylever pawl and the index interposer at rest. The individual adjusting slots of the backspace, carrier return, and tab keylever should be adjusted to obtain .020" to .025" clearance between the keylever pawl and the interposer at rest. The spacebar lever eccentric should be adjusted with the high point forward to obtain a keylever pawl to interposer clearance of .020" to .030".

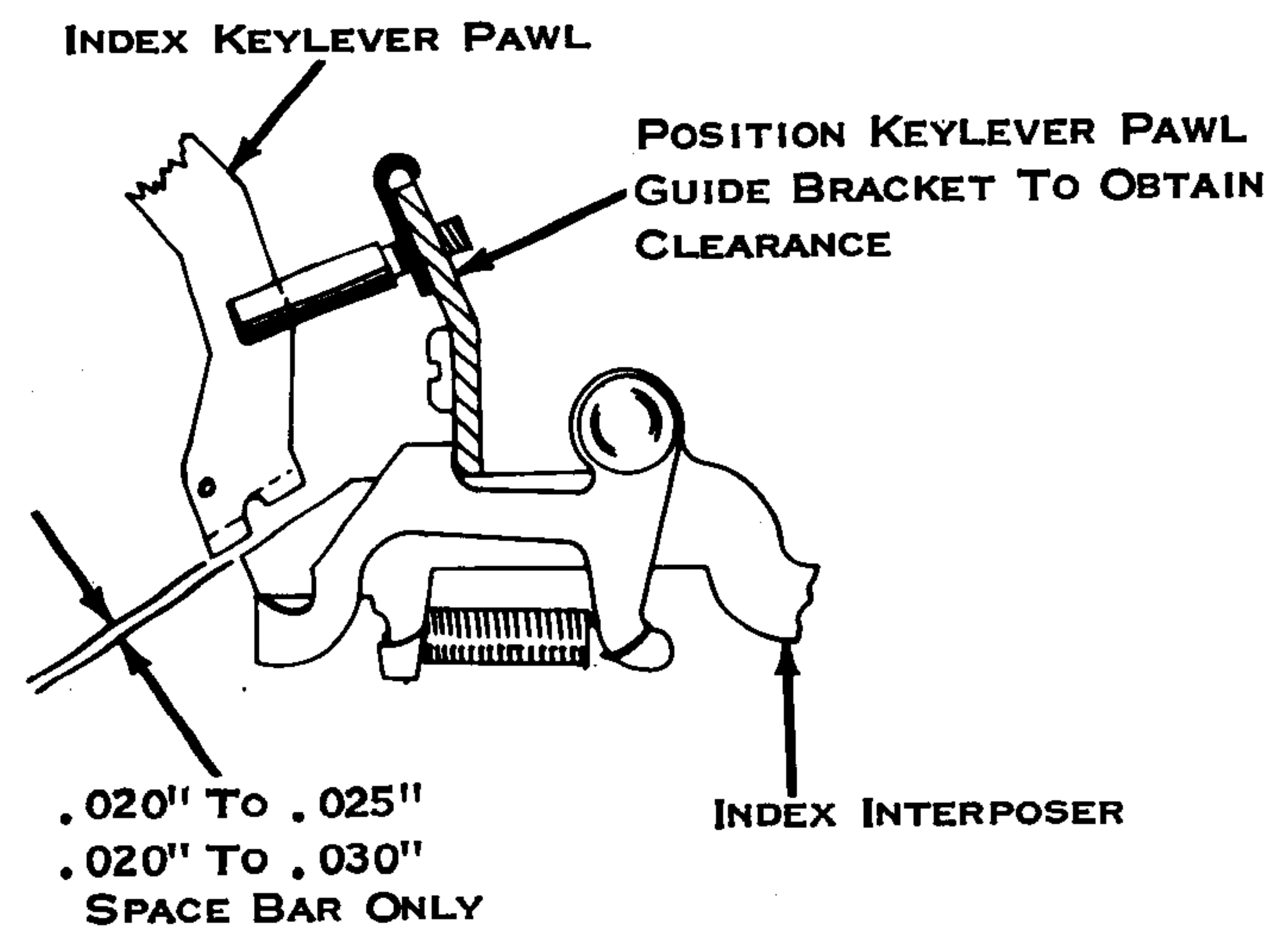


Figure 118. Keylever Pawl To Interposer Clearance

2. Operational Latch Height - The adjustable latch screws (eccentric stop on tab latch) for the backspace, spacebar, and tab operational latches should be adjusted so that the latches will pass under the cam follower lever with a clearance of .001" to .015" (Fig. 119). The carrier return operational latch adjustable stop should be adjusted so that the latch will pass under the cam follower with .001" to .010" clearance (Fig. 120). **NOTE:** Be sure that the cams are at rest when this clearance is observed. The high side of the specification is preferred.

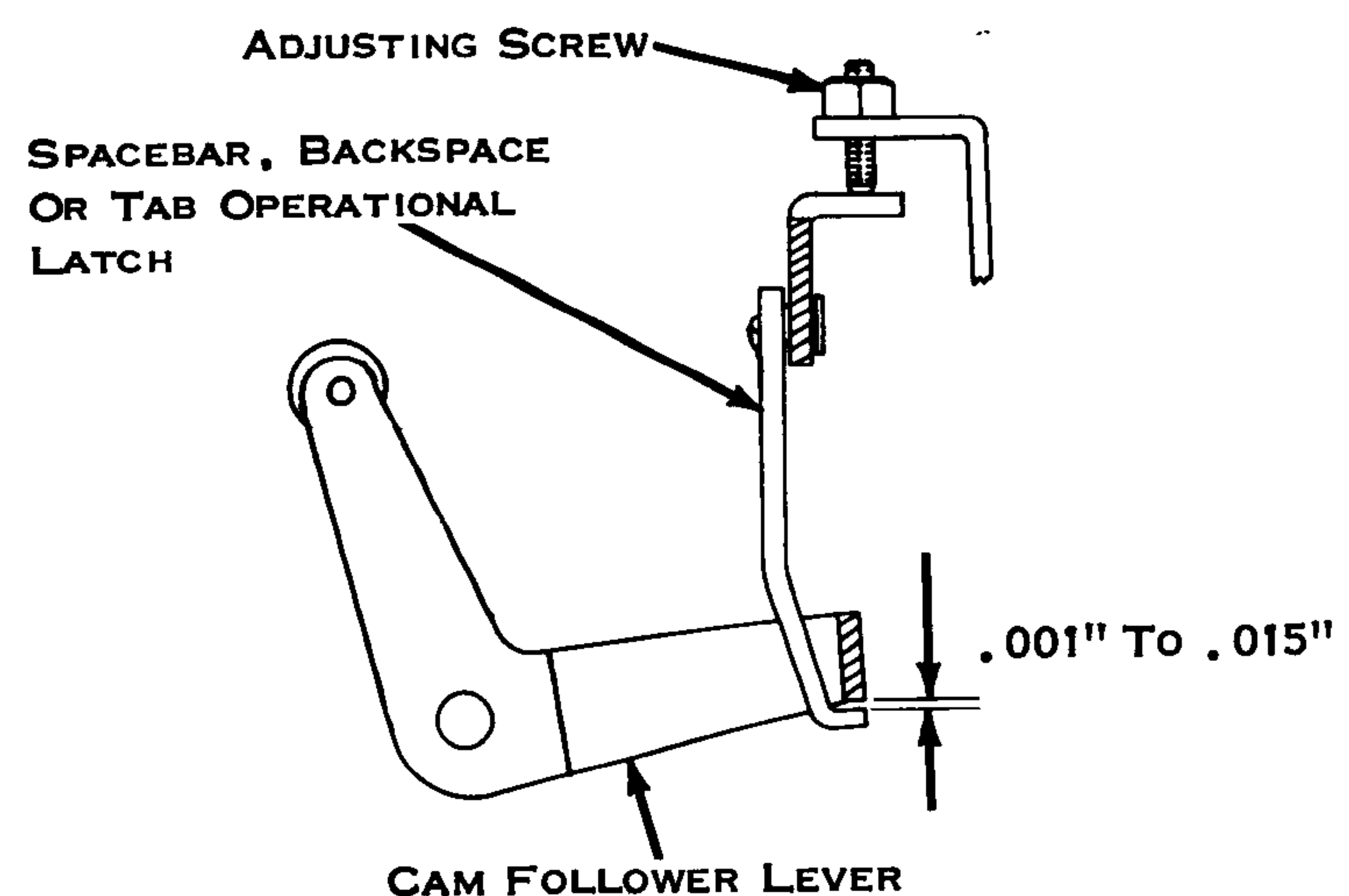


Figure 119. Latch Height



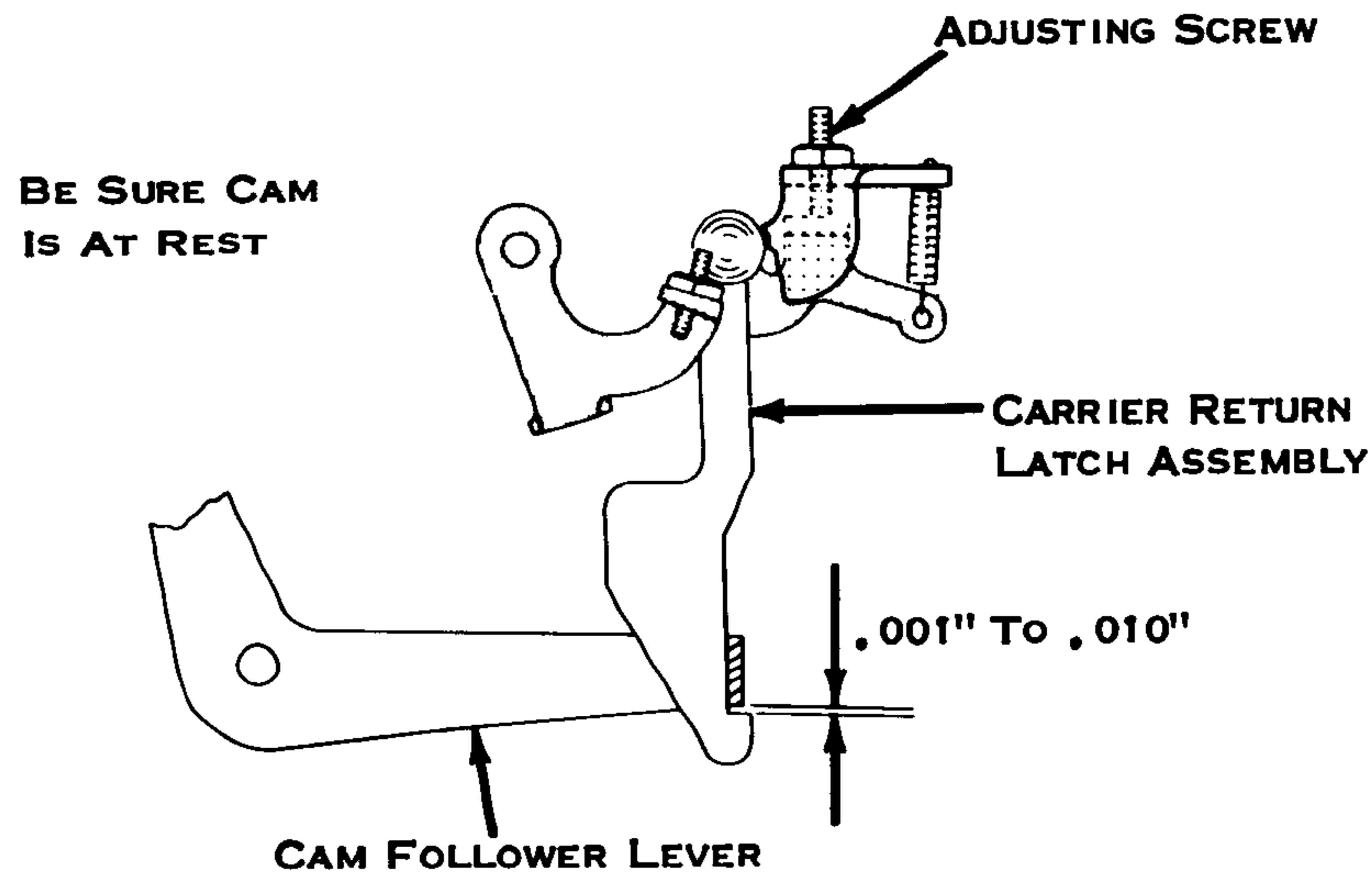


Figure 120. Latch Height

3. Interposer Adjusting Screw (Fig. 121) - Adjust for a clearance of .005" to .015" between the operational latches and their respective cam followers. CAUTION - If the cam followers are operated too far when this adjustment is being checked, the interposer restoring bail will force the interposers forward slightly and an erroneous adjustment will result. The keylever pawl to interposer clearance should be rechecked after this adjustment.

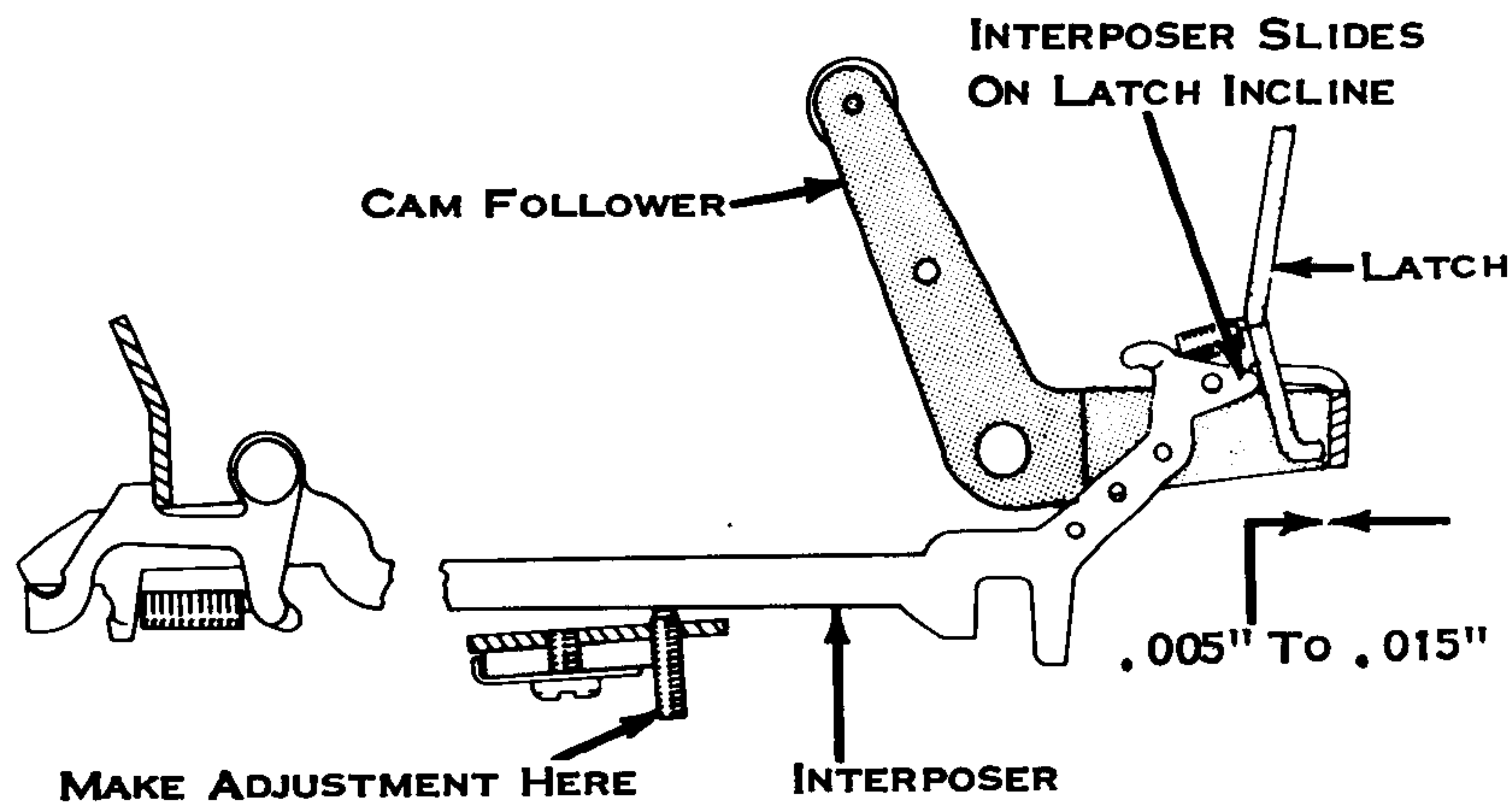


Figure 121. Interposer Adjusting Screw

4. Keylever Pawl Overlap (Fig. 122) - Adjust keylever pawl guide stud so keylever pawls overlap their respective interposers by .035" to .045" (except index pawl which should overlap .040" to .050") with both parts at rest. NOTE: Recheck individual keylever to interposer clearance after this adjustment.

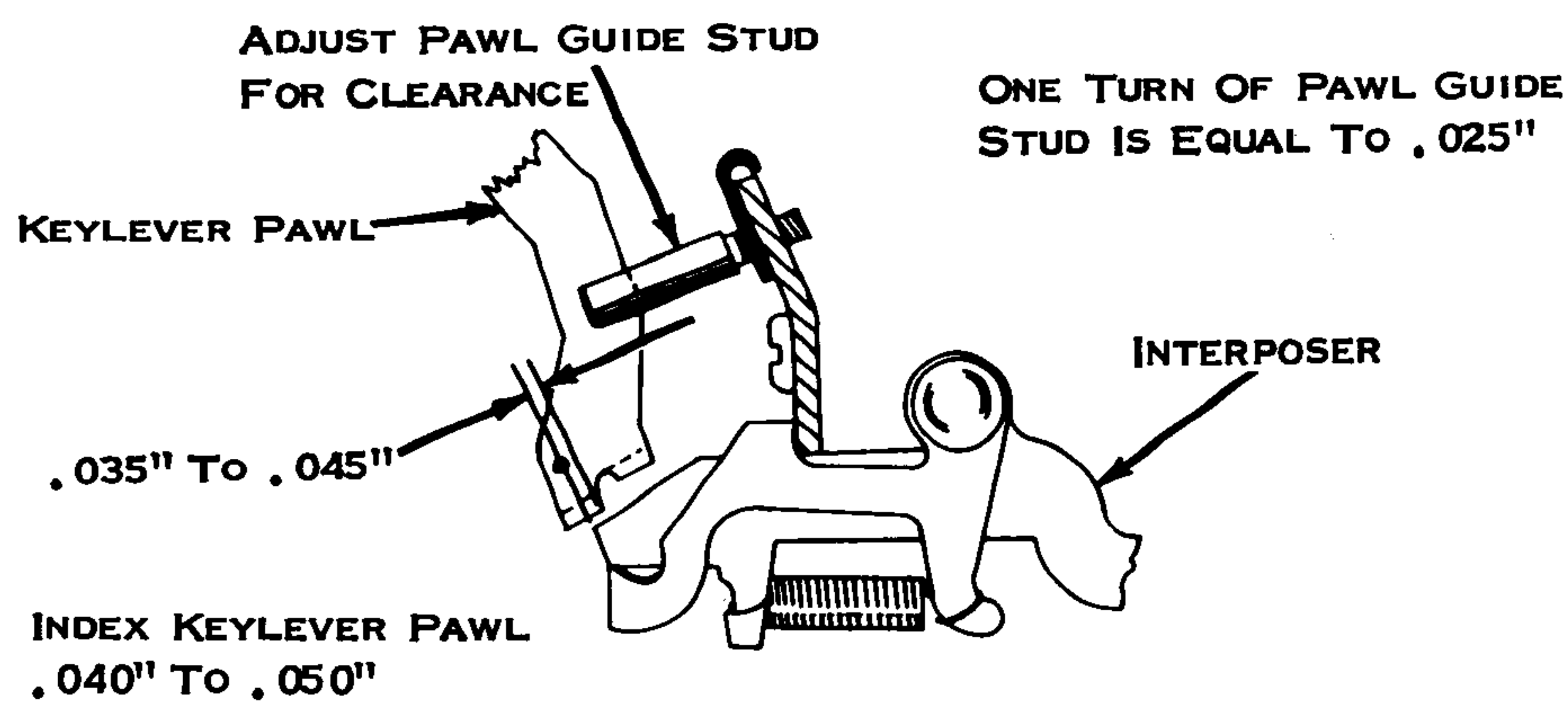


Figure 122. Keylever Pawl Overlap

5. Cam Check Ring (Fig. 123) - The cam check ring eccentric should be adjusted so that a clearance of .010" to .015" exists between the tip of the cam pawl and the teeth of the cam ratchet with the cam latch in the rest position.

NOTE:

The check ring mounting screw must be loosened.

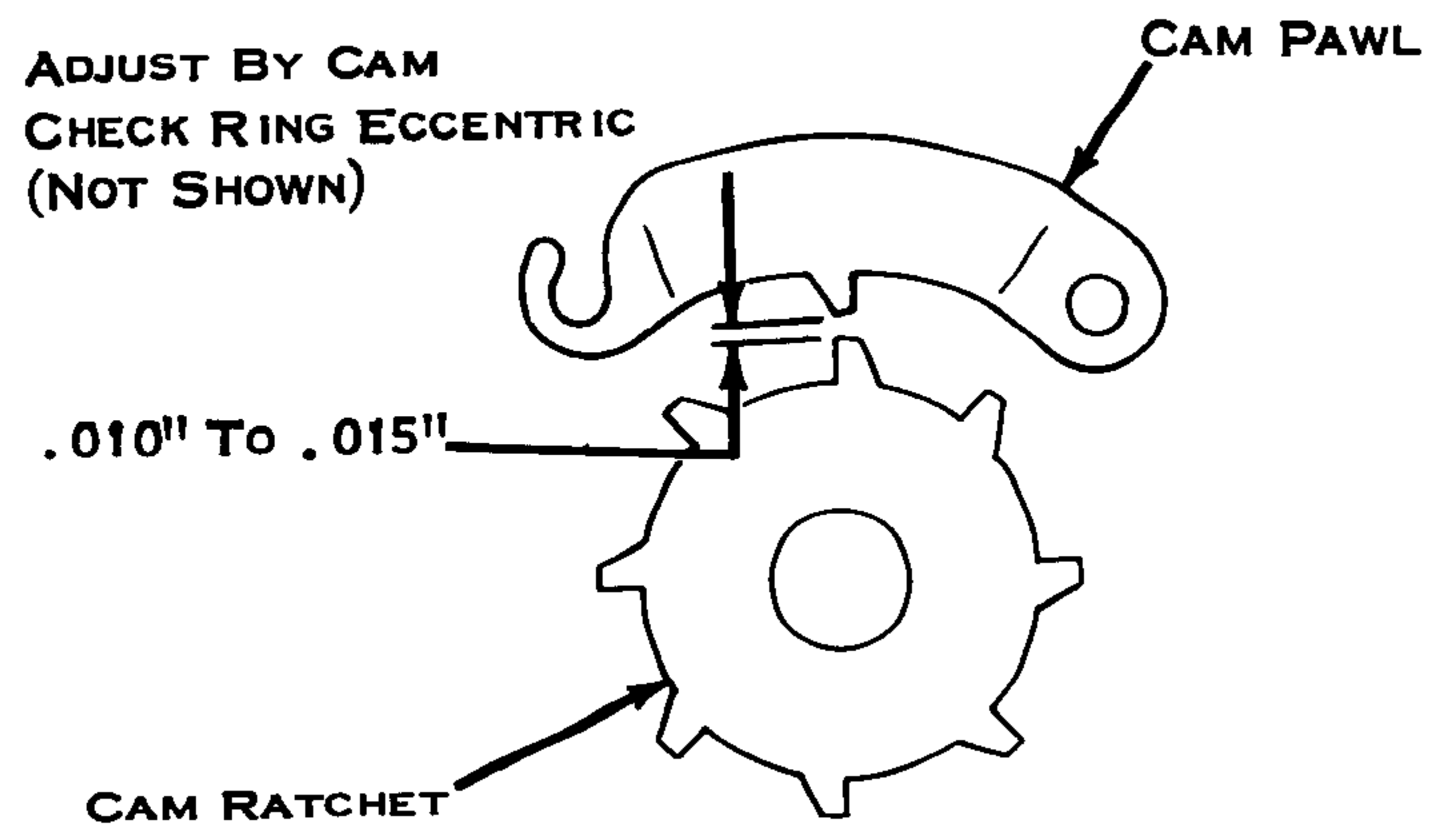


Figure 123. Cam Check Ring

6. Clutch Release Arm Stop Pad (Fig. 124) - Form the stop pads so that when the clutch release arm is on the high point of the cam ring, there is .030" to .040" between the stop pad and the release arm.

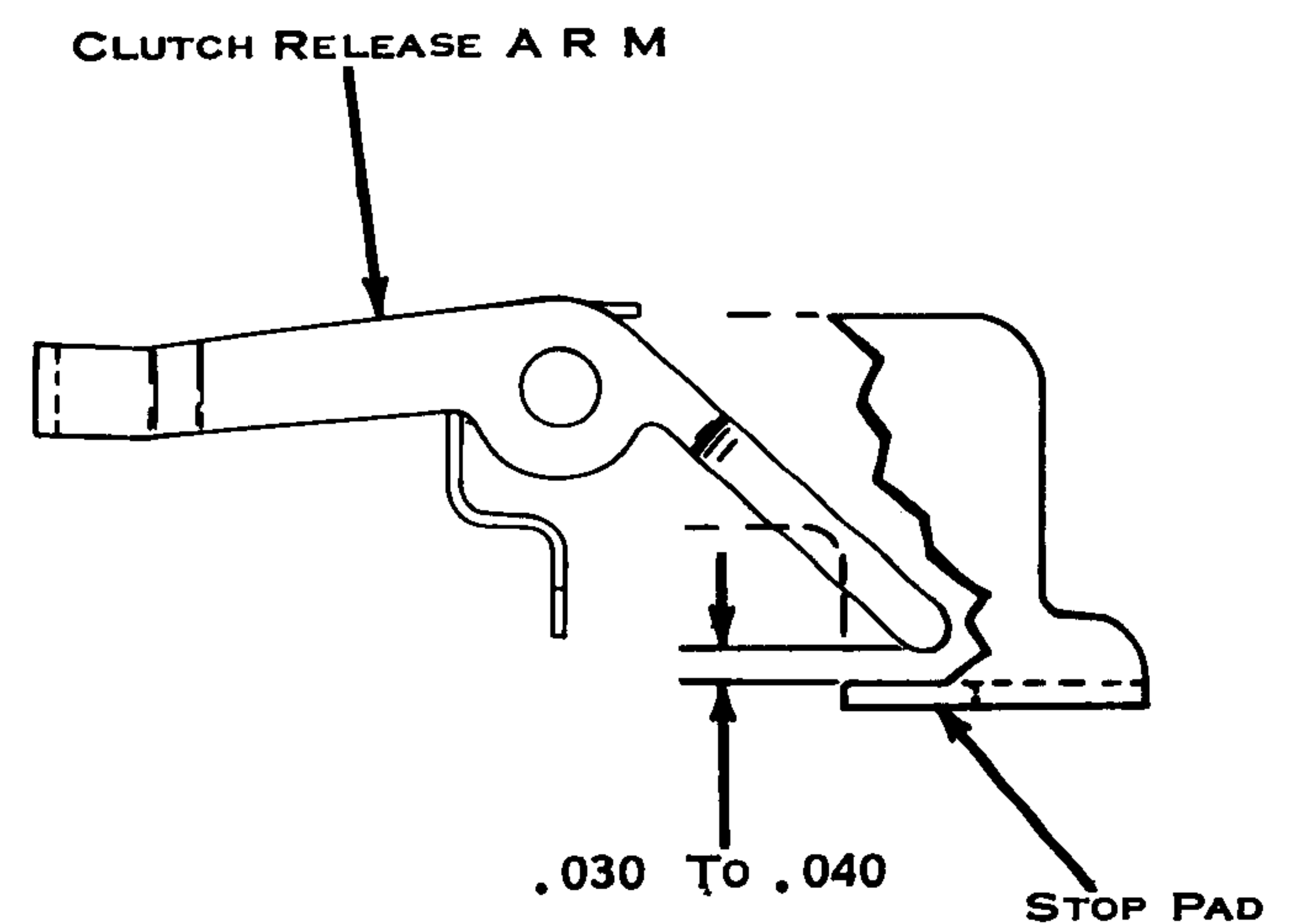


Figure 124. Clutch Release Arm Stop Pad

7. Clutch Release Arm (Fig. 125) - The lug at the bottom of each clutch release arm should be formed so that it clears the interposer lug by .030" to .035" on Carrier Return, Index and .035" to .045" on Tab, Backspace, and Spacebar.

NOTE: The interposers and cams must be latched when the adjustment is observed. Clearance may be judged with the use of the pusher end of the large spring hook. The end of the spring hook is approximately .035" thick.

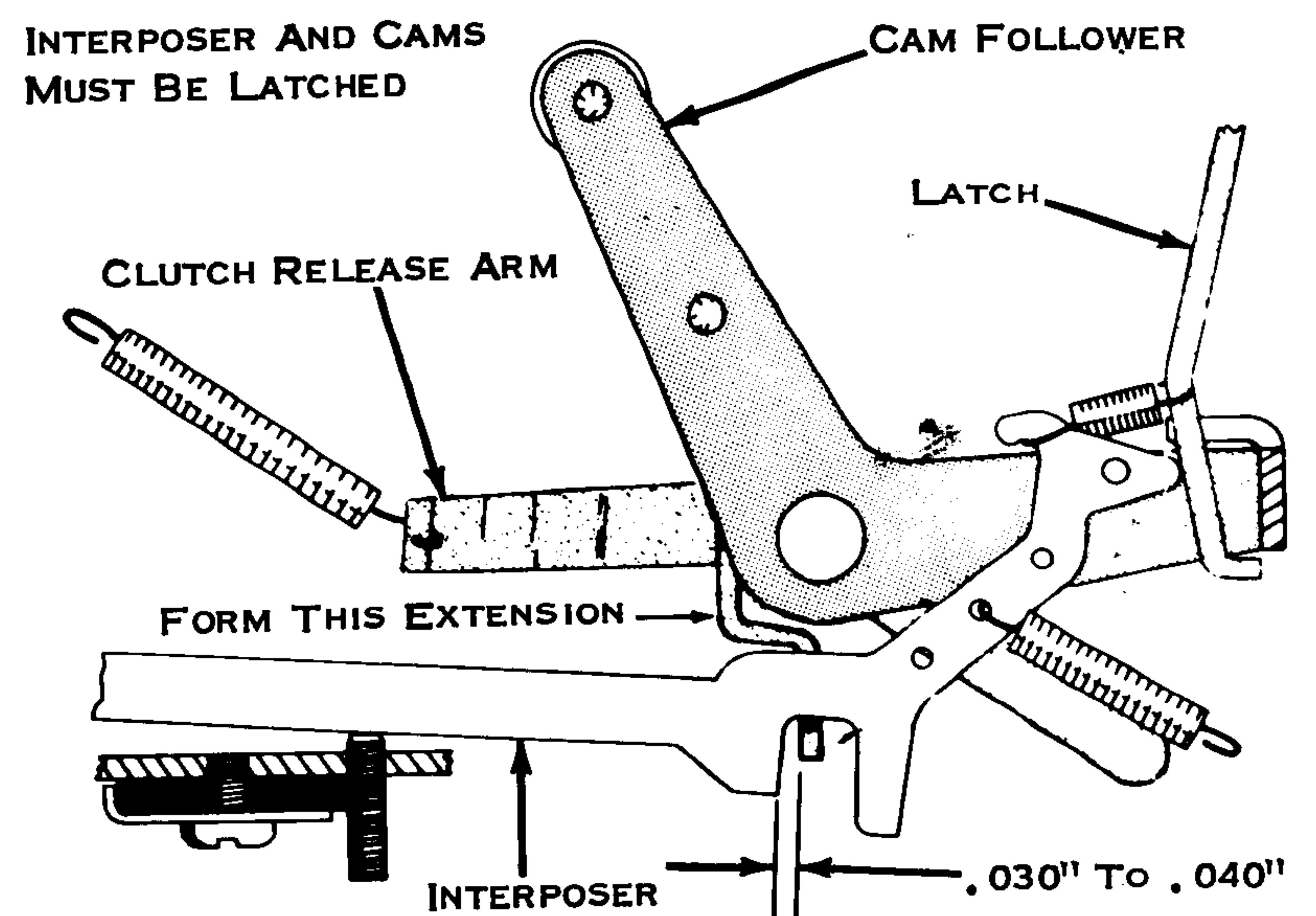


Figure 125. Clutch Release Arm



8. Interposer Restoring Bail (Fig. 126) - The interposer restoring bail lug should be formed at each side of the restoring bail so that the interposers will be restored forward .010" to .030" past the latching point.

NOTE: Forming the lugs forward increases the throw of the interposers. Care should be used in forming these lugs. Too much forming will cause them to break.

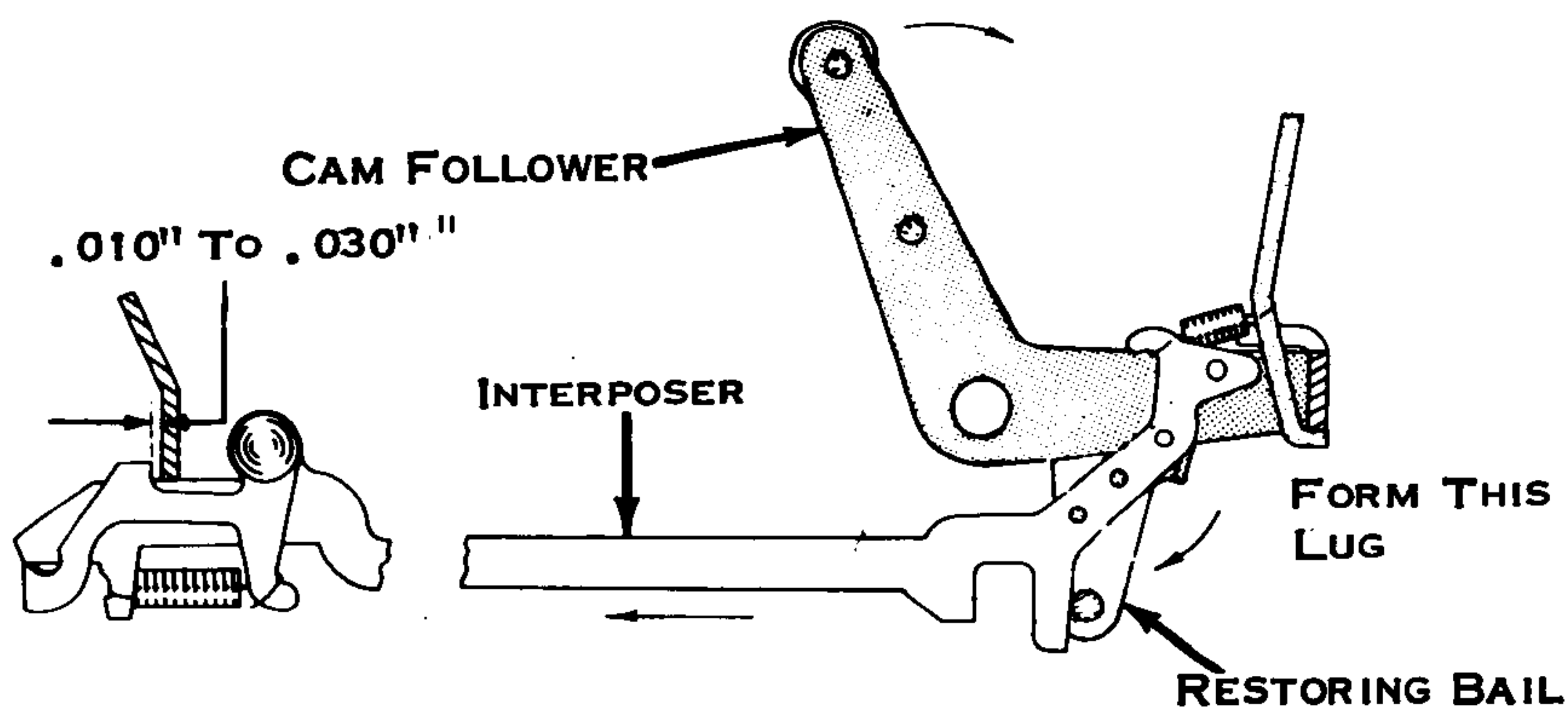


Figure 126. Interposer Restoring Bail

### OPERATIONAL MAGNET ASSEMBLY

1. Tab, Backspace, and Index Magnets (Fig. 127 & 128) -

- Backspace Pivot Plate - Position, vertically, so that the armature (manually attracted) clears its yoke by .001" to .003" (all three screws must be loose). Position, horizontally, so that all armatures center their yokes.
- Pivot Plate - Tighten the backspace pivot plate screw and position so that the left and right armatures clear their yokes by .001" to .003".

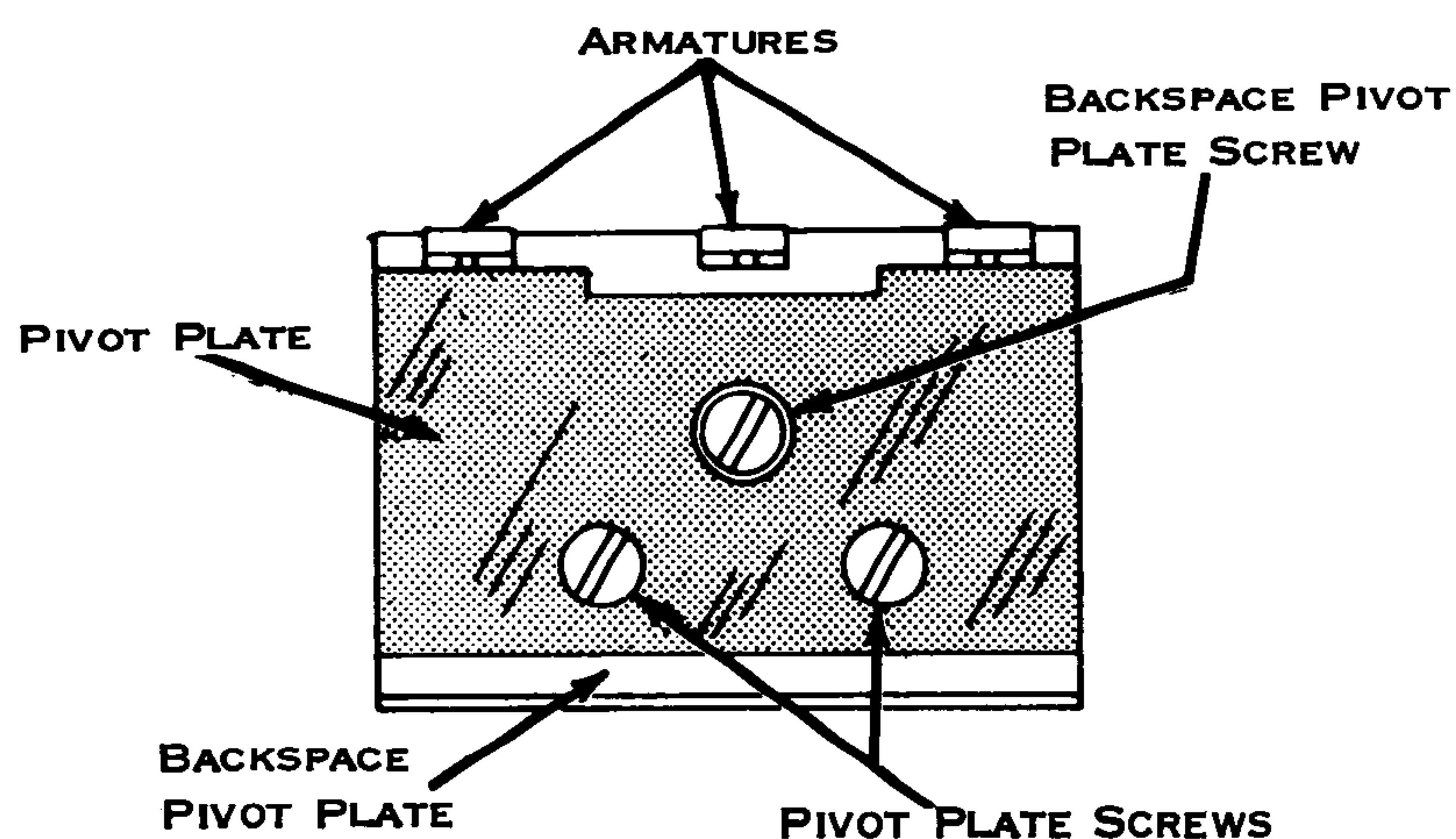


Figure 127. B/S Pivot Plate Location

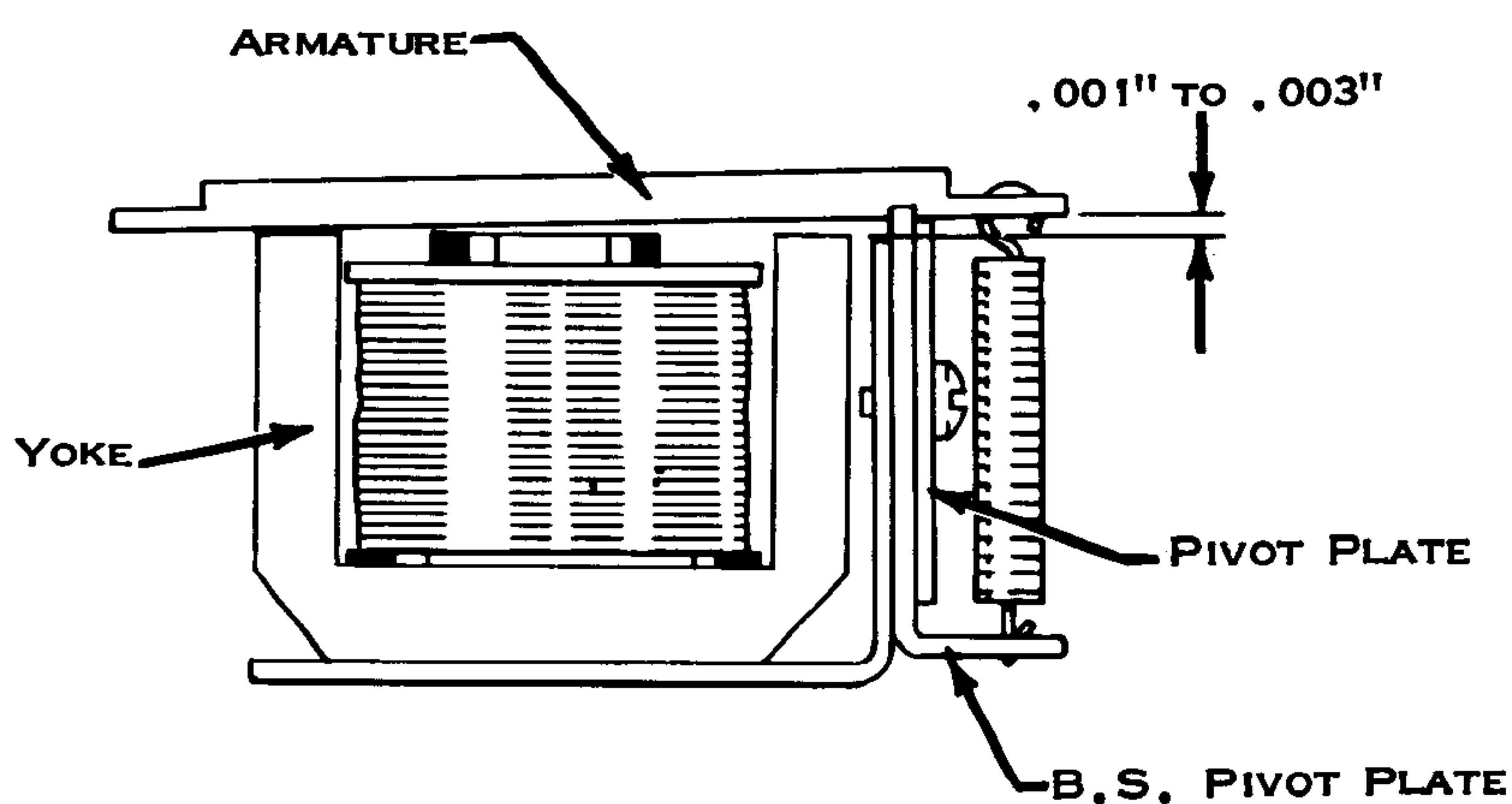


Figure 128. Backspace Pivot Plate

2. Carrier Return And Space Bar Magnet Pivot Plate (Fig. 129) - Position as follows:

- Vertically - so that the left and right armatures clear their yokes by .001" to .003".
- Horizontally - so that the armatures center their guide slots.

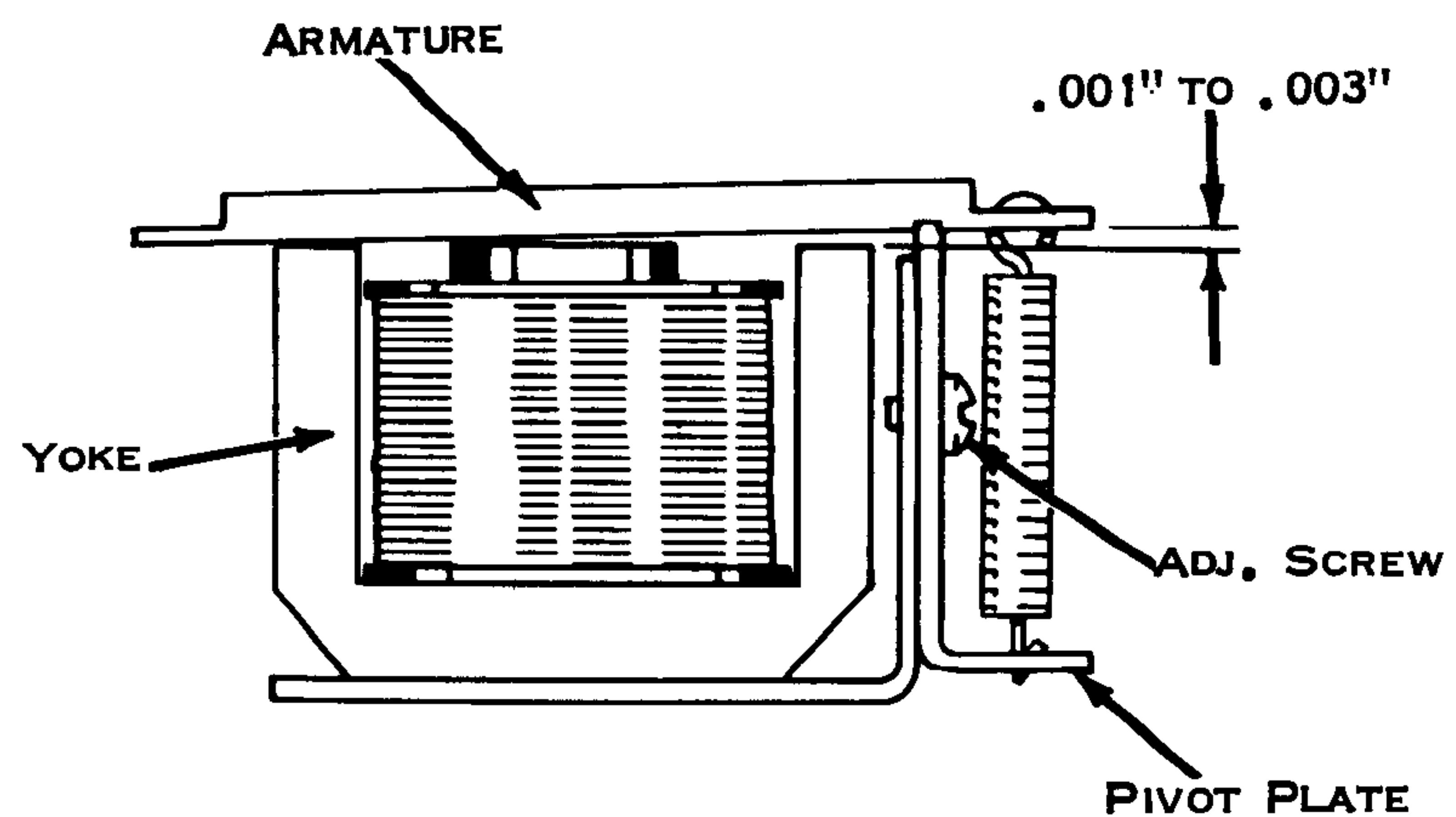


Figure 129. Pivot Plate

3. Armature Backstop (Fig. 130) - Position (armatures at rest) so that the armatures clear their yokes by .020" to .025".

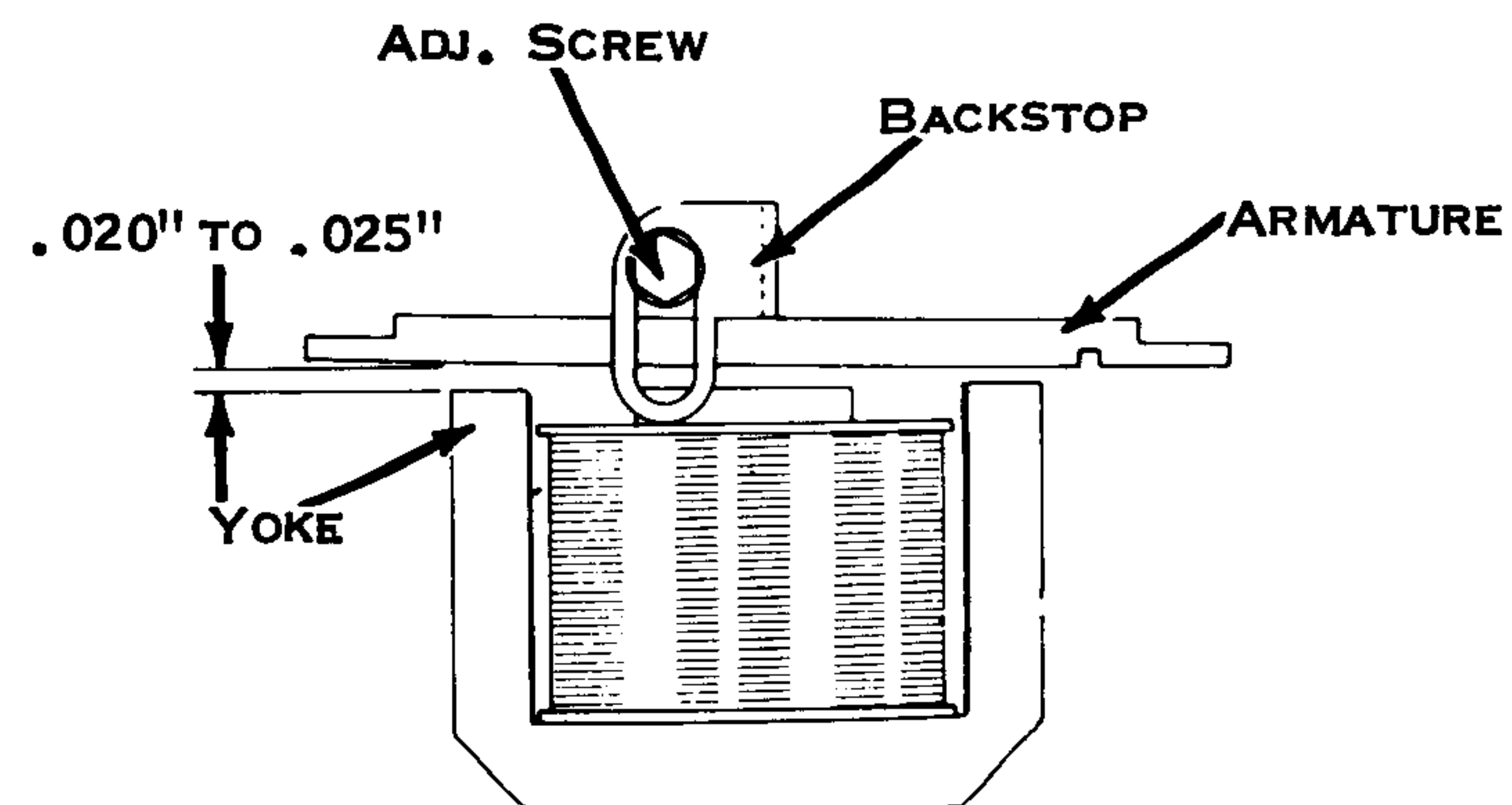


Figure 130. Armature Backstop

4. Magnet Unit Position - Position as follows:

- Left to Right - so that the armatures are directly beneath their corresponding interposers (Fig. 131).
- Front to Rear - so that the armature link holes are slightly to the rear of the interposer link holes (Fig. 132).

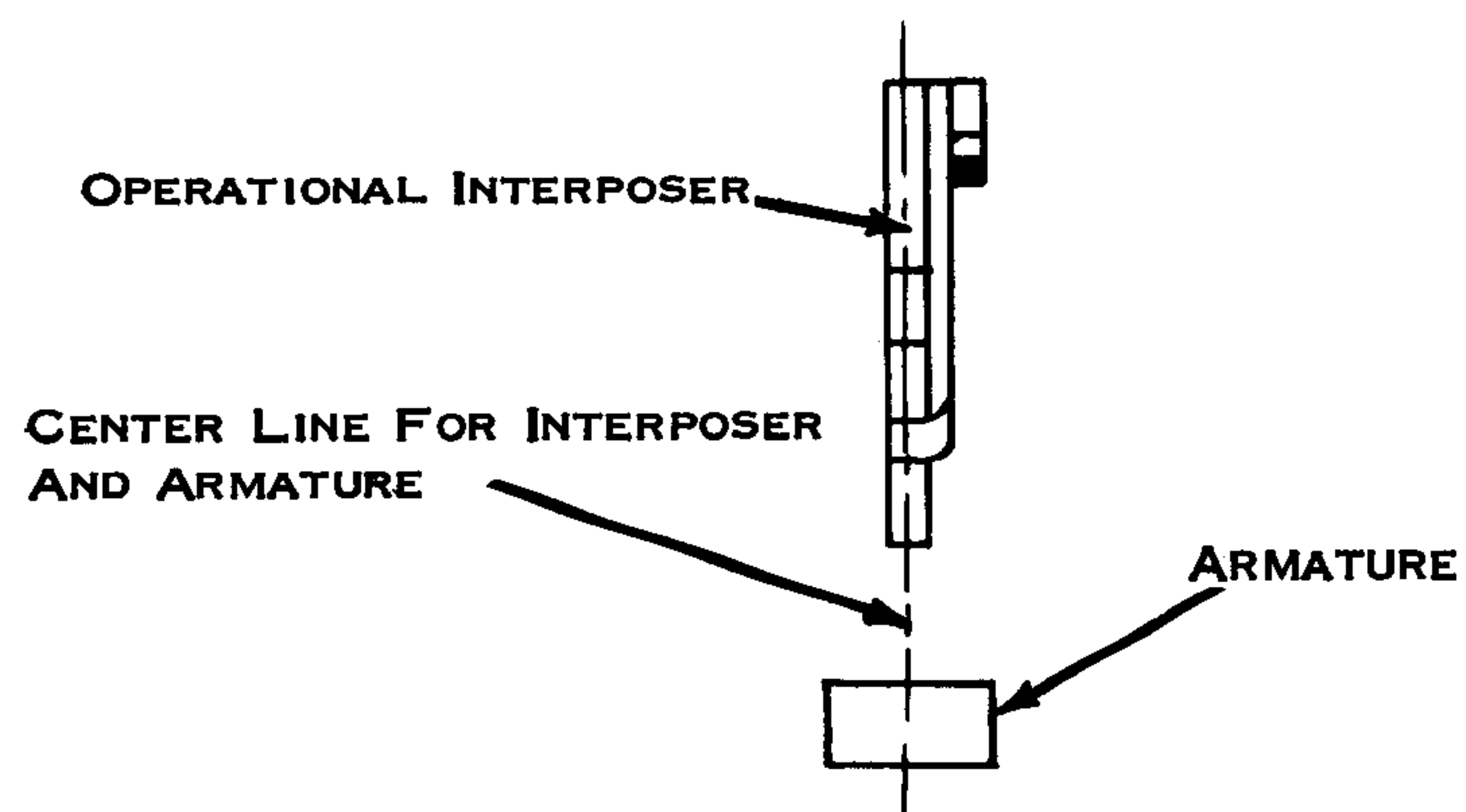


Figure 131. Left to Right



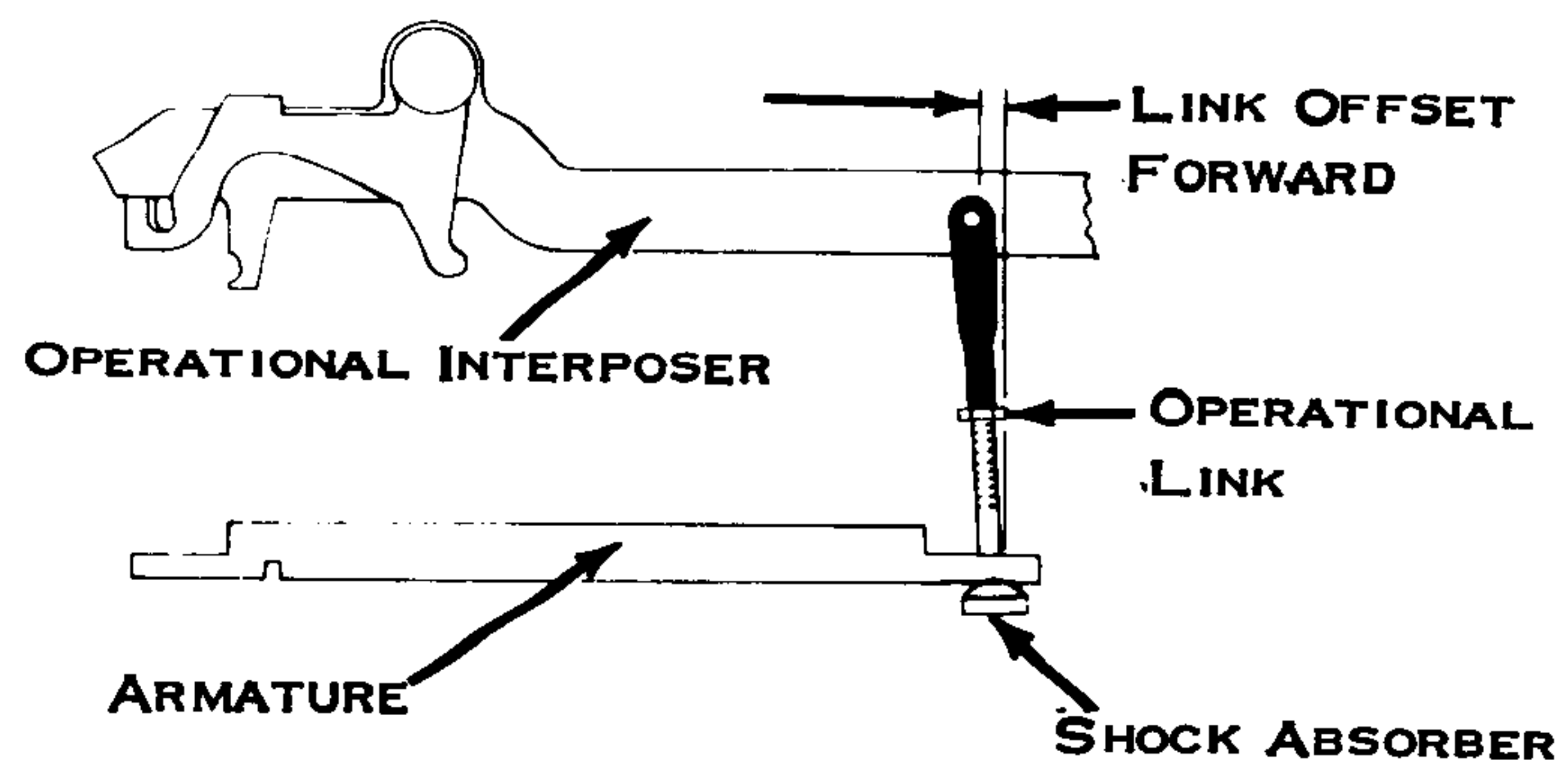


Figure 132. Front to Rear

5. Trip Link (Fig. 133) - Shorten (interposer latched and armature against backstop) until the interposer latch barely begins to lift off the latch bracket, then lengthen by 1/2 turn.

NOTE: Test adjustment with armature manually attracted. The interposer should clear the latch bracket by .005" to .010" (Fig. 134).

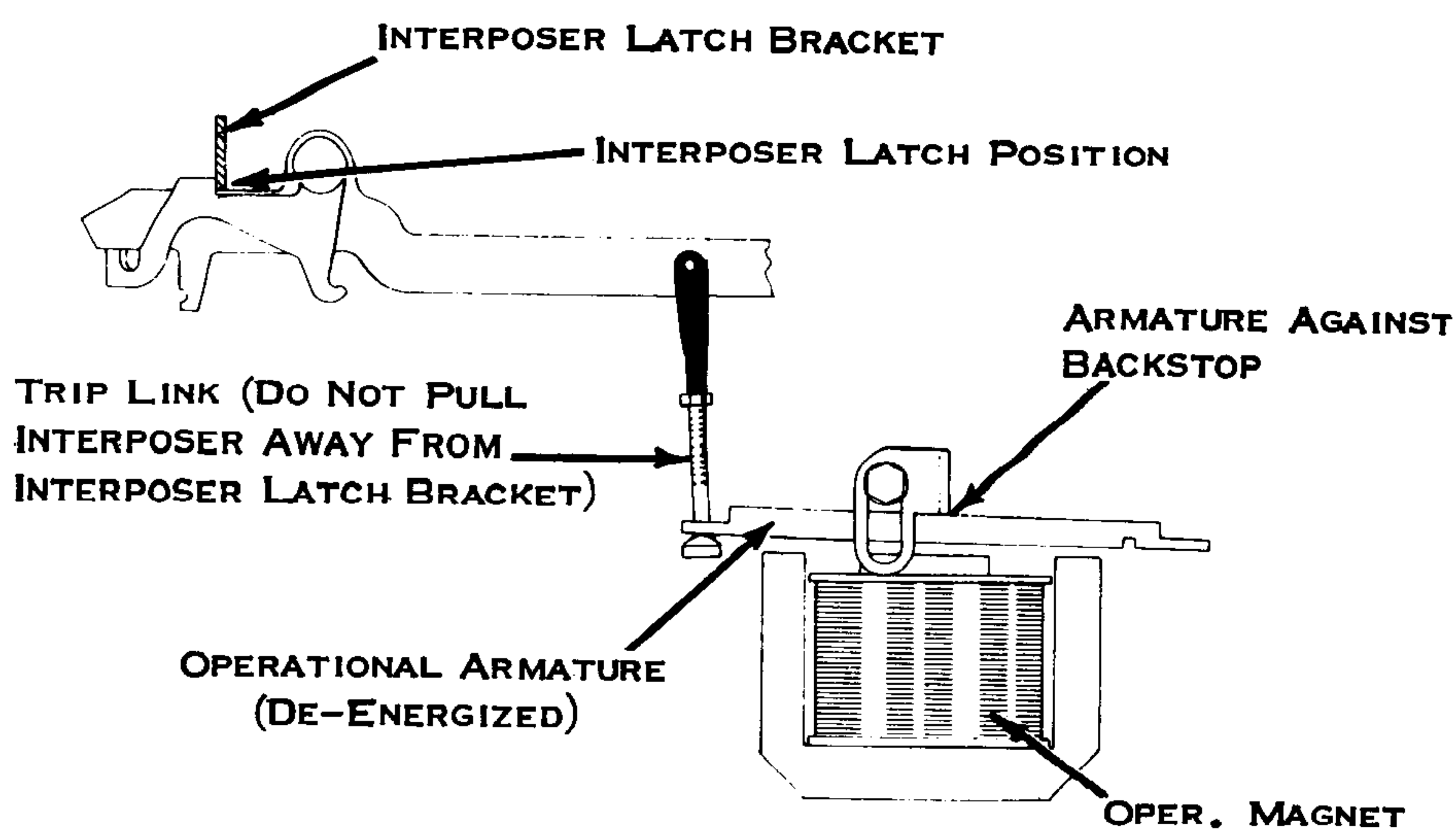


Figure 133. Trip Link

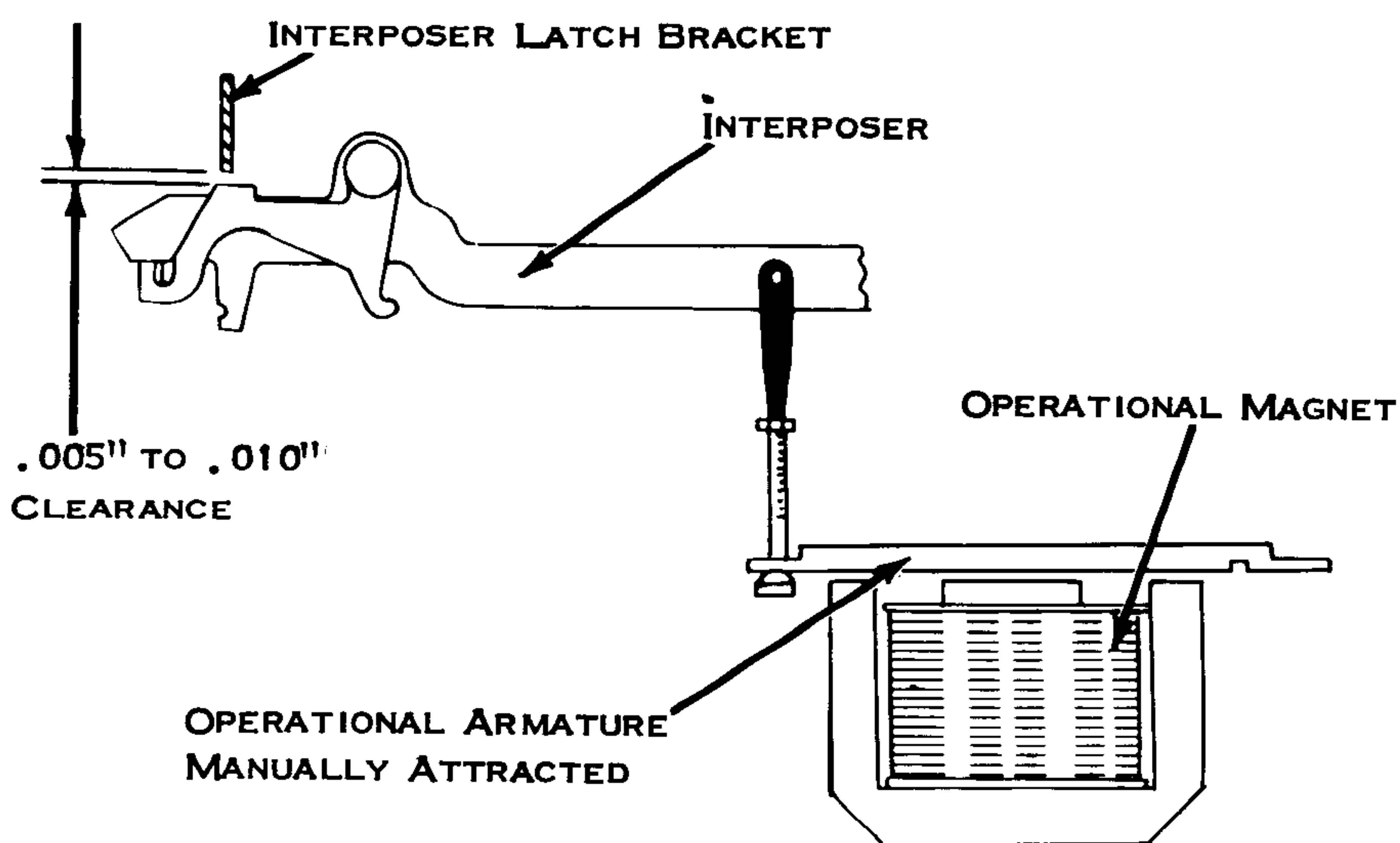


Figure 134. Check, Trip Link

**OPERATIONAL CONTACT AND LATCH ASSEMBLY ADJUSTMENTS (UNIT REMOVED)**

1. Contact Strap Position (Fig. 135) - With the contacts latched, position the straps under the two mounting screws for the following conditions.
  - a. Latches centered on O/S stops.
  - b. Vertical alignment of mating contacts.
  - c. All contacts of each stack must lie in the same horizontal plane (individual forming may be required).

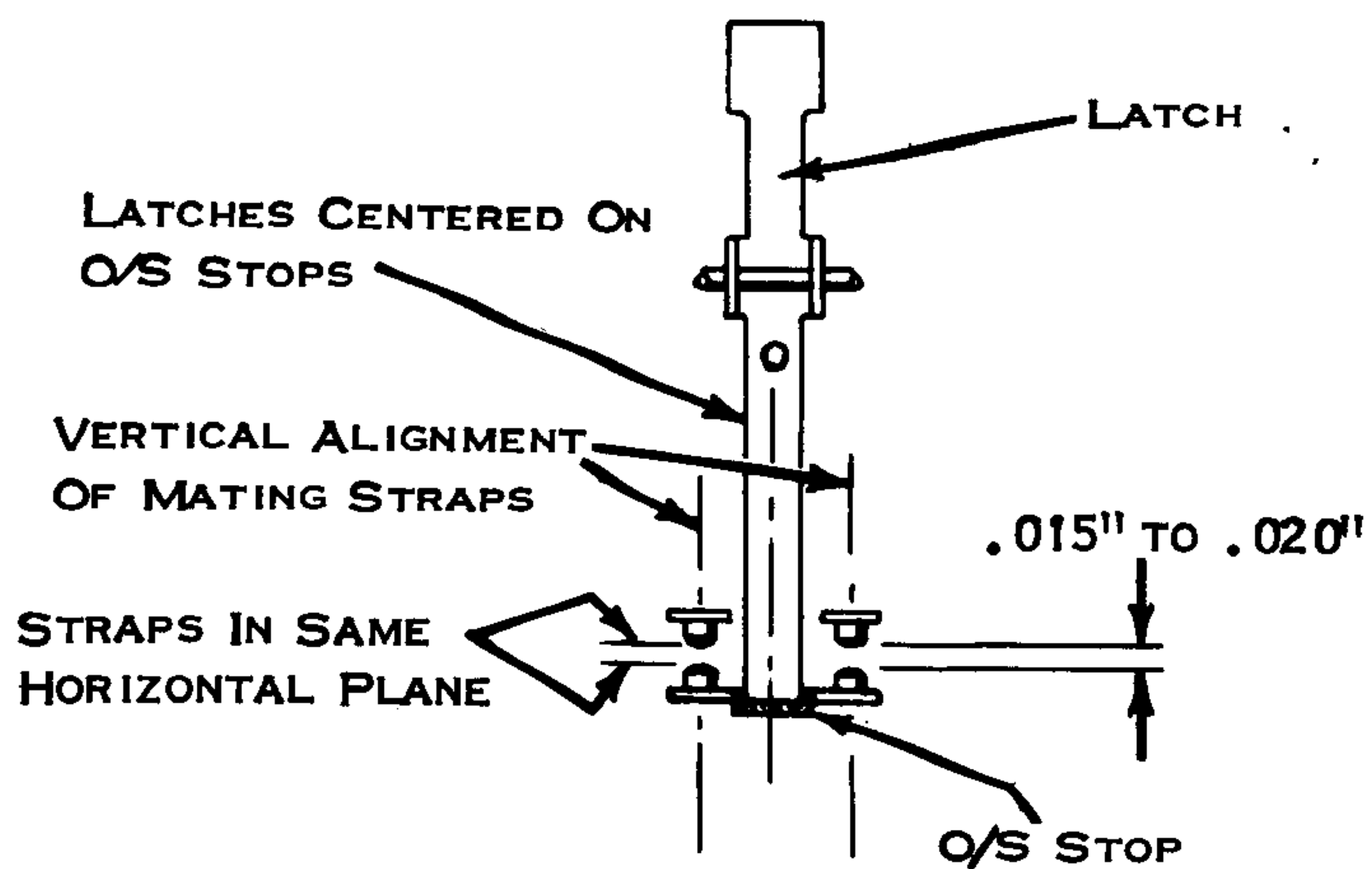


Figure 135. Contact Air Gap

3. Normally Open Contact Rise (Fig. 136) - With the contacts unlatched, form the N/O straps for .005" minimum rise.

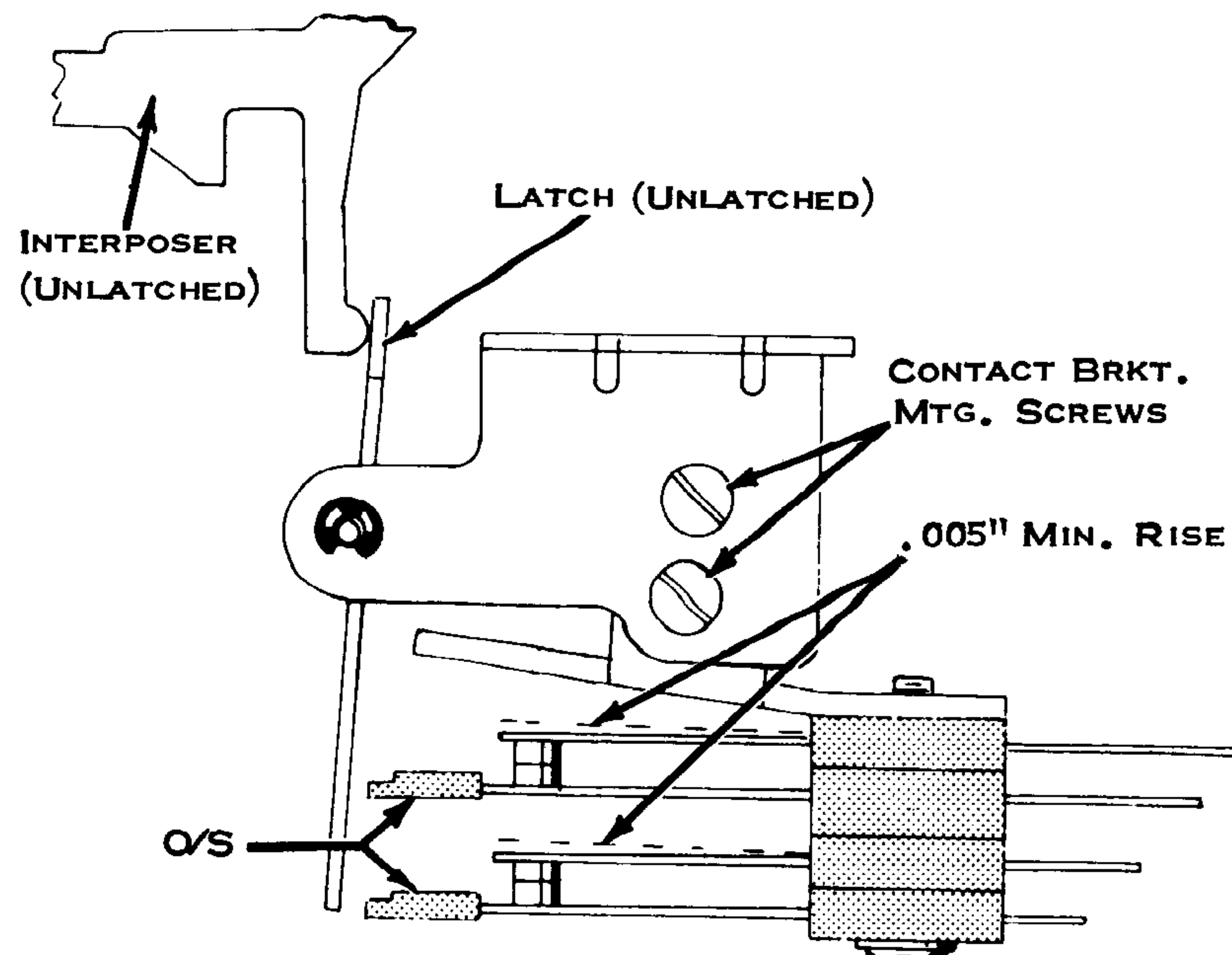


Figure 136. N/O Contact Rise

4. Latch Stop (Present On New Models) Fig. 137 - Position so that the end of the O/S stops are flush with the forward latch surface.

NOTE: Form individual latches as required in the area shown in Fig. 137.

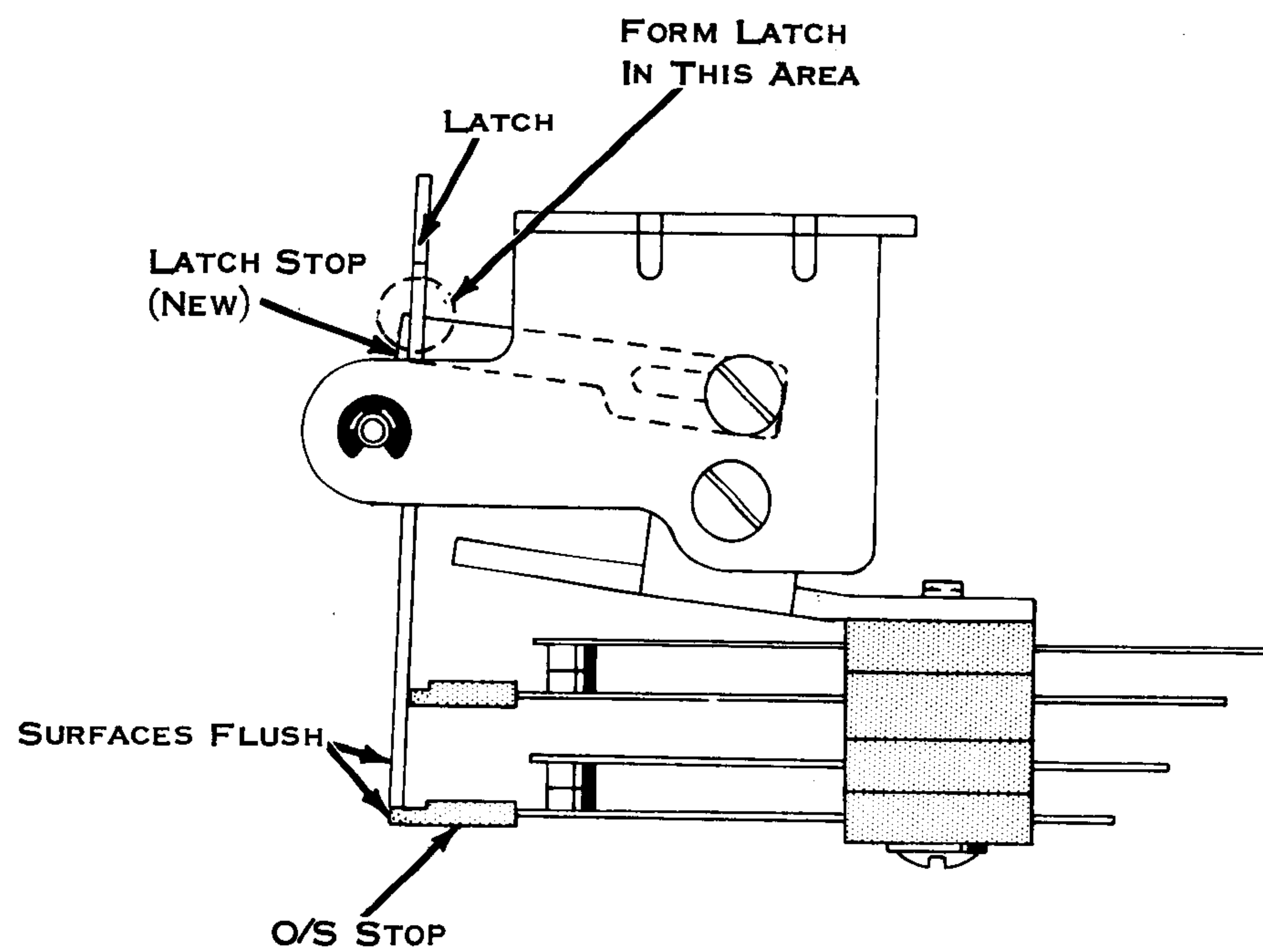


Figure 137. Latch Stop

2. Contact Air Gap (Fig. 135) - Rotate the contact mounting bracket under its four screws for .015" to .020" contact air gap - see Fig. 136 for mounting screws.



**OPERATIONAL CONTACT AND LATCH ASSEMBLY  
ADJUSTMENTS (UNIT INSTALLED)**

1a. Assembly (with latch stop) Position (Fig. 138) - With the operational interposer released, position the unit (front to rear) so that the latches clear the O/S stops by .005" to .015".

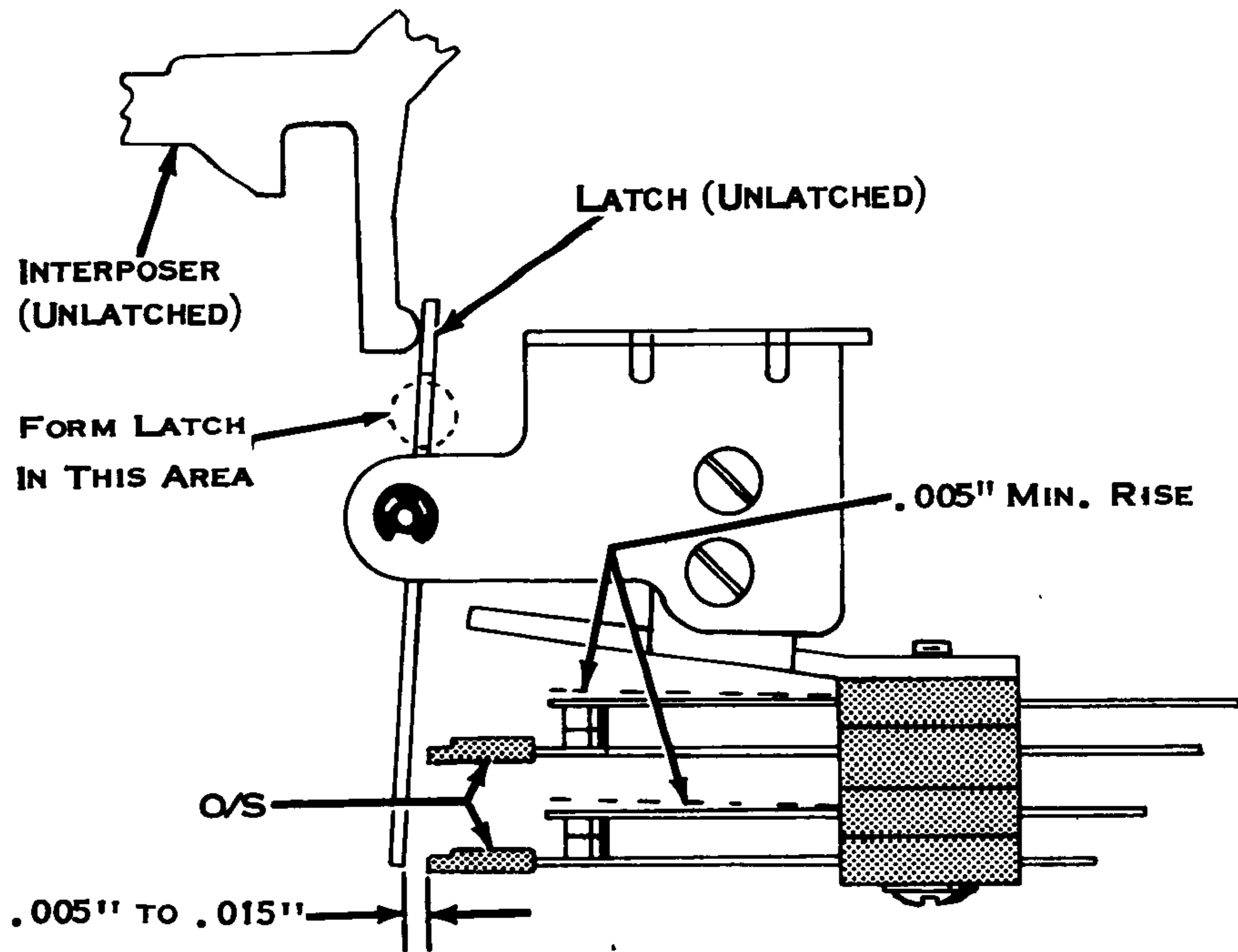


Figure 138. Assembly Position (With Latch Stop)

1b. Assembly (without latch stop) Position (Fig. 139) - With the contacts latched, position the assembly (front to rear) for the following inter-related conditions.

- The latch just touches the interposer extension.
- The forward latch surface is flush with the end of the O/S stop.

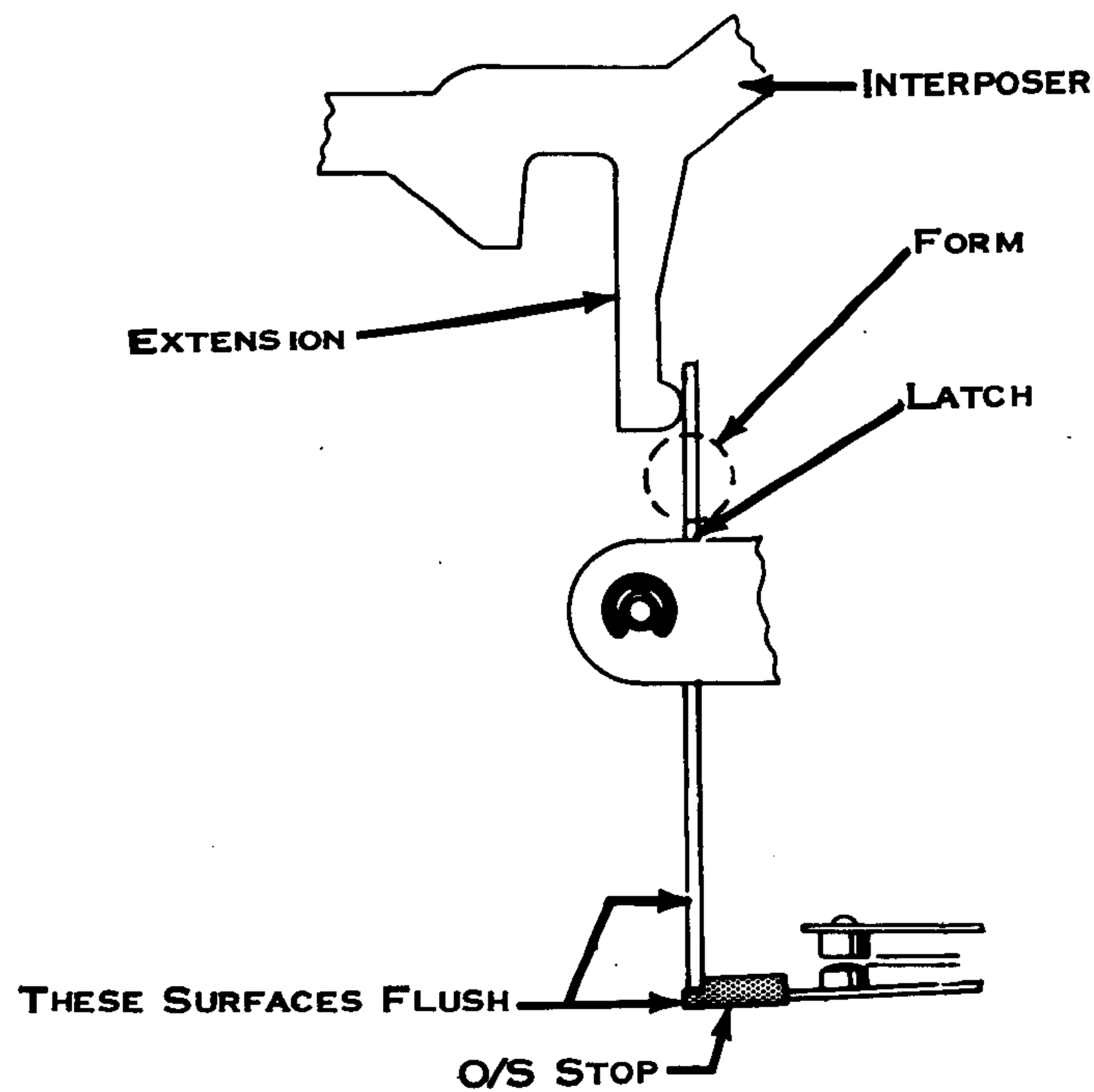


Figure 139. Assembly Position (Without Stop)

2. Bail Eccentric (Fig. 140) - Adjust (all operational functions restored) so that the latches clear the O/S stops by .001" to .008".

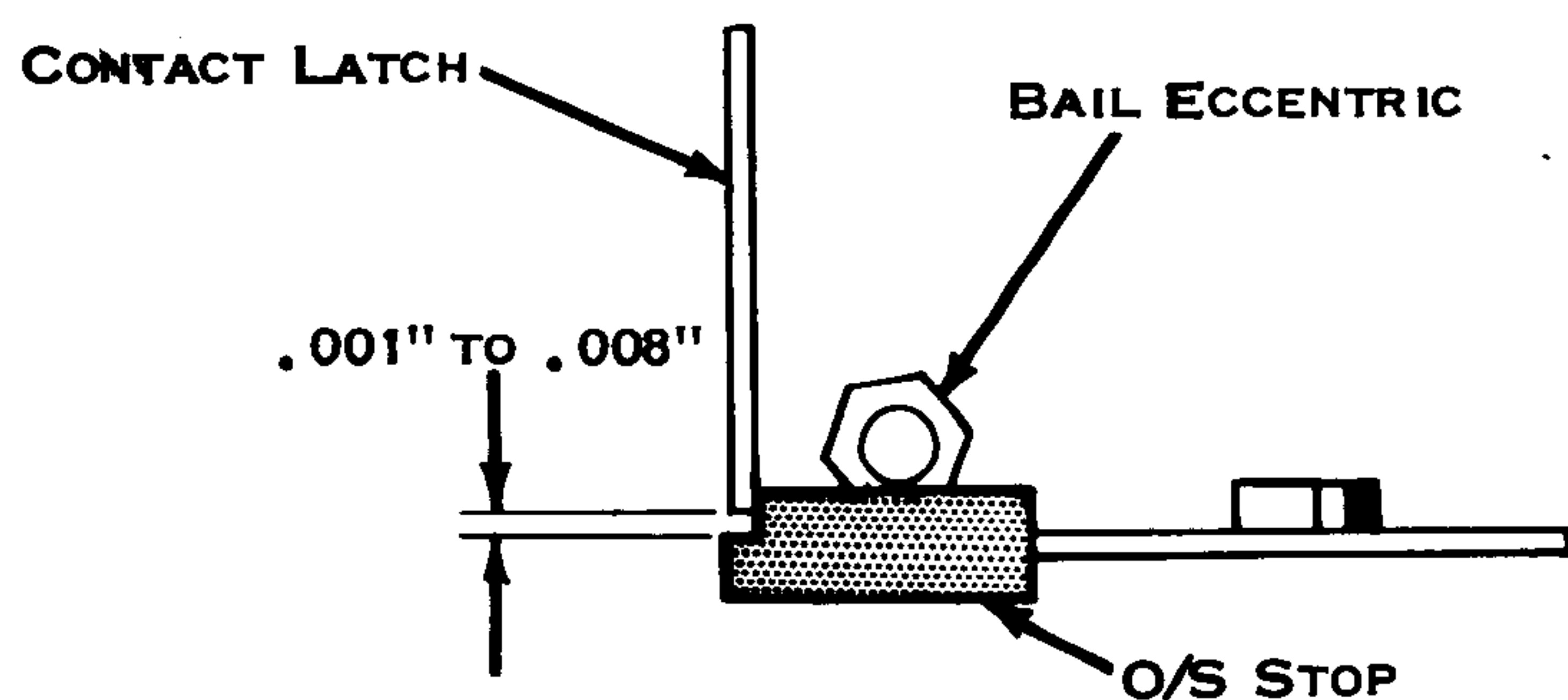


Figure 140. Bail Eccentric

3. Parallel Actuating Bails (Fig. 141) - Form the actuating arm slot as required to provide equal latch to O/S stop clearances where a bail actuates more than one contact.

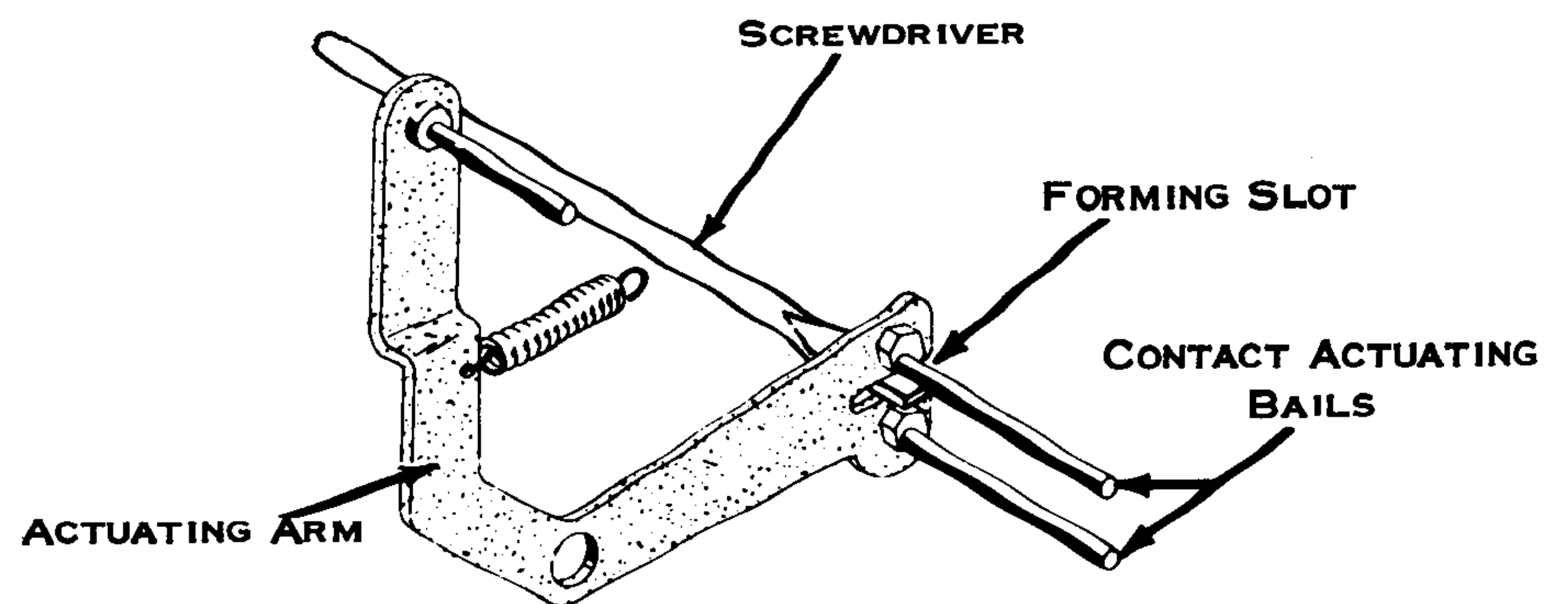


Figure 141. Parallel Actuating Bail

NOTE: With the operational cams on their high points, the actuating bails must clear the O/S stops by a minimum of .005" (Fig. 142).

This condition should have been satisfied by previous adjustments and is required in order to provide adequate contact rise

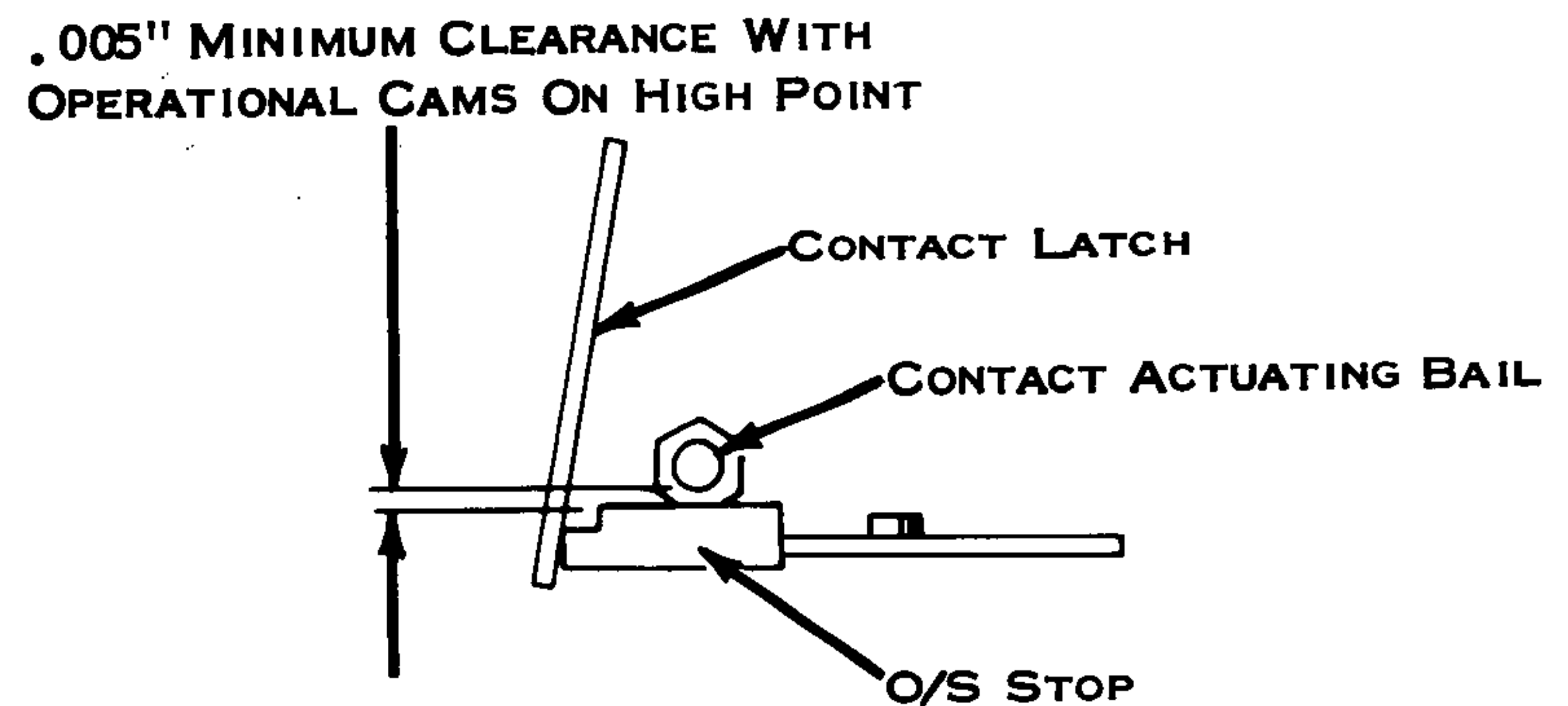


Figure 142. Check On Eccentric Bail

**OPERATIONAL FEEDBACK CONTACTS**

1. Position the O/S's centrally under the actuator tab (Fig. 143).

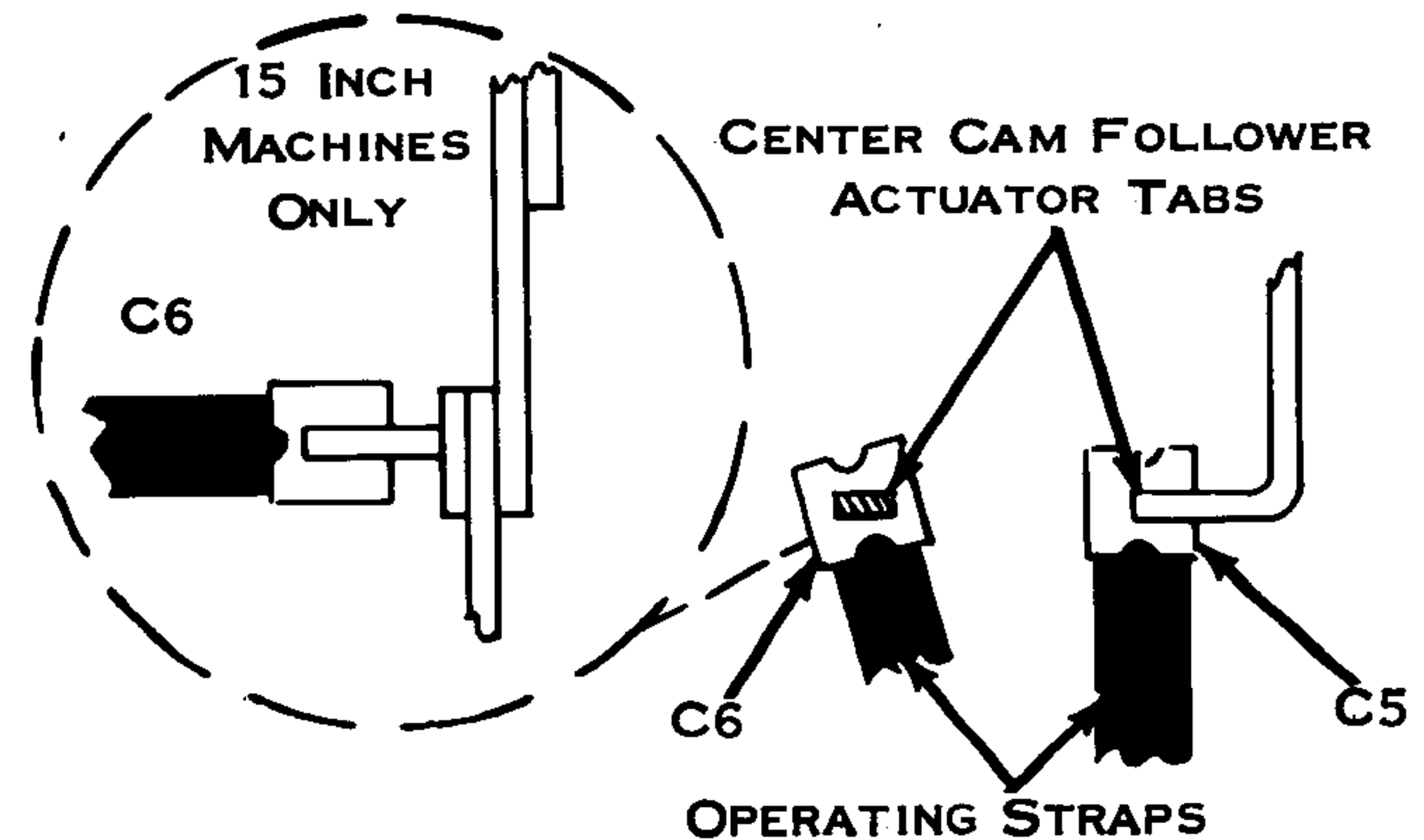


Figure 143. Operating Straps

- Form the N/C supports so that the O/S's lift the N/C contacts .002 to .005" (Fig. 144).
- Form the N/O supports for .035" to .045" air gaps between the O/S's and N/O contacts (Fig. 144).
- Form or adjust the contact mounting bracket (up or down) for make and break times (Fig. 144). Refer to the timing charts for contact timing and duration.



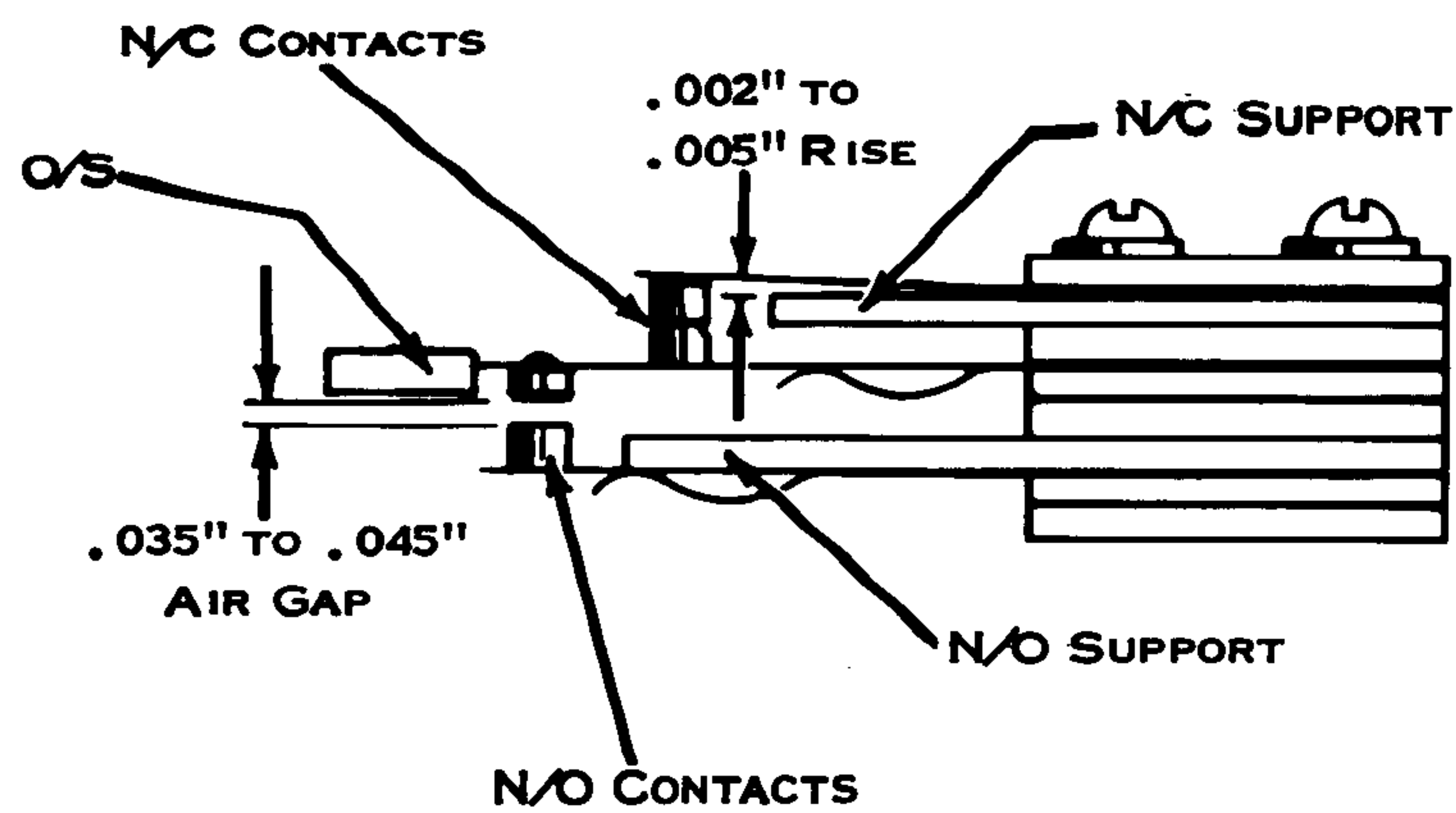


Figure 144. Feedback Contact

**ESCAPEMENT AND SPACEBAR MECHANISM**

1. Escapement Bracket (Fig. 145) - Adjust front to rear so that .011" to .017" clearance exists between the escapement bracket and the tab torque bar.

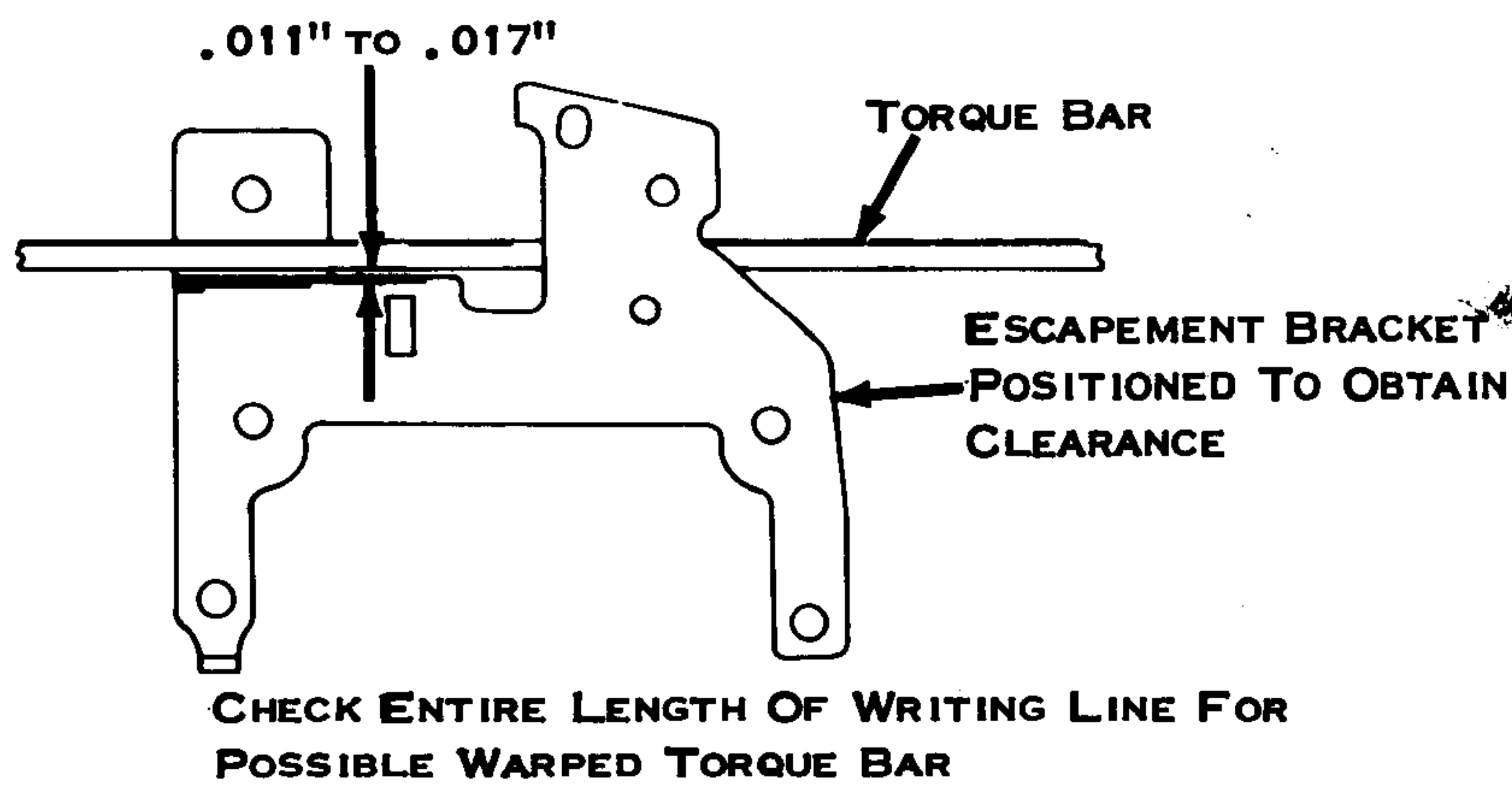


Figure 145. Escapement Bracket

2. Escapement Torque Bar (Fig. 146) -
  - a. New Style - The torque bar stop should be positioned to obtain a clearance of .008" to .010" between the torque bar and the lug of the escapement or backspace pawl, whichever is closer.
  - b. Old Style - Form the torque bar stop to obtain .002" to .006" between torque bar and lug of the escapement or backspace pawl, whichever is closer.

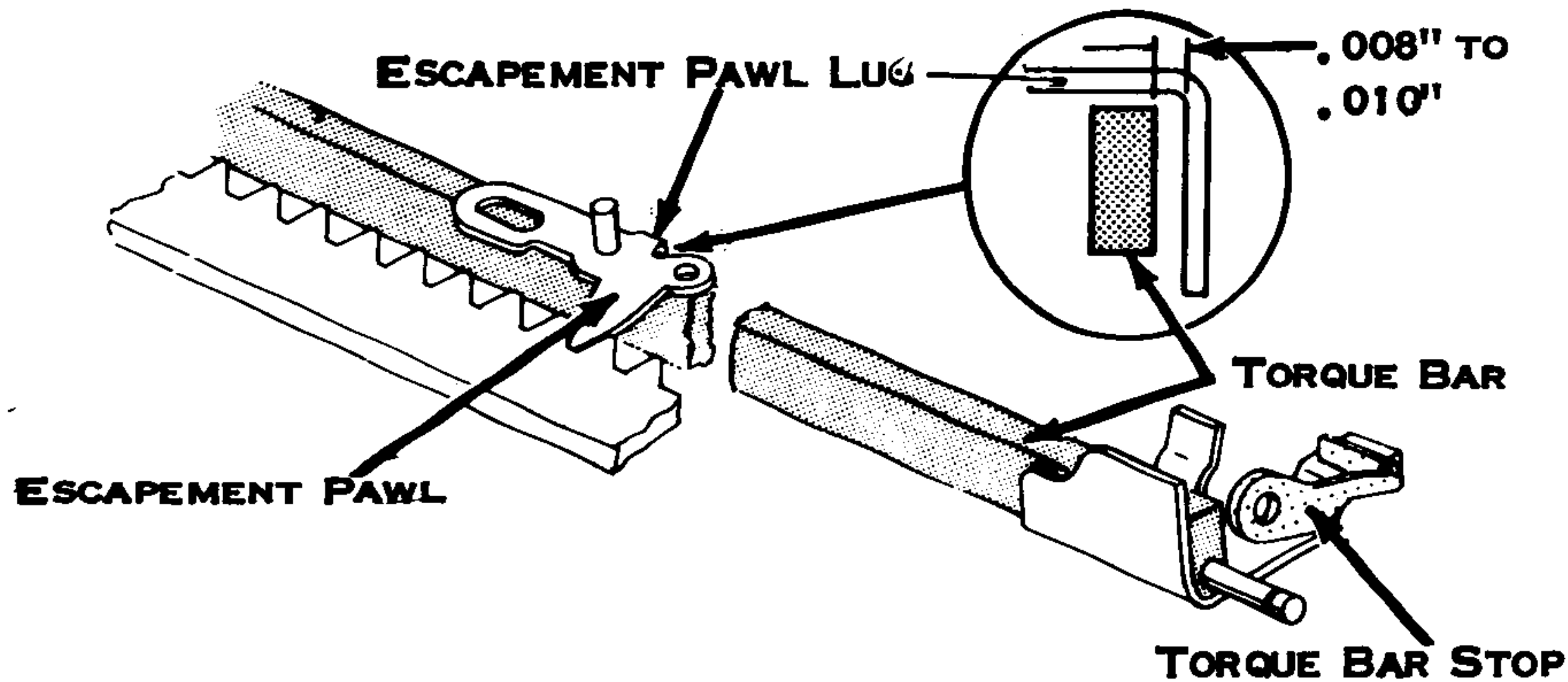


Figure 146. Escapement Torque Bar (New)

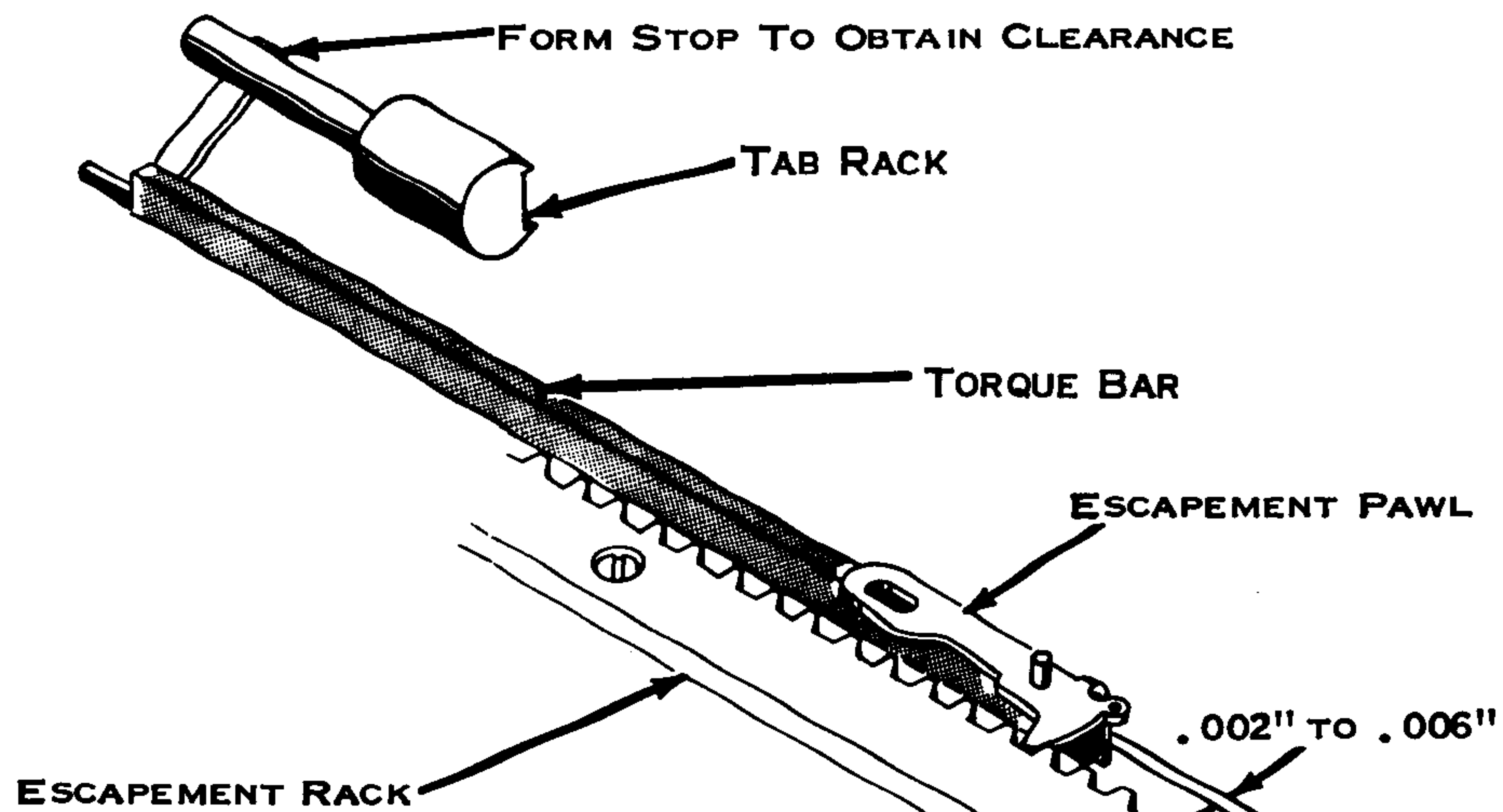


Figure 146. Escapement Torque Bar (Old)

3. Pawl Mounting Stud or Eccentric (Fig. 147) - Position so the stud (left side) or eccentric clears the escapement torque bar by .001" at closest point.

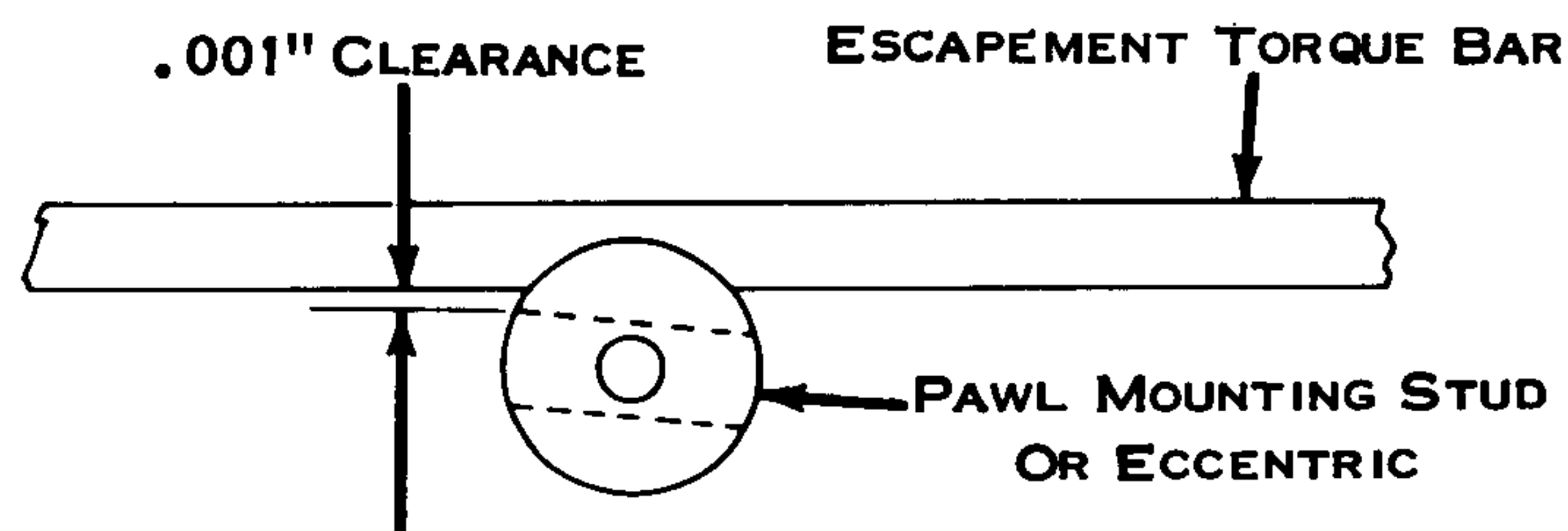


Figure 147. Pawl Mounting Stud or Eccentric

4. Operational Latch Pawl Pivot Pin Eccentric, Old Style Only (Fig. 148) - The eccentric collar should be adjusted with the high point up so that it just touches the operational latch bracket. NOTE - The eccentric may require a readjustment if the rest position of the pivot pin is changed during carrier return adjustments. End play of the pivot pin on 15" machines should be .002" to .005".

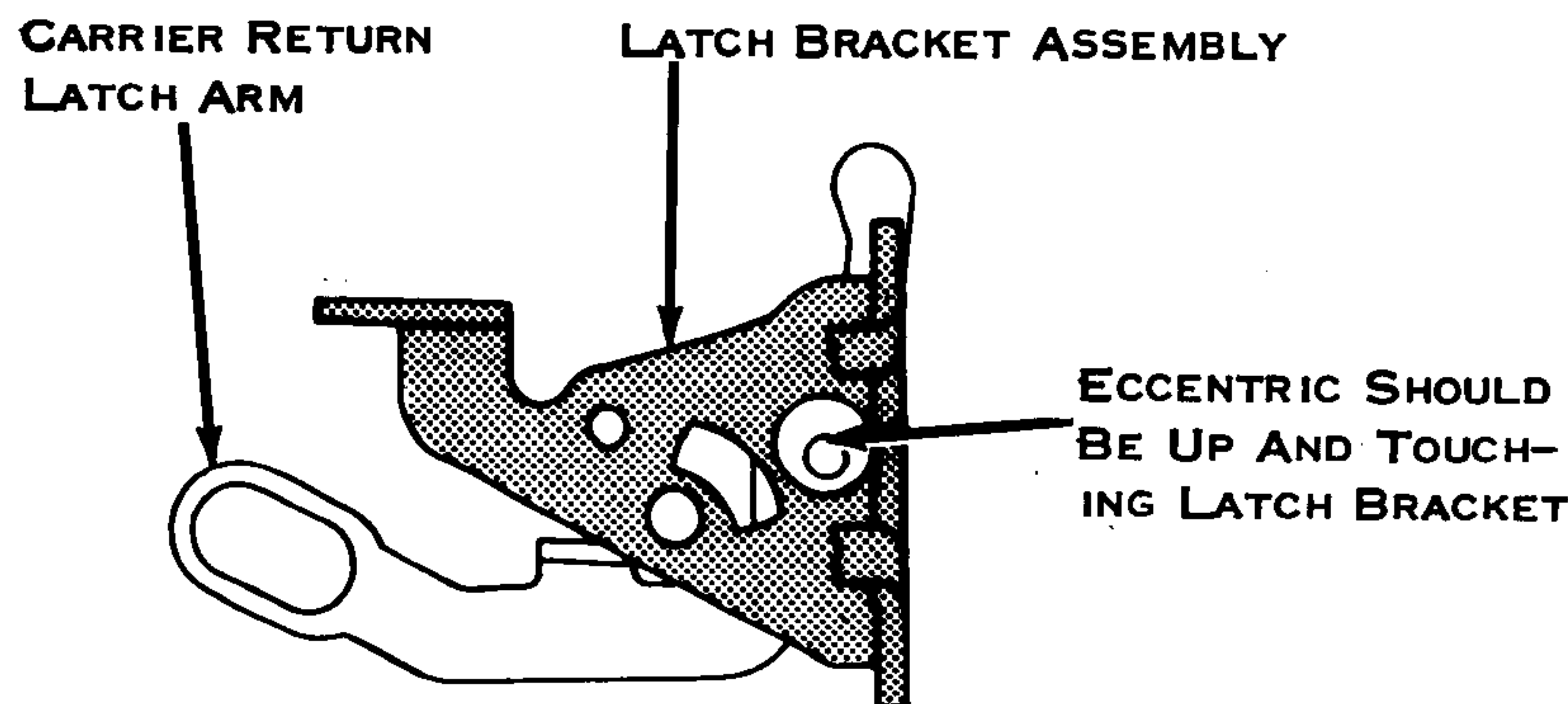


Figure 148. Pivot Pin Eccentric

5. Escapement Trigger Guide (Fig. 149) - Adjust so that the escapement trigger will become disengaged from the torque bar lug when the escapement pawl clears the rack by .010" to .015".

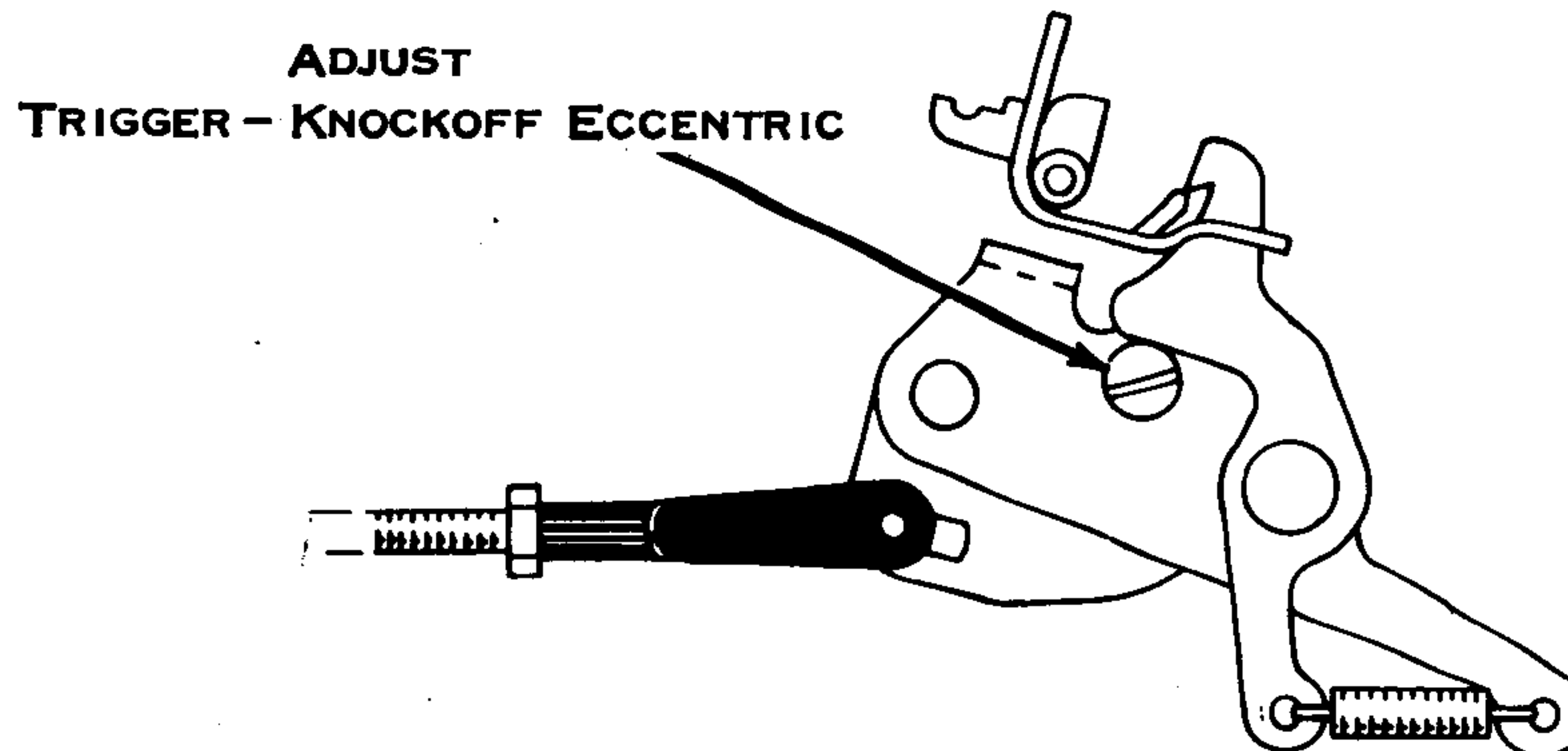


Figure 149. Escapement Trigger, New Style



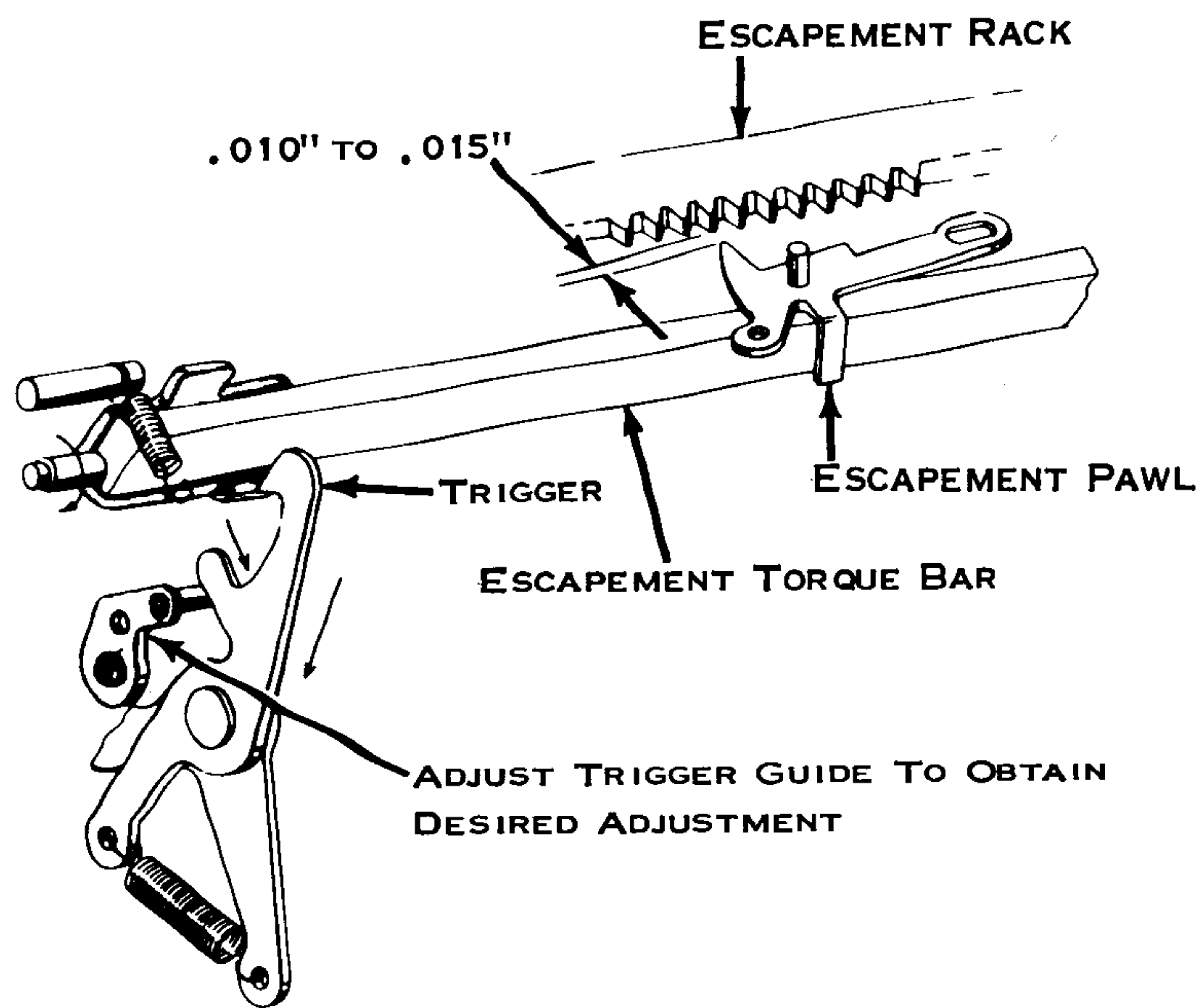


Figure 149. Escapement Trigger Old Style

6. Escapement Trip Link - With a clearance of .007" to .010" between the spacebar trigger and torque bar lug (on 15" machines raise trigger upstop) match the trip link clevis to cam follower.

7a. Spacebar Interlock Cam & Escapement Cam (New Style) -

a. Spacebar Interlock Cam - Position the cam (Fig. 150):

- (1) Left to Right - so that the cam is against the flute of the filter shaft and the set screw is toward the RH side of the machine.
- (2) Rotate the cam so that the tip of the spacebar interlock lever will rest on the high point of the cam when the filter shaft is at rest.

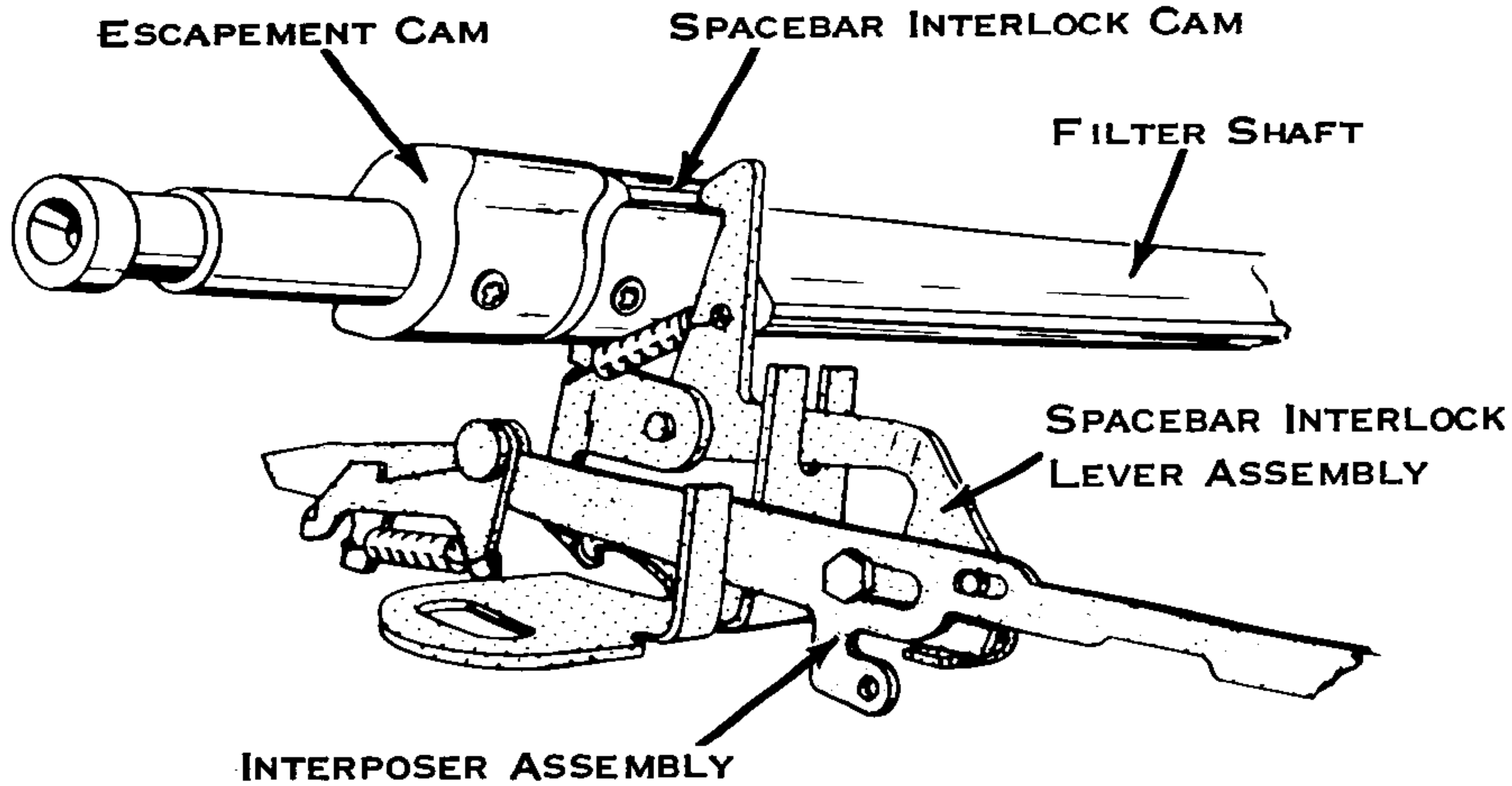


Figure 150. Interlock Cam (New)

b. Escapement Timing (Fig. 151) - With the machine at rest, rotate the escapement cam so that the follower roller rests on the low dwell and just touches the back side of the cam. Position escapement cam against the spacebar interlock cam. CAUTION - Escapement should not occur prior to printing.

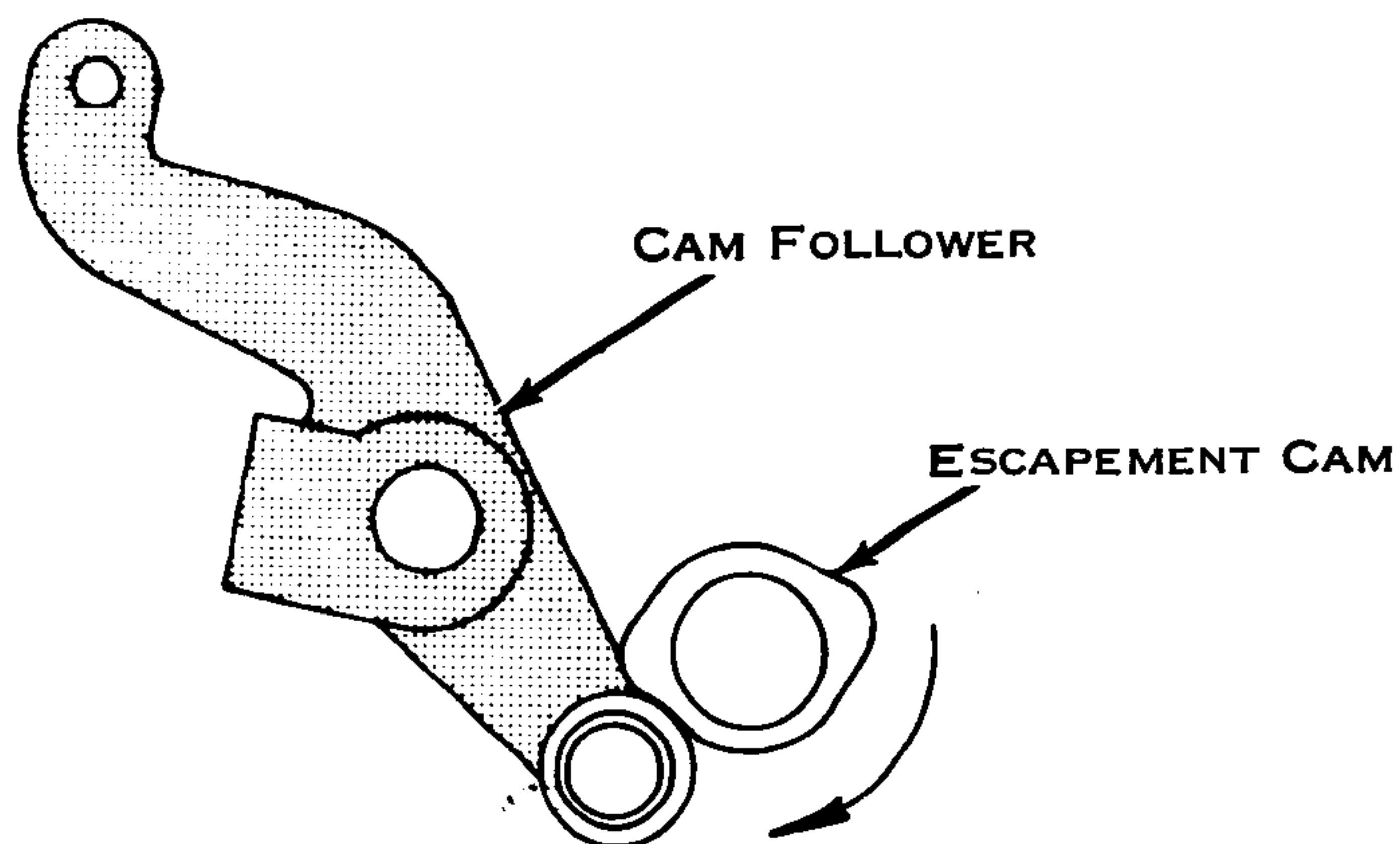


Figure 151. Escapement Cam (New)

c. Spacebar Interlock Bracket (Fig. 152) - With the spacebar interposer tripped and the filter shaft at rest, position the interlock bracket for .040" to .050" clearance between the interlock interposer and the adjustable stop on the spacebar interposer.

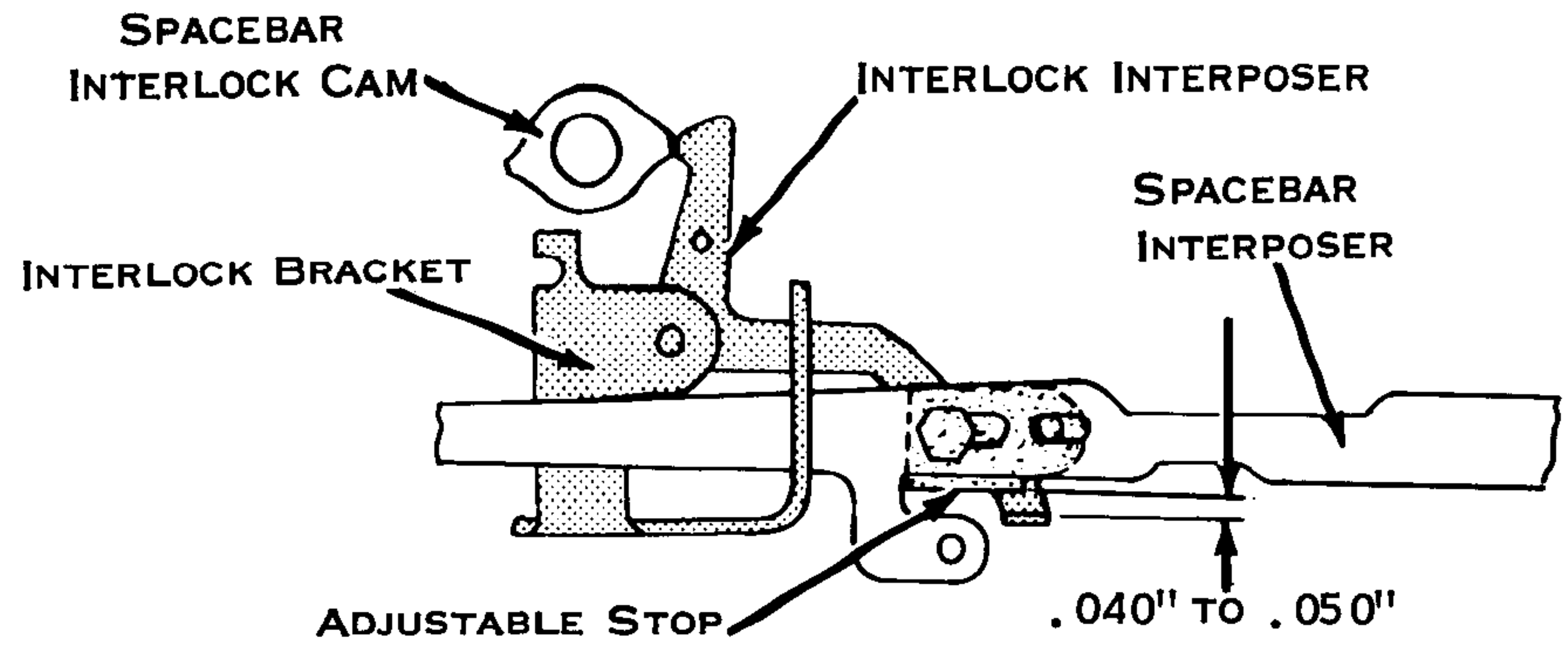


Figure 152. Interlock Bracket (New)

d. Spacebar Interposer Adjustable Stop (Fig. 153) - With the machine half-cycled, position the adjustable stop to obtain .020" to .025" clearance with the interlock interposer.

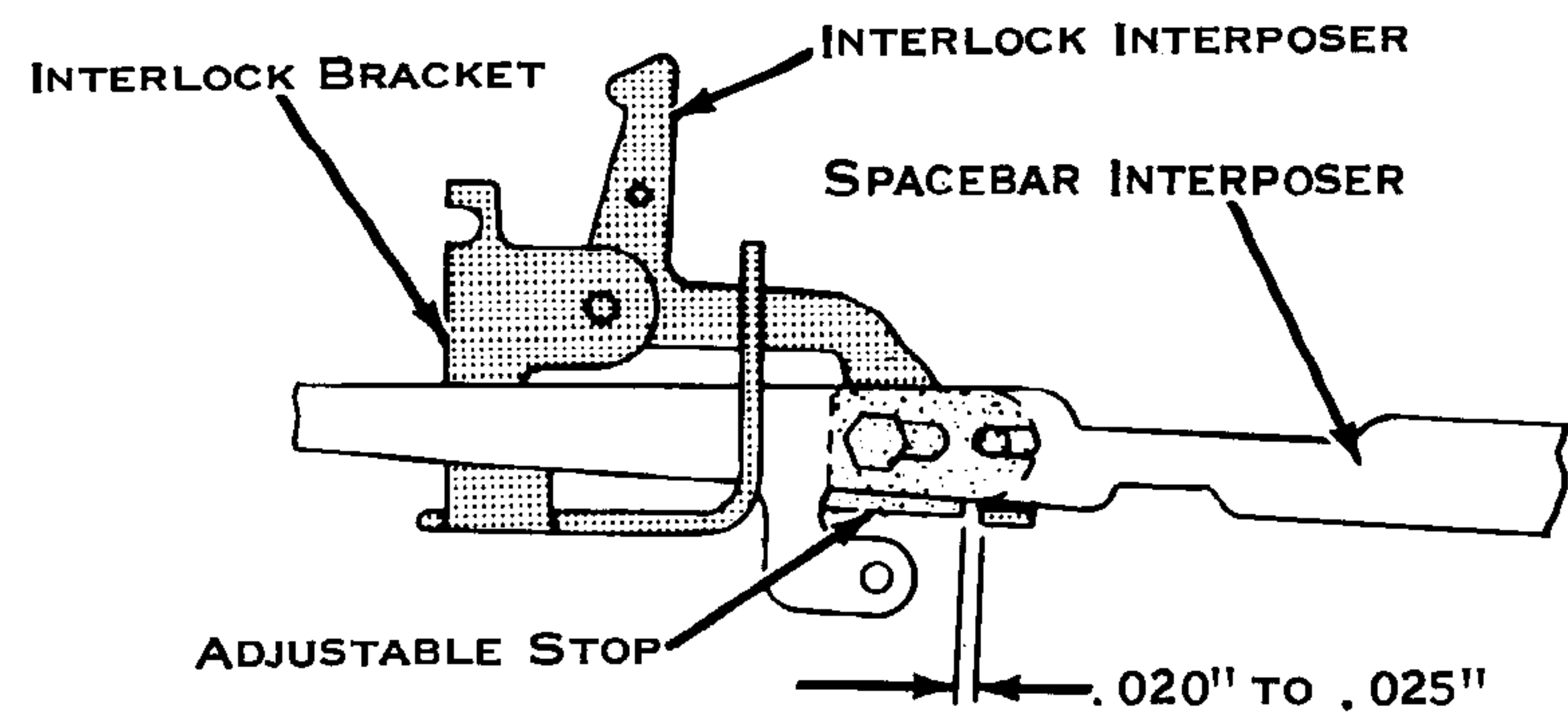


Figure 153. Adjustable Stop (New)

7b. Spacebar Interlock Cam & Escapement Cam (Old Style) -

a. Escapement Timing (Fig. 154) - The escapement cam on the filter shaft should be adjusted left to right. When the interlock cam and the escapement cam lateral surfaces are on their high points, .050" to .060" lateral motion should remain before complete collapse of the spring. With machine at rest, rotate the escapement cam so that the follower roller rests on the low dwell and just touches the back side of the cam. CAUTION - Escapement should not occur prior to printing.

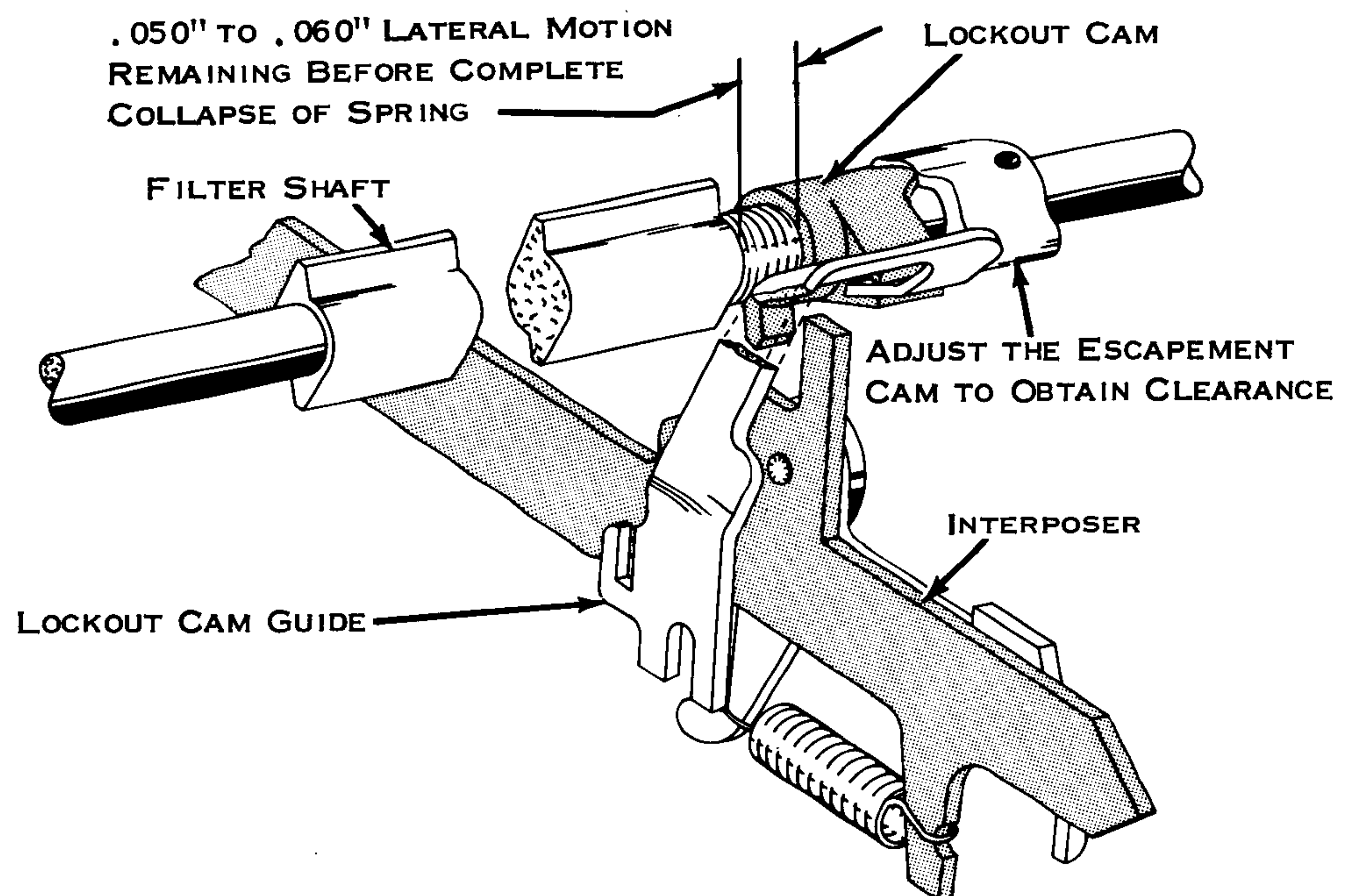


Figure 154. Escapement Cam (Old)



- b. Interlock Cam Stop (Fig. 155) - The stop should be adjusted up or down so that a tripped spacebar interposer will be allowed to move to the rear .020" to .030". The filter shaft should be rotated until the interlock cam moves fully to the right. Check this adjustment by looking for a clearance of .005" to .020" between the spacebar interposer and the clutch release arm when the spacebar is operated and the lockout prevents its rear travel.

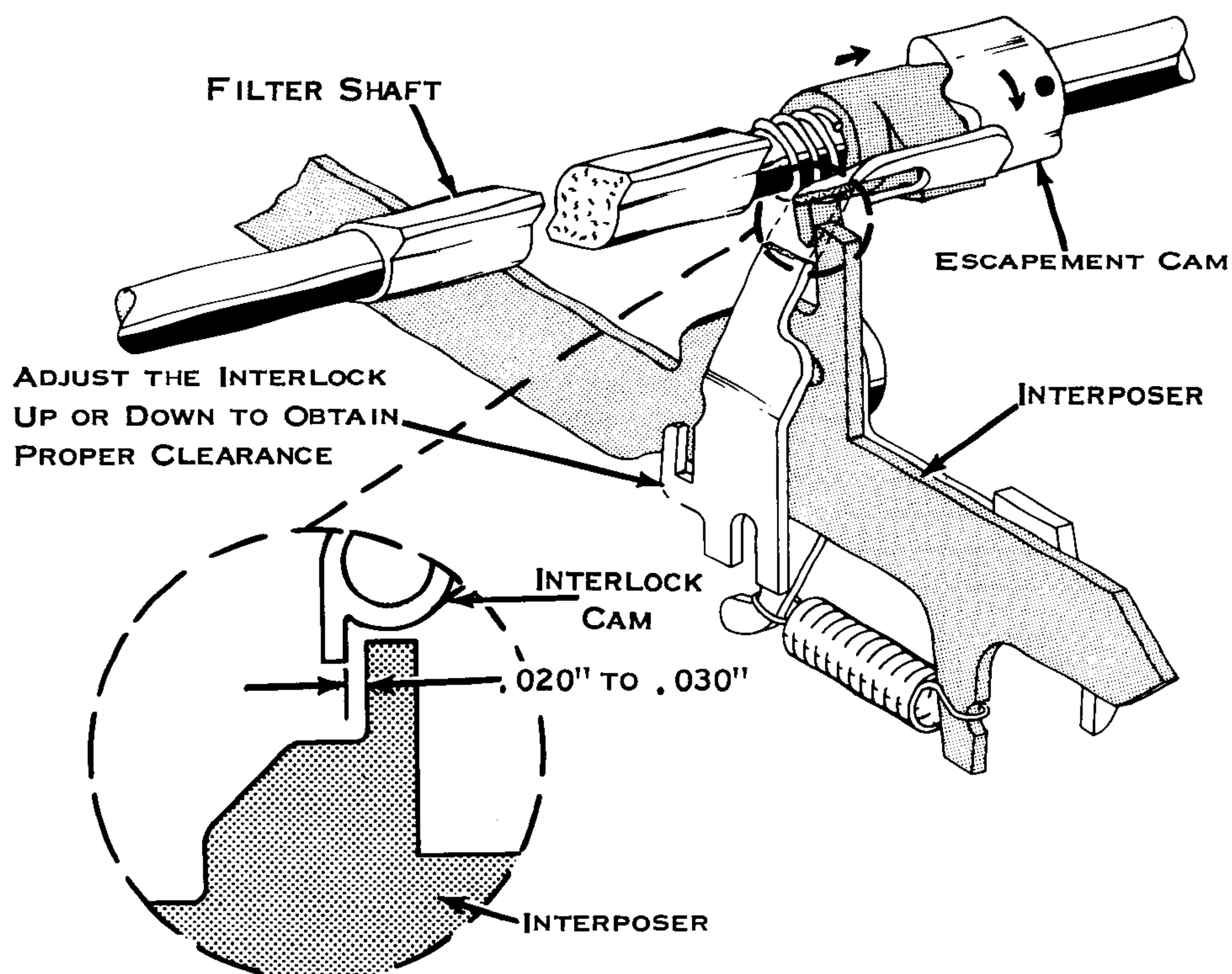


Figure 155. Interlock Cam Stop (Old)

- c. Interposer Guide (Fig. 156) - With the filter shaft at rest, adjust the guide so that a clearance of .015" to .025" exists between the interposer and cam with the interposer released.

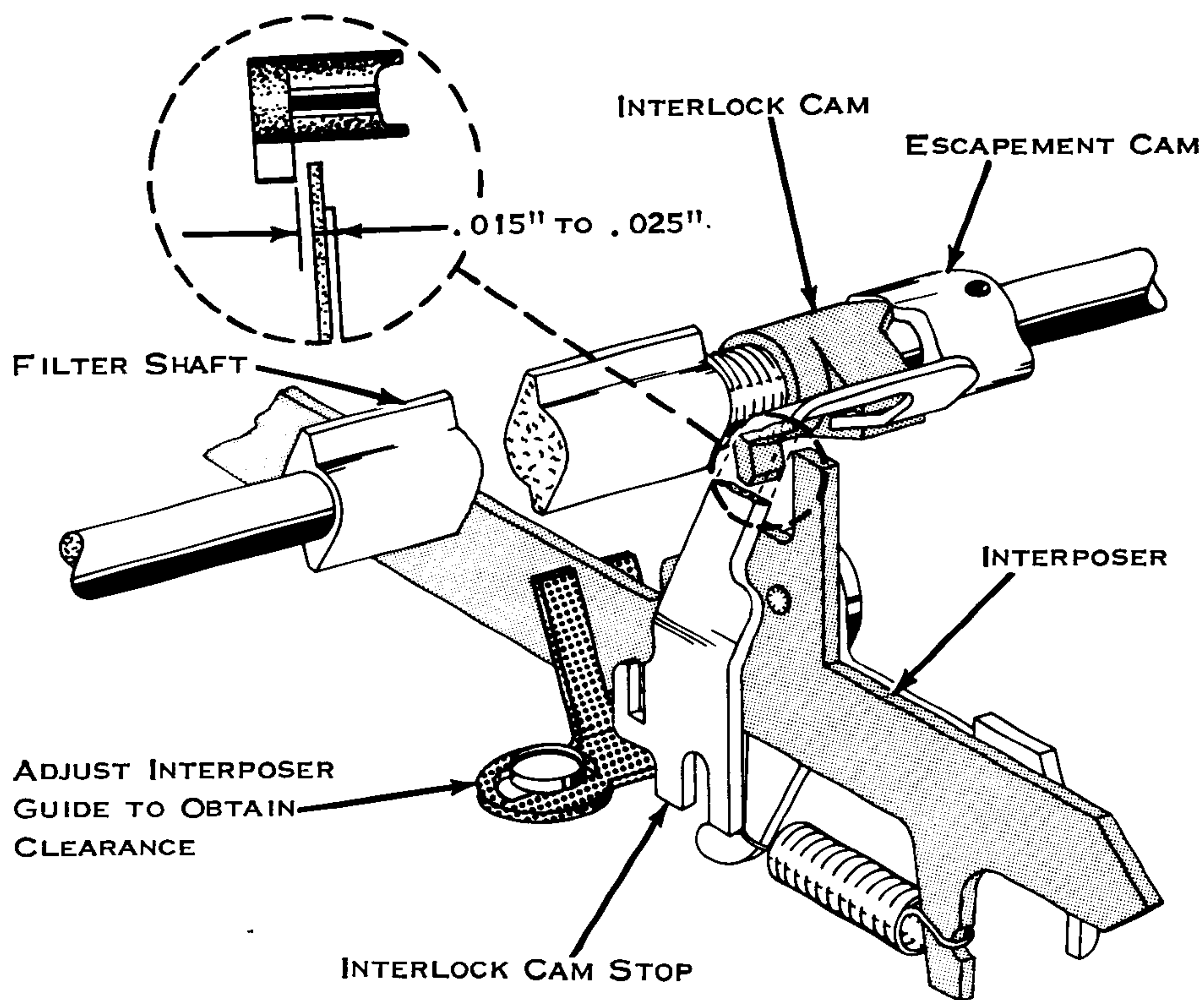


Figure 156. Interposer Guide (Old)

8. Spacebar Latch Lever Screw (Fig. 157) - Adjust so that the escapement trigger clears the escapement torque bar by .007" to .010".

NOTE: Escapement trip link must be removed to check this adjustment. On 15" machines, move trigger upstop to clear trigger by .001" to .005".

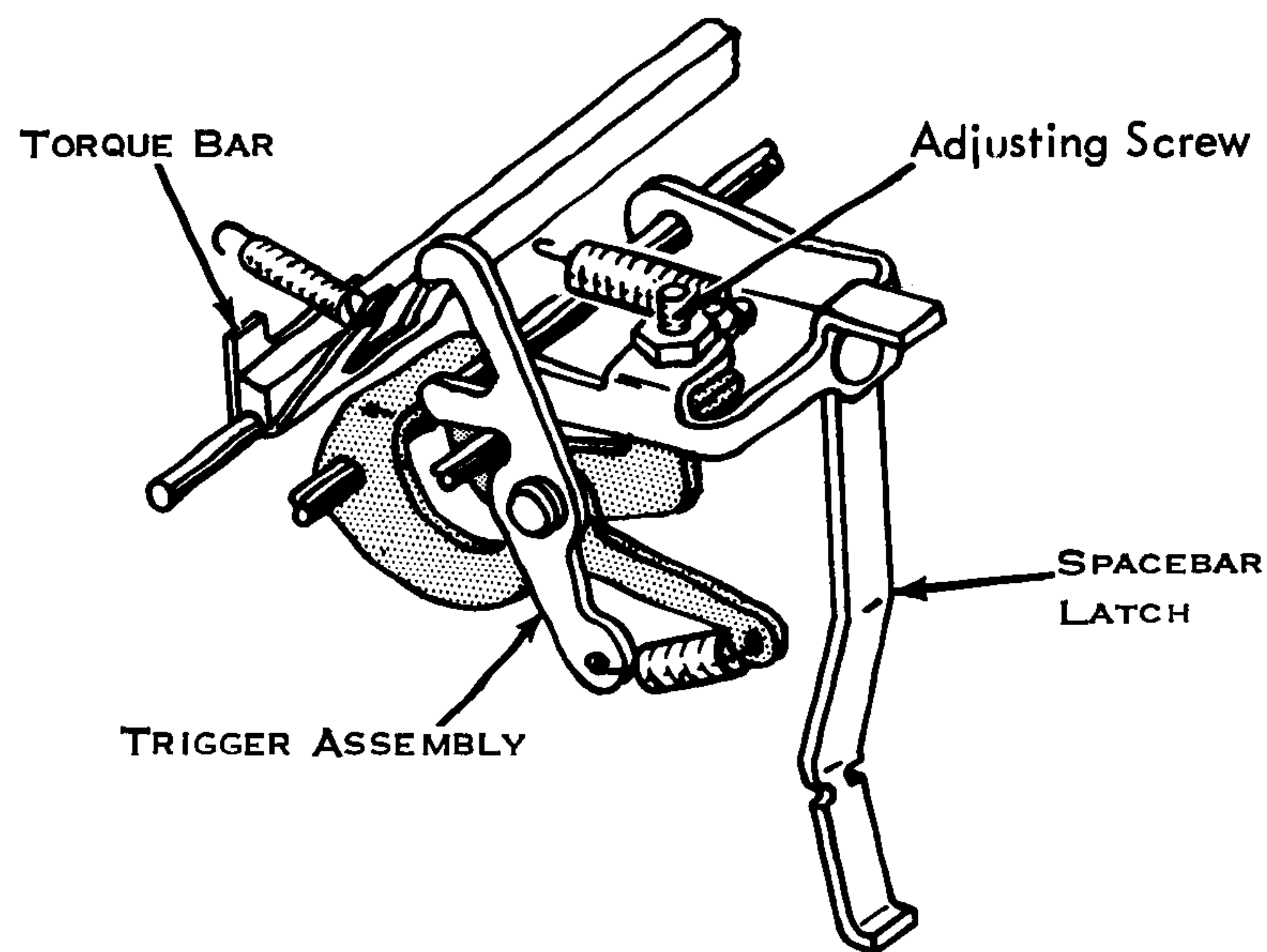


Figure 157. Spacebar Latch Lever Screw, 11 Inch Machine

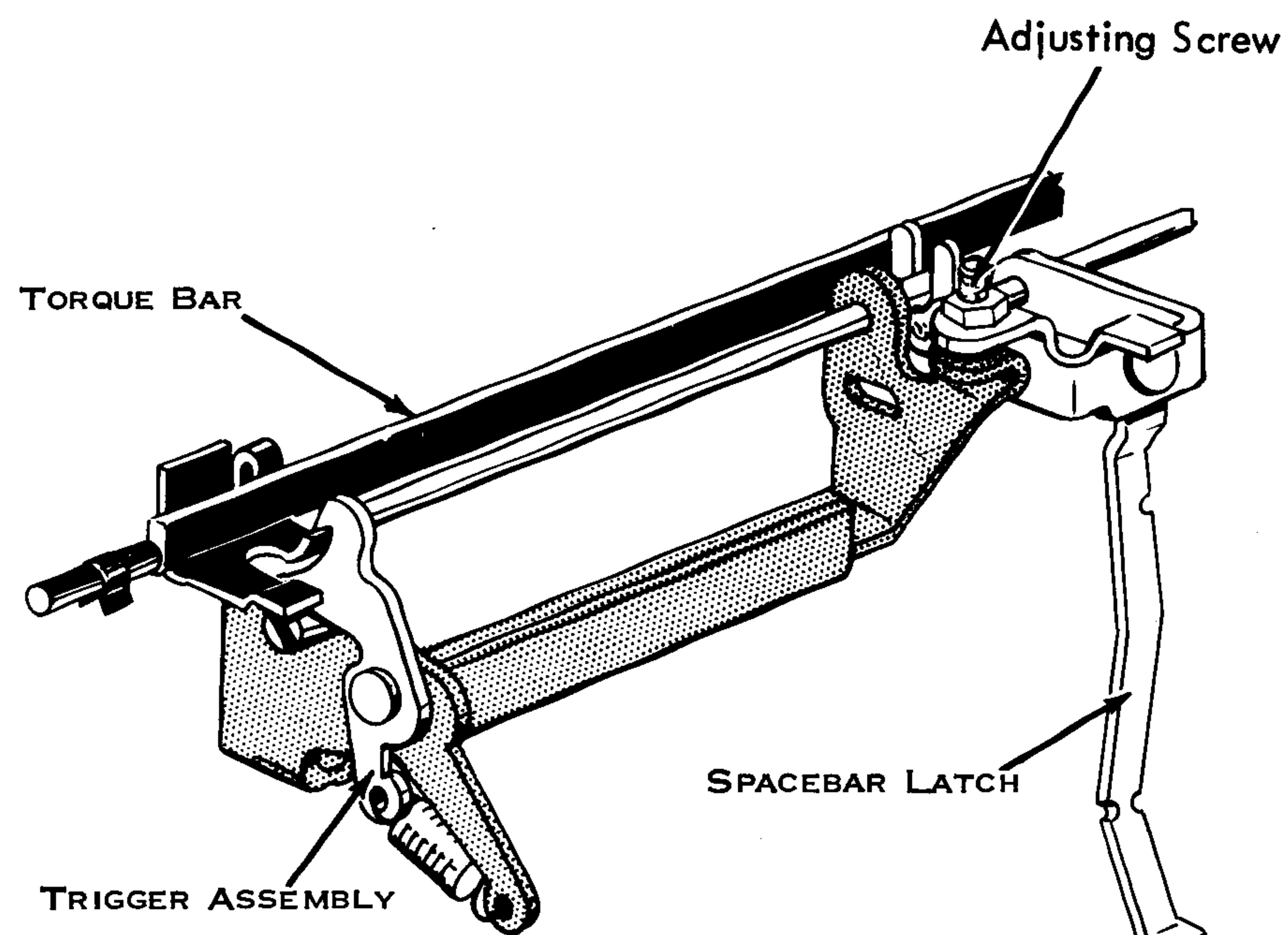


Figure 157. Spacebar Latch Lever Screw, 15" Machine

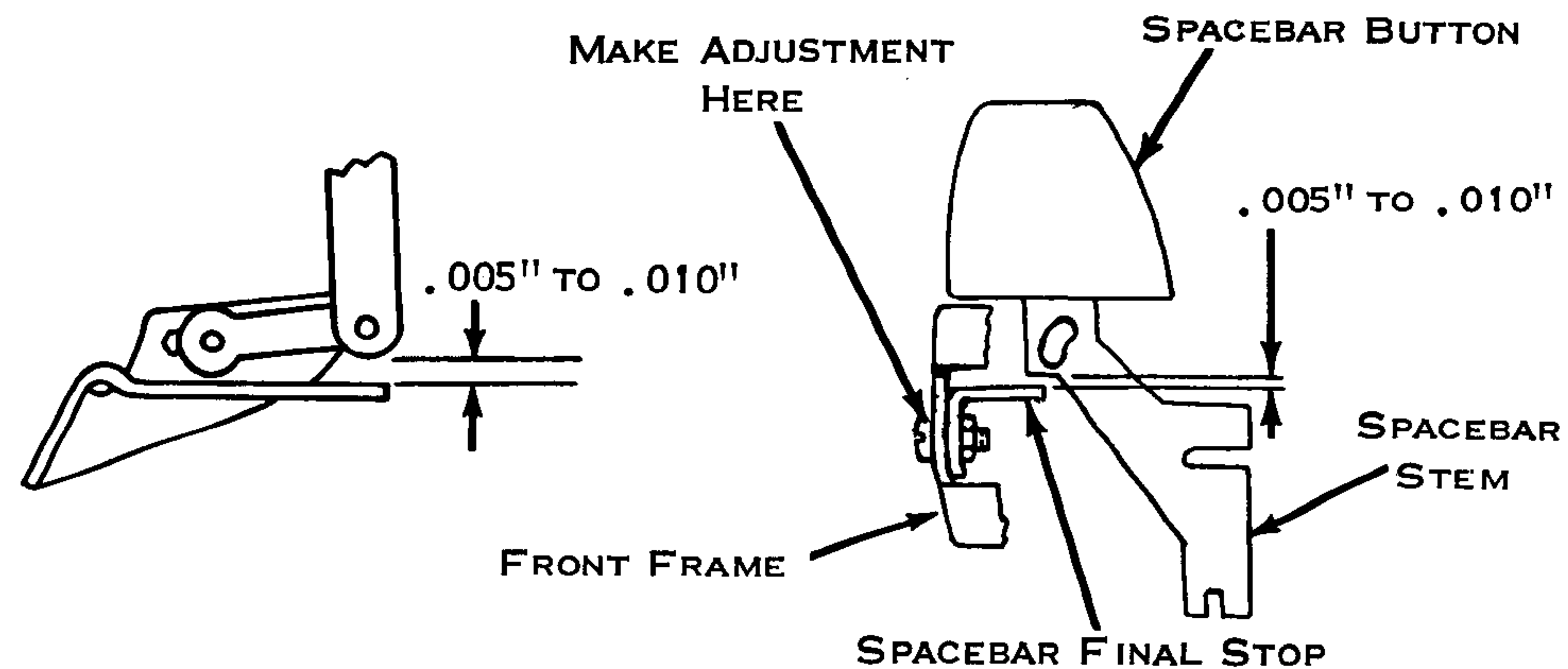
9. Guide Stud -

- a. New Style - Adjust for a clearance of 1/16" to 3/32" between the bottom of the skirt on a depressed 4th row keybutton and the bottom of the skirt on the spacebar.
- b. Old Style - Position return spring so spacebar operates freely and spacebar is level.

10. Spacebar support (New Style) - Adjust to guide the spacebar shaft without binding.

11. Final Stop (Fig. 158) - Form for .005" to .010" clearance between final stop and spacebar stem with the spacebar depressed to just trip the spacebar interposer.

NOTE: Some machines have keylever pawl repeat lug broken off and no final stop present.



(New Style) — Figure 158. Final Stop — (Old Style)



## BACKSPACE MECHANISM

1. Be sure that print escapement and operational control adjustments are correct before attempting backspace adjustments.
2. Tab Lever Stop (Fig. 159) - Form front to rear so that .001" to .003" clearance exists between the tab lever lug and the backspace pawl with the backspace pawl bottomed in its rack.

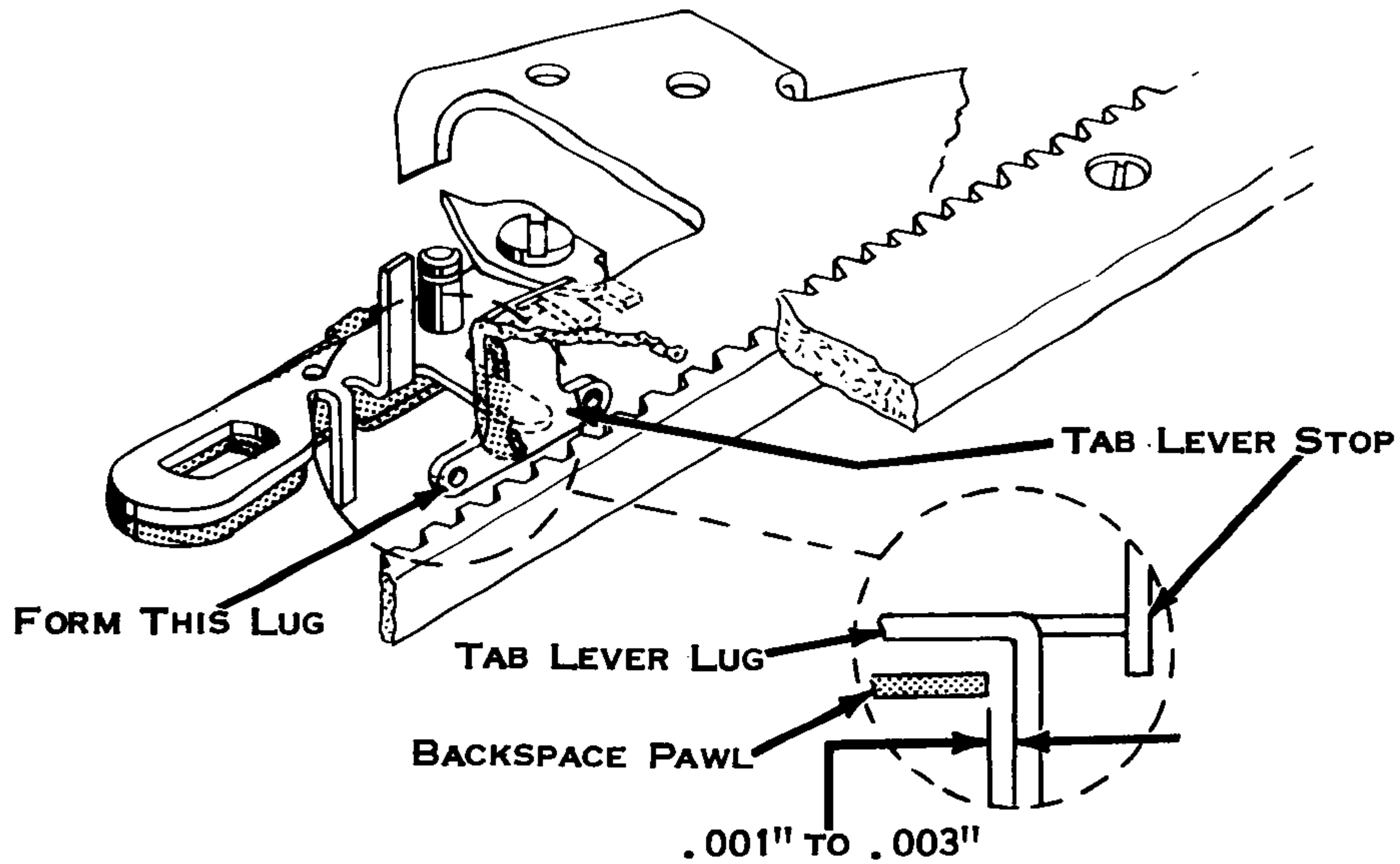


Figure 159. Tab Lever Stop

3. Backspace Rack (Fig. 160) - The hexagon head stud in the backspace bellcrank should be adjusted with the backspace rack in the rest position to obtain .005" to .015" between the working surface of the rack tooth and the backspace pawl.

NOTE: This clearance should be checked at each end and in the middle.

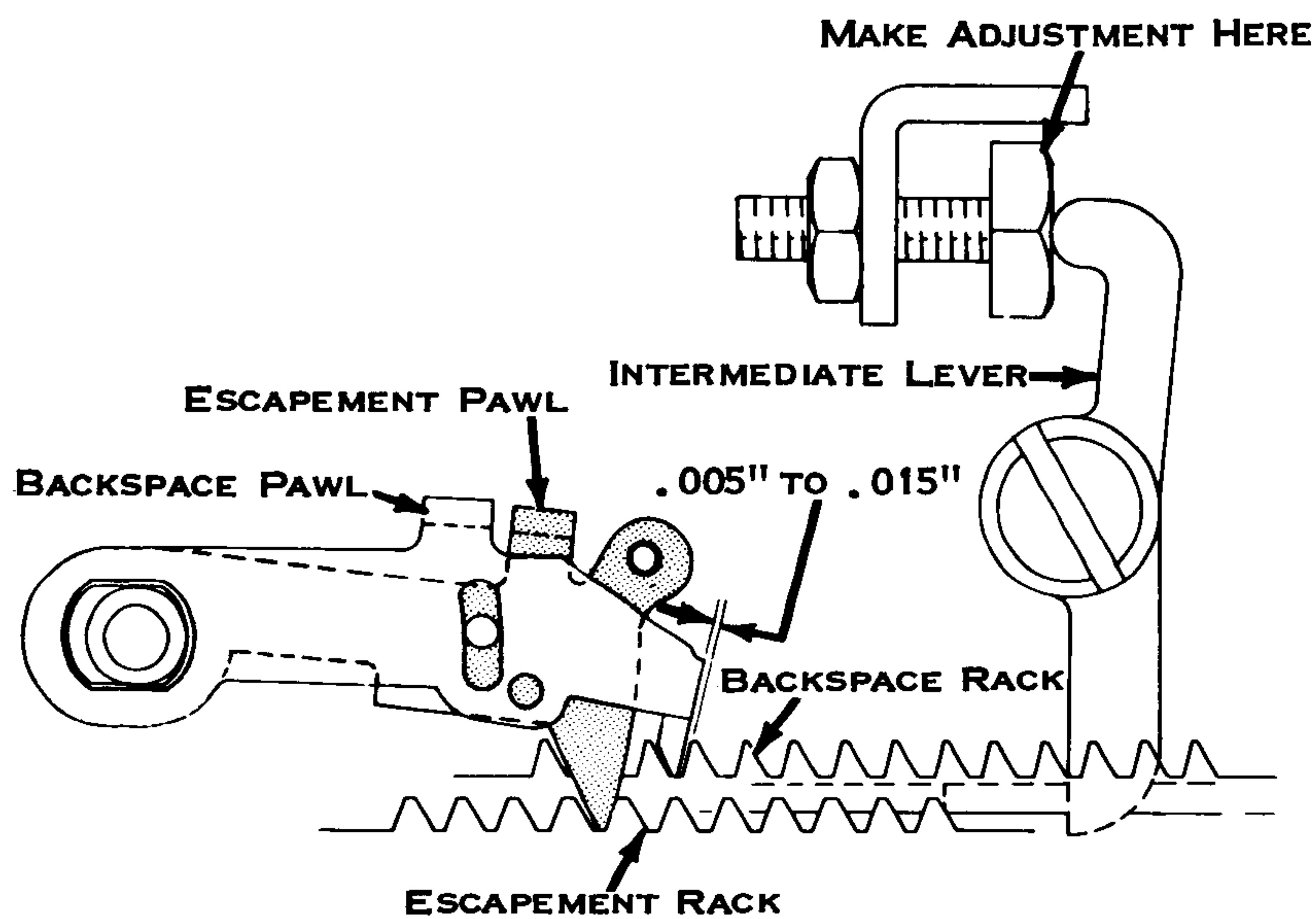
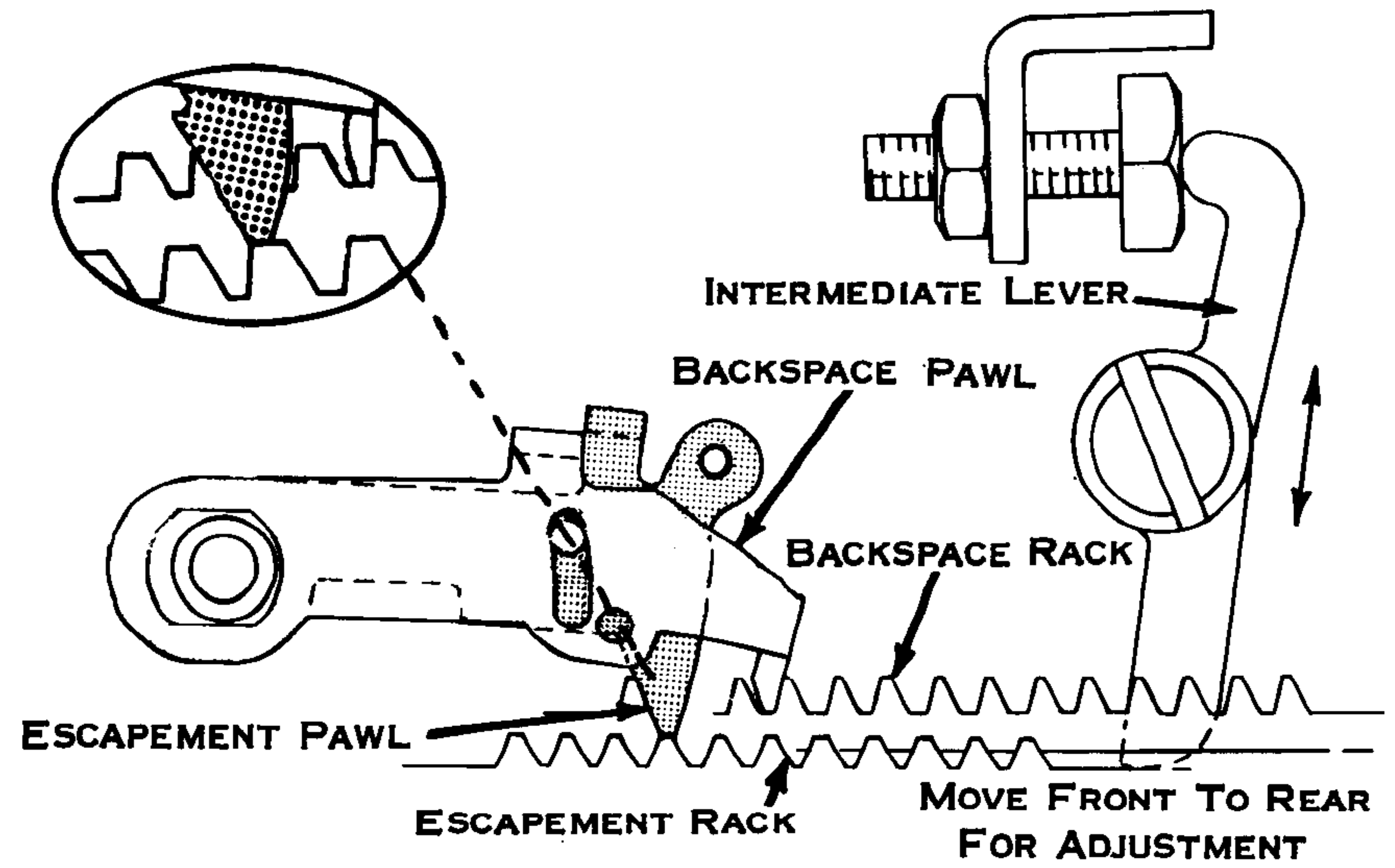


Figure 160. Backspace Rack

4. Intermediate Lever (Fig. 161 & 162) -

- a. New Style - Fig. 161 (Identify by presence of auxiliary cam follower) - With the backspace cam on its high point, the escapement pawl should rest on the top of an escapement rack tooth. This adjustment is made by moving the intermediate lever forward or back in its elongated mounting hole.

NOTE: The rest position of the backspace rack should be checked.



NOTE: WHEN PROPERLY ADJUSTED, THE BACKSPACE MECHANISM WILL FAIL UNDER HAND OPERATION.

Figure 161. Intermediate Lever (New Style)

- b. Old Style - Fig. 62 (Identify by absence of auxiliary, C5, cam follower) - With the backspace cam on its high point, the escapement pawl should be overthrown past the preceding rack tooth by .005" to .010".

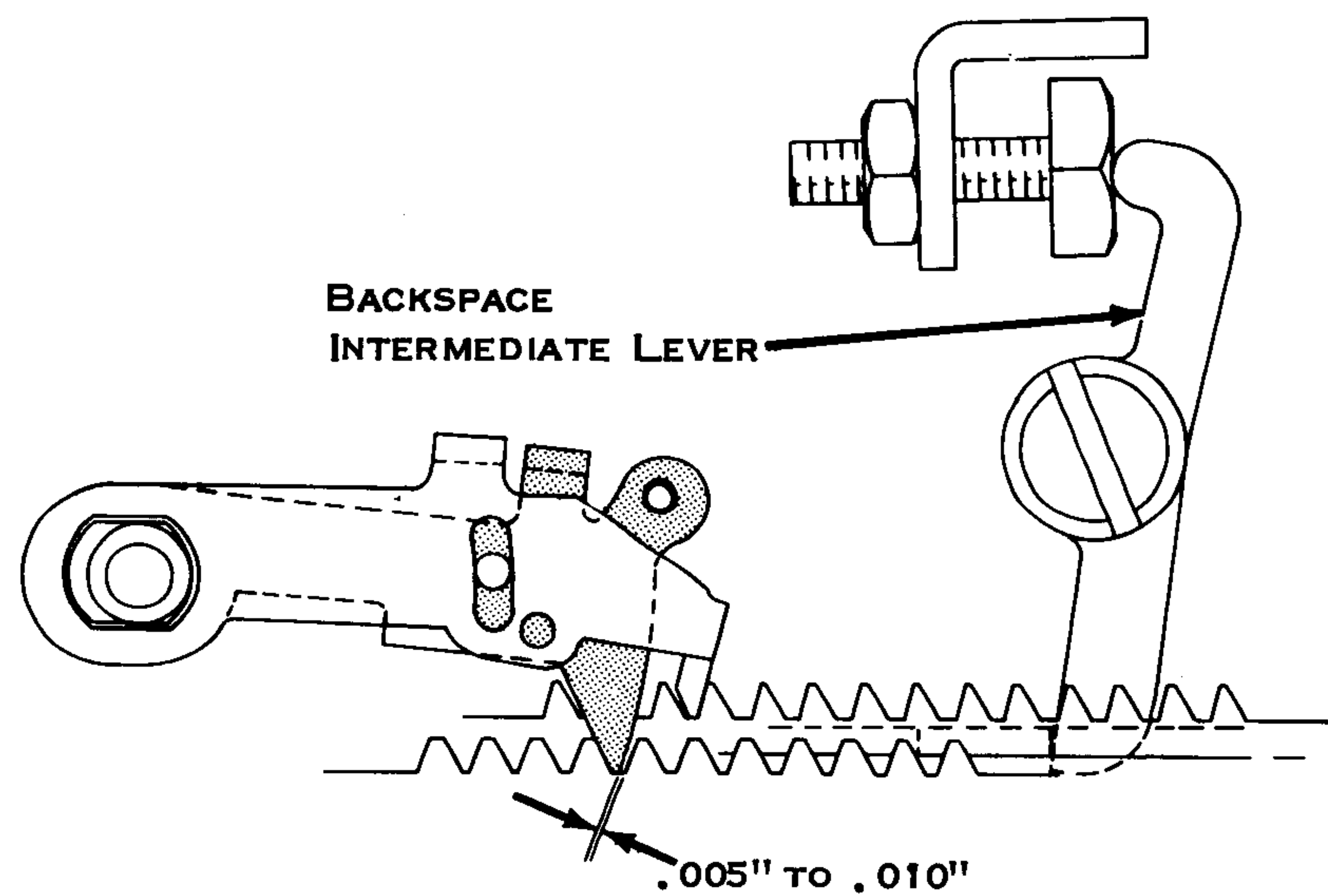


Figure 162. Intermediate Lever (Old Style)

## TABULATOR SET AND CLEAR MECHANISM

1. Tab Rack Bellcrank (Fig. 163) - The tab rack bellcrank should be adjusted so a non-set tab stop is centered between the tab lever pawl and the tab set lug of the escapement bracket. CAUTION - Be sure the tab set and clear lever is fully seated on top of the pivot pins on the left side of the power frame.

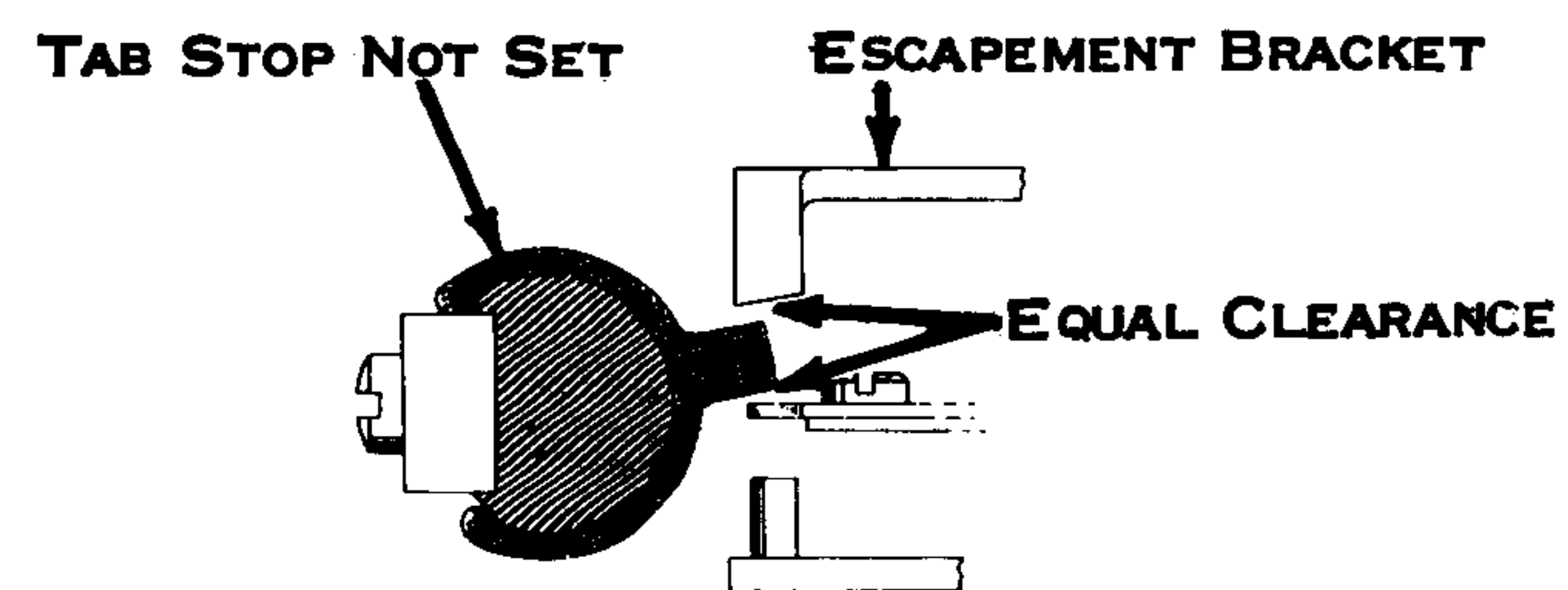


Figure 163. Tab Rack Bellcrank

2. Tab Set and Clear Link - The link should be adjusted so the slope of the keybutton matches the slope of the "on" and "off" switch keybutton with the switch in the "off" position.

NOTE: On 15" machines, the intermediate lever should be vertical within .015".



NOTE: On new style modified one piece mechanisms, the upper slot edges should be pinched so that link cannot accidentally disengage.

3. Set and Clear Lever Stops - The set and clear lever stops should be adjusted so they limit the movement of the lever just as the tab stop reaches its fully set or clear position.

NOTE: On new style modified one piece mechanisms, form the extension provided on the rear stop lug so the tab set and clear arm cannot pivot sideways out of engagement with its bellcrank.

4. Tab Rack Brake (old machines only) - The tab rack brake should be adjusted so the tab rack will not flip past the rest position when released from either a set or a clear position. CAUTION - The index detent lever will rest against the tab rack with the platen removed. Be sure the lever is clear of the tab rack when the brake adjustment is checked.

### TABULATION MECHANISM

1. Tab Lever Stop (Fig. 164) - The escapement bracket lug which acts as a forward stop for the tab lever should be adjusted so that .001" to .003" clearance exists between the tab lever lug and the backspace pawl.

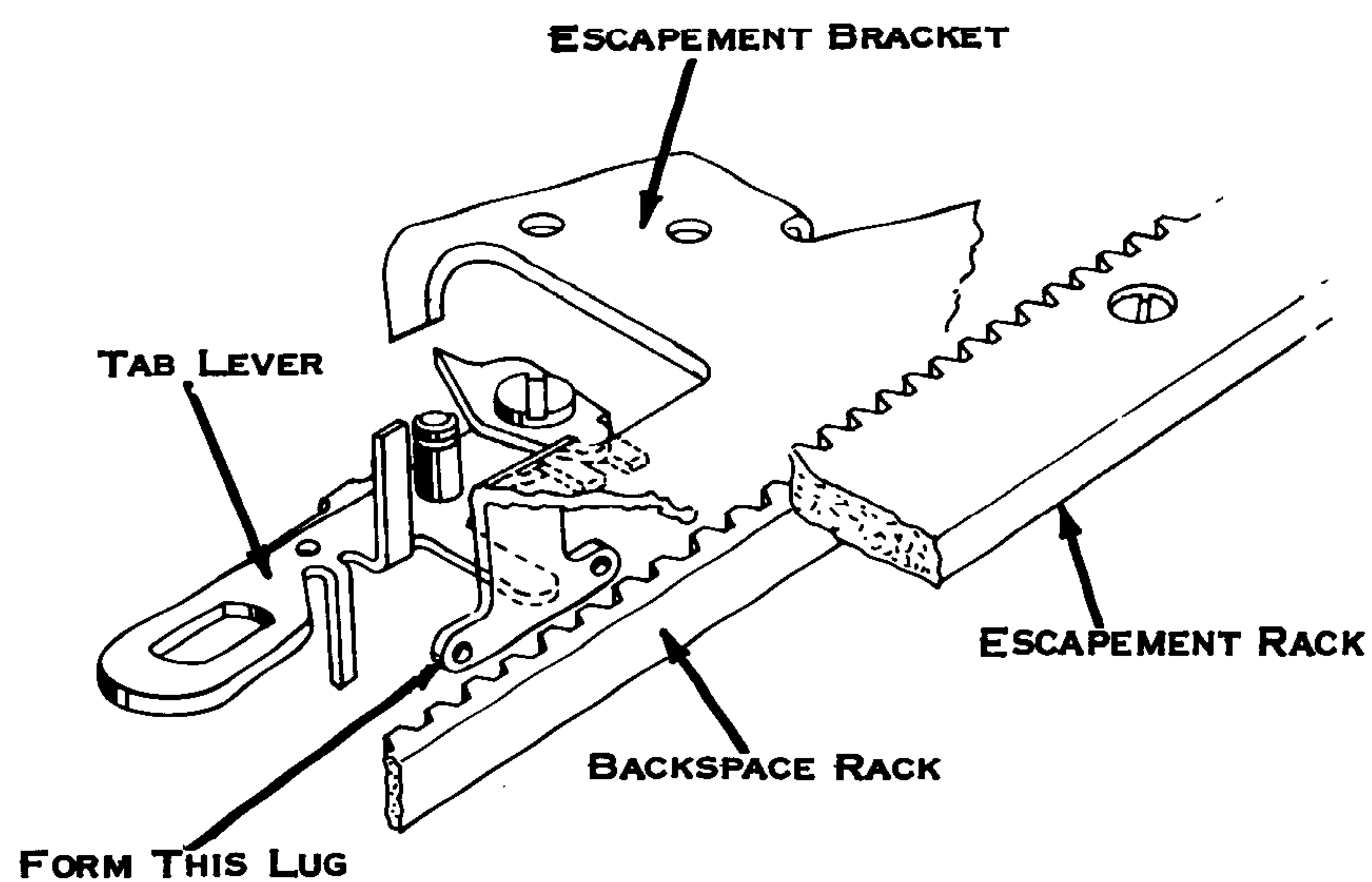


Figure 164. Tab Lever Stop

2. Tab Lever Pawl (Fig. 165) - The tab lever pawl should be adjusted forward or back on the tab lever so that the tip of the pawl clears the set tab stop by .035" to .045" with the tab lever at rest.

NOTE - THE PUSHER END OF THE LARGE SPRING HOOK IS APPROXIMATELY .035"

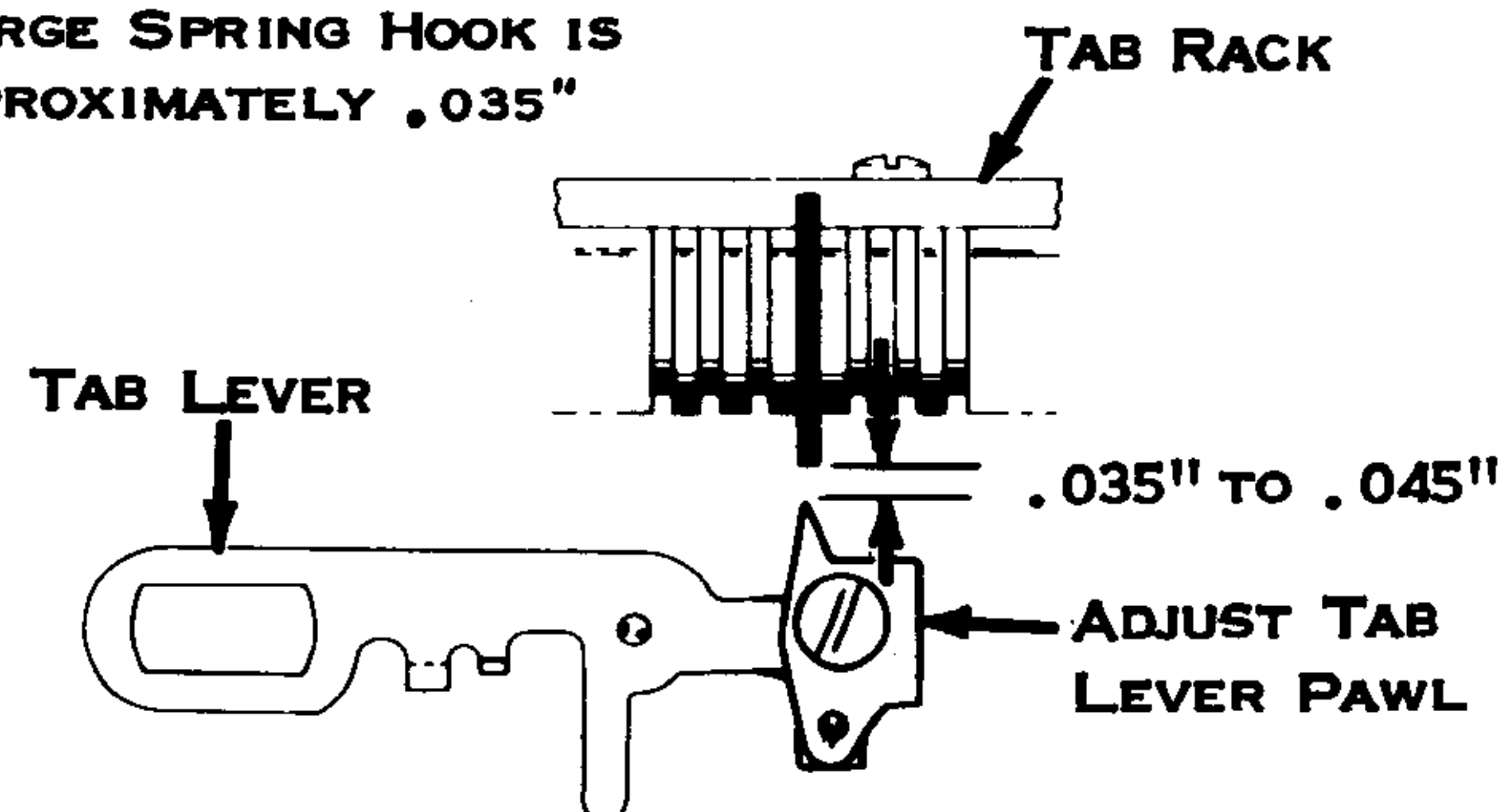


Figure 165. Tab Lever Pawl

3. Tab Rack (Fig. 166) - The tab rack bushing should be adjusted so that .005" to .020" clearance exists between the tip of the tab lever pawl and the tab stop as the tips are in line with each other.

NOTE: The head of the tab rack bushing should clear the tab rack plate by about 3/32" when the adjustment has been completed.

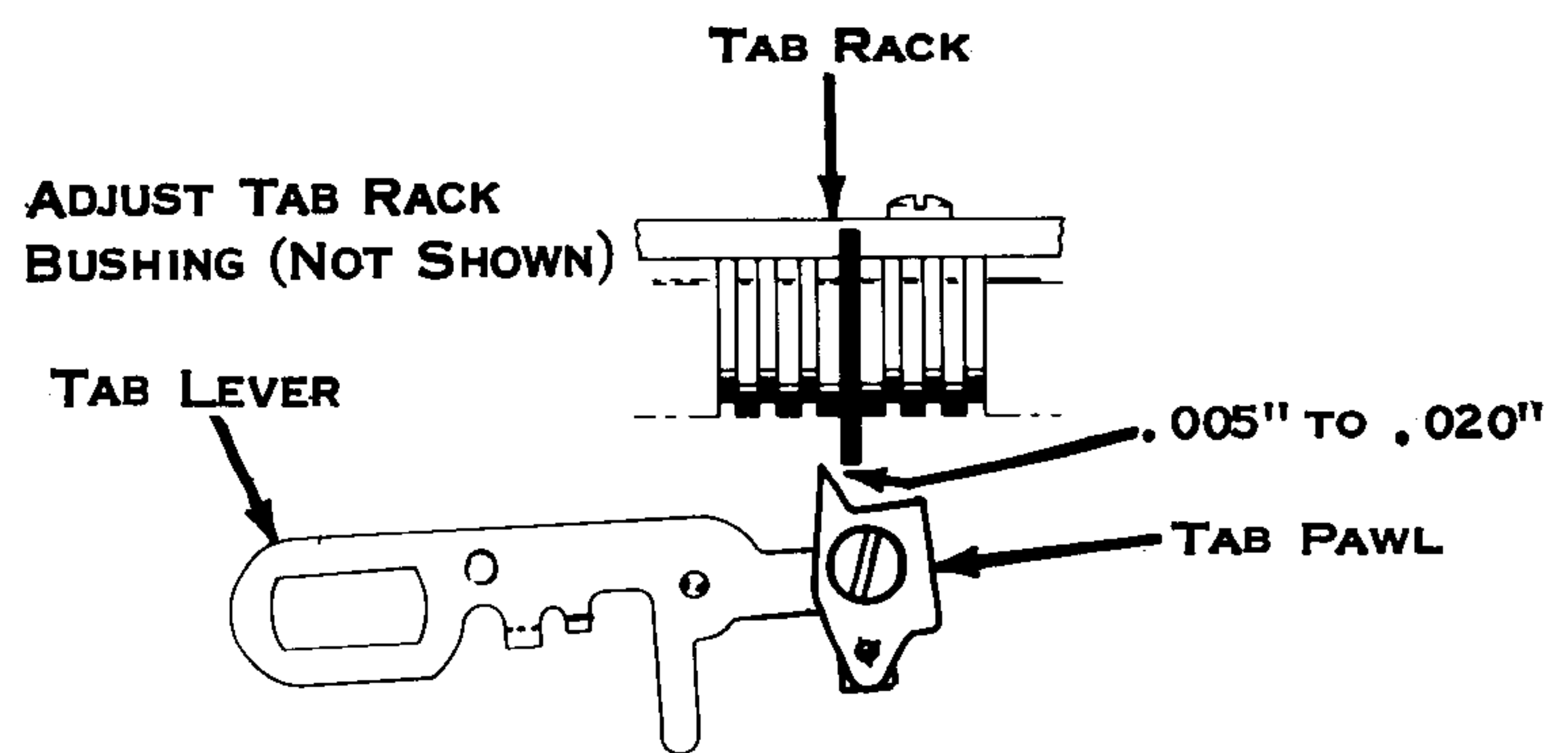


Figure 166. Tab Rack Bushing

4. Pawl Clearance (Fig. 167) - The upright lug of the tab latch should be formed forward or back so the tip of the escapement pawl clears the escapement rack teeth by .005" to .010" when the tab lever is latched to the rear.

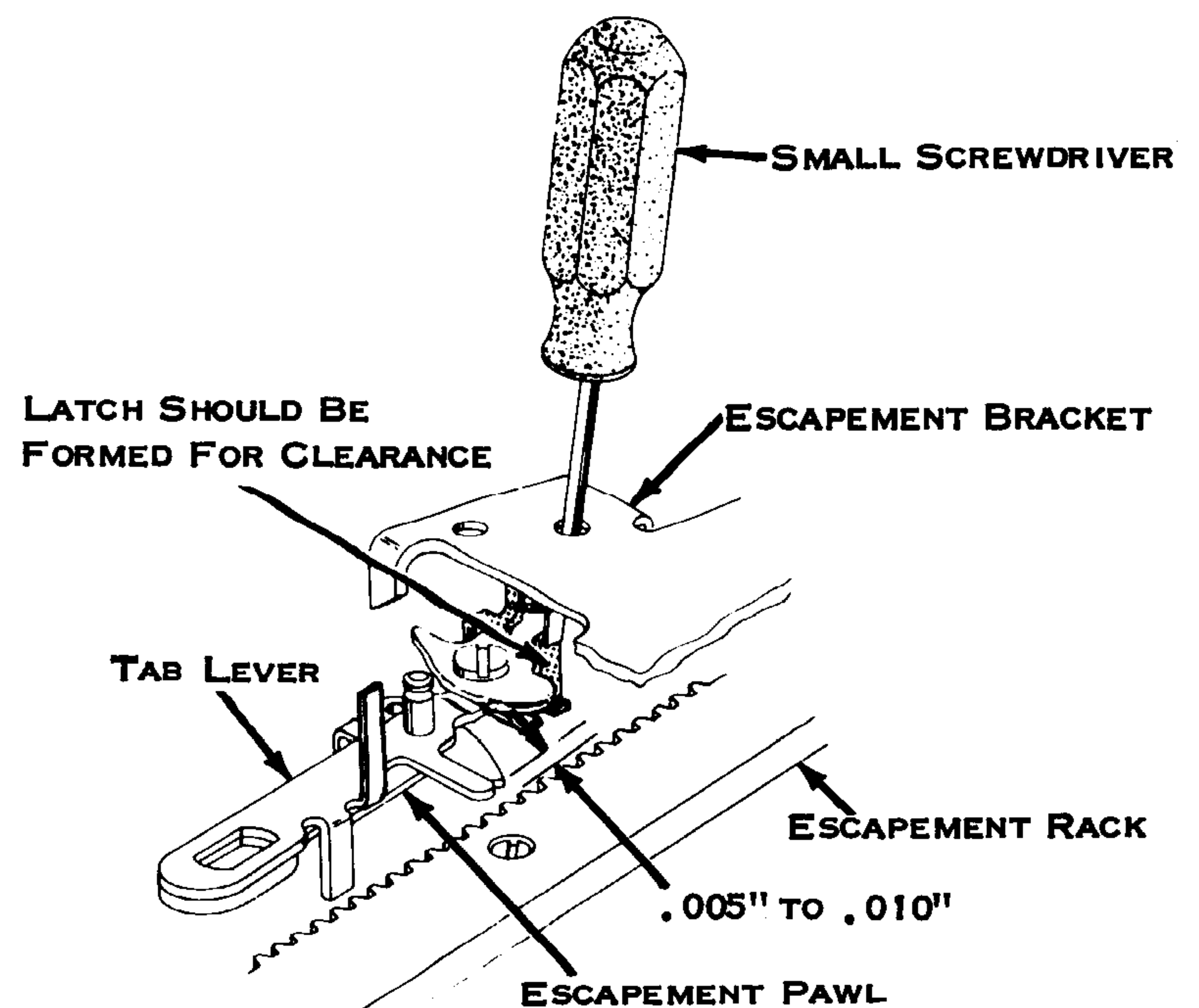


Figure 167. Pawl Clearance

5. Adjusting plate, 11 inch machine (Fig. 168) - Position as follows:
  - a. Front to Rear - so that the actuator link and clevis clears the power frame.

NOTE: Clearance must be observed throughout full motion of the tab bellcrank.

- b. With the tab interposer released and the backspace cam on its high point, rotate the torque bar (relative to the adjusting plate) so that the tab lever overthrows the tab latch by .005" to .010".

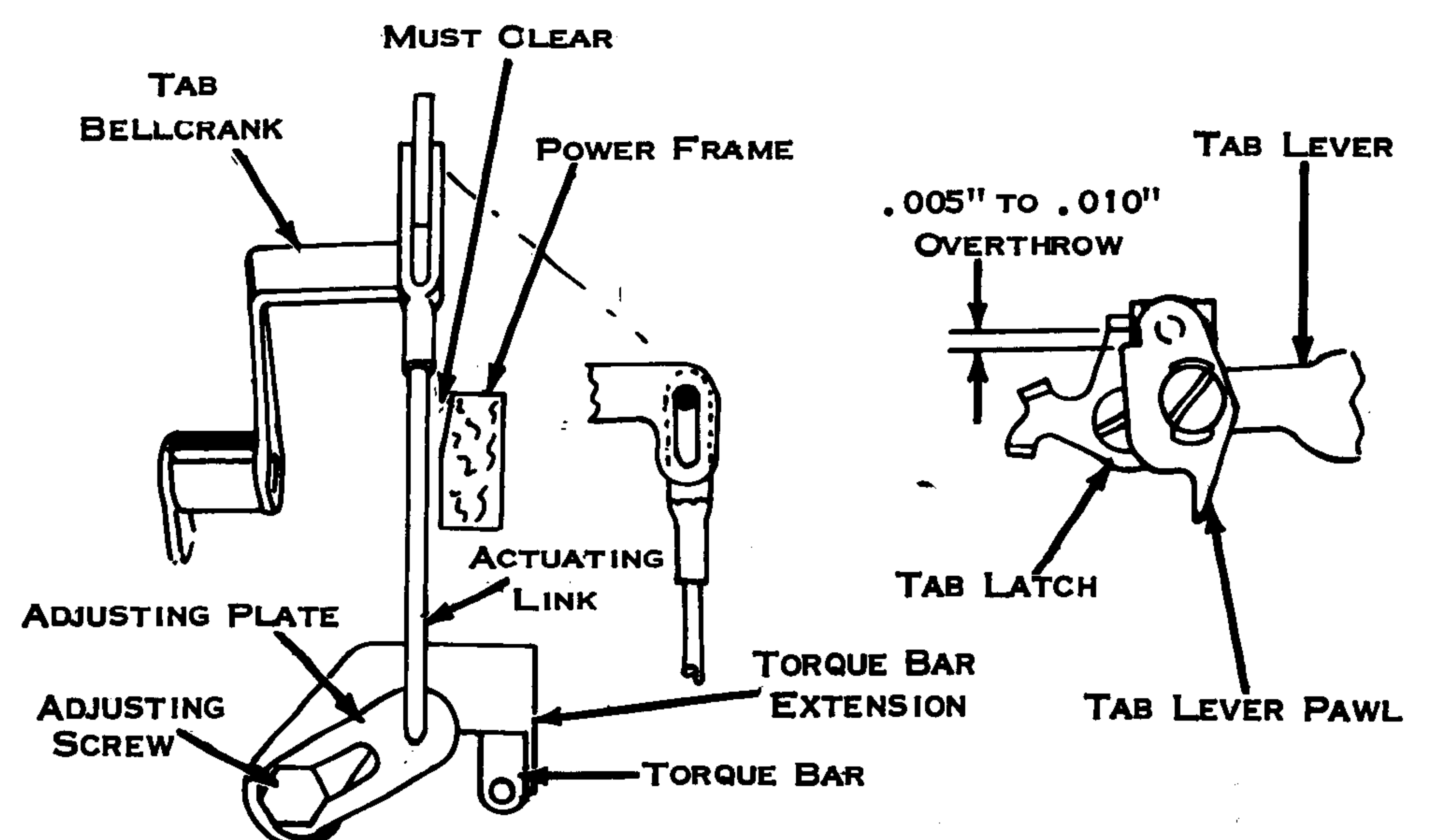


Figure 168. Adjusting Plate, 11 Inch Machine



6. Actuating Link, 15" Machine (Fig. 169) - With the backspace cam latched and the intermediate lever resting against its upstop, adjust the actuating link clevis so that the tab torque bar hangs vertically.

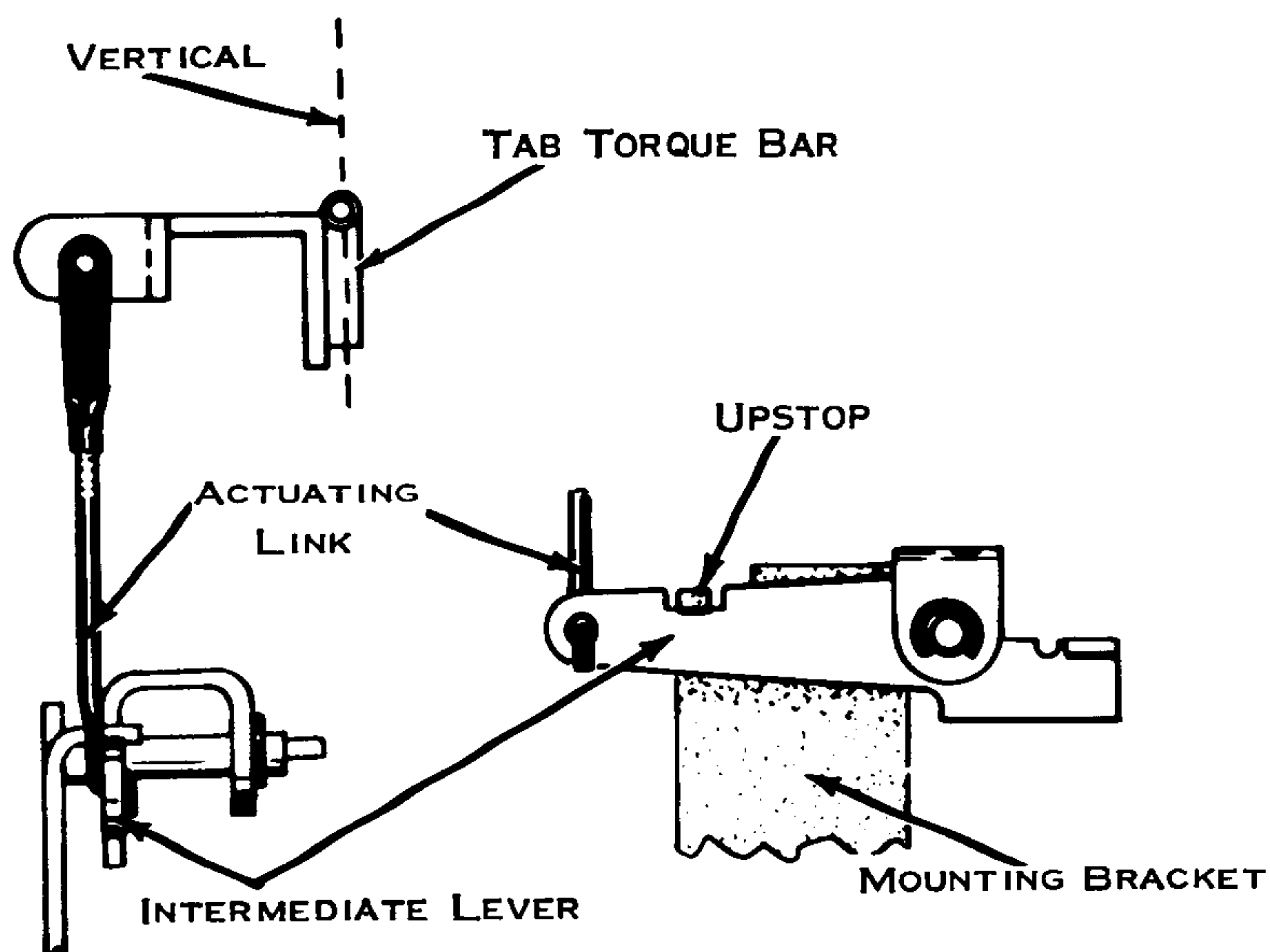


Figure 169. Actuating Link, 15" Machine

7. Intermediate Lever Tab, 15" Machine (Fig. 170) - With the tab interposer released and the backspace cam on its high point, form the intermediate lever tab so that the tab lever pawl overthrows the tab latch by .005" to .010".

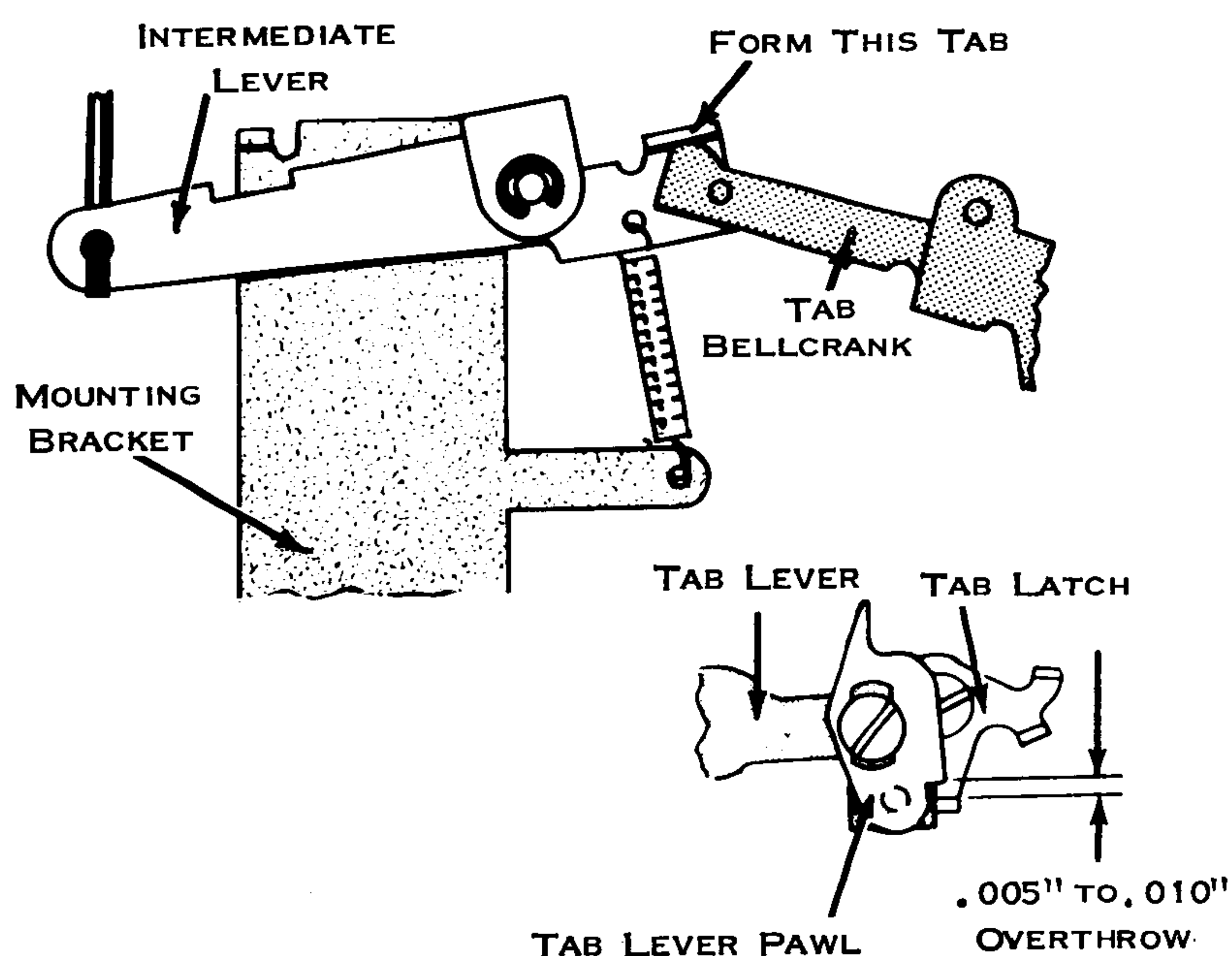


Figure 170. Intermediate Lever Tab

8. Lockout Lever (Fig. 171) - Position to clear the torque bar by .005" to .010" with the torque bar at rest.

NOTE: The position of the lockout lever must not choke off the motion of the tab lever during unlatching.

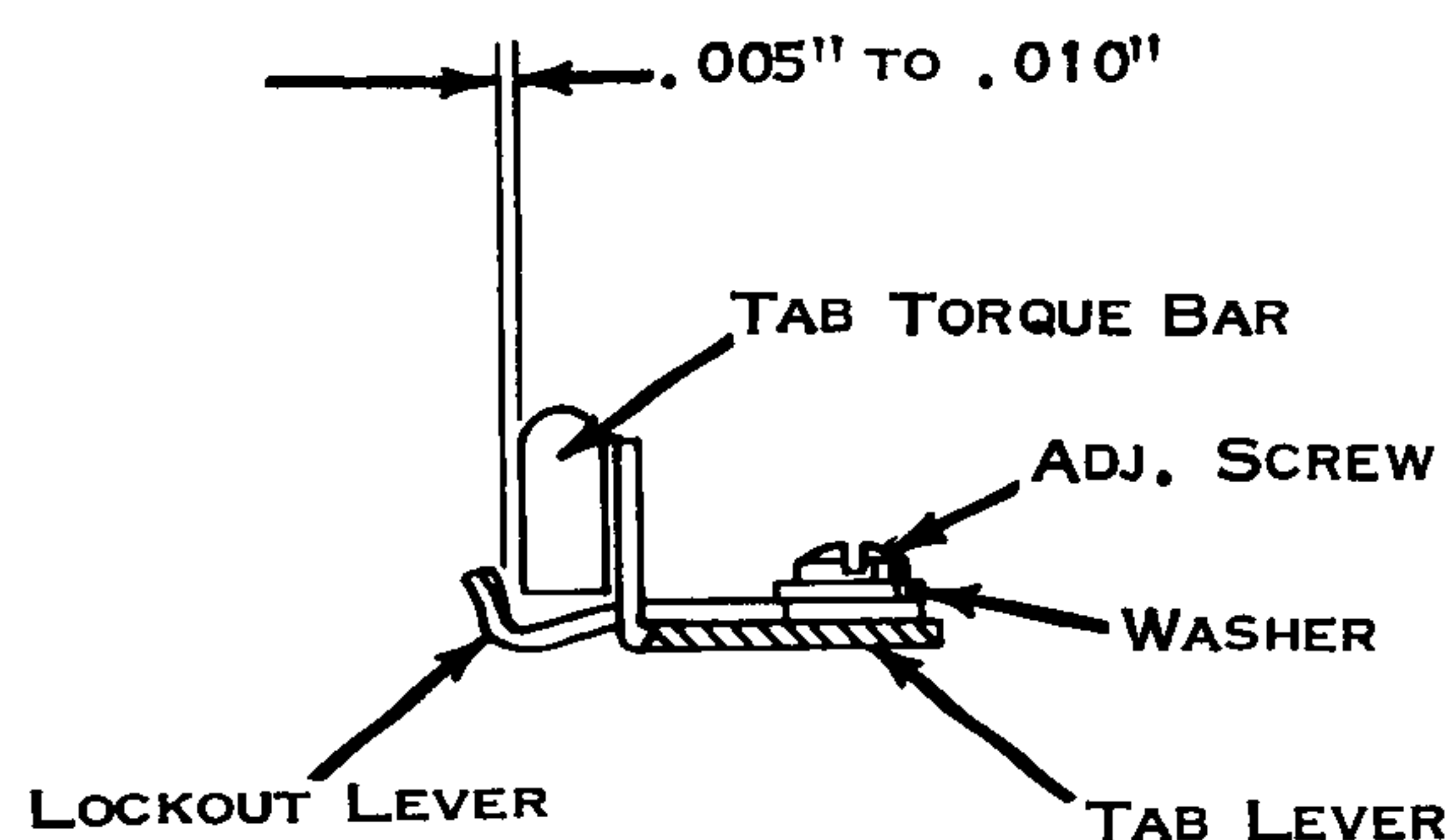


Figure 171. Lockout Lever

9. Tab Torque Bar Support (Fig. 172) - With the tab torque bar at rest, position the torque bar support (relative to the escapement plate) to clear the torque bar by .001" to .006".

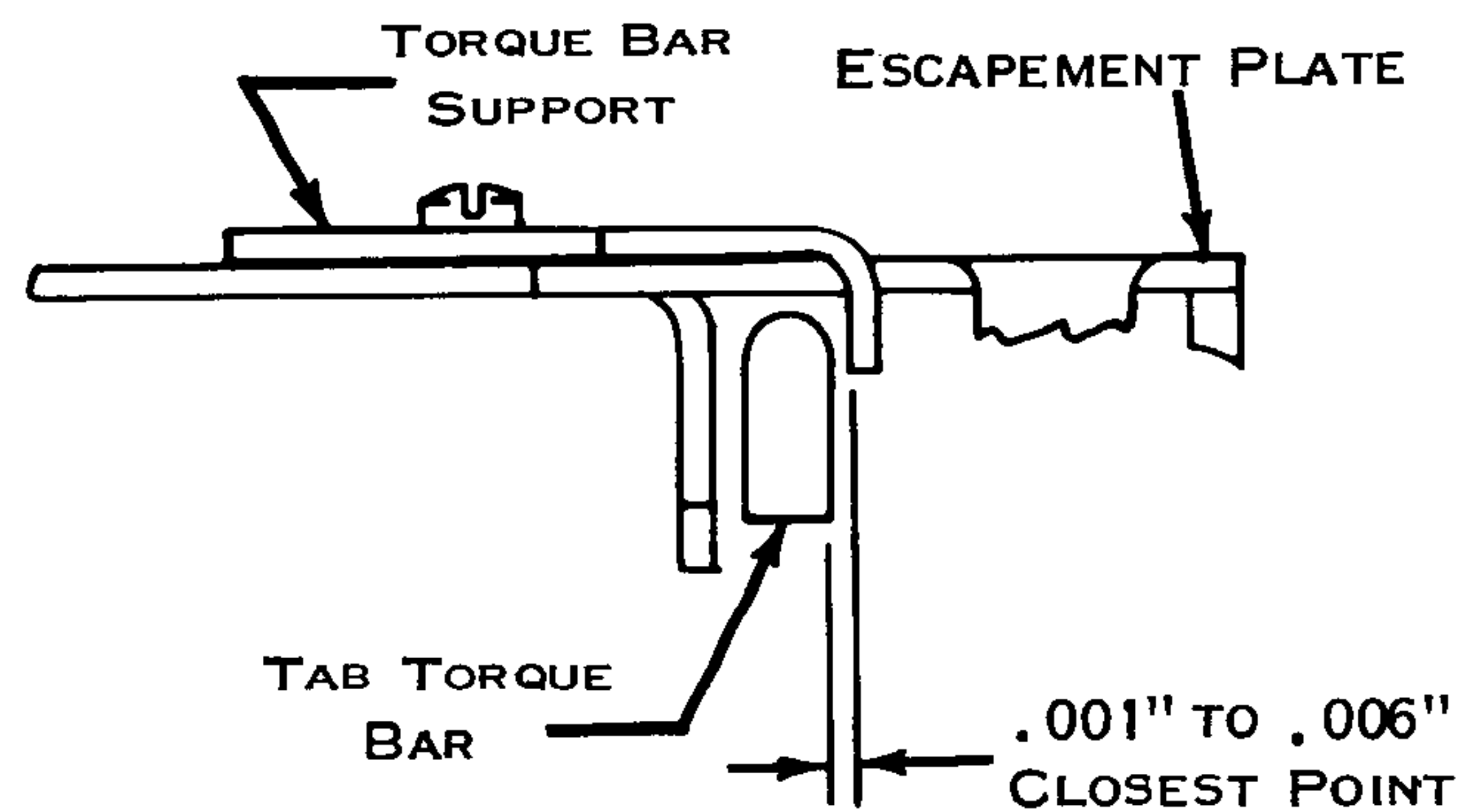


Figure 172. Tab Torque Bar Support

10. Tab Lever Overthrow Stop (Fig. 173) - Adjust forward or back so that .005" to .015" clearance exists between the lug of the tab lever and the overthrow stop when the tab lever is latched to the rear.

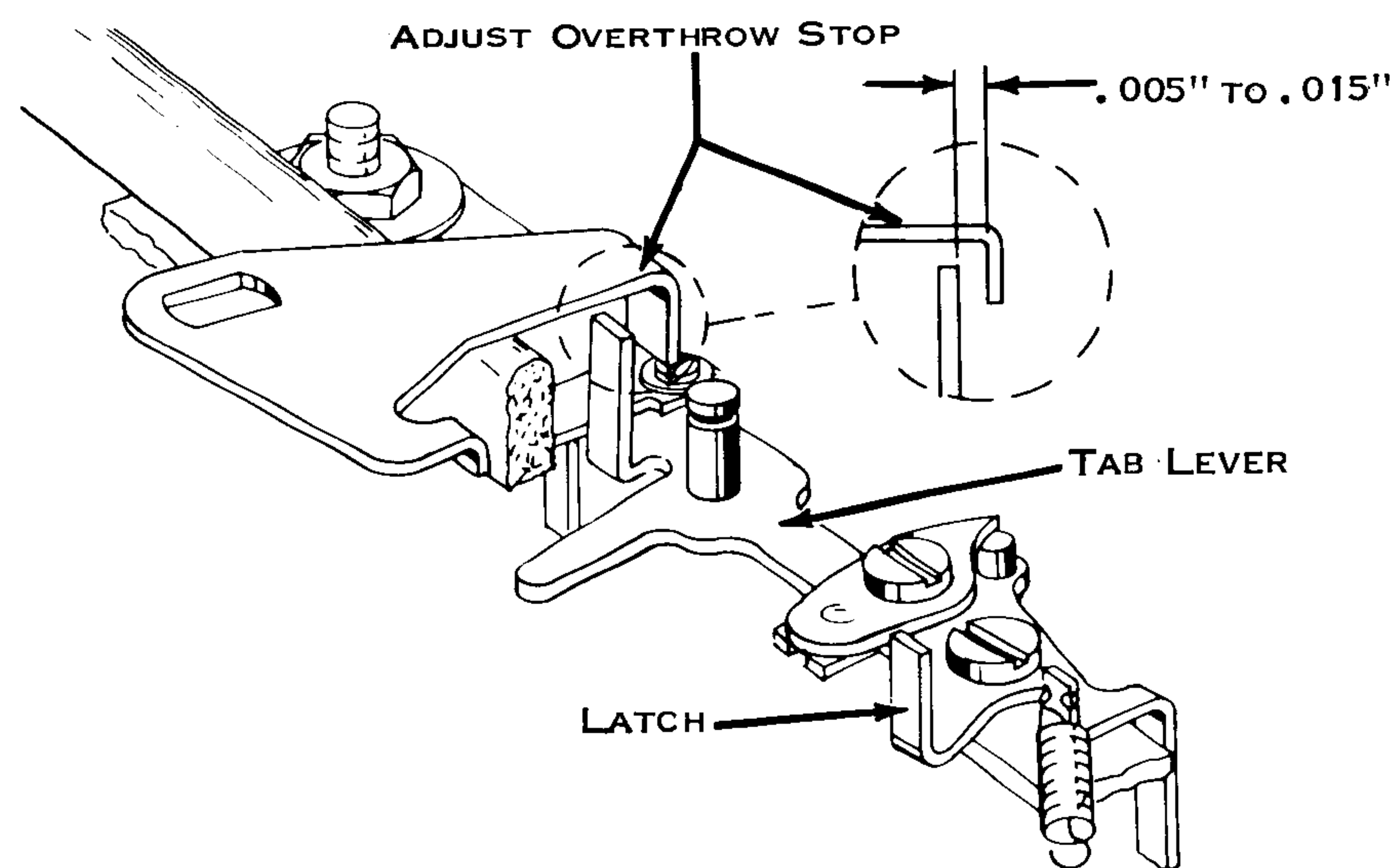


Figure 173. Tab Lever Overthrow Stop

11. Carrier Return/Tab Interlock (Fig. 174) - With the carrier return clutch latched, the upright lug of the tab latch should clear the end of the tab lever pawl by .005" to .025". The rear lug of the tab latch should be formed forward or back to obtain this condition.

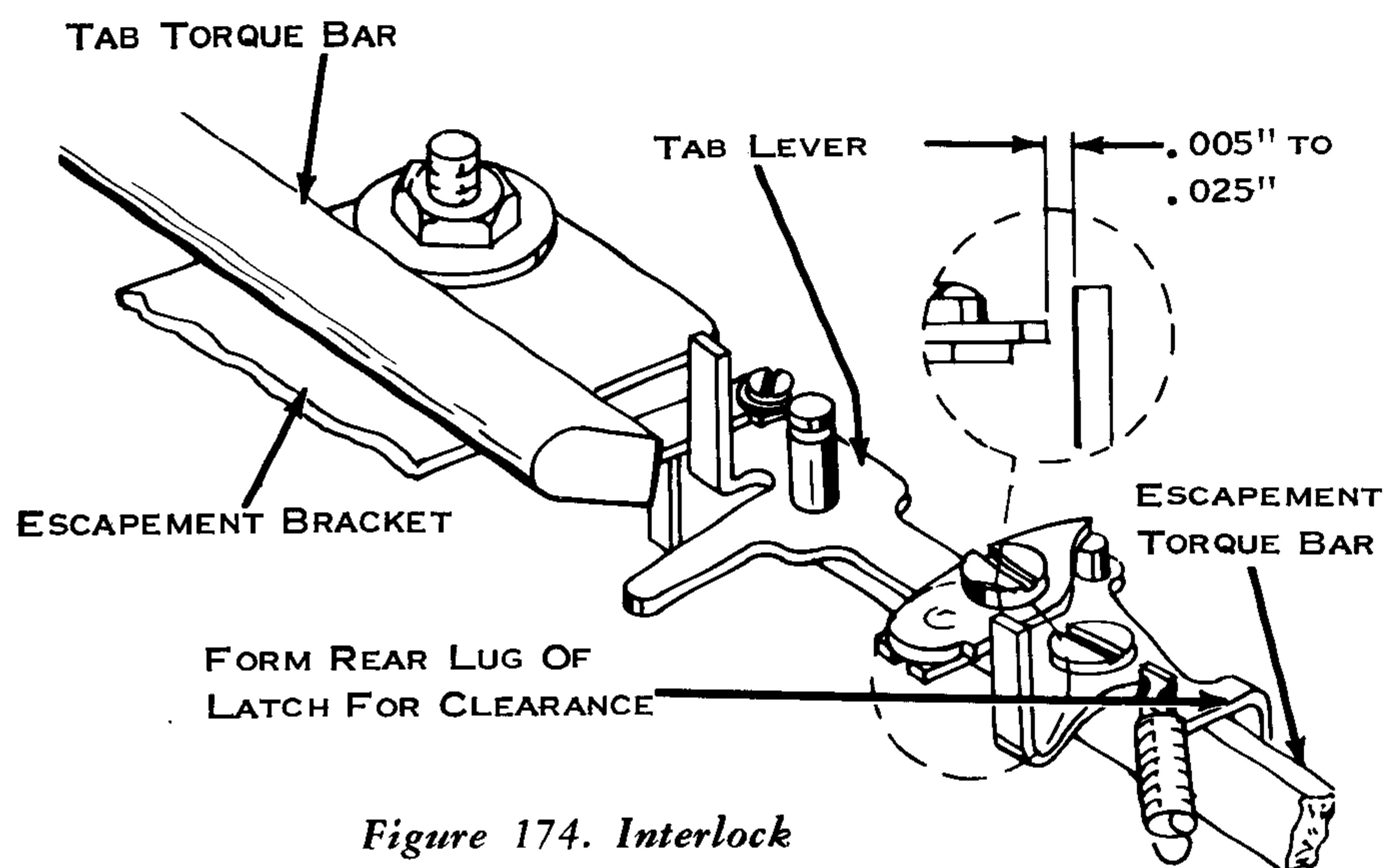


Figure 174. Interlock

12. Tab Interlock Contact -

- a. Form (in circled area) the actuating wire (left or right) so that it contacts the actuating arm near the right angle bend (Fig. 175).



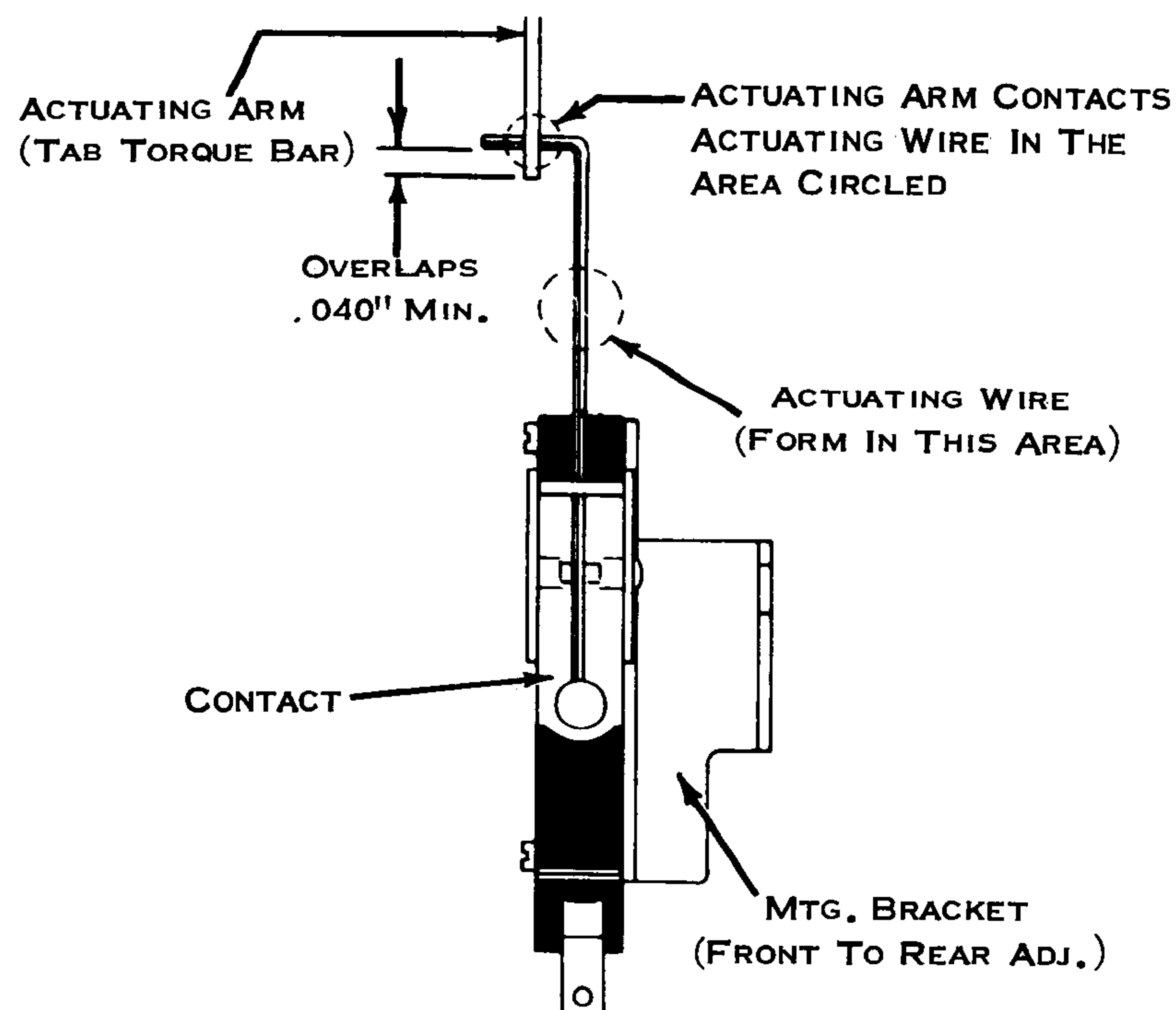


Figure 175. Interlock Contact

- b. With the tab interposer released and the backspace cam on its high point, position the mounting bracket (front to rear) so that the actuating arm overlaps (.040" minimum) the actuating wire (Fig. 175).
- c. As the tab torque bar restores, position the mounting bracket (up or down) so that the contact actuating wire travels .031" to .062" after the contact transfers (Fig. 176).

NOTE: During initiation of a tab operation, the switch must transfer (up position) before the backspace cam reaches its high point. Torque bar bounce must not retransfer the contact while the tab lever is latched out.

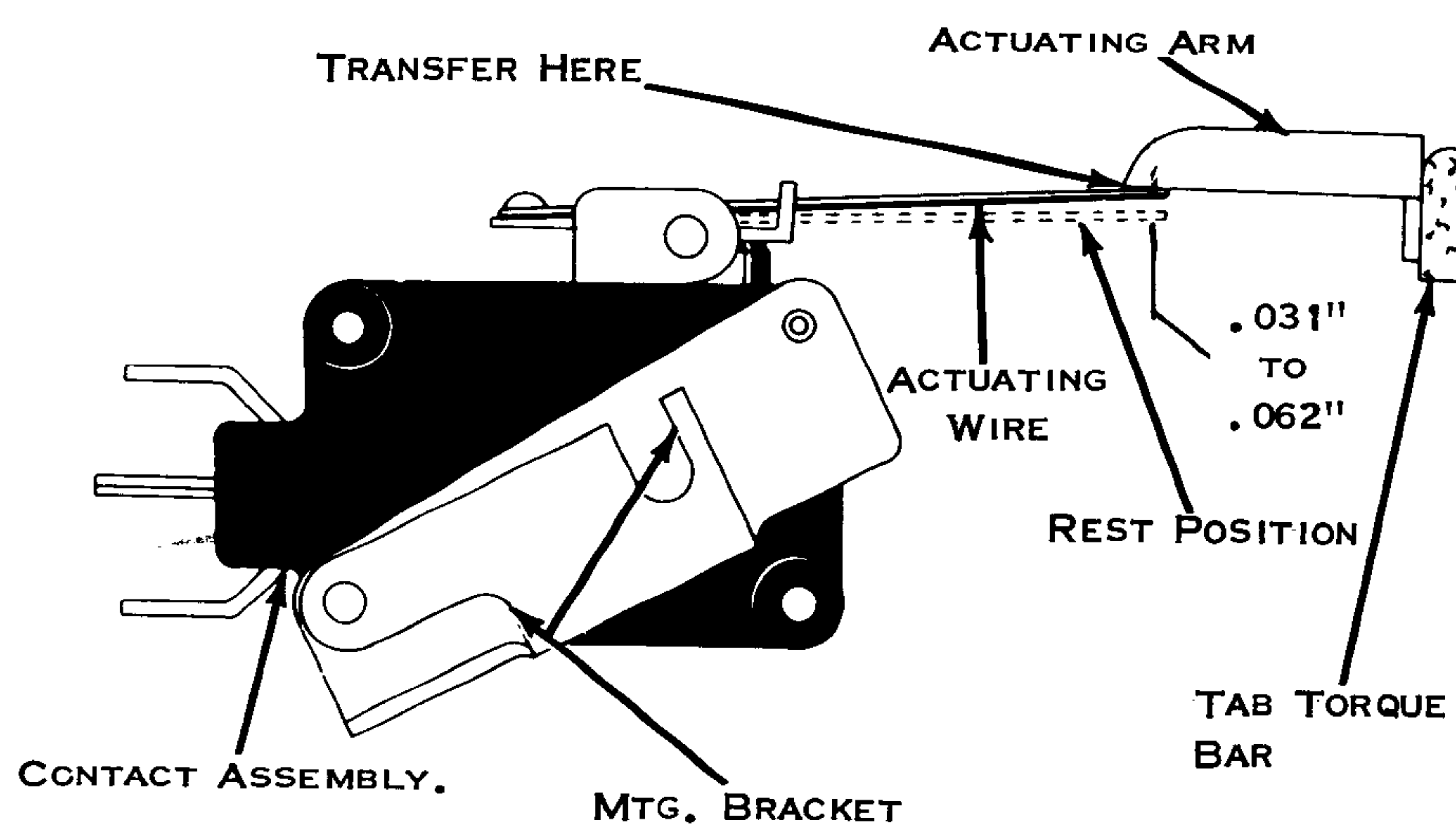


Figure 176. Interlock Contact

#### CARRIER RETURN MECHANISM

Be sure the print, escapement, and operational control adjustments are correct before attempting the carrier return adjustments.

1. Pawl Clearance (Fig. 177) - The clutch latch eccentric should be adjusted so that the escapement pawl will clear the rack teeth by .005" to .015" when the latch is being held down by the keeper. On 15" machines, this adjustment should be made after adjustments 3 and 4.

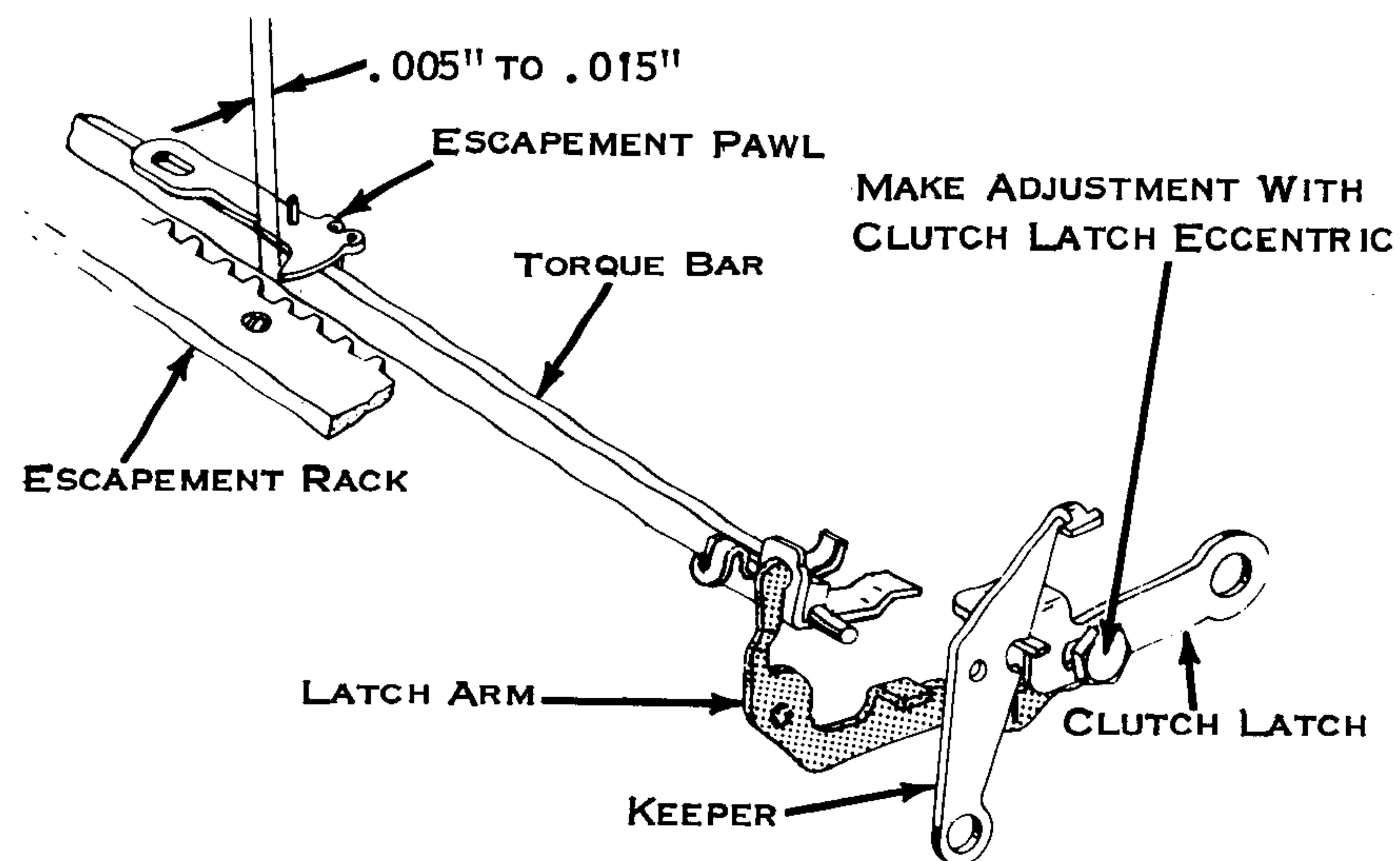


Figure 177. Pawl Clearance

2. Clutch Latch Overthrow, 11" Machine (Fig. 178) - The adjusting screw in the carrier return latch arm should be adjusted so that there is .030" to .040" clearance between the working surface of the keeper and the clutch latch with the cam follower on the high point of the cam.

NOTE: Platen and Feed Rolls must be in machine when making this adjustment.

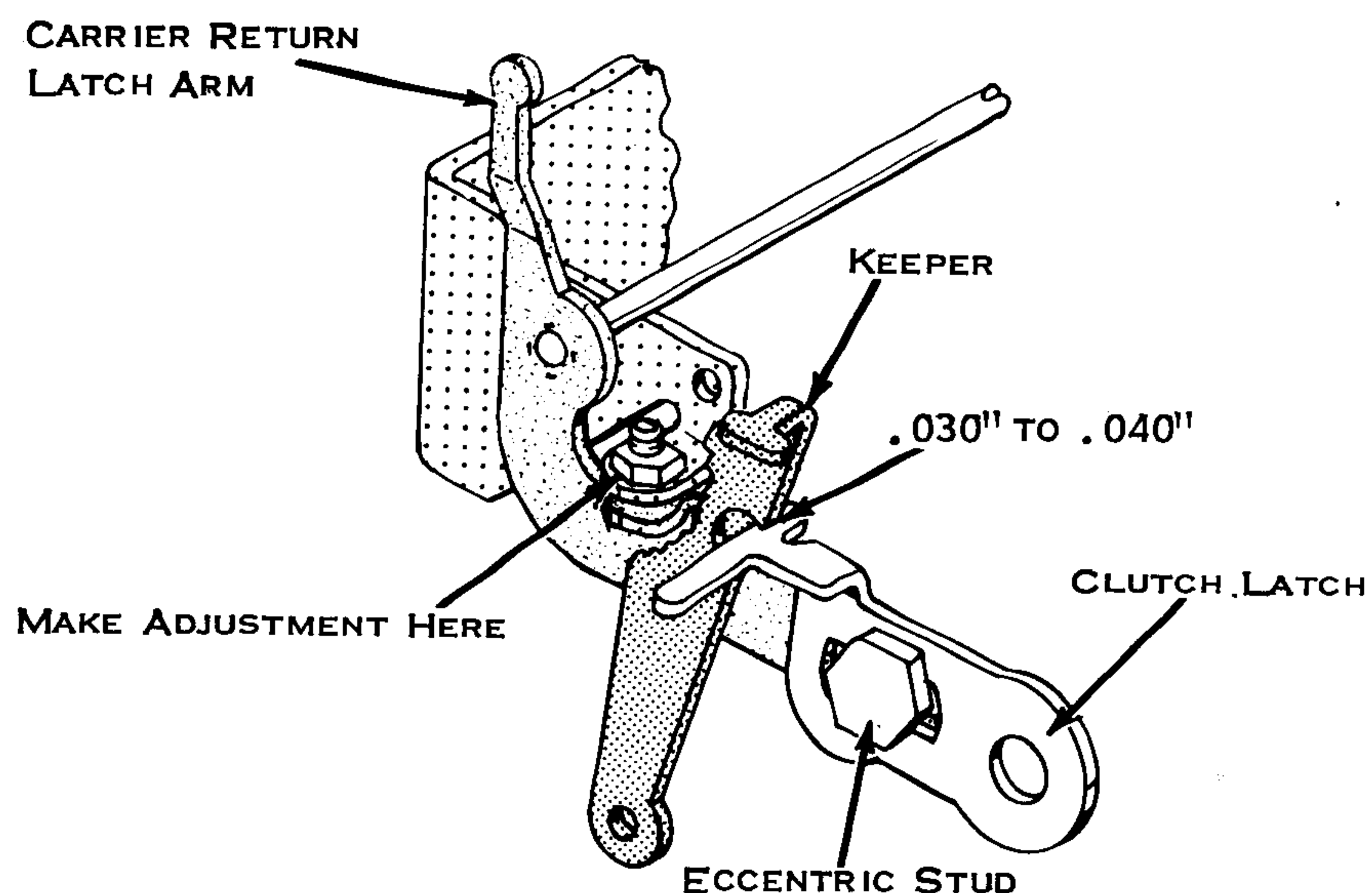


Figure 178. Clutch Latch Overthrow, 11" Machine

3. Carrier Return Latch Arm, 15" Machines Only (Fig. 179) - The adjusting screw should be adjusted so that a clearance of .002" to .005" exists between the arm and the torque bar.

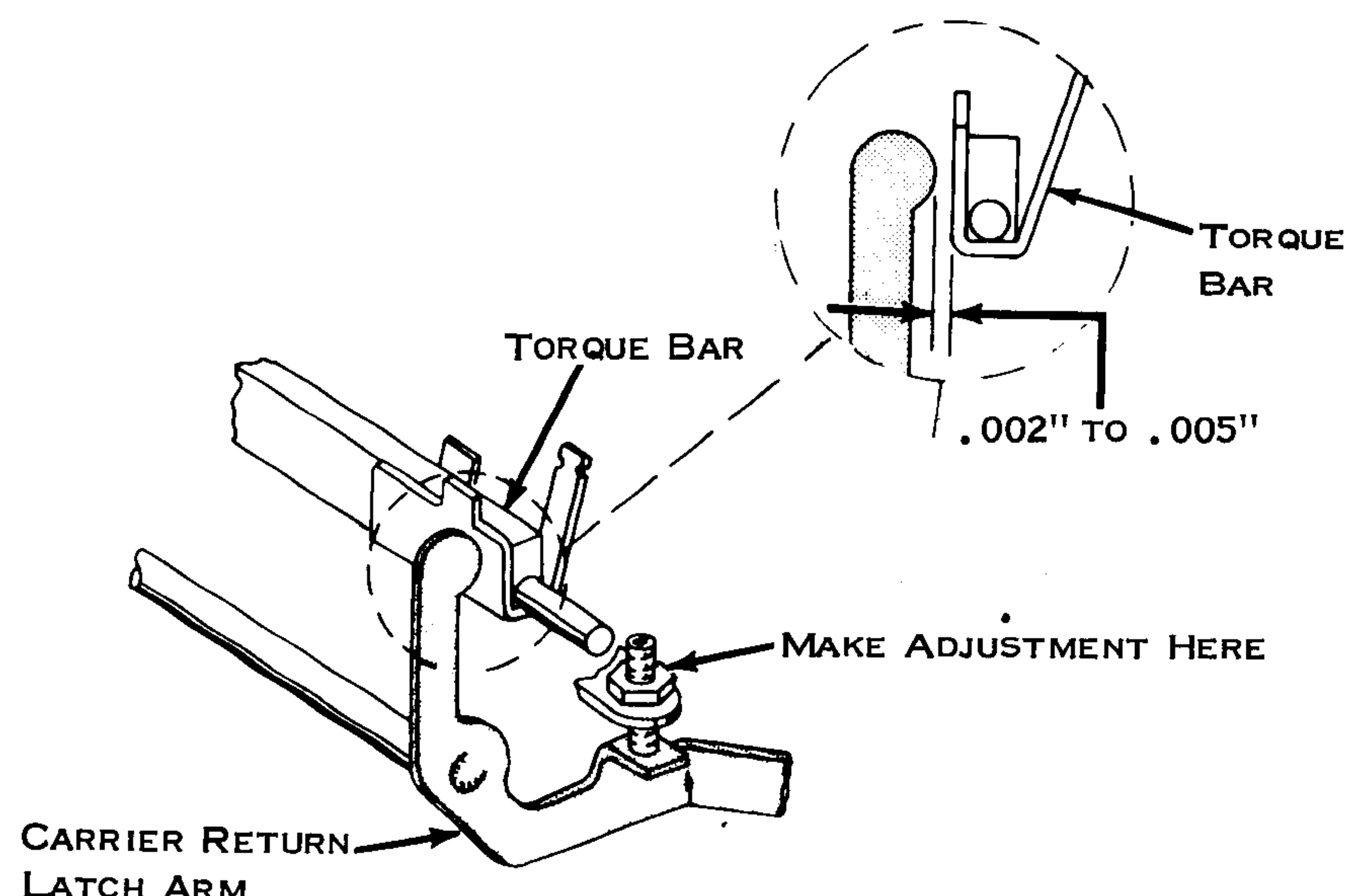


Figure 179. Carrier Return Latch Arm, 15" Machine



Lever Assembly, 15" Machines Only (Fig. 180) - Position on carrier return latch arm so that the flat bottom portion of the lever is horizontal. The lever assembly adjusting screw should then be adjusted for .030" to .040" latch to keeper overthrow (Ref. Fig. 178).

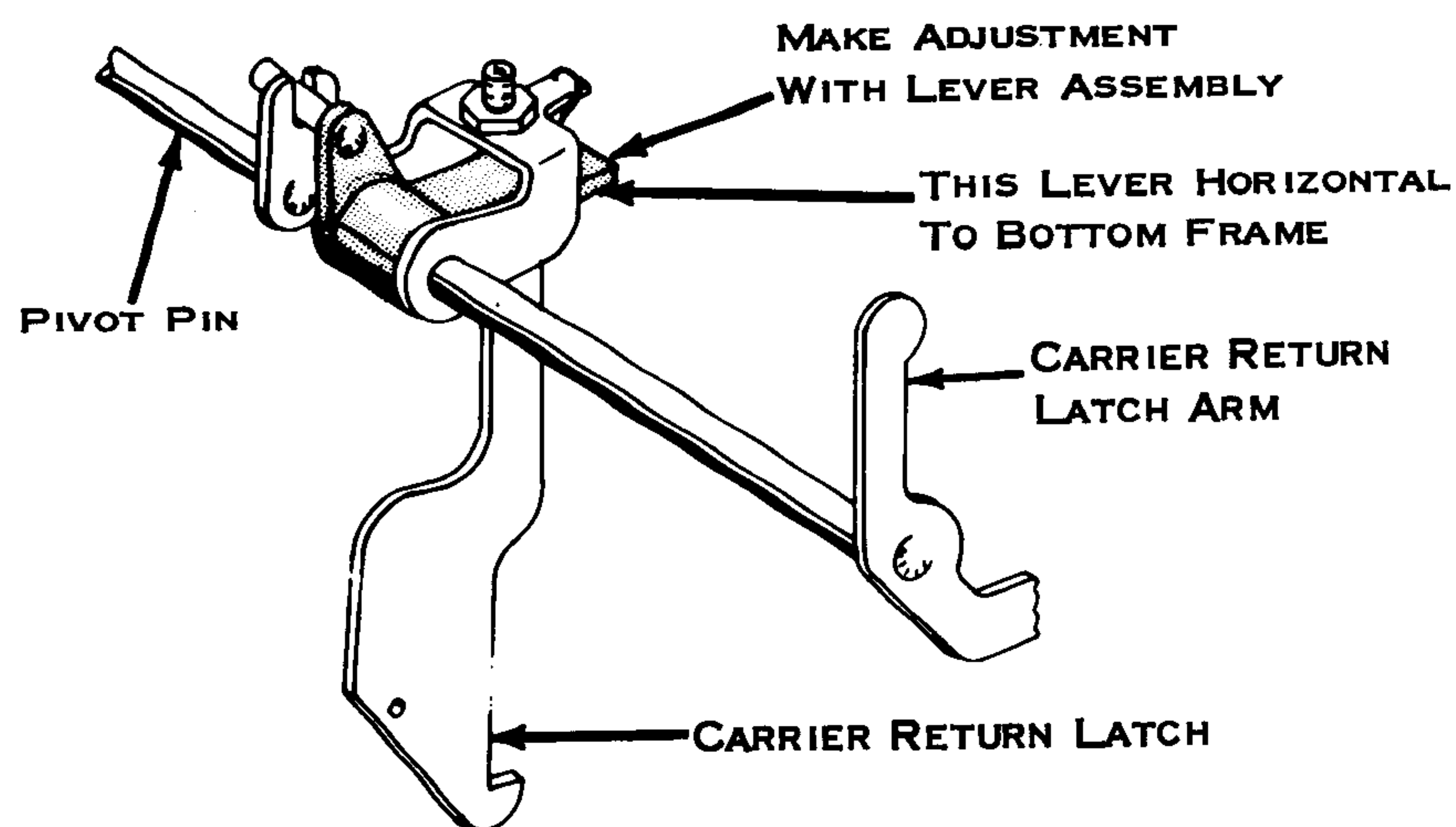


Figure 180. Lever Assembly, 15" Machine

- Carrier Return Shoe (Fig. 181) - The carrier return actuating arm bracket should be positioned left or right so that the carrier return shoe overlaps the last three coils on the right hand end of the clutch spring.

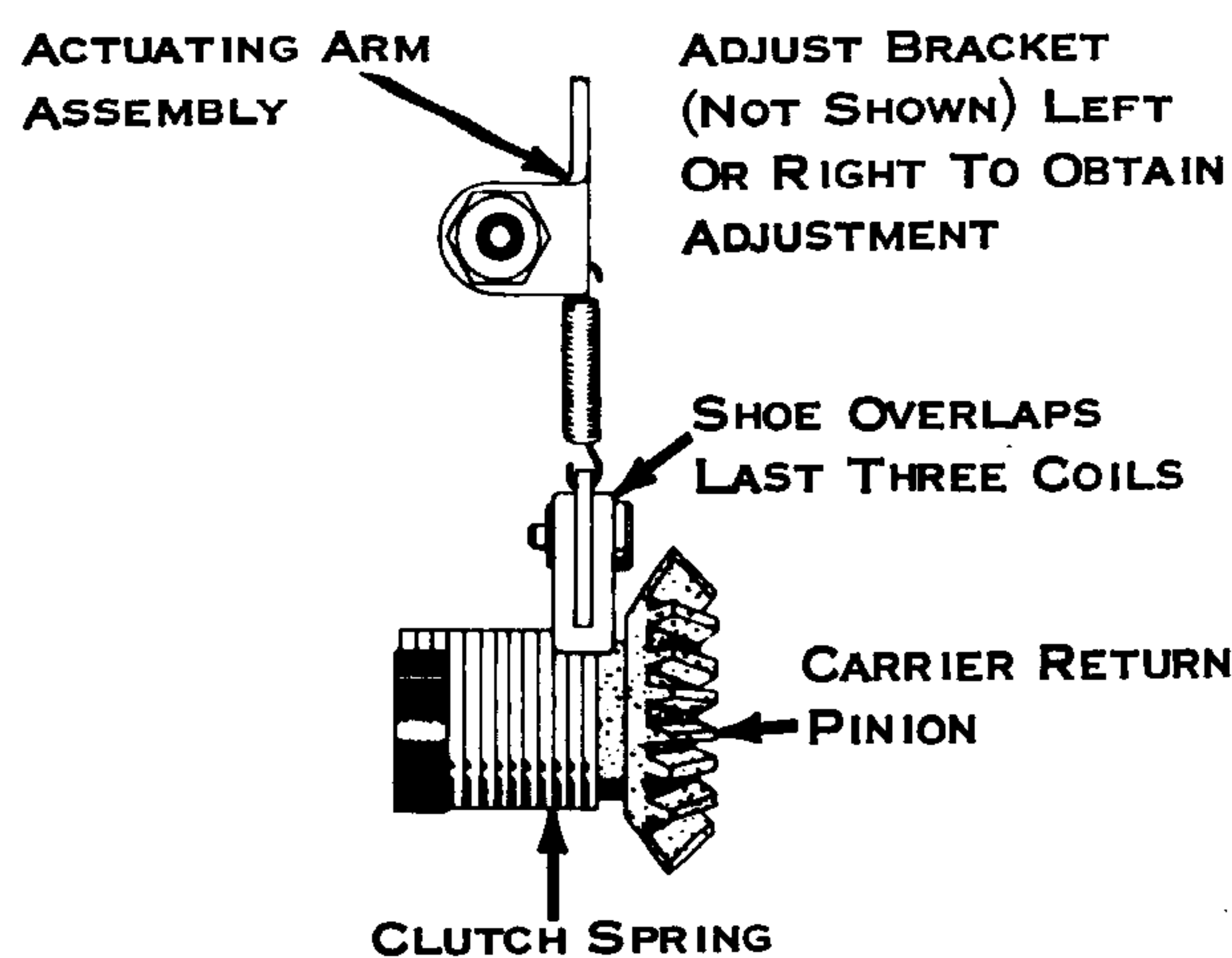


Figure 181. Carrier Return Shoe

- Carrier Return Actuating Arm (Fig. 182) - Adjust to provide a clearance of .010" to .020" between the shoe and the clutch spring with parts at rest.

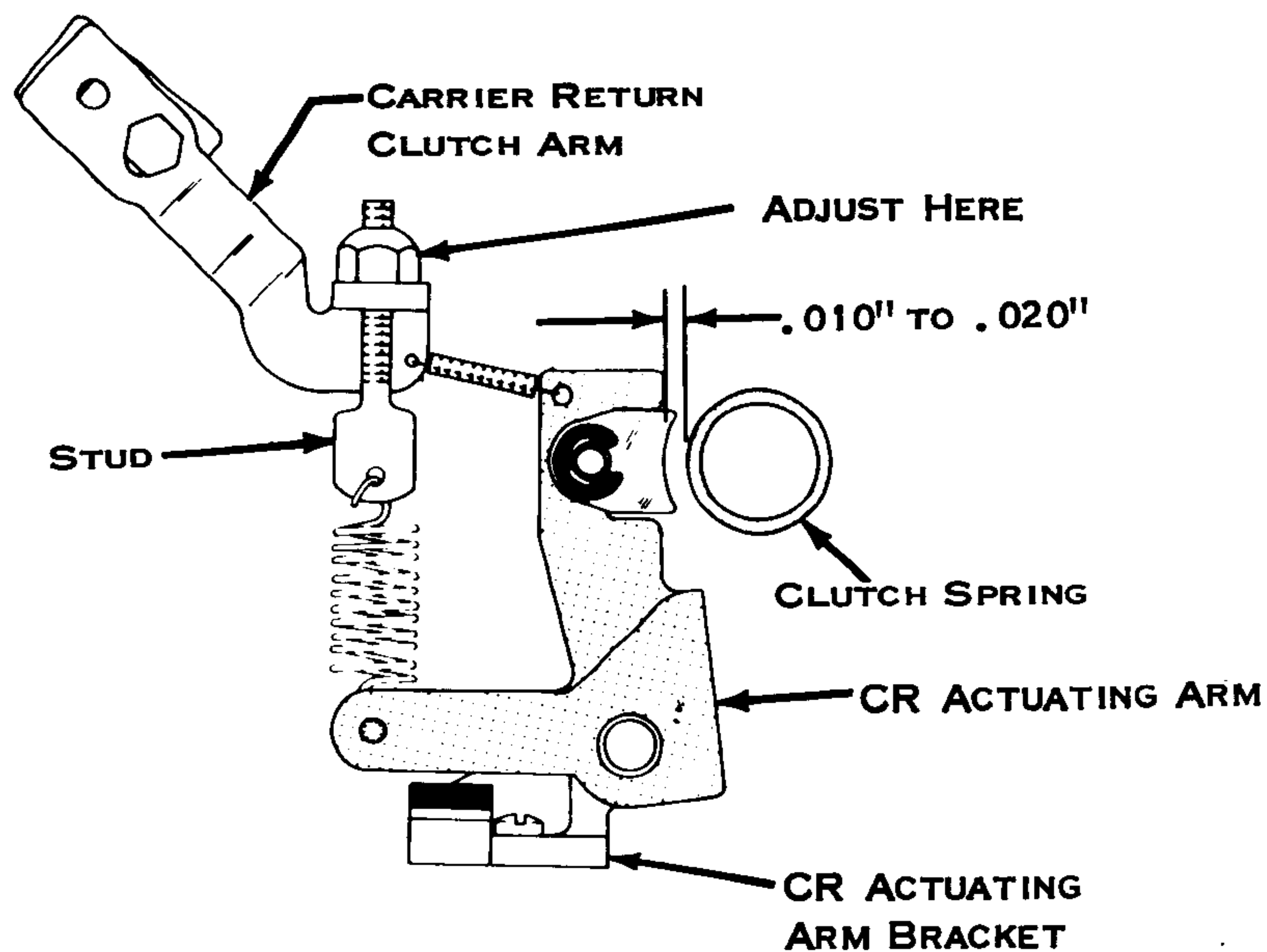


Figure 182. Carrier Return Actuating Arm

- Overbank (Fig. 183) - Adjust the left hand margin rack bushing so that when the carrier is held fully to the left against the margin stop, a clearance of .003" to .008" will exist between the working surface of the escapement pawl and the escapement rack tooth. This adjustment can be made by obtaining .026" to .035" (with carrier

at rest) between the left margin rack bushing and the margin rack.

NOTE: All machines with the new margin rack plate (Fig. 186) will not require this adjustment.

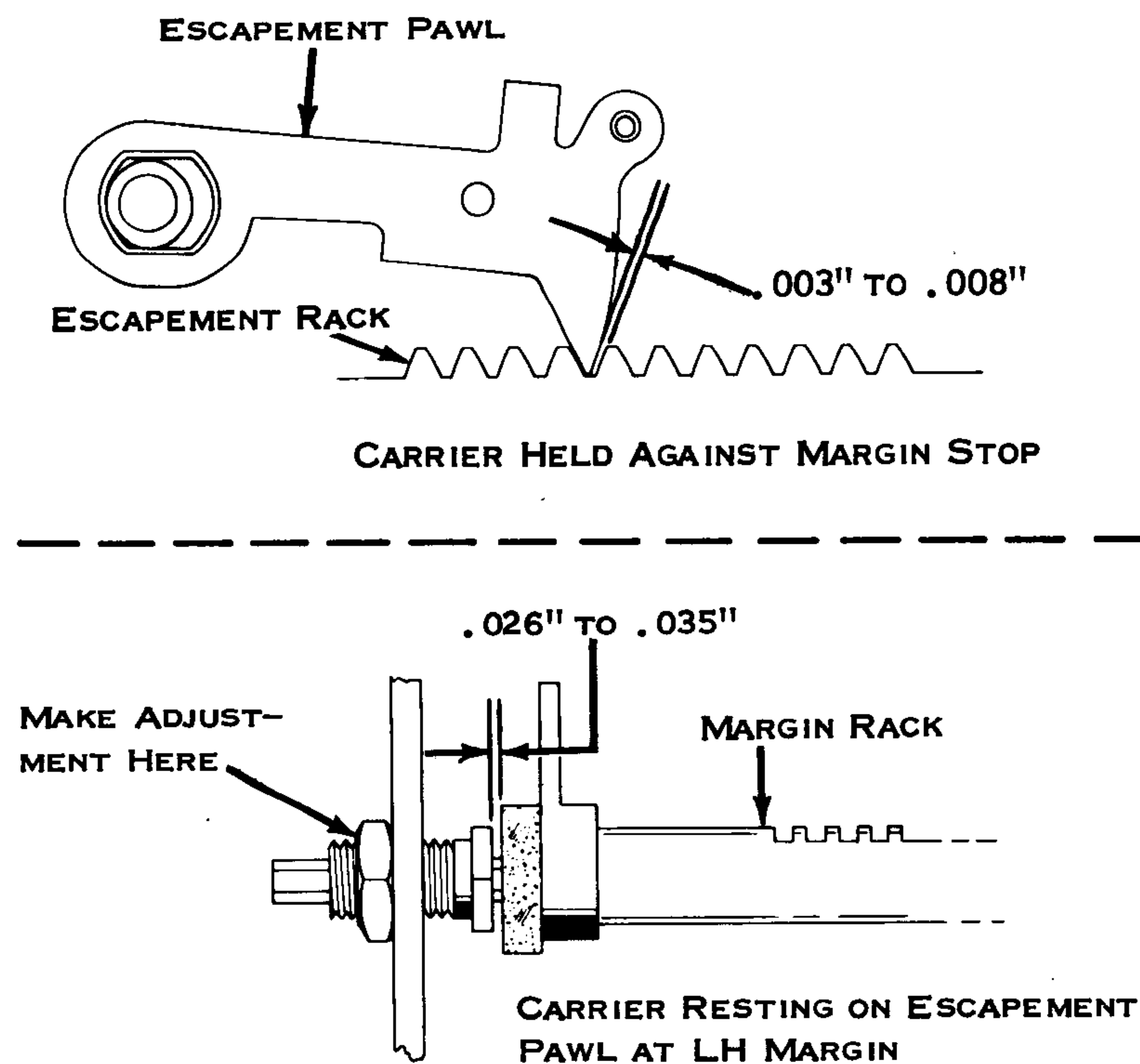


Figure 183. Overbank

- Clutch Unlatching Link (Fig. 184) - Adjust so that when the margin rack is held fully to the left against the bushing, the carrier return latch keeper will clear the latch by .005" to .015" at the unlatching point.

NOTE: Any change in the overbank will directly effect the unlatching adjustment.

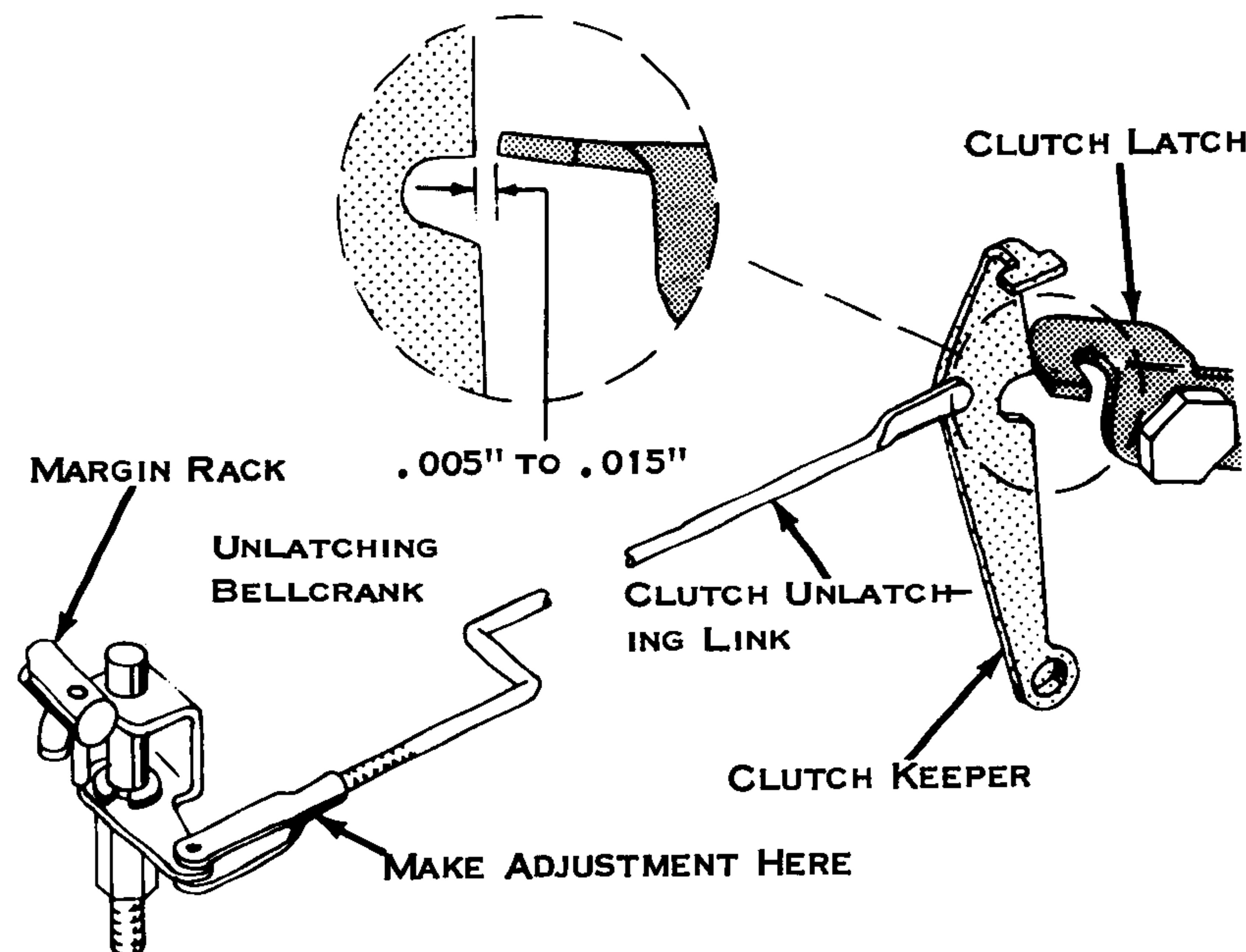


Figure 184. Clutch Unlatching Link

- Torque Limiter - The eccentric stud in the torque limiter hub should be adjusted so that the torque limiter transmits 1/2 to 1-1/2 pounds pull on the carrier as the carrier is unlatching the clutch at the left margin.

NOTE: The carrier return clutch arbor should provide an end play of .004" to .006" between the torque limiter hub and the C-clip on the operational shaft.



10. Carrier Return Interlock Contact -

- Form the N/C support so that the O/S lifts the N/C contact .002" to .005" (Fig. 185A).
- Form the N/O support so that the O/S clears the N/O contact .035" to .045" (Fig. 184).
- With the carrier return clutch latched, position the mounting bracket so that the N/O contact rises .010" to .020" from the N/O support (Fig. 185B).

NOTE: The N/O contacts must remain closed during return of the carrier to the left margin.

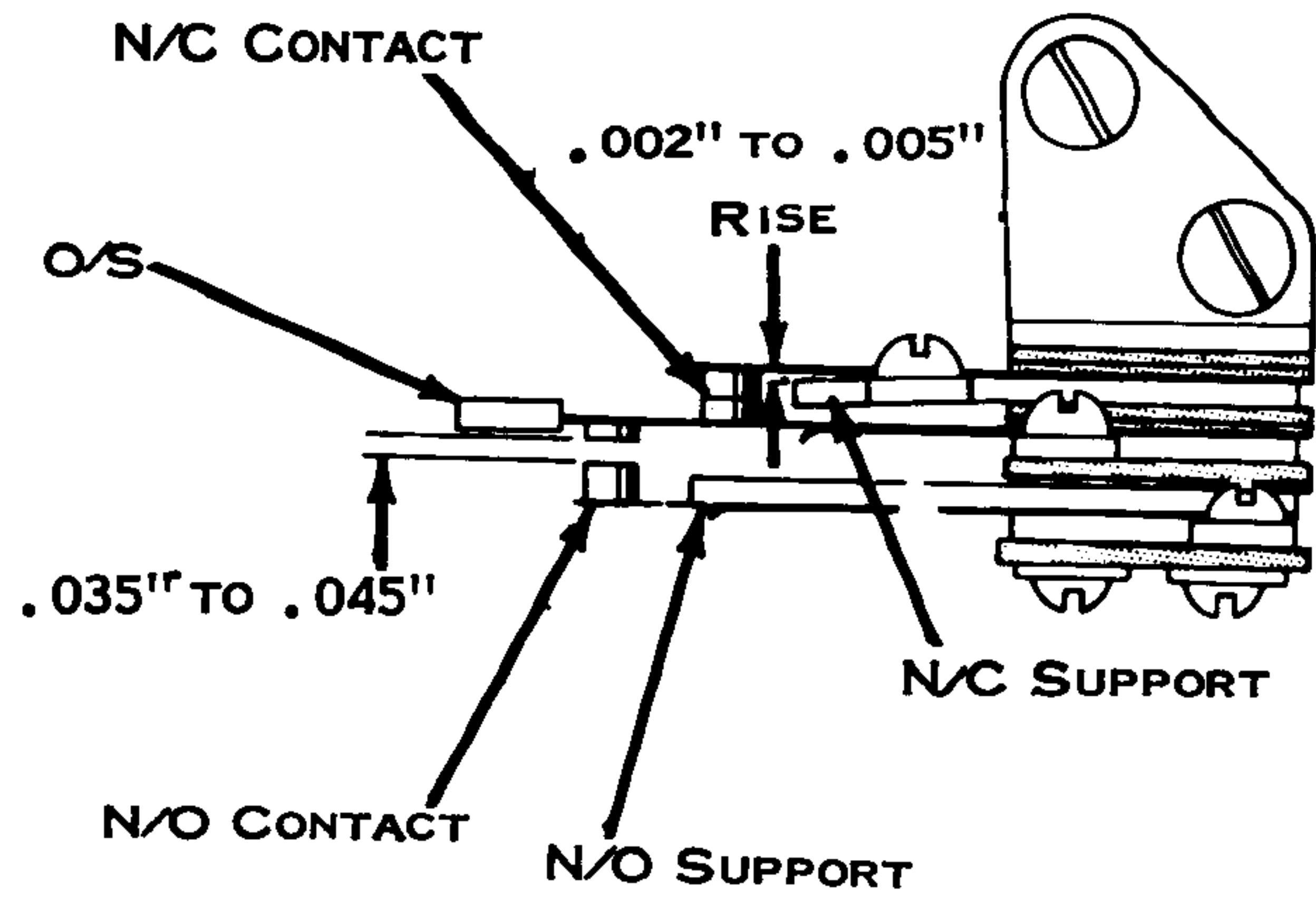


Figure 185A. Carrier Return Interlock Inactive

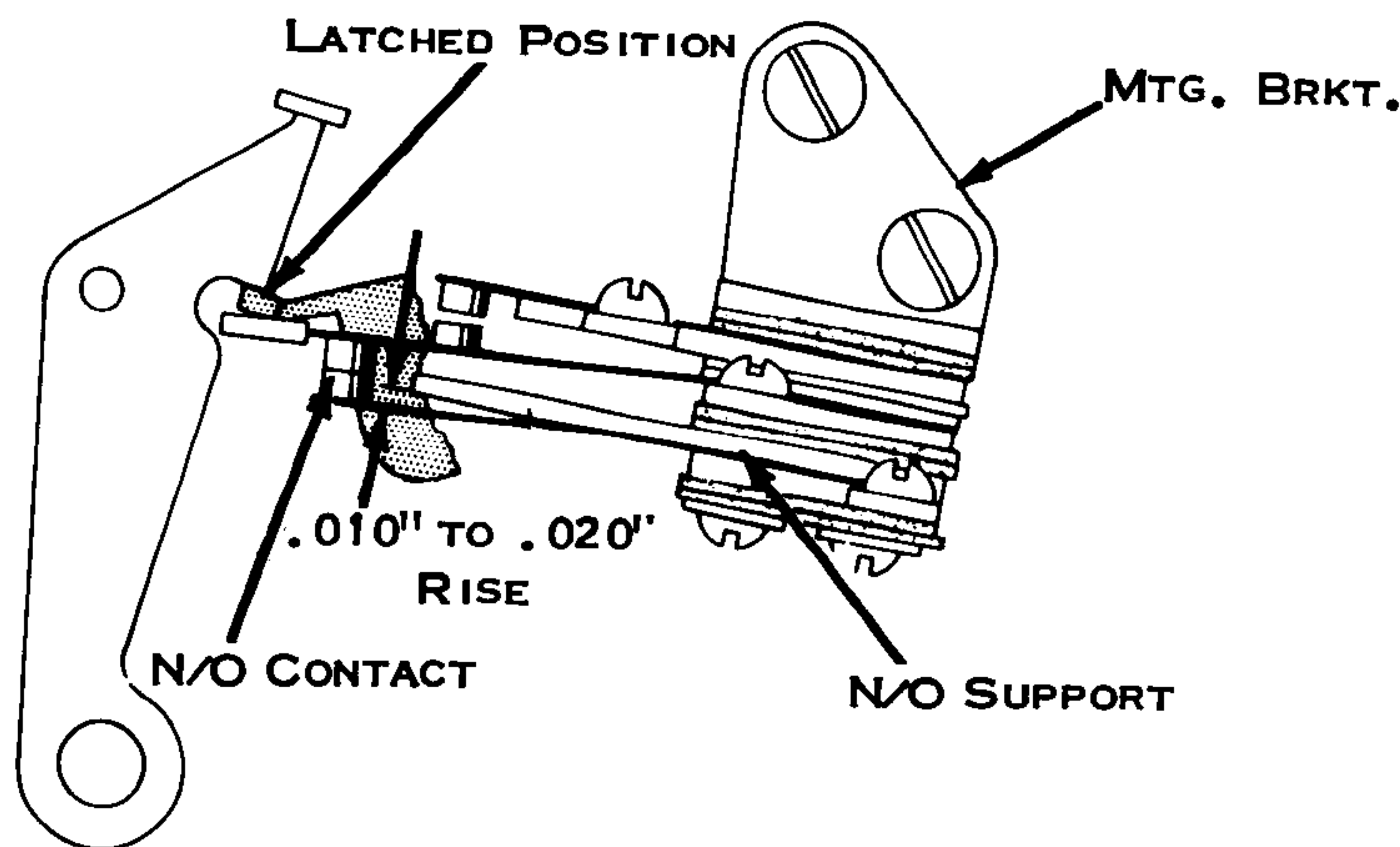


Figure 185B. Carrier Return Interlock Active

MARGIN CONTROL MECHANISM

- Margin Release - The margin release lever should be adjusted so that the margin rack is level when at rest.
- Margin Rack Plate (Fig. 186) - The plate on the right end of the margin rack should be adjusted to obtain .001" to .005" clearance between the margin stop and the margin stop latch on the carrier (Fig. 187).

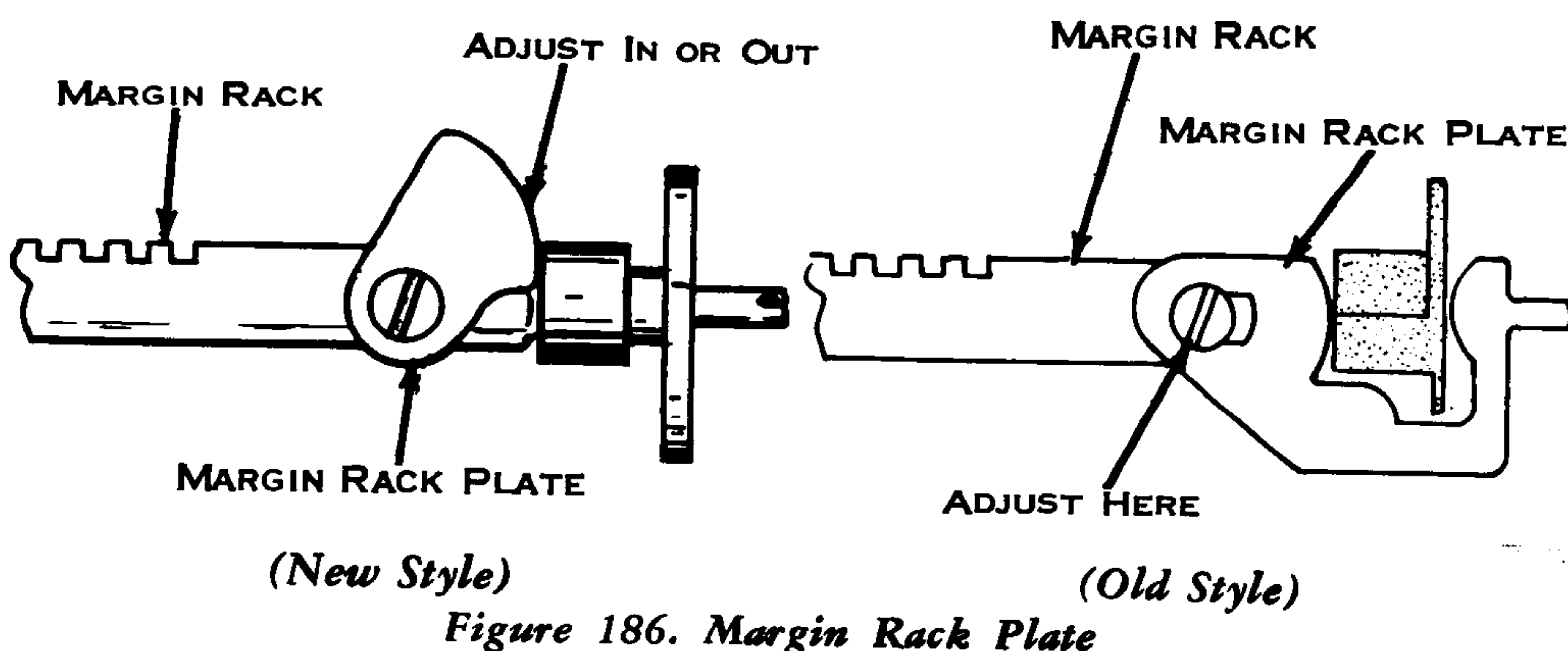


Figure 186. Margin Rack Plate

NOTE: The carrier must be allowed to rest at the left margin position when the adjustment is observed.

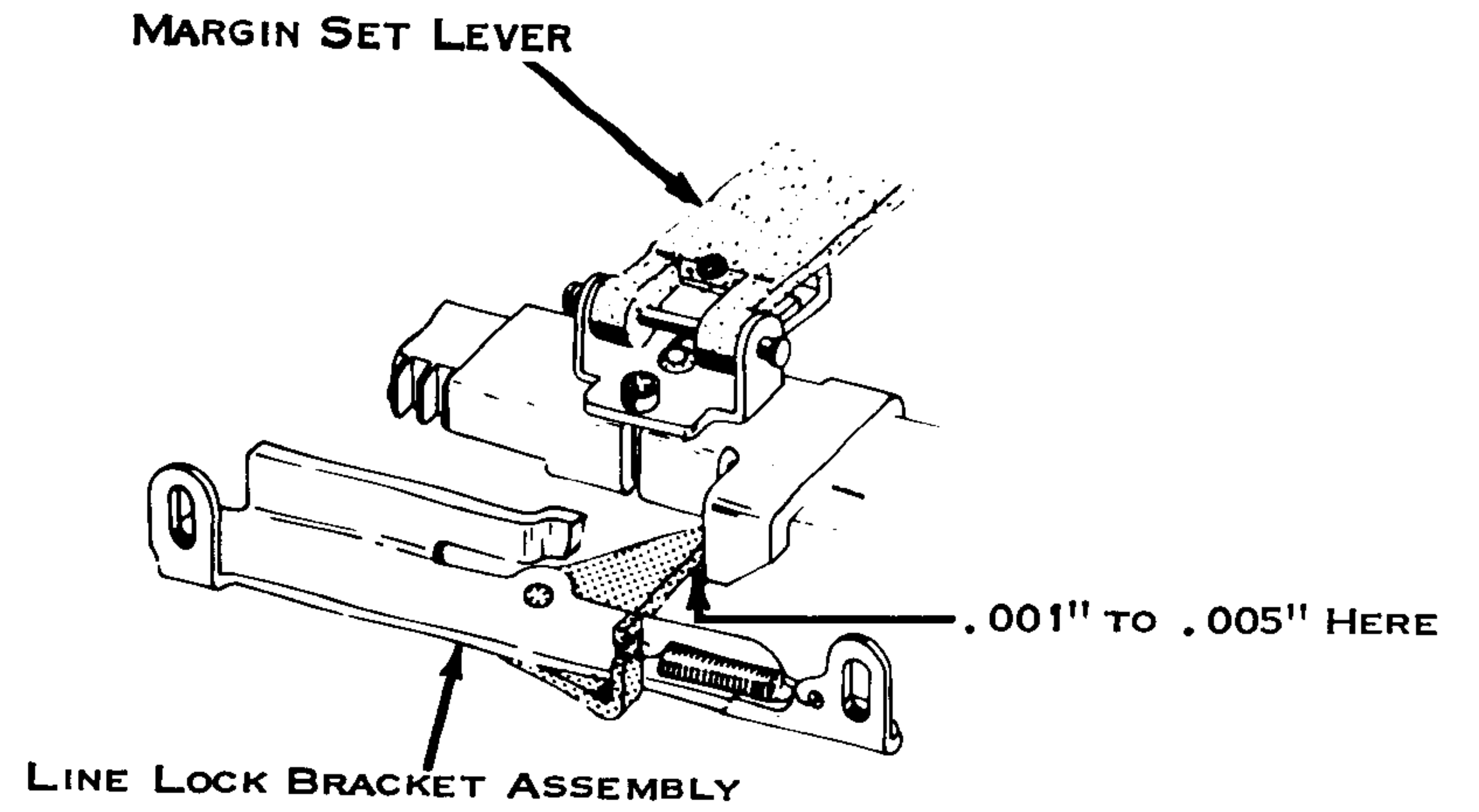


Figure 187. Adjust Margin Rack Plate For This Condition

- Margin Final Stop (Fig. 188) - The lug of the final stop should be adjusted to obtain a clearance of .001" to .010" between the final stop and the margin stop with the margin stop fully seated in the extreme left tooth of the margin rack.

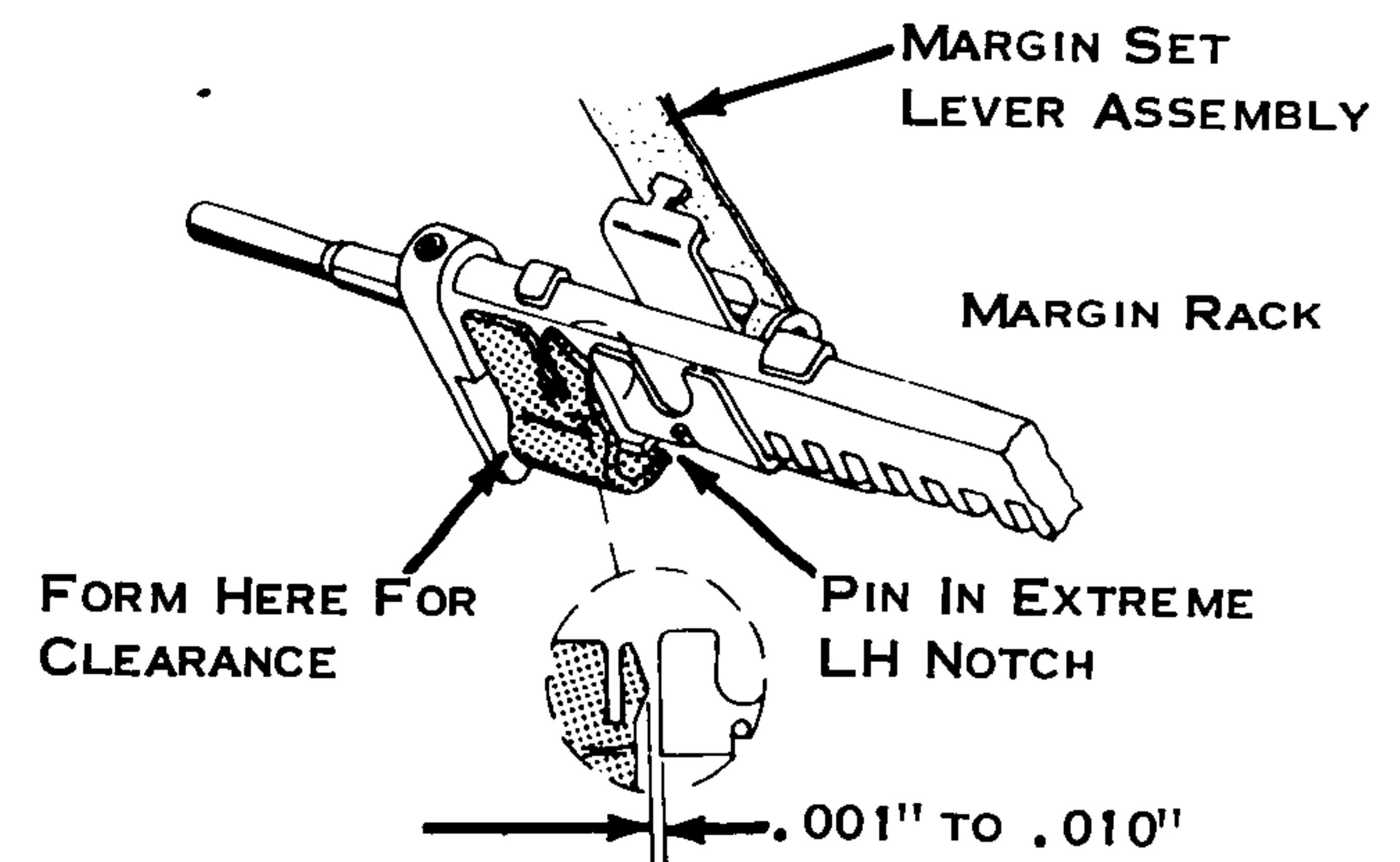


Figure 188. Margin Final Stop

4. Bell Ringer Bail Stop -

- Machines Without Bell - The bail stop located at the right end of the bail should be adjusted so the bellringer bail is not moved until the bellringer bellcrank begins to rise on the final ramp of the line lock bracket.
- Machines With Bell - Adjust so the bellringer bail clears the bellringer bellcrank by .005" to .020" with the bellringer bellcrank held counterclockwise. On old style machines, the bail stop is on the right end of the bail. On new style (Fig. 189) adjust by positioning bell bail lever with respect to the bellringer bail.

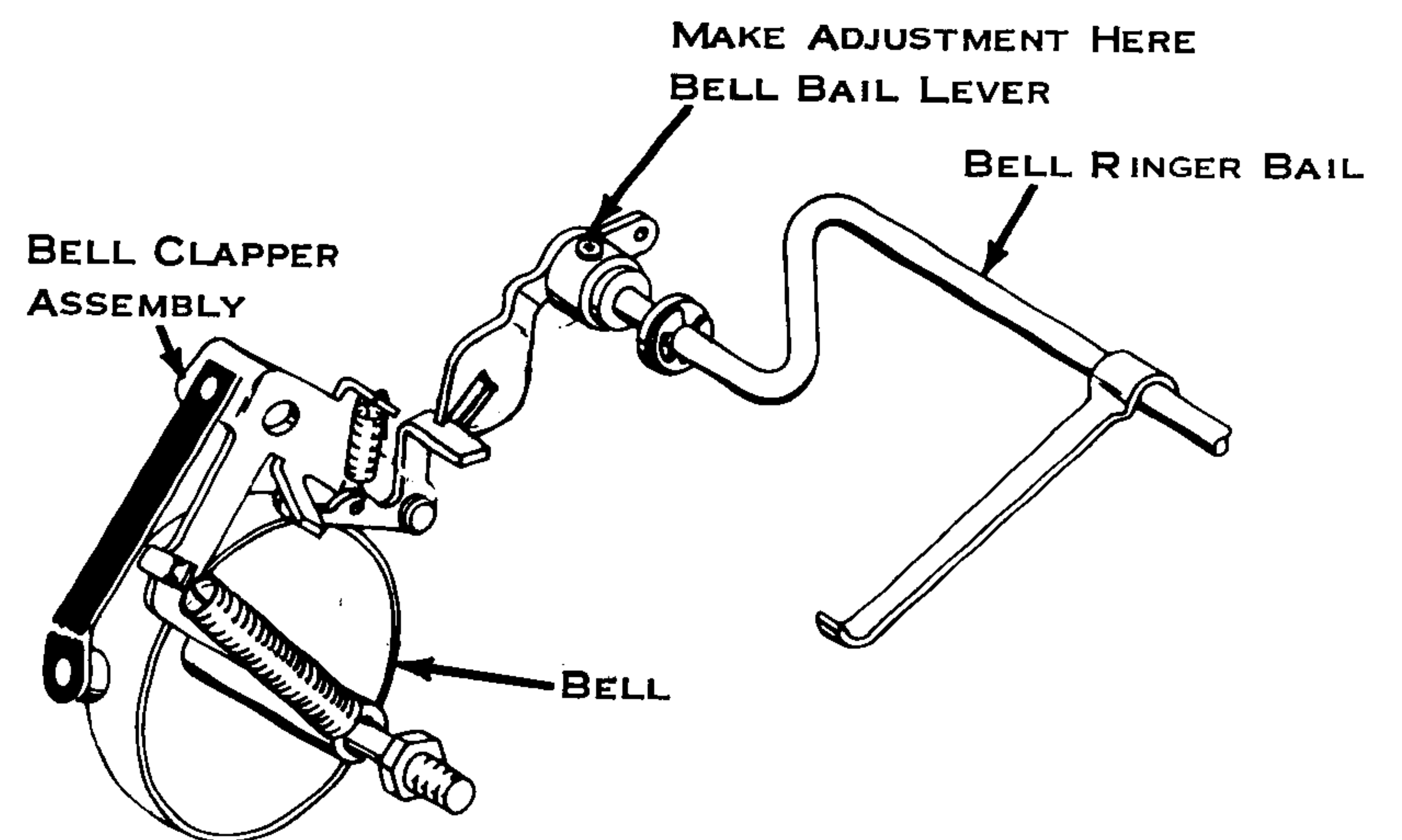


Figure 189. Bellringer Bail (New)



5. Line Lock Bracket - The line lock bracket should be adjusted up or down so that the bellringer bellcrank will contact the middle of the camming surface on the bracket.
6. Bell Clapper Bellcrank Lever (Fig. 190) - The lug on the bell clapper bellcrank should be formed so the bell will ring one space before the bellringer bellcrank moves on the front surface of the line lock bracket.

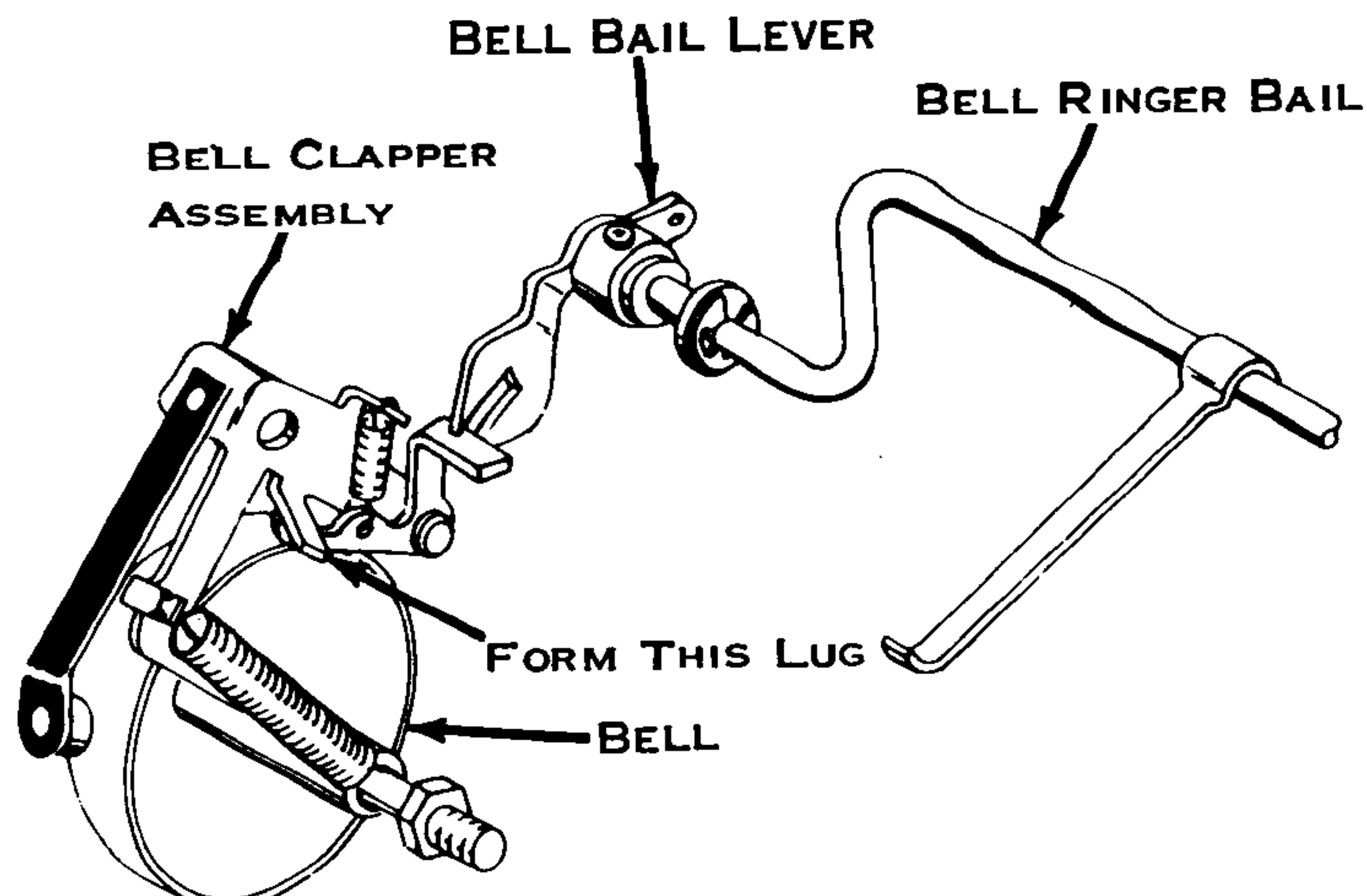


Figure 190. Bell Clapper Bellcrank Lever (New)

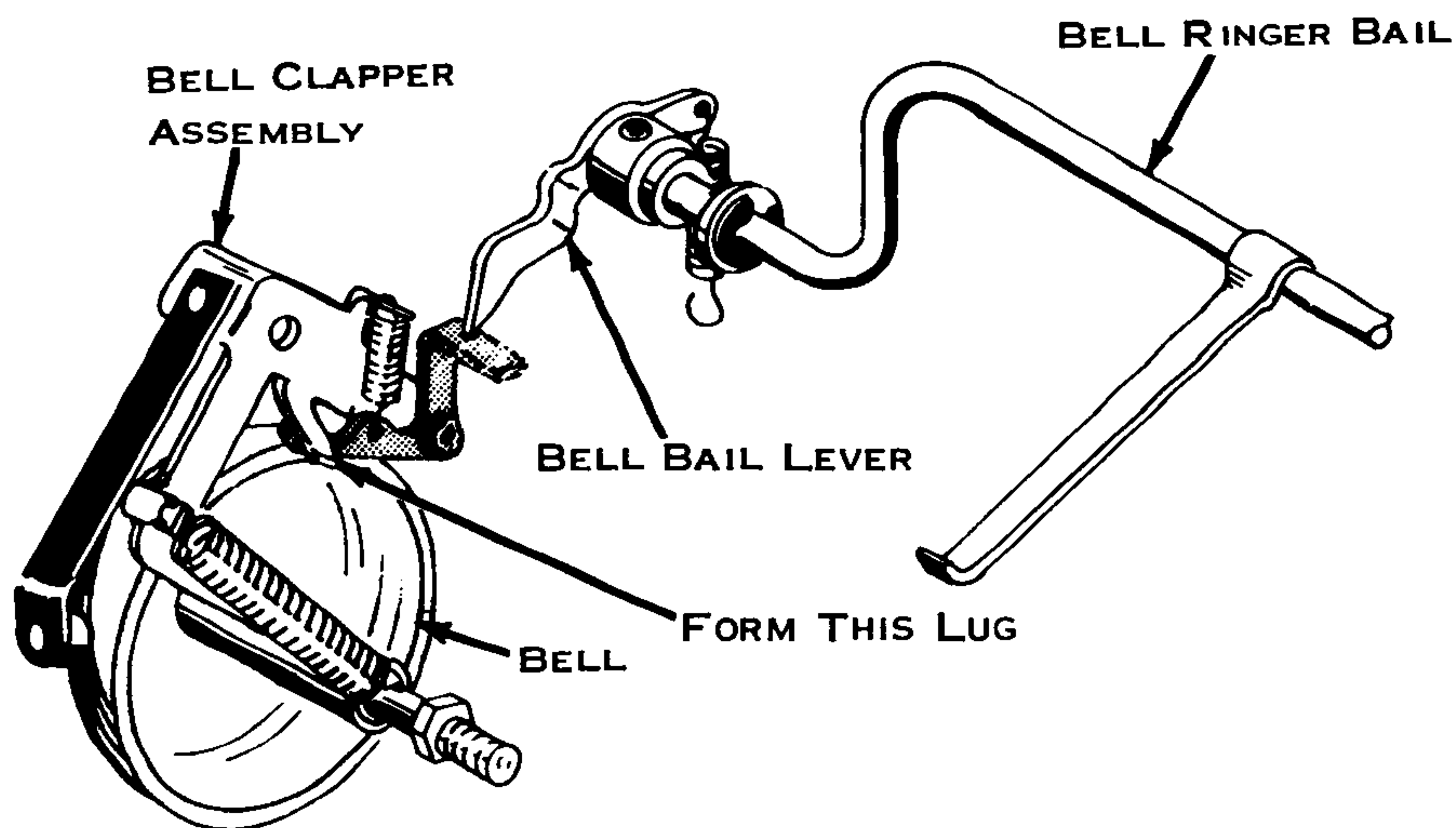


Figure 190. Bell Clapper Bellcrank Lever (Old)

7. Bell Ringer Bail Lever, Old-Style (Fig. 191) - The lever at the left end of the bail should be adjusted to have .005" to .020" clearance between the bell clapper bellcrank lever and bell bail lever when the bail is at rest against its stop.

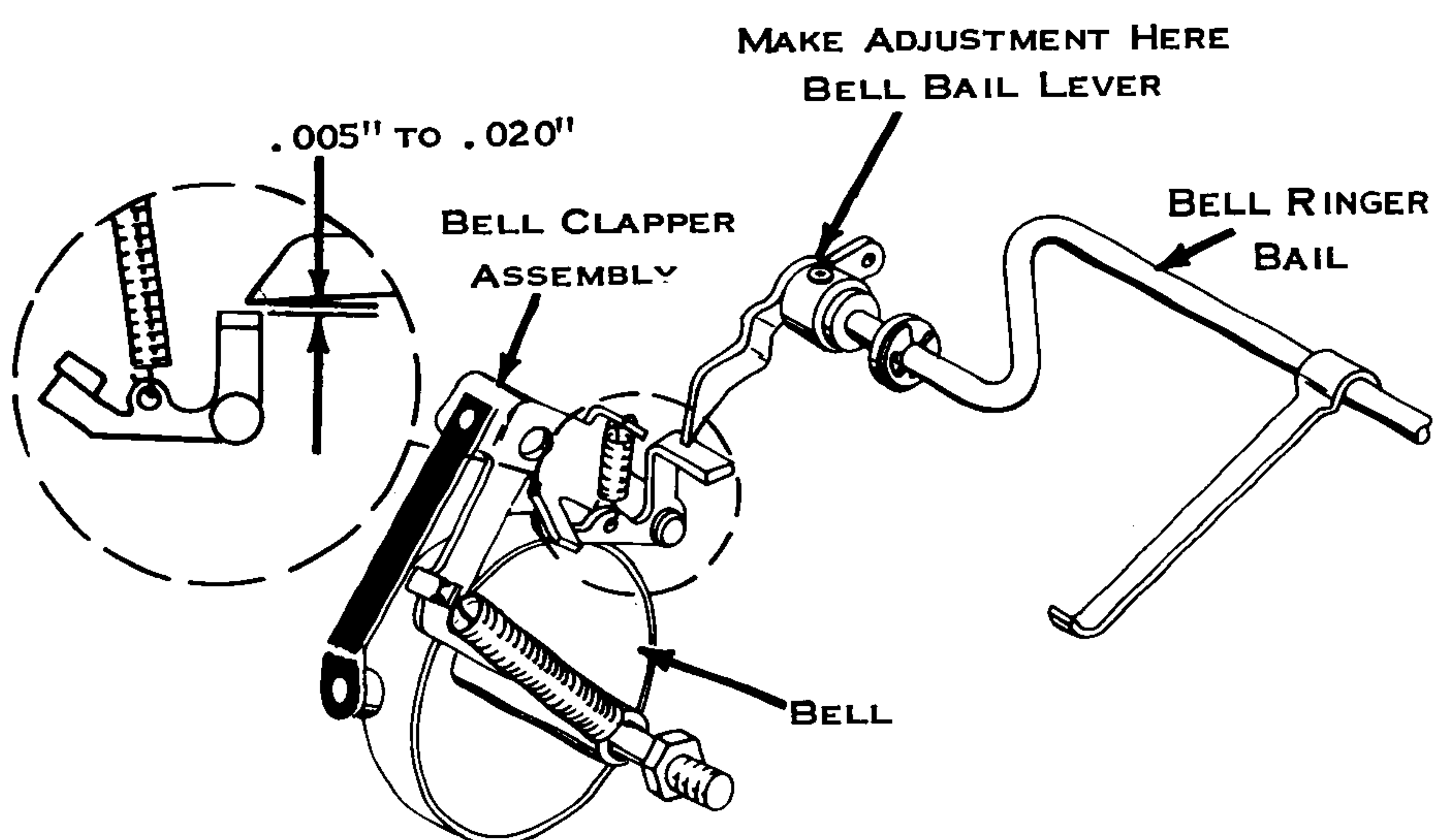


Figure 191. Lever (OLD)

8. Line Lock Bracket Adjustable Plate (Fig. 192) - Position, with the carrier in the next to last space, to a point where the inclined surface just begins to deflect the bellringer bellcrank.

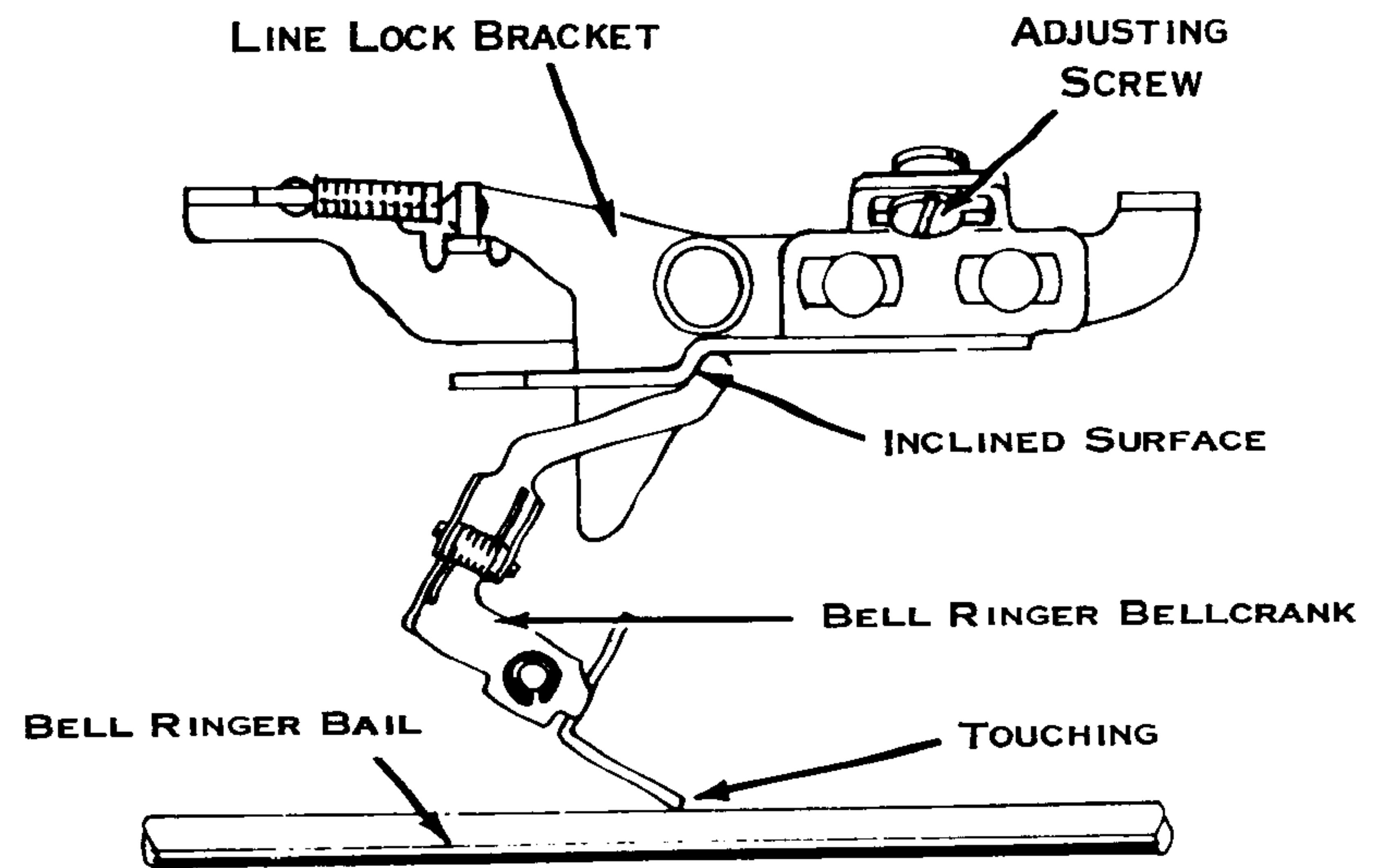


Figure 192. Line Lock Bracket

9. Line Lock (193) - The line lock actuating arm should be formed on the bellringer bail so that as the line lock interposer is fully depressed, the carrier pointer is in line with the mark on the right margin stop.

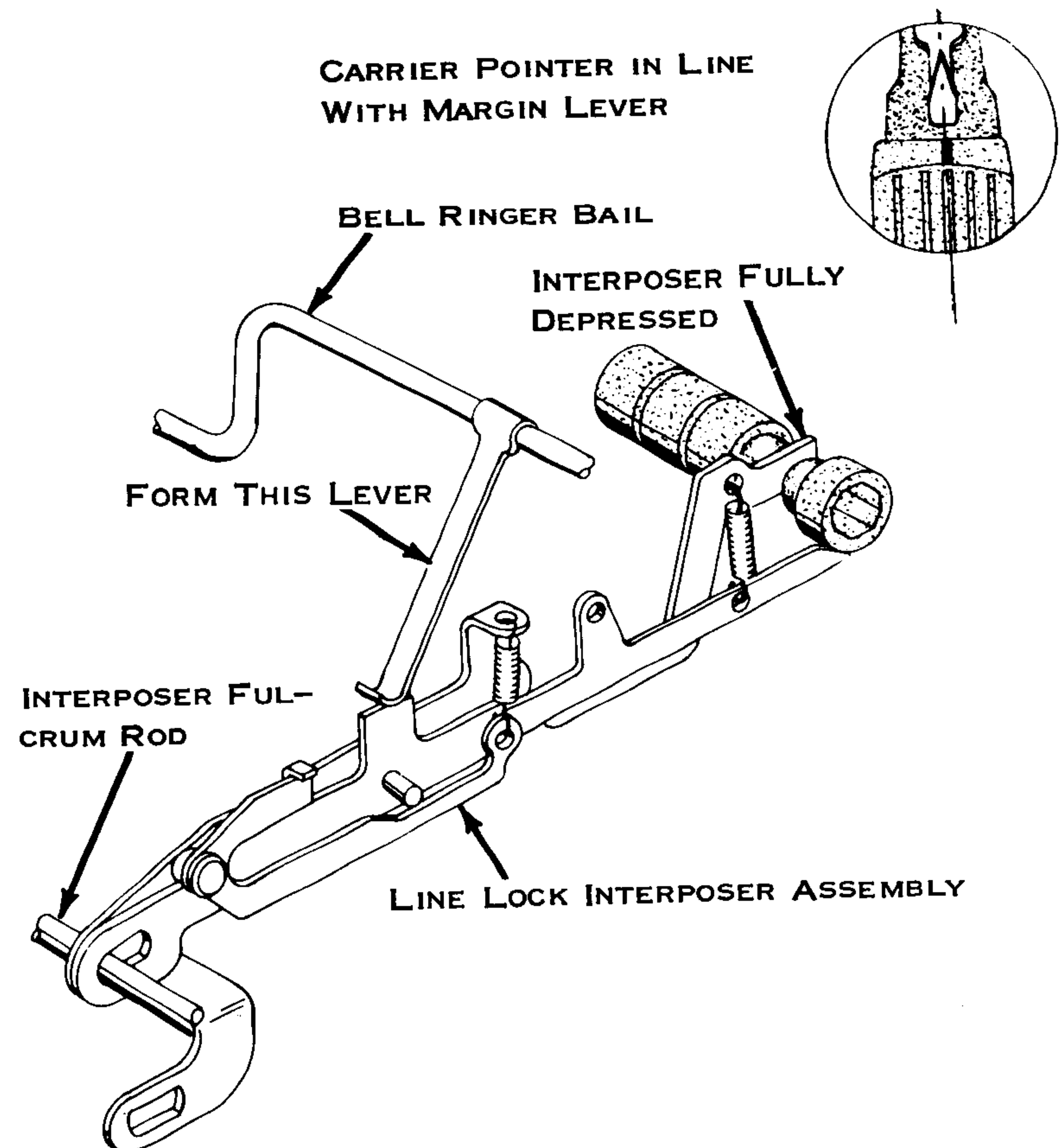


Figure 193. Line Lock

10. End of Line Contacts (Fig. 194) -
  - a. Form the N/C support so that the O/S (at rest) produces a slight rise of the N/C contact.
  - b. Form the N/O support so that the N/O contact clears the O/S by .020" to .030".
  - c. Position (carrier in next to last space) the contact actuator on the bellringer bail so that it just touches the O/S. When positioning the actuator, all back lash must be held out of the actuator to line lock bracket linkage.

NOTE: To place the carrier in the next to last space, proceed as follows;

- (1) Space to the right until the right hand margin setting locks the key board.
- (2) Backspace two spaces.



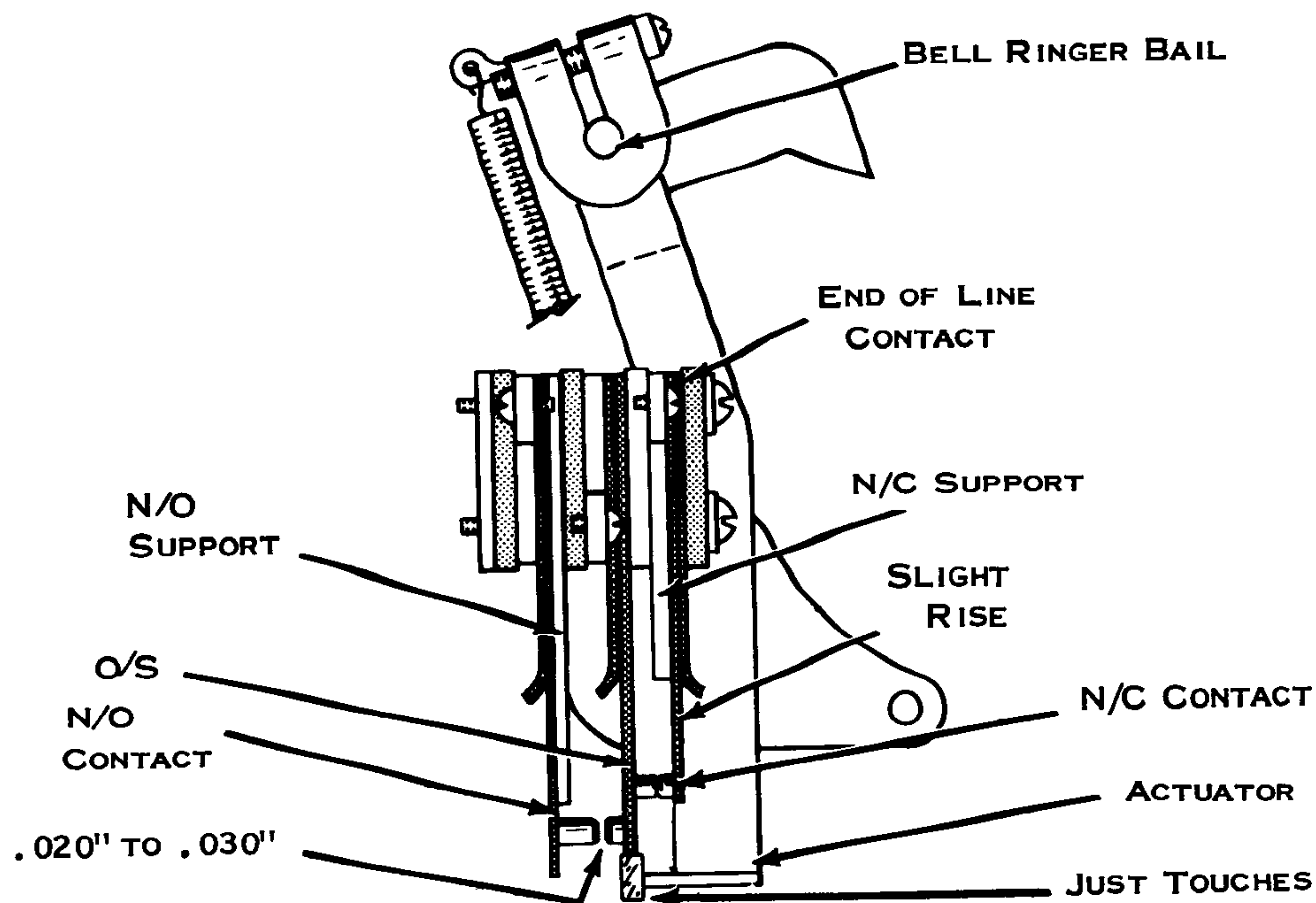


Figure 194. End Of Line Contact Adjustment

d. As the carrier moves from the next to last to last space, check for the following conditions (Fig. 195):

- (1) The contact transfer must be complete (and without bounce) within one space.
- (2) N/C contact must break.
- (3) O/S must lift the N/O contact sufficiently to insure reliable make.

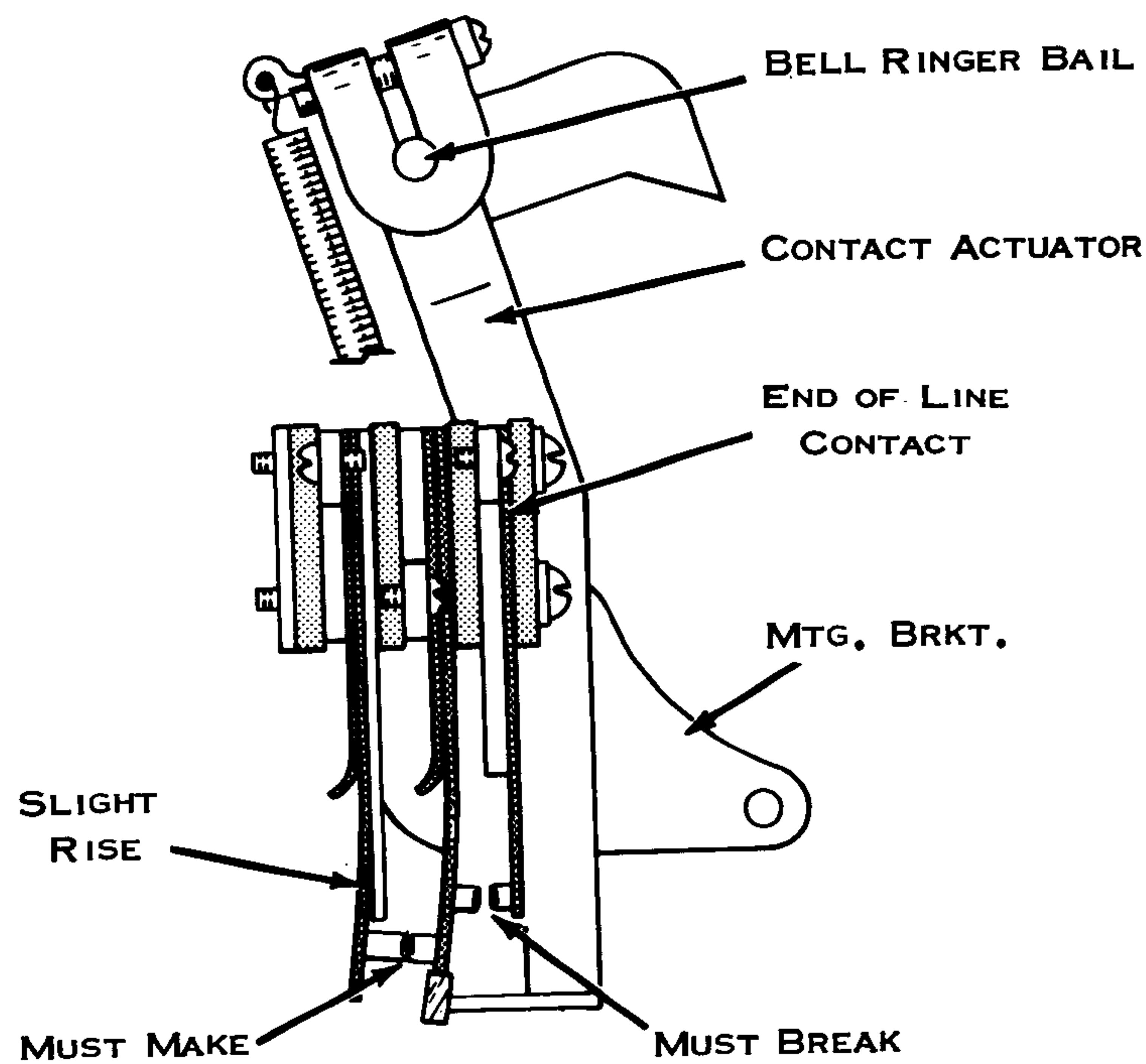


Figure 195. End Of Line Contact Adjustment

#### PAPER FEED MECHANISM

1. Paper Release (Fig. 196) - The feed roll release arm should be adjusted to obtain a release clearance of .055" to .065" between the rear feed rolls and the platen.

NOTE: The clearances can be equalized at both ends by adjusting either the left or right feed roll release lever.

2. Paper Bail Shaft - Position the bail shaft in the right hand bail arm so that each arm can be pulled forward the same distance from the platen before the entire bail begins to move.
3. Bail Stop - The lugs that stop the backward movement of the paper bail arm should be formed to obtain a .005" to .010" clearance between the lug and the bail arms when the copy control lever is at the extreme rear position.
4. Platen Variable - The left hand platen knob should be adjusted left or right so that the variable is disengaged after one half the travel of the knob toward the right.

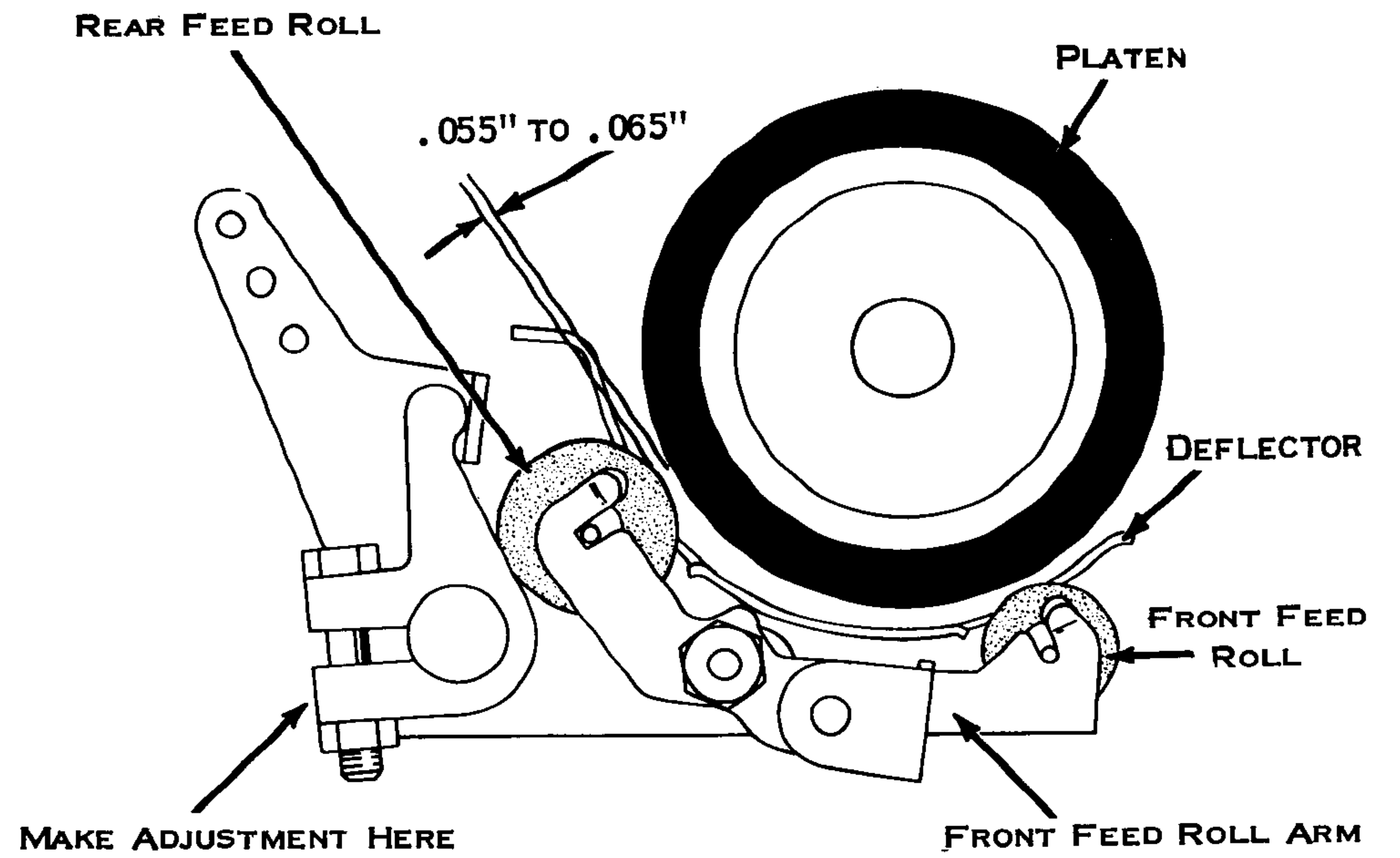


Figure 196. Paper Release

5. Line Gage Card Holder - The line gage card holder should be adjusted forward or back for a .005" to .010" clearance with the platen. The vertical adjustment should be such that graduated edge is parallel to and .002" to .005" below the feet of the typed character when viewed from the operator's position. The card holder should be adjusted left or right so that the point of a letter "V" will align with the mark in the middle of the line gage card holder loop.

NOTE: On Pin Feed Platen machines, the graduations on the left hand card holder should be lined up with the bottom of a series of V's.

6. Paper Feed Braces and Supports (Fig. 197) - The adjustable braces that connect the carriage tie rods to the feed roll actuating shaft should be adjusted as long as possible without deflecting either rod. With the feed roll tension springs disconnected, the supports for the carriage tie rods and feed roll actuating shaft should be adjusted to just touch the bottom of each shaft. The tension springs should be placed in the hole that will provide 3-1/4 pounds for the 11" and 2-3/4 pounds for the 15" machine on the front feed rolls.
7. Paper Feed Mounting Arm (Fig. 197) - The right hand paper feed mounting arm should be adjusted left or right so that the rear feed roll has an end play of .015" to .030" when the feed roll is against the platen.

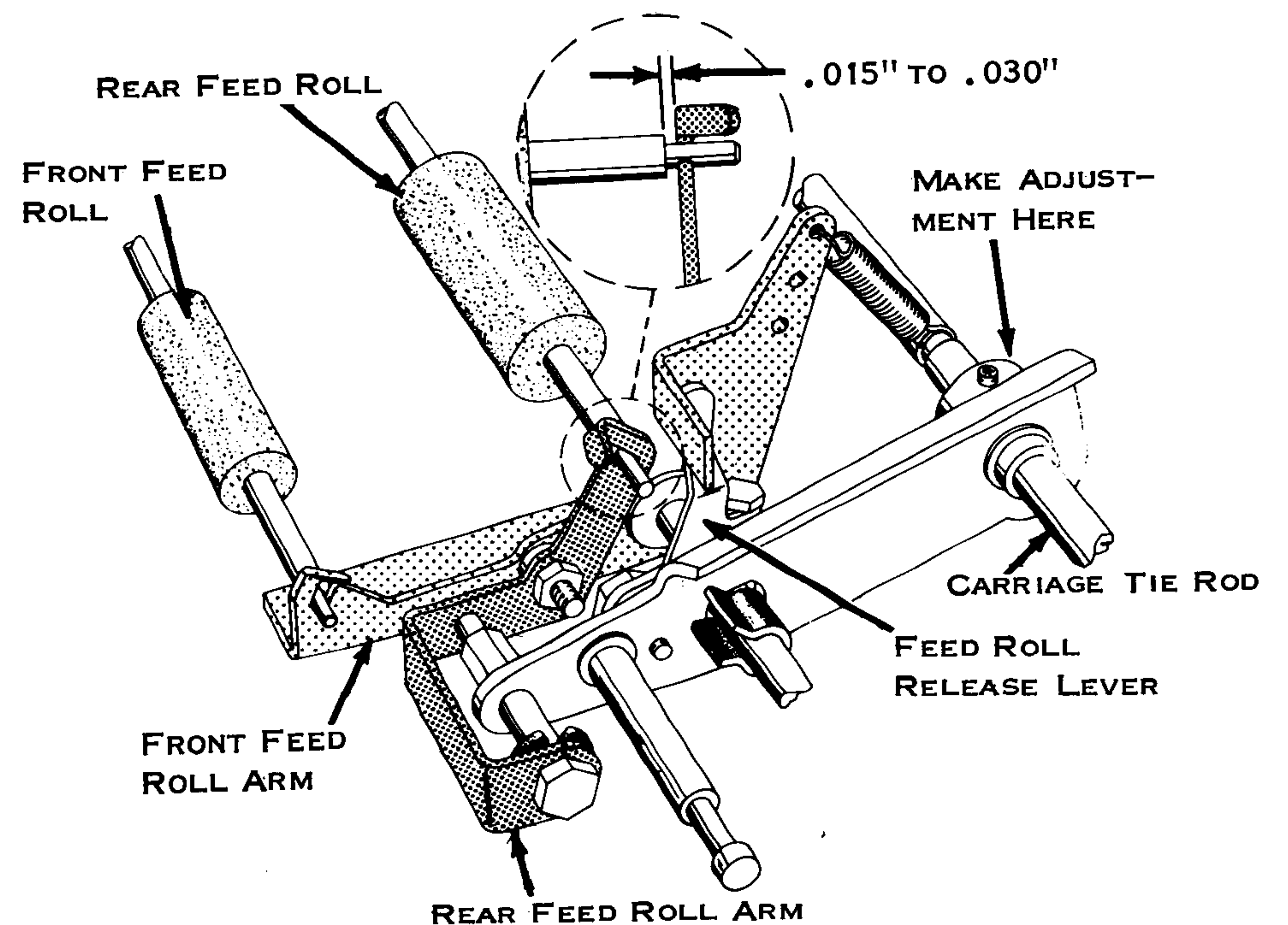


Figure 197. Paper Feed Mounting Arm

8. Feed Roll Adjustment -
  - a. Front Feed Roll Adjusting Arm, New-Style (Fig. 198) - Adjust so that when two data cards are placed between the front feed rolls and the platen, there is a clearance between the rear



feed rolls and the platen. When one data card is placed between the front feed rolls and the platen, no clearance between the rear feed rolls and the platen should exist.

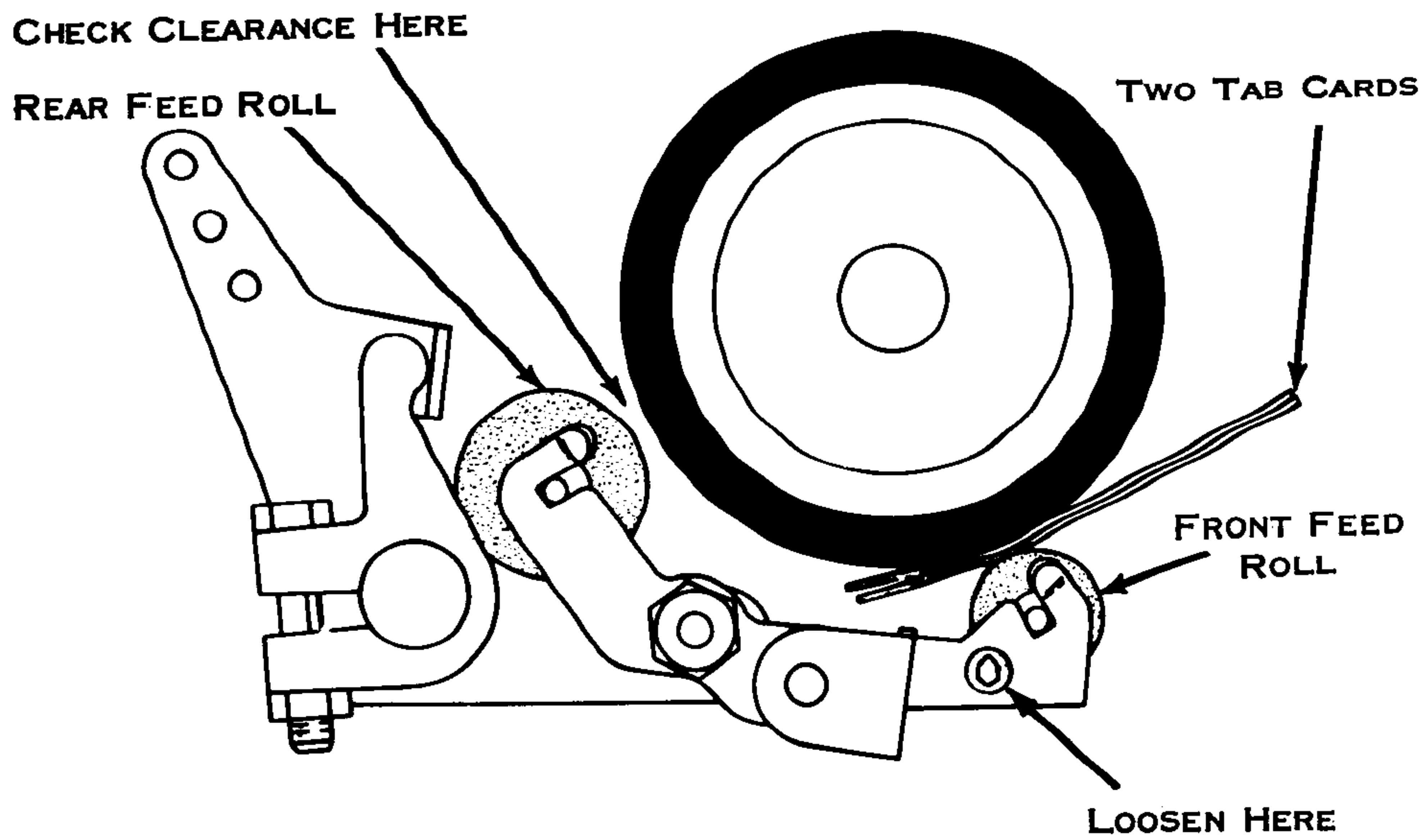


Figure 198. Feed Roll Adjusting Arm (New Style)

- b. Feed Roll Adjusting Eccentrics, Old-Style (Fig. 199) - The eccentrics (high point to the rear) should be adjusted so that three data cards inserted between the platen and the rear feed roll will cause a clearance of .008" to .012" between the front feed roll and the platen. Clearance should be equal (within .002") on both ends.

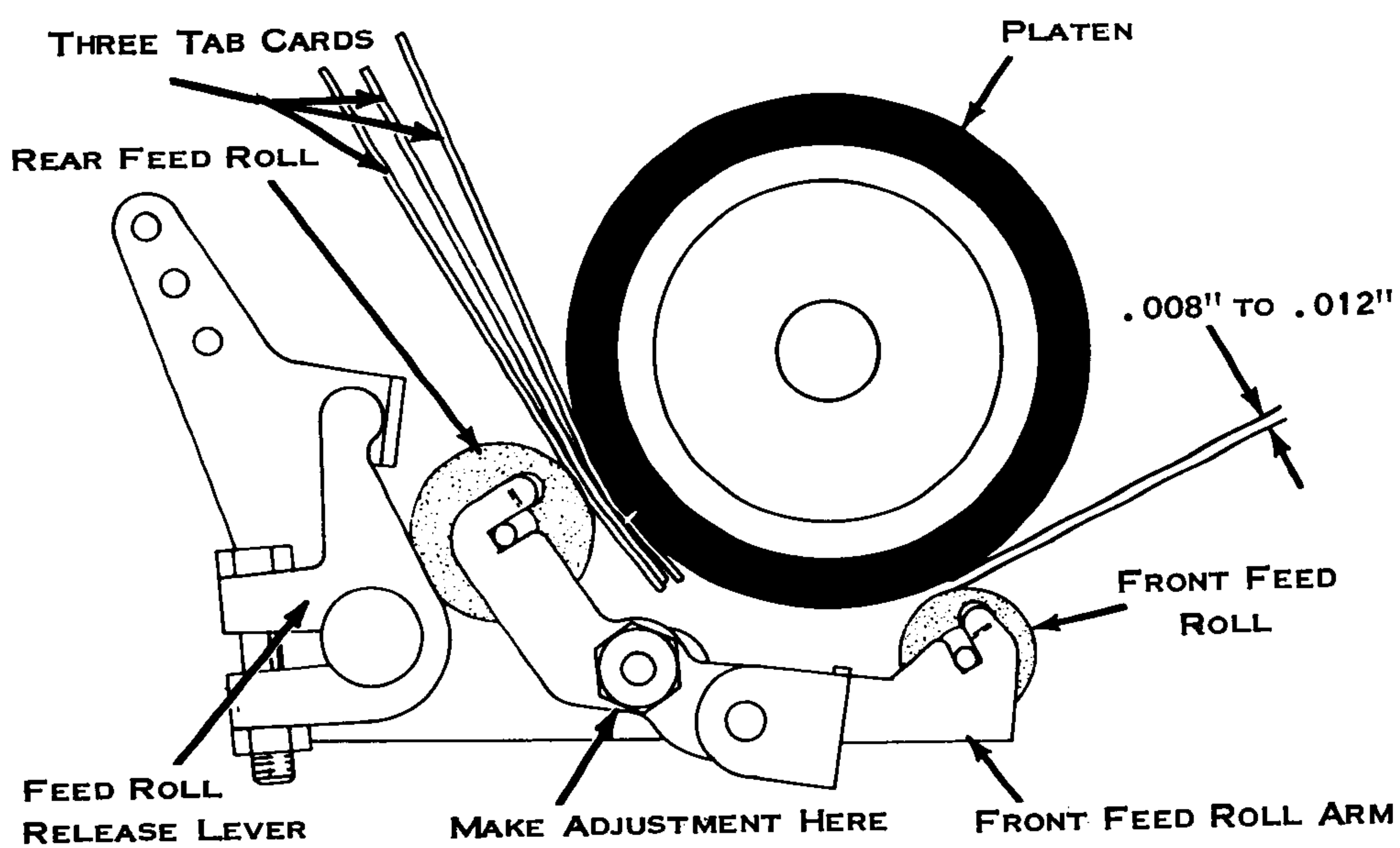


Figure 199. Feed Roll Adjusting Eccentrics (Old Style)

9. Deflector (Fig. 200) - The deflector should clear the platen by the thickness of two data card strips at the front and by the thickness of one strip of 20# bond paper at the rear. The support lugs on the front and rear feed rolls should be formed to obtain this adjustment.

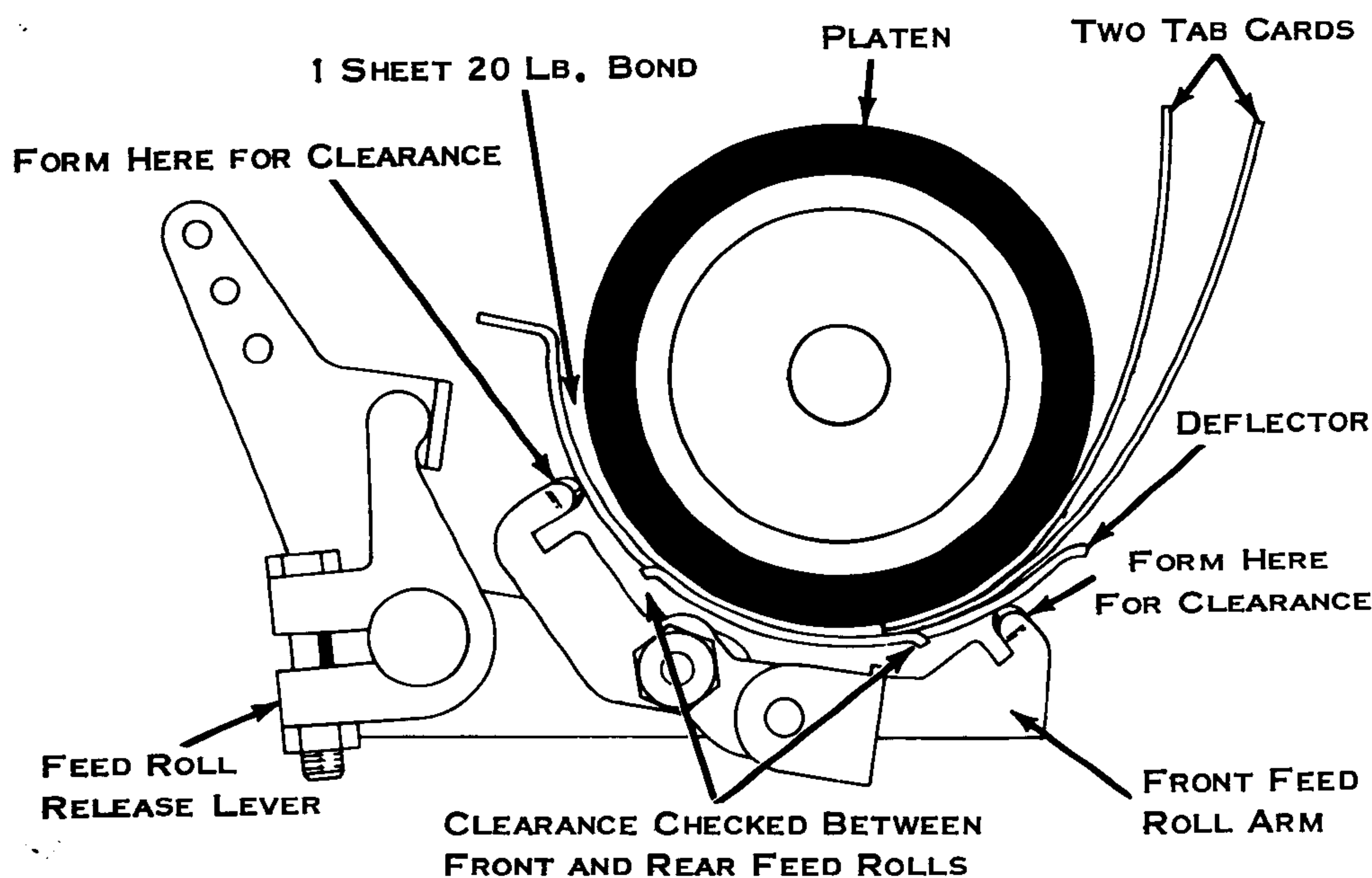


Figure 200. Deflector

## INDEXING MECHANISM

All operational control adjustments must be correct before any attempt is made to adjust the indexing mechanism.

### 1. Index Link -

- a. New Style - Adjust the length of the link to drive the index pawl and just feed the platen one full tooth in single linespace position and two full teeth in double linespace position.
- b. Old Style - With the index selection lever in the single linespace position and the index link stud in the middle of the slot of the pawl carrier, adjust the index link so that the index pawl bottoms in the ratchet against a tooth after .025" to .035" rise on the index cam.

NOTE: The cam rise may be simulated by leaving the cam latched in the rest position and placing four strips of data cards between the cam and the cam follower.

2. Index Link Stud, Old-Style (Fig. 201 & 202) - The stud should be adjusted forward or back in the slot of the pawl carrier so that one full tooth of motion is given the index pawl after it starts to drive the platen.

### 3. Upper Index Pawl Stop -

- a. New Style (Fig. 201) - With the cam on the low point (double line space), adjust the cam for .015" minimum clearance between the index pawl and ratchet.

NOTE: The index pawl pin should be centered on the cam surface in the single index position.

- b. Old Style (Fig. 202) - With the index cam latched, adjust the upper index pawl stop so that the index pawl clears the ratchet by .015" to .030".

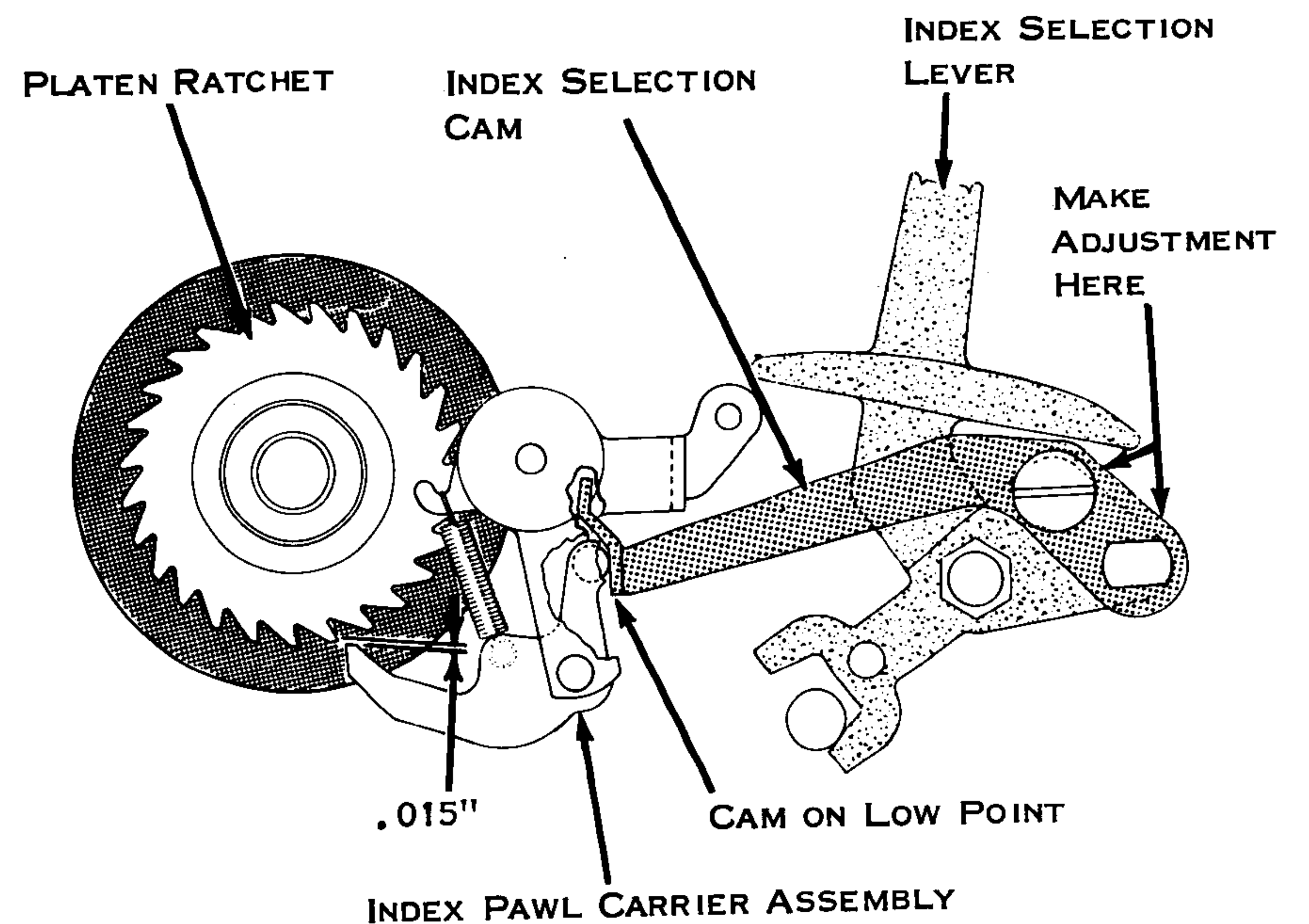


Figure 201. Index Selection Cam (New Style)

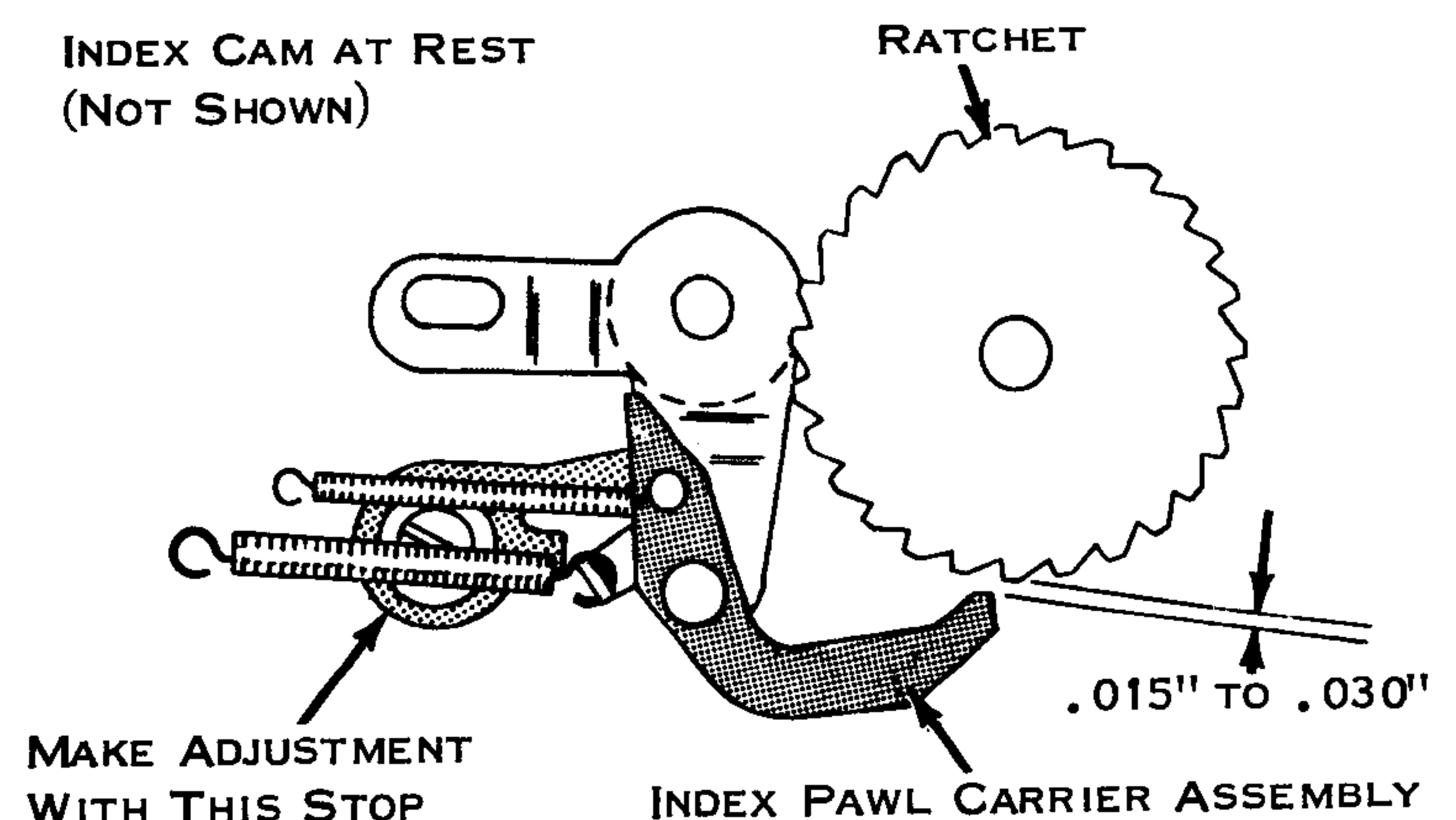


Figure 202. Upper Index Pawl Stop (Old Style)



4. Multiplying Lever Stop -

- a. New Style (Fig. 203) - Position (front to rear) until the vertical motion of the index link is .360" to .375" as the index cam is rotated from the low to high point.

NOTE: The multiplier lever must rest against its stop. Platen should be out of machine.

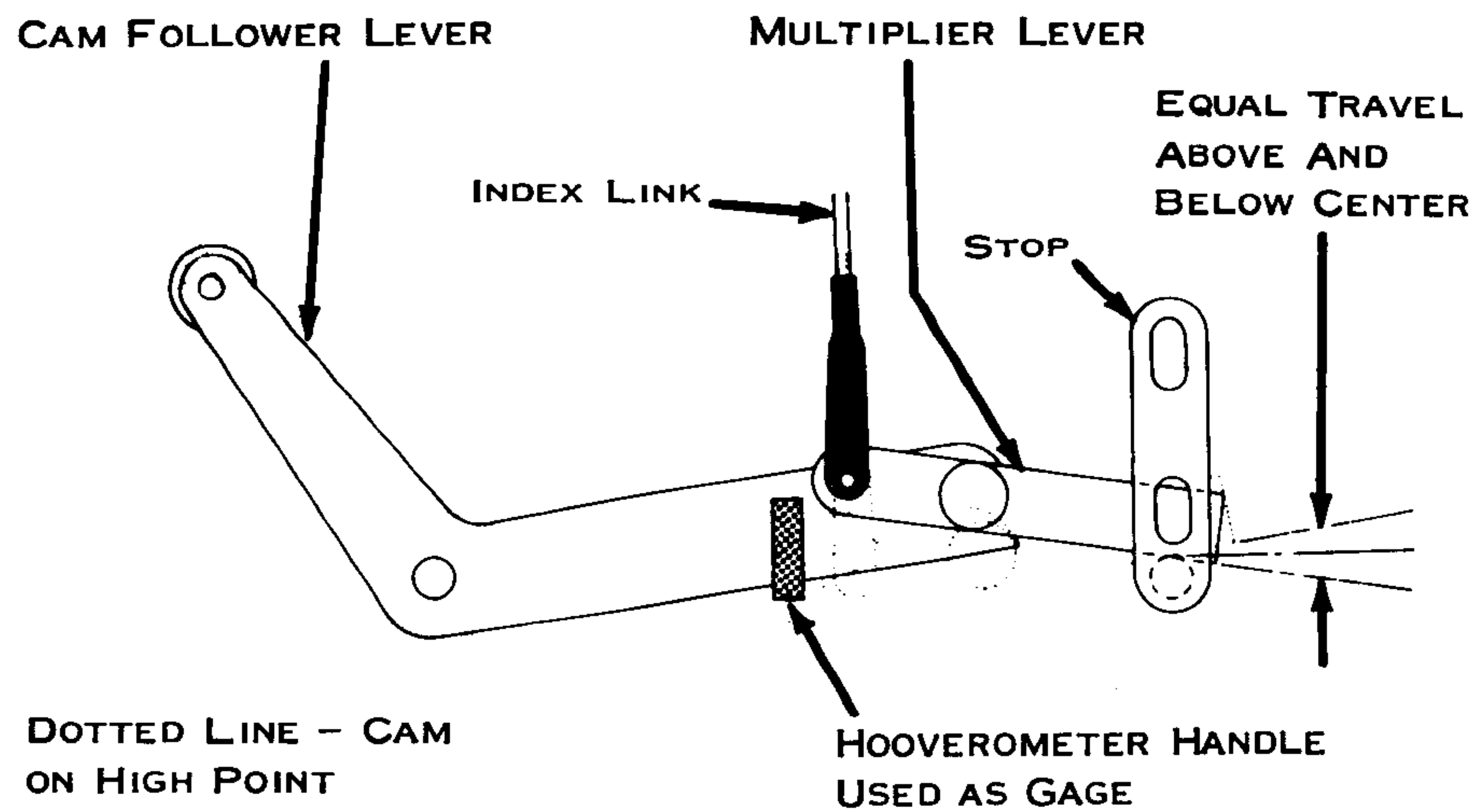


Figure 203. Multiplying Lever Stop

b. Old Style (Fig. 204) -

- (1) Preliminary - Position the multiplying control lever stop (front to rear) so that its elongated hole is centered.
- (2) With the index selection lever in the double linespace position, adjust the multiplying control lever eccentrics (keeping the high point forward) so the multiplying control lever just clears the bottom edge of the multiplying lever.
- (3) Re-adjust the multiplying control lever stop (front to rear) until two full teeth of motion is given the pawl after it starts to drive the platen.

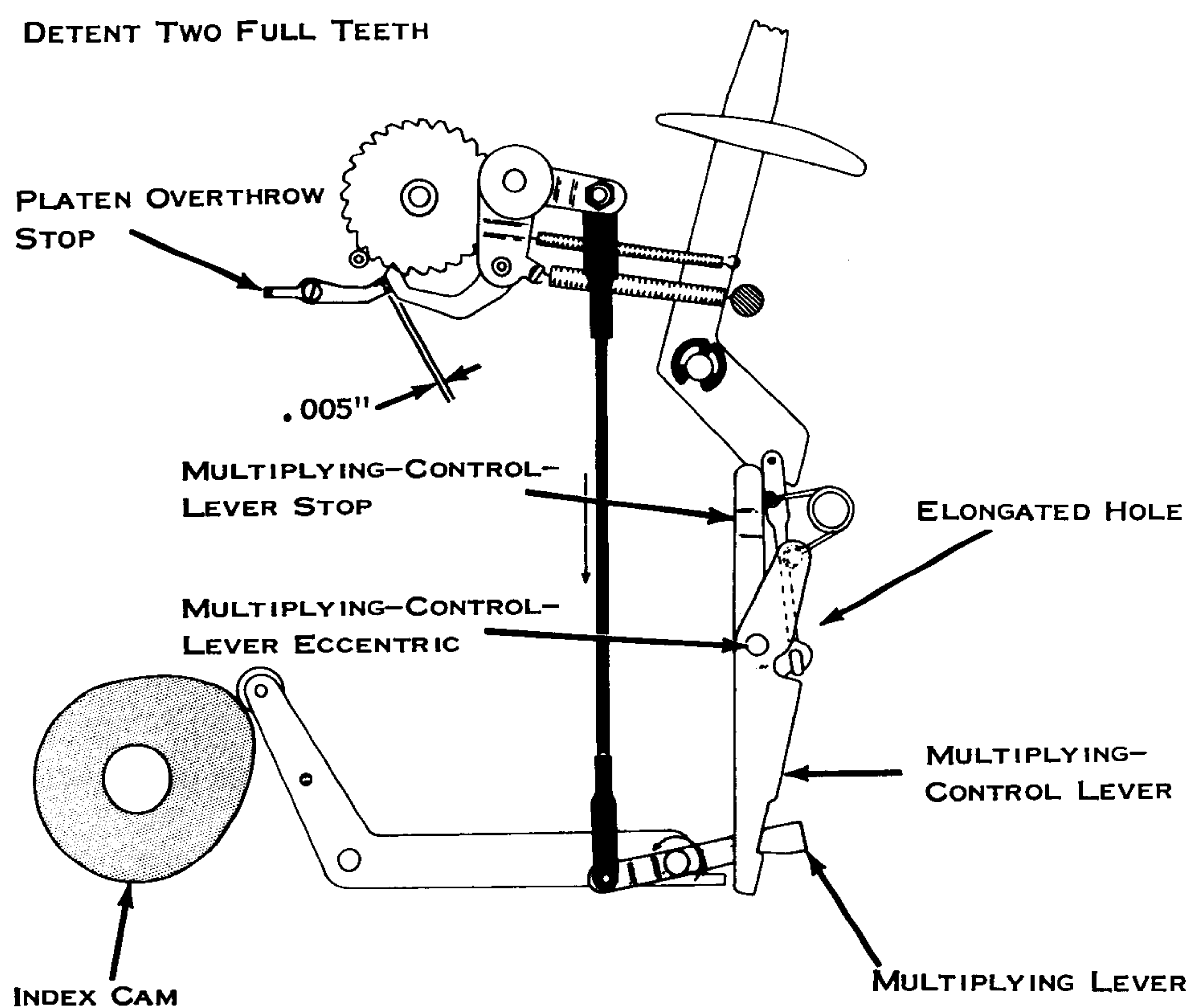


Figure 204. Index Travel Adjustment

5. Platen Overthrow Stop (Fig. 205) - With the index link pull so that it has moved the platen one full tooth (index selection in single linespace position) adjust the stop to clear the index pawl by .005".

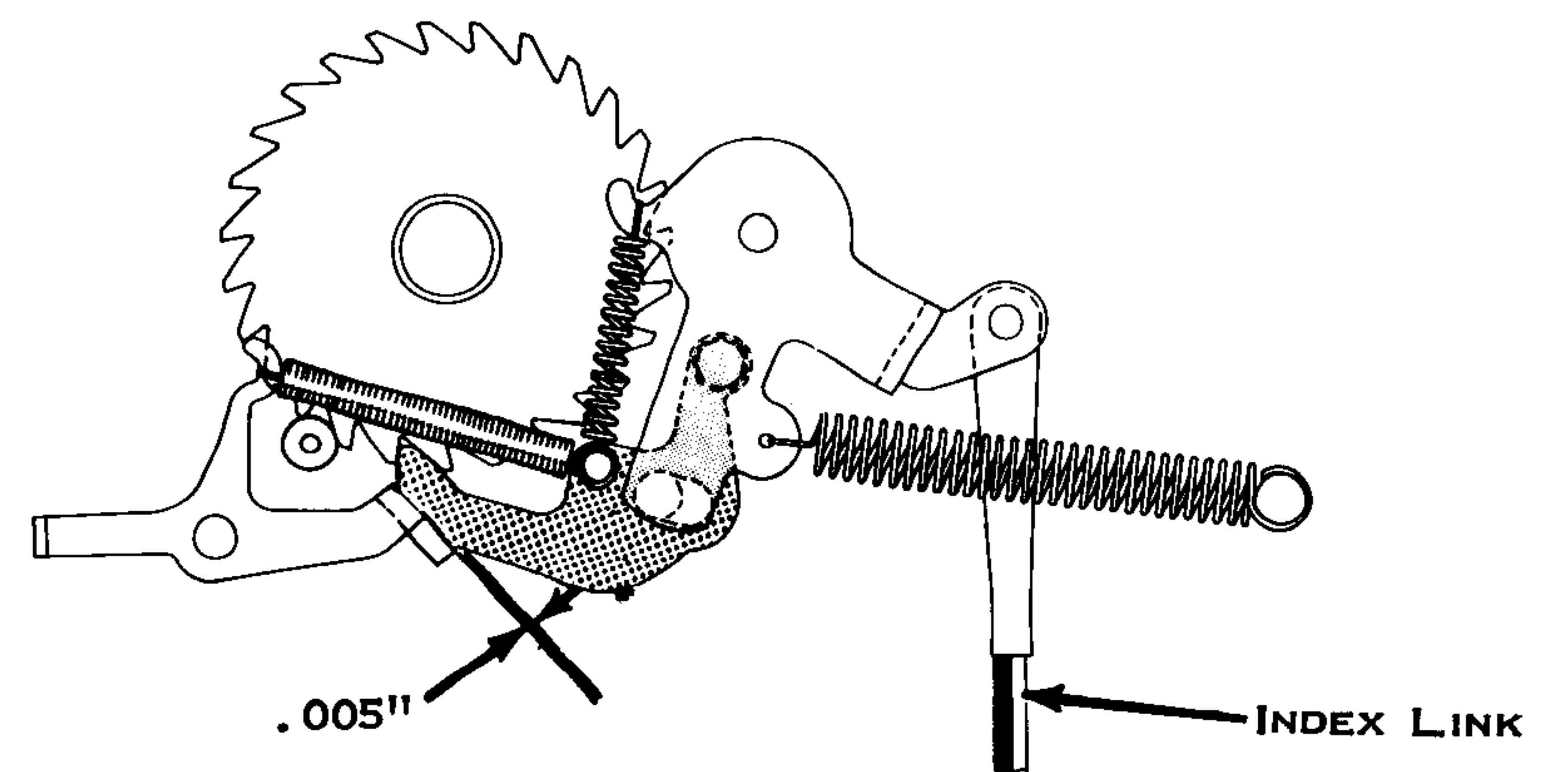


Figure 205. Platen Overthrow

RIBBON MECHANISM

1. Centering Springs (Fig. 206) - With the ribbon reverse interposer centered, form the lugs on the ribbon feed plate for .003" to .005" clearance in the centering spring loops.

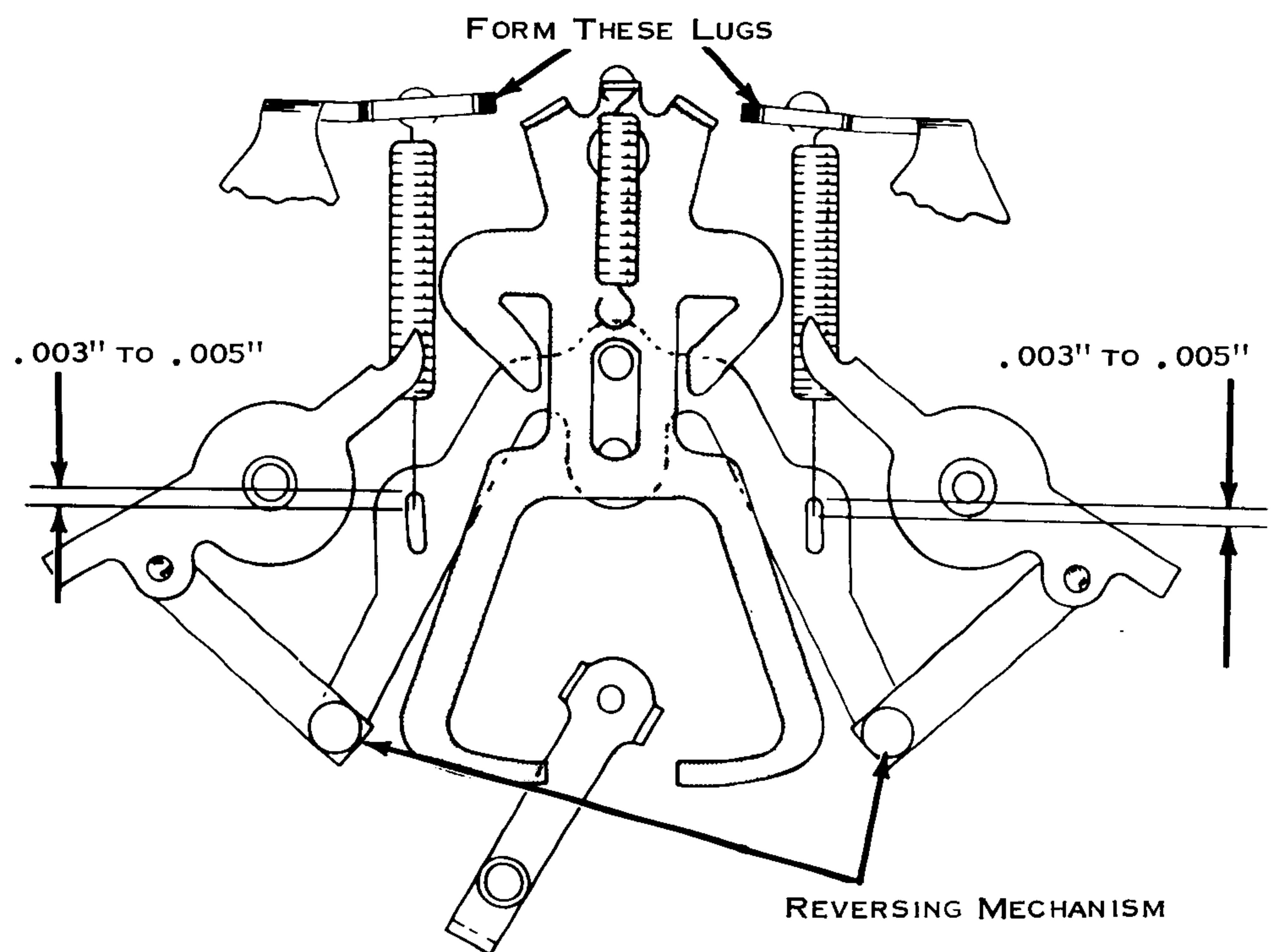


Figure 206. Centering Springs

2. Ratchet Brake Spring - The left and right ratchet brake spring should be formed so that each will hold its ratchet in position after the ratchet has been manually rotated far enough to fully actuate the reverse mechanism.
3. Ribbon Feed Plate (Fig. 207) - With the ribbon mechanism set for a reversing operation and the ribbon feed cam at its high point, adjust the ribbon feed plate forward or back so that the ribbon feed pawl holds the reverse interposer within .001" to .015" of its total travel.

NOTE: The mechanism must feed two teeth each time a character is operated.

4. Cartridge Guides - The ribbon feed plate lug should be formed to guide the cartridge into position so that the ribbon spools are centered in the holes of the cartridge and there is .001" to .010" lateral movement of the cartridge.



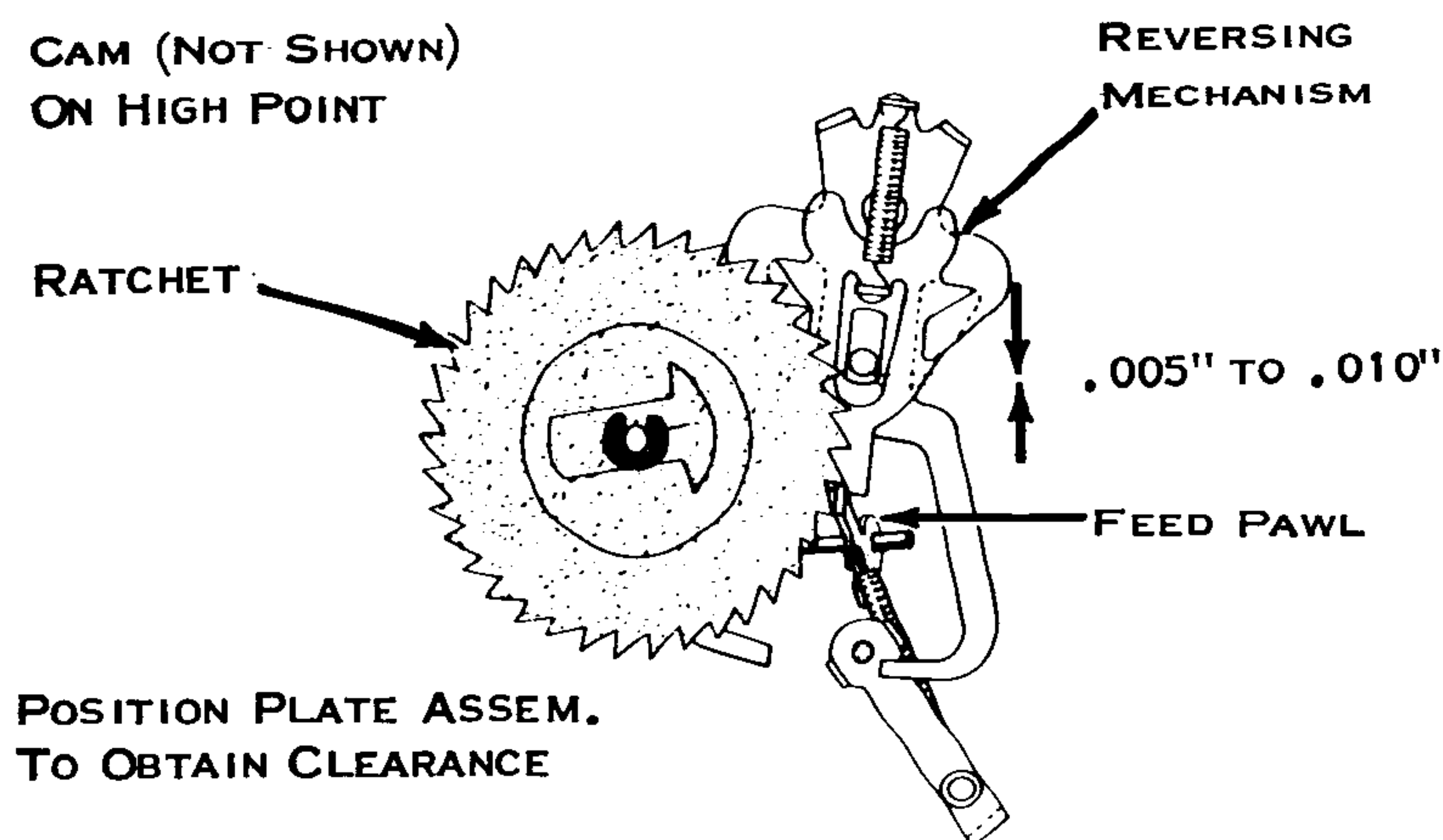


Figure 207. Ribbon Feed Plate

5. Ribbon Lift Guide Plate (Fig. 208) - Adjust as low as possible without causing a change in the ribbon lift guide height as the ribbon lift lever is moved from the low lift to the high lift position.

LIFT SHOULD NOT WHEN LEVER IS MOVED FROM HIGH TO LOW LIFT POSITION.

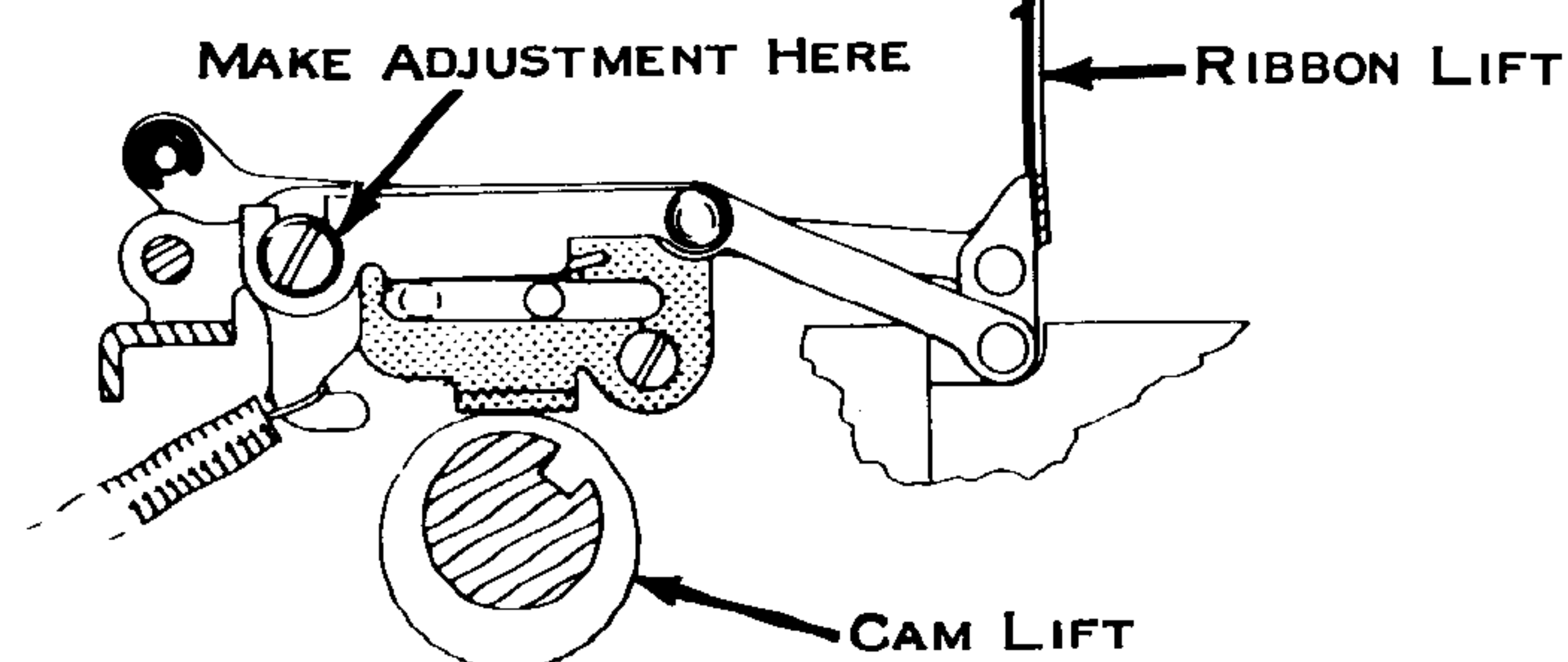


Figure 208. Ribbon Lift Guide Plate

6. Ribbon Lift Control Link - Adjust by means of the clevis so that the underscore will strike the ribbon 1/16" from the bottom edge.
7. Ribbon Lift Lock - Adjust so that it will positively hold the ribbon lift guide in the load position.
8. Stencil Lockout (Fig. 209) - With the lift lever in stencil position and the cam follower on the high point of the ribbon feed cam, form the ribbon feed latch for .010" clearance with the lug on the cam follower.

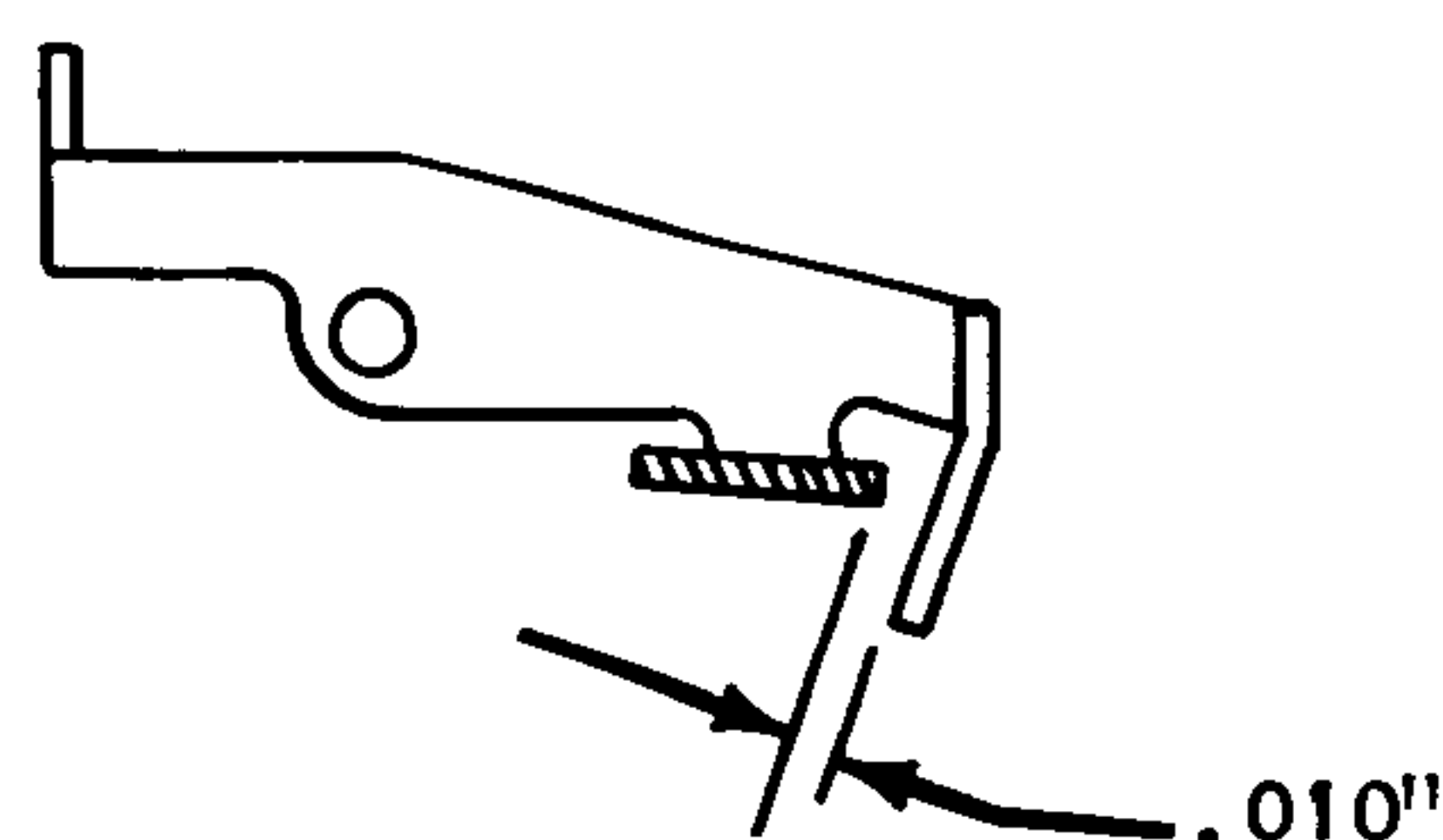


Figure 209. Stencil Locking

## RIBBON SHIFT MECHANISM

1. Magnet Adjustments (2 Magnet) -

- a. With the armatures energized, position the hinge plates so that the armatures clear the magnet yokes by .003" to .005" (Fig. 210).
- b. With the armatures energized, position the armature stops so that the armatures clear the magnet yoke by .003" to .005" (Fig. 211).

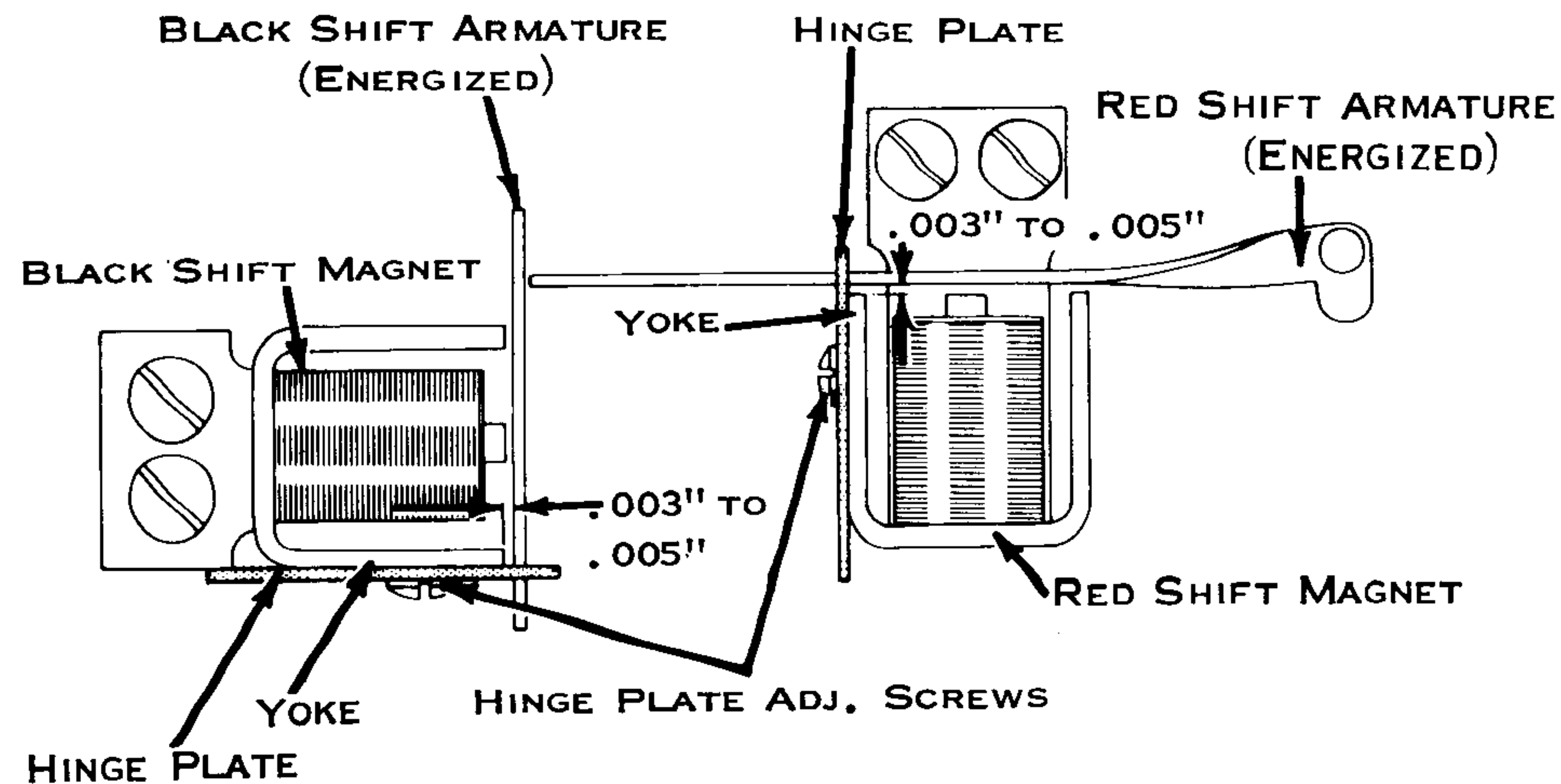


Figure 210. Hinge Plates

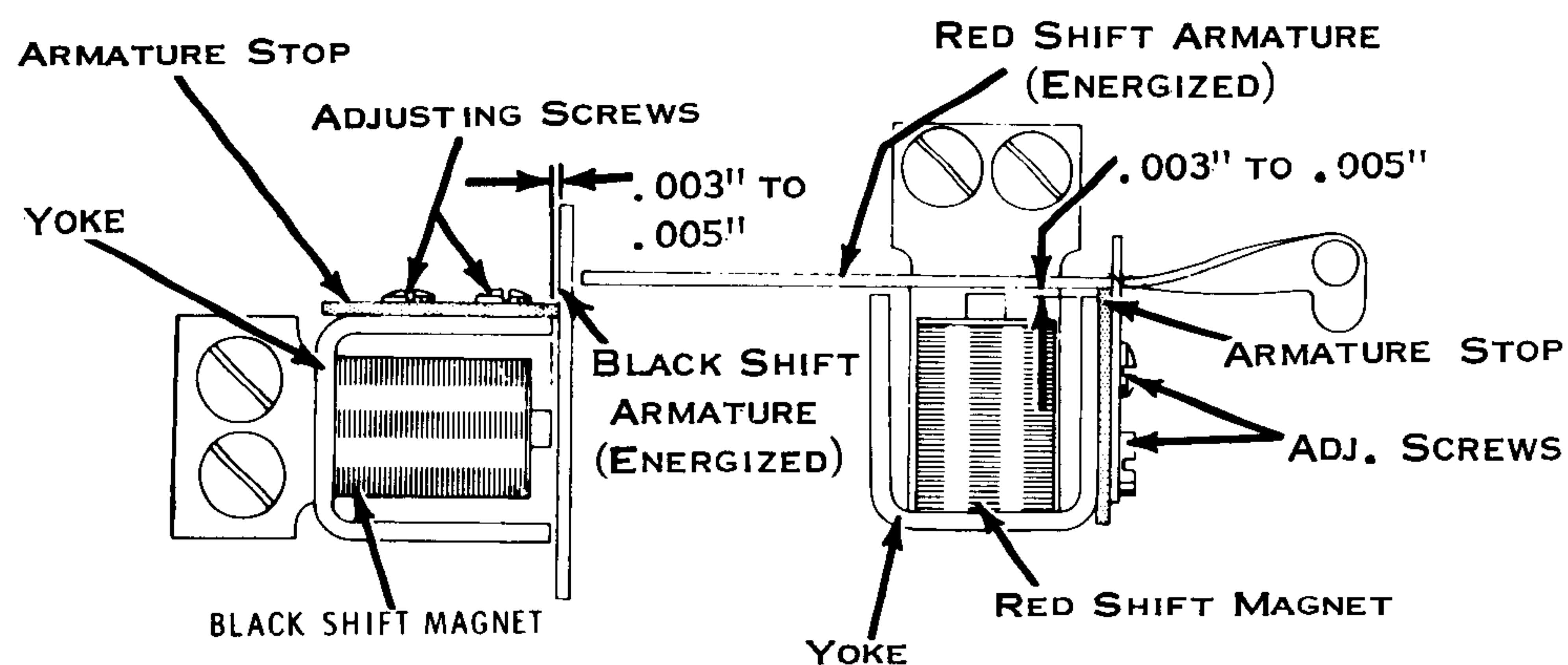


Figure 211. Armature Stops

2. Black Shift Magnet - With the black shift magnet armature energized and the red shift magnet armature de-energized, position the black shift magnet for a clearance of .010" between the black and red shift armatures (Fig. 212).

NOTE: With the red shift armature energized and the black shift armature de-energized, the black shift armature must overthrow the red shift armature by .003" to .006" (Ref. Fig. 213).

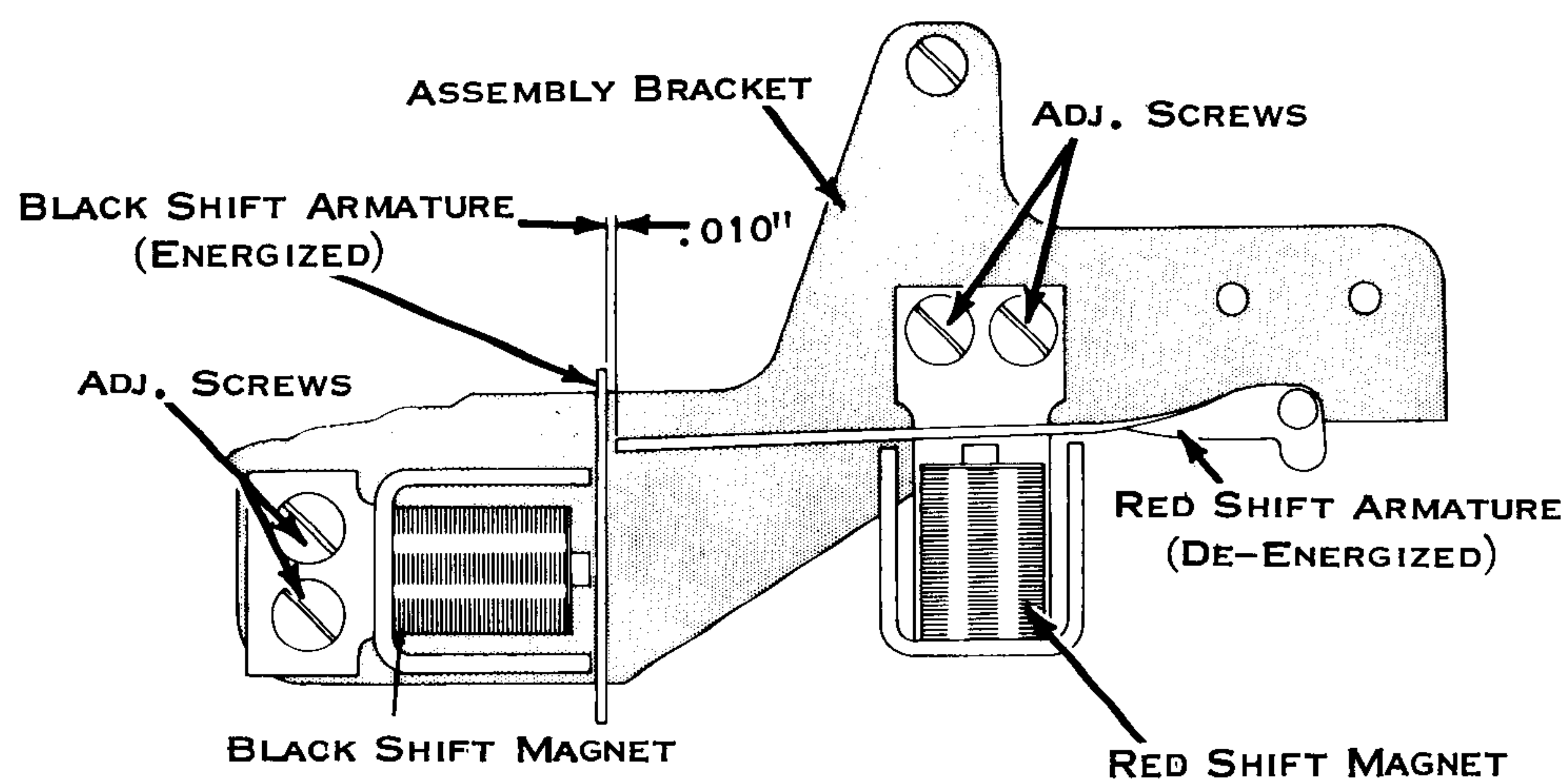


Figure 212. Magnet Positioning



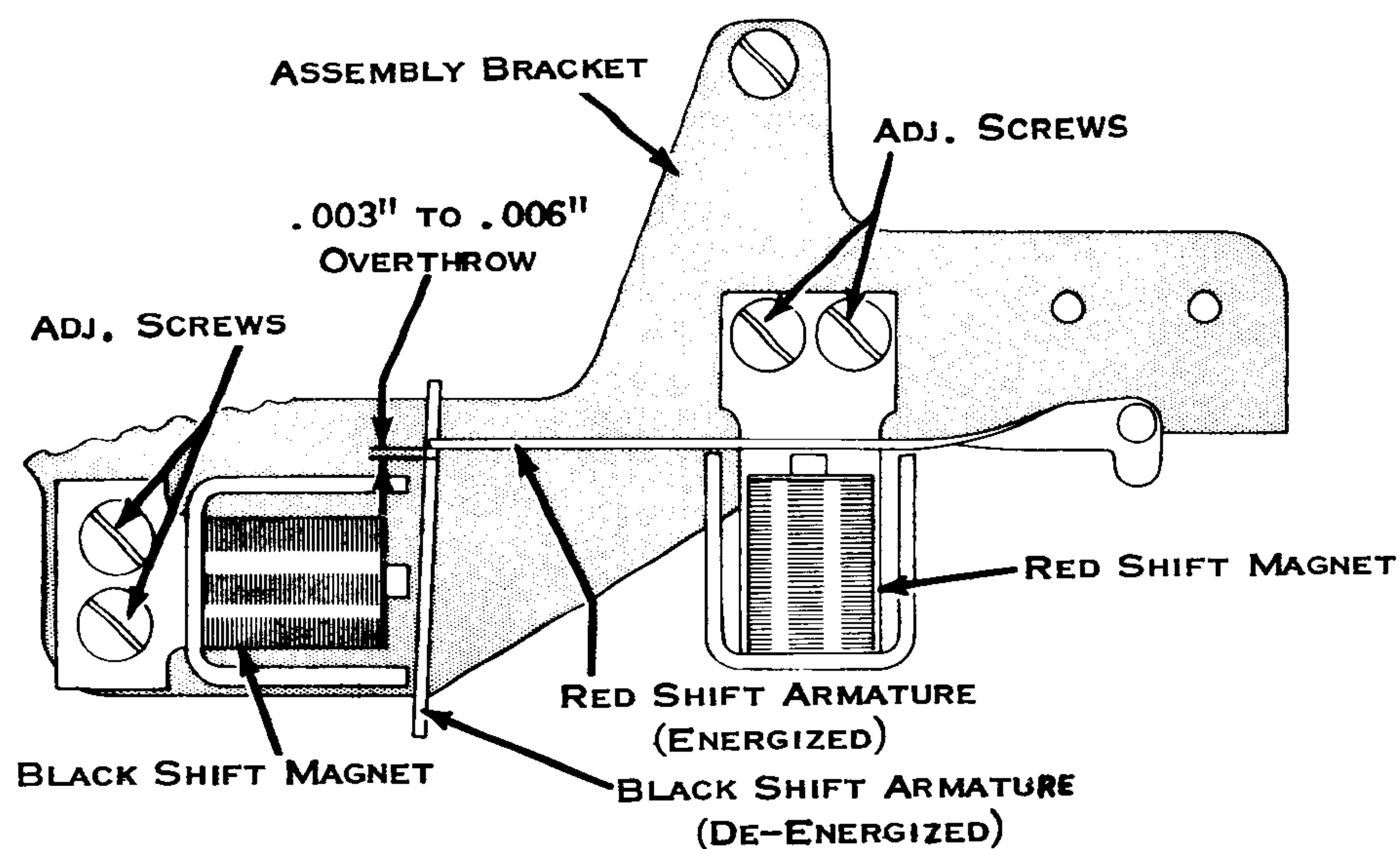


Figure 213. Black Shift Armature Overthrow

3. Magnet Adjustments (1 Magnet) (Fig. 214) - With the red shift magnet armature energized, position the hinge plate and armature stop so that the armature clears the yoke (both inner and outer poles) by .003" to .005".

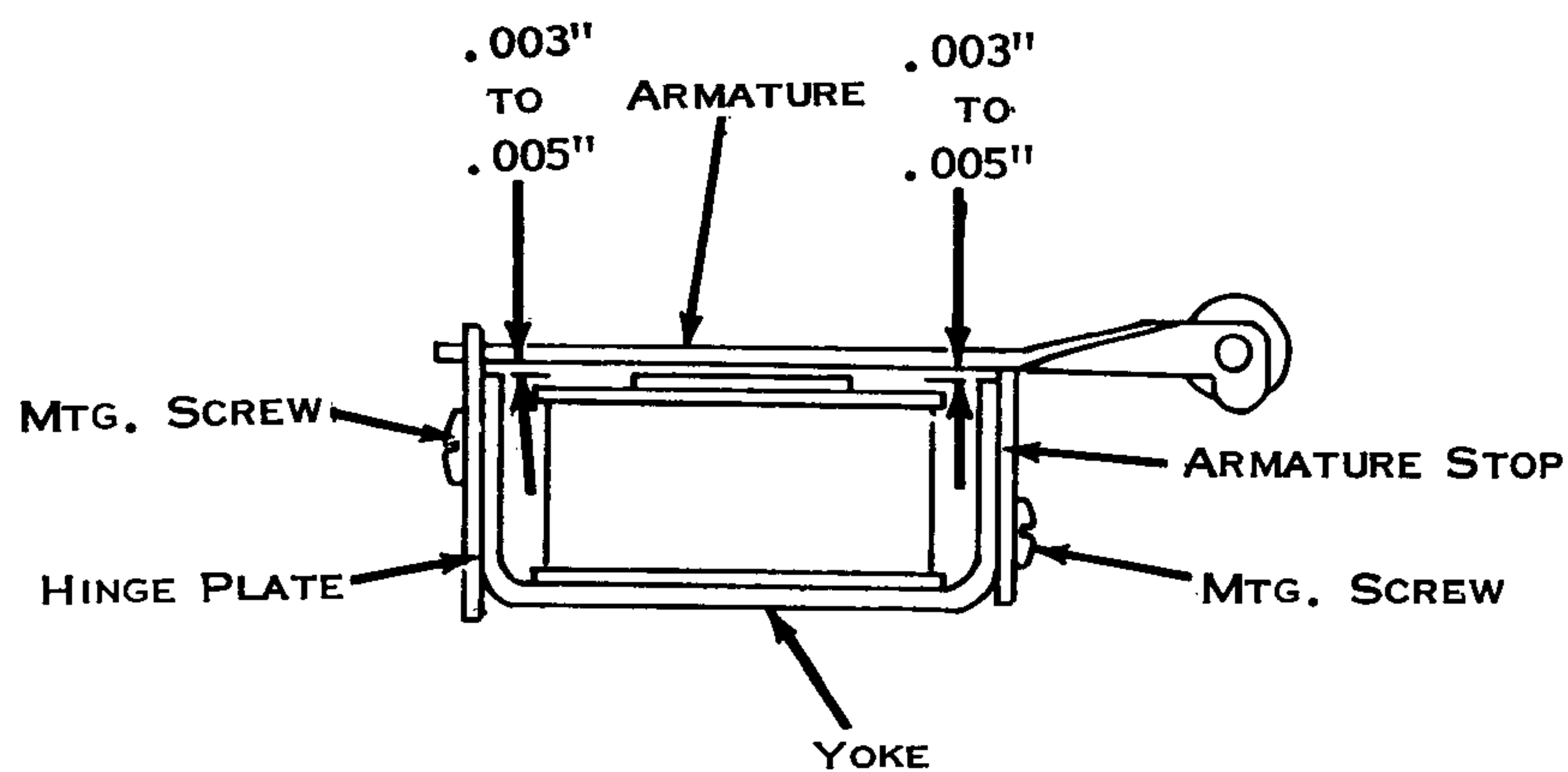


Figure 214. Magnet Adjustments (1 Magnet)

Ribbon Shift Adjustments Common To Both The One And Two Magnet Mechanisms

4. Pivot Arm (Fig. 215) - With the manual ribbon lift lever in the black position, form the pivot arm extension (up or down) so that the latch does not drag when moved from the latched to the unlatched position.

NOTE: Position the pivot arm bracket so that the highest and lowest characters print equidistant from the top and bottom of the red portion of a black and red ribbon .

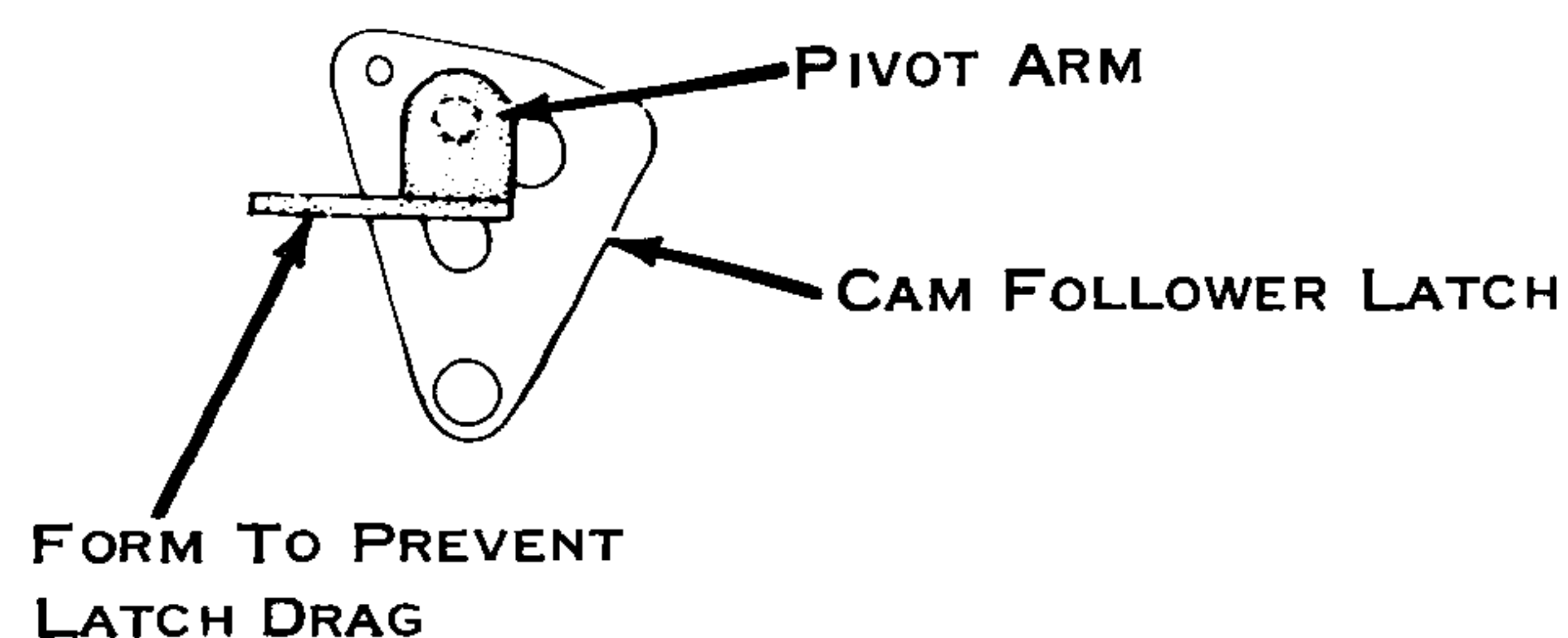


Figure 215. Pivot Arm

5. Right Hand Pulley (Fig. 216 & 217) - With the red shift armature energized, position the right hand pulley pivot to obtain .002" to .005" clearance between the stud and follower latch slot.

NOTE: The pulley nut must be loosened before adjusting the pivot screw.

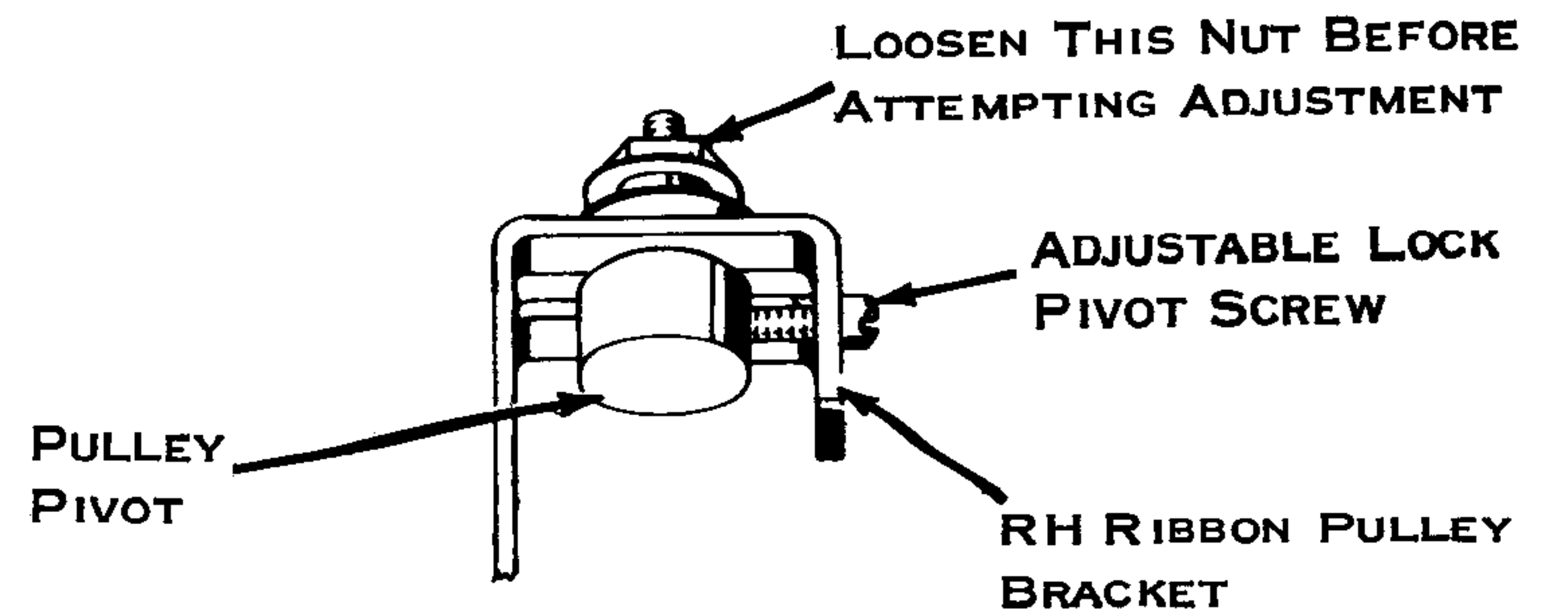


Figure 216. Right Hand Pulley

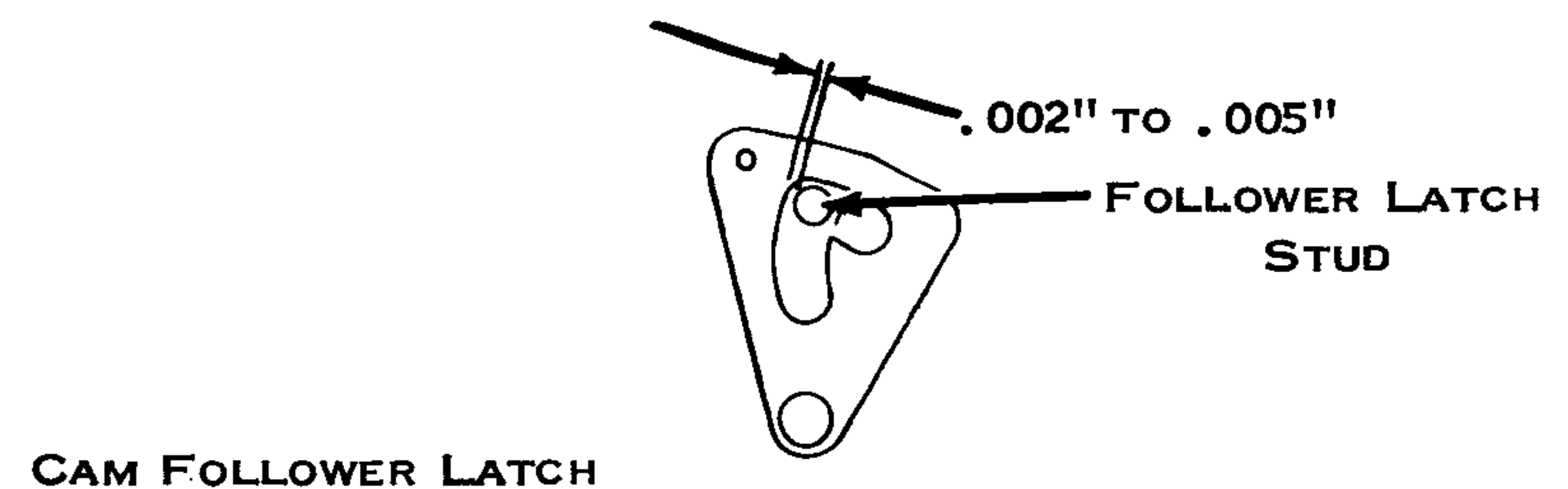


Figure 217. Cam Follower Latch

6. Red Shift Armature Backstop (Fig. 218 & 219) - With the armature de-energized, position the red shift armature backstop to obtain .002" to .005" clearance between the stud and the follower latch slot.

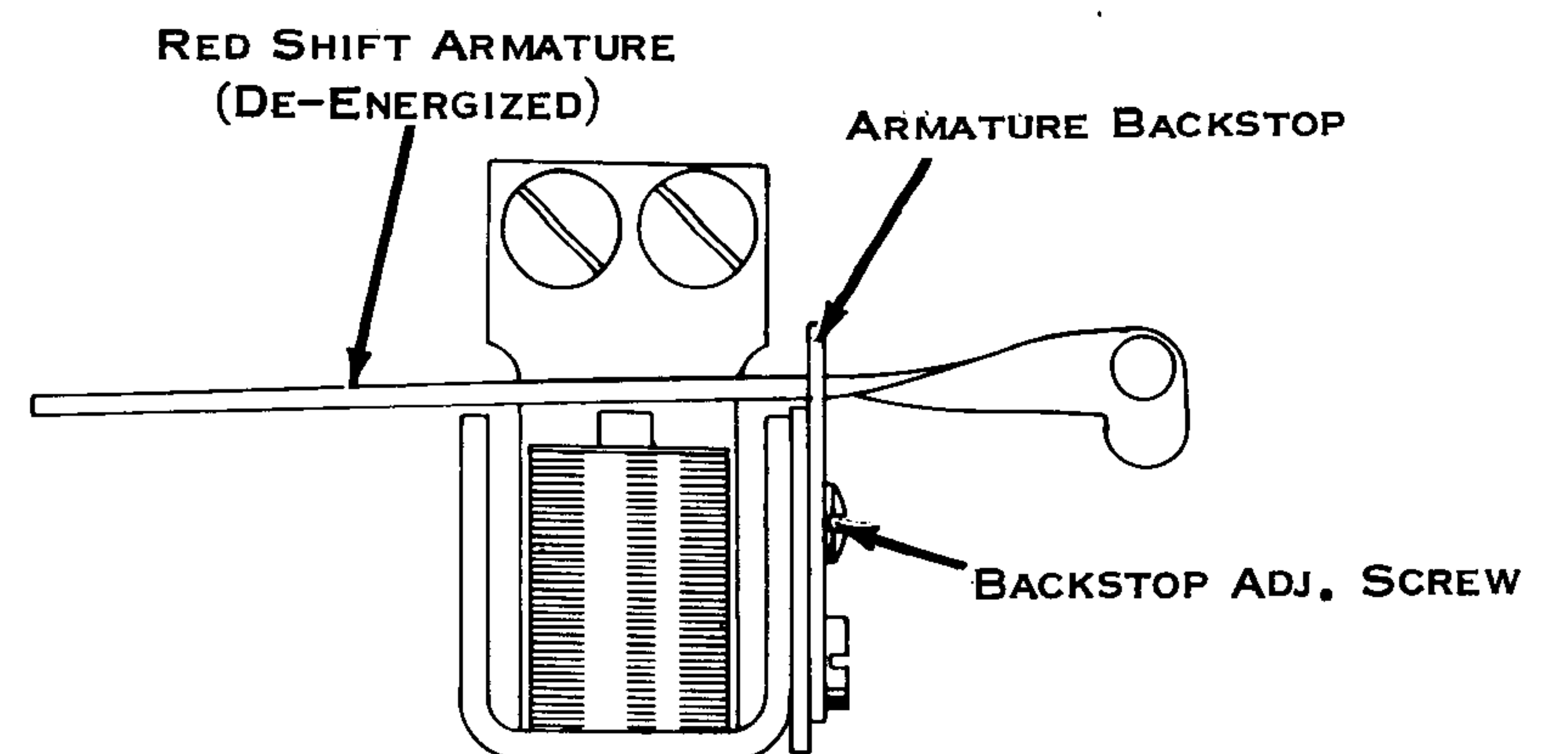


Figure 218. Red Shift Armature Backstop

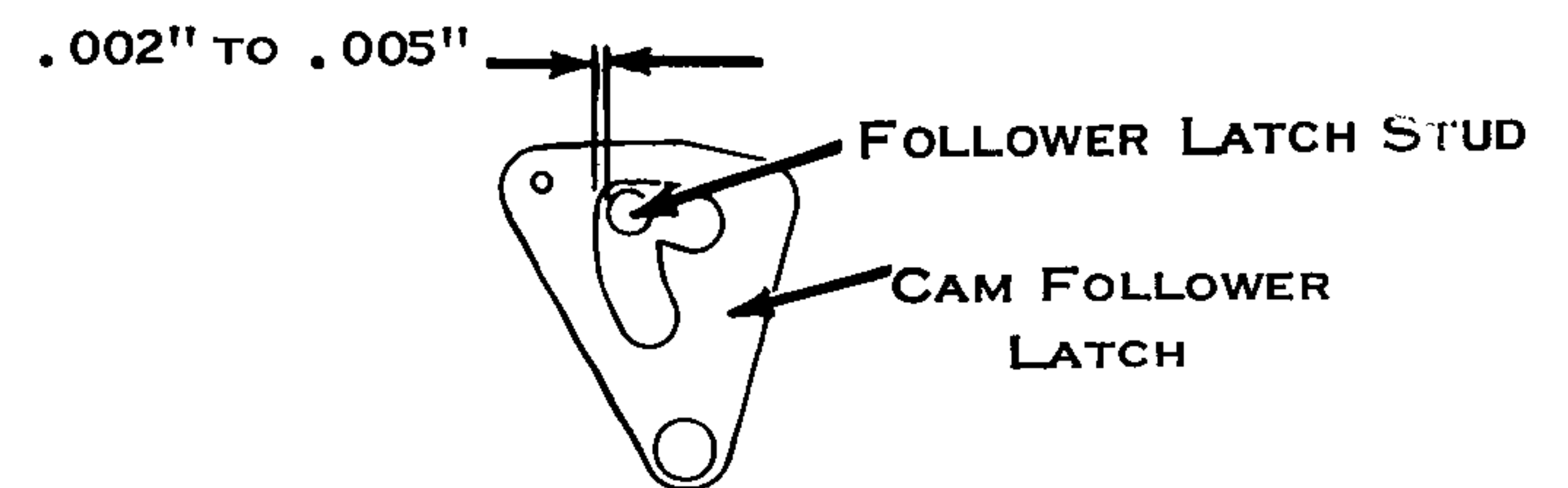


Figure 219. Cam Follower Latch

7. Ribbon Mode Contacts (Fig. 220) -

- a. Form the O/S so that it lifts the N/C contact by .005" to .008".
- b. Form the N/O contact so that it clears the O/S by .020" to .030".
- c. Position the contact mounting bracket on the magnet mounting bracket so that red shift armature (at rest) clears the O/S pad by .002" to .005".



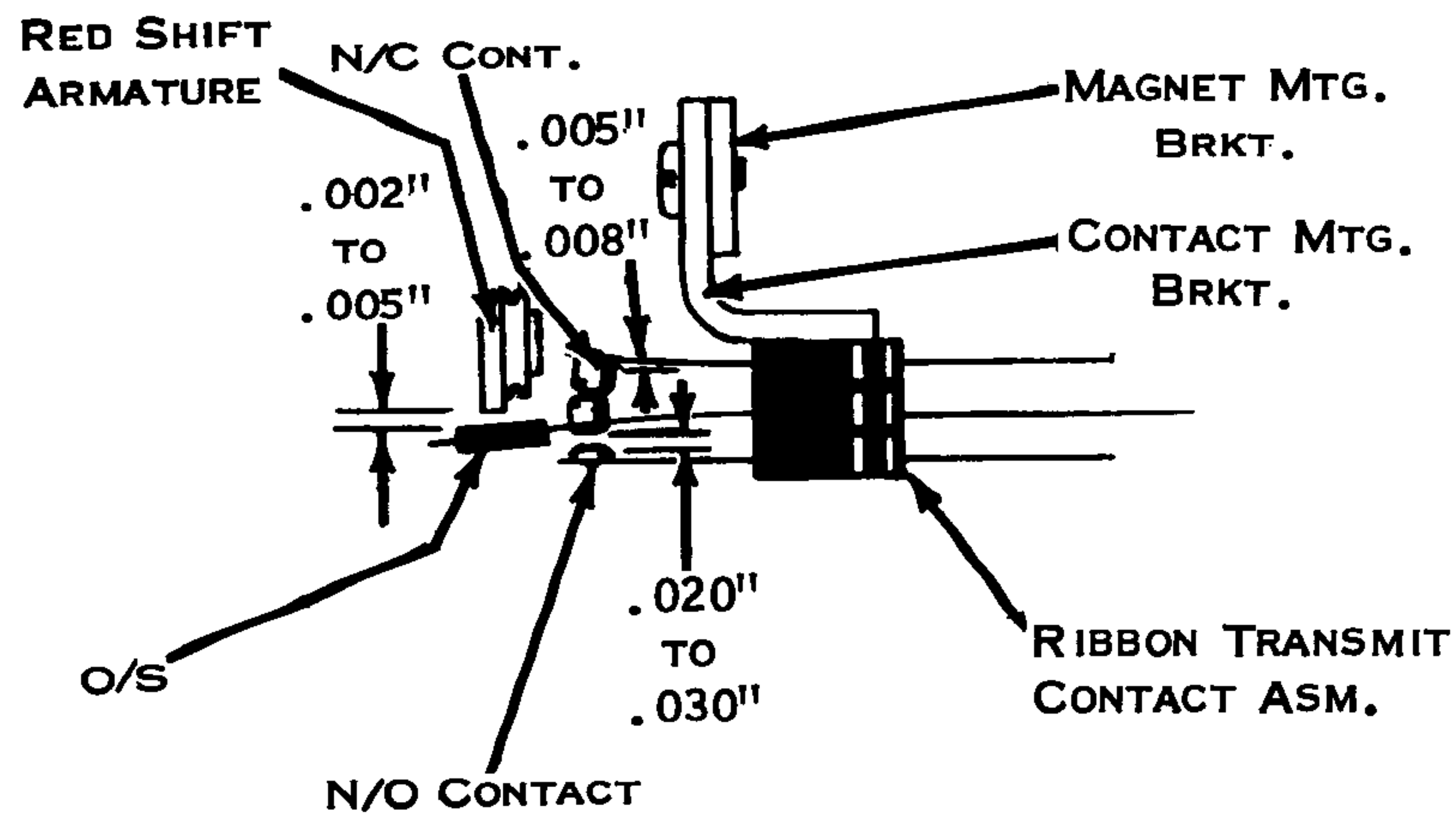


Figure 220. Ribbon Mode Contact

COVER SECTION

1. Top Cover Hinge (Fig. 221) - The hinge should be adjusted so that the contour of the top cover matches the contour of the center cover section.

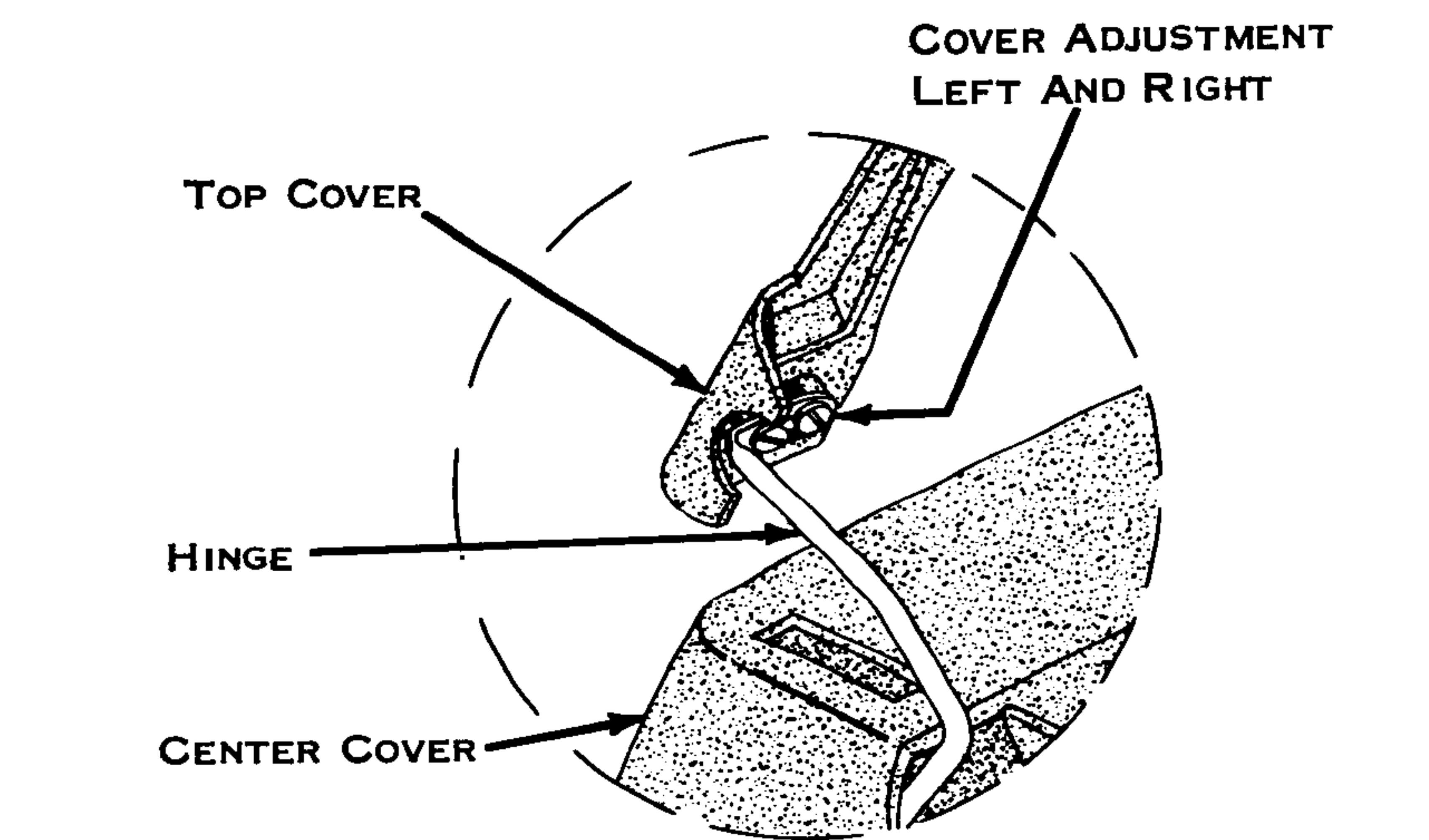
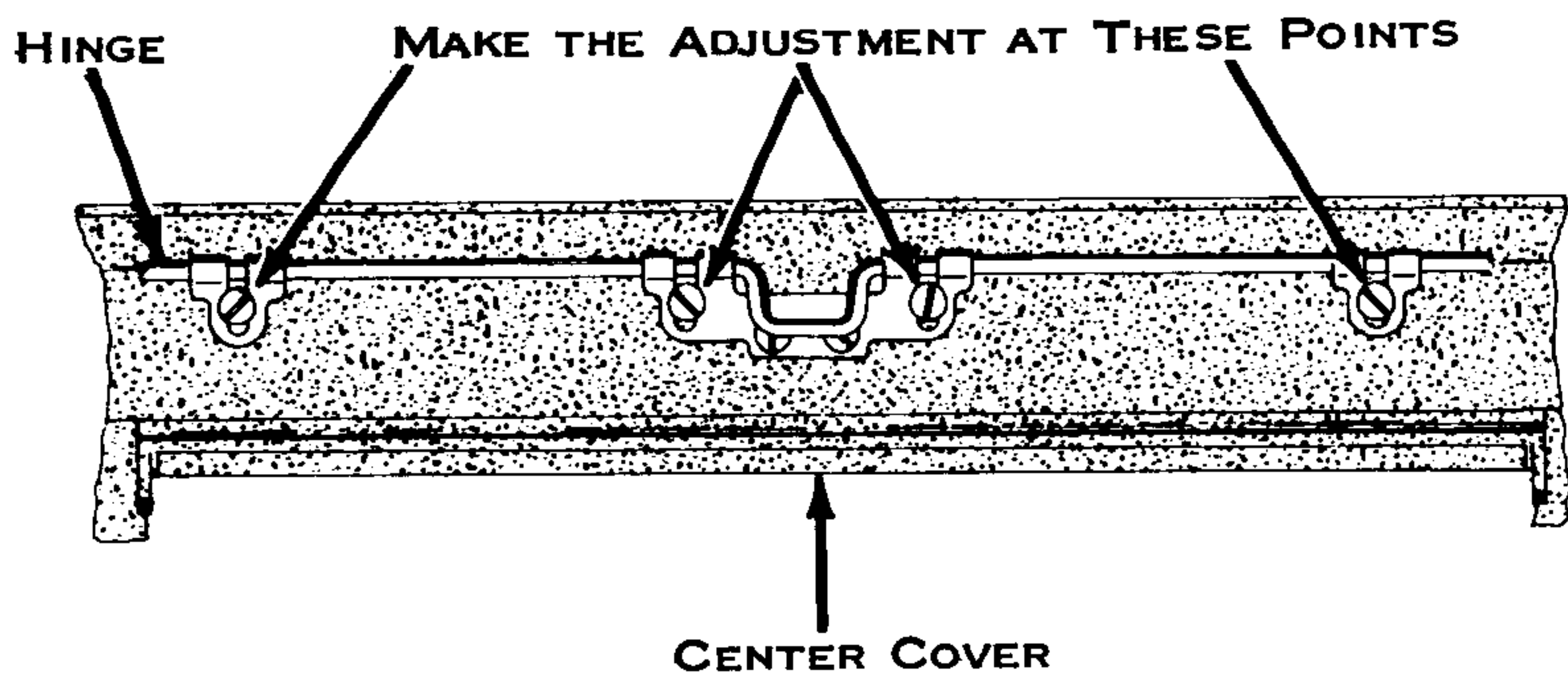


Figure 221. Top Cover Hinge

2. Center Cover Latch (Fig. 222) - Position so that the top cover is latched securely in the closed position.

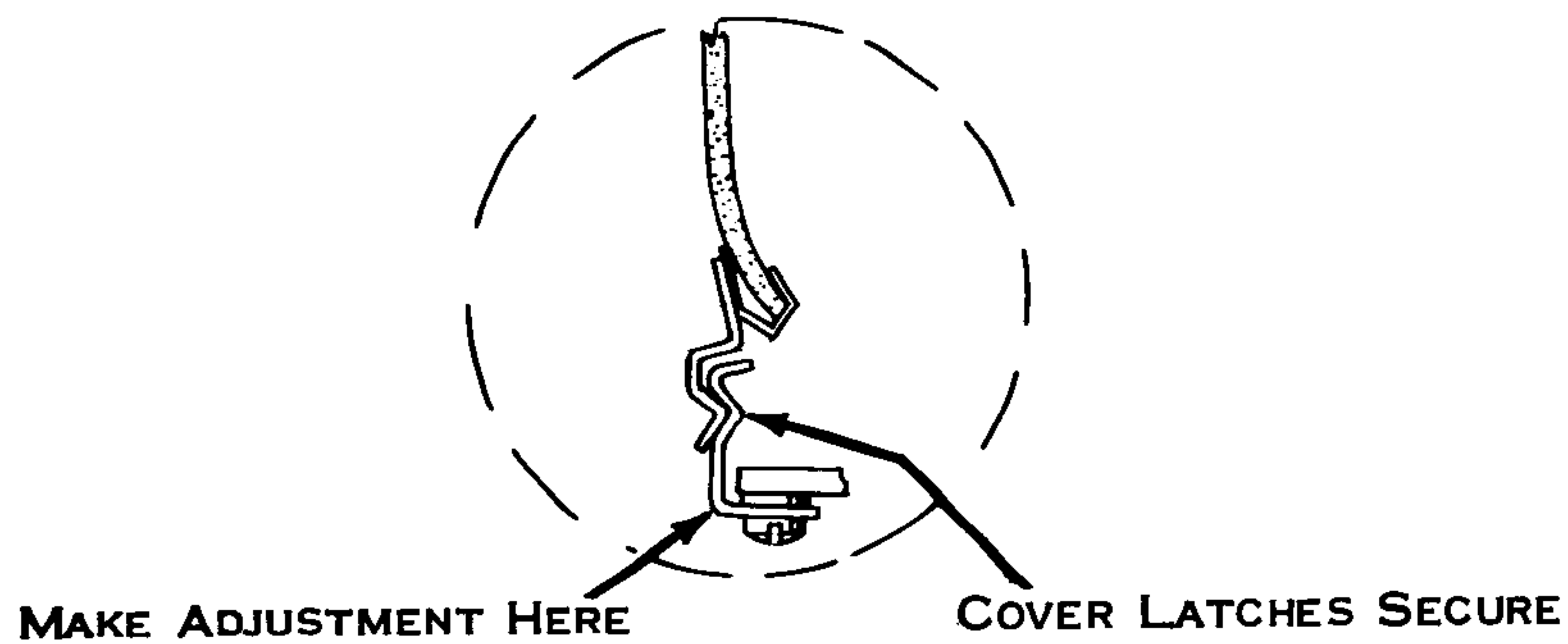


Figure 222. Center Cover Latch

3. Hinge Spring (Fig. 223) - Position so that the top cover will be detented and held in the open position.

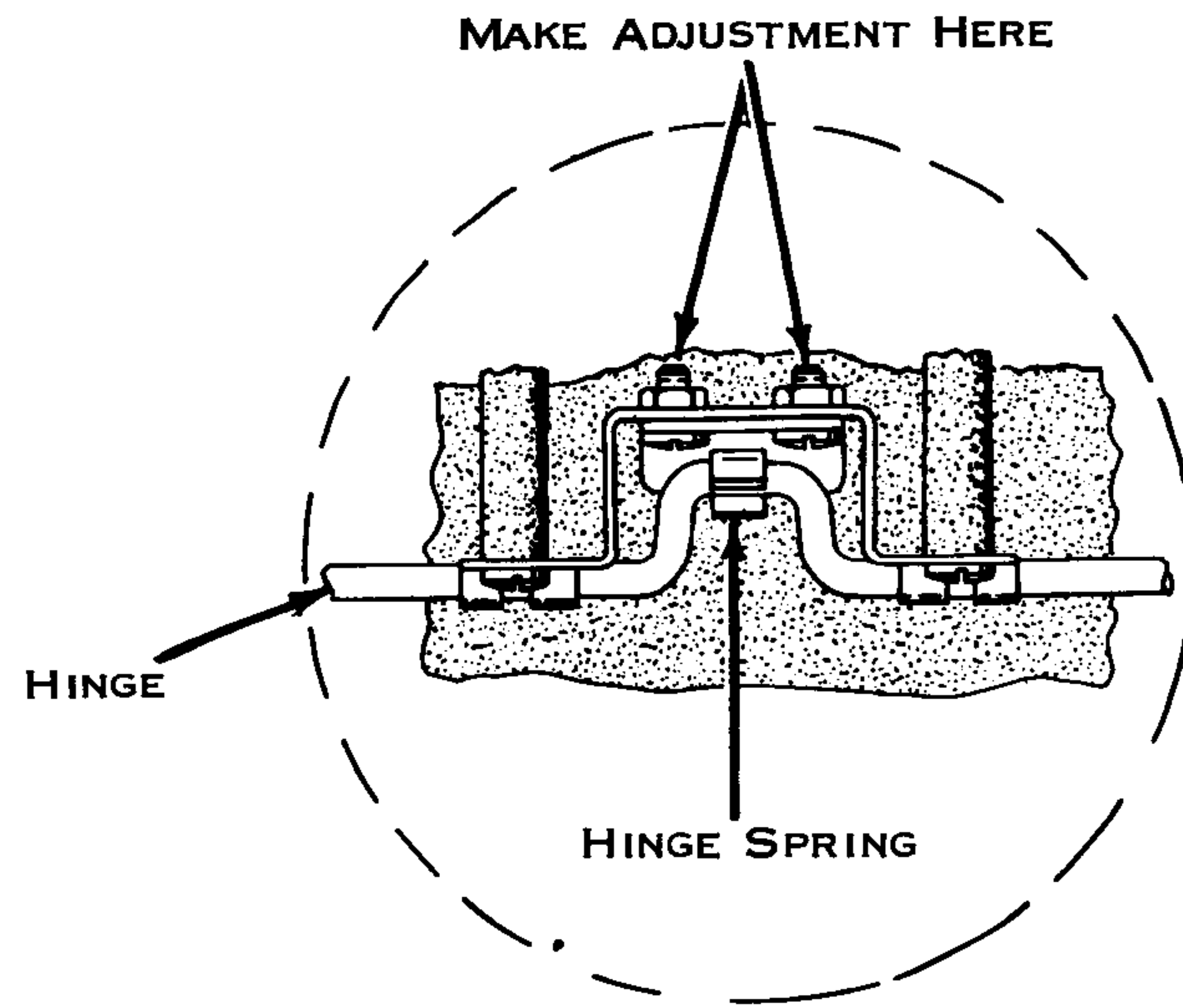


Figure 223. Hinge Spring

4. Shock Mounts (Fig. 224) - Position so that the keybuttons have equal clearance on all sides, a clearance of .020" to .040" exists between the paper guide and deflector, and the top of the spacebar is 1-1/2" above the parting line of the cover. The platen should clear the covers when it is in the extreme front and rear positions. Adjustment should be checked when the machine is suspended in the covers.

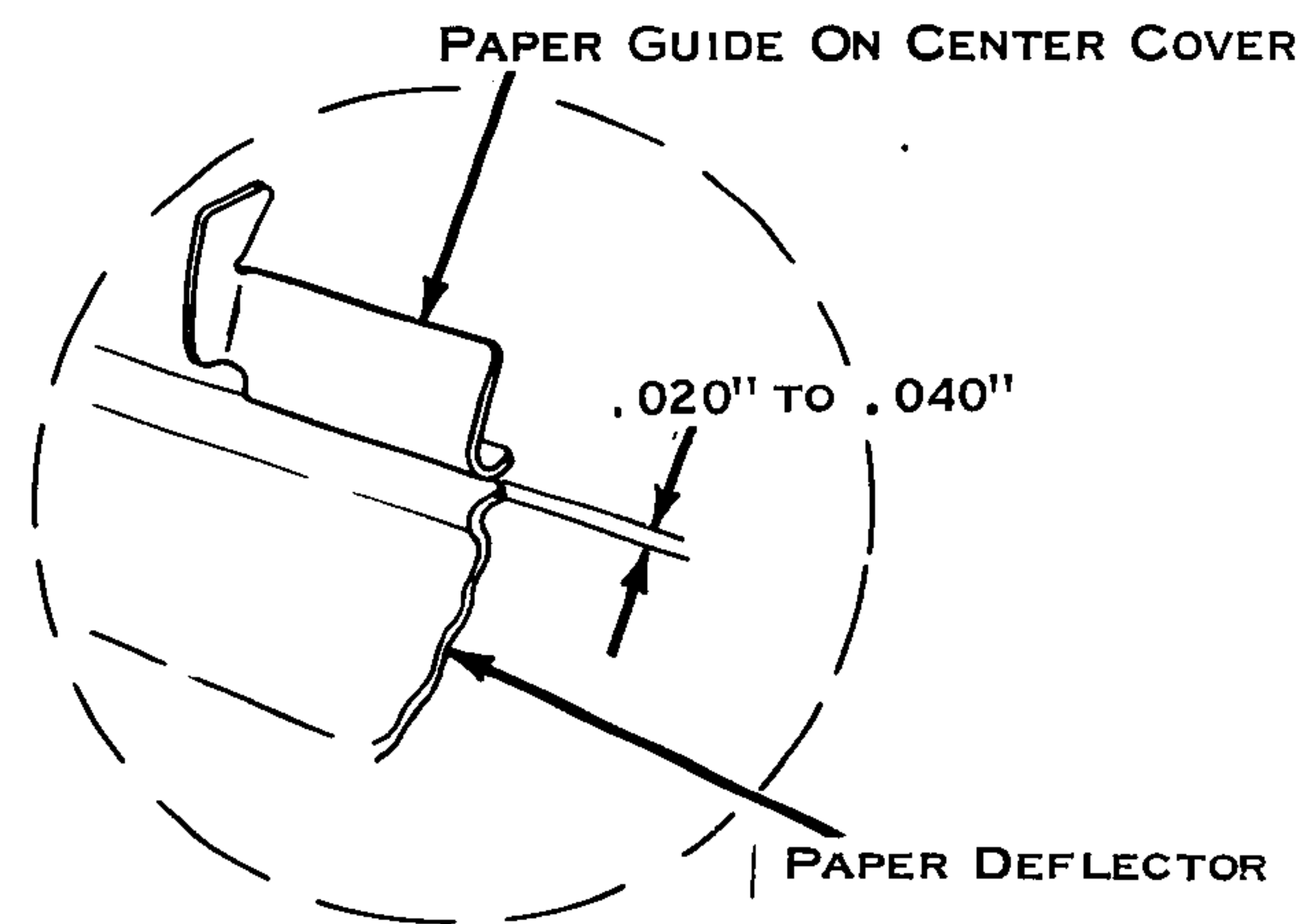


Figure 224. Shock Mounts

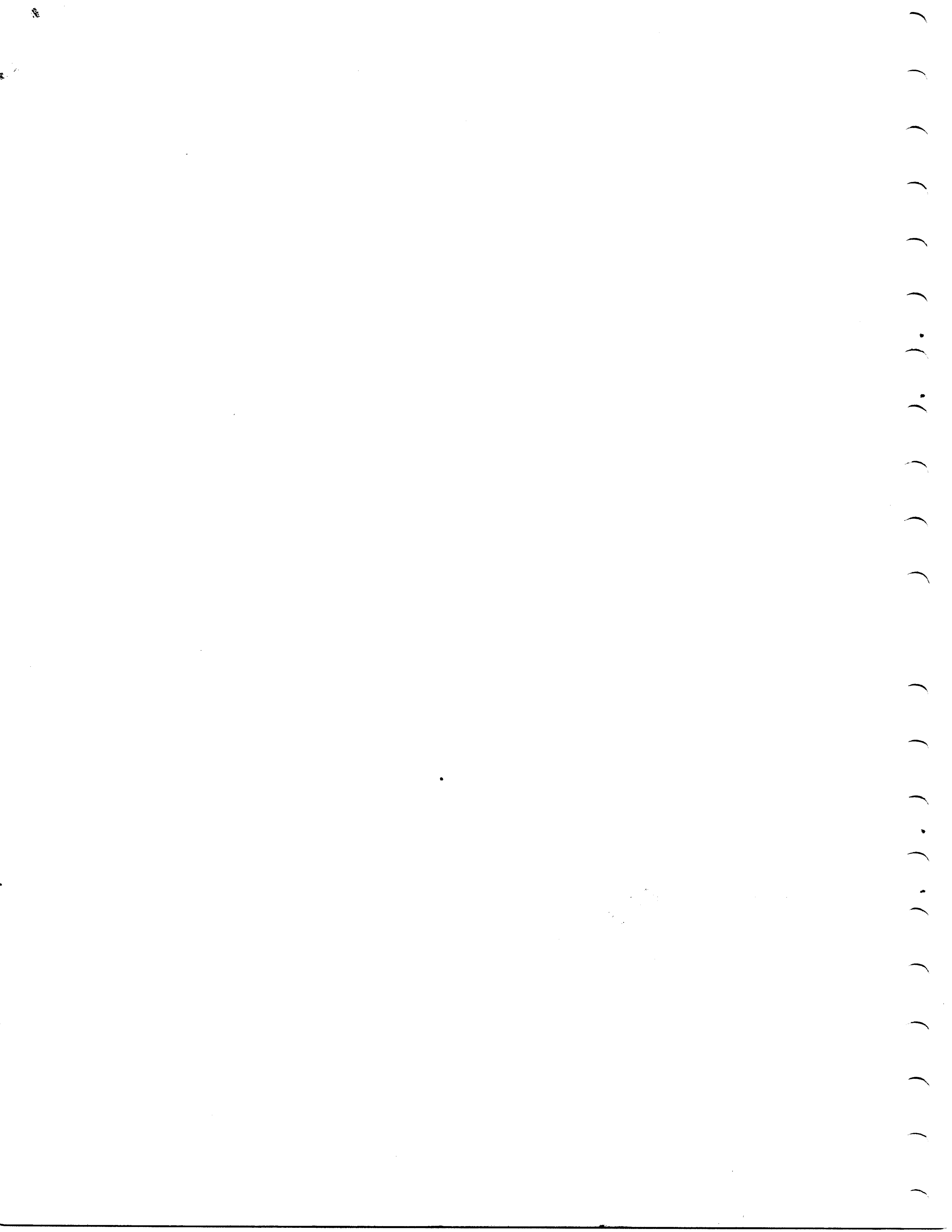


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## CYCLE CLUTCH AND CYCLE SHAFT REMOVAL

1. Remove the covers and ring mount (not shown).
2. Position the carrier to the extreme right.
3. Remove the degree wheel pointer (#1, Figure 1).
4. Remove the degree wheel (#2, Figure 1).
5. Remove the gear guard (#3, Figure 1).
6. Remove the left dust cover (not shown).
7. Remove the two screws (#1, Figure 2) that hold the contact plate to the frame. Remove the contact assembly and hold it to the front with a rubber band.
8. Remove the two pivot screws (#1, Figure 3).
9. Remove the front screw from the C1 - C2 contact assembly (#1, Figure 4) and swing the assembly down out of the way of the bearing plate.
10. Remove the cycle-clutch check pawl and spring (#1, Figure 5).
11. Remove the three bearing-plate screws (#2, Figure 4).
12. Remove the bronze intermediate gear (#3, Figure 4).
13. Remove the C1 - C2 cams (#4, Figure 4) and the cycle shaft gear (behind the C1 - C2 cams).
14. Remove the bearing plate (#5, Figure 4) by prying it away from the frame (front end first) with a screwdriver and sliding it off the cycle shaft.
15. Force the positive bail down with a screwdriver (#2, Figure 5), making sure all the latches are under the bail. Insert a bristol wrench through the lower left bearing plate mounting hole (#2, Figure 4) over the top of the bail to hold it down.  
Note: Do not remove the positive bail restoring spring.
16. Remove the cycle shaft, pushing the Negative 5 and Rotate 2 links out of the way with a spring hook pusher end. The pusher-restoring-bail arms will easily bend to the left to allow removal.
17. Remove the shims from the old shaft and put them on the new one. Be sure the flexible nylon shim is the first one put on.

18. The following adjustments should be checked after the cycle-shaft is replaced:
  - a. Idler Gears
  - b. Cycle Shaft End Play
  - c. Cycle-Clutch Spring
  - d. Cycle-Clutch Latch Bite
  - e. Damper Spring
  - f. Filter Shaft Timing
  - g. Print Shaft Timing
  - h. C1 and C2 Contact Timing.

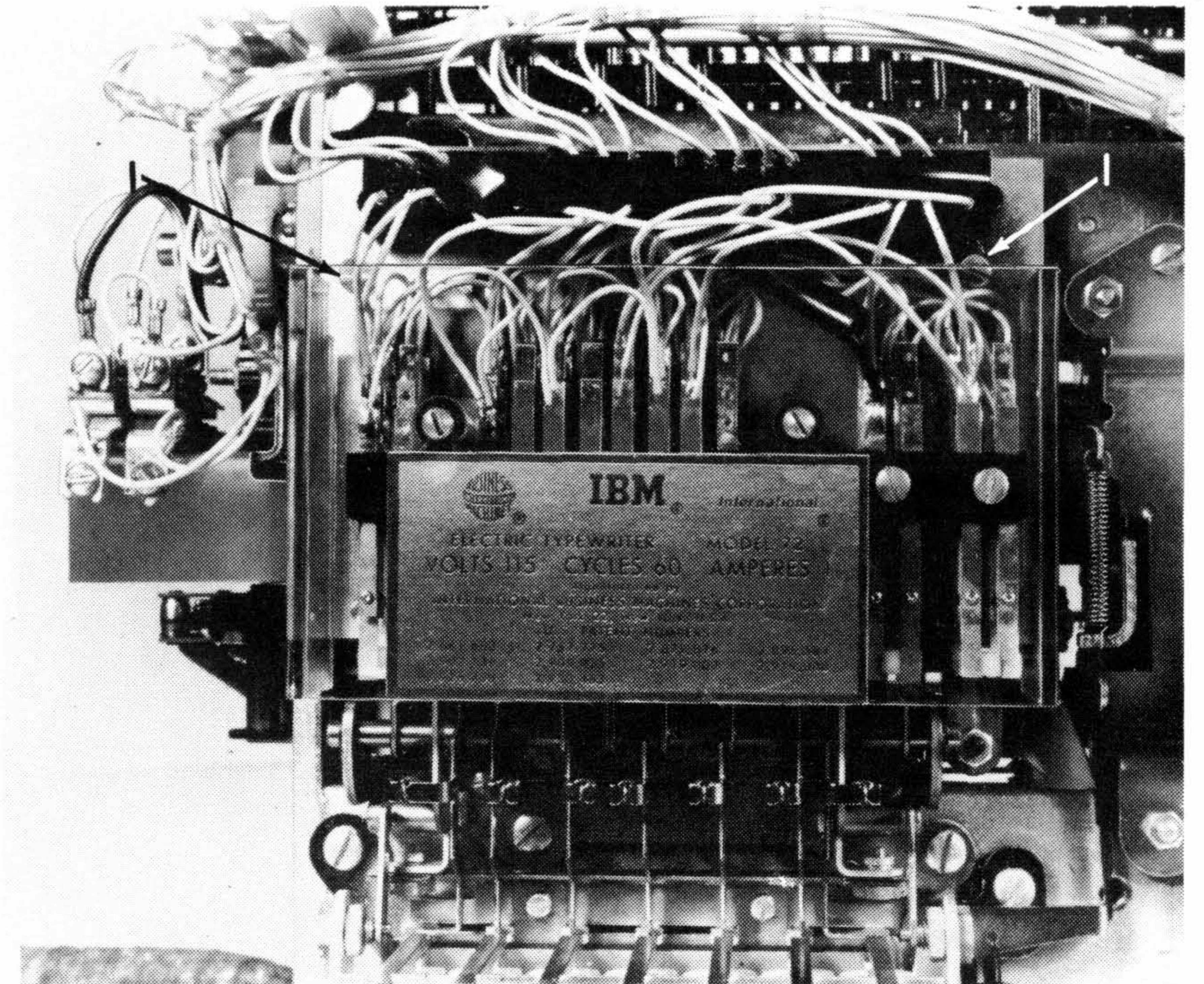


Figure 2. Cycle Clutch and Cycle Shaft Removal

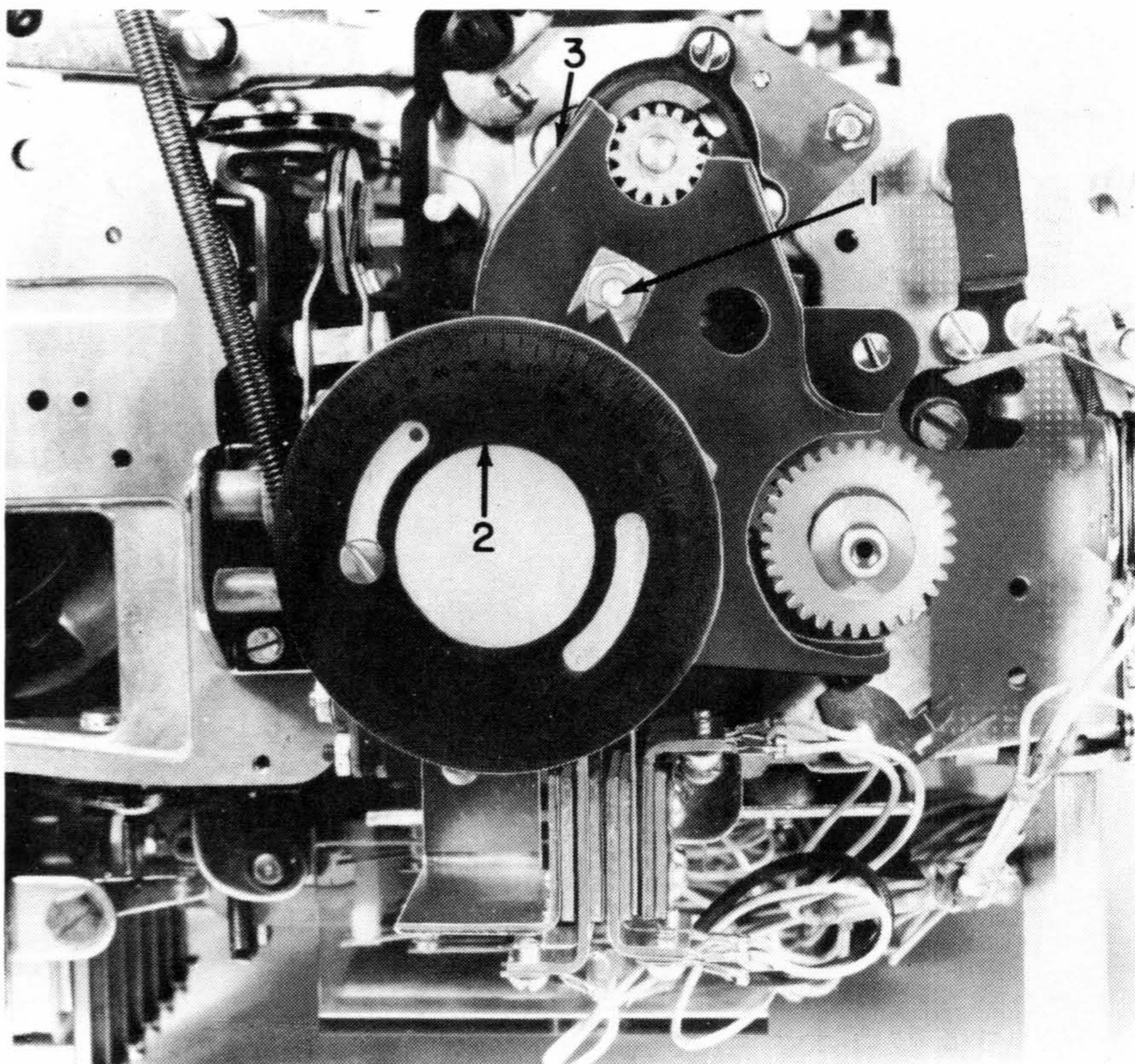


Figure 1. Cycle Clutch and Cycle Shaft Removal

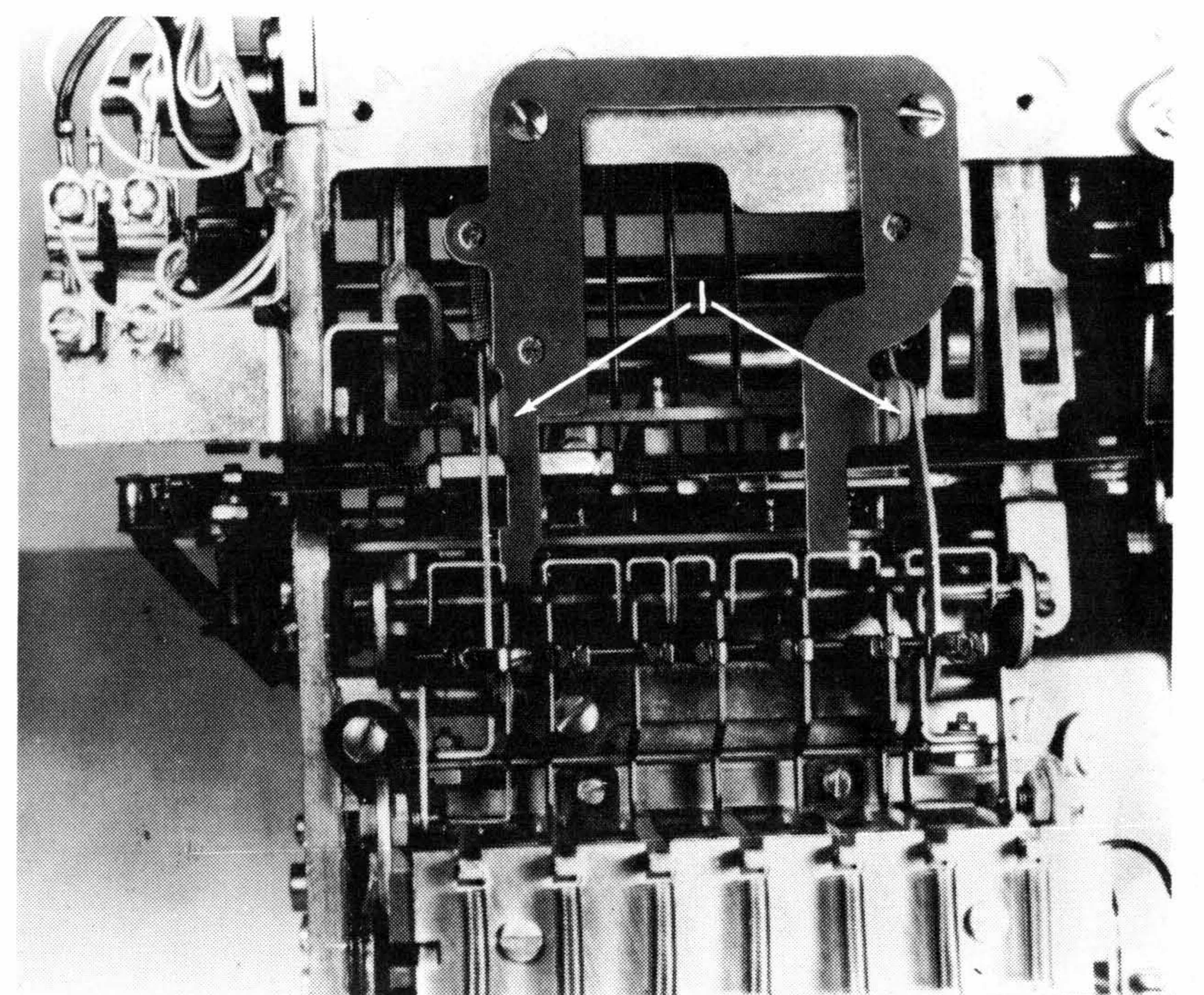


Figure 3. Cycle Clutch and Cycle Shaft Removal



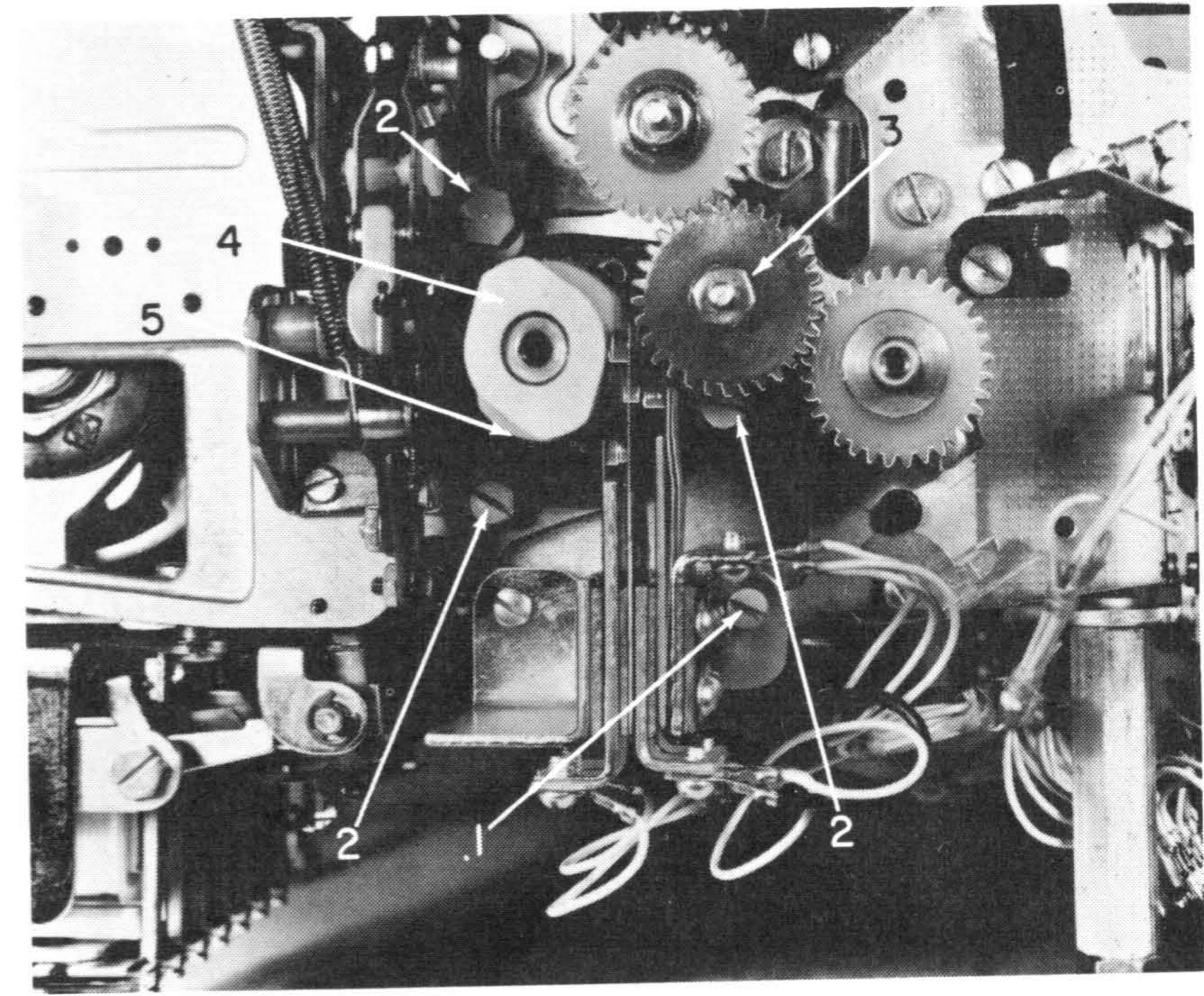


Figure 4. Cycle Clutch and Cycle Shaft Removal

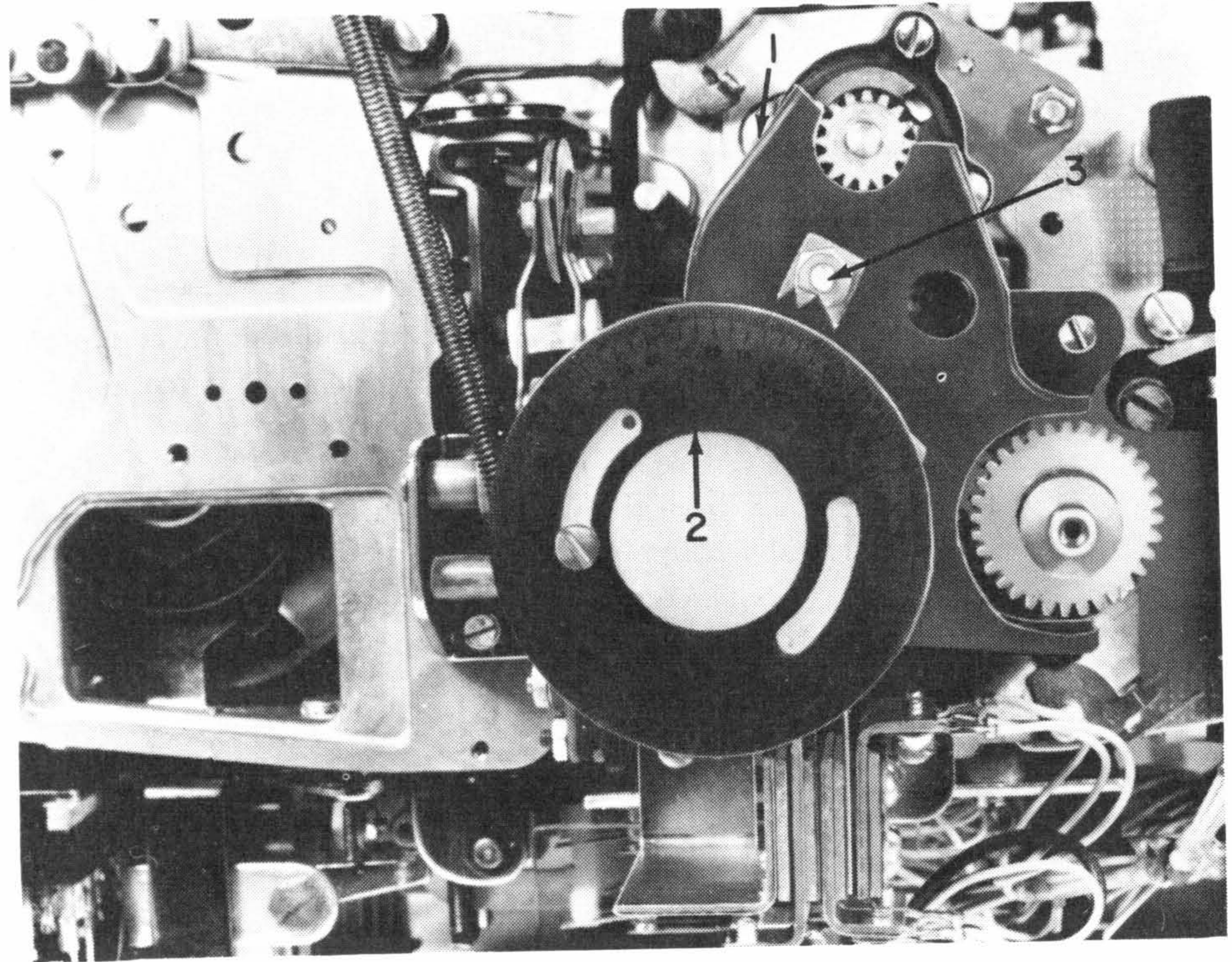


Figure 6. Belt Replacement

#### BELT REPLACEMENT

1. Position the carrier to the extreme right.
2. Remove the degree-wheel pointer (#3, Figure 6).
3. Remove the degree wheel (#2, Figure 6).
4. Remove the gear guard (#1, Figure 6).
5. Remove the left dust cover (not shown).

6. Remove the two screws (#1, Figure 7) that hold the plate to the frame. Remove the contact assembly, holding it to the front with a rubber band.
7. Remove the cycle-clutch check pawl and spring (#1, Figure 8).
8. Remove the front screw from the C1 and C2 contact assembly (#1, Figure 9) and swing the assembly down.
9. Remove the bronze intermediate gear (#3, Figure 9).

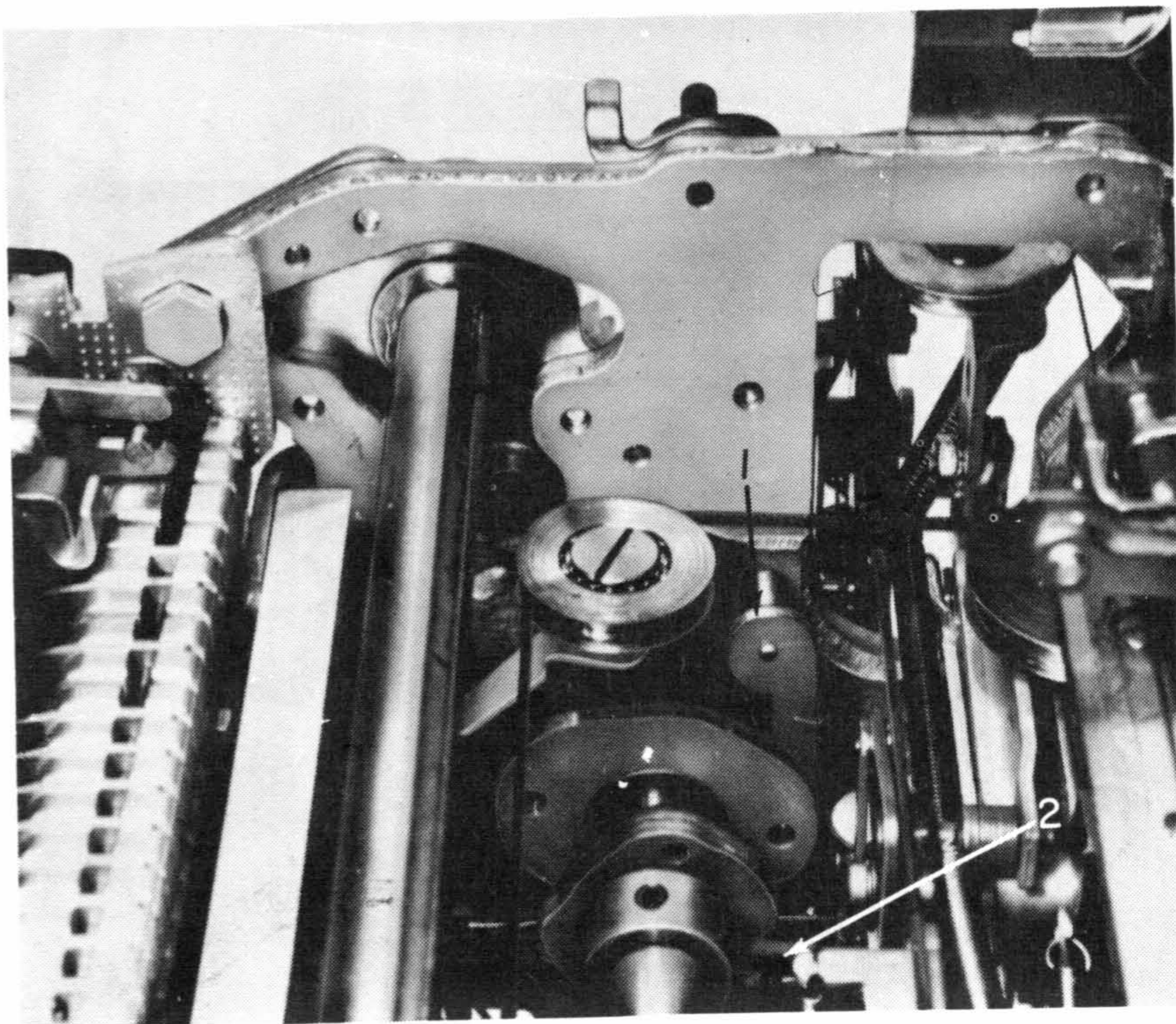


Figure 5. Cycle Clutch and Cycle Shaft Removal

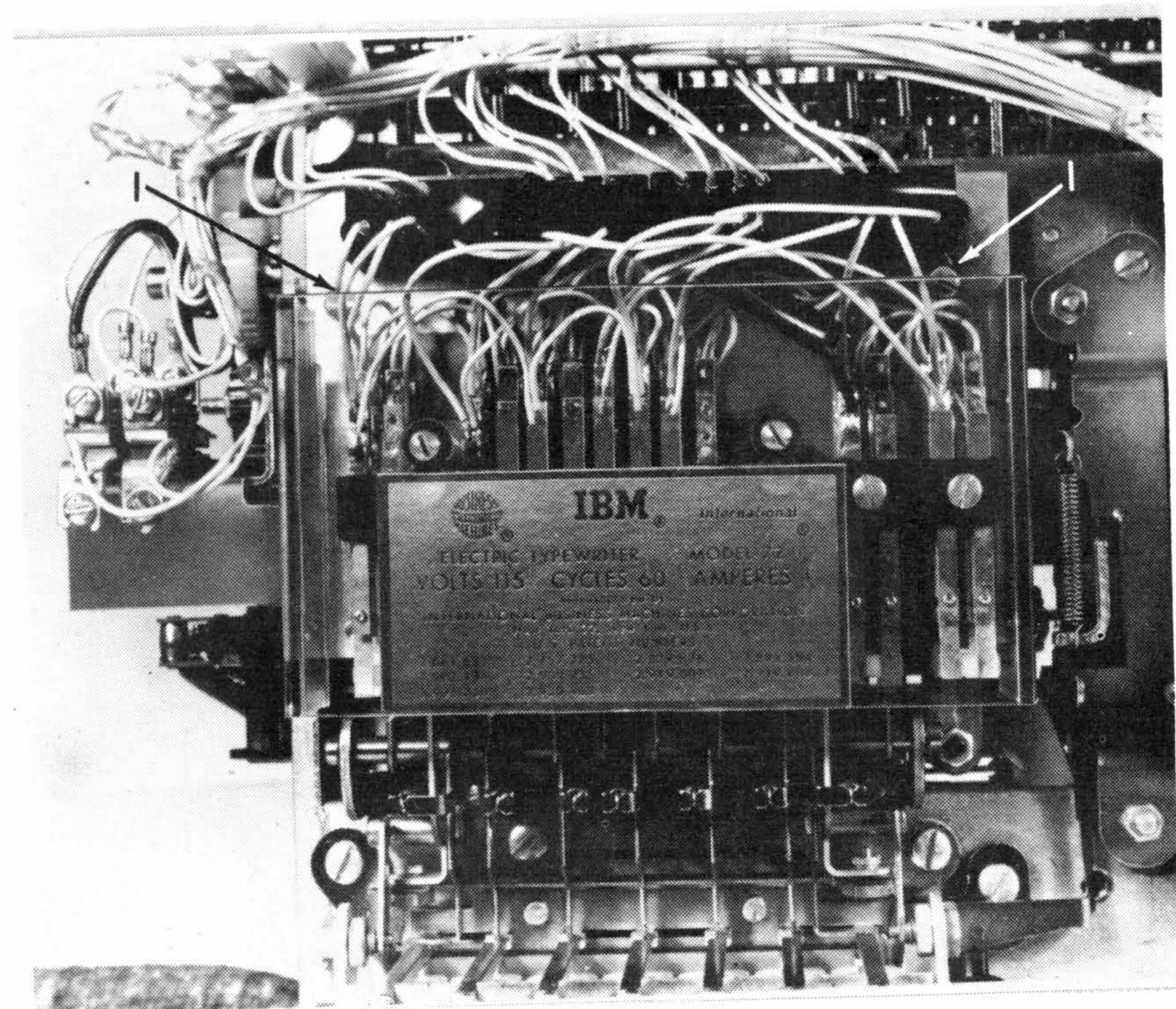


Figure 7. Belt Replacement



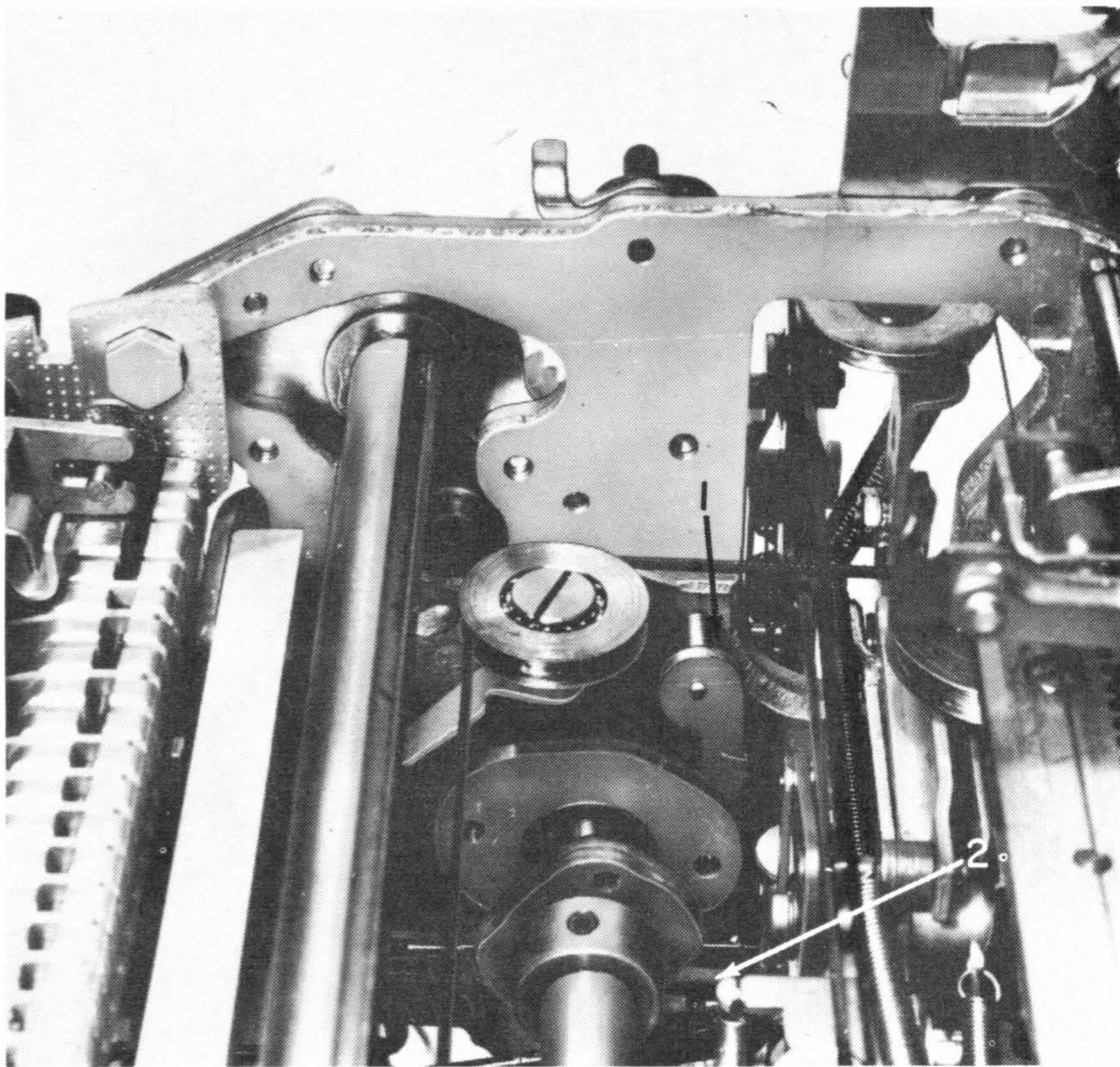


Figure 8. Belt Replacement

10. Remove the three bearing plate screws (#2, Figure 9) and remove the bearing plate.
11. Cut the old belt and remove it from the machine.
12. Force the positive bail down with a screwdriver (#1, Figure 11) making sure all the latches are under the bail. Insert a bristol wrench through the lower left bearing plate mounting hole over the top of the bail to hold it down.
13. Loosen the two cycle-clutch latch-bracket mounting screws (#1, Figure 10). Slip the new belt through the bearing plate hole, around the shaft, and over across the cycle shaft to the cycle-clutch latch (Figure 11). Work it between the latch and the cycle-clutch sleeve.

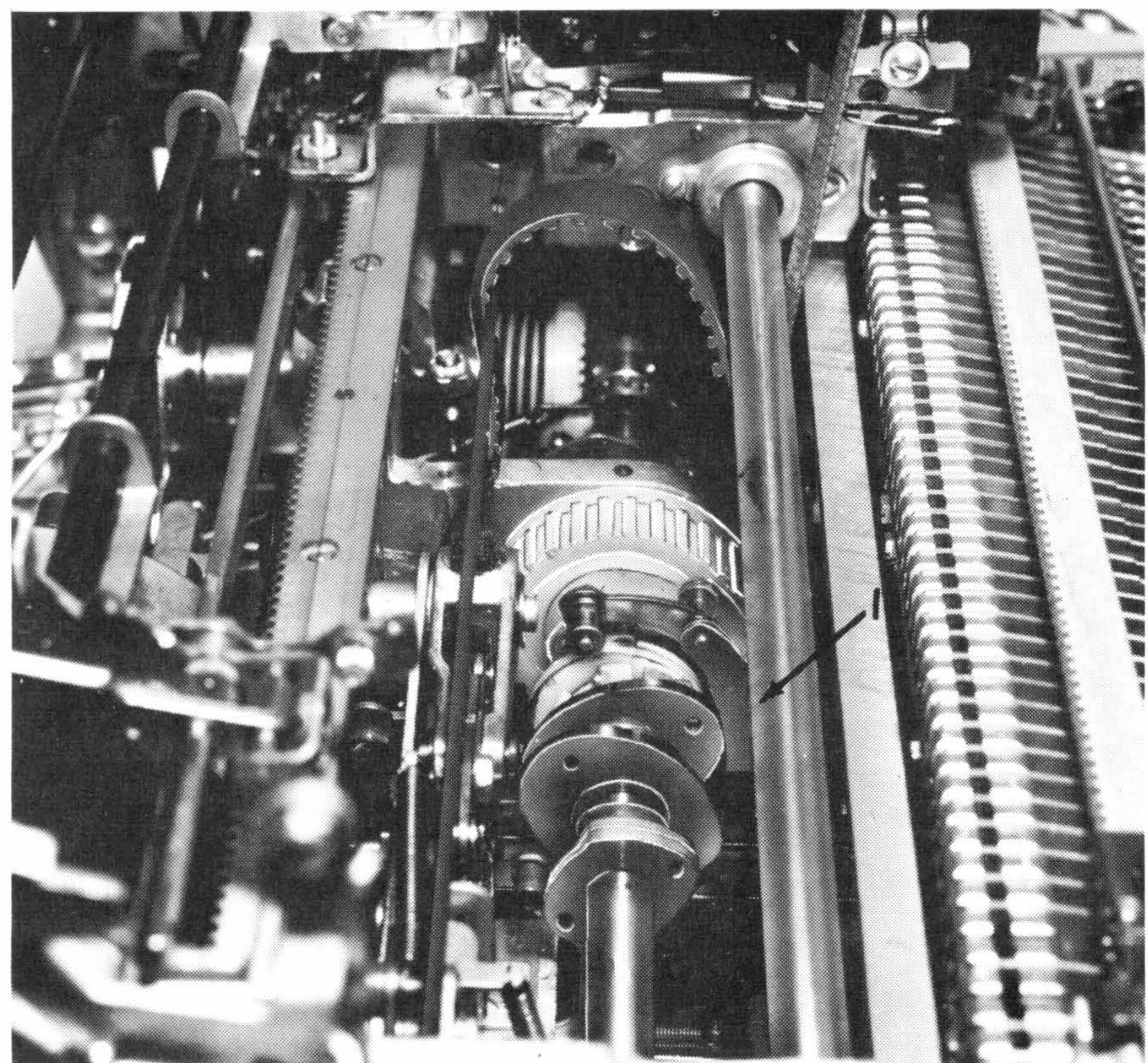


Figure 10. Belt Replacement

14. Loosen the motor mount and slip the belt over the centrifugal clutch.
15. The following adjustments should be checked after the belt is replaced:
  - a. Idler gears
  - b. Damper spring
  - c. Filter shaft timing
  - d. Print shaft timing
  - e. C1 and C2 contact timing
  - f. Cycle clutch latch bracket height

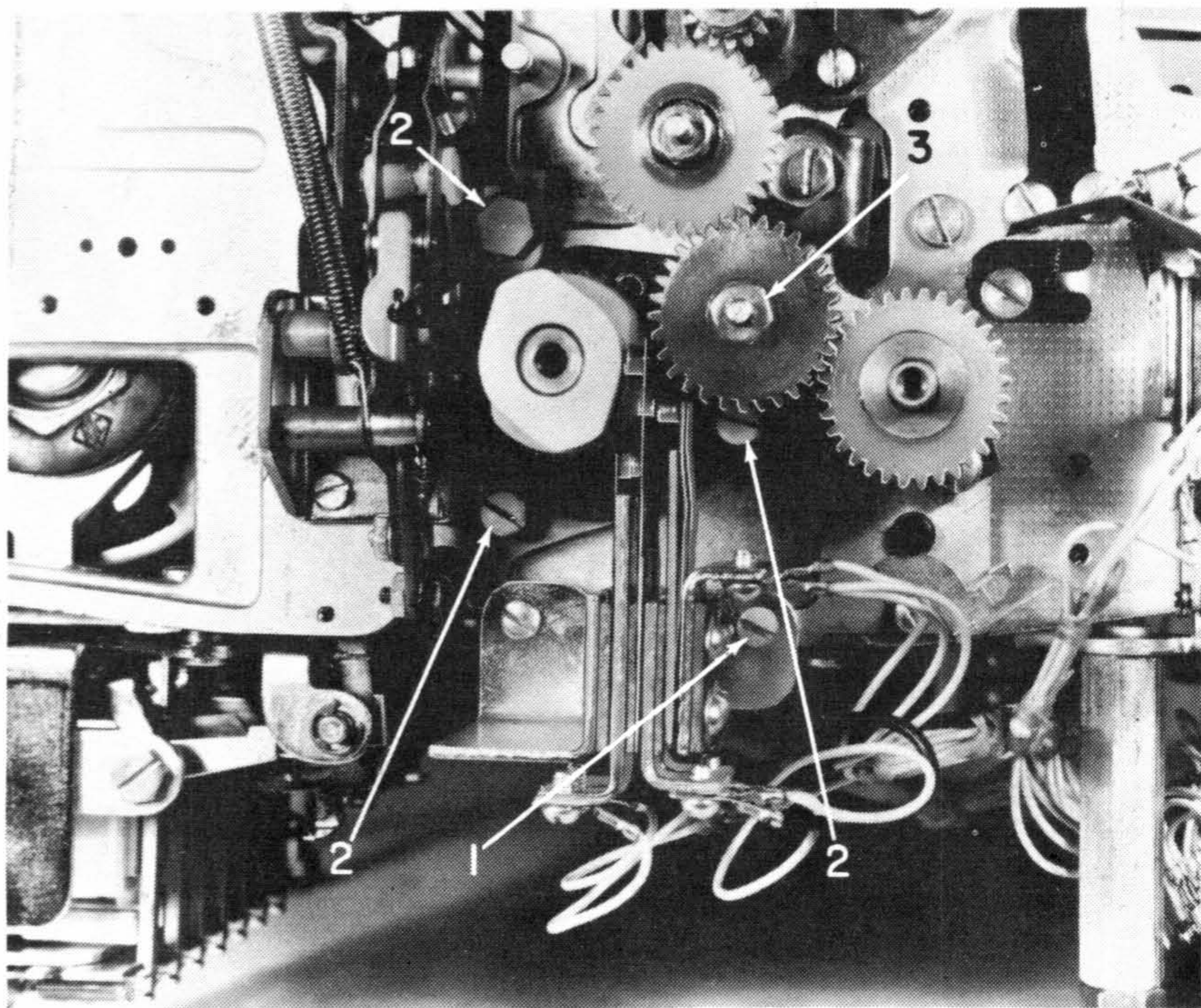


Figure 9. Belt Replacement

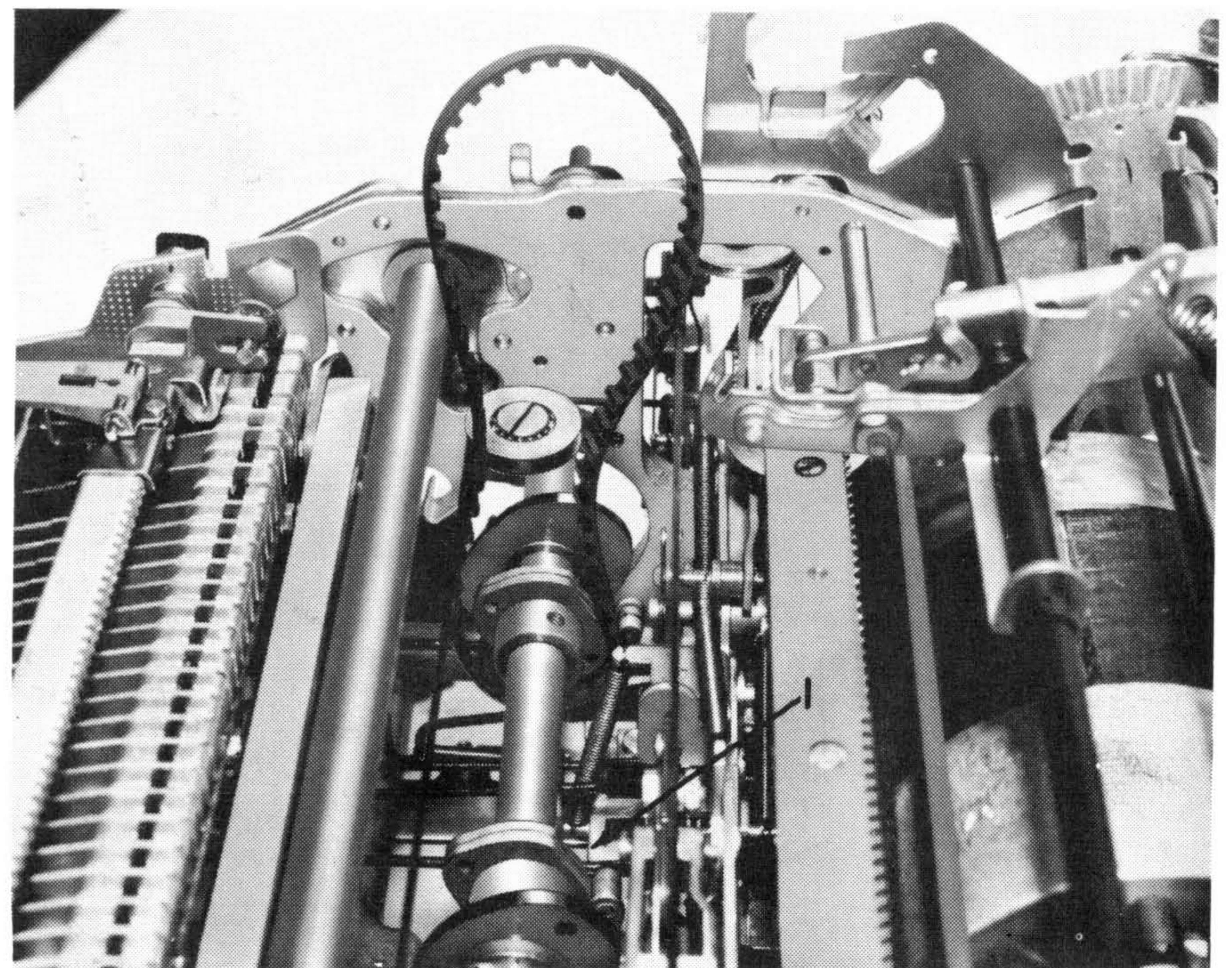


Figure 11. Belt Replacement



## ROTATE SPRING REPLACEMENT

1. Remove the left dust cover
2. Remove the ribbon cartridge
3. Center the carrier over the camshaft
4. Remove the two screws (#1, Figure 12) that hold the contact plate to the frame. Remove the contact assembly, holding it to the front with a rubber band.
5. Remove the two nuts (#1, Figure 13), one on newer machines, immediately to the right of the yoke on the carrier, remove the black clip from under the nut (#2, Figure 13) and gradually remove the tension from the rotate spring.
6.
  - a. On older machines, back out the two screws (#1, Figure 14) on the right 1/4" and remove the screw on the left, which is under the cycle shaft (#2, Figure 14).
  - b. On newer machines, remove the lower right and left screws and back out the upper right screw 1/4" (Figure 14).

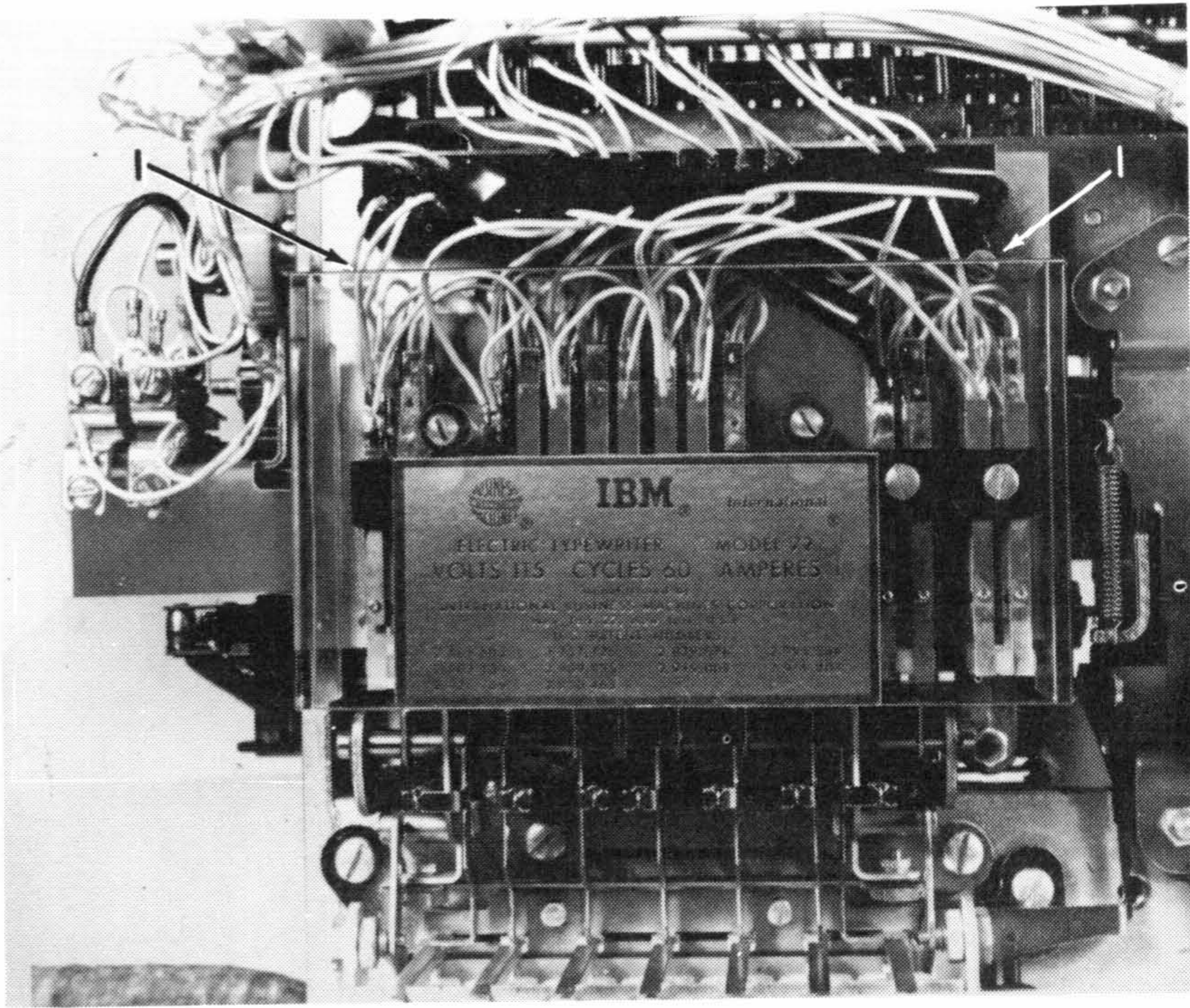


Figure 12. Rotate Spring Replacement

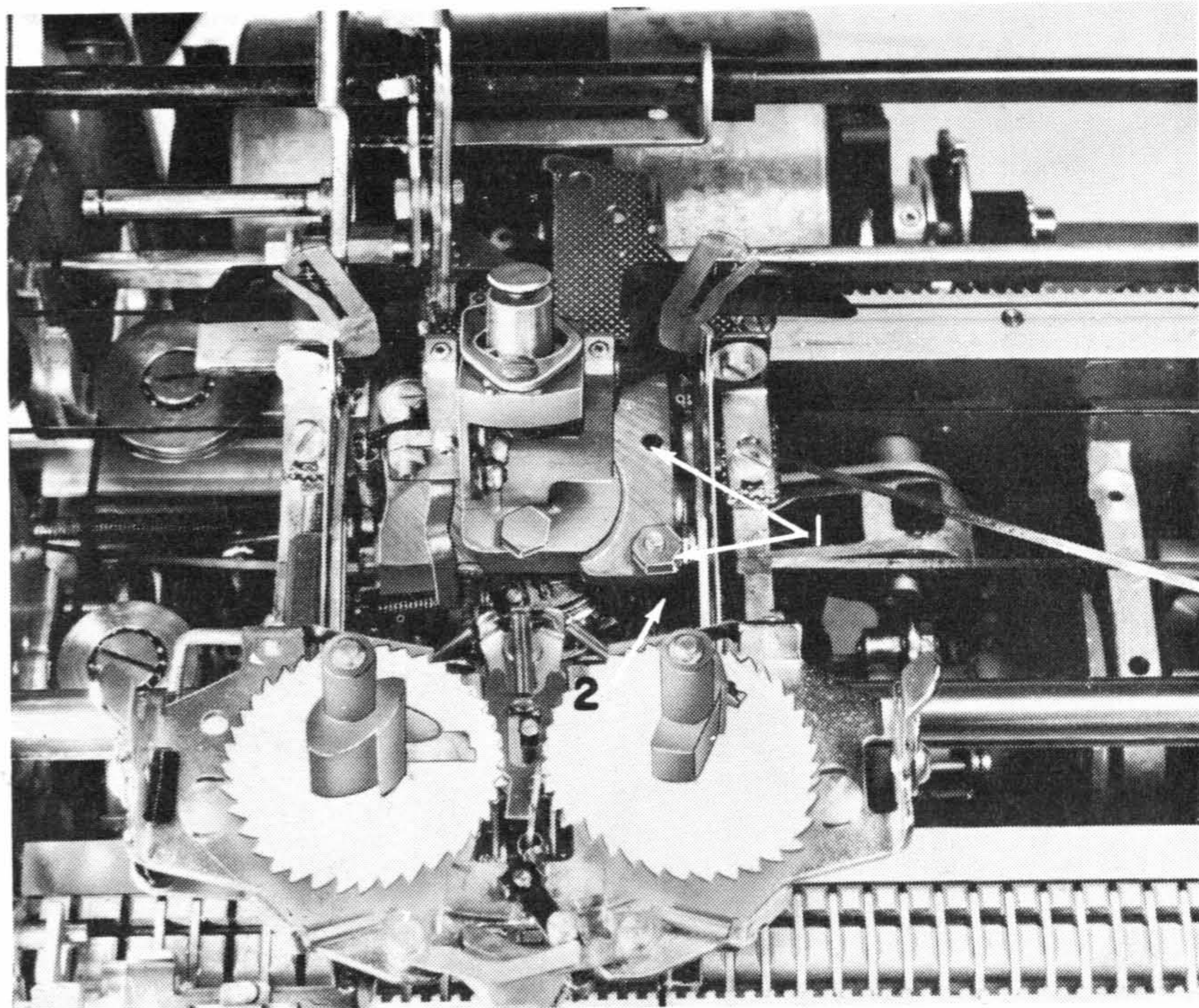


Figure 13. Rotate Spring Replacement

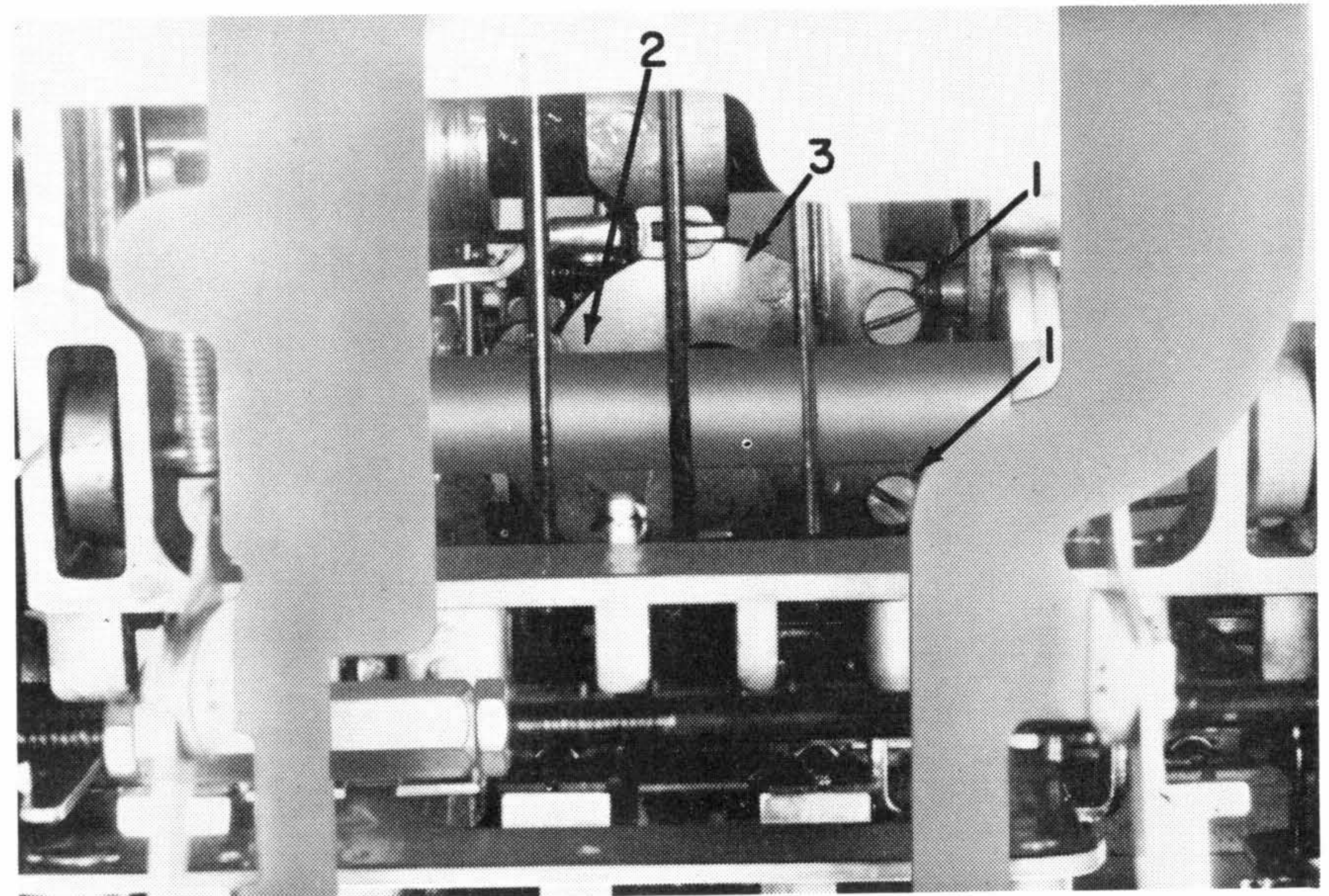


Figure 14. Rotate Spring Replacement

7. Remove the striker and rotate-spring retaining plate (#3, Figure 14). The rotate spring can now be removed. Note: In newer machines there may be a spring clip (PN 1141238) that prevents the spring from being trapped in the pulley notch. If not, one should be added on re-assembly.
8. Note: On some machines it may be necessary to shim the retaining plate and striker because they will cause the new rotate spring to bind.
9. The following adjustments should be checked after the rotate-spring is replaced:
  - a. Rotate Spring Tension
  - b. Typehead Homing
  - c. Damper Spring



## LOWER BALL SOCKET AND TILT RING REMOVAL

1. Remove the left dust cover and ribbon cartridge. Center the carrier over the cycle shaft.
2. Shift into upper case.
3. Remove the two screws (#1, Figure 12) that hold the print contact plate to the frame. Remove the contact assembly, holding it to the front with a rubber band.
4. Half cycle a 0-rotate 1-tilt character. Note which position the tilt detent is in for replacement and be sure the machine is still in upper case.
5. Loosen the two setscrews (#1, Figure 15).
6. Remove the two pivot pins (#2, Figure 15).
7. Remove the tilt ring (#3, Figure 15) and remove the ball joint.
8. Loosen the rotate pulley setscrew (#1, Figure 16).
9. Use the butt end of a small spring hook as a follower to push out the lower ball socket (#2, Figure 16). Note: This prevents the wedge from being lost. When replacing the socket be sure the pin is pointing toward the front-left and right-rear corners.
10. The following adjustments should be checked after the lower ball socket and tilt ring is replaced.
  - a. Tilt Detenting
  - b. Typehead Homing
  - c. Tilt Ring
  - d. Upper Ball Socket

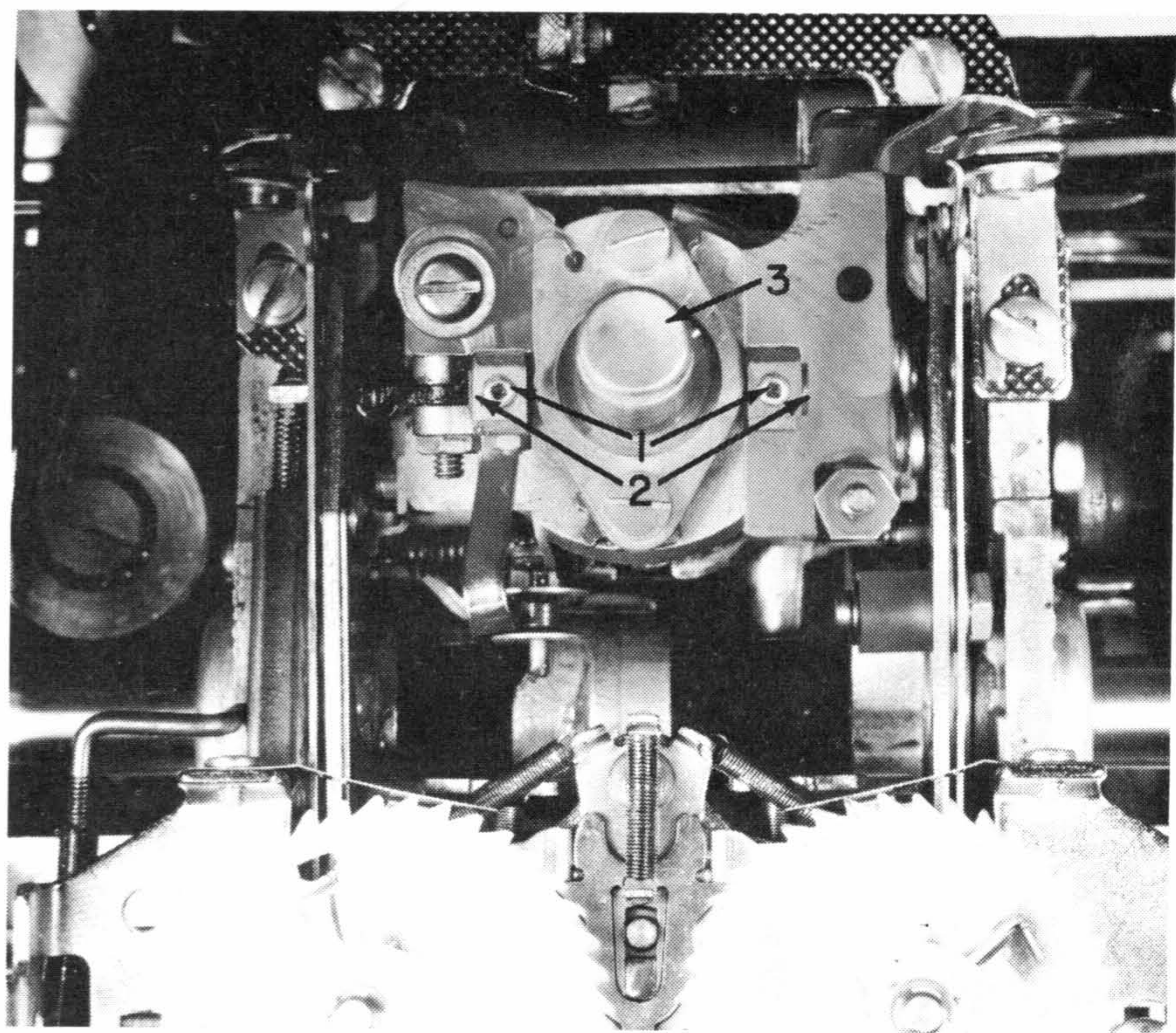


Figure 15. Lower Ball Socket and Tilt Ring Removal

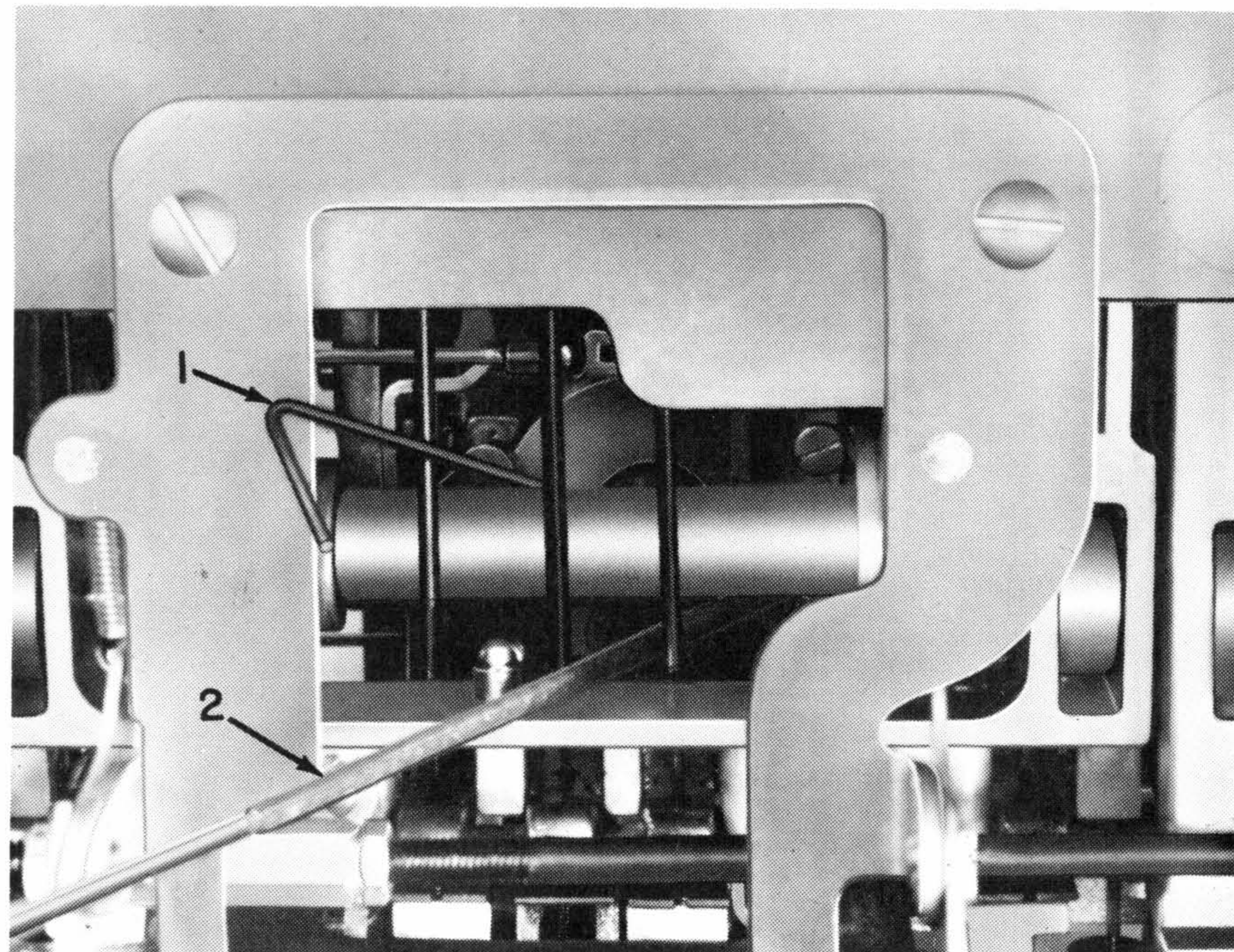


Figure 16. Lower Ball Socket and Tilt Ring Removal

## ROTATE TAPE REPLACEMENT

1. Remove the left and right dust covers.
2. Position the carrier 3" from the left frame.
3. Remove the broken pieces of tape from the machine.
4. Disconnect the tilt-pulley tension spring (not shown).
5. Pull the tilt ring toward the front of the machine and turn the rotate pulley until the T-slot is accessible (#1, Figure 17).
6. Insert the rotate tape, eyelet first (#2, Figure 17), between the rotate pulley and the right side of the yoke from beneath the ribbon mechanism.
7. Pull the tape through and insert the T-tip of the tape into the T-slot of the pulley (#1, Figure 18).
8. Thread the tape around the rotate-arm pulley, top to front, keeping it under the carrier-return cord, around the shift-arm pulley, and anchor it to the carrier.
9. Connect the tilt-pulley spring with the open end to the rear (#2, Fig. 19).
10. Restore the 2 pounds of rotate-spring tension.
11. Check the typehead homing adjustment.

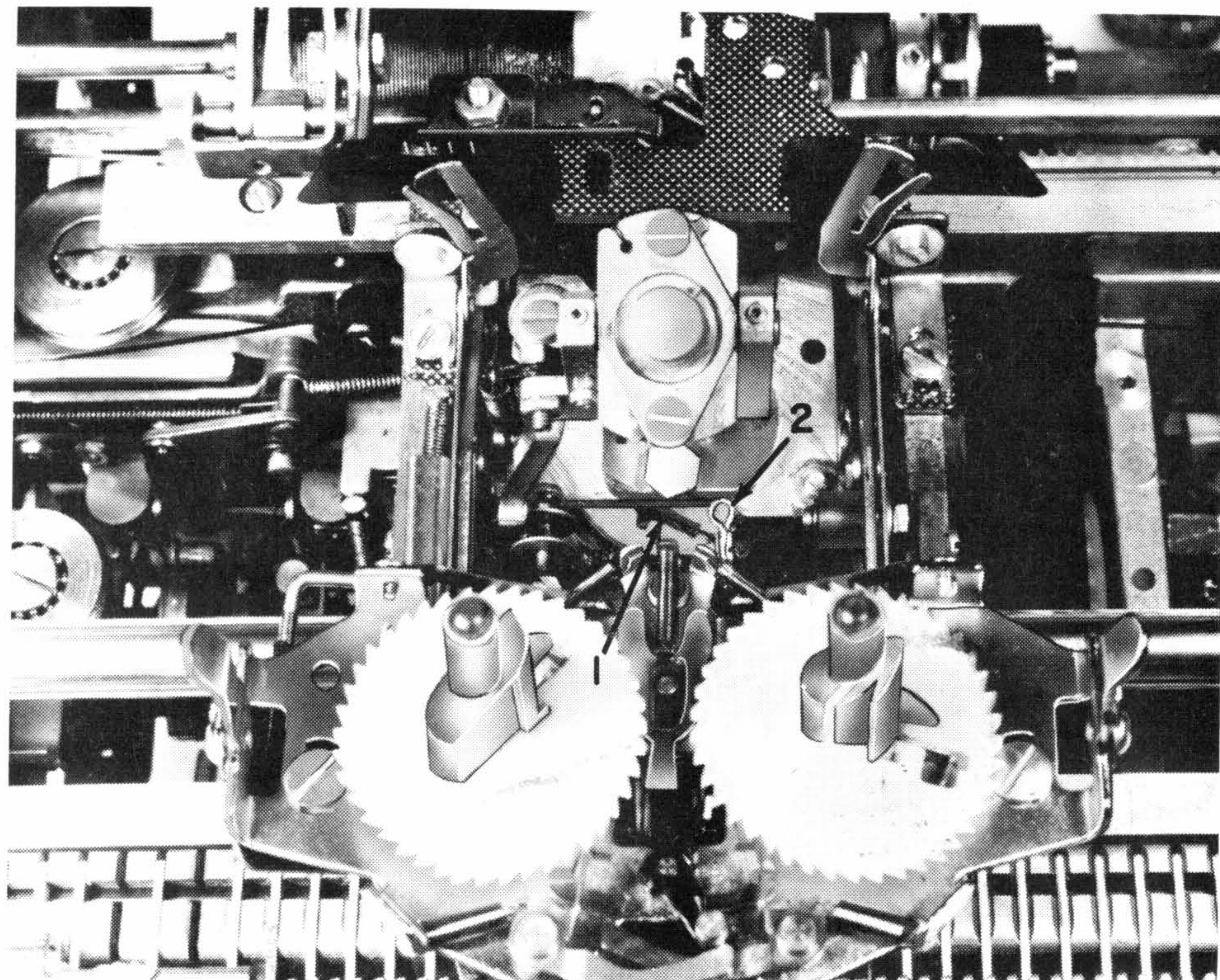


Figure 17. Rotate Tape Replacement



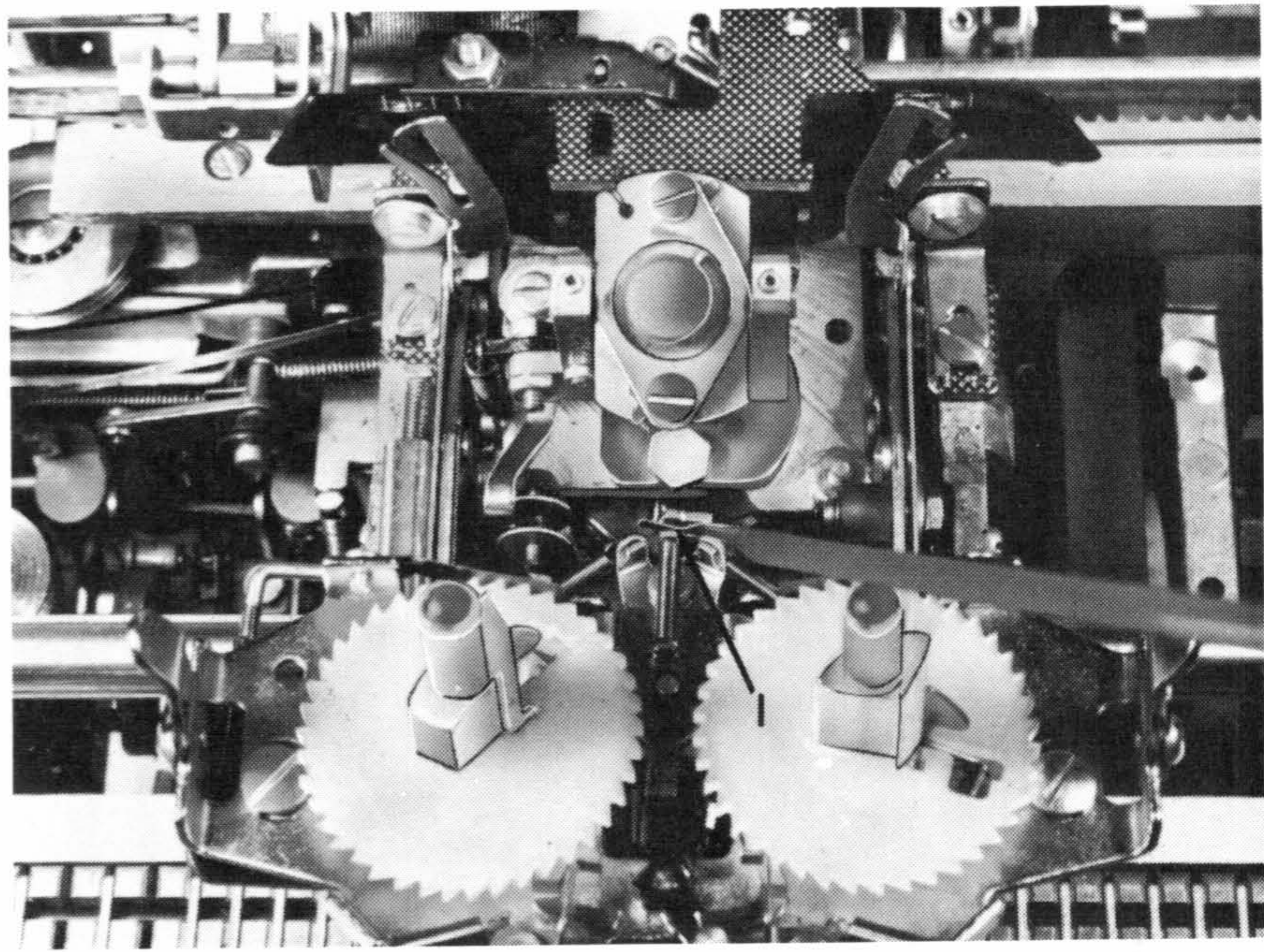


Figure 18. Rotate Tape Replacement

#### TILT TAPE REPLACEMENT

1. Remove the left and right dust covers.
2. Position the carrier 3" from the left frame.
3. Remove the broken pieces of tape from the machine.
4. Insert the tilt tape, eyelet first (#1, Figure 19), between the tilt pulley and the right side of the yoke from beneath the ribbon mechanism.
5. Thread the tape around the left tilt-arm pulley, right tilt-arm pulley, and take up the slack in the tape.
6. Withdraw the rotate detent, turn the head counter-clockwise to relieve the rotate-tape tension, tilt the head to the front, and restore the detent.
7. Remove the tape retaining pin from the carrier and insert the tilt tape, keeping it on top of the rotate tape.
8. Restore the typehead to the rest position.
9. Check the tilt detent adjustment. (R.H. Tilt Pulley)

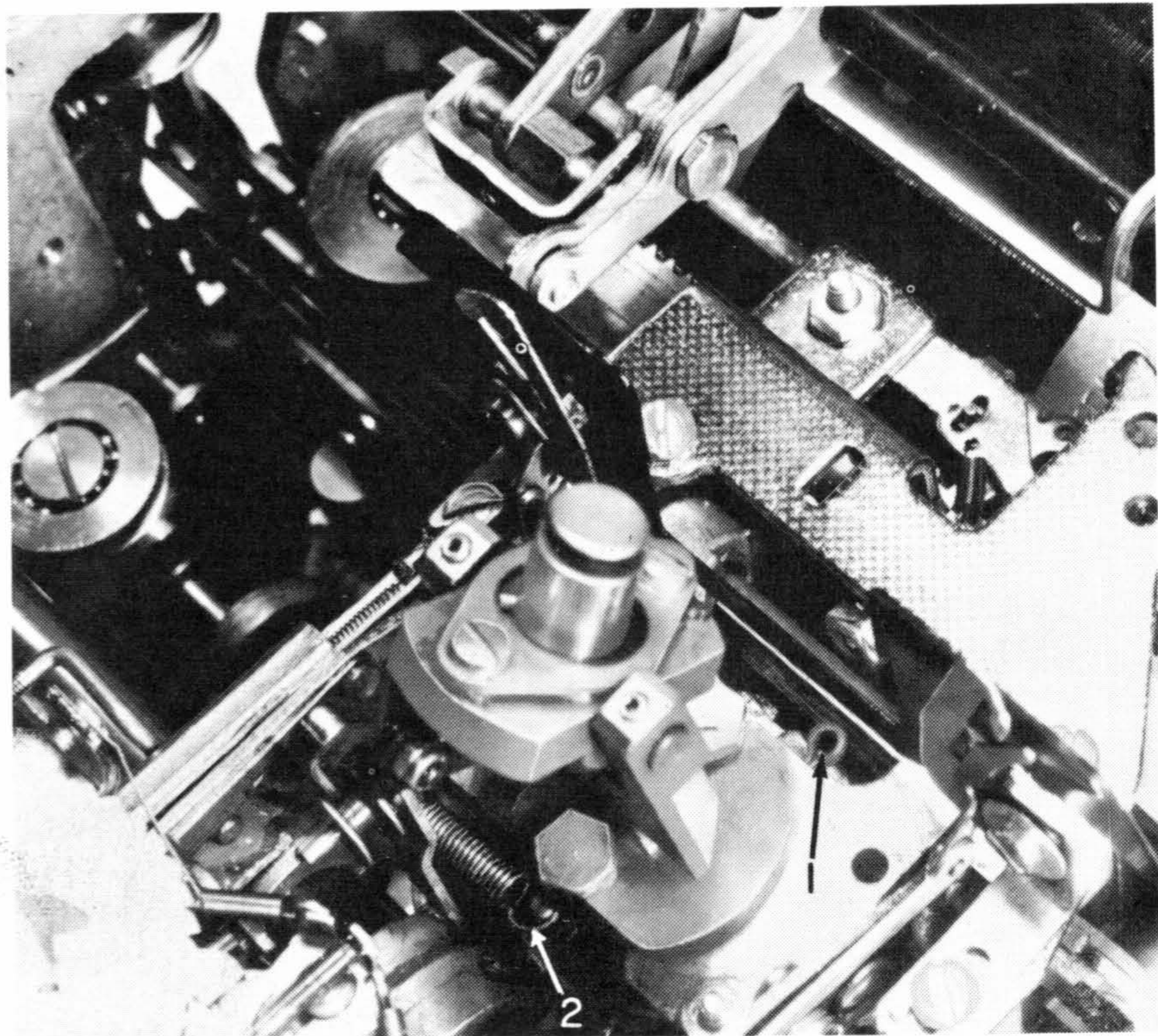


Figure 19. Tilt Tape Replacement

#### ROTATE SELECTION DIFFERENTIAL REMOVAL

1. Position the carrier to the extreme right.
2. Remove the left dust cover, platen, feed rolls, and paper deflector.
3. Remove the two screws (#1, Figure 21) that hold the plate to the frame. Remove the contact assembly, holding it to the front with a rubber band.
4. Disconnect the clevises and remove them from the links (#2, Figure 20).
5. Remove the springs from the rotate interposers (#1, Figure 20).
6. Disconnect the rotate link at both ends and remove it (#1, Figure 22).
7. Remove the latch-bail spring (#2, Figure 22).
8. Remove the motor.
9. Remove the rotate-latch springs (#1, Figure 23).
10. Pull out the rotate links (#2, Figure 23).
11. Remove the check-latch spring (#3, Figure 23).
12. Remove the guide-bracket mounting stud and screw (#4, Figure 23).
13. Remove the balance-arm mounting stud (#1, Figure 24).
14. Disconnect the minus-five bail drive link from the right end of the balance arm (#2, Figure 24).
15. Disconnect the tilt-differential spring (#3, Figure 24).
16. Rotate the cycle shaft until the cam followers are on the low points of the cams.
17. Remove the rotate-differential assembly.
18. The following adjustments should be checked after the rotate-selection-differential assembly is replaced:
  - a. Typehead Homing
  - b. Rotate Latch Clearance
  - c. Rotate Differential Guides.

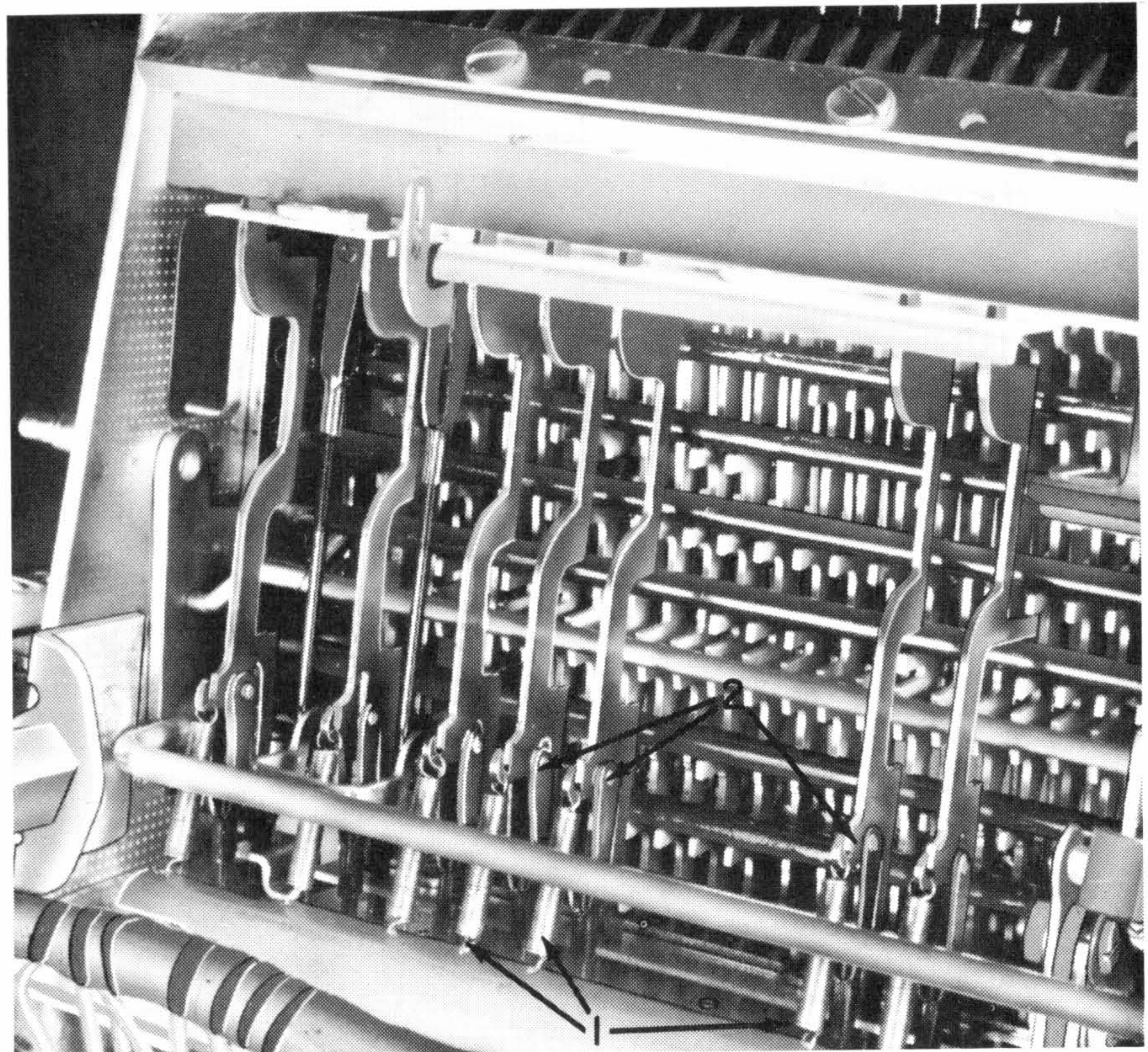


Figure 20. Rotate Selection Differential Removal



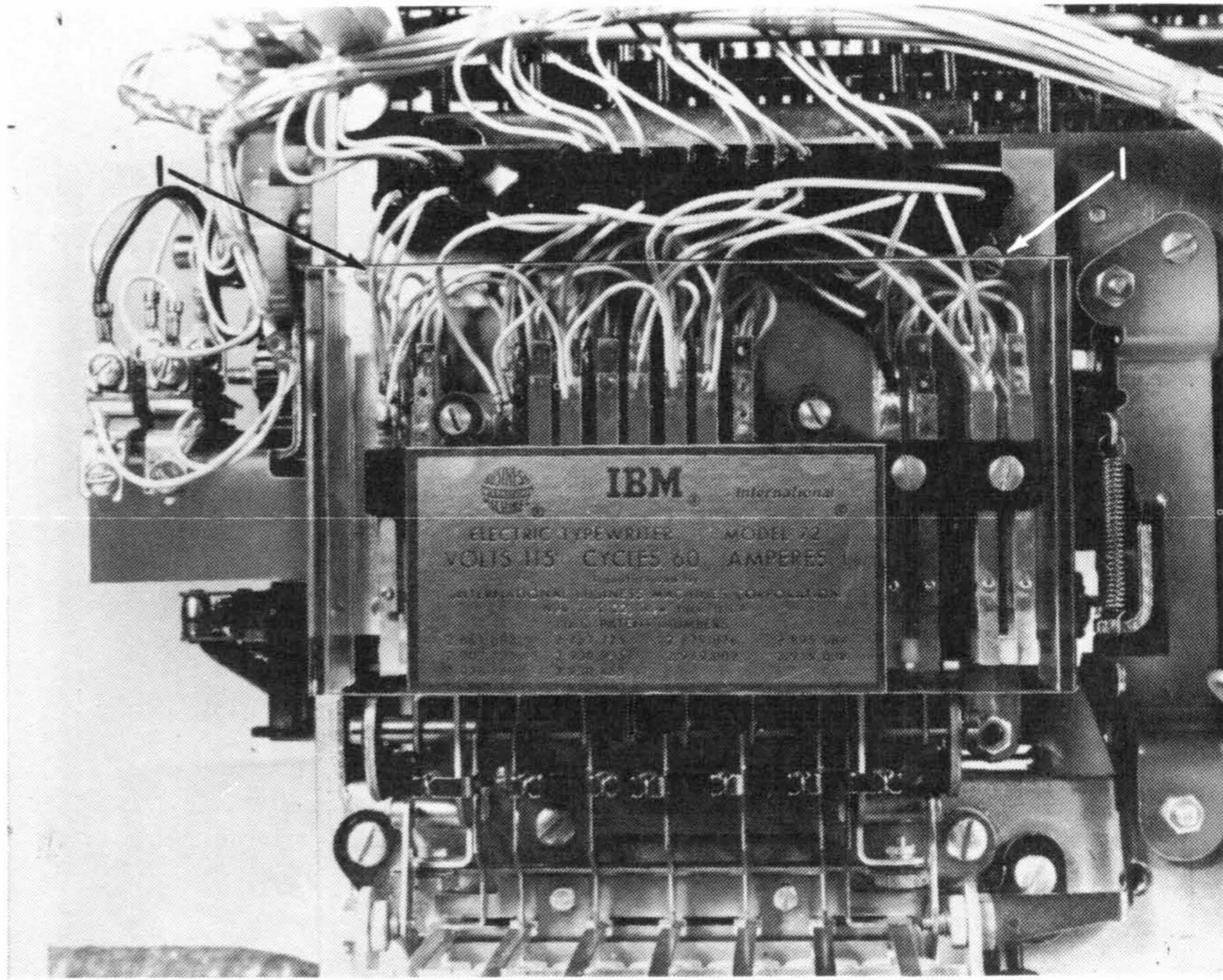


Figure 21. Rotare Selection Differential Removal

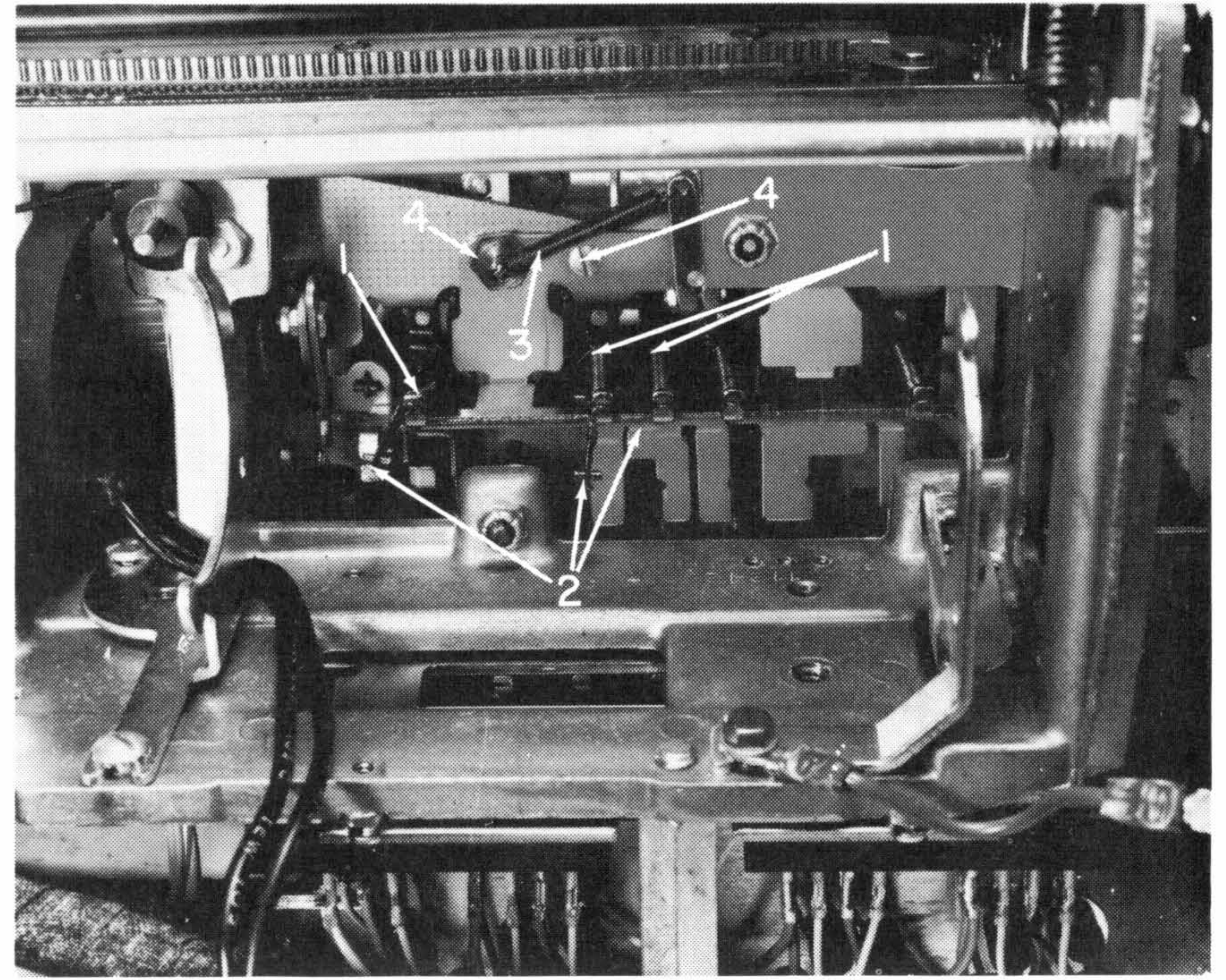


Figure 23. Rotare Selection Differential Removal

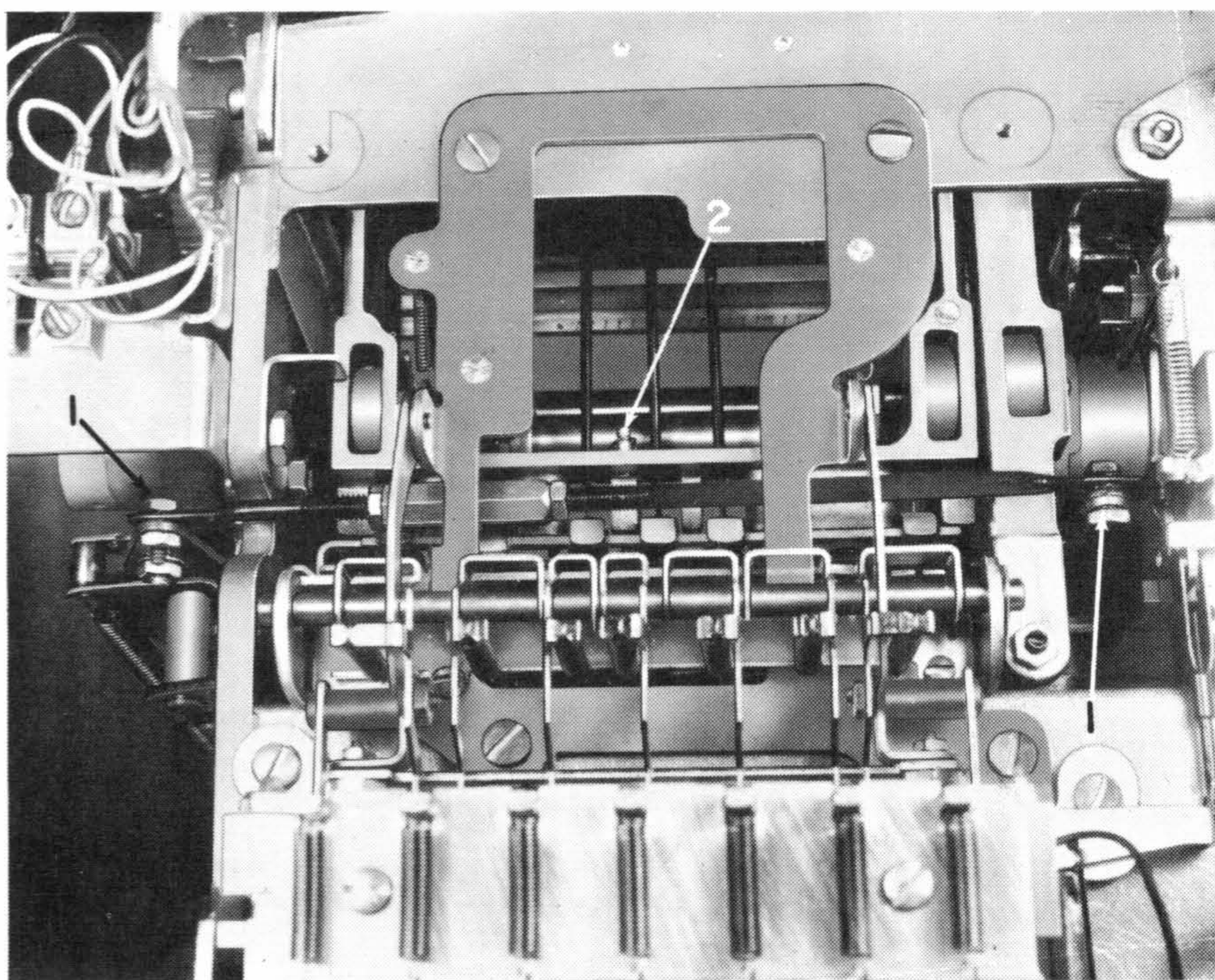


Figure 22. Rotare Selection Differential Removal

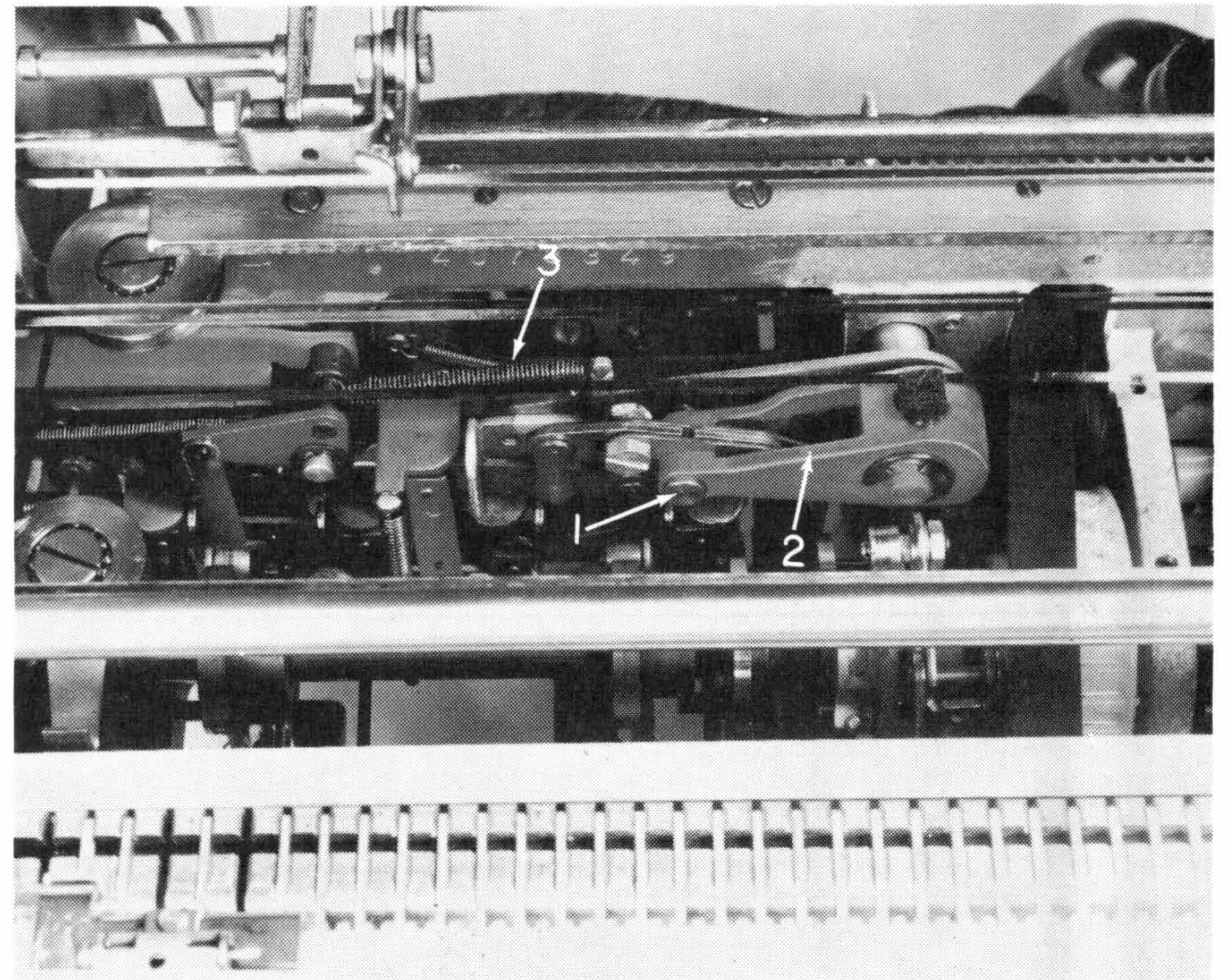


Figure 24. Rotare Selection Differential Removal



## TILT SELECTION DIFFERENTIAL REMOVAL

1. Position the carrier to the extreme right.
2. Remove the left dust cover, platen, feed rolls, and paper deflector.
3. Remove the springs from the tilt interposers (#1, Figure 25).
4. Disconnect the clevises and remove them from the links (#2, Figure 25).
5. Remove the motor.
6. Remove the tilt-latch springs (#1, Figure 26).
7. Remove the tilt links (#2, Figure 26).
8. Remove the positive bail spring (#1, Figure 27).
9. Remove the tilt-differential spring (#2, Figure 27).
10. Remove the rotate-arm spring (#3, Figure 27).
11. Remove the two C-clips and remove the tilt-differential assembly (#4, Figure 27).
12. The following adjustments should be checked after the tilt-differential assembly is replaced.
  - a. Tilt Detenting
  - b. Tilt Latch Clearance
  - c. Rotate Differential Guides

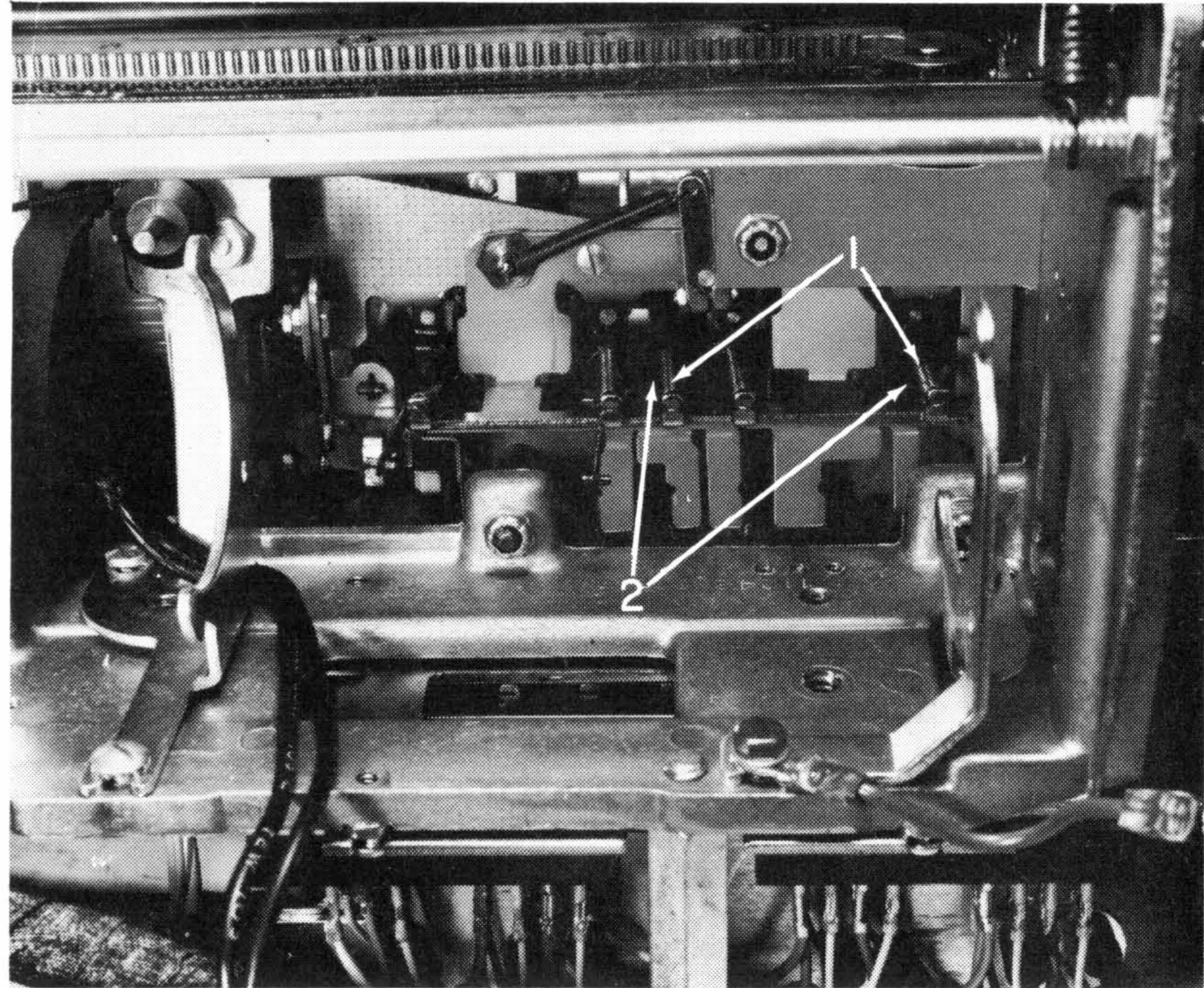


Figure 26. Tilt Selection Differential Removal

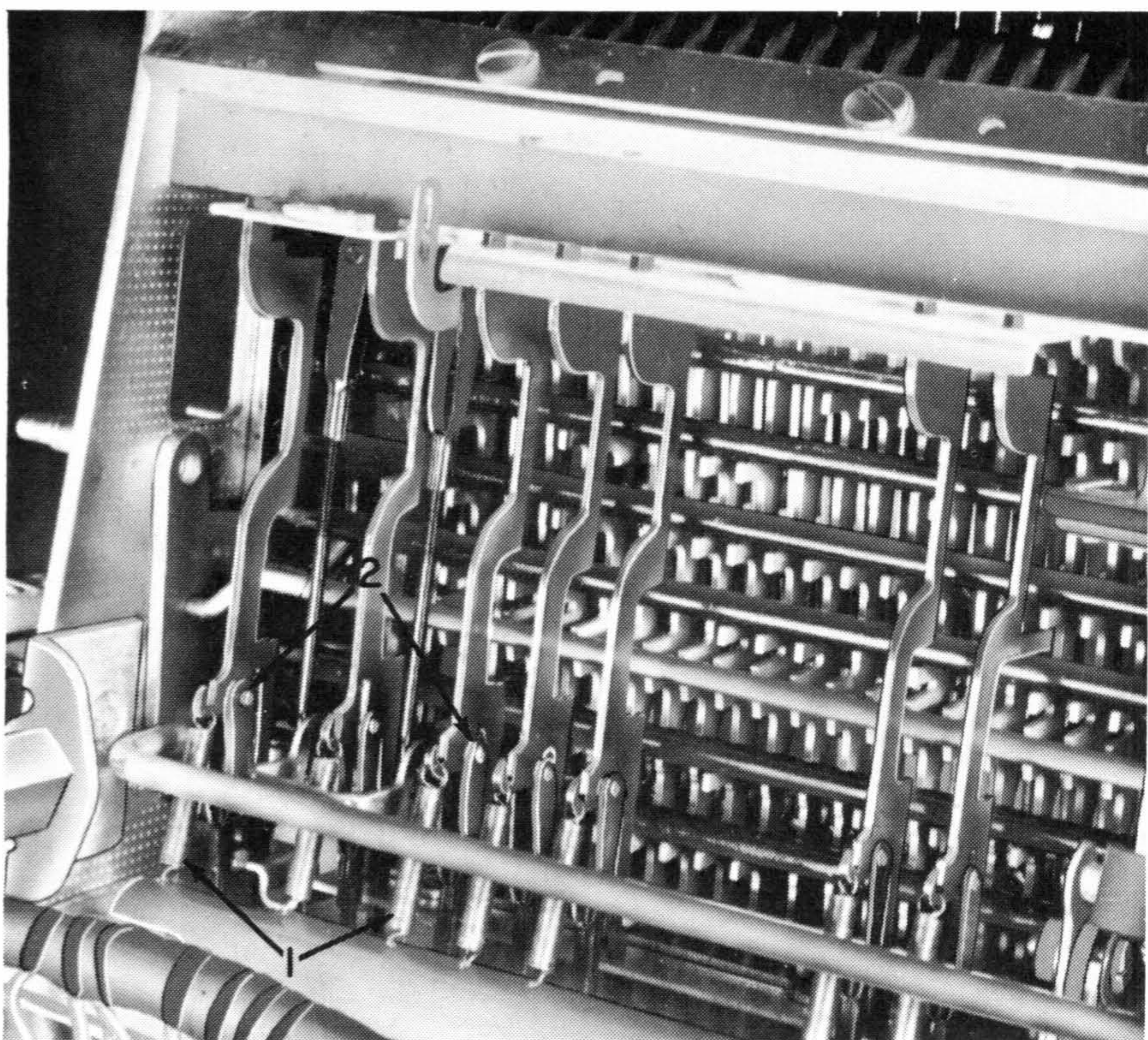


Figure 25. Tilt Selection Differential Removal

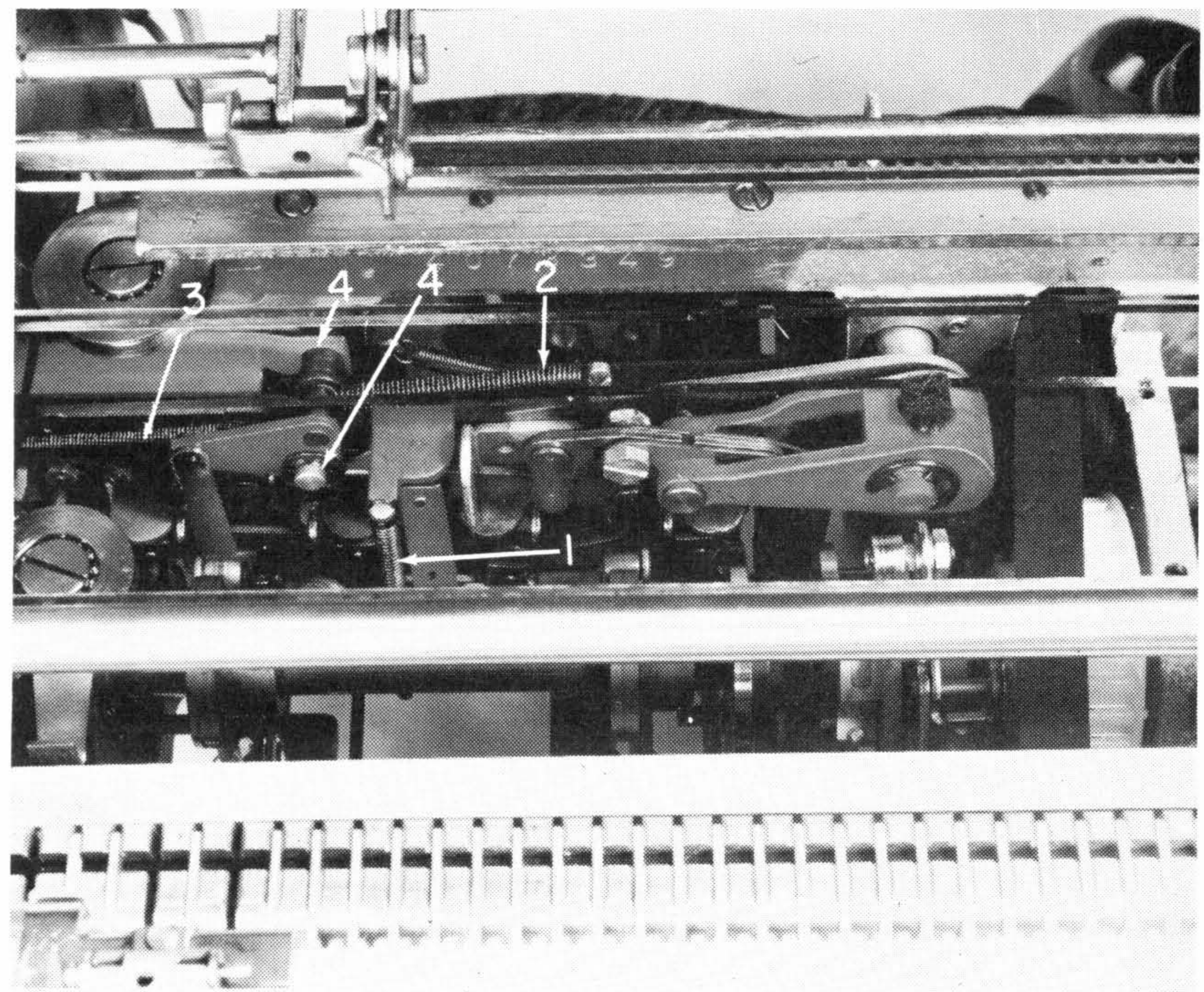


Figure 27. Tilt Selection Differential Removal



## DIFFERENTIAL PLATE REMOVAL

1. Position the carrier to the extreme right.
2. Remove the left dust cover, platen, feed rolls, and paper deflector.
3. Remove all the springs from the interposers (#1, Figure 28).
4. Disconnect the clevises and remove them from the links (#2, Figure 28).
5. Remove the two screws (#1, Figure 29) that hold the contact plate to the frame. Remove the contact assembly, holding it to the front with a rubber band.

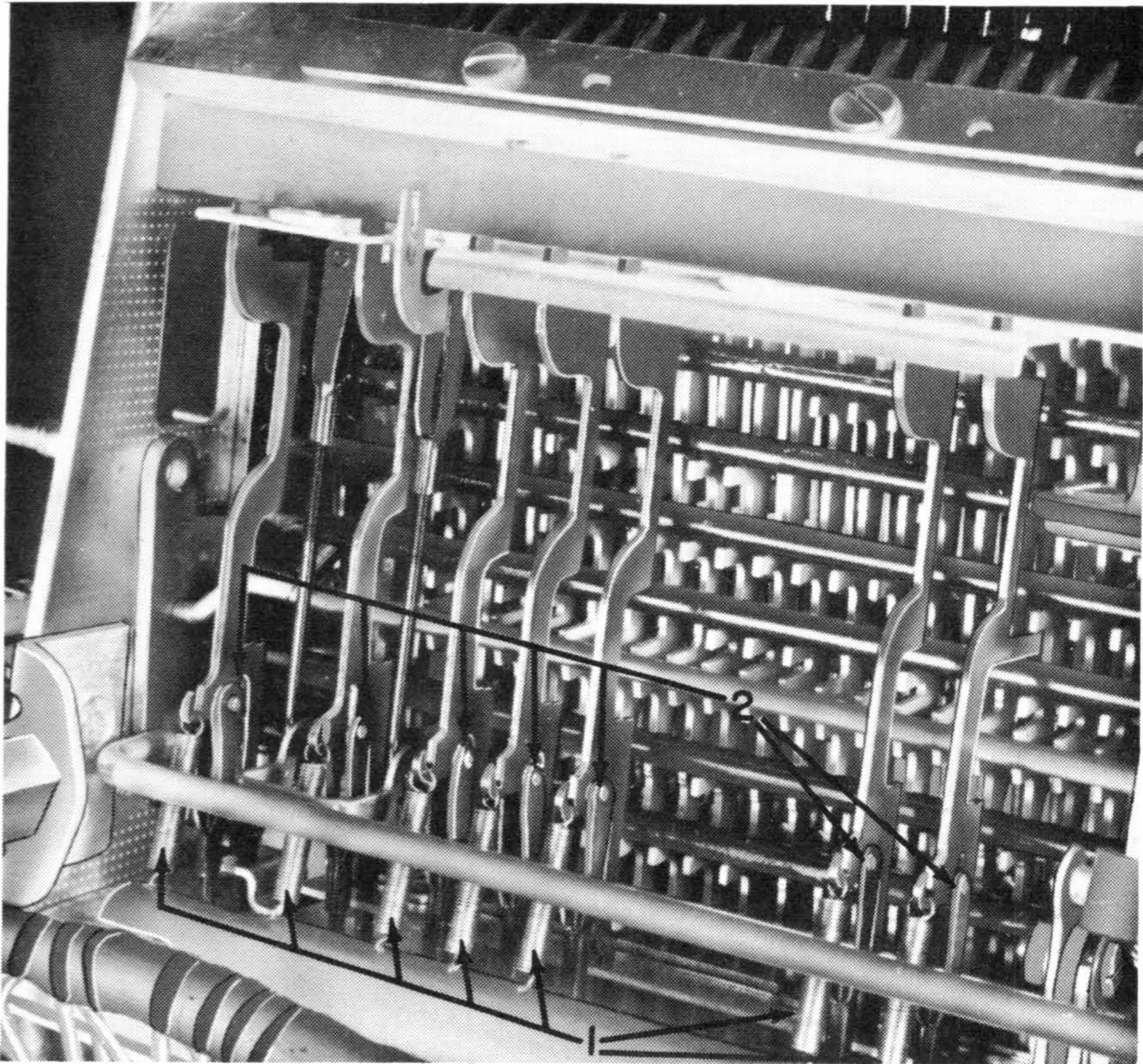


Figure 28. Differential Plate Removal

6. Unhook the check-latch-link spring (#1, Figure 30).
7. Remove the rotate-arm link (#2, Figure 30).
8. Scribe the position of the pusher-arm plate to the power frame and remove the four mounting screws (#3, Figure 30).
9. Remove the positive bail spring (#4, Figure 30).
10. Carefully remove the pusher-arm-plate assembly.
11. Remove the motor.
12. Remove all latch springs (#1, Figure 31).
13. Remove all latch links (#2, Figure 31).

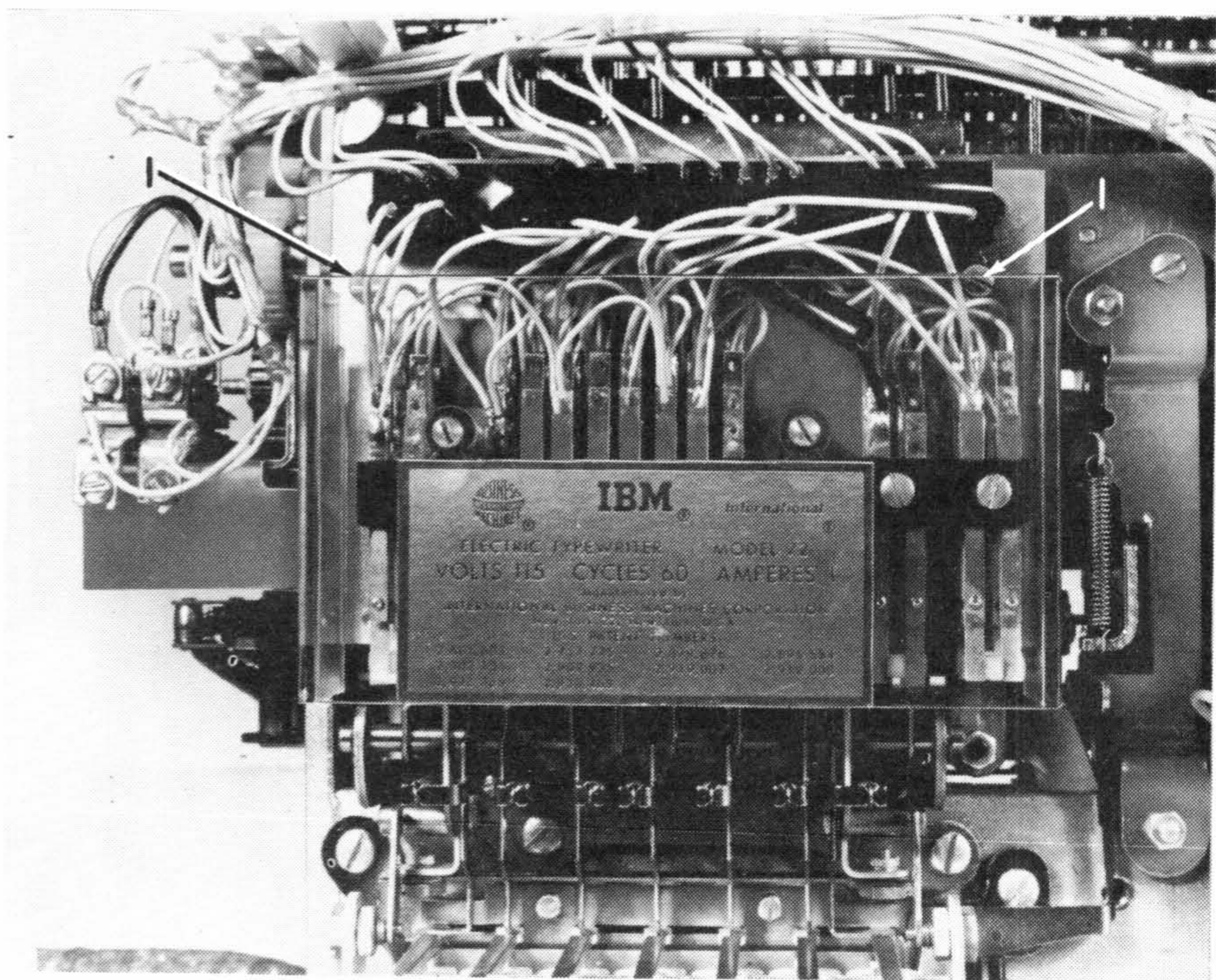


Figure 29. Differential Plate Removal

14. Remove the left-hand motor mount (#3, Figure 31).
15. Remove the four differential mounting nuts (#4, Figure 31). Note: Do not lose the wedge in the lower-left mounting stud.
16. Complete the Cycle-Shaft Removal section.
17. Remove the cycle-clutch latch bracket (#1, Figure 32).
18. Remove the C-clip from the negative latch link (#2, Figure 32).
19. Remove the C-clip from the tilt-link stud (#3, Figure 32).
20. Remove the rotate-arm spring (#4, Figure 32).
21. Detach the check-latch clevis (#5, Figure 32).
22. Remove the differential-bracket assembly.
23. The following adjustments should be checked after the differential-plate is replaced.
  - a. Rotate Differential Guides
  - b. Tilt Differential Guides
  - c. Rotate Latch Clearance
  - d. Tilt Latch Clearance
  - e. Tilt Detenting
  - f. Typehead Homing

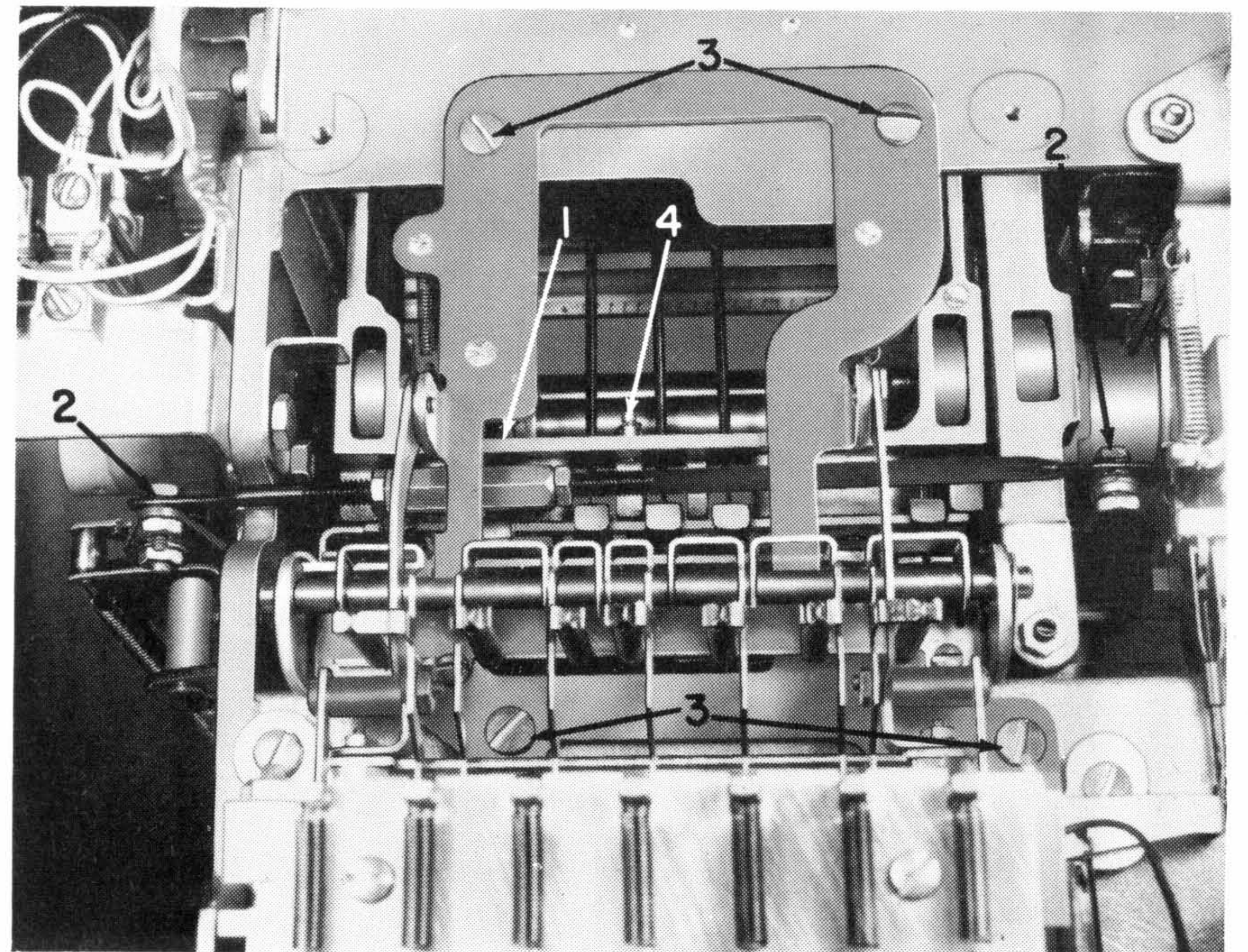


Figure 30. Differential Plate Removal

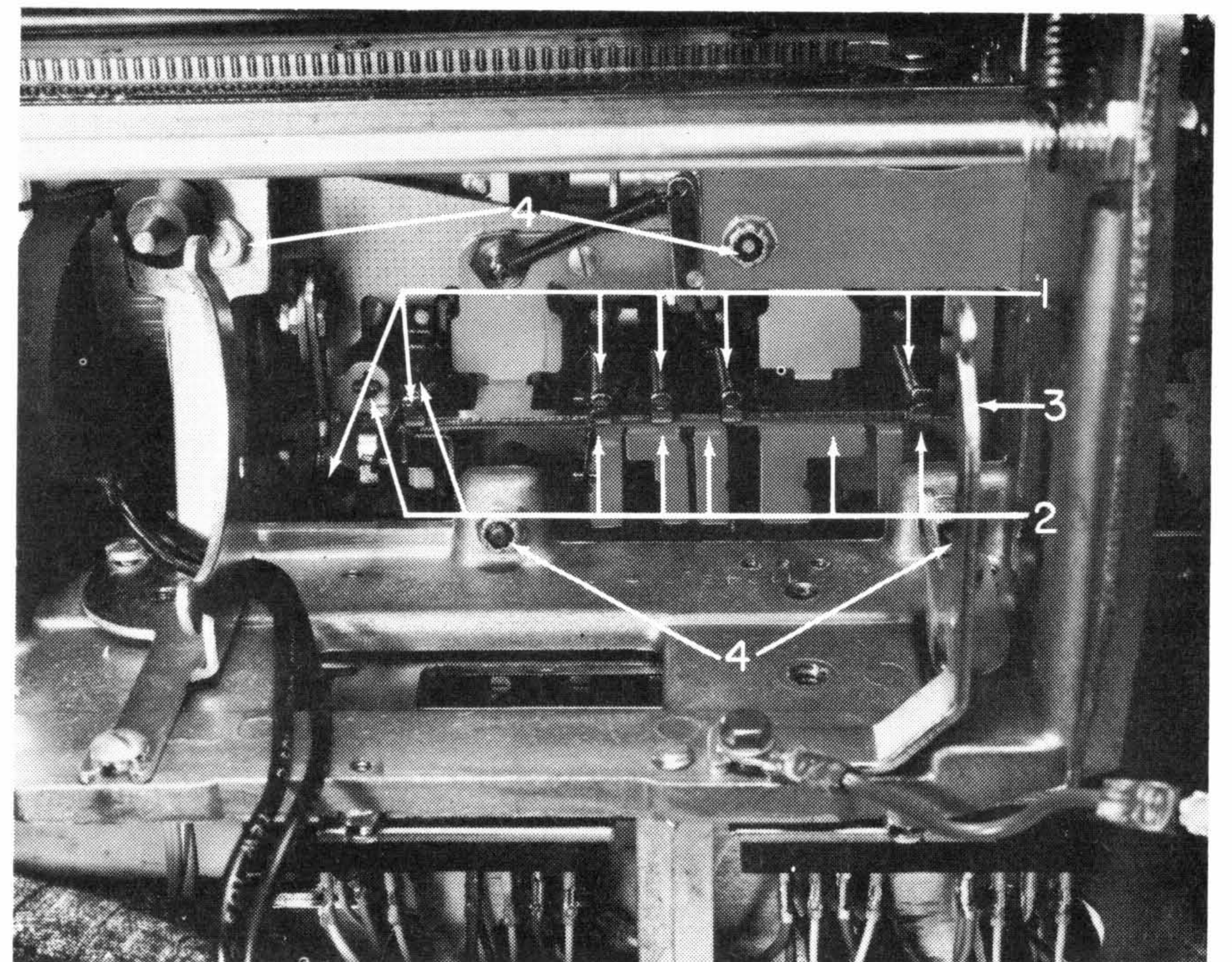


Figure 31. Differential Plate Removal



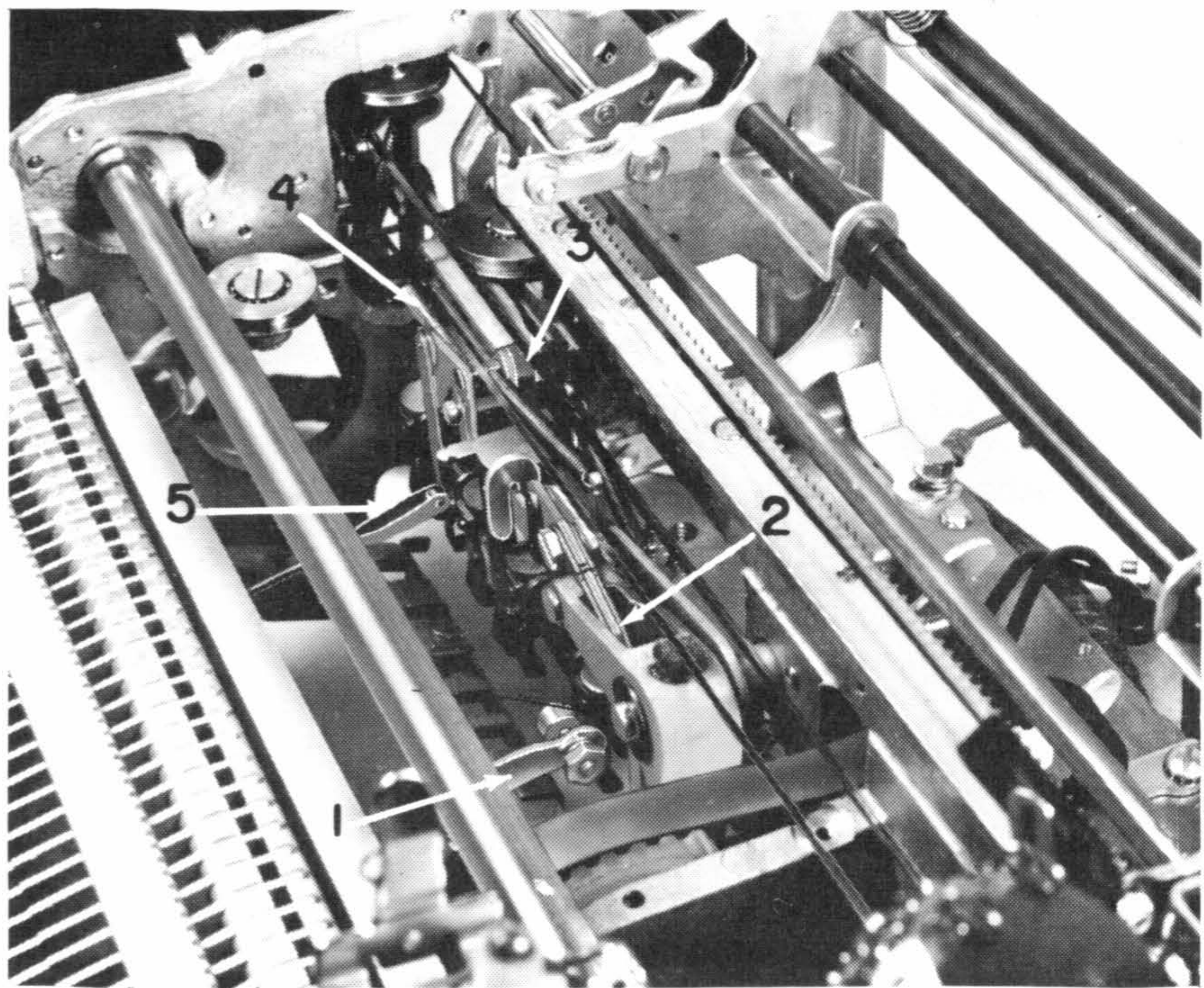


Figure 32. Differential Plate Removal

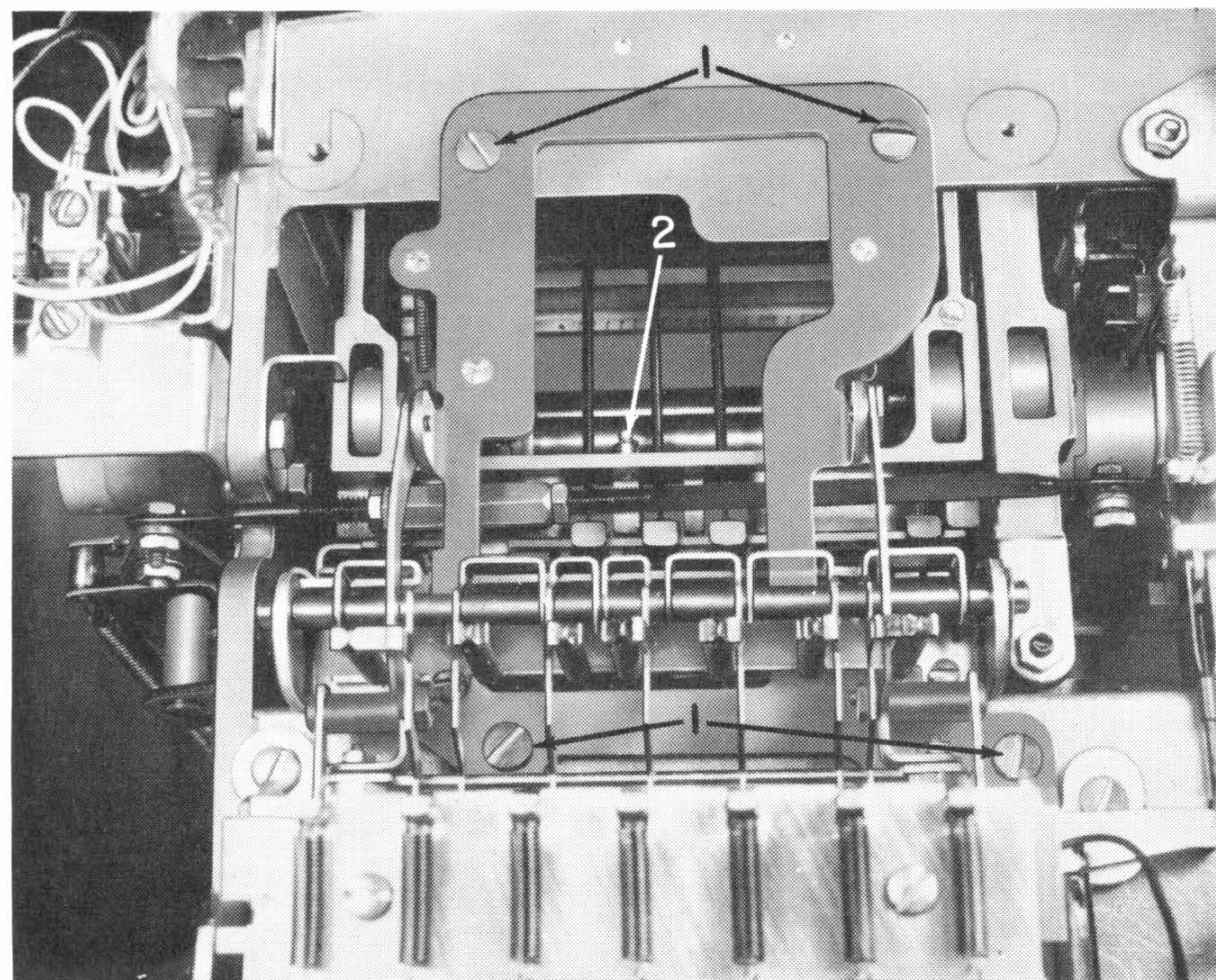


Figure 34. Selector Bail Removal

#### SELECTOR BAIL REMOVAL

1. Remove the two screws (#1, Figure 33) that hold the contact plate to the frame. Remove the contact assembly, holding it to the front with a rubber band.
2. Scribe the power frame, remove the four mounting screws (#1, Figure 34), and carefully remove the pusher-arm assembly.
3. Remove the positive bail spring (#2, Figure 34) and pull the bail down.
4. Remove all the C-clips from the positive bail shaft (#1, Figure 35).
5. Swing the retainer (not shown) on the outside of the power frame out of the way and pull the bail shaft out.
6. Work the bail assembly out through the bottom of the machine.
7. The following adjustments should be checked after Selector-Bail is replaced.
  - a. Latch Clearance
  - b. Bail Down-Stop

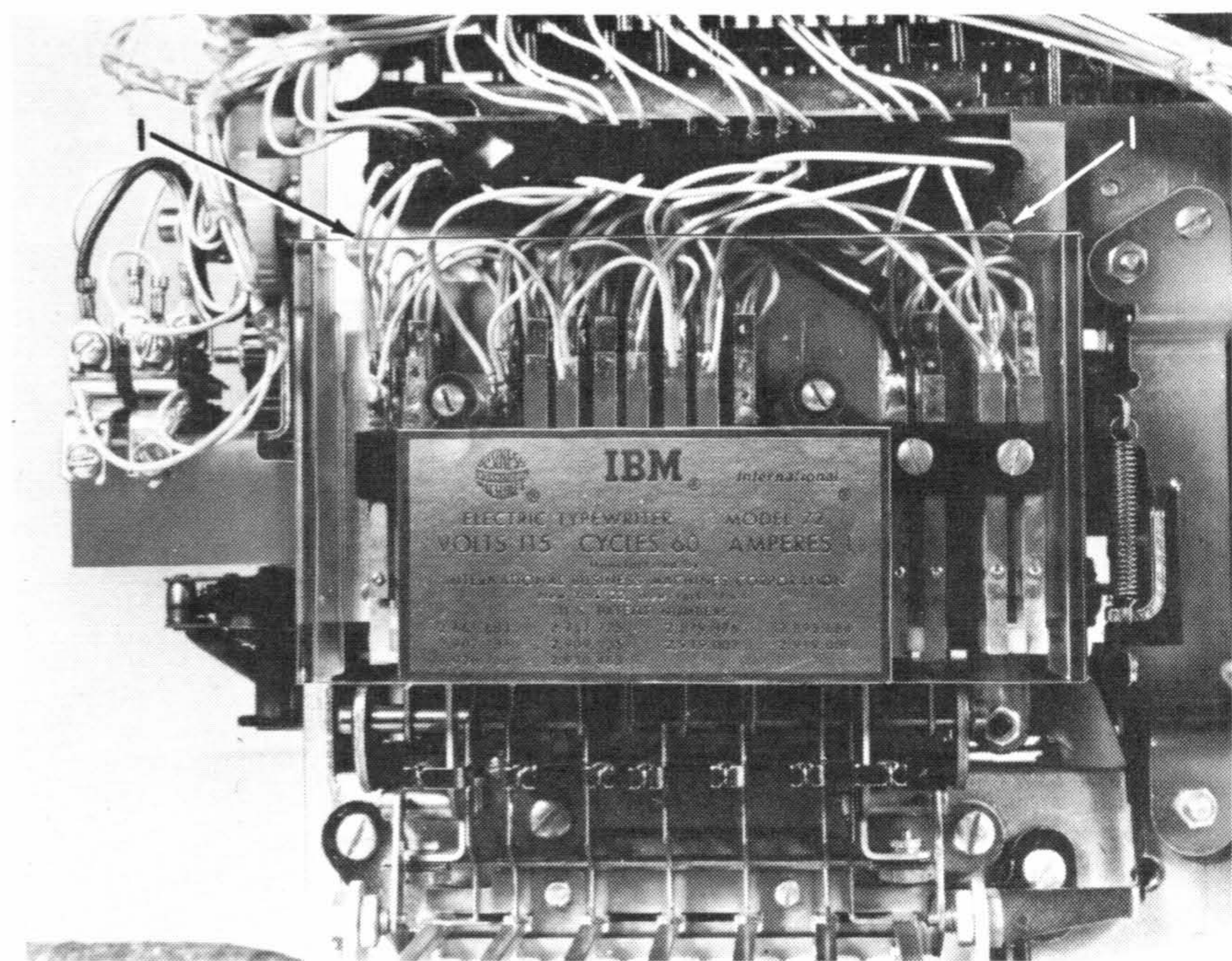


Figure 33. Selector Bail Removal

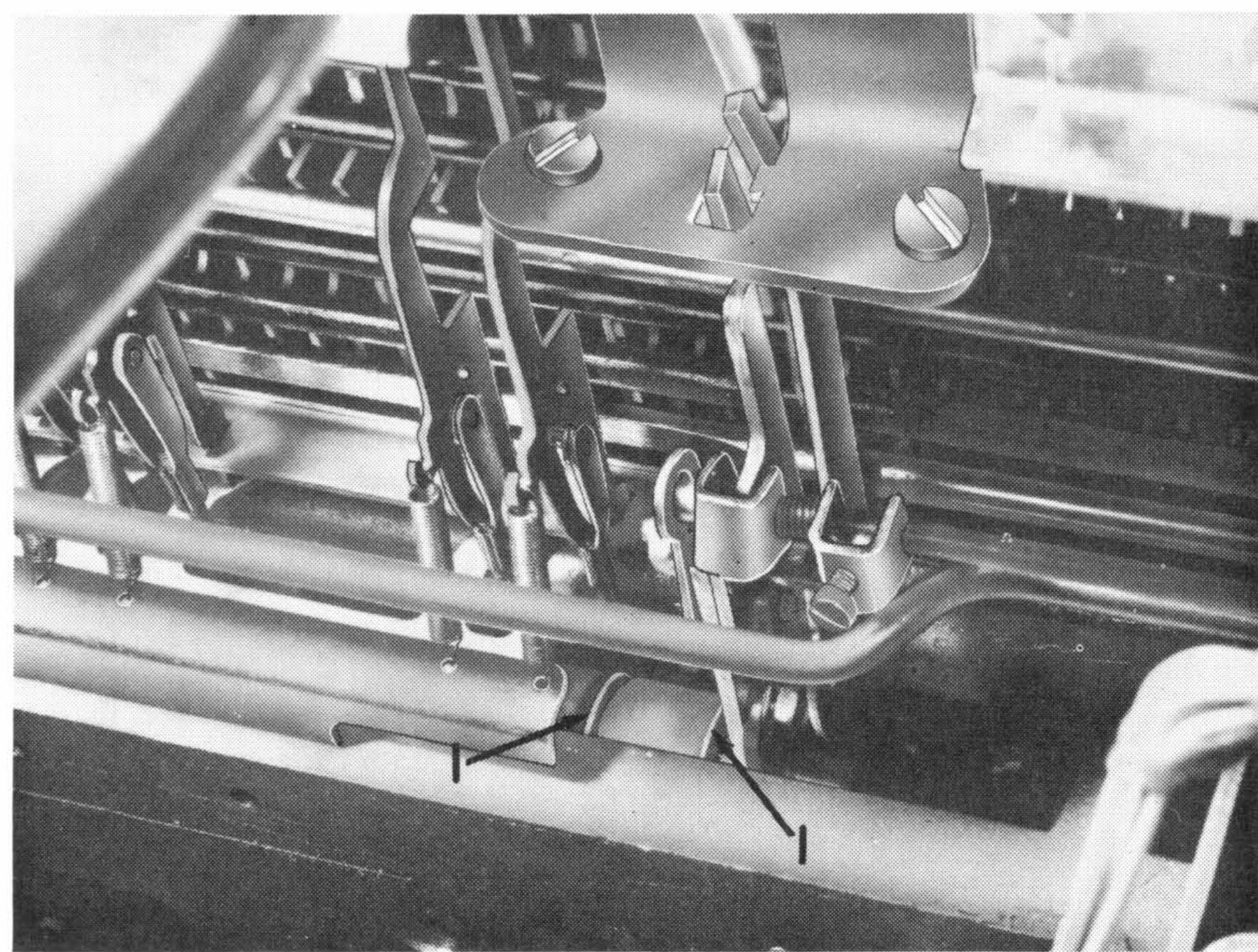


Figure 35. Selector Bail Removal



### PRINT MAGNET ASSEMBLY REMOVAL

1. Disconnect the cycle-clutch trip link (#1, Figure 36).
2. Remove the support leg in the lower left corner (#2, Figure 36).
3. Remove the four mounting screws (#3, Figure 36).
4. Carefully remove the magnet assembly.

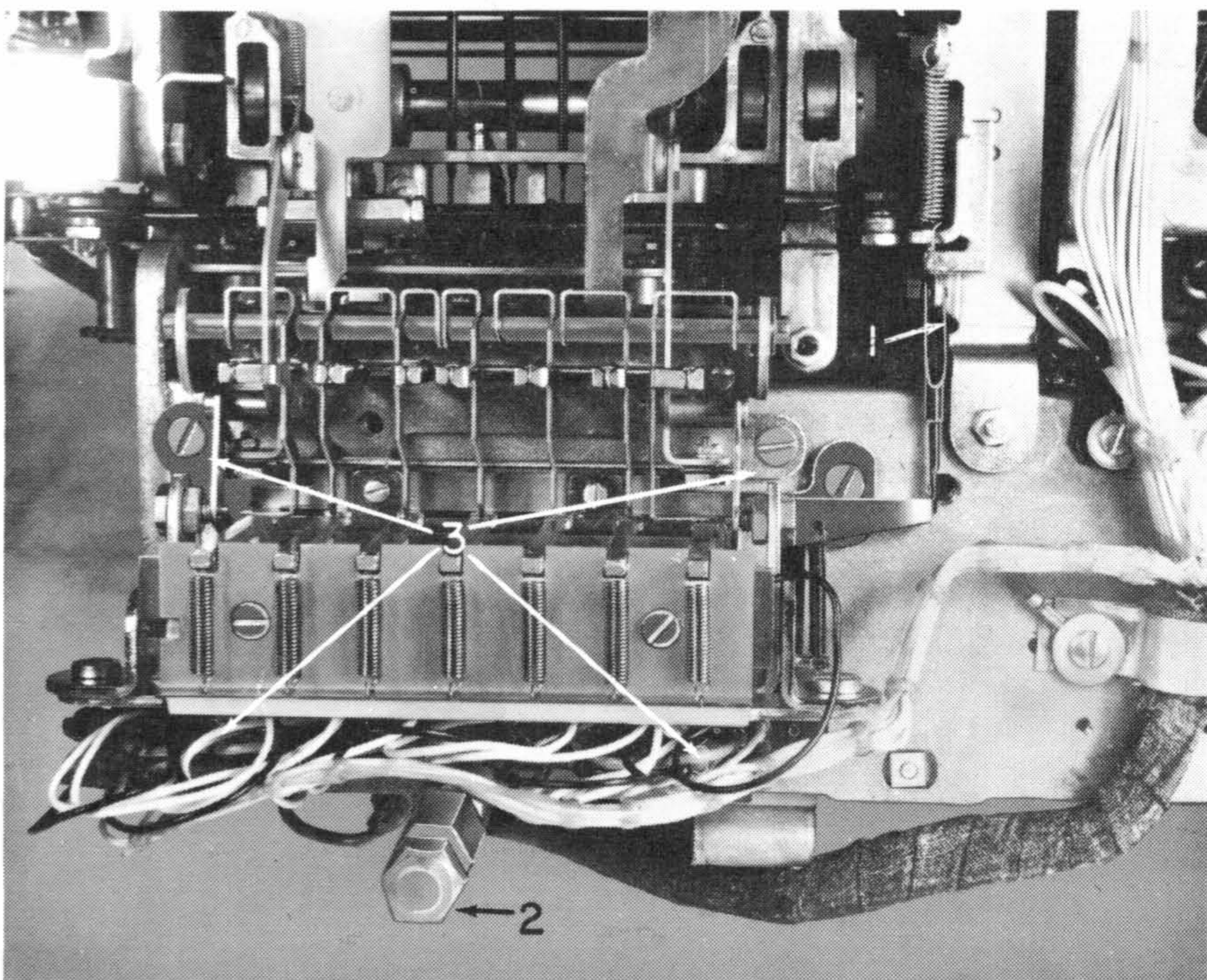


Figure 36. Print Magnet Assembly Removal

### LATCH PUSHER REMOVAL

1. Remove the two screws (#1, Figure 37) that hold the contact plate to the frame. Remove the contact assembly, holding it to the front with a rubber band.
2. Disconnect the pusher springs (#1, Figure 38).
3. Remove the C-clip on the end of the shaft (#2, Figure 38) and remove the shaft until the desired pusher is free.
4. The following adjustments should be checked after a latch-pusher is replaced.
  - a. Latch to pusher clearance
  - b. Latch-pusher to armature clearance

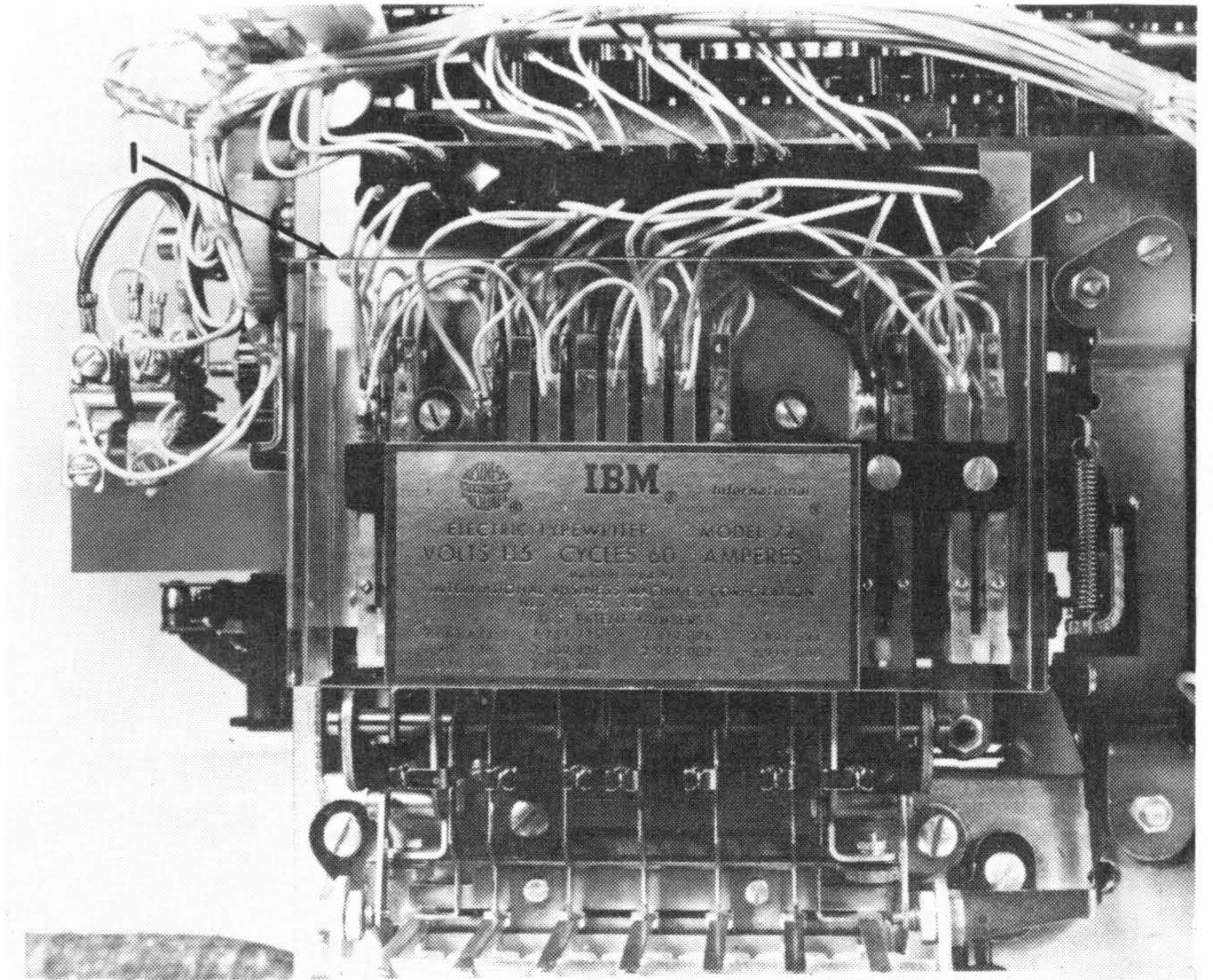


Figure 37. Latch Pusher Removal

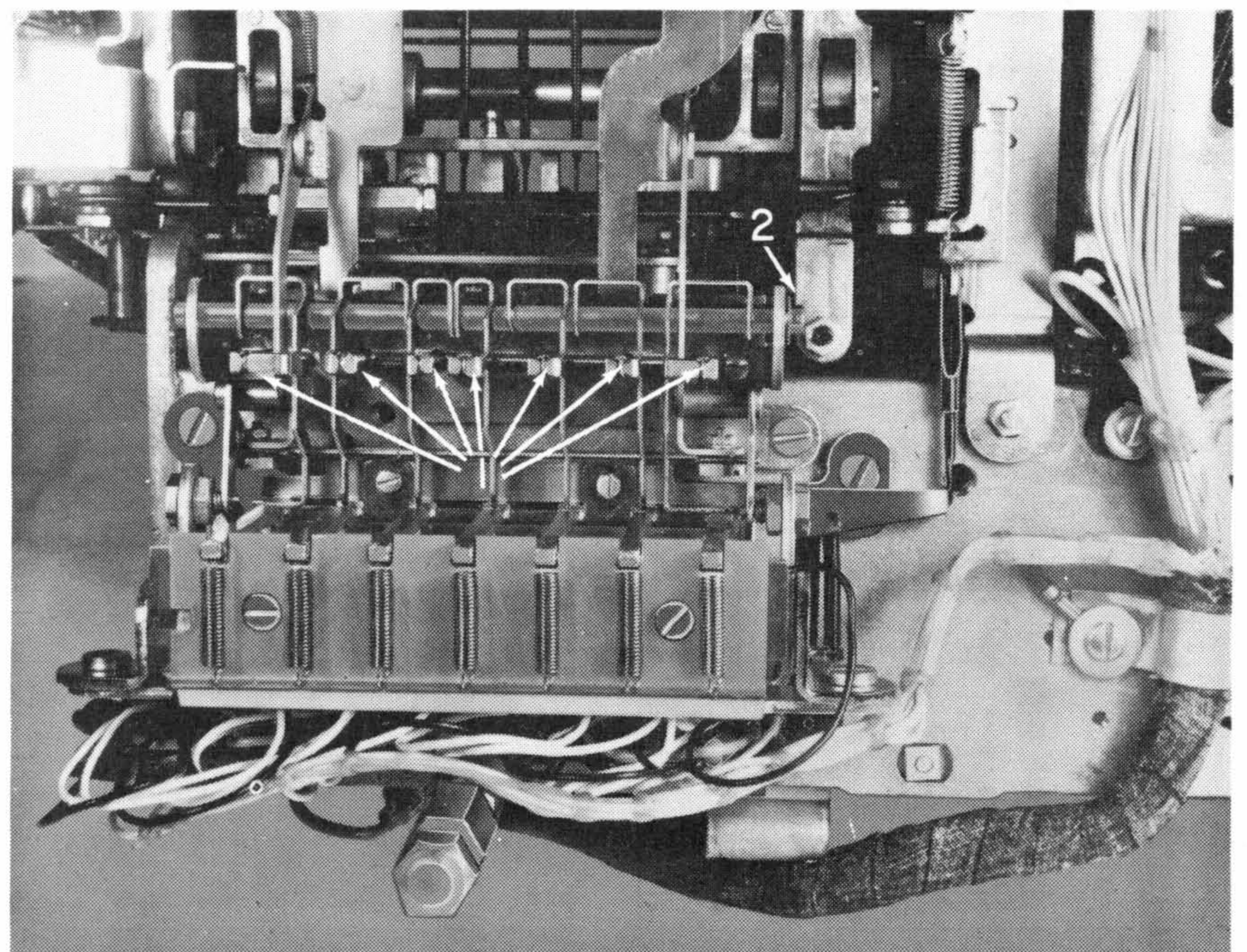


Figure 38. Latch Pusher Removal



### SHIFT MAGNET ASSEMBLY REMOVAL

1. Remove the spring from the hold armature (#1, Figure 39).
2. Loosen the front mounting stud (#2, Figure 39).
3. Loosen the rear mounting screw (#3, Figure 39).
4. Slide the assembly forward and remove it.
5. The following adjustments should be checked after the shift magnet assembly is removed.
  - a. Shift-magnet assembly adjustments

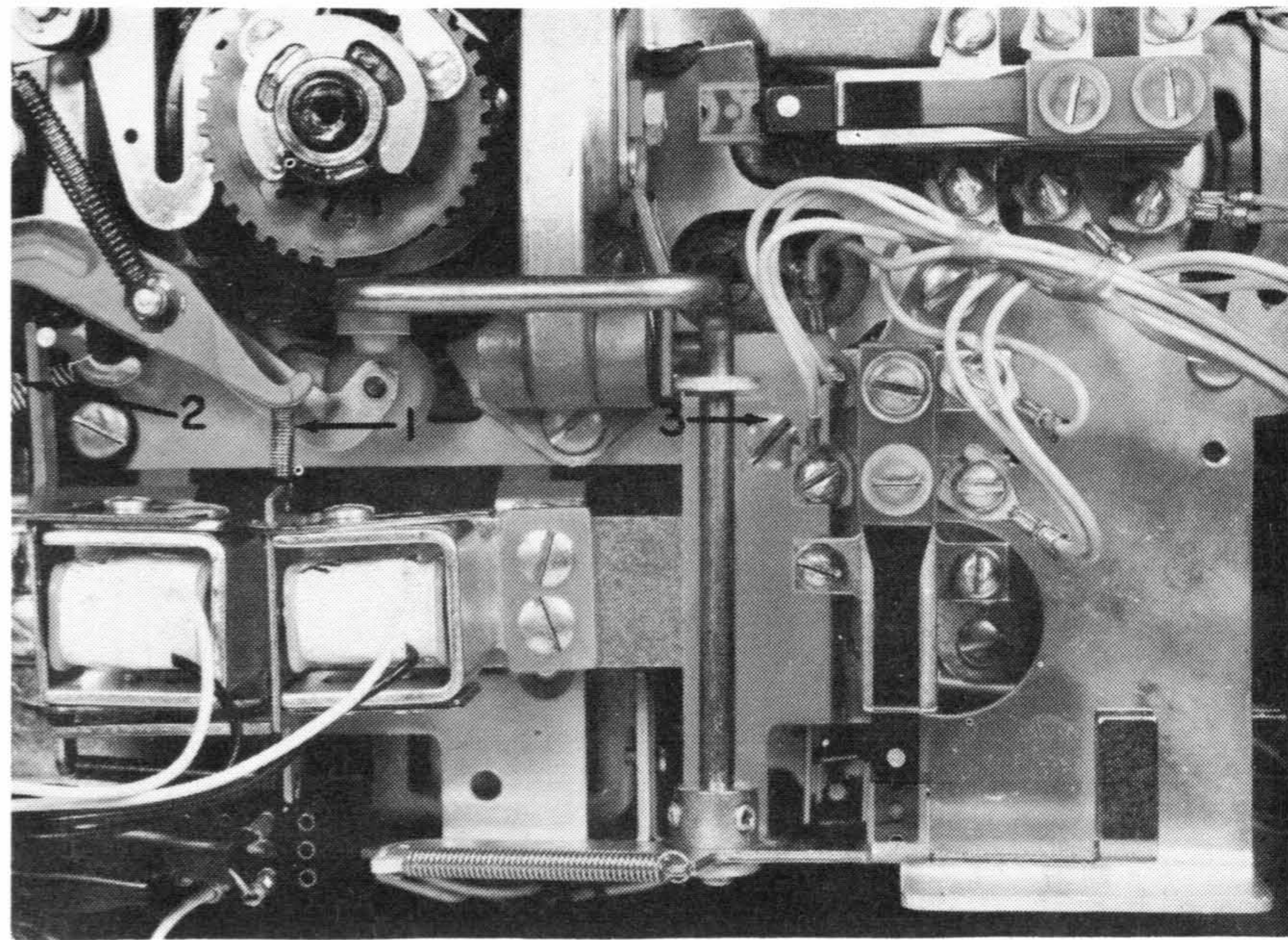


Figure 39. Shift Magnet Assembly Removal

### SHIFT ARM REMOVAL

1. Position the carrier to the left and remove the right dust cover.
2. Remove the shift-contact assembly (#1, Figure 41).
3. Remove the shift-arm brace (#2, Figure 41).
4. Loosen the setscrews that hold the shift-arm pivot (#3, Figure 41).
5. Rotate the head counterclockwise, remove the tape from the shift-arm pulley, and put it on the tilt pulley.
6. Remove the shift-arm pivot and arm.
7. The following adjustments should be checked after the shift-arm is replaced.
  - a. Typehead Homing
  - b. Shift Contact Adjustments

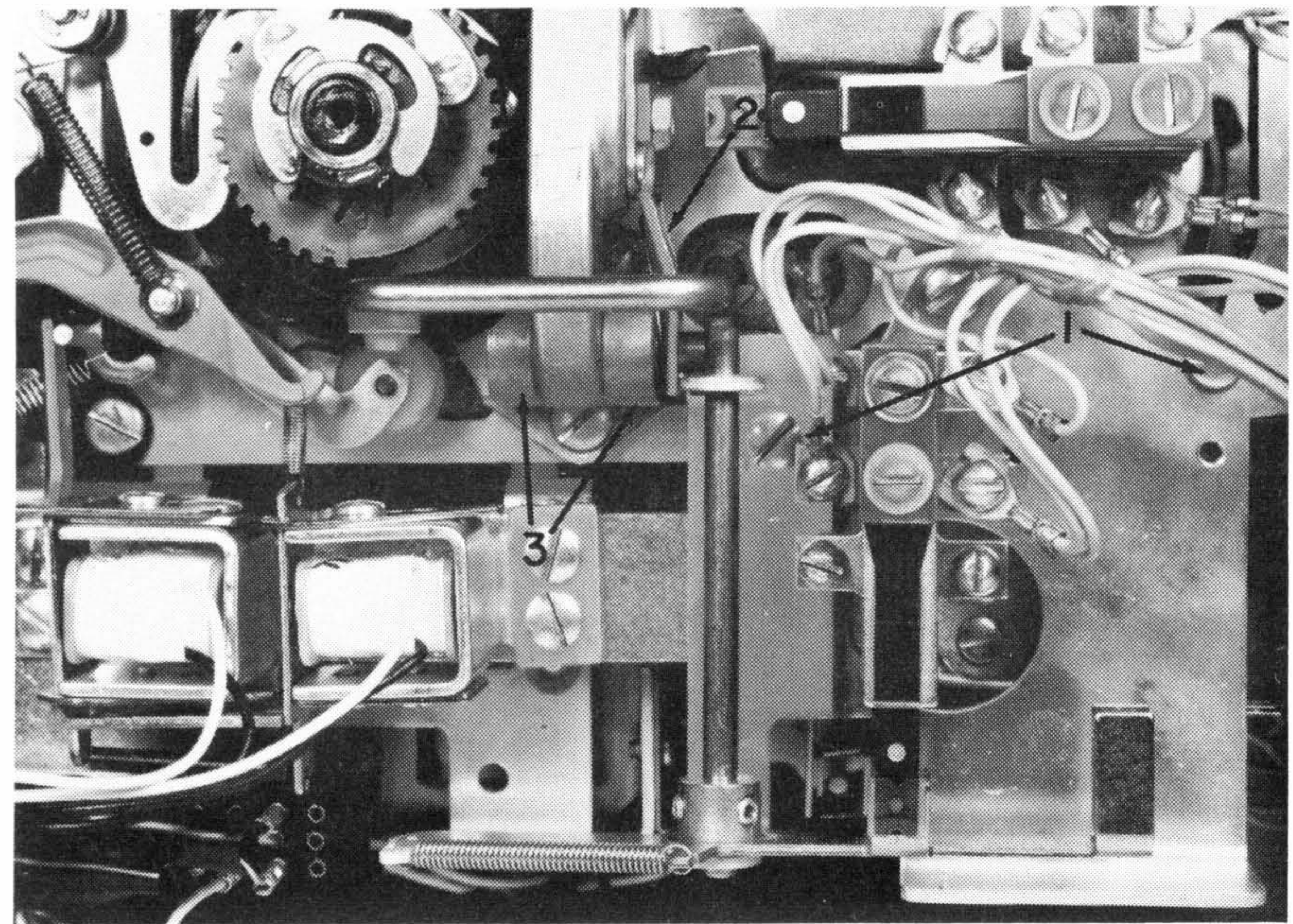


Figure 41. Shift Arm Removal

### BACKSPACE RACK REMOVAL

1. Remove the motor.
2. Remove the backspace-rack spring (#1, Figure 40).
3. Remove the three backspace-rack mounting studs (#2, Figure 40), one of which is not shown, and remove the rack.
4. The following adjustments should be checked after the backspace rack is replaced.
  - a. Tab-Lever Stop
  - b. Backspace Rack
  - c. Intermediate Lever

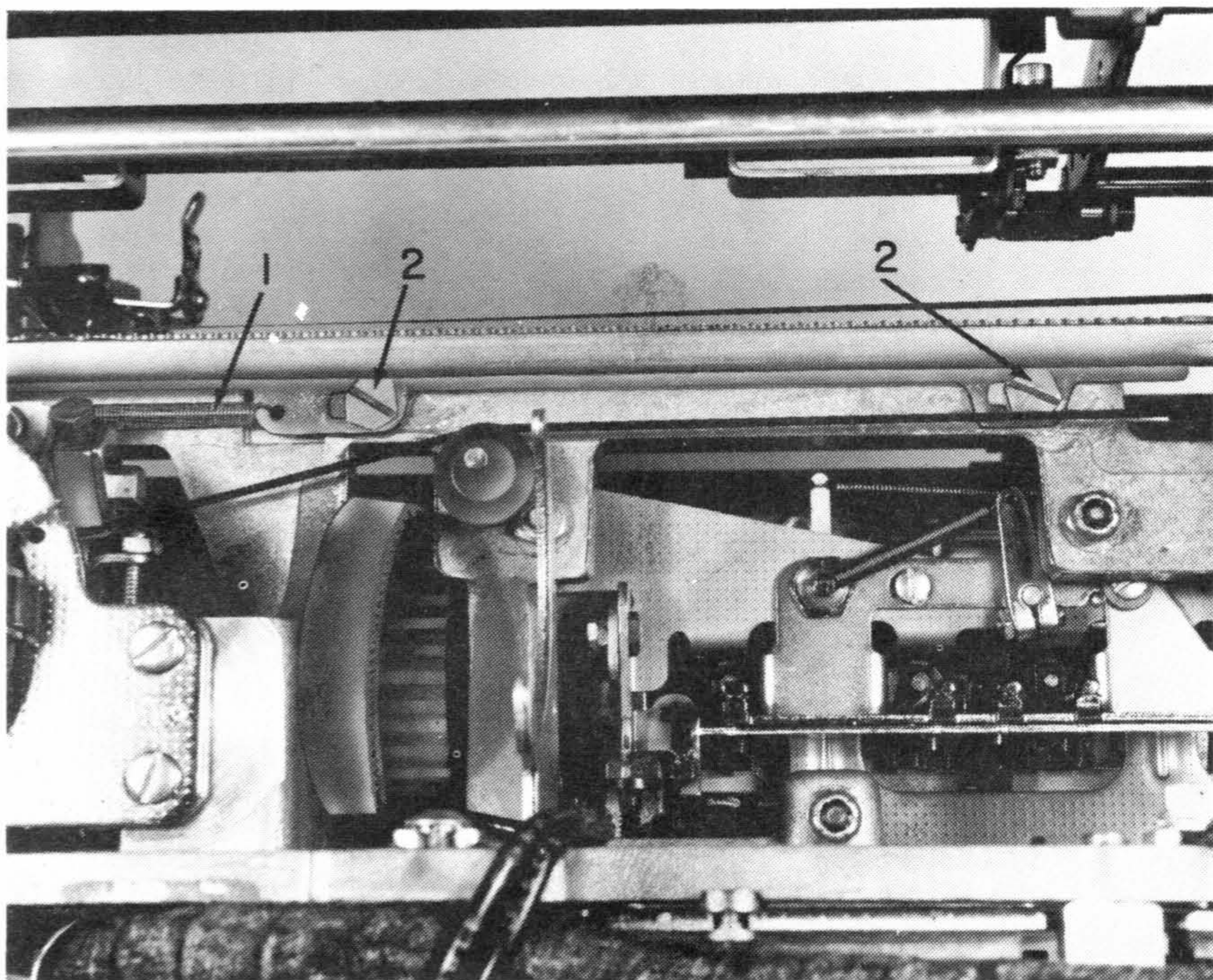


Figure 40. Backspace Rack Removal

### OPERATIONAL CAM CHECK PAWL AND ESCAPEMENT CAM FOLLOWER REMOVAL

1. Position the carrier to the left and remove the right dust cover.
2. Disconnect the escapement link (#1, Figure 42).
3. Remove all C-clips from the check pawl shaft (#2, Figure 42).
4. Slide the shaft to the left until the desired part is free. Note: Remove springs only as necessary.

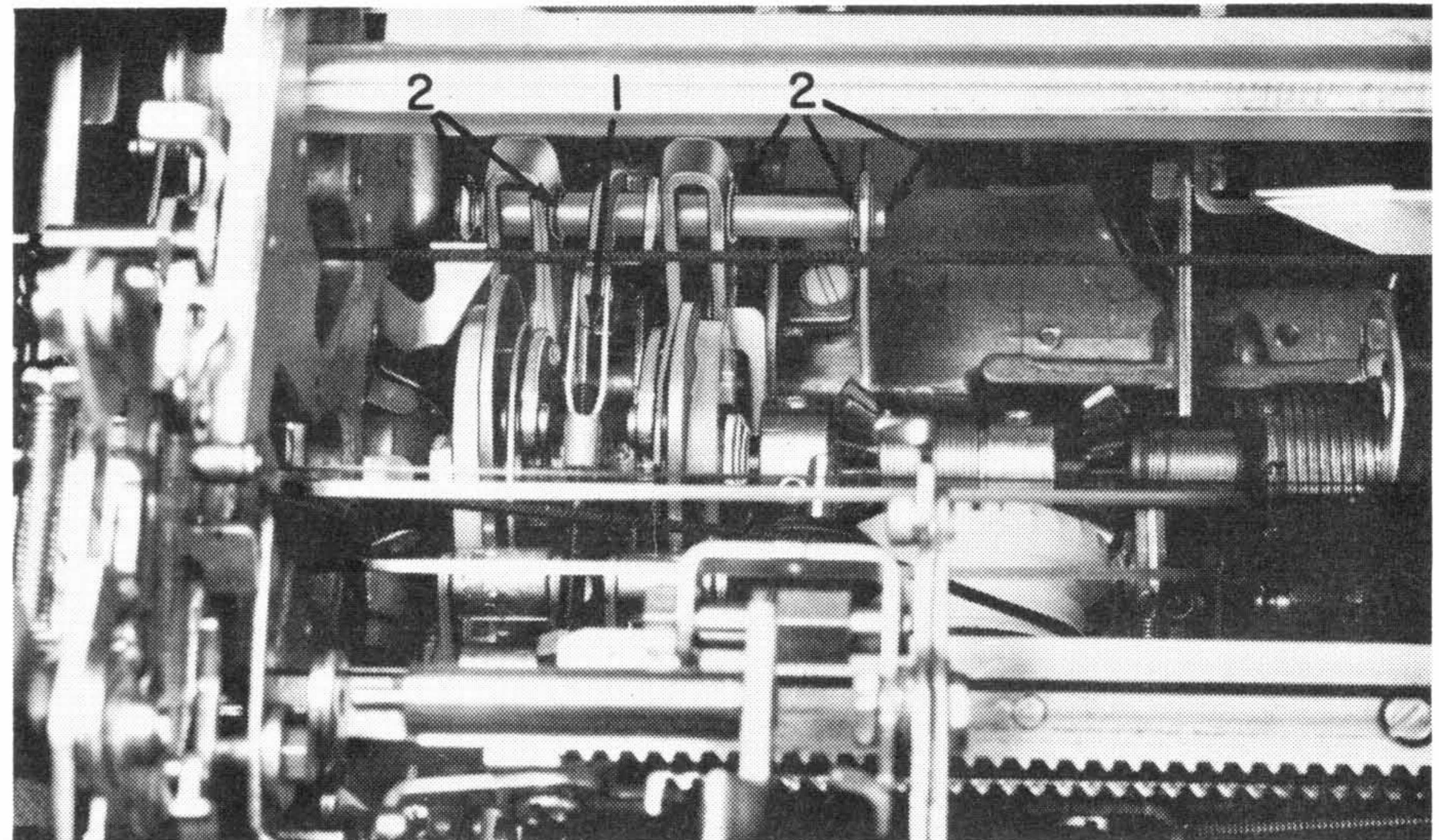


Figure 42. Operational Cam Check Pawl and Escapement Cam Follower Removal



#### OPERATIONAL CAM FOLLOWER REMOVAL

1. Remove the C-clips from the cam-follower pivot shaft (#1, Figure 43).
2. Remove the auxiliary cam-follower spring (#2, Figure 43).
3. Work the shaft to the right until the desired part is free.

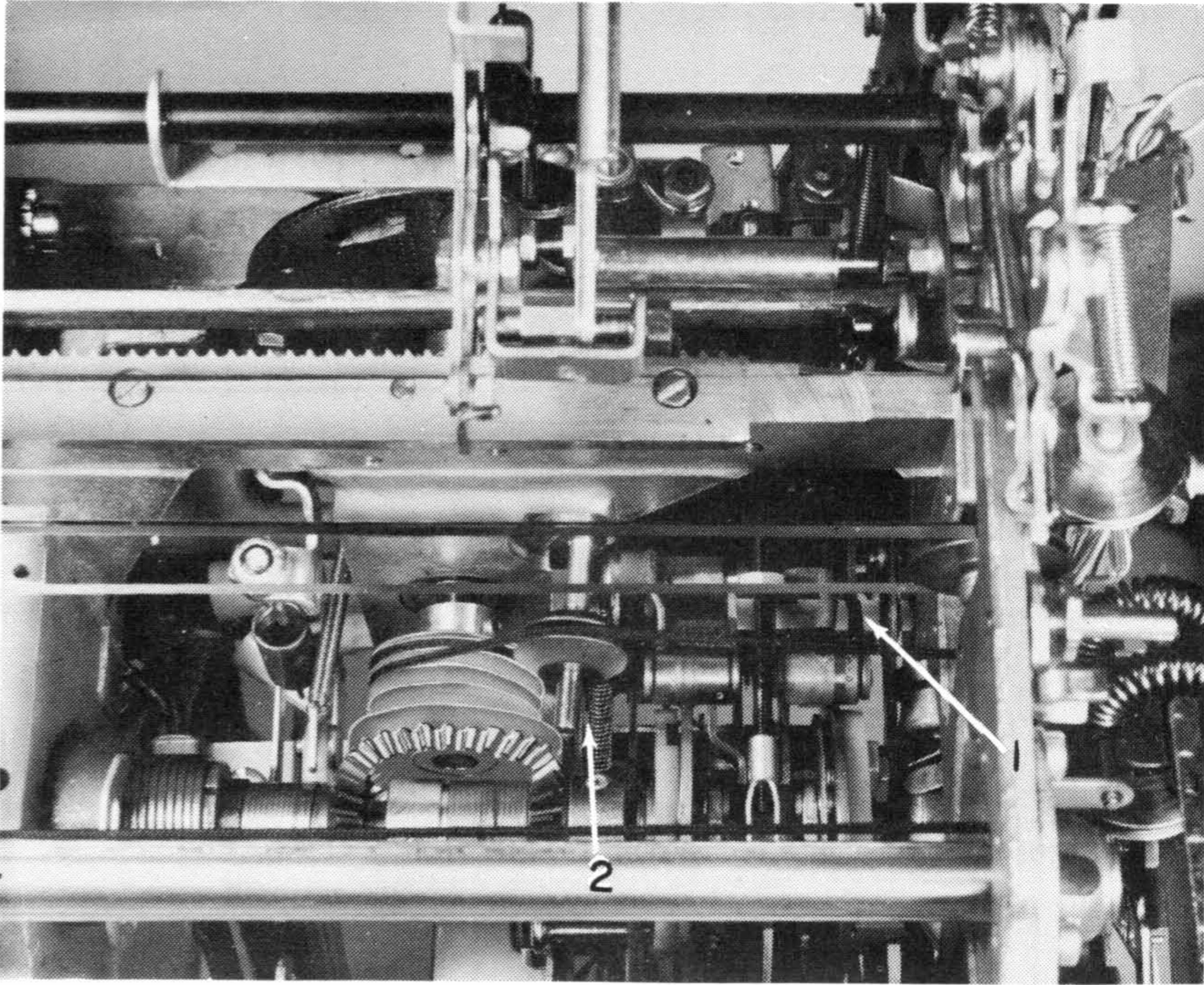


Figure 43. Operational Cam Follower Removal

#### OPERATIONAL CONTACT REMOVAL

1. Remove the right rear mounting leg (#1, Figure 44).
2. Remove the two mounting screws (#2, Figure 44) and remove the contact assembly.

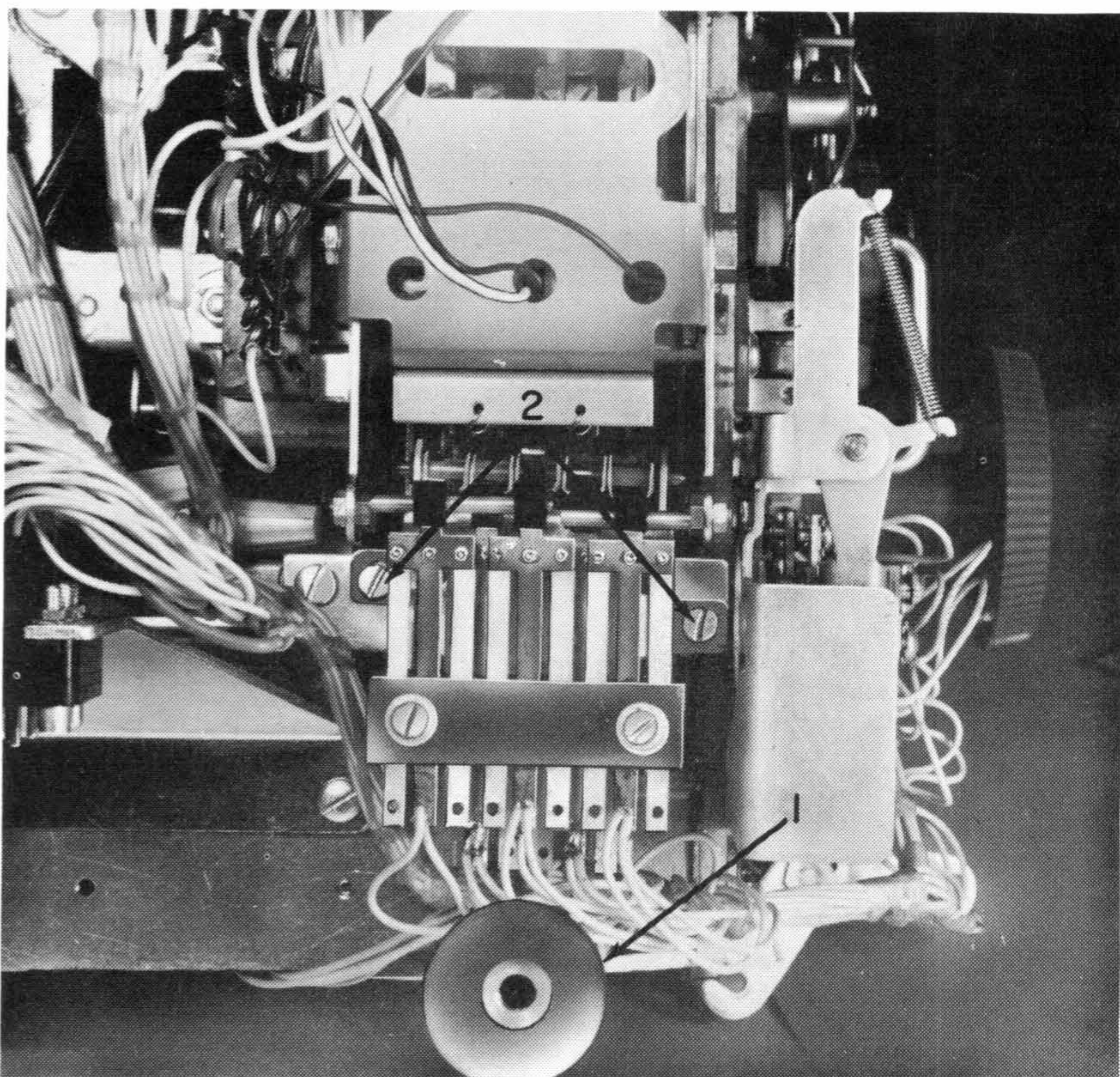


Figure 44. Operational Contact Removal

#### OPERATIONAL MAGNET ASSEMBLY REMOVAL

1. Perform the Shift-Magnet-Assembly Removal.
2. Remove the actuator-arm spring (#1, Figure 45).
3. Remove the two mounting screws (#2, Figure 45).
4. Remove the actuator-arm pivot screw (#3, Figure 45).
5. Remove the armature-link clevises (#4, Figure 45).
6. Remove the mounting screw (#1, Figure 46).
7. Remove the nut (#2, Figure 46) and carefully remove the magnet assembly.

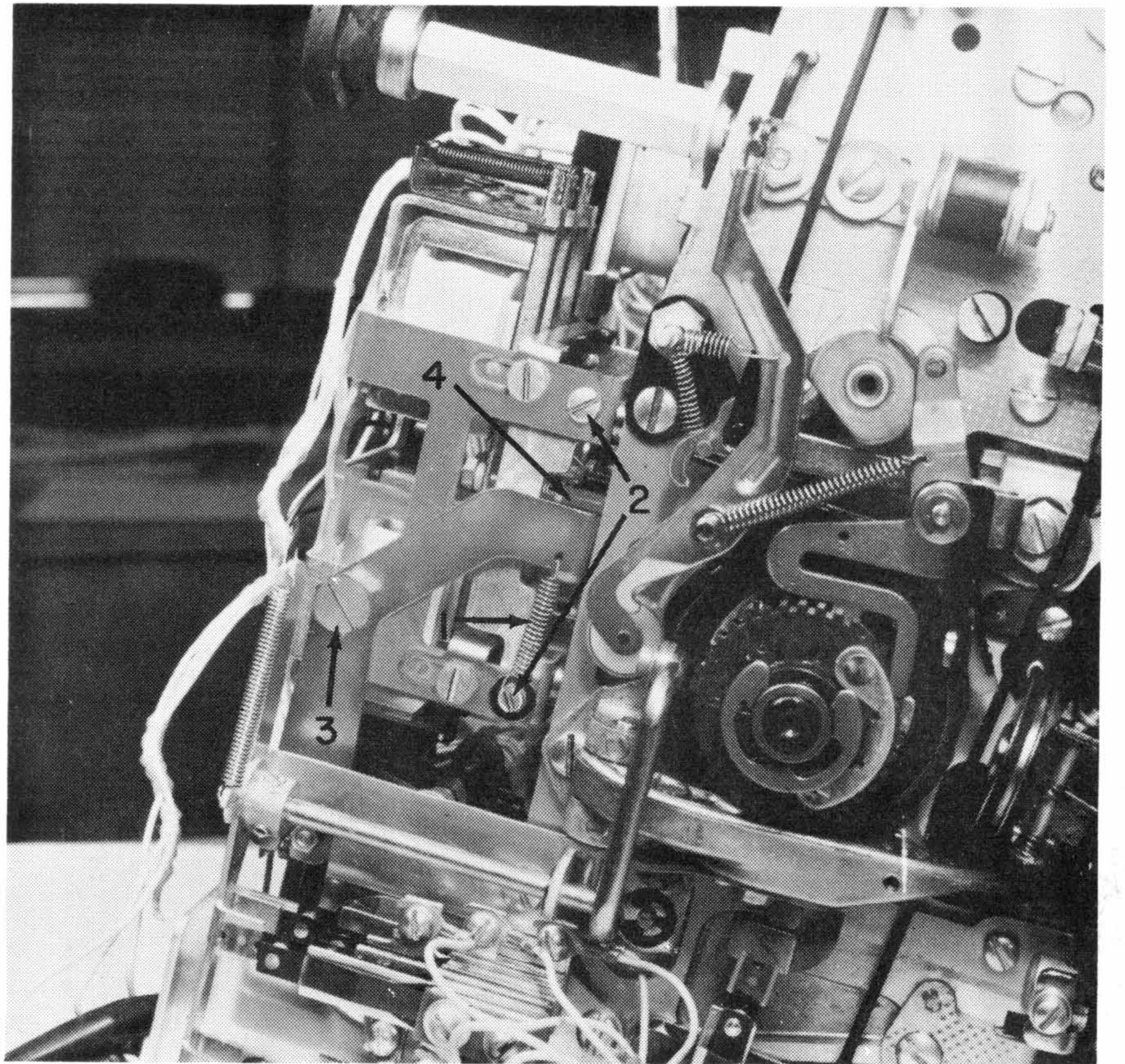


Figure 45. Operational Magnet Assembly Removal

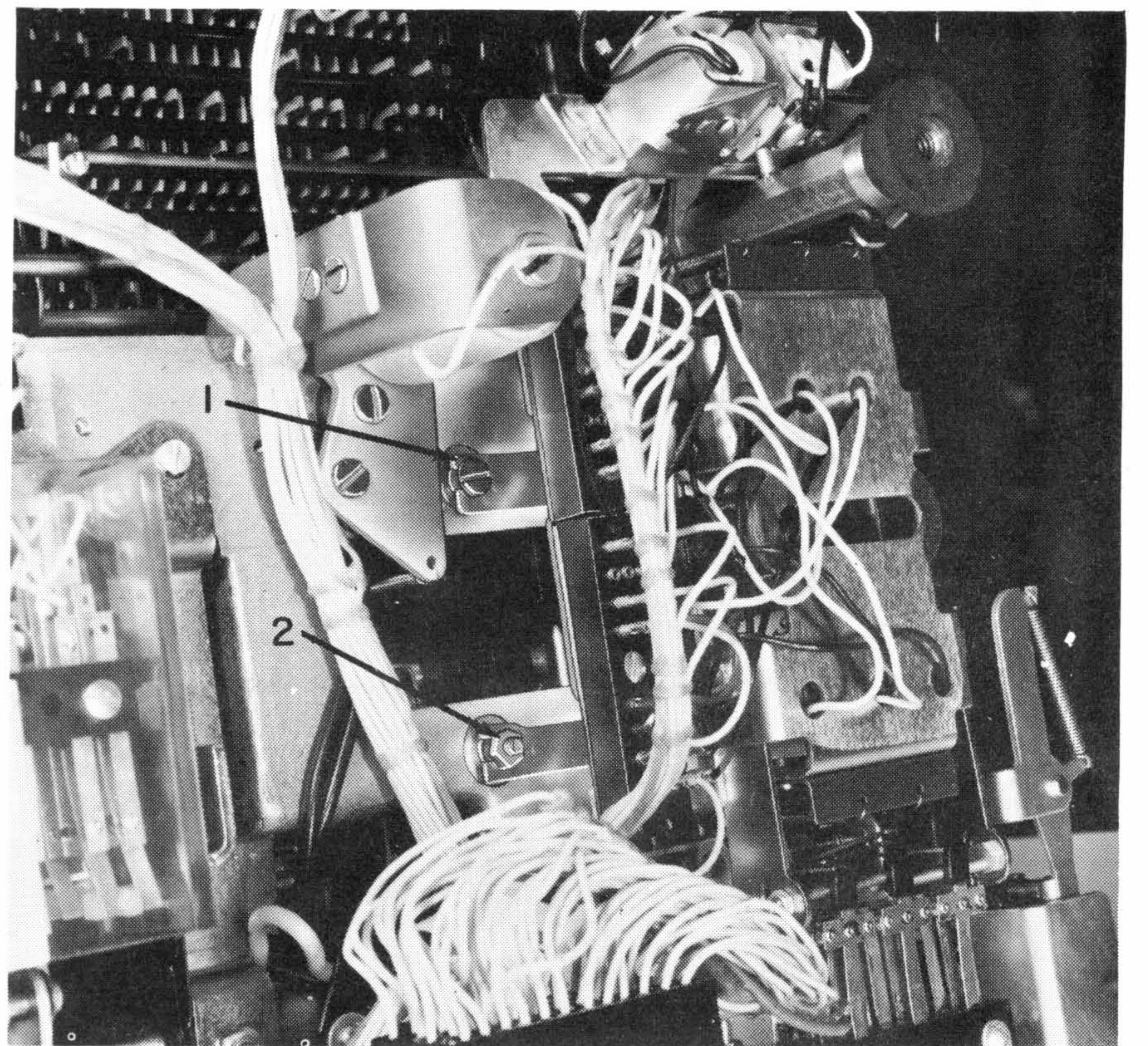


Figure 46. Operational Magnet Assembly Removal



## OPERATIONAL LATCH BRACKET REMOVAL

1. Remove the feedback-contact-assembly bracket by loosening the two screws (#1, Figure 47).
  2. Remove the mainspring and hub (#2, Figure 47).
- Caution - Care must be used when unwinding and removing main spring.
3. Disconnect the backspace-latch spring (not shown).
  4. Remove the back plate (#3, Figure 47).
  5. Disconnect the backspace-rack spring (#1, Figure 48).
  6. Disconnect the cam-follower spring (#2, Figure 48).
  7. Disconnect the spacebar and tab-latch springs (#3, Figure 48).
  8. Disconnect the tab-bellcrank link clevis (not shown).

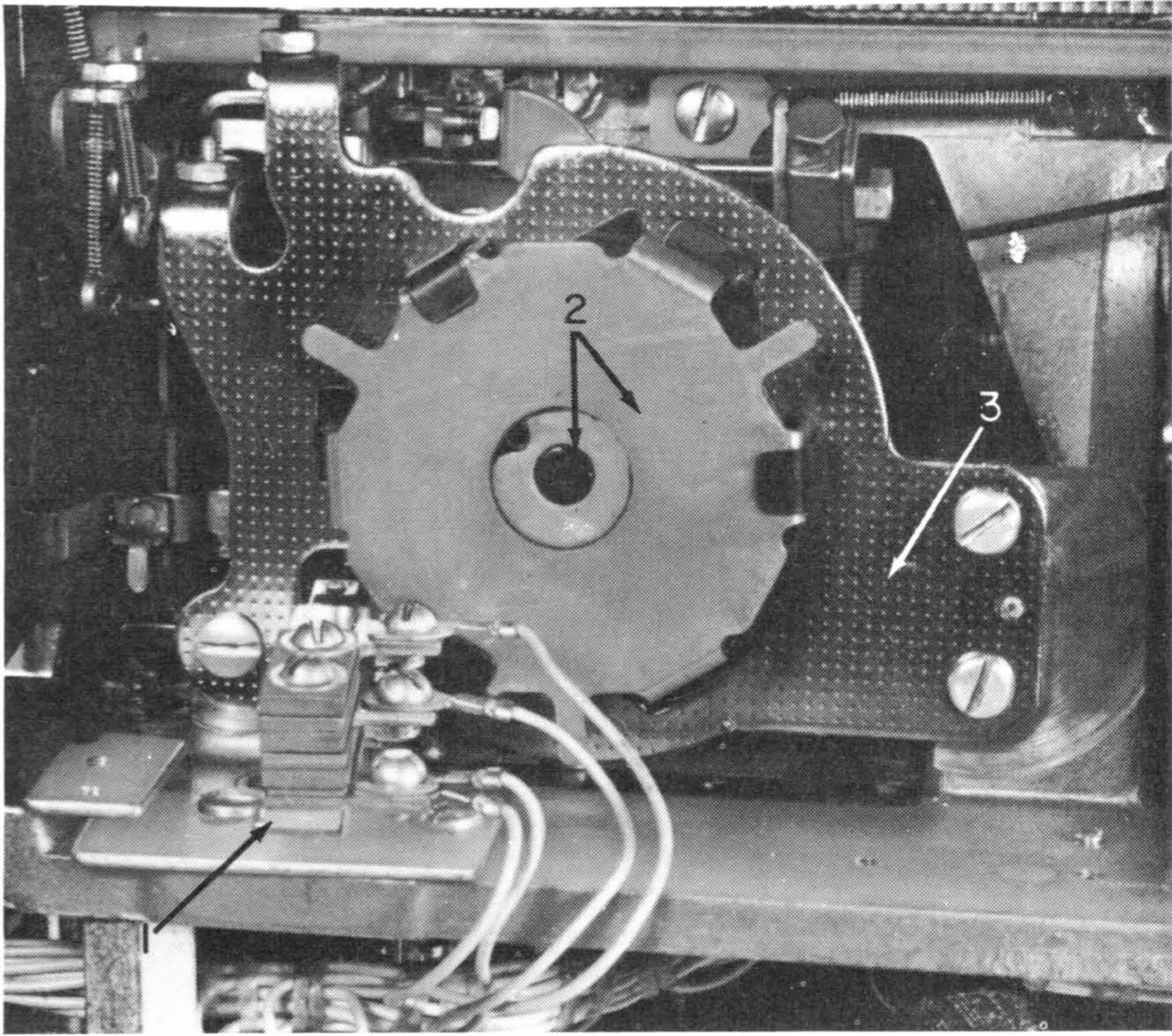


Figure 47. Operational Latch Bracket Removal

9. Disconnect the detent spring (#4, Figure 48).
10. Disconnect the carrier-return latch spring (#5, Figure 48).
11. Remove the index-selection link (#6, Figure 48).
12. Remove the carrier-return eccentric by removing the eccentric nut (#7, Figure 48).

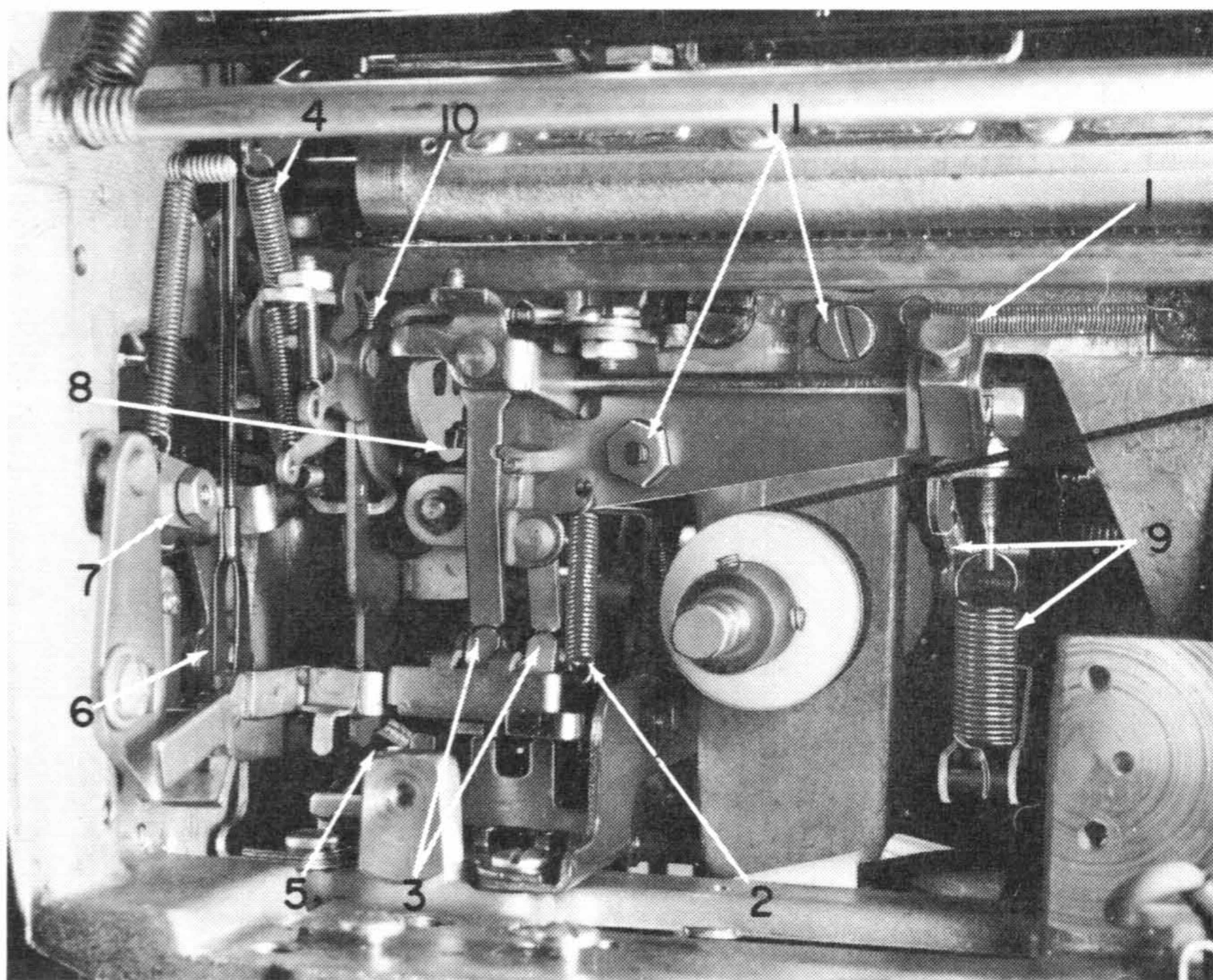


Figure 48. Operational Latch Bracket Removal

13. Remove the escapement link (#8, Figure 48).
14. Disconnect the carrier-return actuating spring and carrier-return actuating-arm spring (#9, Figure 48).
15. Remove the escapement-torque-bar restoring spring (#10, Figure 48).
16. Remove the two mounting screws (the left one is not visible) and one nut (#11, Figure 48).
17. Work the operational-latch bracket out of the machine.
18. The following adjustments should be checked after the operational-latch-bracket is replaced.
  - a. C5 and C6 Timing
  - b. Mainspring Tension

## SHIFT CAM REMOVAL

1. Turn the typehead counterclockwise and remove the relaxed rotate tape from the shift-arm pulley and put it around the tilt pulley.
2. Remove the lower-case armature spring (#1, Figure 49).
3. Remove the cam-follower spring (#2, Figure 49).
4. Loosen the setscrews and remove the cam follower arm (#3, Figure 49).
5. Remove the shift-magnet assembly (#4, Figure 49).
6. Remove the three springs (#5, Figure 49).
7. Remove the interlock C-clip (#6, Figure 49).
8. Remove the detent (#7, Figure 49).
9. Remove the C-clip from the shaft and remove the ratchet (#8, Figure 49).
10. Disconnect the shift link (#9, Figure 49).
11. Remove the shift-release arm (#10, Figure 49).
12. Remove the shift-clutch spring (behind the ratchet). Note: Observe the spring position for replacement.
13. Remove the shift arbor (#11, Figure 49). Note: Do not rotate the shaft backward.
14. Remove the shift cam (#12, Figure 49).
15. The following adjustments should be checked after the shift-cam is replaced.
  - a. All shift mechanism adjustments
  - b. Shift Magnet Assembly
  - c. Upper Case Typehead Homing

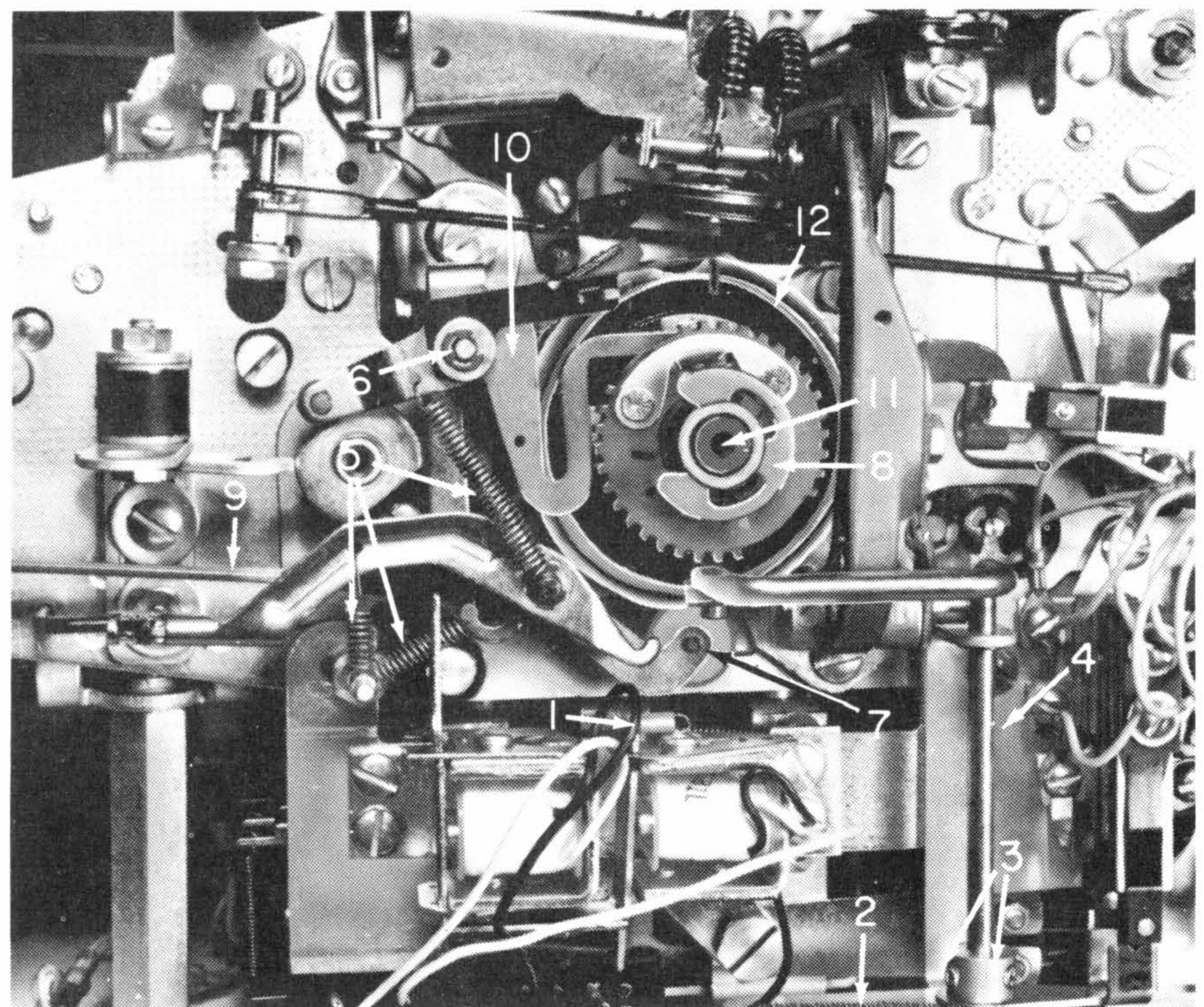


Figure 49. Shift Cam Removal



### OPERATIONAL SHAFT REMOVAL

1. Complete the Shift-Cam Removal.
2. Remove the two lugs and two screws from the bearing mounting plate (#1, Figure 50) and slide the plate off.
3. Disconnect escapement link.
4. Work the operational shaft to the right until it clears the cycle clutch pulley hub, then lift shaft out the top.
5. The following adjustments should be checked after the operational shaft is replaced.
  - a. All Shift Mechanism Adjustments
  - b. Shift Magnet Assembly
  - c. Upper Case Typehead Homing
  - d. Gear Mesh

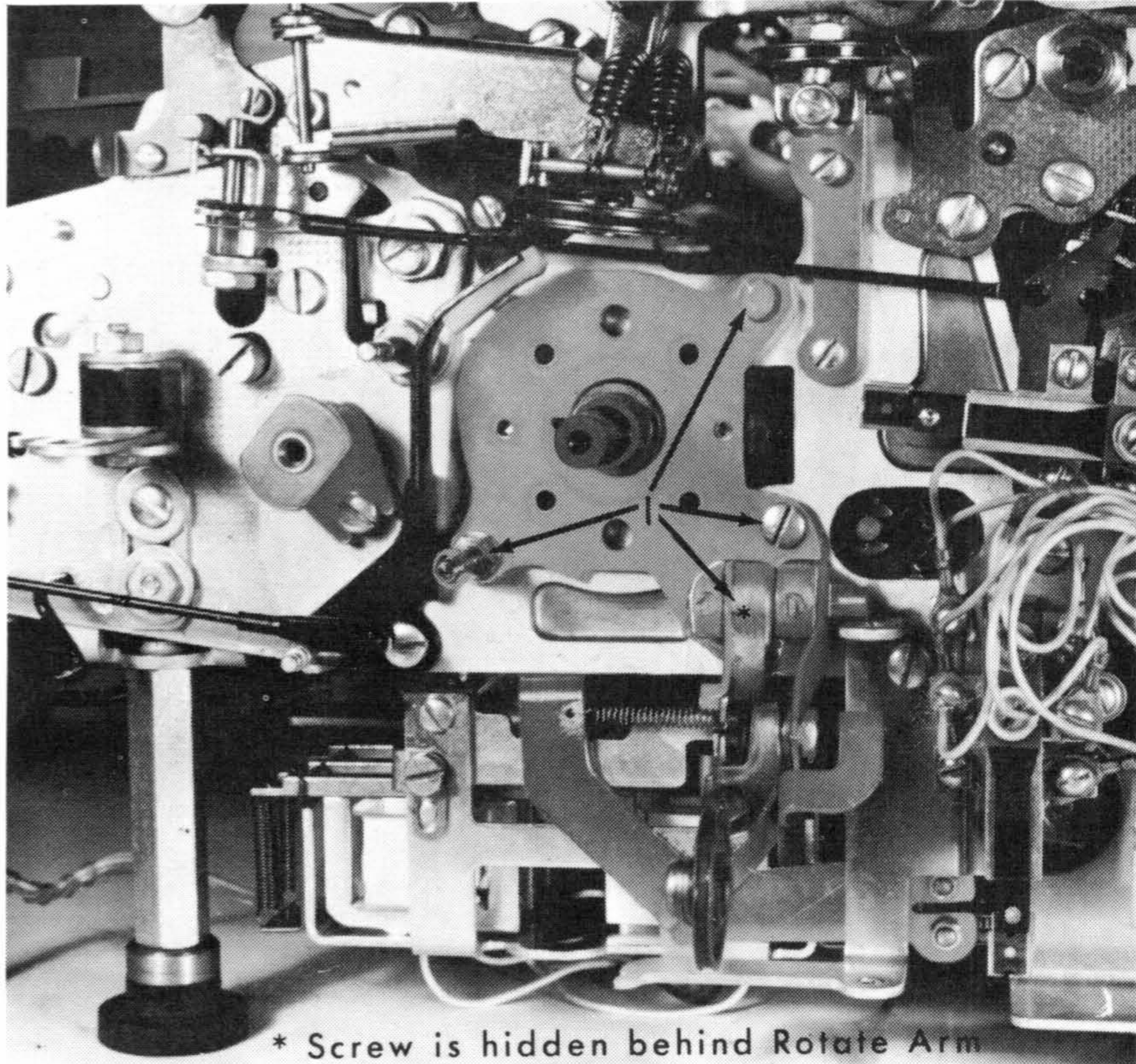


Figure 50. Operational Shaft Removal

### OPERATIONAL INTERPOSER BRACKET REMOVAL

1. Complete the Shift-Cam Removal.
2. Complete the Operational-Magnet Removal.
3. Complete the Operational-Shaft Removal.
4. Complete the Operational-Latch-Bracket Removal.
5. Remove the six (two shown) mounting screws (#1, Figure 51).
6. Remove the C5 Auxiliary Cam Follower.

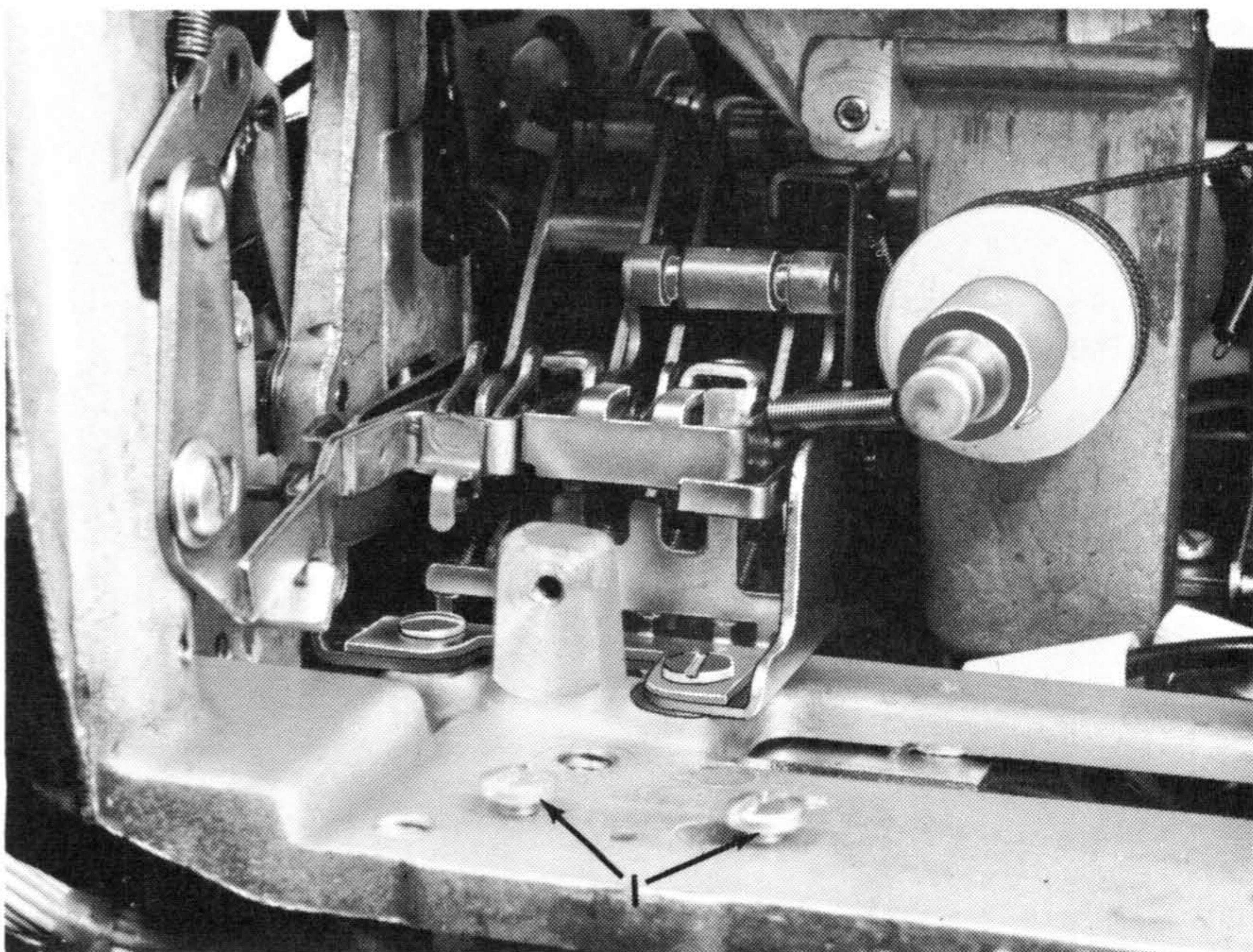


Figure 51. Operational Interposer Bracket Removal

7. Remove the key-lever pawl guides from the operational-interposer bracket (not shown).
8. Work bracket asm. out through rear of machine.
9. The following adjustments should be checked after the operational-interposer-bracket assembly is replaced.
  - a. All Shift Mechanism Adjustments
  - b. Shift Magnet Assembly
  - c. UpperCase Typehead Homing
  - d. Gear Mesh
  - e. Operational Latch Pivot Pin Eccentric
  - f. Escapement Trigger Guide
  - g. Mainspring Tension
  - h. Keylever Pawl to Interposer Clearance
  - i. Operational Latch Height
  - j. Backspace Rack
  - k. Pawl Clearance
  - l. Clutch Latch Overthrow
  - m. Carrier Return Actuating Arm
  - n. Multiplying Control Lever

### CARRIER SHOE REMOVAL

1. Remove the two card-holder screws (#1, Figure 52).
2. Remove the two escapement-bracket screws (#2, Figure 52).
3. Work the carrier out from under the escapement bracket to the right.

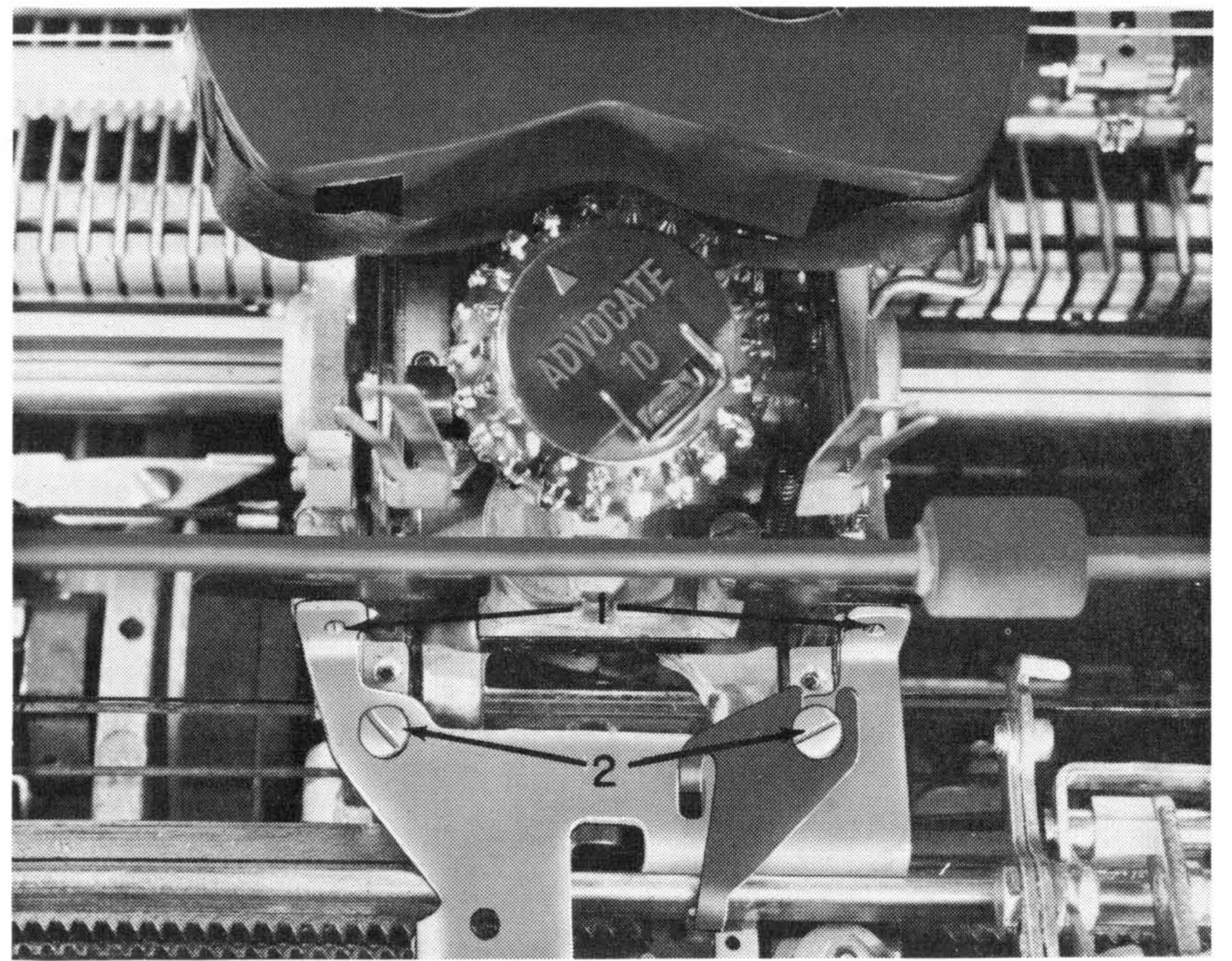


Figure 52. Carrier Shoe Removal

4. Remove the nut from the carrier-shoe stud and remove the shoe (#1, Figure 53).
5. The following adjustments should be checked after the carrier-shoe is replaced.
  - a. Carrier Shoe
  - b. Escapement Bracket



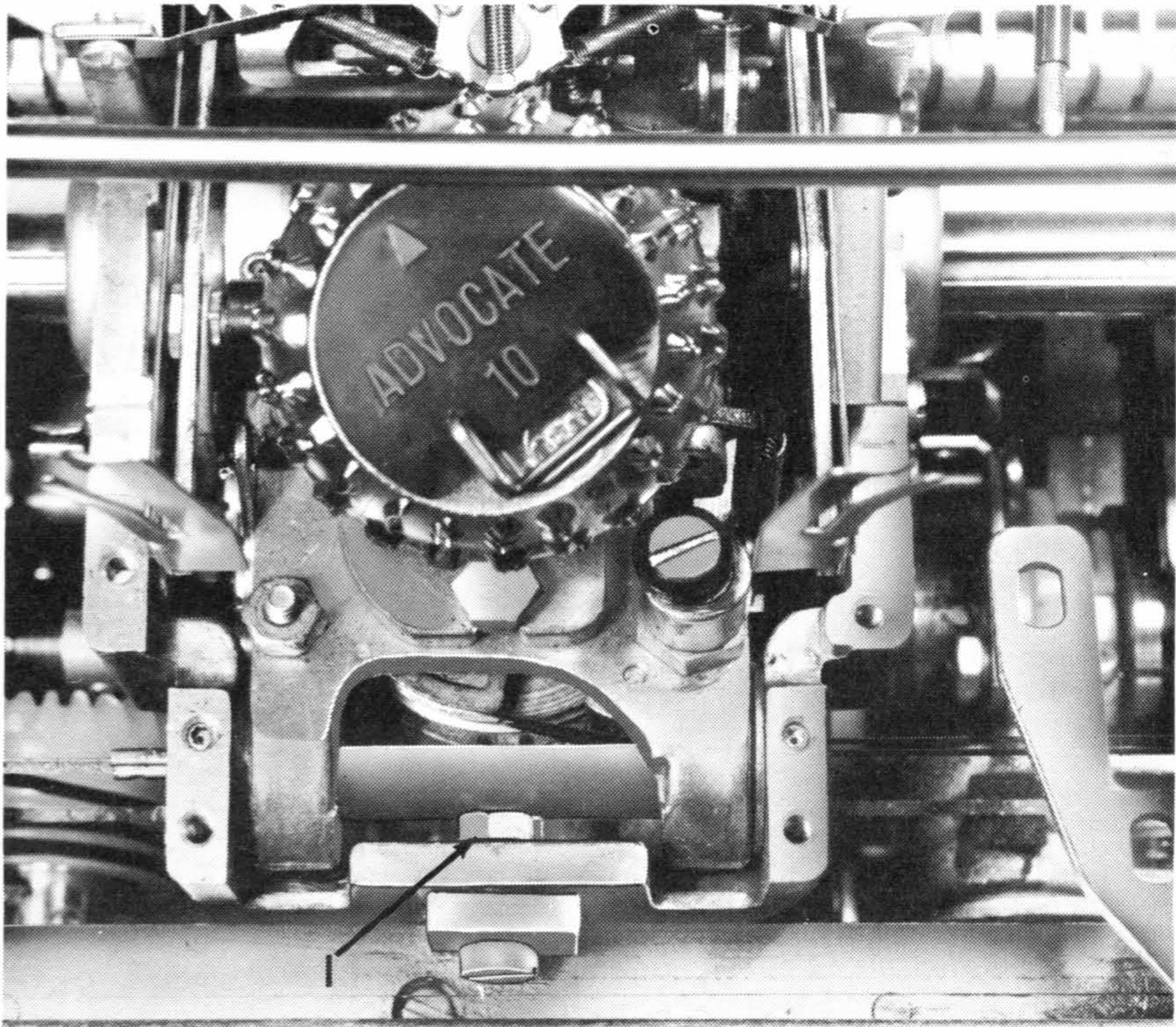


Figure 53. Carrier Shoe Removal

#### INTERPOSER REMOVAL

1. Align the carrier over the line lock interposer (#1, Figure 55).
2. Disconnect the operational keylever springs, carrier-return spring, and backspace spring (#2, Figure 55).
3. Remove keylever upstop (#4, Figure 55).
4. Remove the spacebar equalizing rod (#5, Figure 55).
5. Remove the bell bail lever (#6, Figure 55).
6. Remove the bell ringer bail (#7, Figure 55).
7. Remove the margin rack (#8, Figure 55).
8. Slip sound deadening over operational keybuttons (#9, Figure 55).

9. Push the fulcrum rod to the interposer being removed with a fulcrum rod tool (#1, Figure 56).
10. Remove the spring from the interposer being removed (#2, Figure 56).
11. To remove the line lock interposer, it is necessary to remove the screws marked "A" on Figure 55 and pull the interposer guide comb support forward (not shown).
12. The following adjustments should be checked after the interposer is replaced.
  - a. Keylever Guide
  - b. Bell Ringer Bail Lever

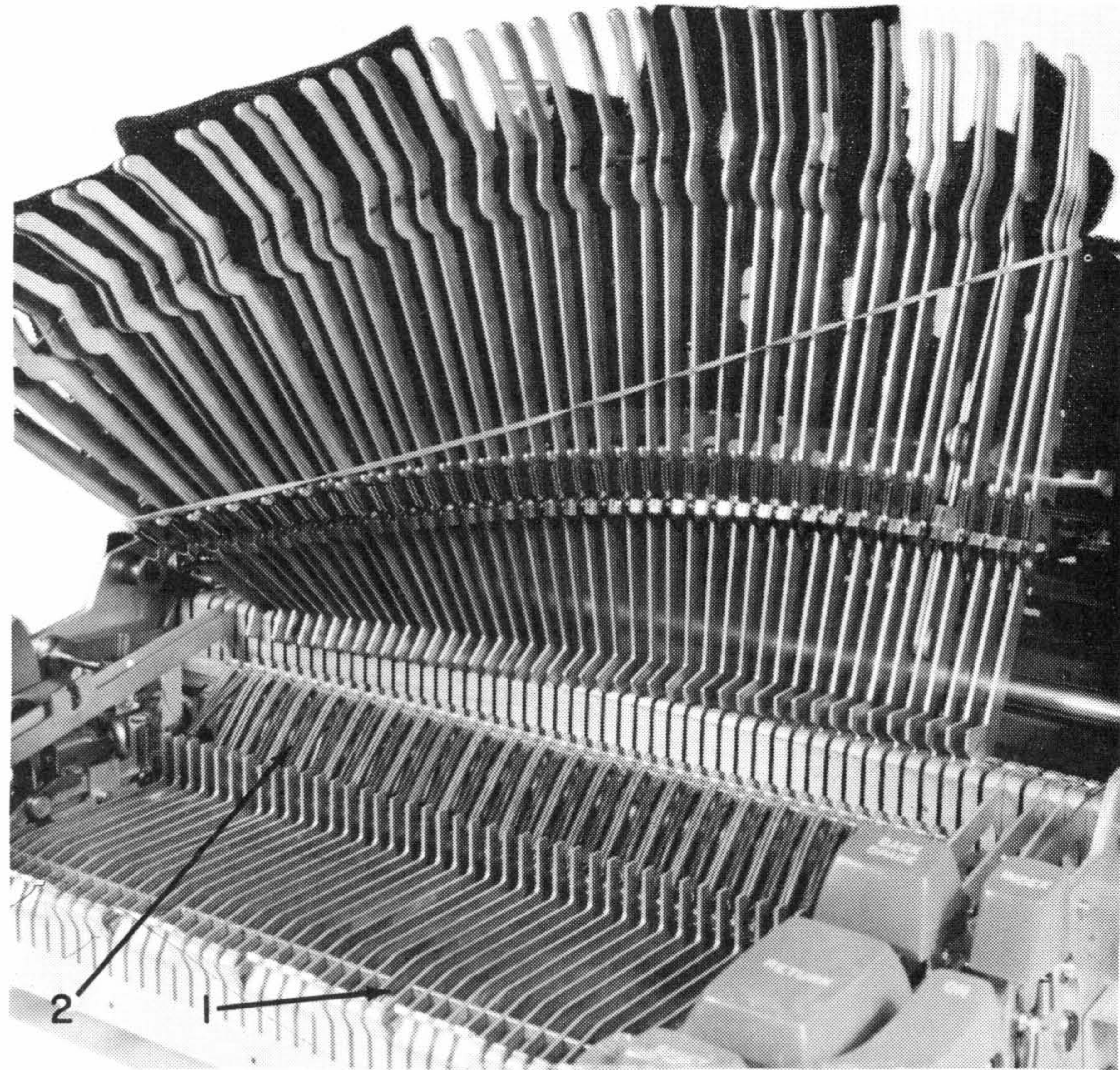


Figure 56. Interposer Removal

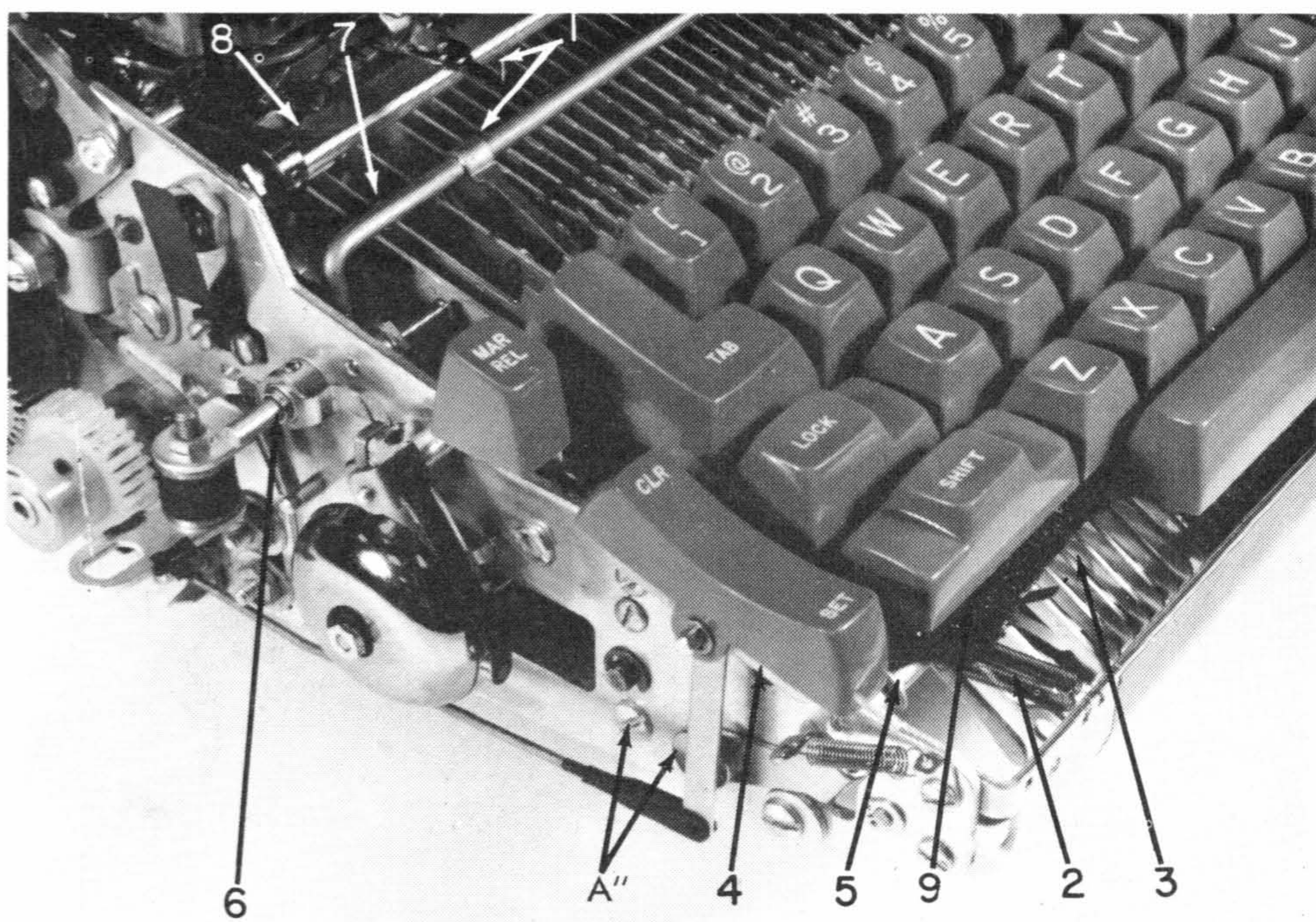


Figure 55. Interposer Removal



## CARRIER AND ROCKER REMOVAL

1. Remove mounting screws (#1, Figure 57).
2. Remove card holders (#1, Figure 58).
3. Disconnect ribbon lift spring (#3, Figure 58).
4. Release rotate spring tension (#4, Figure 58).
5. Remove tilt pulley spring (#5, Figure 58).
6. Remove tape anchor screw (#6, Figure 58).
7. Remove tapes (#7, Figure 58).
8. Remove tape wiper (#8, Figure 58) if present.

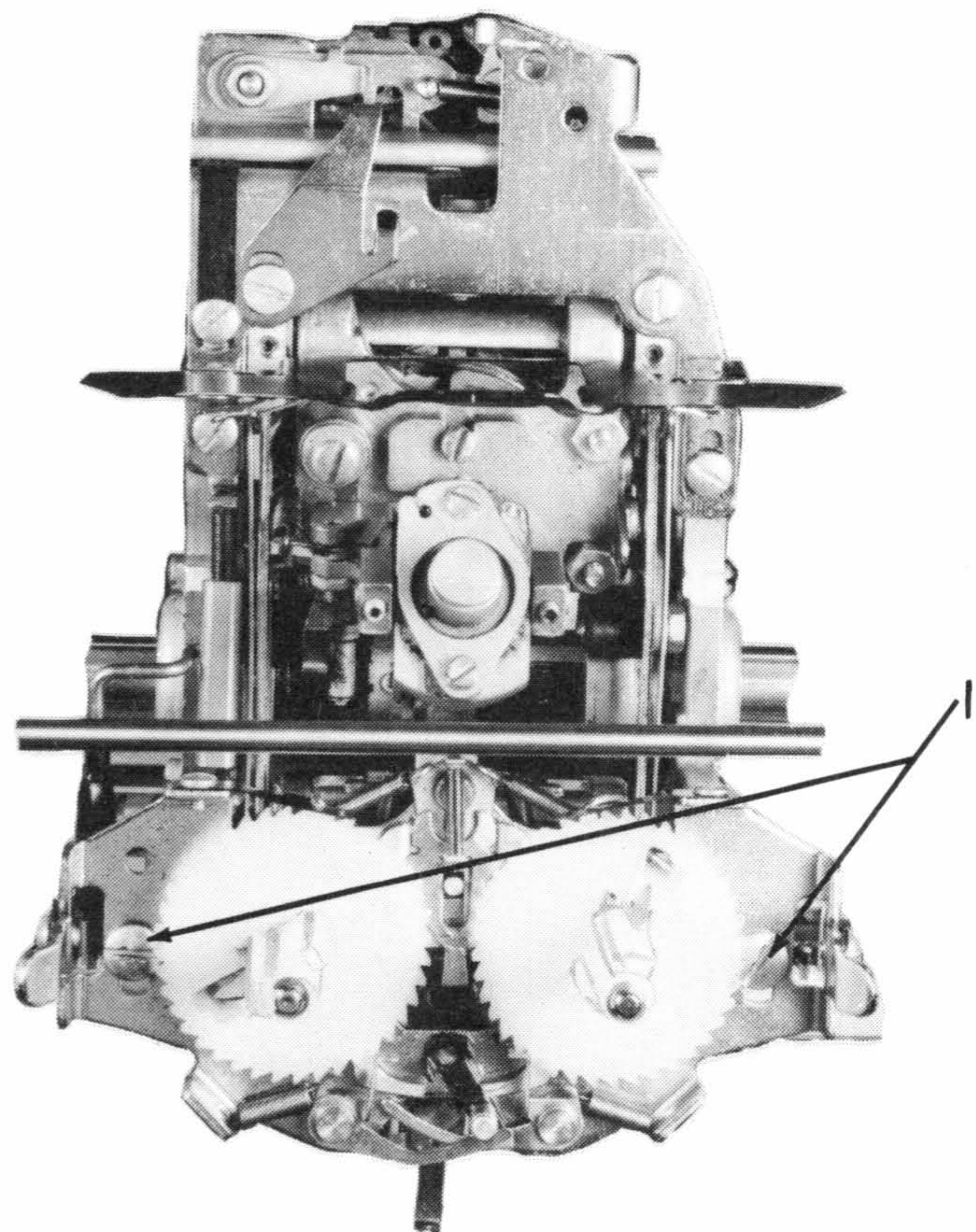


Figure 57. Carrier and Rocker Removal

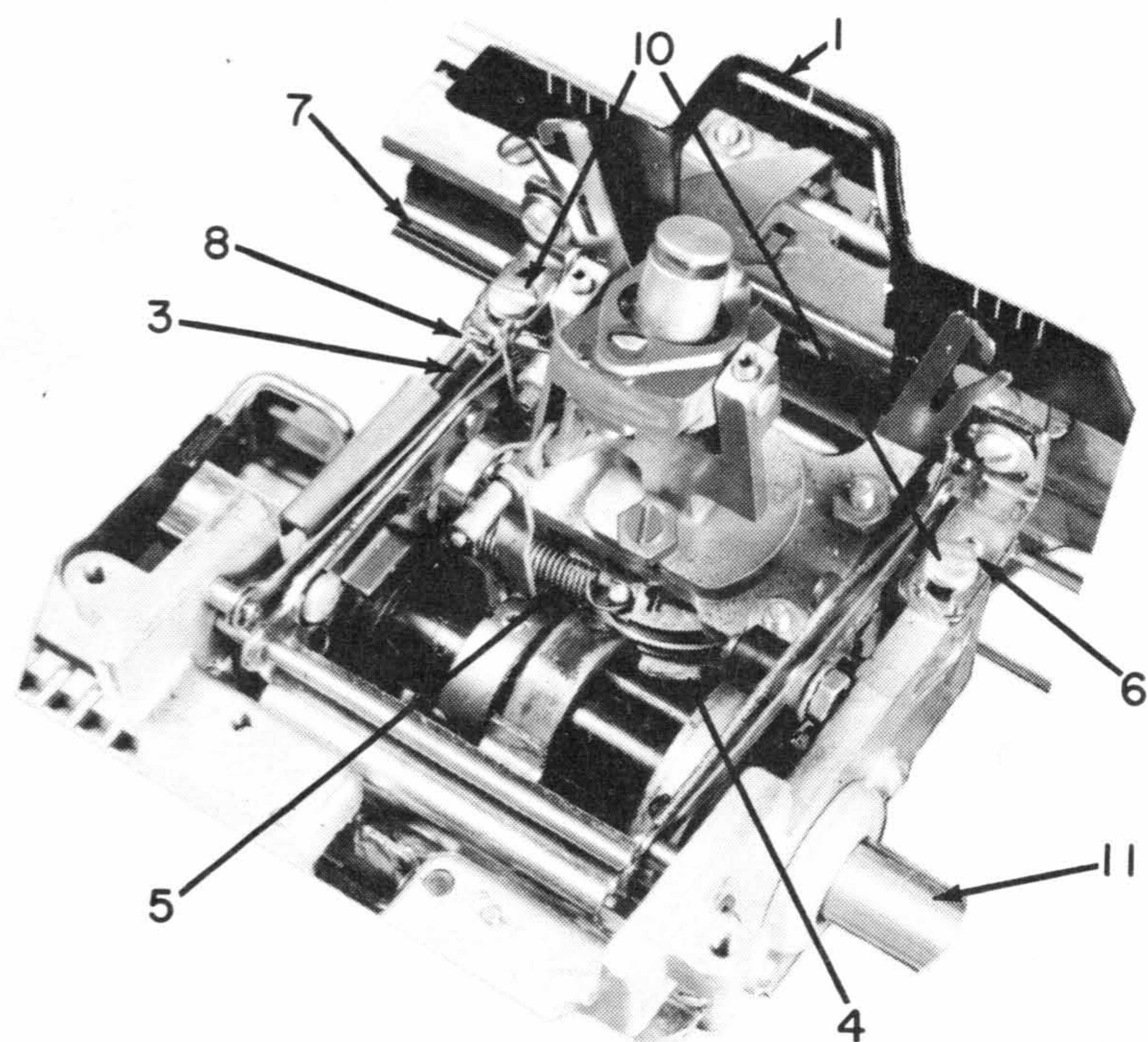


Figure 58. Carrier and Rocker Removal

9. Remove escapement bracket mounting screws (#10, Figure 58).
10. Remove transport spring bracket screw (#1, Figure 59).
11. Remove print shaft gear (not shown).
12. Remove print shaft (#11, Figure 58).
13. Remove Carrier & Rocker assembly.

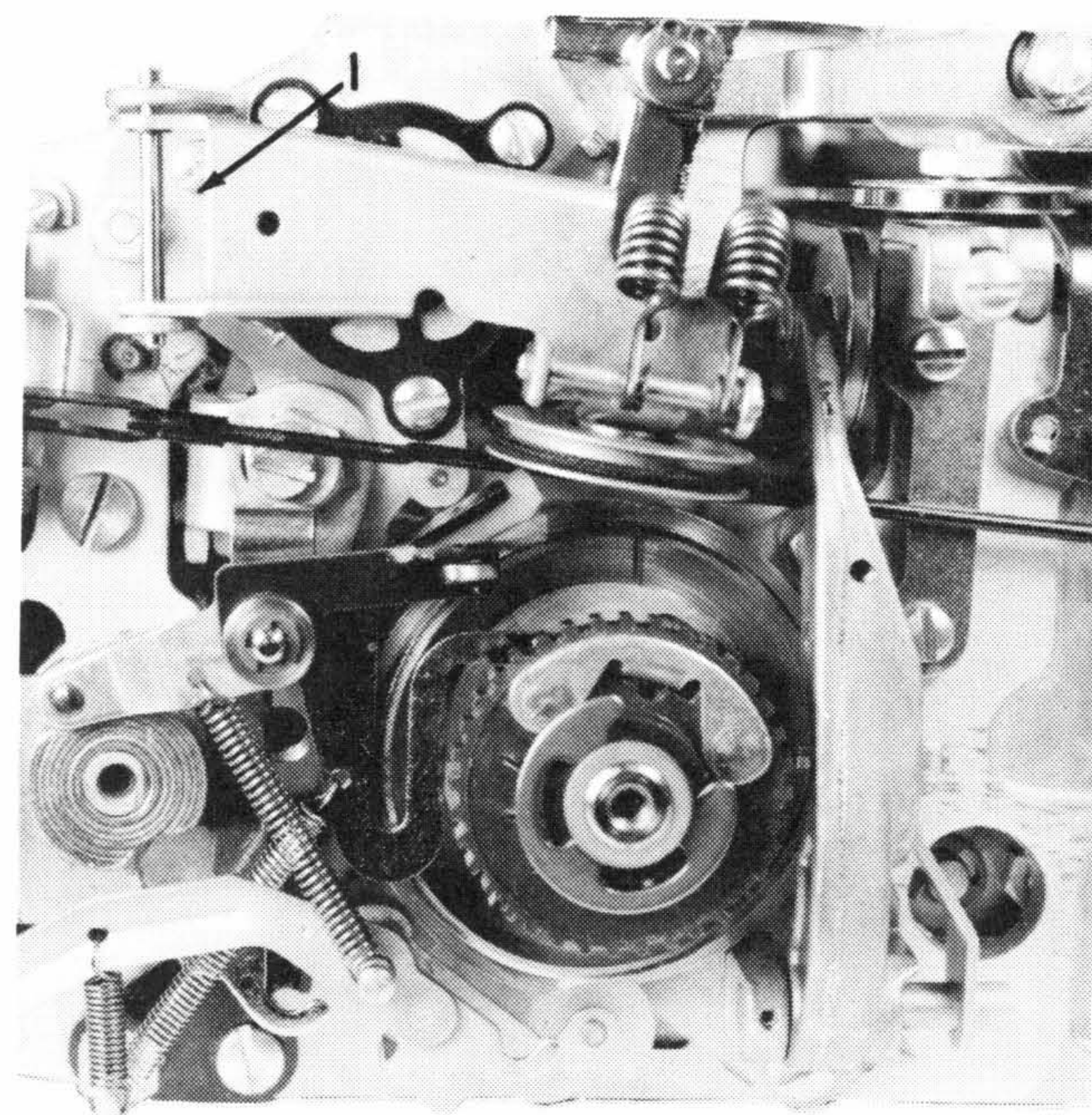


Figure 59. Carrier and Rocker Removal

NOTE: If rocker removal is necessary, complete the following steps.

14. Remove anvil striker (#1, Figure 60).
15. Remove rotate spring, cage and pulley (#2, Figure 60).
16. Remove tape guide (#3, Figure 60).
17. Remove "C" clip on rocker shaft (#4, Figure 60).
18. Loosen rocker shaft set screw and remove rocker shaft (#5, Figure 60).
19. Check carrier & rocker and alignment adjustments after reassembly.

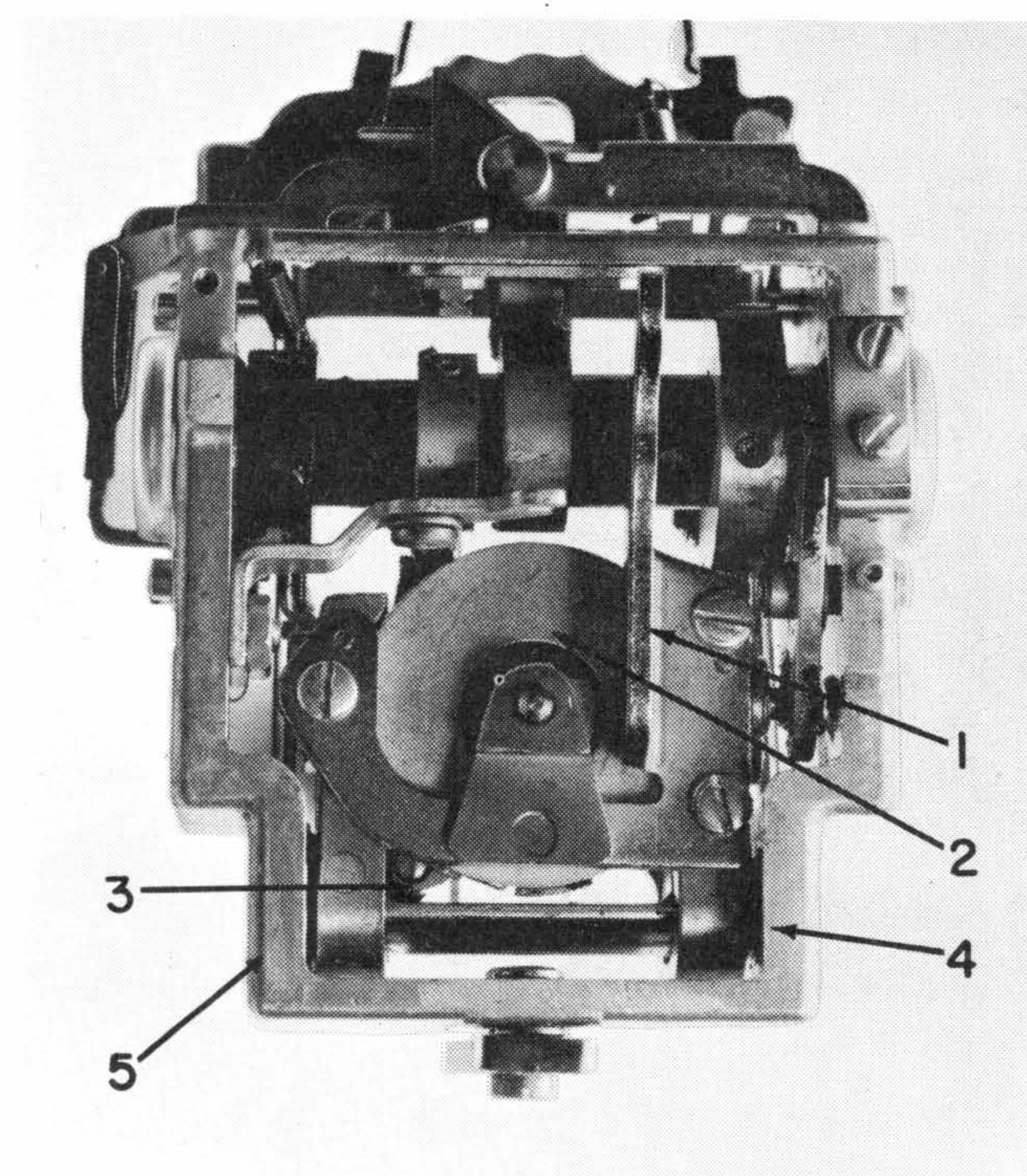
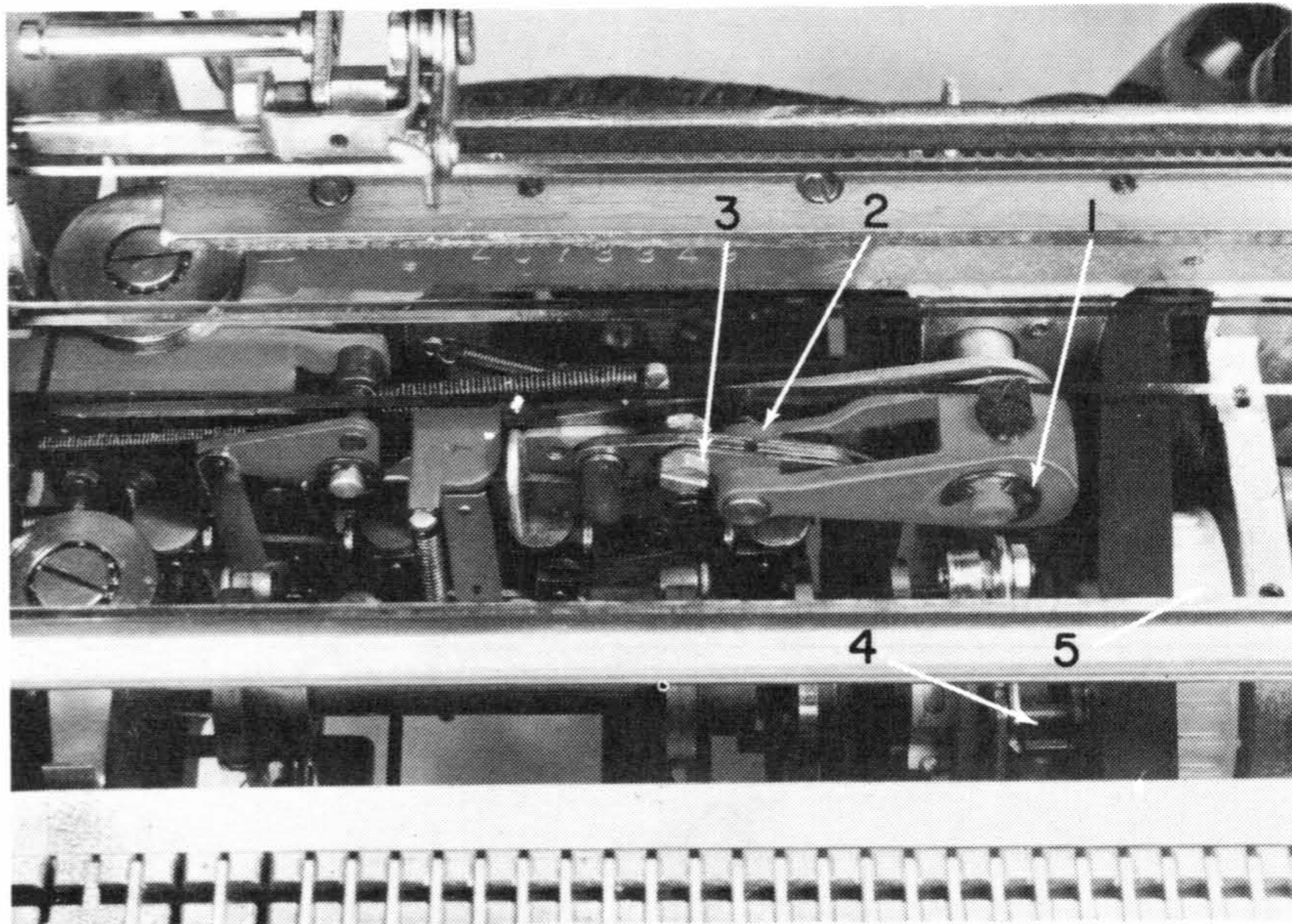


Figure 60. Carrier and Rocker Removal



## CYCLE CLUTCH PULLEY REMOVAL

1. Perform the Cycle-Clutch and Cycle-Shaft removal.
2. Remove the "C" clip from the rotate bellcrank pivot pin (#1, Figure 61).
3. Disconnect the rotate link from the rotate bellcrank (not shown).
4. Remove "C" clip and remove pivot pin (#2, Figure 61).
5. Push down on the rotate balance arm (#3, Figure 61) and lift up on the rotate bellcrank until the two are clear of each other and then remove the bellcrank.
6. Remove the cycle-clutch-latch spring (not shown).
7. Remove the "C" clip which holds cycle-clutch-latch link to the cycle-clutch latch and disconnect the link from the latch (not shown).
8. Remove the bottom latch screw, loosen the top latch screw and slide the latch up and out (#4, Figure 61).
9. Take the belt off the pulley and remove the pulley (#5, Figure 61).
10. The following adjustments should be checked after the cycle-clutch pulley is replaced.
  - a. Latch Height
  - b. Cycle Shaft End Play
  - c. Idler Gears
  - d. Cycle-Clutch Spring
  - e. Cycle-Clutch Latch Bite
  - f. Damper-Spring
  - g. Filter Shaft Timing
  - h. Print Shaft Timing
  - i. C1 and C2 Contact Timing



*Figure 61. Cycle Clutch Pulley Removal*



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## GENERAL PROCEDURE

Power clean the printer with the covers removed. Clean the feed rolls, platen, and deflector. Unless otherwise stated, all parts of the printer should be inspected and lubricated once every three months. NOTE: Lubrication must be applied judiciously to eliminate excessive quantities and prevent migration or spin-off into electrical contacts.

## LUBRICATION

Figures 1 through 7 show the points that require lubrication. The number references require ET IBM #6, P/N 460052. The letter references require IBM #17. The x references require Sil-X\* P/N 9900188 or an equivalent lubricant. Points that do not require lubrication every three months are identified with the required frequency in the reference list. A rule of thumb should be "All bearing areas having a sliding motion use IBM #17 and all bearing areas having rotational motion use ET IBM #6 unless otherwise specified."

Machines with power on 24 hours daily require more frequent lubrication than machines used for single-shift operation. The following areas are primarily affected by idling time, since only the operational shaft is driven:

1. Motor and motor pulley
2. Cycle-clutch spring and arbor
3. Driven-pulley hub and bearing
4. Operational cam bearings
5. Right-hand operational shaft and shift cam bearing
6. Shift-clutch spring and arbor.

Since these machines are hot 24 hours daily, some lubricant evaporation can be expected in areas not driven during idling, however, they are not nearly so affected as items 1 through 6. Where power is on 24 hours daily, we recommend lubricating these items every six weeks.

\* Standard Oil of Kentucky Trademark



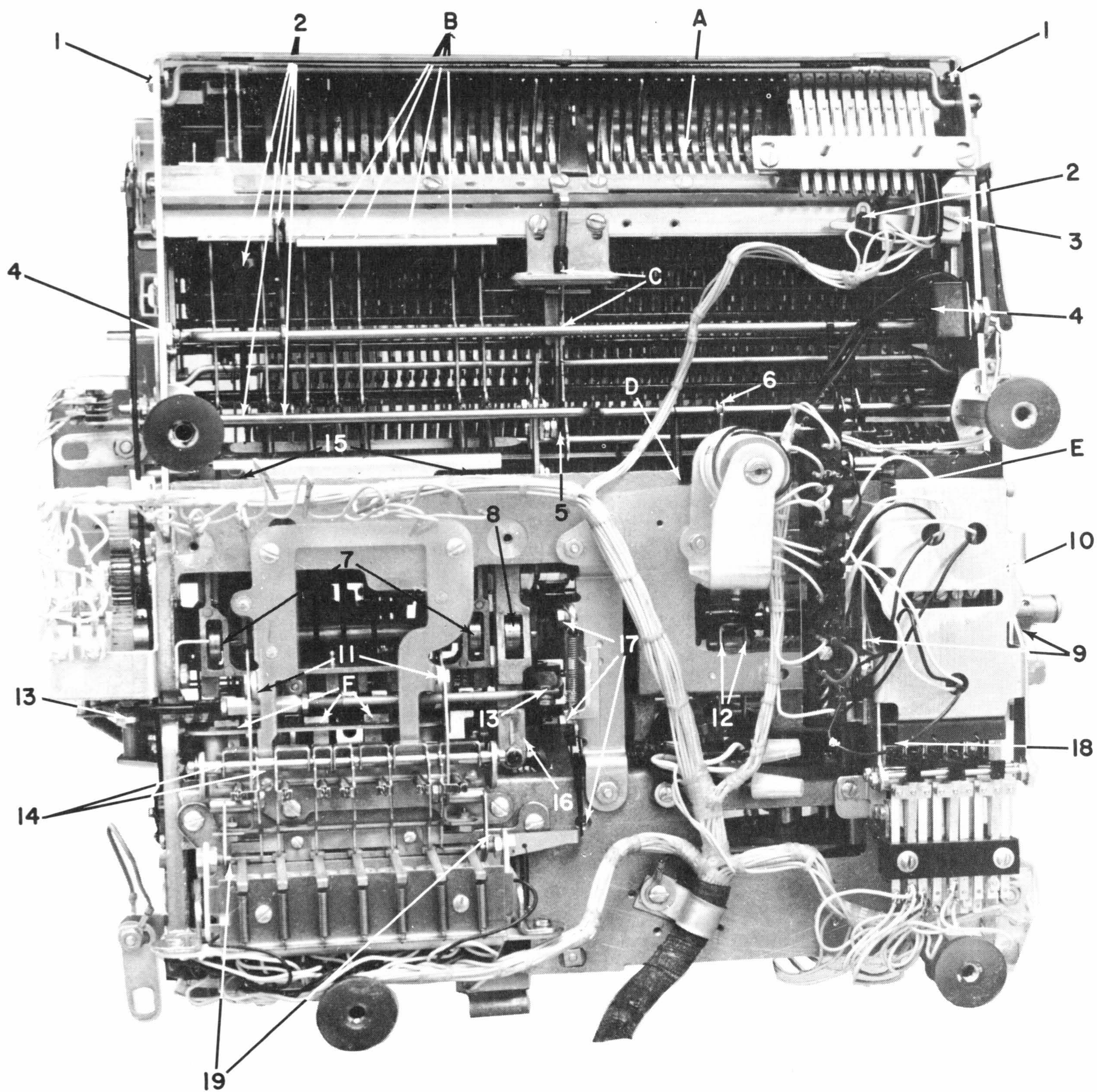


Figure 1. Bottom View Of The Printer

IBM #6

- 1. Power-tab key-lever bail pivots
- 2. Clevis and link pivots
- 3. Keyboard-lockout bellcrank pivot
- 4. Keyboard-lockout bail pivots
- 5. Cycle-clutch pawl and link pivots
- 6. Keyboard-lockout bail roller and lever pivot
- 7. Selector bail roller pivots
- 8. Negative-five bail roller pivot
- 9. Actuating-arm pivots
- 10. Operational pull links
- 11. Pusher bail-arm pivots
- 12. Carrier-return actuating-arm pivot
- 13. Rotate-link pivots
- 14. Pusher-arm pivots

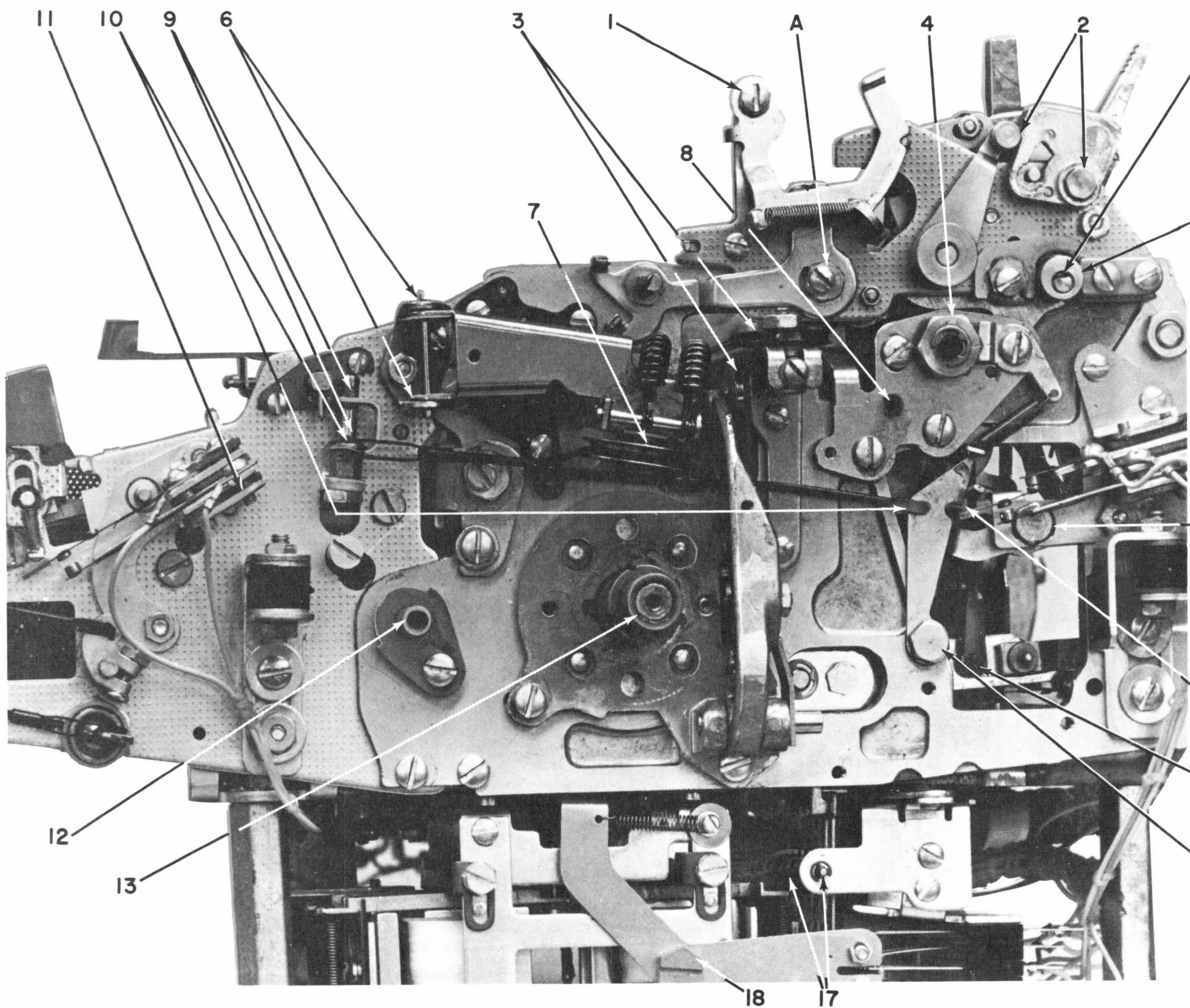
- 15. Selector-latch bail pivots
- 16. Negative-five link bearing
- 17. Cycle-clutch trip pivots
- 18. Contact-latch pivots
- 19. Cycle-clutch trip-bail pivot points

IBM #17

- A. Keyboard-lockout-comb sliding surface\*
- B. Interposer sliding surfaces
- C. Cycle-clutch latch surfaces
- D. Filter-shaft surface
- E. Operational-arm pivots
- F. Selector-latch surfaces

\*Every six months.





**Figure 2. Right Side Of The Printer**

**IBM #6**

- 1. Platen-release pivot\*
- 2. Paper-release-lever pivots
- 3. Rotate and tilt pulley bearings
- 4. Tab-rack support bearing
- 5. Copy-control eccentric pivot\*
- 6. Pulley-assembly pivots
- 7. Right-hand cord-pulley bearing
- 8. Escapement torque-bar pivot
- 9. Carrier-return unlatching-bellcrank pivot
- 10. Carrier-return unlatching-link pivot
- 11. Bellringer bail pivot
- 12. Filter-shaft bearing
- 13. Operational-shaft bearing
- 14. Carrier-return latch-keeper pivot
- 15. Index-link pivot
- 16. Carrier-return-link pivots
- 17. Operational-contact link-rod pivots

- 18. Contact-bail pivots

**IBM #17**

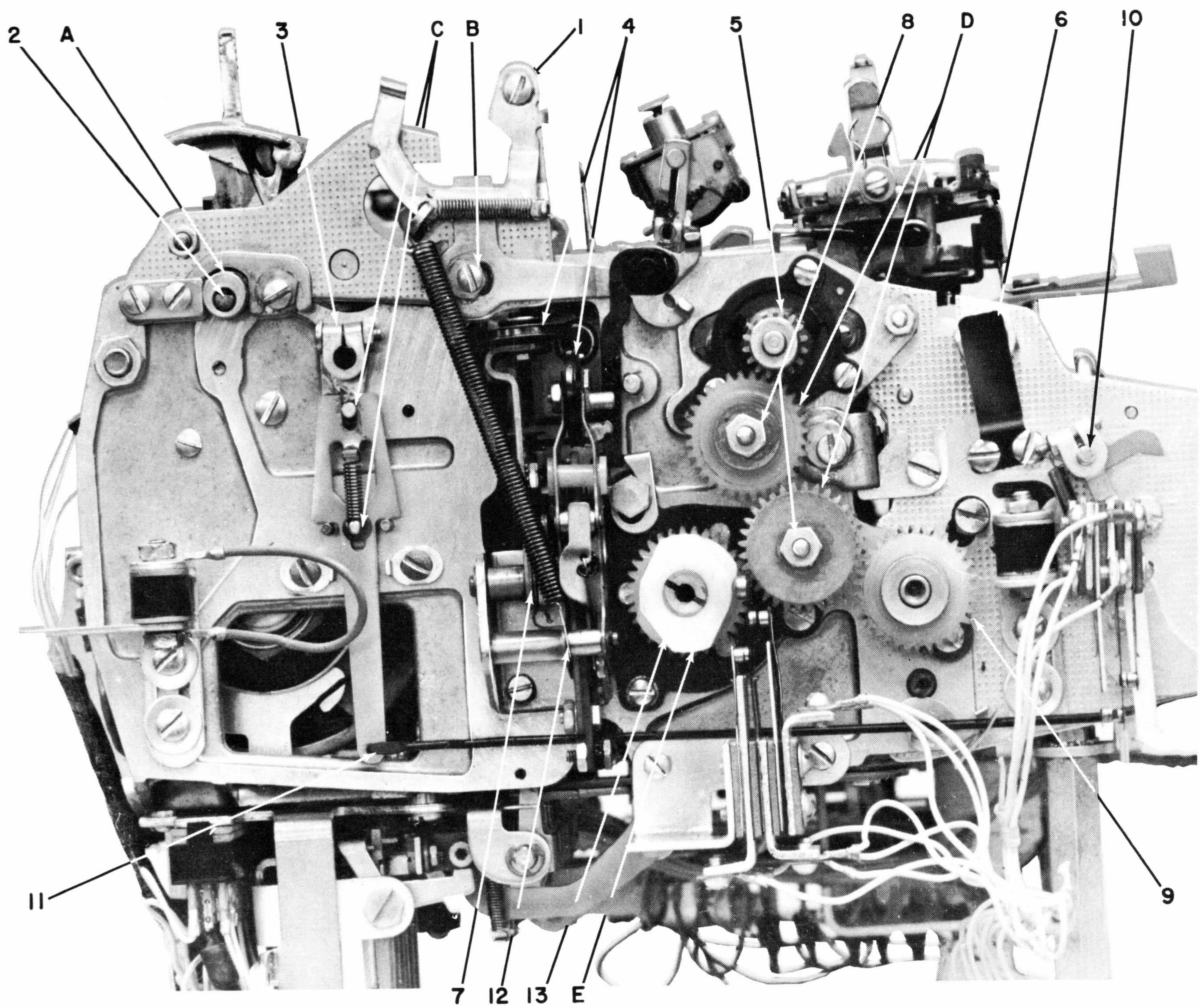
- A. Guide-bracket sliding surface\*
- B. Copy-control eccentric surface\*
- C. Carrier-return latch keeper

Sil-X P/N 9900188

Shift clutch spring & arbor (not shown)

\* Every 6 months / 1 Shift Operation  
 Every 3 months / 2 Shift Operation  
 Every 6 weeks / 3 Shift Operation





**Figure 3. Left Side Of The Printer**

**IBM #6**

- 1. Platen-release pivot\*
- 2. Copy-control eccentric pivot\*
- 3. Tab-rack support bushing
- 4. Rotate and tilt pulley bearings
- 5. Print-shaft bearing
- 6. Left-hand margin-rack bushing
- 7. Tilt-arm pivot
- 8. Idler-gear bearings (lightly)
- 9. Filter-shaft bearing
- 10. End-of-line bail

- 11. Tab set/clear link pivots
- 12. Wear-compensator pivots
- 13. Cycle-shaft bearing

**IBM #17**

- A. Copy-control eccentric surface\*
- B. Guide-bracket sliding surface\*
- C. Tab set/clear bellcrank
- D. Idler gear teeth
- E. C1 and C2 cam surfaces

\* Every six months.



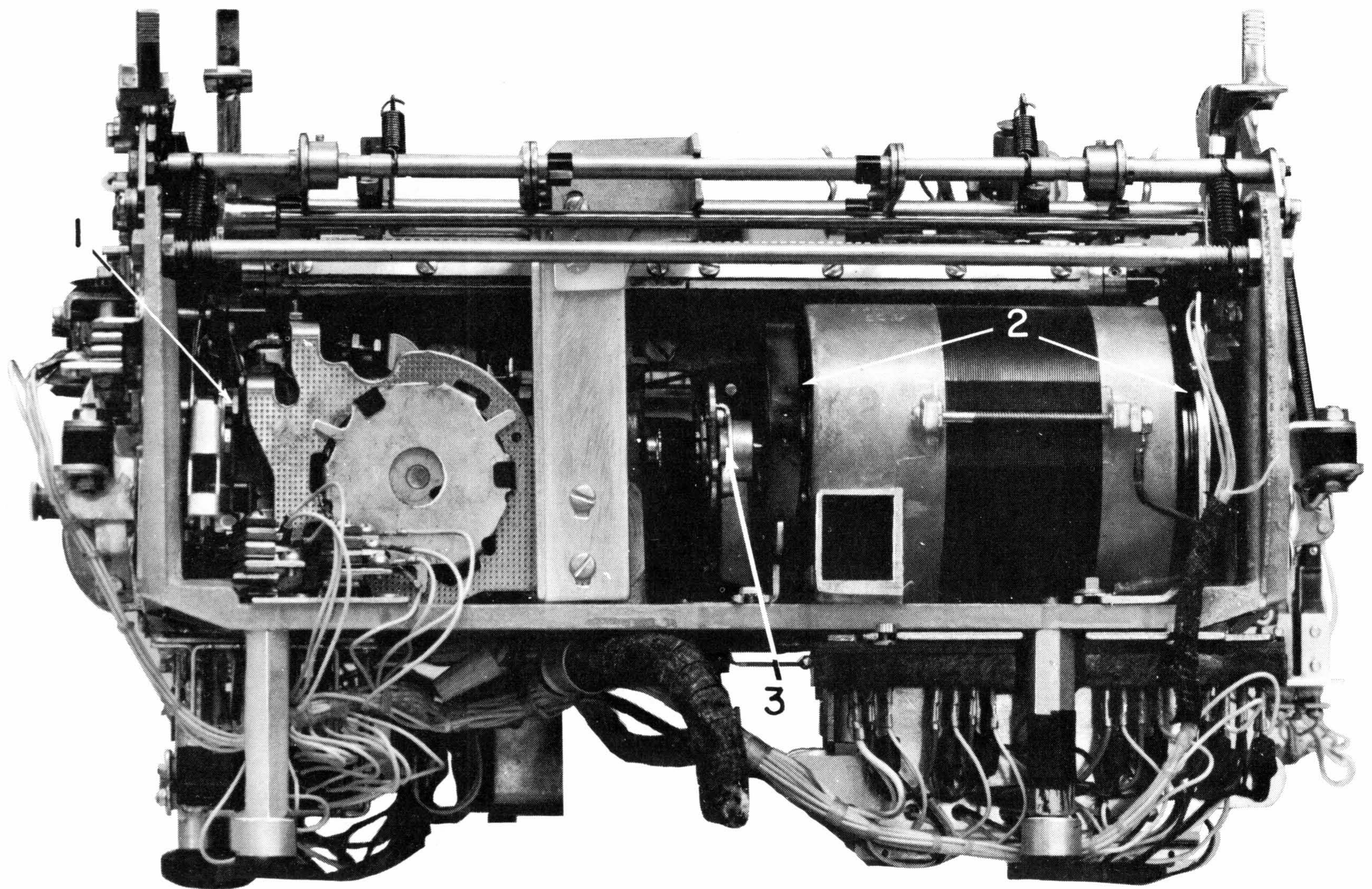


Figure 4. Back Of The Printer

IBM #6

1. Index-control lever (old style)
2. Motor bearings  
All pivots and bearings in operational unit.

IBM #9

3. Motor pulley and clutch assembly.



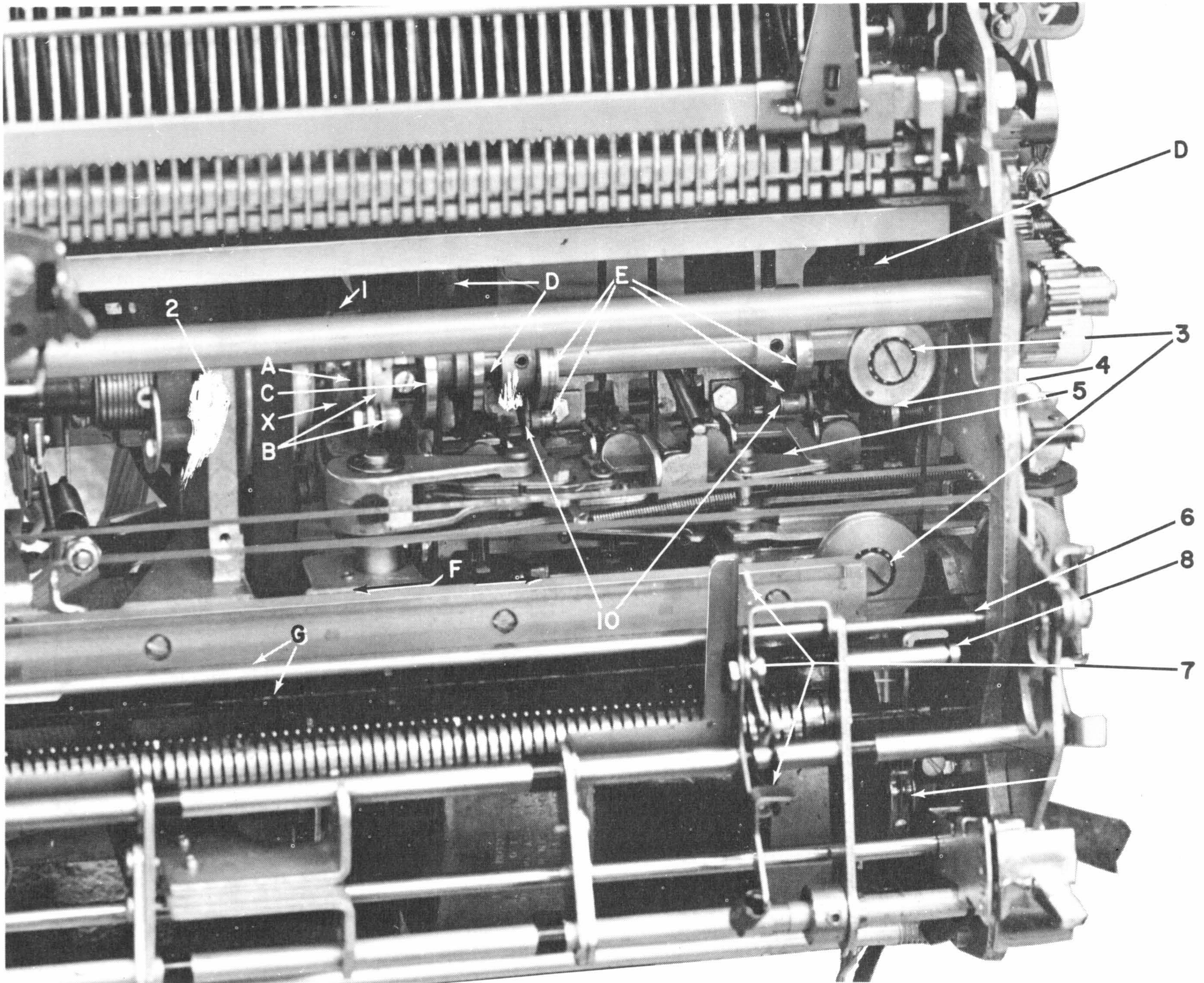


Figure 5. Differential Mechanism

IBM #6

1. Cycle-clutch latch pivot
2. Center bearing\* - #9
3. Carrier-return pulleys
4. Cycle-clutch check-latch pivot
5. Check-selector latch pivot
6. Tab-torque-bar pivot
7. Feed-roll bearings
8. Escapement-torque-bar pivot
9. All selector latch and differential mechanism pivots
10. Latch pusher roller and pivot studs

IBM #17

- A. Cycle-clutch sleeve surface
- B. Cycle-clutch restoring cam and roller \*
- C. Negative-five cam surface
- D. Selector-cam surface and roller
- E. Pusher-bail cam surface and arm rollers \*
- F. Surface of the escapement rack
- G. Torque bars (light film)

Sil-X

X cycle-clutch (inside) \*

\*Every 6 months / 1 Shift Operation  
 Every 3 months / 2 Shift Operation  
 Every 6 weeks / 3 Shift Operation



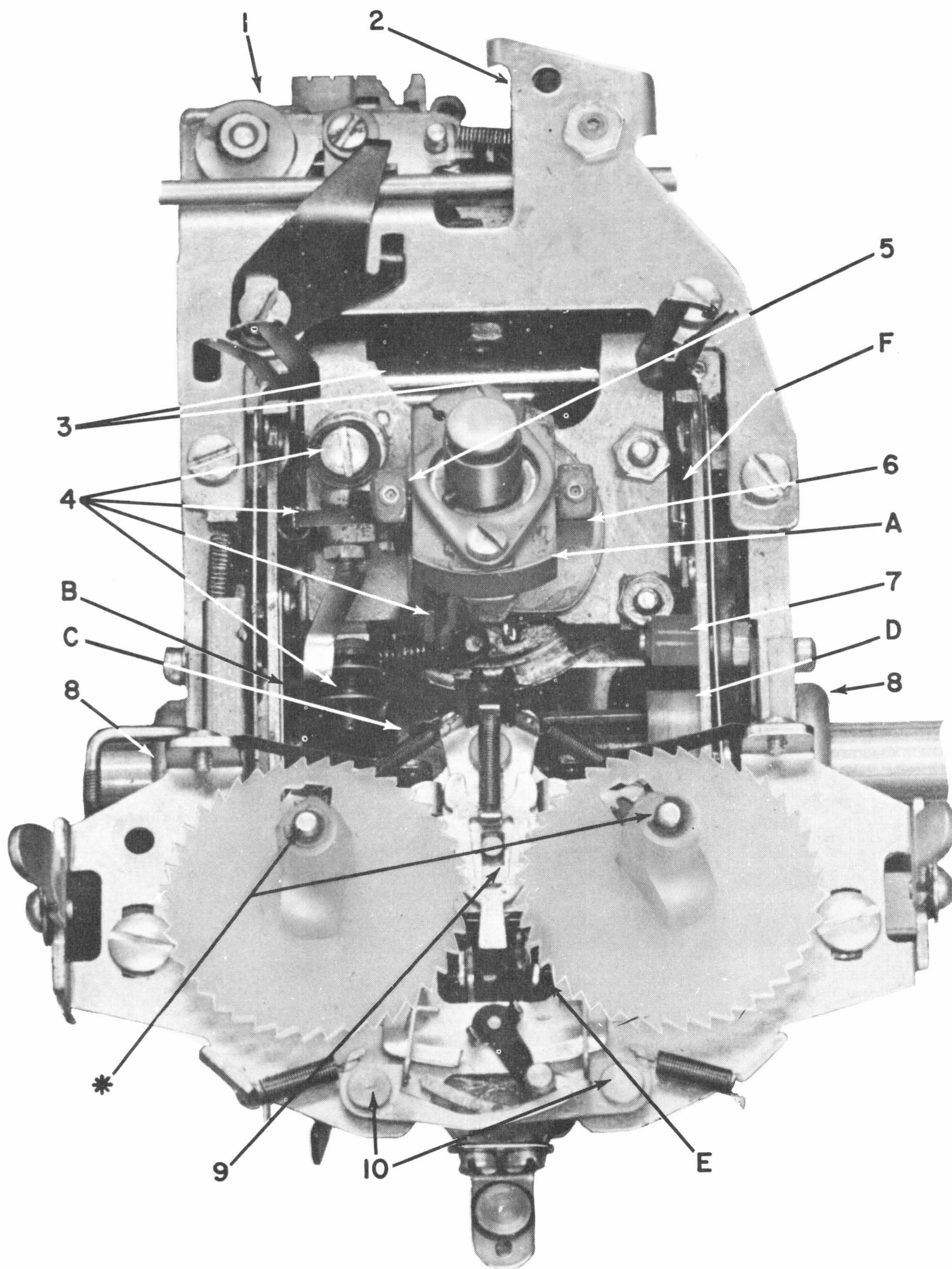


Figure 6. Carrier Mechanism

\* Keep cartridge and spindles free of all lubricants  
IBM #6

1. Tab-lever pivot
2. Tab-lever latch pivot
3. Rocker pivots
4. Detent pivots
5. Tilt-ring pivots
6. Tilt tube and lower ball socket
7. Print-cam roller bearing
8. Print-shaft wipers

9. Interposer-lever sliding surface
10. Detent-lever bearings

IBM #17

- A. Tilt ring and ball joint
- B. Ribbon-lift cam surface
- C. Ribbon-feed and detent cam surface
- D. Print-cam surface
- E. Ribbon-feed pawl
- F. Velocity control plate pin



PRINTER CONTACT LOCATIONS

Figures 8 to 12 show the locations of the printer contacts.

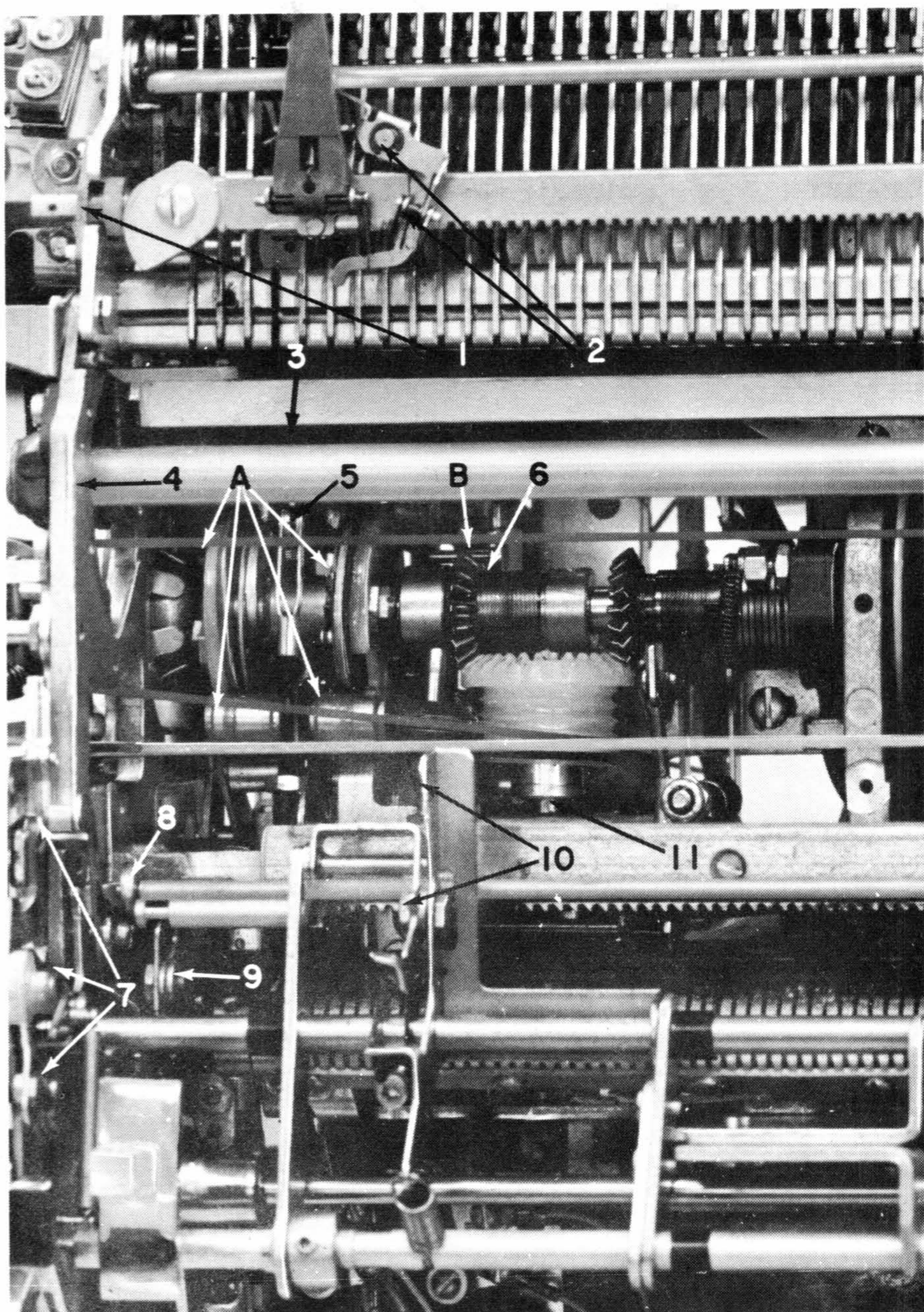


Figure 7. Operational Mechanism

IBM #6

1. Right-hand margin-rack bushing
2. End-of-line contact-actuating pivots
3. Escapement-cam-follower roller
4. Print-shaft bearing
5. Escapement clevis
6. Spring-clutch arbor. Oil carriage return spring clutch only when reassembly is necessary
7. Index pawls
8. Tab-torque-bar pivot
9. Power-tab bellcrank-link ends and pivots
10. Feed-roll bearings
11. Escapement-shaft bearing

IBM #17

- A. Operational-cam surfaces, rollers, and drive ratchets
- B. Actuating arm and check-pawl contact surface

Sil-X

X-Torque-limiter spring clutch\*

- \*Every 6 months / 1 Shift Operation
- Every 3 months / 2 Shift Operation
- Every 6 weeks / 3 Shift Operation

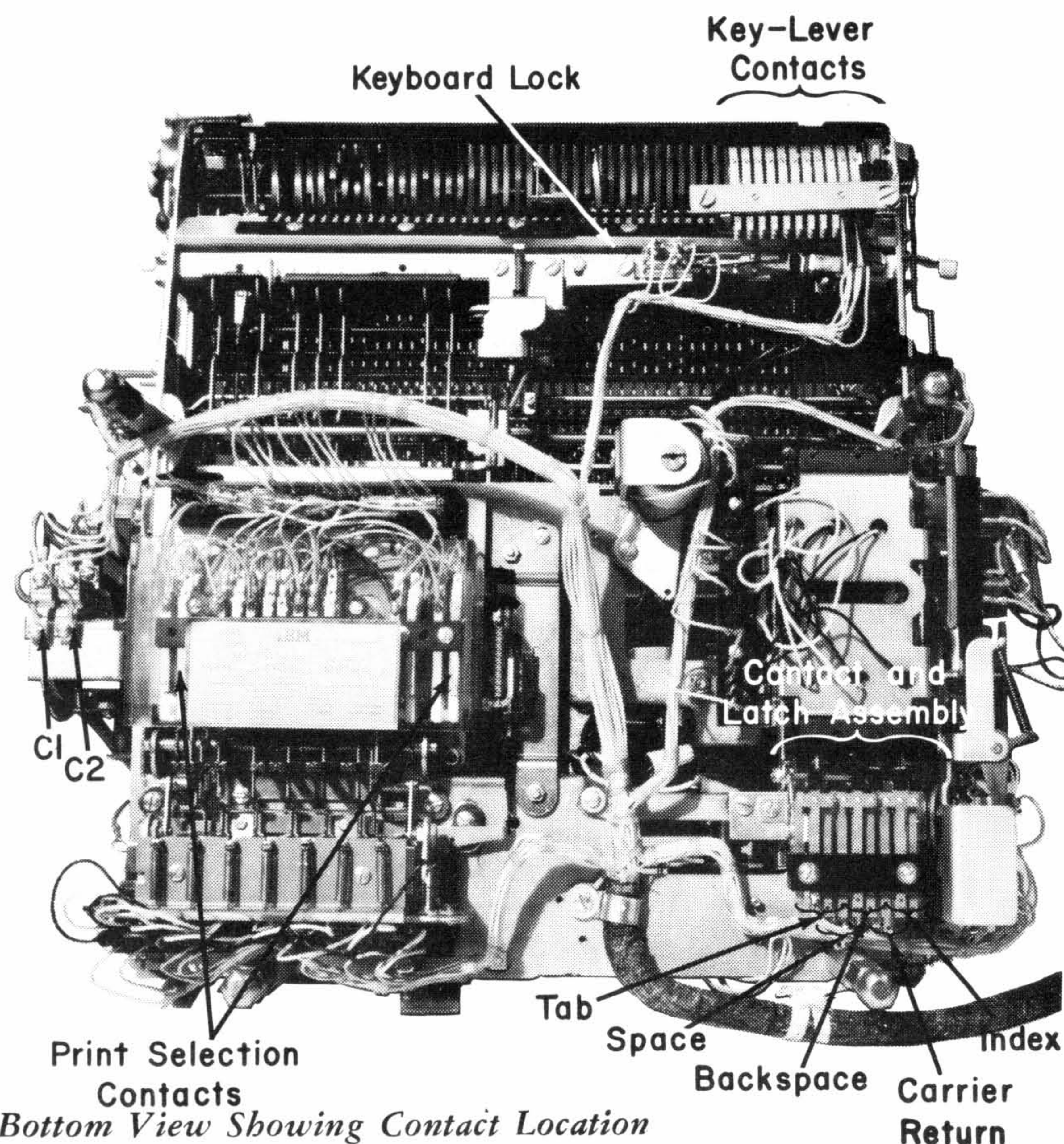


Figure 8. Bottom View Showing Contact Location

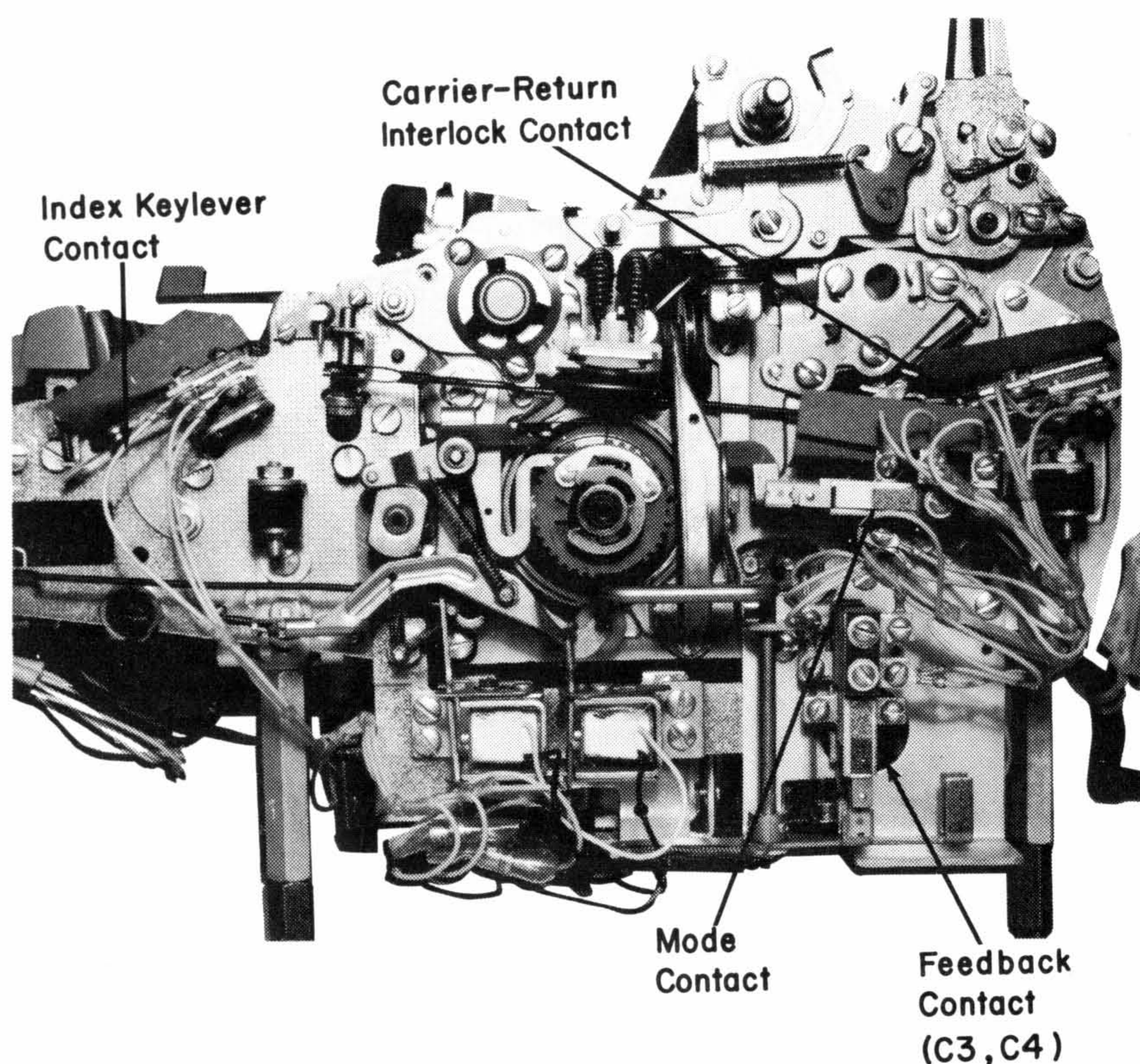


Figure 9. Right View Showing Contact Location



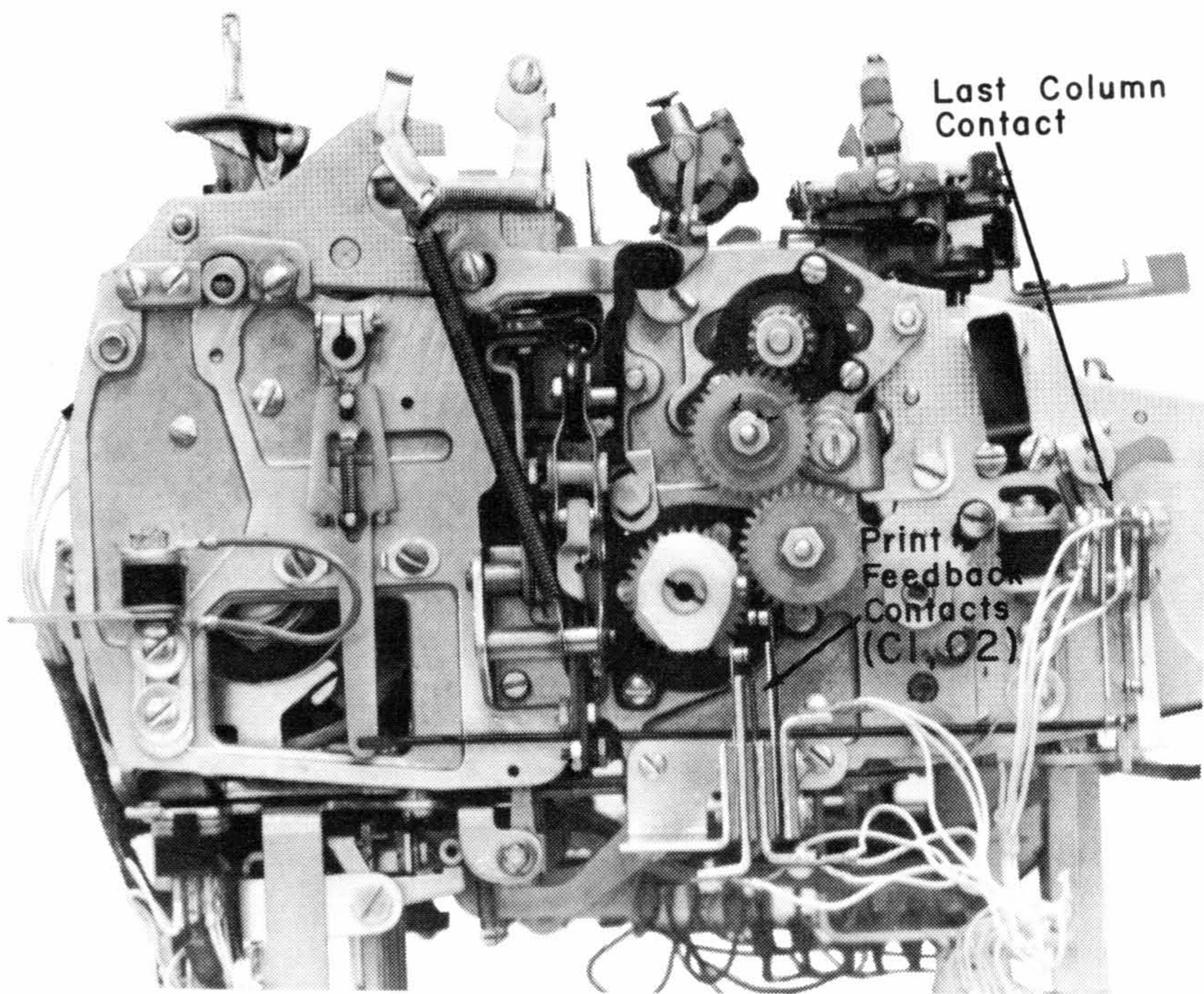


Figure 10. Left View Showing Contact Location

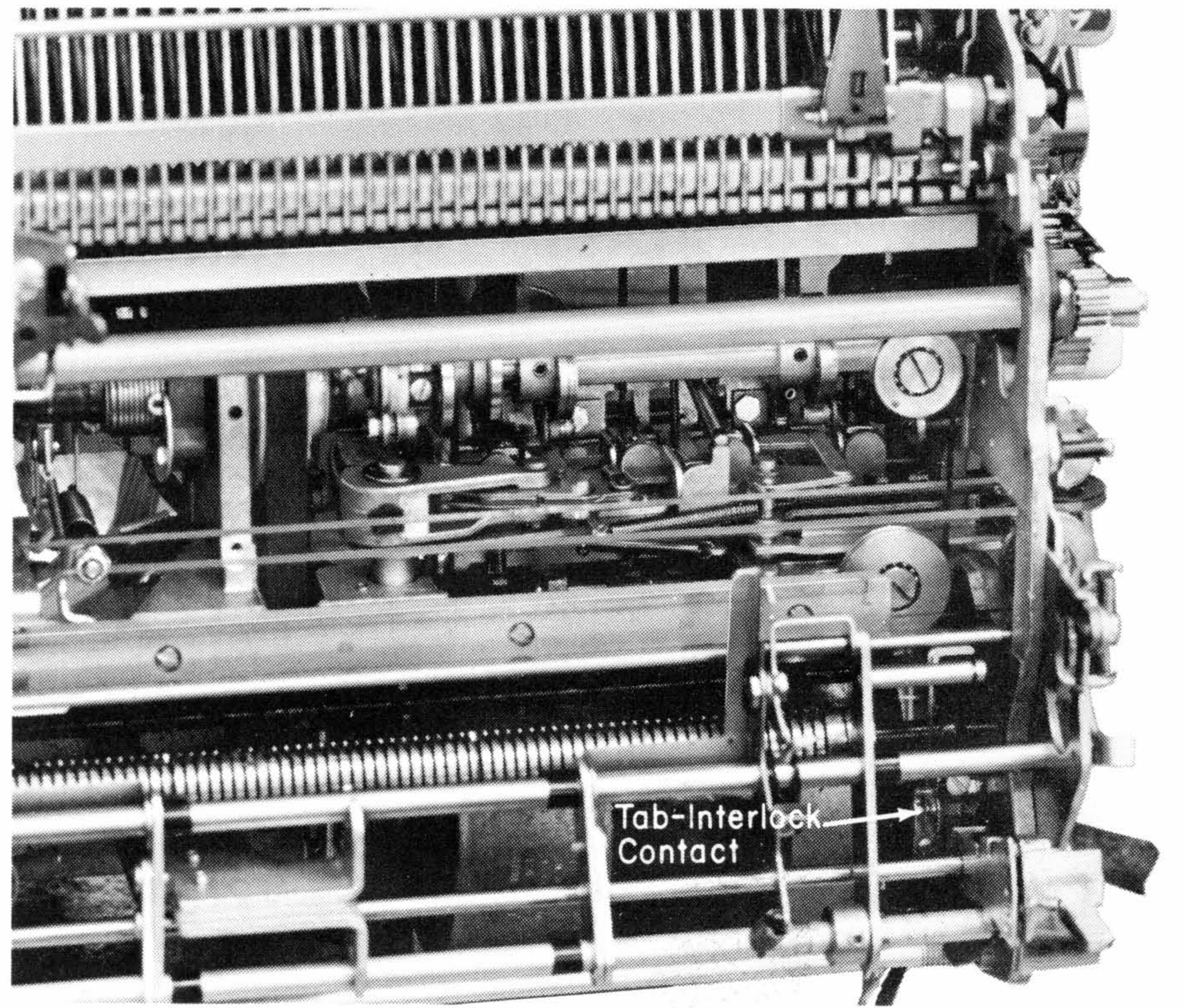


Figure 12. Upper Left Rear Corner Showing Contact Location

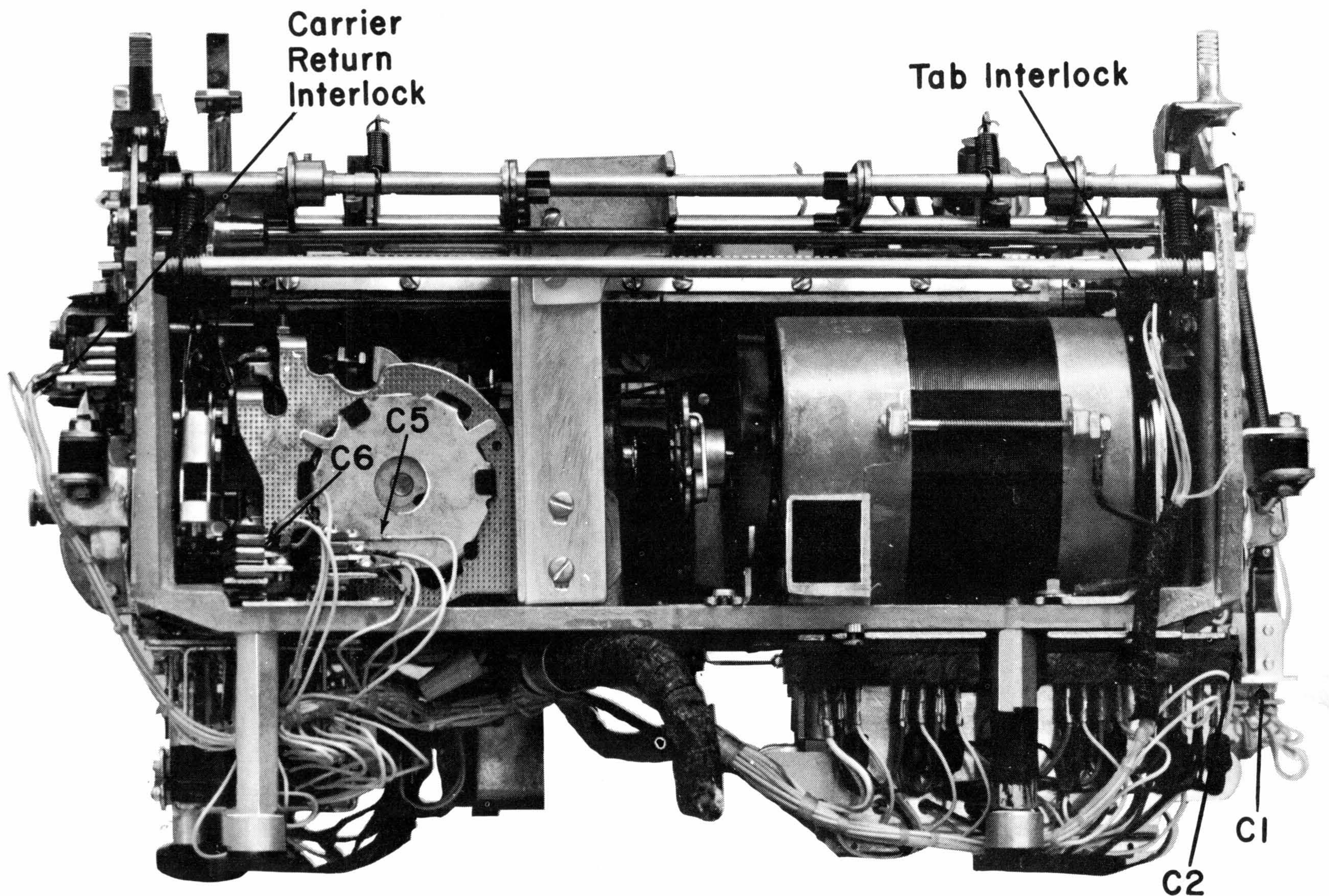


Figure 11. Rear View Showing Contact Location



## CYCLE INSPECTION

<u>Inspection Period</u>	<u>Inspection Area</u>
1	Cycle Clutch Tilt Mechanism Ribbon Feed Mechanism
2	Keyboard Area Impression and Alignment Rotate Mechanism Detenting
3	Selection Magnet Units Cycle Clutch Unlatching Operational Magnet Units Pusher Unit Contact Cleaning
4	Escapement Motor Drive and Carrier Return Indexing and Paper Feed Shift (Enter Mechanism)

### FIRST INSPECTION PERIOD

#### CYCLE CLUTCH

1. Latch height: Measure with #3 scribe line on Hooverometer.
2. Cycle shaft collar: The cycle clutch should begin to slip approximately 5° before the check pawl detents. Hand cycle the machine, using a -5 rotate, 0-tilt character.
3. Nylon stop: Adjust for four degrees rotation or overthrow when the cycle shaft is latched home.
4. Shaft end play: .001" - .003".
5. All gears: Minimum play, no binds, screws tight.
6. Print-shaft timing: The keyway should be toward the dowel pin on the carrier.
7. Filter-shaft timing: With an interposer latched down, there should be .005" - .010" between the interposer and the filter shaft.

#### TILT MECHANISM

1. Check the tilt motion: Use T0 and T3.
2. Check the tilt detenting: Use a T3 character and half-cycle the machine. Place a slight pressure on the rear of the tilt ring. Remove the detent, and allow it to return slowly. The ring should move no more than .005".

#### RIBBON FEED MECHANISM

1. A -5 rotate, 1-tilt character should strike the ribbon 1/16" from the bottom in the high lift position.
2. Check for enough tension of the ribbon-feed mechanism-ratchet-brake springs to hold the ribbon ratchets in a rotated position, to overcome positively the action of the centering spring.
3. The ribbon-feed pawl should hold the reversing interposer within .005" - .010" of its total travel with the ribbon-feed cam on its high point and the ribbon mechanism set for a reversing operation. Positive two-tooth feed plus .010" overthrow should result.

### SECOND INSPECTION PERIOD

#### KEYBOARD AREA

1. All key levers operate freely. No binds.
2. All key levers have enough travel to fully latch an interposer and restore positively.
3. With any interposer latched down, the cycle-clutch-release pawl should clear its keeper by .002" - .008" (unlatching adjustment).
4. The cycle-clutch-latch-pawl bite on the keeper must be one-half the thickness of the keeper. Adjust the bail upstop.
5. The cycle-clutch-latch pawl overthrows the keeper by .020" - .025" (under manual operation) when restoring.

### DYNAMIC CHECK

1. a. Move the roller to the top of the compensator.  
b. Repetitively type minus-five selections. The roller should return to the compensated position. If wear has caused the compensator roller to drop almost to the bottom of the slot, half-cycle a -5 character. Tilt the machine up on its back. Raise the nylon wedge manually, and tighten the rotate link until there is 1/16" travel left in the nylon wedge. Tighten the nuts on the rotate link. Note: The compensator nylon wedge must be clean and free of oil. If it does not drop easily, or appears to be oily or dirty, flush the wedge with cleaning fluid and wipe dry.
2. The general condition of all selection and output-motion adjustments can be checked by making a complete strikeup of the keyboard. Type back over it several times, watching for signs of misalignment with the previously typed characters. If alignment is not satisfactory, the need for closer inspection can be met by observing the dynamic detenting action of the typehead.
6. Operational key levers should allow for positive single operation.

Latch Selection. The latch links should allow the latches to overhang the bail flush to .010" overlap.

Manually half-cycle the following selections one at a time, and observe the latches:

- 0-rotate, 1-tilt character
- 5 rotate, 1-tilt character
- + 1 rotate, 0-tilt character
- + 2 rotate, 0-tilt character
- + 3 rotate, 0-tilt character

These characters allow each latch to be checked individually. Observe that the selected latches clear the bail fully, and do not snap off. Observe that the nonselected, or operated, latch seats fully on the bail, does not jump off, and makes the correct selection.

#### IMPRESSION AND ALIGNMENT

1. The rotate and tilt tapes must be free from kinks and nicks.
2. Check for binds or excessive play in the tilt and rotate detents with respect to their guides. Check the tilt ring in relation to its pivots, and the upper ball socket with respect to the tilt-ring spacer.
3. Check for smooth compensator action.  
Static check:
  - a. Half-cycle a -5 selection with the typehead removed.
  - b. Pull the rotate arm out until it is completely removed from the compensator leaf spring.
  - c. Release the rotate arm. This should cause the leaf spring to collapse against the power frame.

#### ROTATE MECHANISM

1. Half-cycle a 0-rotate, 3-tilt character and observe the detenting. Follow the same procedure for a +5 rotate, 3-tilt character, a -3 rotate, 3-tilt character, and a -5 rotate, 3-tilt character.

The variance in bandwidth of these characters should not exceed .030".

Note: Check as follows. Half-cycle the character and remove detent from the head. Take the play out of the head in a clockwise direction. Allow the detent to return slowly, and observe the point the detent strikes or enters the skirt. Bandwidth equals the difference between the best and worst character.

#### DETENTING

1. Print-shaft timing: The detent must enter and leave the head without hitting the skirt. Check by manually half-cycling. Use a -5, home, and a +5 character.
2. The skirt clearance should be .025" - .035" in a 2-tilt position. When both detents are engaged fully in their respective notches, there should be .001" minimum motion of the detent-cam follower with respect to the detent lever.



## THIRD INSPECTION PERIOD

### SELECTION MAGNET UNITS

1. Check the pick times of all magnets by observing (on an oscilloscope) the voltage rise across a 10-ohm, 1/2-watt resistor (part 321271) in series with the individual magnet coils, when a 48-volt pulse is applied to the coil. All pick times must be ten milliseconds or less, with the exception of U.C. shift magnet, red ribbon shift magnet and the keyboard-lock solenoid. The U.C. magnet and red ribbon shift magnet armatures must seal within 12 milliseconds maximum and the keyboard lock solenoid must pick in a maximum of 55 milliseconds. See Figure 13 for wave form of magnet pick time.

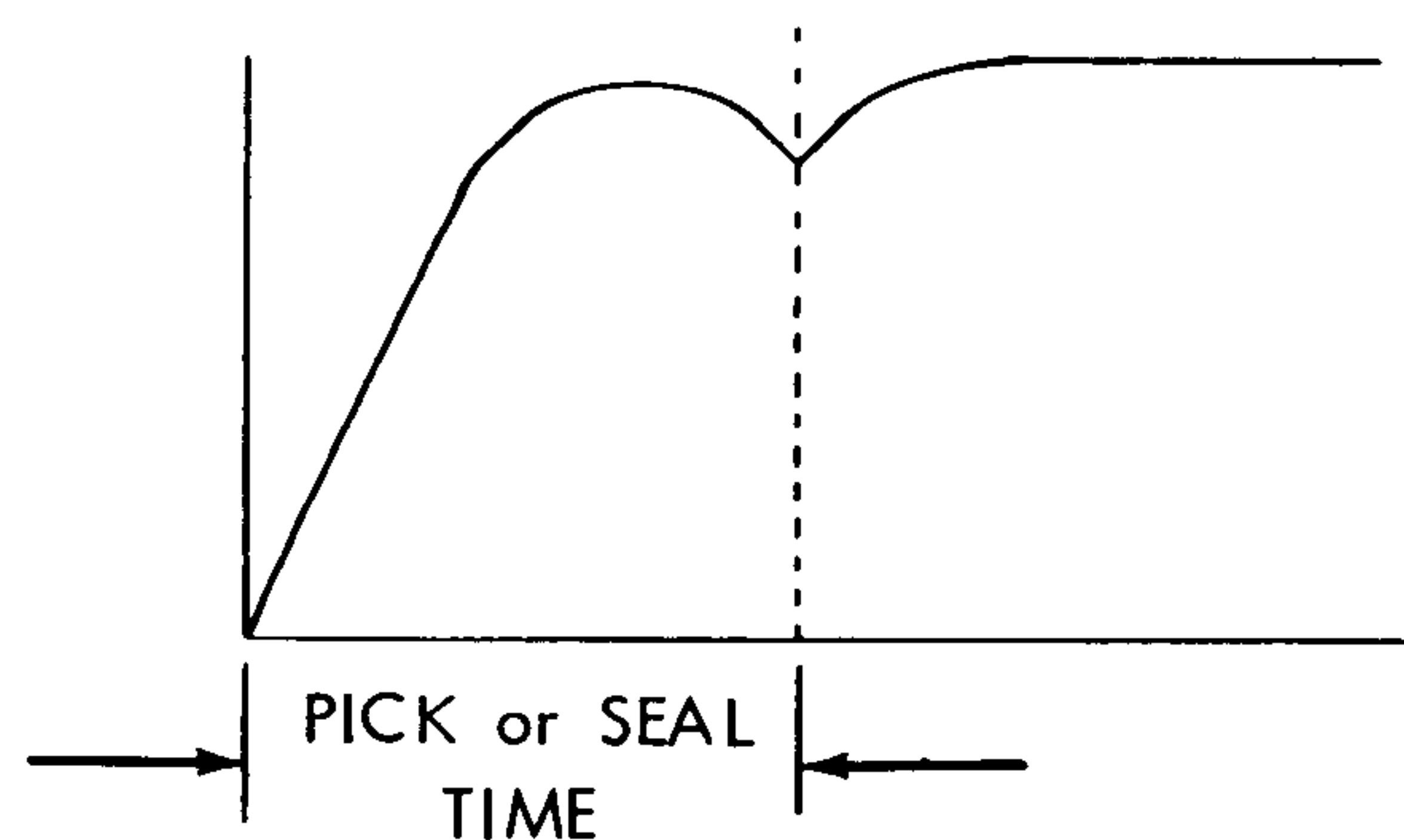


Figure 13. Waveform of Magnet Pick Time

Pick-time readings are the best indicator of magnet performance. High pick times foretell adjustment discrepancies, wear, or sluggishness. They are often evidenced by noticeable machine slowness when repeat operations are performed. Note the following items when high pick times are encountered:

- a. With the armature manually attracted, an armature-to-yoke clearance of .001" - .006" is necessary to prevent an armature from rocking on the yoke. Carefully check the pivot points for wear (pivot plate adjustment).
- b. Except in the case of the operational magnets, the armature stops are to be adjusted for a .004" - .008" armature-to-yoke clearance. This clearance must be maintained to prevent permanent residual effects in the armature.
- c. In no case should an armature rock on the core.

### CYCLE CLUTCH UNLATCHING

1. Positive unlatching of the cycle clutch must occur when each armature is operated by hand, with the latch overthrow .002" - .007" (old style trip mechanism). On the spring-loaded (new style) trip mechanism, overthrow (with an armature operated) should measure .005" - .020" between the trip lever and the latch lever. Check to insure that the K.O. eccentrics do not choke off the armature travel (K.O. eccentrics should clear trip bail extensions by .003" to .008" with armatures manually attracted).
2. Check for .005" - .010" vertical clearance between the selection-armature latching surface and the pushers, and for .001" - .010" horizontal between the tip of the pushers and the armatures.
3. The trip bail pivot eccentrics must allow equal motion to be transmitted from the T2 and R5 armatures to the trip link. The eccentrics must be in the upper sphere of their adjustment to prevent binding.

### OPERATIONAL MAGNET UNITS

1. When an armature is operated, the armature pull-link adjustment should allow for positive interposer tripping with .002" - .010" overthrow clearance between the interposer and the pawl guide plate at the point of unlatching.

### PUSHER UNIT

1. Both latch-pusher cam-follower rollers must contact the cams on the selector cam shaft throughout a cycle.
2. Check the individual pusher-to-latch extension clearances. Clean all operational circuit-breaker contacts, and check for pitting.

## CONTACTS

1. The operational transmitting contact latches should be flush with the end of the contact-strap stop (interposers latched), and should have .005" - .015" clearance between the contact-strap stop and the latch (interposers unlatched).
2. There should be .002" - .010" clearance between the print-feed-back O/S's and the low point of the feedback cams.
3. The tab interlock microswitch should move at least .031" after the switch has transferred when the tab torque bar is moving toward its rest position. The switch must remain transferred during tabulation and must transfer before the backspace cam reaches its high point.
4. The carrier-return-interlock (normally-open) strap should rise a minimum of .010" off its support terminal with the carrier-return-clutch latch latched.
5. Check the timing and air-gap adjustments on all contacts. All transmitting and checking contacts should have:
  - a. .020" air gap except the shift which is .040".
  - b. All circuit-breaker contacts and interlocks should have a .040" air gap.

## CONTACT CLEANING

Caution: Under no condition should contact files, burnishing blades or similar tools be used to clean contacts in this machine.

To clean the contacts, use IBM Contact Cleaner and clean bond paper.

## FOURTH INSPECTION PERIOD

### ESCAPEMENT

1. The carrier should escape smoothly and positively throughout the full length of the writing line and through the right-hand margin under letter escapement, spacebar operation, and tabulation.
2. Check for frayed or loose transport cords.
3. Tension should be maintained on the right-hand transport pulley to maintain its mounting parallel to the power frame. Its outside flanges should be 1-7/32" from the right-hand outside surface of the power frame.
4. The line-gage holder must clear the platen at all points, and not impede carrier motion.
5. A minimum of .010" clearance should exist between the carrier-return shoe and the spring-clutch. Note, however, that excessive clearance can result in erratic carrier-return motion.
6. Check for 1/2-3/4 pounds of mainspring tension measured at the carrier as it escapes through the linelock load at the extreme right-hand margin.
7. Check for .002" - .004" backlash of the tab governor and carrier-return pinion gears with the escapement gear.
8. Letter escapement should occur as soon after print as possible.
9. The trigger guide should disengage the trigger from the escapement-torque-bar arm when the escapement pawl has cleared the rack by .010" - .015". Both the letter-escapement and the spacebar operation should allow .005" - .010" excess motion after the trigger has disengaged the trigger from the torque-bar arm.
10. When operated, the tab lever should overthrow the tab-lever latch by .005" - .010" without being choked off by the tab torque-bar lockout lug or backup eccentric, and without overthrowing into the tab rack. Observe the operation at both ends and the middle of the torque bar. Dynamically check for tab failures using five irregularly set tab stops for at least five columns.
11. Check to make sure that the carrier-return operation unlatches the tab when both operations occur simultaneously.
12. With the backspace operated manually, the escapement pawl should just fail to get a new tooth on the escapement rack.
13. There should be a clearance of .005" - .015" between the front of the backspace pawl and a tooth of the backspace rack (with the carrier at rest).
14. Overthrow clearance of .010" - .020" is required between the interposer pawls and the operational-latch bracket when the operational cams are on their high point.



#### MOTOR DRIVE AND CARRIER RETURN

1. Check for adequate tension of the motor-pulley belt, or for a frayed or noisy belt.
2. The selector and operational cam shafts, and the print and filter shafts, must have .002" end play.
3. There must be freedom from binds in the idler gear train with minimum backlash.
4. With the carrier-return cam on its high point, the carrier-return arm should overthrow its keeper by .020" - .030".
5. The carrier-return brake shoe should cause the carrier-return spring clutch to drive the carrier no later than when the escapement pawl clears the last one-third of the escapement rack tooth. The clutch shoe should overlap the last three coils of the spring clutch.
6. The carrier-return unlatching link must positively unlatch the carrier-return latch at the left-hand margin with .005" - .010" over-travel when the margin-rack overbank is set.
7. The escapement pawl must not drag the escapement rack during carrier-return operations.
8. Measure one-half to one pound tension of the shock unloader at the left-hand margin while unlatching the carrier-return keeper-latch arm.

#### INDEXING AND PAPER FEED

1. Check for .015" - .030" clearance between the platen ratchet and the index pawl, at rest.
2. Index operation should result in one full-tooth motion of the index pawl with respect to the platen ratchet (in single-linespace position) and two full-teeth motion with no evidence of hesitation or drag (in the double-linespace position).

#### SHIFT

Check the cam and spring for rust. Check for the positive release of the ratchet when the key lever is two thirds down. Turn power on, and hold the shift ratchet (grey section). Release the ratchet by pressing the key. Allow the ratchet to rotate slowly while holding down on the key. The shift cam should stop at a fully detented position for each 180° operation. The white nylon roller should seat fully in cam notch.



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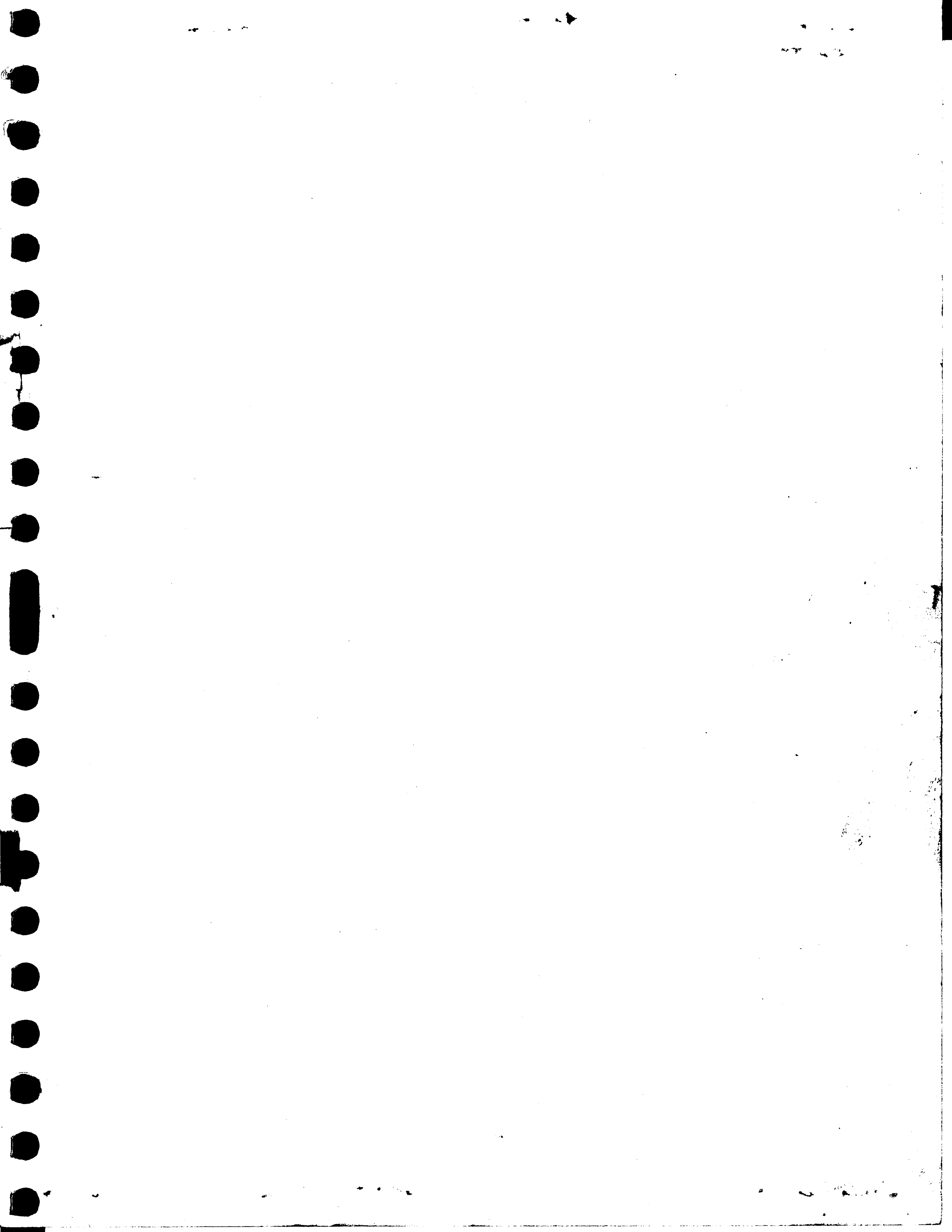
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