

SOTUS—SEQUENTIAL SELECTOR AND SELECTOR PANEL REQUIREMENTS AND PROCEDURES

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1. GENERAL

1.01 This section describes the requirements and procedures for the BS2D, BS3C, BS6L Sequential Selectors (SOTUS) and BSP2 Selector Panel (Base). ↗

1.02 This section is reissued to:

- (1) Add the requirements and procedures for the BS2D Sequential Selector.
- (2) Incorporate the Addendum, Issue 2.
- (3) Revise the requirements for various adjustments.

The changes are indicated by marginal arrows.

1.03 Requirements which are unique to a particular selector are indicated in the TABLE OF CONTENTS and in the text of the section adjacent to the requirement or main paragraph heading. Principally, the three selectors differ as follows:

<u>Feature</u>	<u>For</u>
Mechanical Timer	BS3C and BC6L
H-Answerback	BS6L only

The BS2D does not have these features. ↘

1.04 The units may be operated at 60 or 75 speed.

1.05 To facilitate several adjustments in Part 3, SEQUENTIAL SELECTOR, the Blocking and Latching-Lever Assembly is removed and restored at two places. These operations are indicated by notes in the text. On pages where the notes do not appear, the following table identifies the position of the Blocking and Latching-Lever Assembly.

Blocking and Latching-Lever Assembly Position

	Paragraph
ON	3.01 to 3.02
OFF	3.03 to 3.25
ON	3.26 to 3.32
OFF	3.33 to 3.50
ON	3.51 to 3.53

2. SELECTOR MECHANISM

2.01 See BSP P32.001.

3. SEQUENTIAL SELECTOR

3.01 **Main Shaft:** The selector cams on the selector-cam assembly should line up with their respective selector levers.

- (a) Gauge by eye while rotating the main shaft.
- (b) To adjust: Loosen the mounting screw in the gear-hub and the mounting screw in the ratchet-hub assembly if necessary and reposition the main shaft. Tighten the screws.

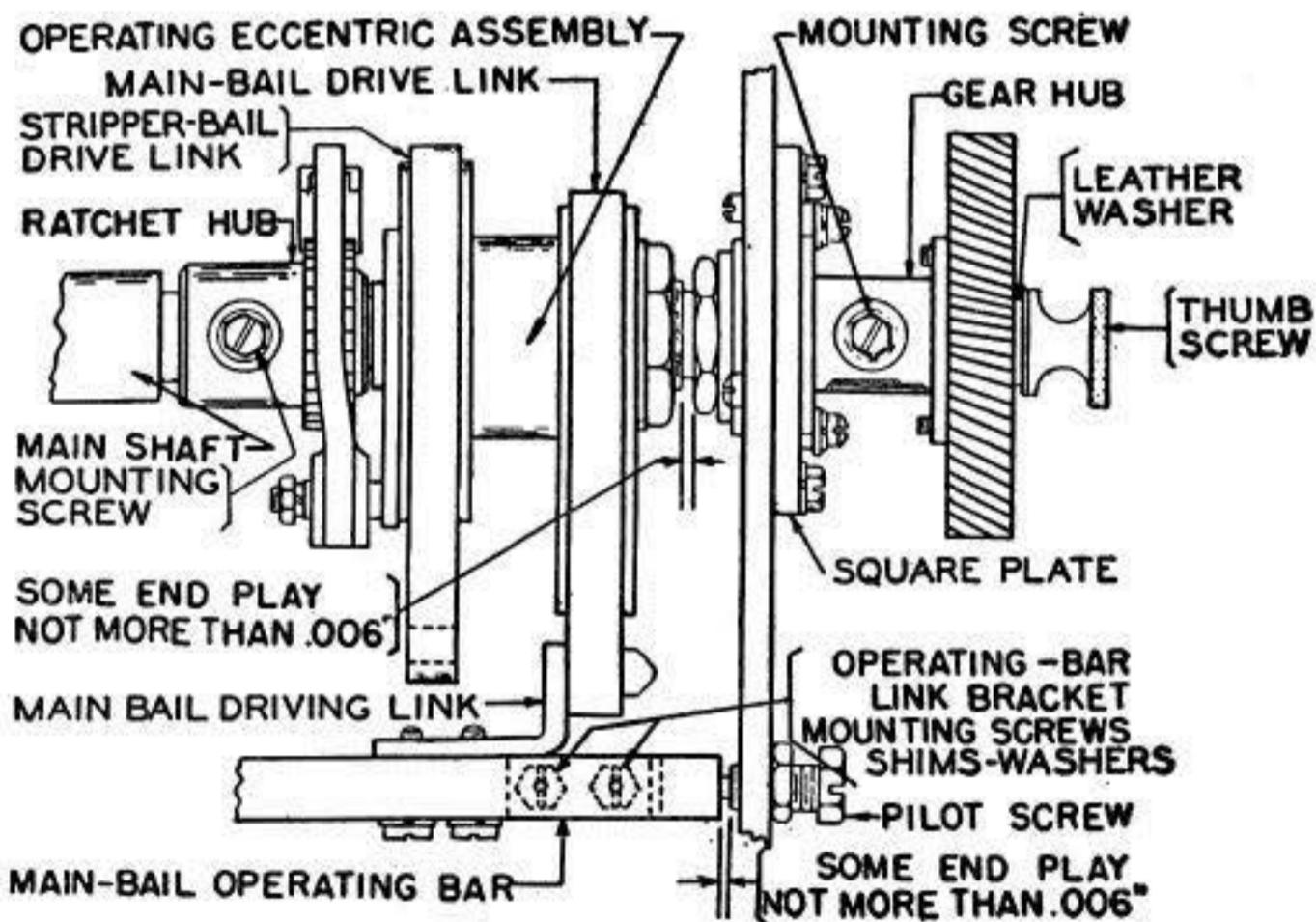


Fig. 1

3.02 **Selector-Vanes** should have some endplay, not more than .010". **Fig 2**

(a) To adjust: Loosen the vane-guide-bracket mounting screws and position the guide-bracket by means of its elongated mounting holes. Tighten the screws.

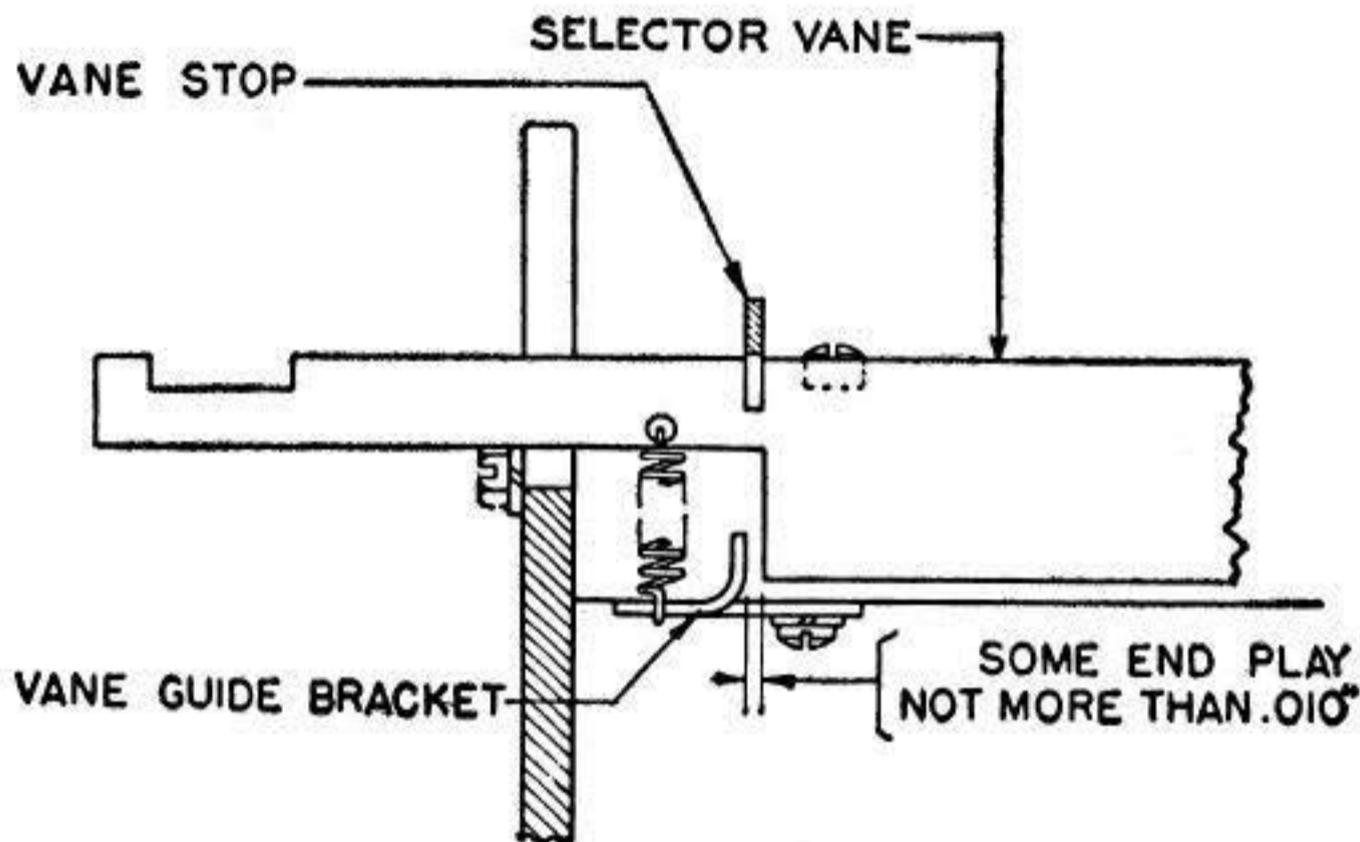


Fig 2

Note: Remove the Blocking and Latching-Lever Assembly

3.03 **Mainbail Height:** There should be a clearance of Min .055", Max .065", between the No. 5 vane and the associated projection of the right- and left-vane locklevers at their closest point. **Fig 3**

(a) To gauge: Rotate the main shaft to its STOP position.
 (b) To adjust: Raise or lower the mainbail by means of the two eccentric shoulder screws which connect the links to the bail. The low part of the eccentric, which is indicated by a mark on the screwhead, should be positioned to the front of the unit.

Note: On some old-style units which are not equipped with the eccentric shoulder screws, add or remove shims between the mainbail operating-bar and the operating-bar-link brackets.

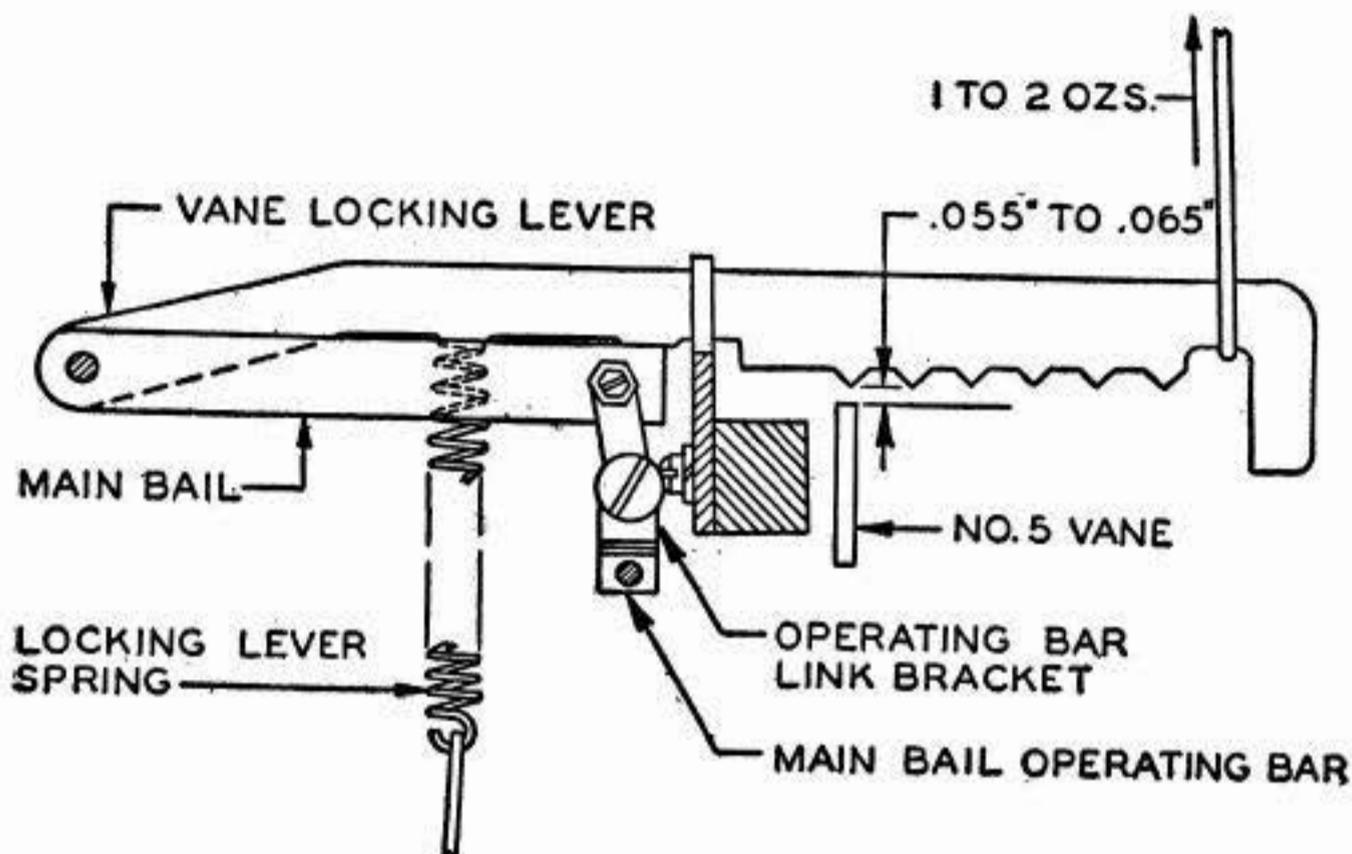


Fig 3

3.04 **Left-Vane-Stop Position:** With the Nos. 1, 2 and 5 vanes in the SPACING position, they should be approximately in the center of the blocking extensions on the FIGS code-lever.

Fig 4

Note: Before making the following adjustments check the codebars to make certain they fit snugly on the function levers. If any are found to be loose, the slot of the codelevers should be pressed together until a tight fit is obtained.

- (a) To gauge: Place the vanes in the SPACING position and rotate the main shaft until the function levers are in the down position.
- (b) To adjust: Loosen the left-vane-stop mounting screws and reposition the stop by means of its enlarged mounting holes.

If the right vane-stop interferes with the vanes in making this adjustment, loosen the right-vane-stop mounting screws and move the stop. If the vane-operating pushbar bracket is so positioned that the pushbars prevent the vanes from traveling the required distance, loosen the vane-operating pushbar-bracket mounting screws and move the bracket.

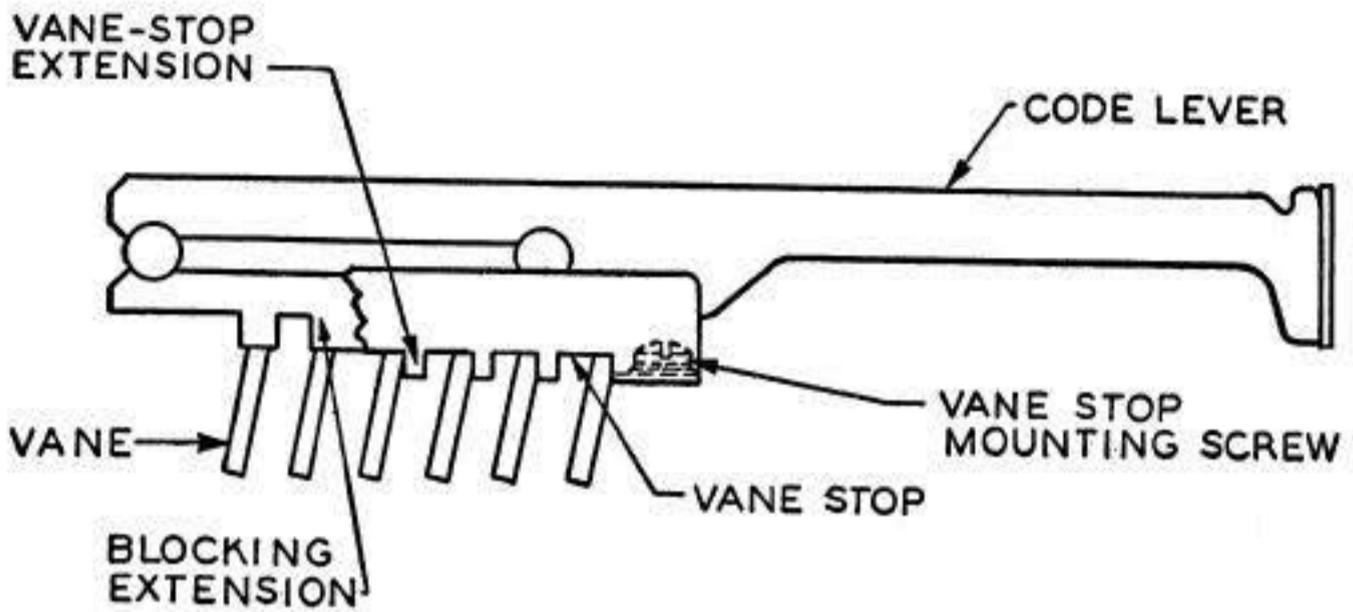


Fig 4

3.05 **Right-Vane-Stop** extensions should touch at least one of the vanes.

- (a) To gauge: Place the vanes in the SPACING position and note that they are resting against at least one of the extensions of the left-vane-stop.
- (b) To adjust: Loosen the right-vane-stop mounting screws and position the stop by means of its enlarged mounting holes. Tighten the screws.

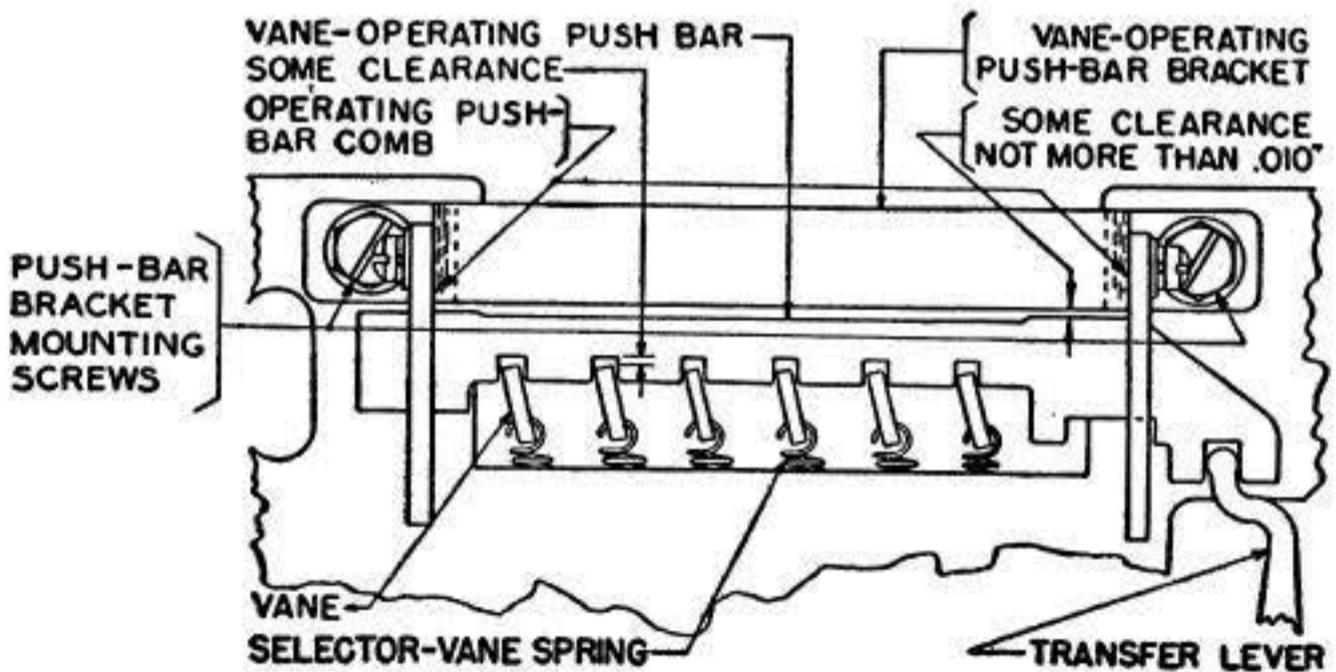


Fig 5

3.06 **Selector-Vane-Operating Pushbar Bracket:** The vanes should have full travel between their stops and there should be some clearance between the top of the vanes and the top of the slots in the vane-operating pushbars. **Fig 5**

(a) Gauge by eye.

(b) To adjust: Loosen the selector-vane-operating pushbar-bracket mounting screws and position the bracket by means of its elongated mounting holes. Tighten the screws.

3.07 **Front- and Rear-Selector-Vane-Operating Pushbar Combs:** The selector-vane-operating pushbars should operate without bind, be in alignment with their selector-transfer levers and there should be some clearance, not more than .010", between the bottom of the selector-vane-operating pushbar bracket and the top surface of the selector-vane-operating pushbars. Check both front and rear. **Fig 5**

(a) To gauge: Rotate the main shaft to its stop position with the vanes in the marking (rearmost) position.

(b) To adjust: Loosen the front- and rear-selector-vane-operating pushbar combs. Position the front comb by means of its elongated mounting holes so that the pushbars are in line with the transfer levers and the edges of the comb teeth are parallel to the pushbars. Tighten the screws on the front comb. Reposition the rear comb by means of its elongated mounting holes so as to eliminate any bind between the pushbars and the combs. Tighten the rear-comb mounting screws.

3.08 **Selector-Vane Spring:** It should require Min 1/4 oz, Max 1 oz to start the operating pushbar moving. **Fig 5**

(a) To gauge: Hold the swords manually away from the transfer levers and place all selector-vanes in a forward position. Place the push end of an 8-oz scale against each operating pushbar and push horizontally.

3.09 **Operating-Eccentric Assembly** on the main shaft should have some endplay, not more than .006". **Fig 1**

(a) To adjust: Loosen the ratchet-hub mounting screw and reposition the ratchet hub by means of its elongated mounting hole being careful to eliminate any bind between the drive-links and their associated driving-links. Tighten the screw.

3.10 **Mainbail Operating-Bar:** There should be some endplay, ← not more than .006" and there should be no bind between the mainbail drive-link and its associated driving-link. **Fig 1**

(a) Adjust by means of the pilot screws.

3.11 Mainbail-Reinforcing Plate: The horizontal leg of the mainbail-reinforcing plate should contact the lower edge of the mainbail across its entire length. **Fig 6**

(a) To adjust: Position the plate by means of its enlarged mounting holes.

Note: This adjustment is made at the factory before the mainbail is assembled in the unit and should not be made unless the mainbail reinforcing plate has been removed.

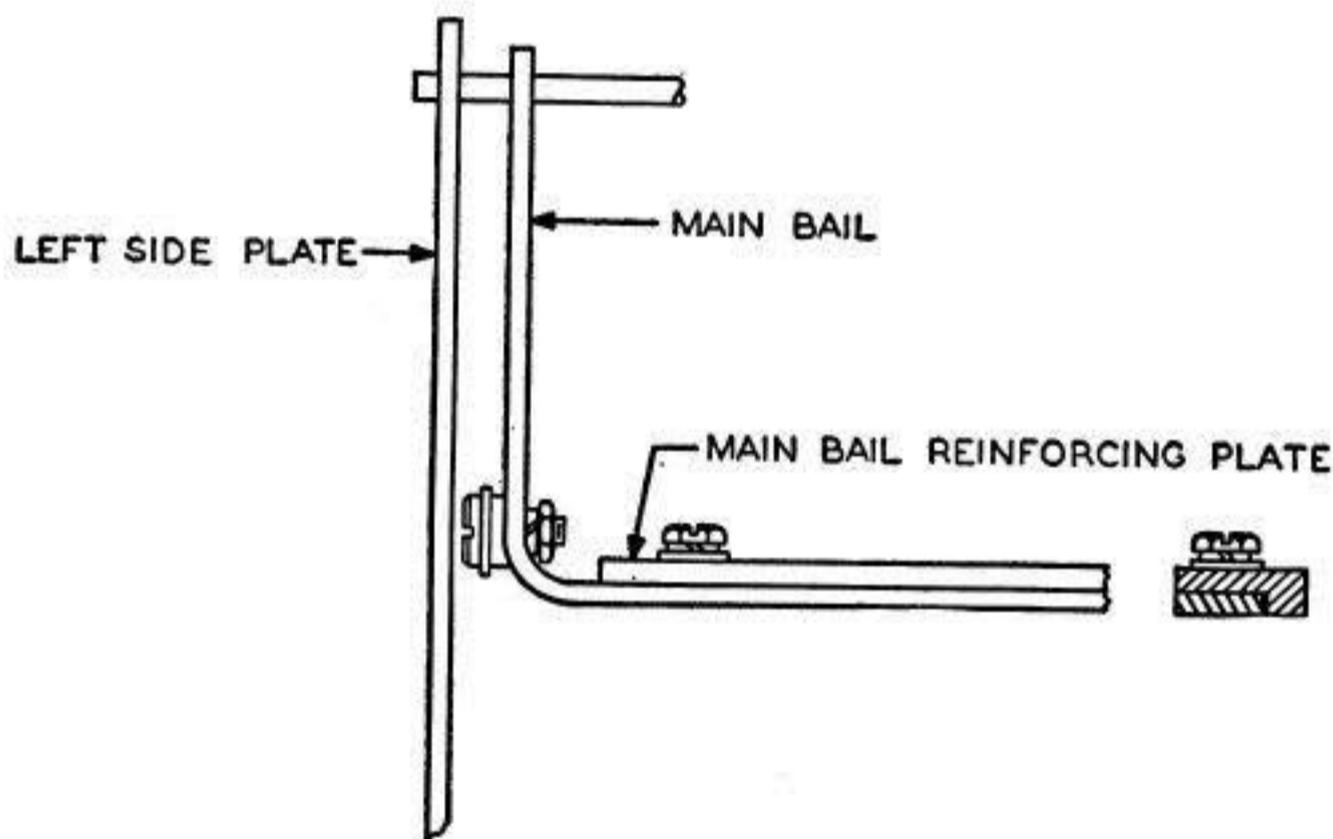


Fig 6

3.12 Stripper-Bail Operating-Bar: The stripper-bail operating-bar (located directly below vane No. 2) should have some endplay, not more than .006". **Fig 7**

(a) Adjust by means of the pilot screws.

Note: Make certain there are no binds between the drive-links and their associated link-brackets.

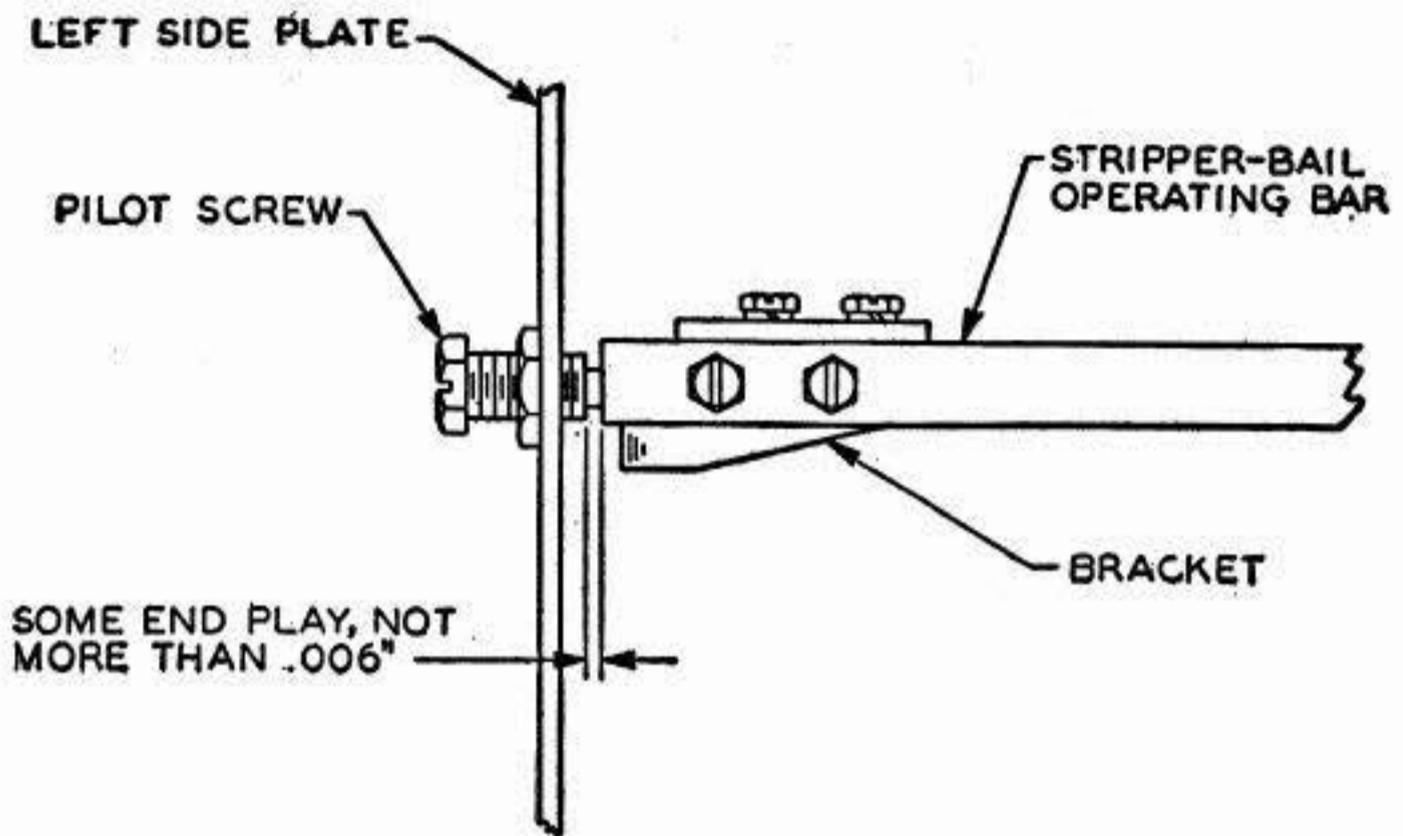


Fig 7

3.13 Stripper-Bail Assembly:

- (a) The stripper-bail assembly should be centered on its pilot screws with some endplay, not to exceed .010". The left- and right-links should be free from bind.
- (b) With the stripper bail in its rearmost position and the play taken up to the right to reduce the clearance to a minimum, there should be at least .010" clearance between the left-hand pullbar and the end of the stripper-bail left-hand reset-screw post.

Fig 8

(1) Adjust by means of the pilot screws.

Note: The latch-bail backstop, mounted on the latch-bail shaft, should be located midway between function-lever extensions 17 and 18. The backstop should be temporarily rotated out of the way so as not to interfere with the adjustment of the stripper bail. (For backstop adjustment, see 3.35)

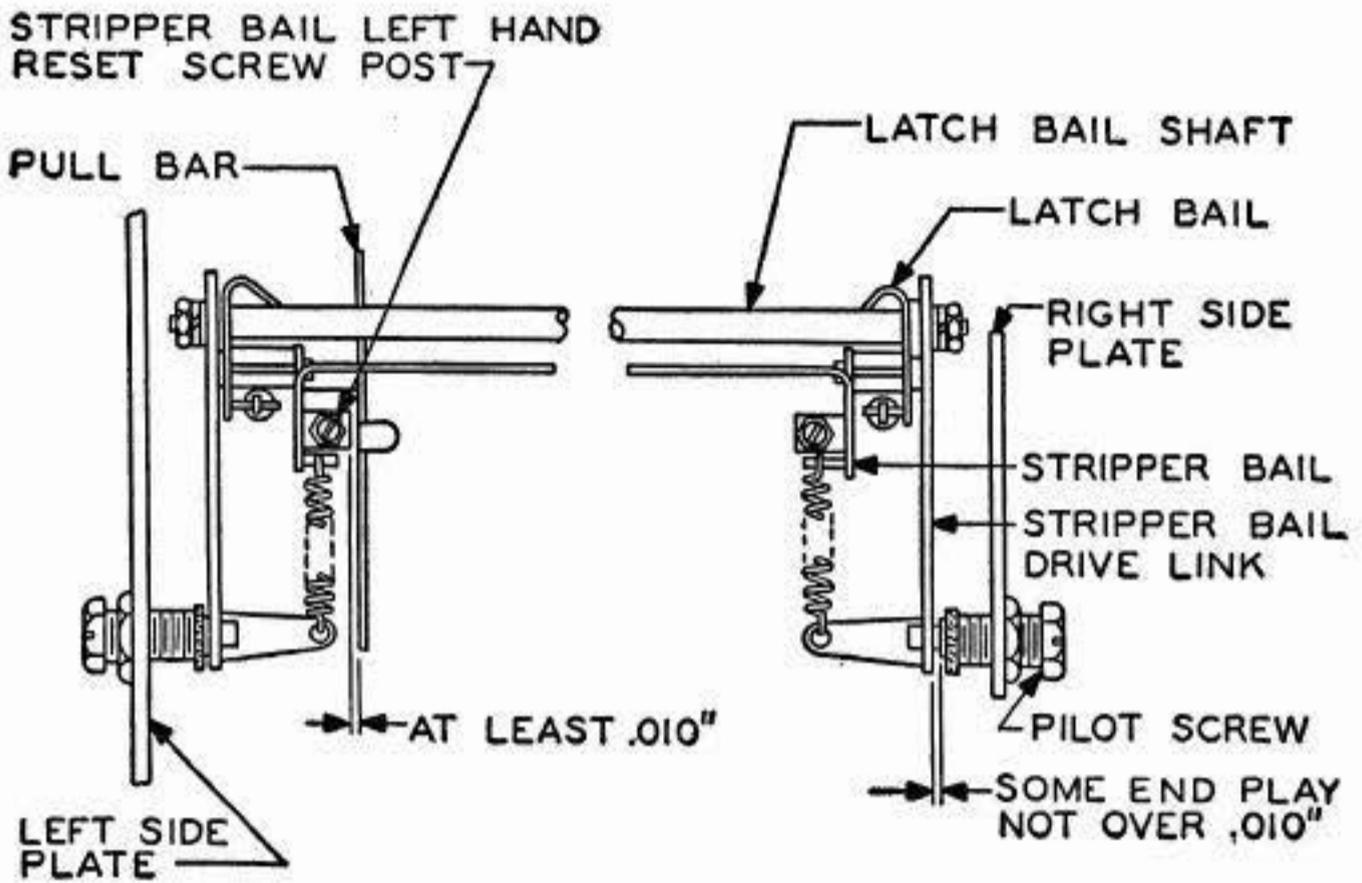


Fig 8

3.14 **Latch-Bail Shaft:** There should be Min .050", Max .055" clearance between the right-hand Y function-lever extension U and the latch bail. Also, this clearance should exist between the function-lever extension U in position 2 and the latch bail when the H and Y codelevers are interchanged.

Fig 9

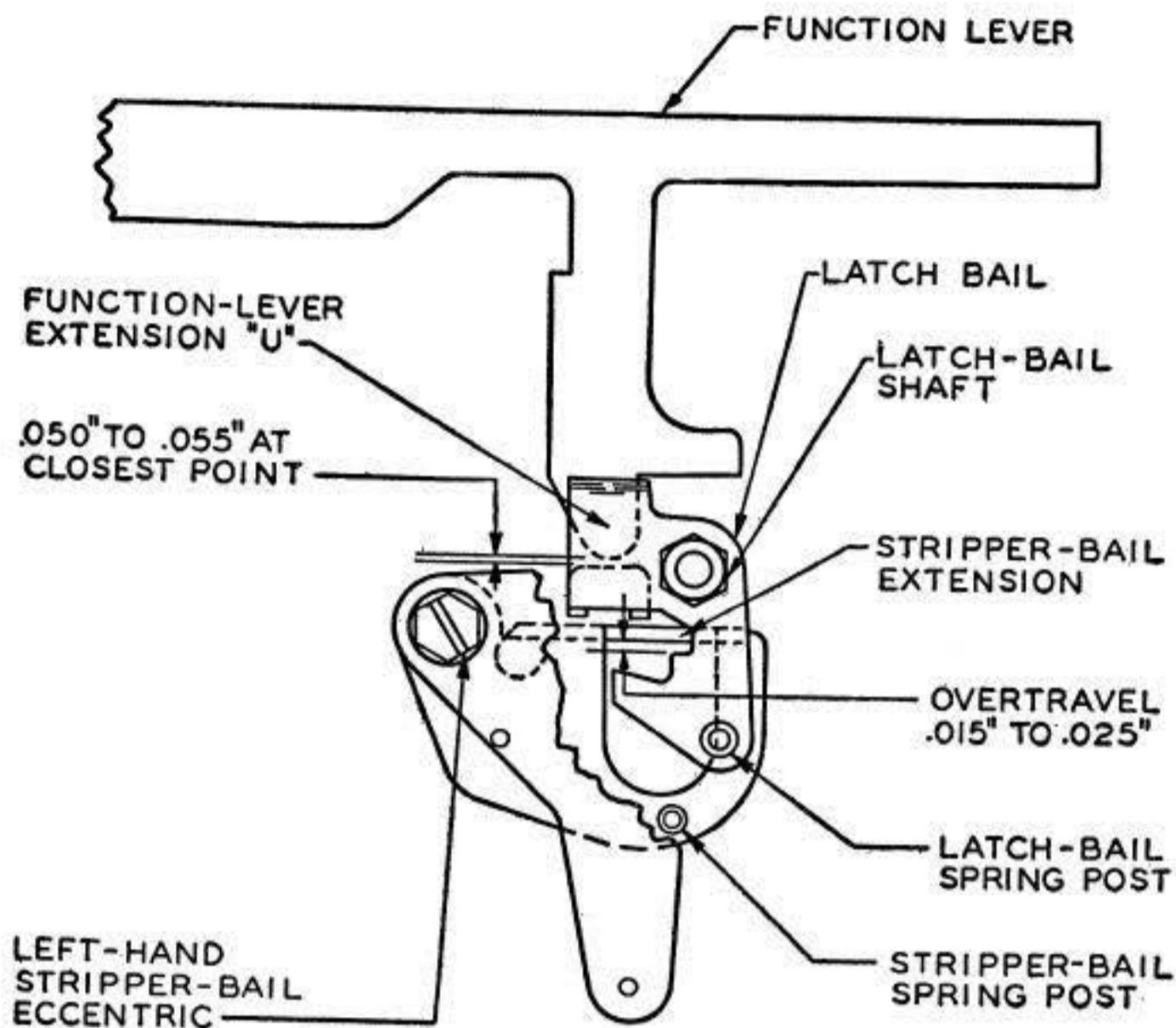


Fig 9

(a) To gauge:

(1) With the FIGS combination selected, the sixth vane in the activated (rear) position, all pullbars in their unlatched (down) position, and the stripper-bail latch in the upper notch of the latch bail, rotate the main shaft until the extension U of the Y function lever is at its closest point to the latch bail.

(b) To adjust:

- (1) Rotate the large-headed eccentric shoulder screws located on the stripper-bail assembly until the indicating mark on each screw is downward (link in its lowest position).
- (2) When necessary, back off the stripper-bail reset-adjusting screws to a position where they will not interfere with the adjustments.
- (3) Remove the stripper-bail springs.
- (4) Loosen the right-hand nut on the latch-bail shaft friction-tight and raise or lower the shaft in its elongated mounting hole by tapping it lightly to meet the requirement for the Y function-lever extension U. Tighten the nut.
- (5) Interchange the H and Y codelevers.
- (6) Loosen the left-hand nut on the latch-bail shaft and position the shaft to meet the requirement for the (H) function-lever extension U. Tighten the nut.
- (7) When one stripper-bail extension is resting on its upper-latch notch, the other extension should also be resting on its upper notch or clear the notch by not more than .015".
- (8) Recheck the Min .050", Max .055" clearance requirement.
- (9) Reinstall the stripper-bail springs and restore the H and Y codelevers to their proper locations.

3.15 Latch-Bail Spring: It should require Min 1 oz, Max 2 oz, to start the latch bail moving. **Fig 10**

(a) To gauge:

- (1) Rotate the main shaft until the stripper bail is in its forward position and latched.
- (2) Hook the scale over the right-hand latch-bail spring post and pull in line with the spring while holding the stripper bail up slightly so as to clear the latch bail.
- (3) Check the left-hand latch-bail spring in the same manner.

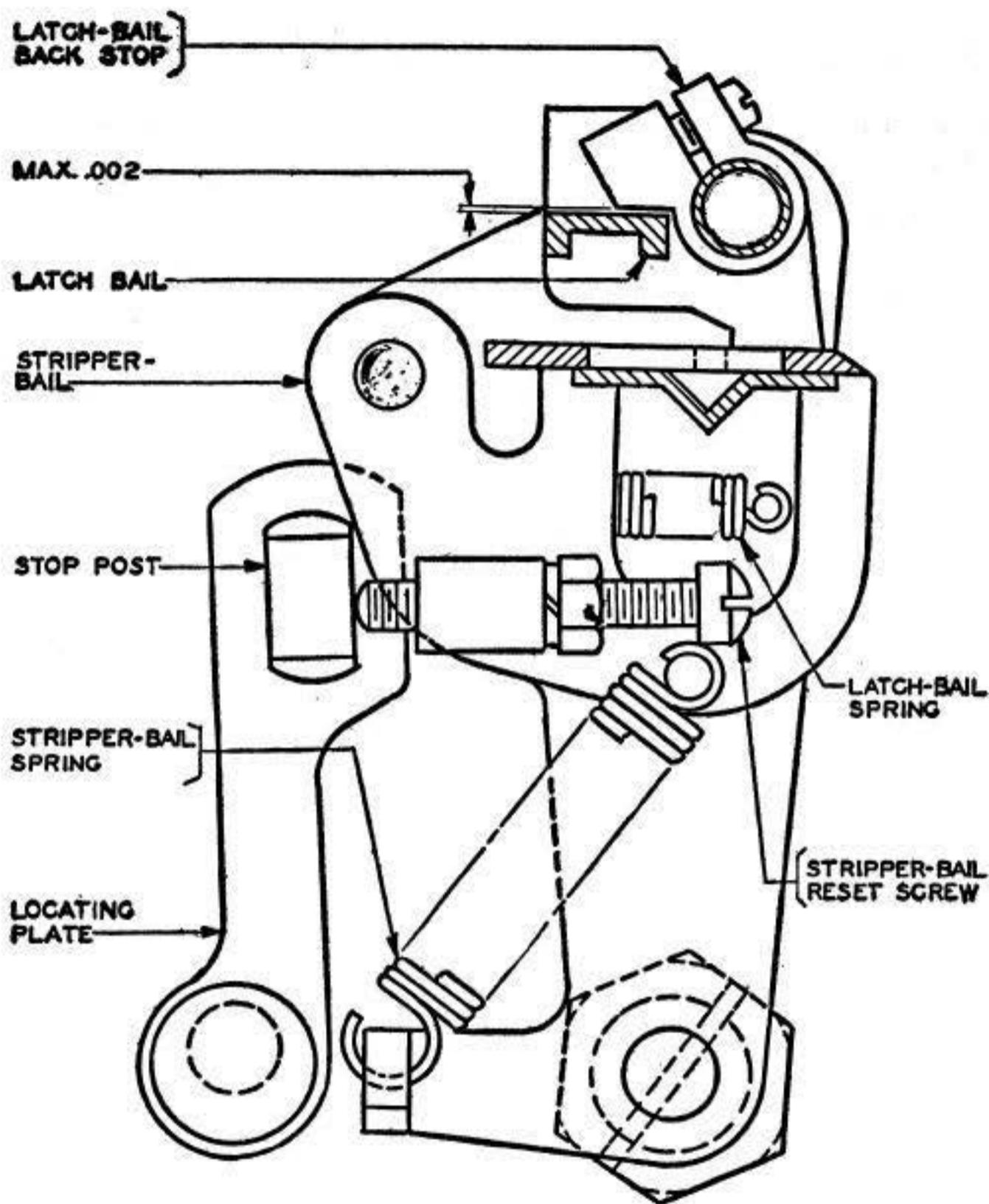


Fig 10

3.16 **Stripper-Bail Spring:** It should require Min 5 oz, Max 7 oz, to pull each spring to position length. **Fig 10**

(a) To gauge:

- (1) Rotate the main shaft until the stripper bail is in its forward position and latched.
- (2) Unhook the right-hand stripper-bail spring from the stripper-bail spring post.
- (3) Check that the stripper bail is latched.
- (4) Hook the scale through the spring-eye and pull to position length.
- (5) Replace the right-hand spring.
- (6) Check the left-hand stripper-bail spring in the same manner.

3.17 **Pullbar Comb:** The pullbar comb should be so located that there is no bind between the pullbars and the comb. **Fig 11**

- (a) Gauge by eye and feel.
- (b) To adjust: Loosen to friction-tight the three screws which mount the comb, and position the comb.
- (c) Tighten the mounting screws and replace the function levers.

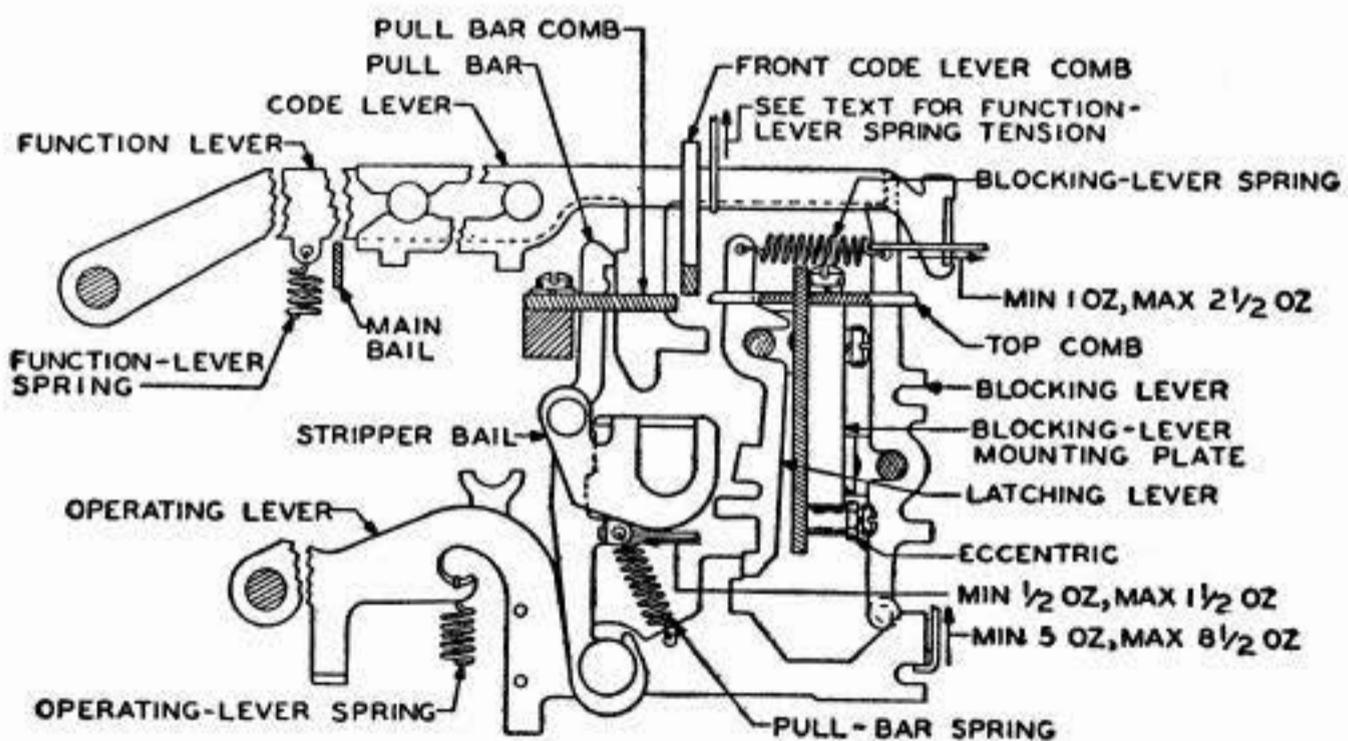


Fig 11

3.18 **Pullbar Spring:** It should require Min 1/2 oz, Max 1-1/2 oz, to start each pullbar moving. **Fig 11**

(a) To gauge:

(1) Rotate the main shaft until the function levers are in their extreme upper position and manually unlatch all pullbars.

(2) Apply the push end of an 8-oz scale to each pullbar at the spring lug and push horizontally against the spring lug.

3.19 **Blocking and Latching-Lever Spring:** It should require Min 1 oz, Max 2-1/2 oz, to start the blocking lever moving. **Fig 11**

(a) To gauge: Hook the scale over the blocking lever just above the upper comb and pull parallel to the spring. Where bridge assemblies and blocking-lever wedges are used, they should be removed before gauging the spring tension. When replacing these bridges and wedges, check to see that the levers move freely in their combs.

3.20 **Blocking and Latching-Lever Shafts:** With both the lower and upper combs secured in their positions, the blocking-lever shaft and the latching-lever shaft should be parallel to each other within .010". **Fig 12**

(a) To gauge the blocking-lever shaft, use a .281" gauge ← between the shaft and the lower comb at the right end, left end and middle of the shaft.

(b) To gauge the latching-lever shaft, place the .156" gauge between the shaft and the upper comb at the right end, left end and middle of the shaft.

(c) To adjust either shaft, remove the eight springs from those blocking levers located directly in front of the shaft-bracket mounting screws, remove the levers and loosen the shaft-bracket mounting screws.

(1) Place the proper gauge as required in (a) or (b) above, and adjust the end and two middle shaft-brackets so that the shaft rests on the gauge. Tighten all bracket mounting screws and replace the eight blocking levers and springs.

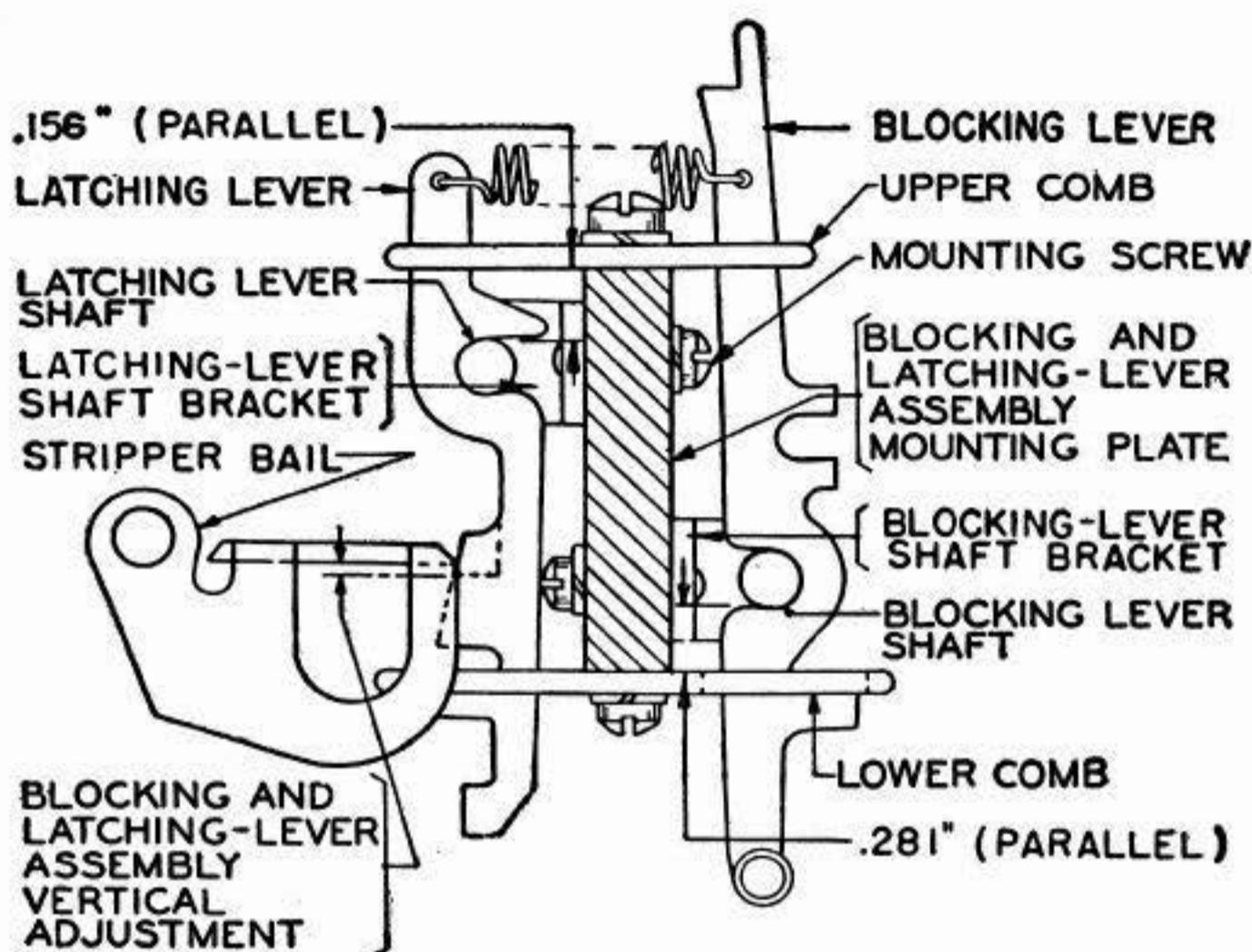


Fig 12

3.21 **Multiple Blocking-Bail Spring:** (BS6L). It should require Min 2 oz, Max 4 oz, to just start the bail moving. **Fig 13**

(a) To gauge:

- (1) Rotate the main shaft until the bail is in its blocking position.
- (2) Hook an 8-oz scale over the extreme upper end of the bail and pull horizontally at right angles to the bail.

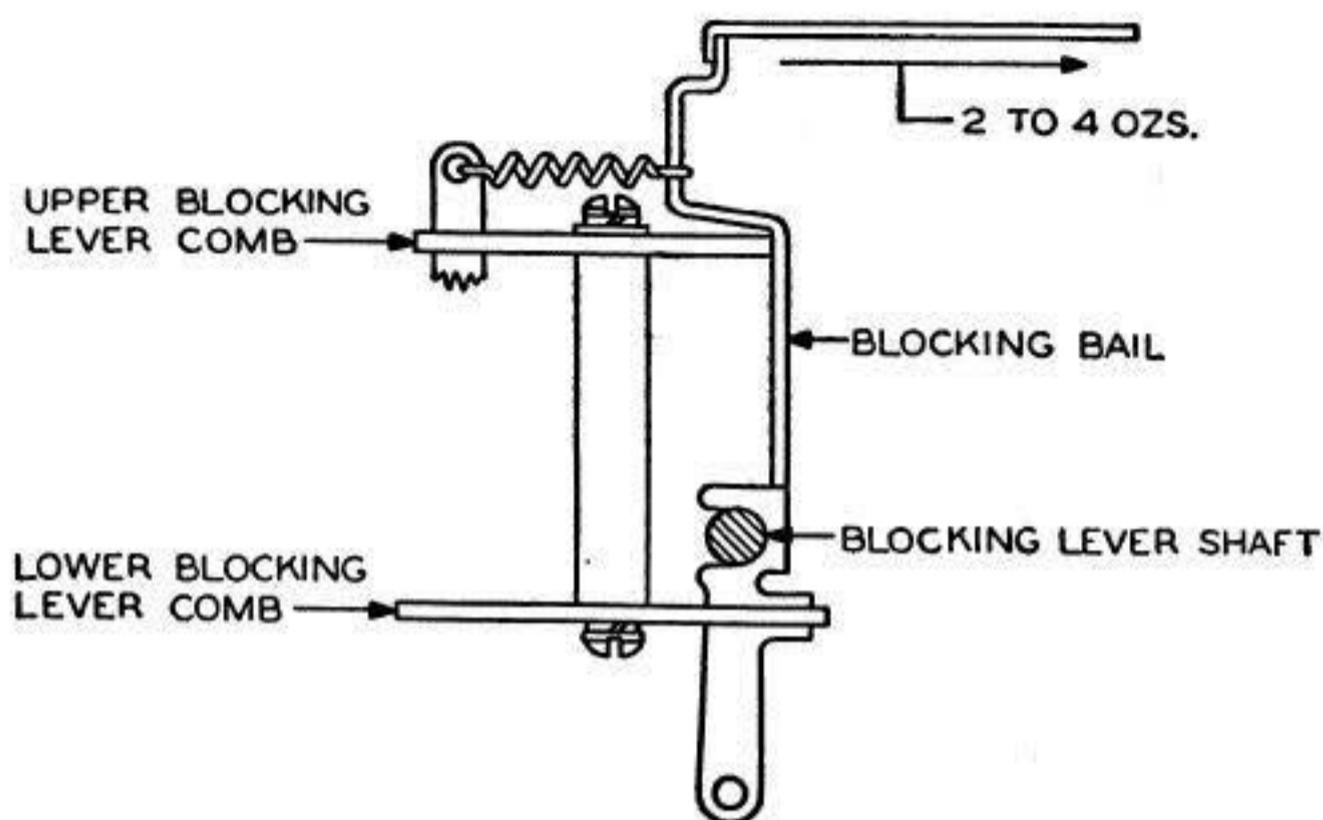


Fig 13

3.22 **Latching-Lever Springs in Positions 8-9-10:** (BS6L). It should require Min 1 oz, Max 2 oz, to start each of these levers moving. **Fig 14**

(a) To gauge: Hook an 8-oz scale over each of the latch levers in positions 8-9-10 at the spring eye and pull horizontally and in line with the spring.

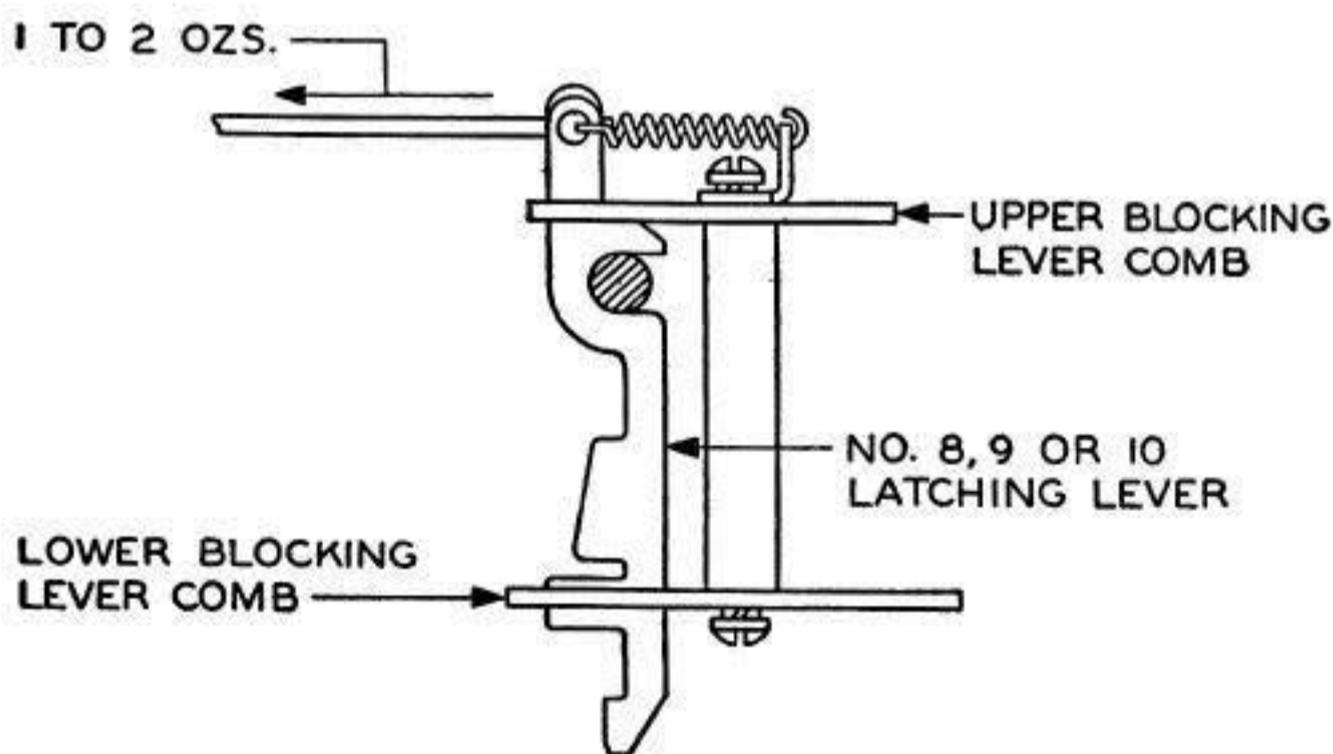


Fig 14

3.23 R-Y Test Mechanism Alignment:

(a) The R trip-off lever should engage the R-Y latch approximately in the center (vertically) of the operating surface of the latch as gauged by eye. **Fig 15**

(1) To adjust: With the R-Y operating lever in the ON position (down; white indicator showing) adjust the R-Y bracket by means of its mounting screws.

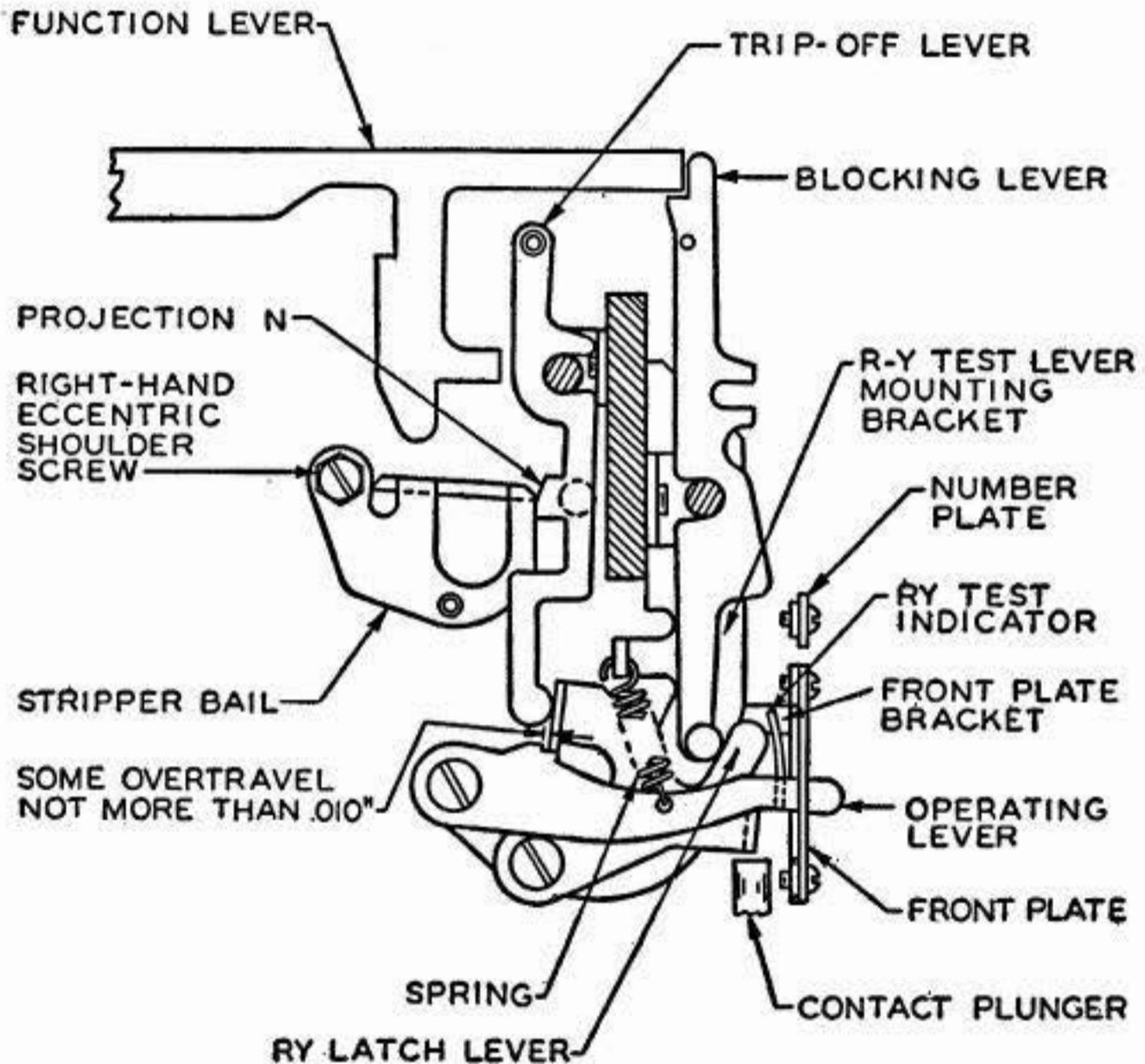


Fig 15

(b) There should be some clearance between the R trip-off lever and the R-Y operating lever when the R-Y latch is in the OFF position (down; green indicator showing). See Fig. 15 for location of parts.

- (1) Gauge by eye.
 - (2) To adjust: With the R-Y latch in the OFF position, refine the position of the R-Y bracket by means of its mounting screws, making sure that requirement (a) is still met.
- (c) The top edge of the designation plate should be parallel with the blocking and latching-lever number plate.

Fig 16

- (1) Gauge by eye.
- (2) To adjust: Shift the R-Y test-designation plate by means of its mounting screws. It may be necessary to reposition the R-Y bracket by means of its mounting screws. If this adjustment is made, recheck (a) and (b).

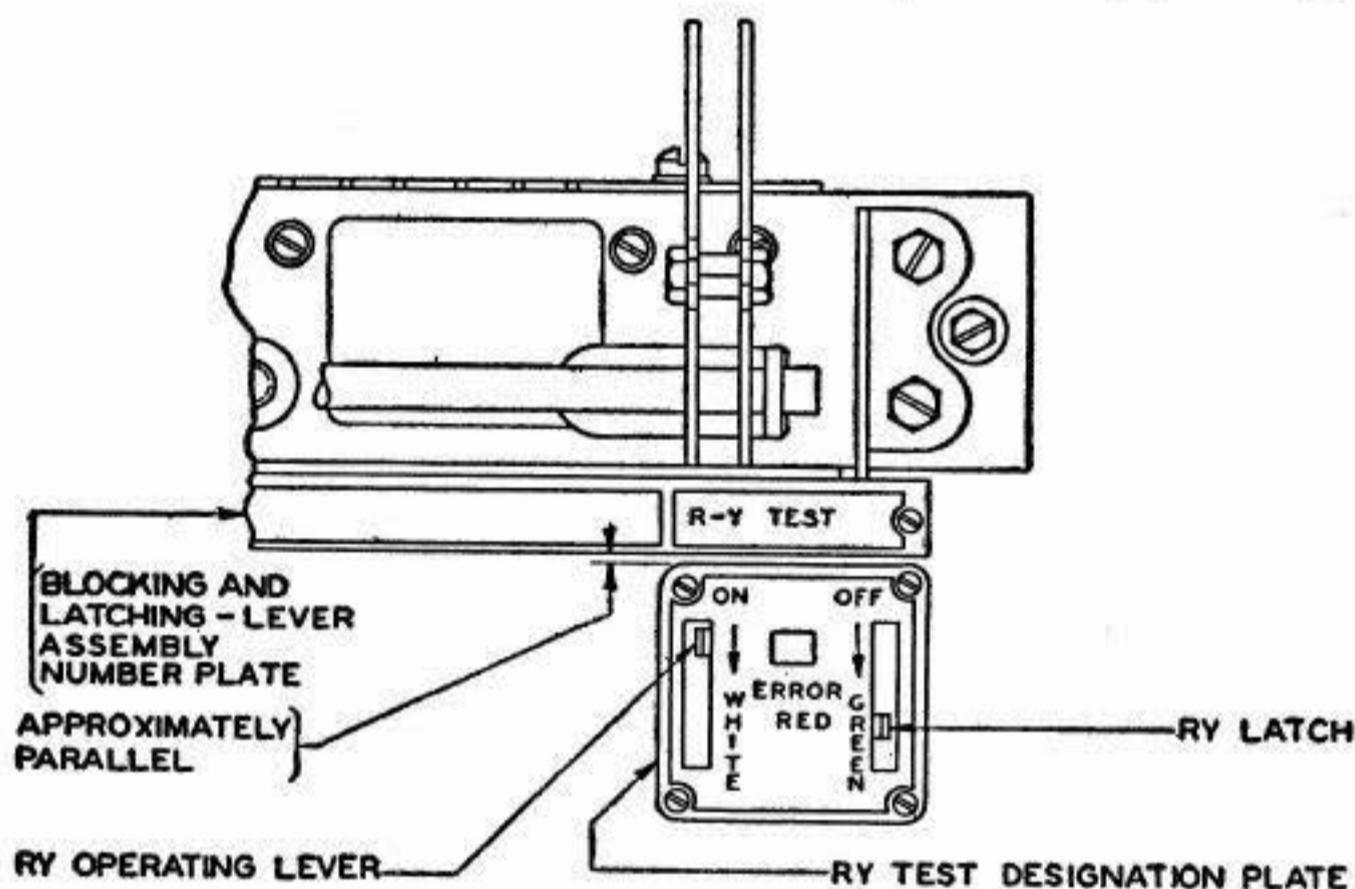


Fig 16

- (d) The R-Y operating lever and R-Y latch should move freely in their slots.

3.24 Blocking and Latching-Lever Assembly Lower Comb (Preliminary Adjustment): The blocking and latching levers should move freely in their combs without bind.

- (a) To adjust: Loosen the lower-comb mounting screws friction-tight. Position the comb to the right or left.

3.25 Front (Code Lever) Function-Lever Comb: The side of the function-lever comb with the greater dimension from the upper corner of the slanted surface to the first slot

should be on the right-hand side. The comb should be positioned so as to prevent any bind on the code and function levers when they are lifted from their slots. **Fig 17**

(a) Gauge by eye and feel.

(b) To adjust: Position the comb by means of its mounting screws.

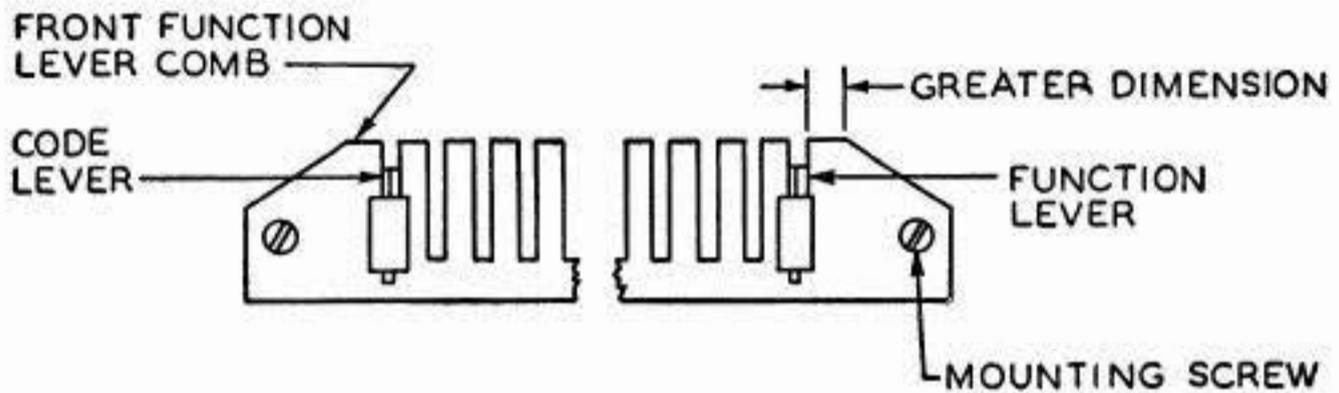


Fig 17

Note: Remount the Blocking and Latching-Lever Assembly.

3.26 Mounting Procedure for Blocking and Latching-Lever Assembly:

Position the eccentrics located on the mounting-brackets for the blocking and latching-lever assembly mounting-plate, so that the high part of each eccentric is toward the left of the unit. Loosen the lock-nut of the horizontal positioning screw, located on the left-side frame and back off the screw sufficiently so as not to interfere with the mounting of the blocking and latching-lever mounting-plate. **Fig 18**

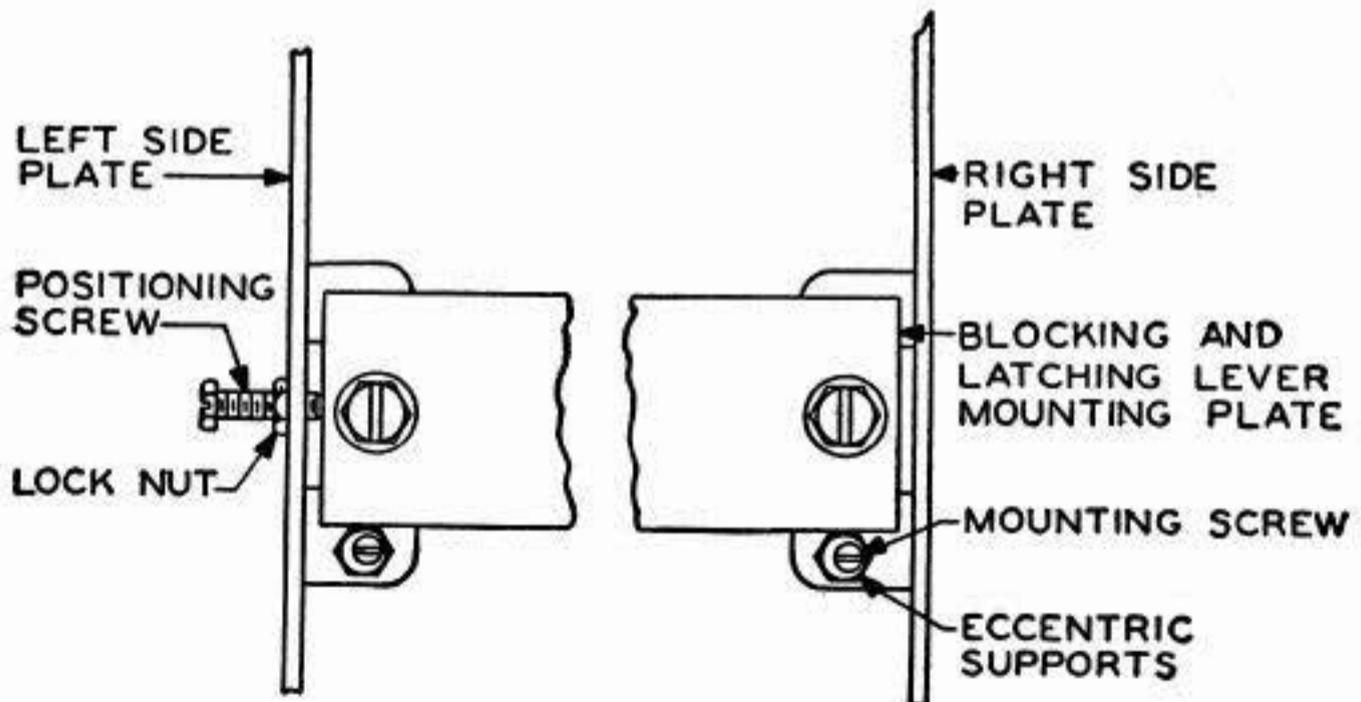


Fig 18

3.27 **Blocking and Latching-Lever Assembly Top Comb:** The top comb should be in its extreme rear position with all screw-hole clearance taken up. **Fig 19**

(a) To check and adjust: Loosen the mounting screws of the top comb and push the comb to the rear in order to obtain maximum engagement between blocking levers and function levers. Tighten the mounting screws and check to see that all function levers move freely in their slots.

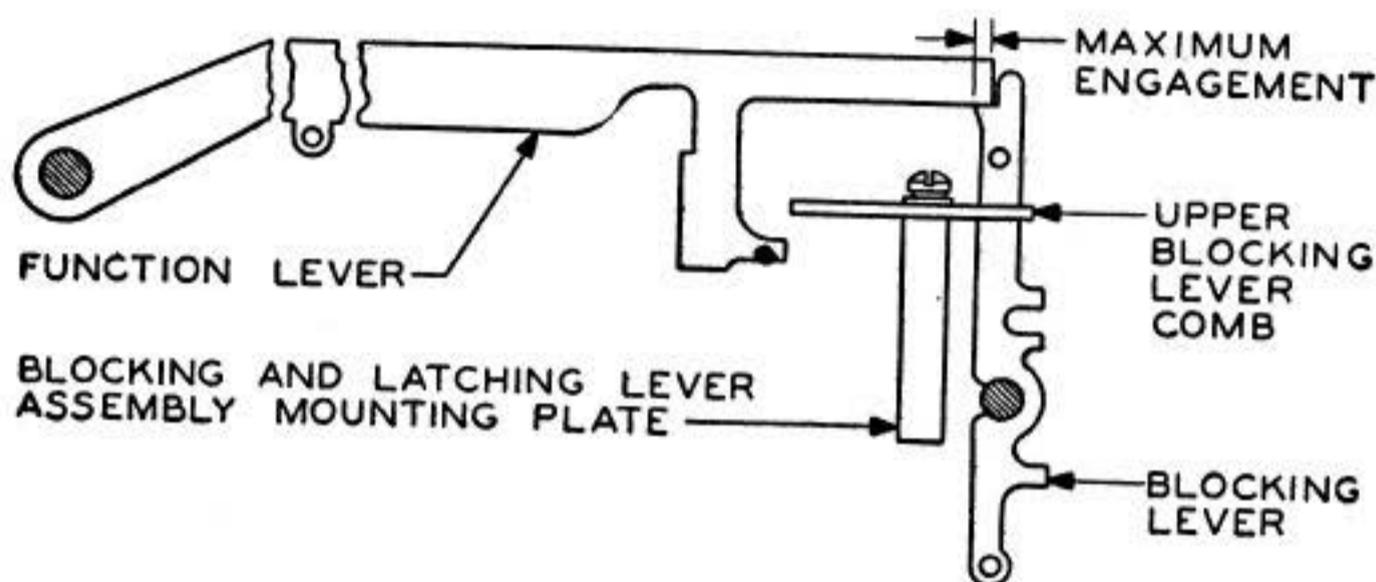


Fig 19

3.28 **Stripper-Bail-Eccentric Shoulder Screws:** There should be Min .055", Max .070" clearance at the two ends of the blocking and latching-lever assembly, between the latching extensions of the contact-operating levers and their associated latch levers. The clearances at the two ends should be equal within .010". **Fig 20**

(a) To gauge:

- (1) With the stripper bail latched, rotate the main shaft until the stripper bail is in its extreme forward position.
- (2) Hold the clutch pawl disengaged and continue to rotate the main shaft until the position of the shaft is found which, due to its eccentricity, gives the least travel to the stripper bail in its forward position.

- (3) Measure the clearances at the positions indicated below:

<u>Unit</u>	<u>Position</u>
BS2D	1 & 29 (Note 1)
BS3C	1 & 32
BS6L	1 & 31

Note 1: To gauge at position 29, remove the blocking and latching-lever assembly and change the No. 1 latch lever and spring to position No. 29 in place of the No. 29 latch lever and spring. Replace the blocking and latching-lever assembly and gauge. After gauging, return the latch levers and springs to their original positions.

- (b) To adjust:

- (1) Turn the left- or right-hand stripper-bail eccentric shoulder screw less than 90 degrees in either direction (keeping the indicating mark below the center of the screw).
- (2) Tighten the eccentric shoulder screw lock-nut while holding the screw in its position with a screwdriver.

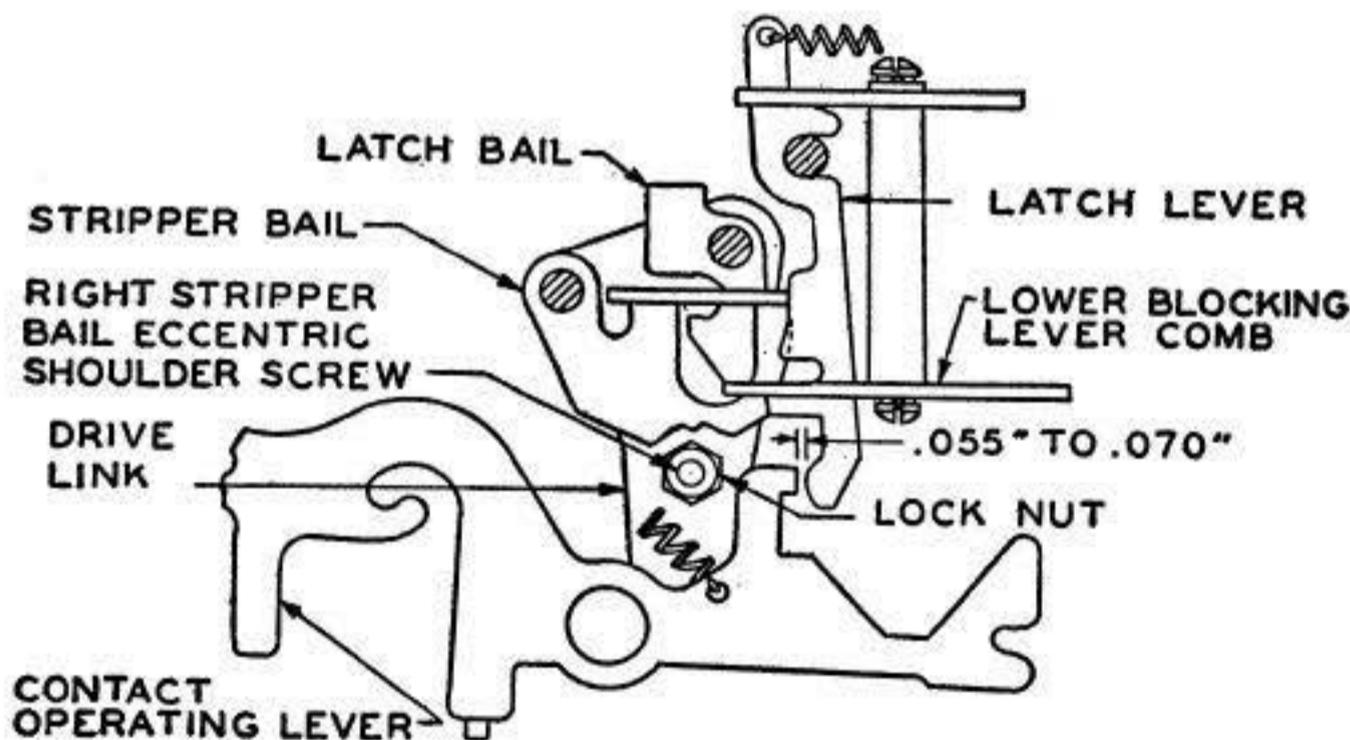


Fig 20

3.29 Blocking and Latching-Lever Assembly (Vertical Adjustment): With the stripper bail latched and in its extreme forward position, there should be Min $.025''$, Max $.035''$

clearance between the lower surface of the stripper bail and the upper surface of the latch-lever projections in the following positions :

<u>Unit</u>	<u>Position</u>
BS2D	4 & 29
BS3C	4 & 29
BS6L	6 & 29

The clearance in position 17 should be Min .020", Max .040". ←
Fig 21

(a) To gauge :

- (1) Rotate the main shaft until the stripper bail is in its extreme forward position and latched. Place the R-Y test lever in its OFF position.
- (2) Check that all the pullbars are in their unlatched (down) position.
- (3) Gauge the clearance through the openings in the blocking and latching-lever assembly mounting-plate.

(b) To adjust :

- (1) Loosen the blocking and latching-lever assembly mounting-plate.
- (2) Move the assembly up or down by turning the eccentrics which support the mounting plate on each side.
- (3) While making this adjustment take up the play in the stripper bail to reduce to a minimum the clearance between the lower surface of the stripper bail and the upper surface of the latch levers.
- (4) After moving the assembly either up or down to meet the adjustment requirement, it will be necessary to rotate the main shaft again to repeat the set-up conditions for checking the clearance. This recycling is required because the stripper bail in its foremost position rests against the latching levers and is inclined to follow any upward or downward movement of the mounting plate.
- (5) Tighten the plate mounting screws and eccentric ↙ screws.

Note: The Blocking and Latching-Lever Assembly may be subsequently removed and replaced without disturbing the vertical adjustment provided the eccentrics are properly positioned and the operation is performed carefully. ↘

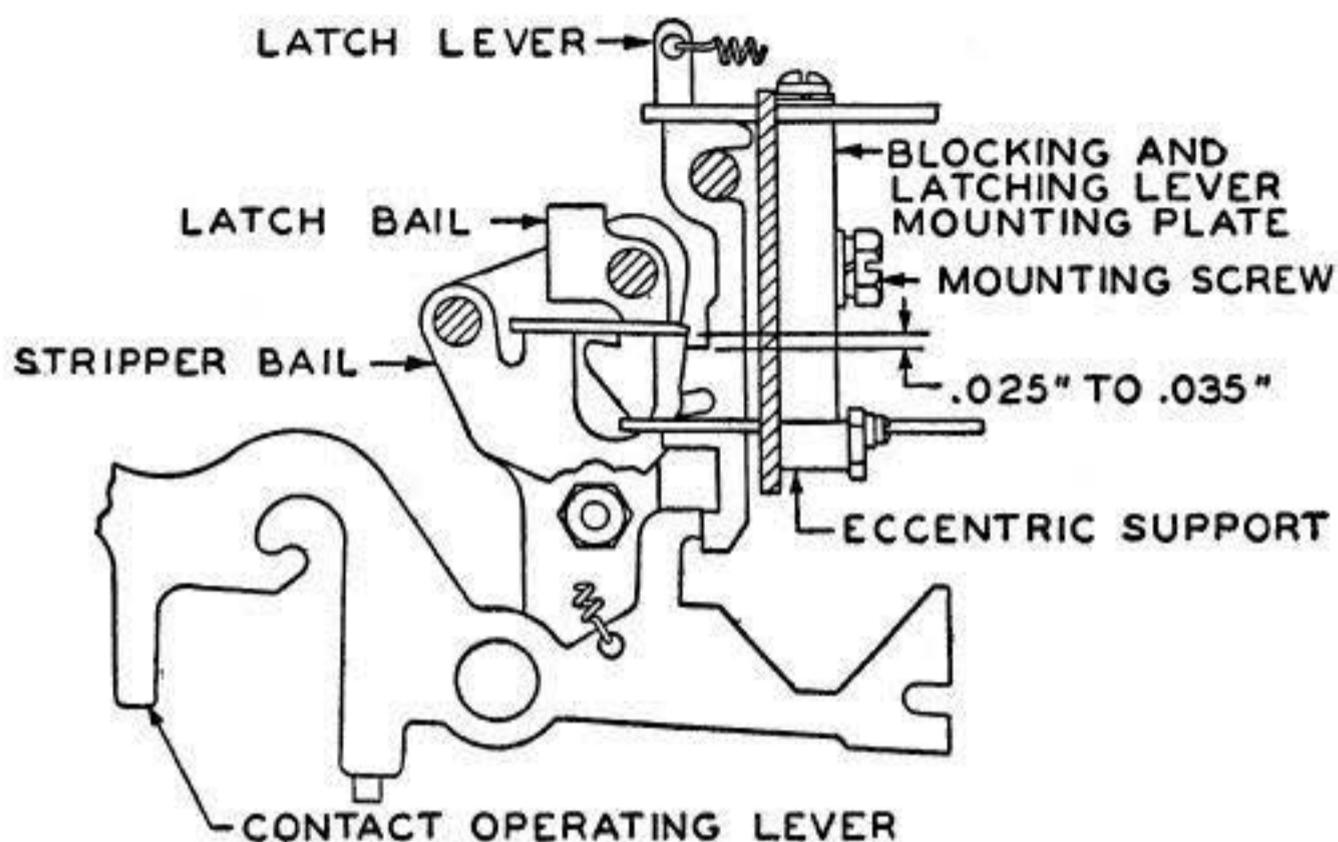


Fig 21

3.30 **Blocking and Latching-Lever Assembly (Horizontal Adjustment):** The sides of the blocking levers should be as close as possible to their associated codelevers without exerting any pressure on them and the latching levers should be in line with and riding on the latching extensions of the operating levers. Fig 11

(a) Gauge by eye as viewed from the front.

(b) To adjust:

(1) Loosen the lock-nut on the positioning screw located on the left-side frame at the end of the blocking and latching-lever mounting plate and back off the screw.

(2) Loosen the right- and left-hand mounting-plate mounting screws to friction-tight and reposition the plate. Tighten the screws.

(3) Position the positioning screw until it just touches the mounting plate and tighten the lock-nut while holding the screw with a screwdriver so as not to disturb its position.

Note: It may be necessary to reposition the front function-lever comb, the pullbar comb and the blocking and latching-lever lower comb to the right or left to meet the above requirements.

3.31 **Blocking and Latching-Lever Assembly Lower Comb:**
On units in which the lower comb has enlarged mounting holes, there should be Min .010", Max .050", clearance between the front edge of the function levers and the rear edge of the upper projections of the unlatched blocking levers.

Fig 22

- (a) To gauge: Rotate the main shaft until the main bail is in its lowermost position.
- (b) To adjust: Loosen the mounting screws and position the lower comb toward the front or rear of the unit by means of its enlarged mounting holes being careful not to disturb the alignment between the latching levers and the latching extensions of the operating levers.

Note: On old-style units without the enlarged mounting holes, this requirement does not apply. ←

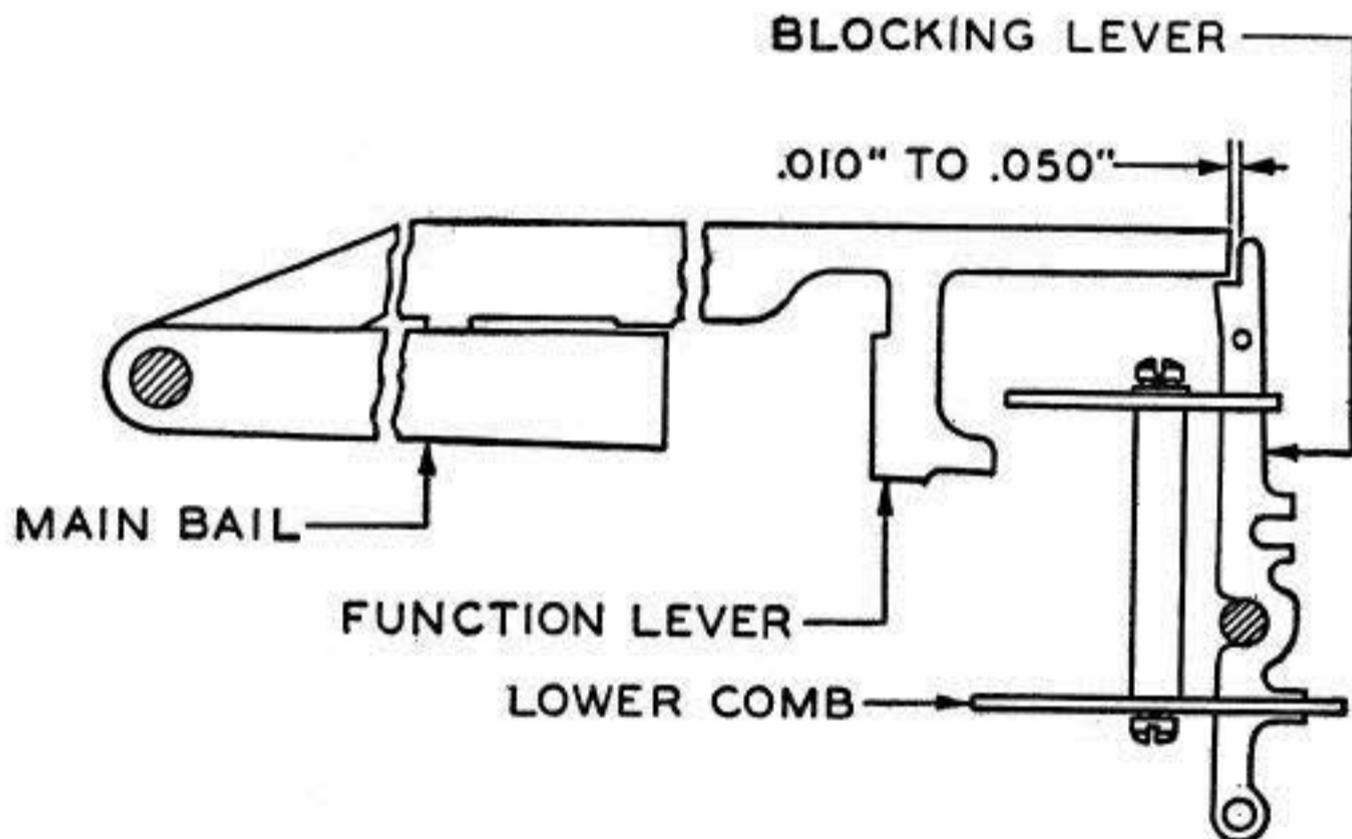


Fig 22

3.32 R-Y Test Mechanism

(a) There should be some clearance, not more than .010", between the rear edge of the upper step of the operating lever and the lower-rear edge of the latching surface of the latch.

Fig 15

(1) To gauge:

(a) Move the R-Y operating lever to the ON position (down; white indicator showing).

(b) With the stripper bail latched, rotate the main shaft until the stripper bail is in its extreme forward position.

(c) Hold the clutch pawl disengaged and continue to rotate the main shaft until the position of the main shaft is found which, due to its eccentricity, gives the least forward travel to the stripper bail.

(d) Observe that the red indicator is now showing.

(e) The clearance may easily be checked through the elongated opening in the right-hand side frame.

(2) To adjust: Locate the lever mounting-bracket by means of the clamp plate and screws.

(3) To check: Manually move the operating lever down until the two respective edges are in line. Tighten the two clamping screws.

(b) The R-Y latch should meet the contact operating plunger in approximately the center of the upper end of the plunger.

(1) Gauge by eye.

(2) To adjust: It may be necessary to refine the R-Y test mechanism mounting-bracket adjustment. (See Paragraphs 3.23 and 3.32(a))

(c) The upper contacts of the R-Y contact-spring assembly should be closed and the contact-spring plunger free, with some endplay, when the R-Y operating lever is in the ON position (down; white indicator showing) and the main shaft in its STOP position.

(1) Gauge by eye.

(2) To adjust: It may be necessary to shorten the contact-spring plunger.

Note: Remove the Blocking and Latching-Lever Assembly.

3.33 Blocking and Latching-Lever Assembly Lower Comb (Final Adjustment): Tighten the blocking and latching-lever assembly lower comb mounting screws (which were left friction-tight for adjustment purposes) being careful not to disturb the comb position. **Fig 22**

3.34 Stripper-Bail Reset Screws: The stripper-bail extension should overtravel the upper notch in the latch bail, both right and left sides, by Min .015", Max .025" when the stripper bail is in its rearmost position. This limit should be met at the position of the main shaft which gives the least amount of overtravel. **Fig 9**

(a) To gauge:

- (1) Hold the selector armature operated and rotate the main shaft to the stop position of the selector cam sleeve.
- (2) Release the main-shaft-clutch blocking lever (see Fig 25 for location of part) and unlatch the stripper bail.
- (3) Rotate the main shaft until all pullbars are stripped off of the function levers.
- (4) Continue to rotate the main shaft until the stripper bail is in its rearmost position.
- (5) Manually hold the clutch pawl disengaged from the ratchet and keep on rotating the main shaft to a position which gives the least amount of overtravel.

(b) To adjust:

- (1) See that the latch-bail backstop does not interfere. **Fig 10←**
- (2) Loosen the lock-nuts on both left and right stripper-bail reset-screws and adjust the screws to provide the required overtravel. The overtravel should be approximately equal on both left and right side.
- (3) Check that both reset-screws touch their respective stop posts.
- (4) Tighten the lock-nut of both screws.

3.35 Latch-Bail Backstop: The latch-bail backstop should be located between the Nos. 17 and 18 function-lever extensions and just touch, or be within .002" of touching, the top surface of the latch bail. **Fig 10**

(a) Gauge by eye and feel.

Note: When the backstop is too close and presses against the latch bail, separation will be observed between the front edges of the stripper-bail extensions and their respective latches.

(b) To adjust: Loosen the clamping-screw and position the backstop. Tighten the clamping-screw.

3.36 Contact-Operating-Lever Spring: It should require the following tensions to start the contact-operating levers moving:

Levers with associated spring contacts; Min 5 oz,←
Max 8-1/2 oz.

Levers without associated spring contacts; Min 1-1/2 oz, Max 2-1/2 oz. **Fig 11**

(a) To gauge:

- (1) Remove all bridge assemblies and check that all contact-operating levers are in the DOWN position.
- (2) With the unit resting on its rear, hook the pull-end of the scale over each operating lever and pull horizontally to the left as viewed from the rangefinder end. If a contact is associated with the operating lever, hold the contact-spring clear while checking the spring tension.
- (3) Replace all bridge assemblies and check that the operating levers move freely in their combs.

3.37 Function-Lever (Without Extension U) Spring: With the unit in its upright position, the main shaft in its stop position and all pullbars unlatched, it should require Min 1 oz, Max 2 oz, to start each function lever moving. **Fig 11**

(a) To gauge: Hook the pull-end of the scale under each function lever in front of the front function-lever comb and pull vertically upward.

3.38 Function-Lever (H, R and Y) (With Extension U) Spring: With the unit in its upright position, the main shaft in its stop position and all pullbars unlatched, it should require Min 12 oz, Max 15 oz, to start each function lever moving. **Fig 11**

(a) To gauge: Hook the pull-end of the scale under each function lever in front of the front function-lever comb and pull vertically upward.

3.39 Vane-Locklever Spring: It should require Min 1 oz, Max 2 oz, to start each locklever moving. **Fig 3**

(a) To gauge:

- (1) With the unit in its upright position, rotate the main shaft until the function levers are in their uppermost position.
- (2) Hook the pull-end of the scale to each locklever just to the rear of its vertical portion and pull vertically upward.

3.40 Contact-Operating-Lever Yoke Yield-Spring: It should require Min 8 oz, Max 10 oz, to start the yoke moving. **Fig 23**

(a) To gauge: Place the unit on its rear and remove the contact guard and contact-bar assembly. Hook the scale over the spring extension of the yoke and pull horizontally in line with the spring. Remount the contact guard and contact-bar assembly.

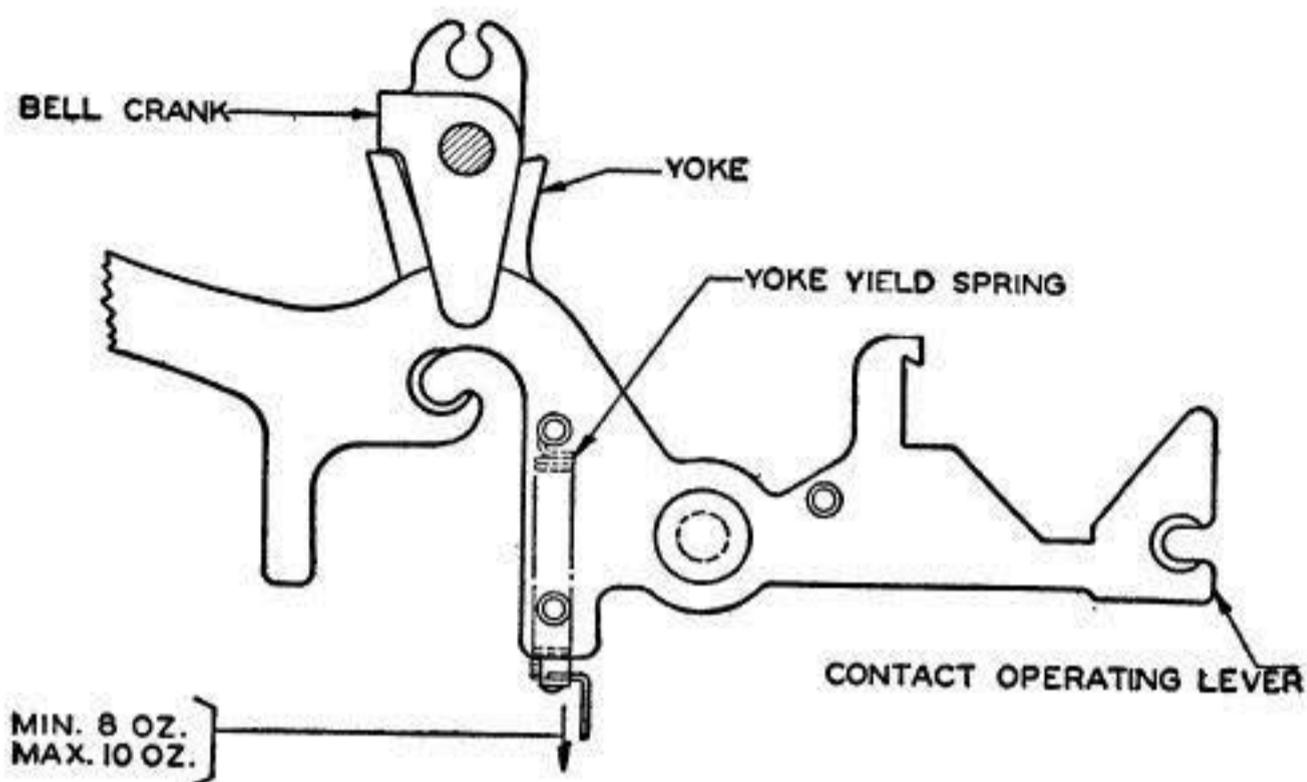


Fig 23

3.41 **Sixth-Vane Detent-Lever Springs:** It should require Min $\frac{3}{4}$ oz, Max $1\frac{1}{2}$ oz, to start each detent lever moving. Fig 24

(a) To gauge:

- (1) Place the sixth vane in the marking (activated) position.
- (2) Hook an 8-oz scale to the spring-eye of the detent lever and pull horizontally and in line with the spring.
- (3) Check both right and left springs in the same manner.

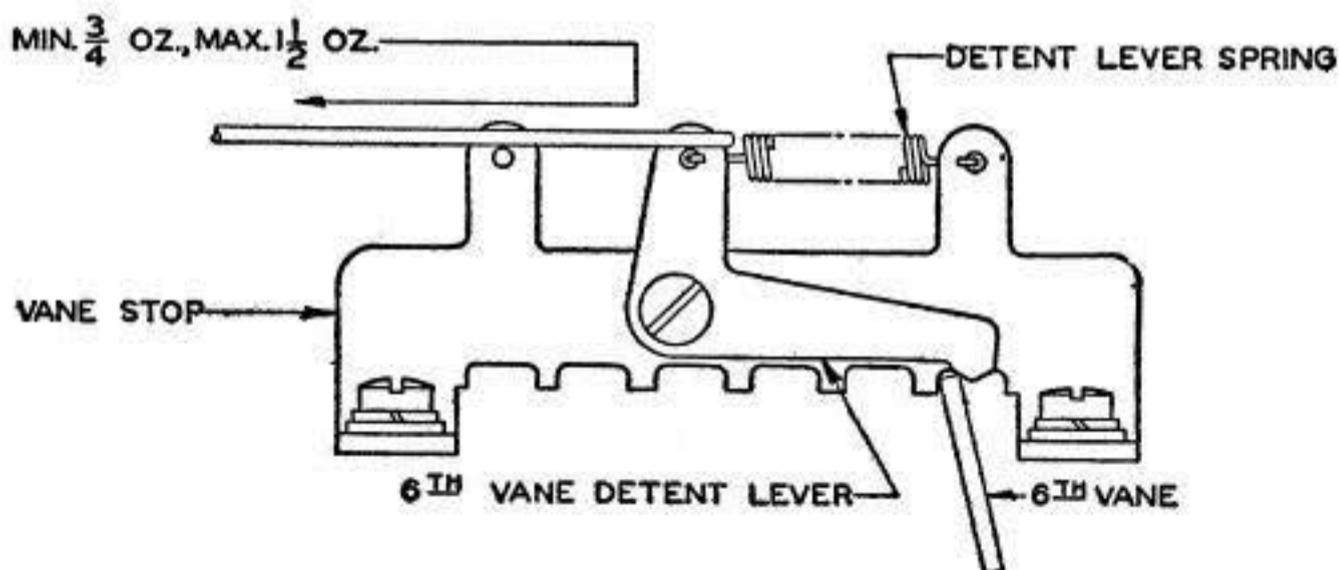


Fig 24

3.42 Sixth-Vane Positioning Springs: With the main shaft in its STOP position, the sixth-vane detent lever held clear and H, LINE FEED and CAR RET contact-operating levers unselected, the vane should remain in either its marking or spacing position. (See Fig 5 for identification of parts.)

(a) To adjust when this condition cannot be met, unhook the sixth-vane positioning springs and remove any twists that may be in them. Rehook springs.

3.43 Clutch-Pawl Spring: It should require Min 3-1/2 oz, Max 4-1/2 oz, to start the pawl moving. **Fig 25**

(a) To gauge:

- (1) With the unit resting on its front, rotate the main shaft until the clutch is in a vertical position.
- (2) Rotate the main shaft backward slightly so that the pawl just fails to touch any ratchet tooth.
- (3) Hook the pull-end of an 8-oz scale to the clutch pawl at the spring hole and pull in line with the spring.

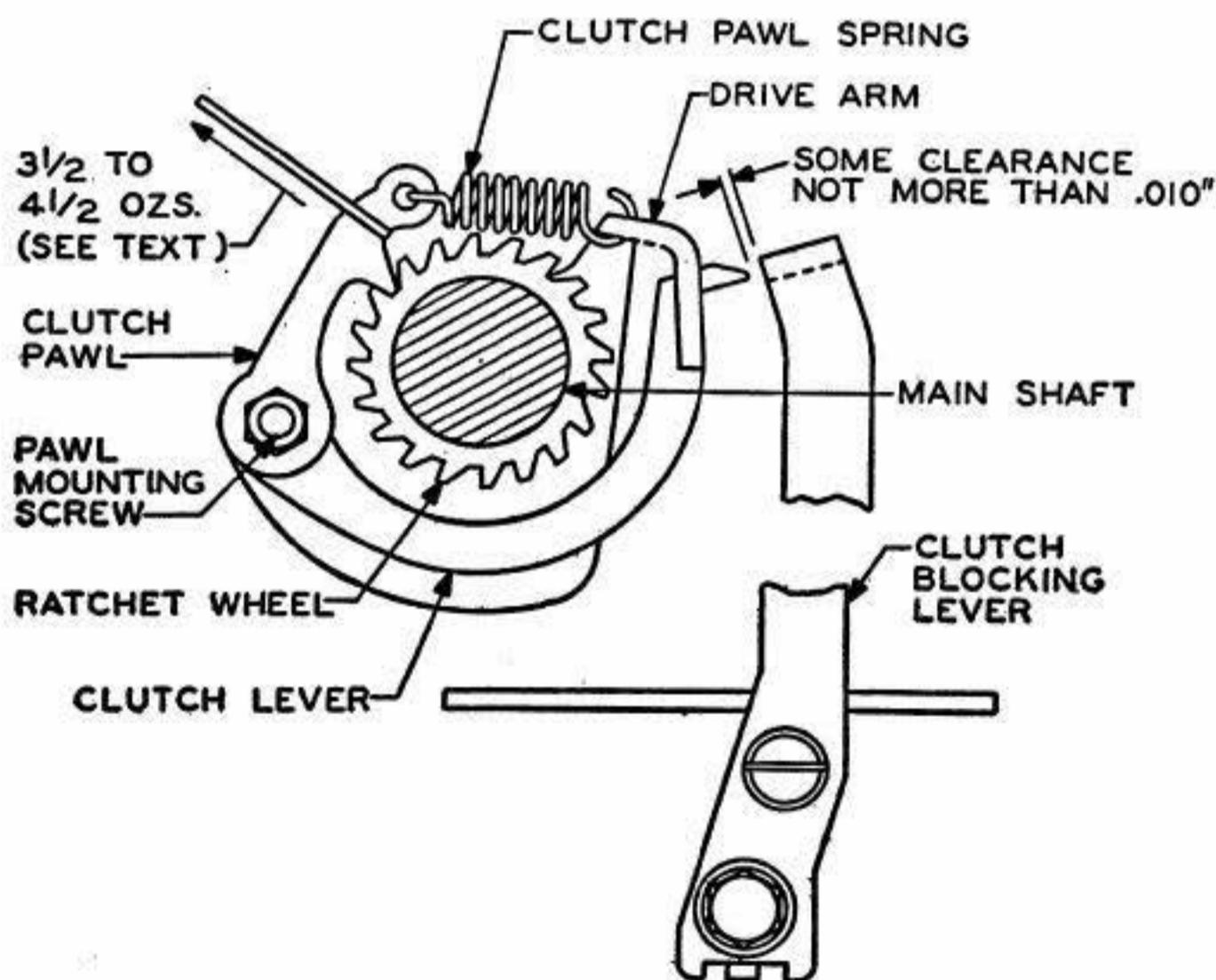


Fig 25

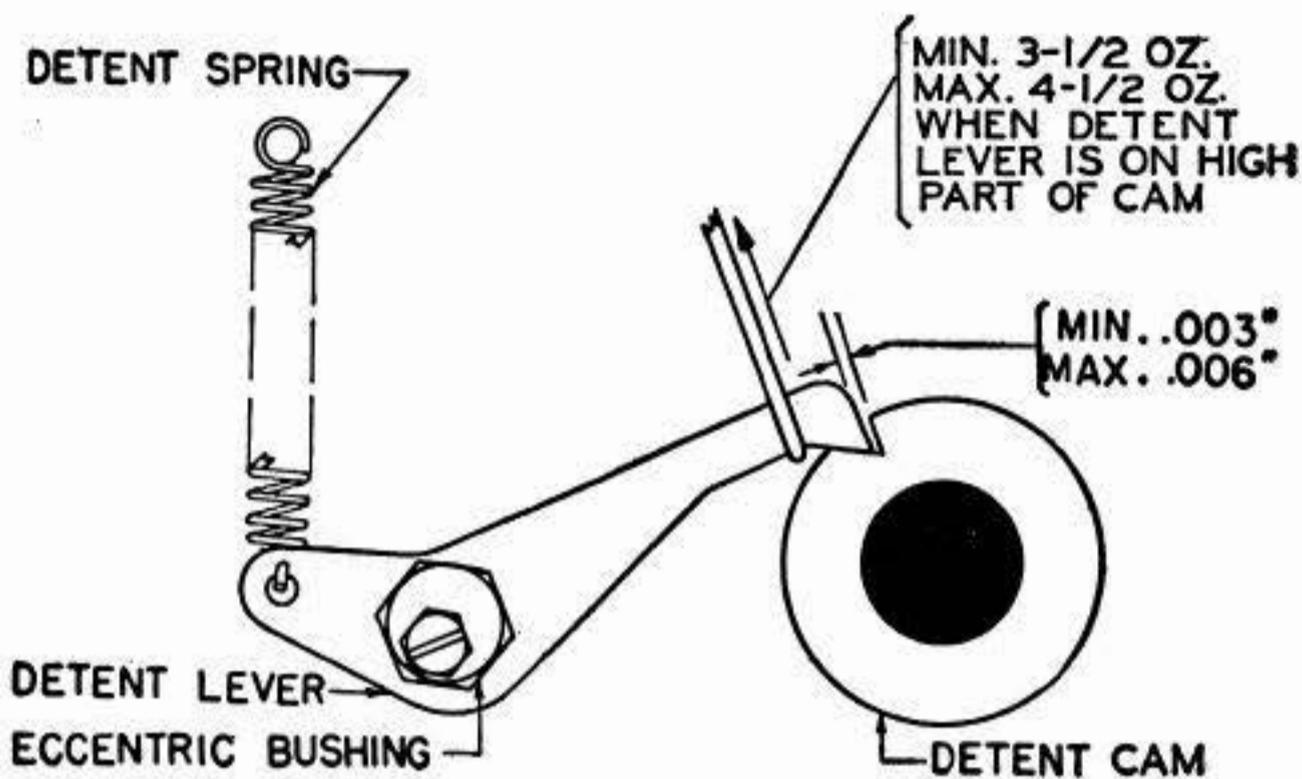


Fig 26

3.44 **Clutch Detent-Lever Eccentric:** With the operating-eccentric assembly held in its full-stop position, there should be Min .003", Max .006" clearance between the end of the detent lever and the shoulder of the notch in the detent cam.

Fig 26

(a) To gauge:

(1) Rest the unit on its top, block the selector armature in its operated position and rotate the main shaft to its stop position.

(2) Pull lightly (approximately two pounds) on the drive-arm mounting post to cause the clutch lever to rest on the bottom of the drive-arm guide-slot (full-stop position) and observe by eye that there is some clearance between the end of the detent lever and the shoulder in the notch of the cam, as the main shaft is rotated throughout one complete revolution.

(3) Continue to rotate the main shaft to the position that gives the least amount of clearance between the end of the detent lever and the shoulder in the notch of the cam.

(b) To adjust: Loosen and turn the eccentric keeping the high part of the eccentric away from the main shaft. Tighten the eccentric and unblock the selector armature.

Note: Three different arrangements of the eccentric are as follows:

(1) On old-style BS2D or BS3C units, a separate bushing on a post.

- (2) On new-style BS2D or BS3C units, a solid post with an eccentric machined on its end.
- (3) On BS6L units, an eccentric stud in place of a post.
- (c) To adjust: The old-style BS2D or BS3C units with the separate eccentric bushing (where the eccentricity may not be enough to meet the requirement) it may be necessary to move the mounting post itself, by using the clearance in the side-plate mounting hole.

3.45 Clutch Detent-Lever Spring: It should require Min 3-1/2 oz, Max 4-1/2 oz to start the detent lever moving. **Fig 26**

- (a) To gauge:
 - (1) With the unit resting on its front, rotate the main shaft until the detent lever is resting on the high part of the detent-cam.
 - (2) Hook the pull-end of an 8-oz scale under the detent lever just to the rear of its pointed surface and pull at right angles to the lever.

3.46 Clutch Trip-Lever: The clutch trip-lever should be centered on its cam (the cam on the selector cam sleeve farthest from the rangefinder) and there should be some end-play, not more than .006" in the blocking-lever shaft. **Fig 27**

- (a) To gauge: Rotate the main shaft until the clutch trip-lever is in contact with its cam on the selector cam assembly.
- (b) To adjust: Position the clutch blocking-lever shaft by means of its pilot screws.

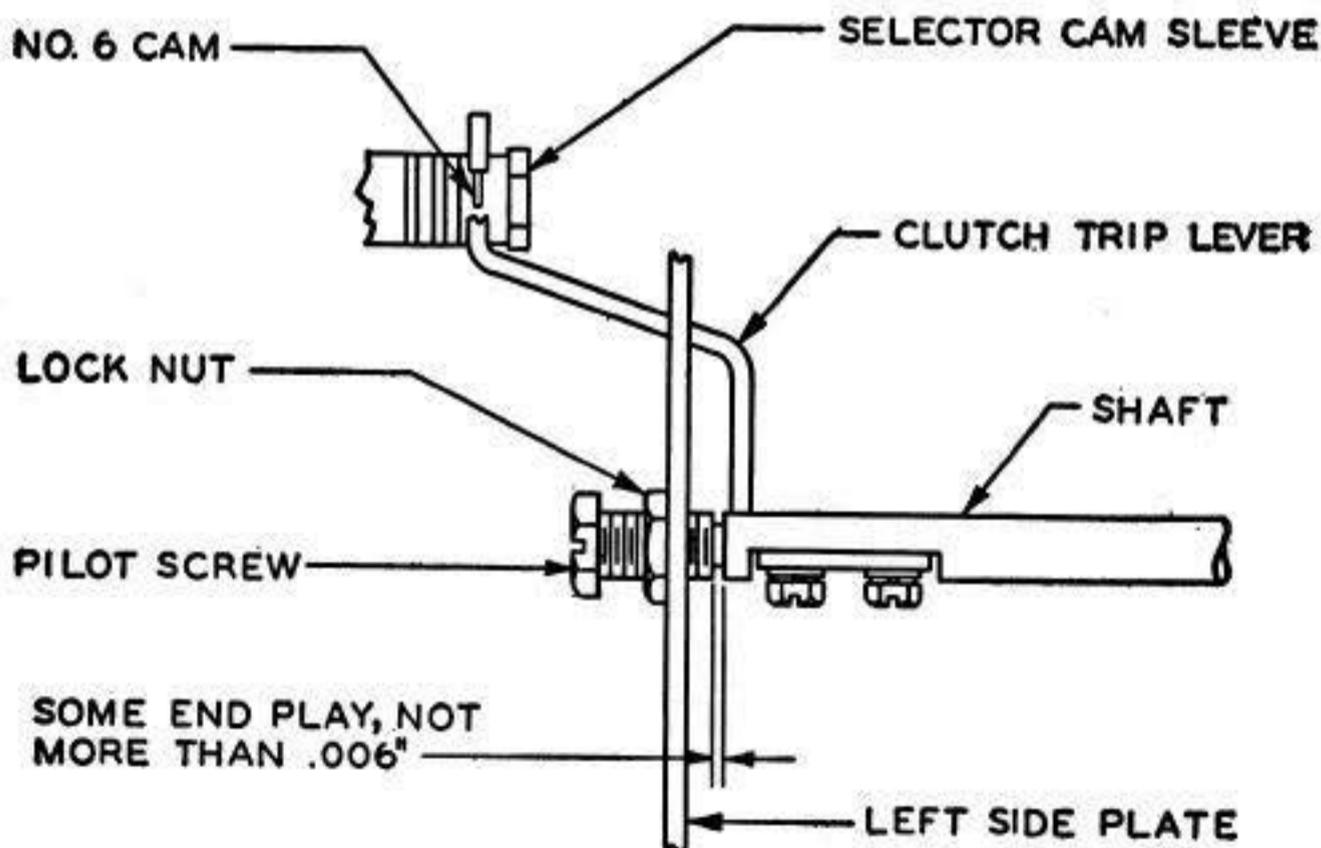


Fig 27

3.47 Clutch Blocking-Lever:

Note: This requirement applies when the clutch is tripped by the clutch lever, actuated by the No. 6 cam on the selector cam sleeve. For the BS6L selector the clutch may also be tripped by the clutch trip-bail. See Paragraph 3.48 for that requirement.

There should be some clearance, not more than .010", between the clutch blocking-lever and the tip of the clutch lever. The edge of the clutch lever should be parallel with the edge of the clutch blocking-lever when viewed from the front of the unit.

Fig 25

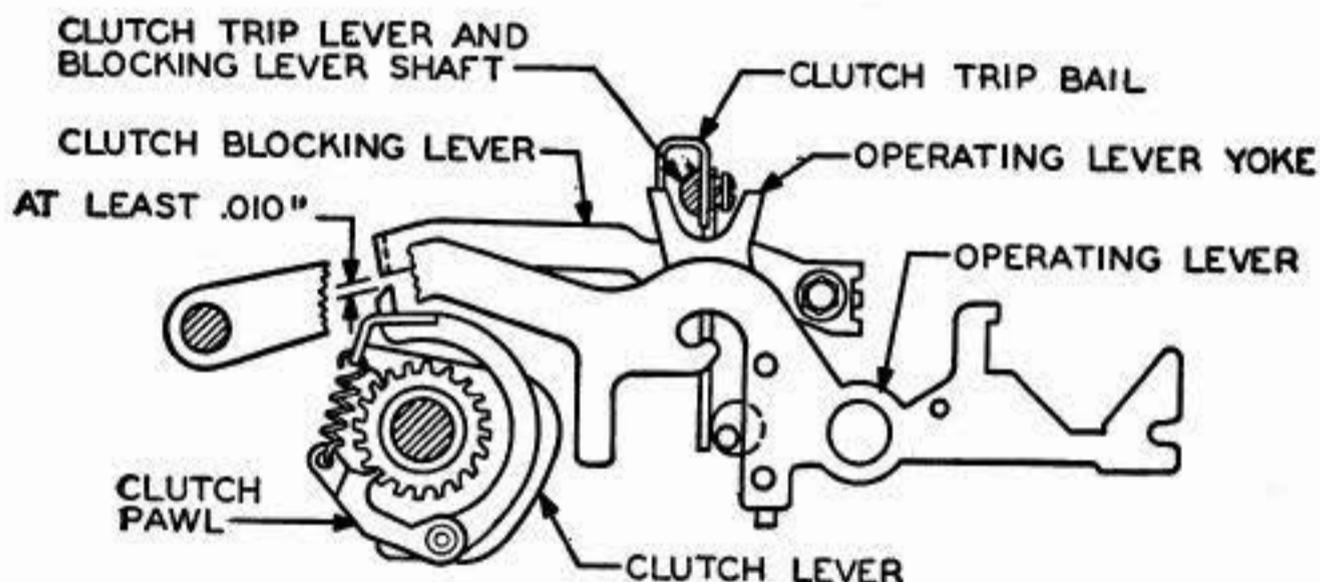


Fig 28

- (1) Rotate the main shaft until the clutch trip-lever (shown in Fig 27) is on the peak of its cam.
 - (2) With the selector-cam assembly held in this position, continue to rotate the main shaft until the tip of the clutch lever is opposite the blocking lever.
- (a) To adjust:

Two-Piece Blocking Lever (new style)

- (1) Loosen the clamping-screws friction-tight and position the blocking lever as required by prying between the projections with a screwdriver.
- (2) Tighten the clamping-screws.

One-Piece Blocking Lever (old style)

- (1) Loosen and back off the right pilot screw of the stripper-bail assembly and raise the assembly out of the way.

- (2) Loosen the clutch-blocking-lever mounting screws friction-tight and position the lever by means of its elongated mounting holes.

Note: In order to meet the requirements of this paragraph, it may be necessary to use the clearance in the mounting holes of the clutch trip-lever (see Fig 27). If the clutch trip-lever is moved for this purpose, recheck Paragraph 3.46.

- (3) Remount the stripper-bail assembly and set up the right-hand pilot screw so that the stripper-bail shaft will have some endplay, not to exceed .010".

Note: If this adjustment is changed, recheck the clutch trip-bail requirement in Paragraph 3.48.

3.48 Clutch Trip-Bail (BS6L)

Note: In connection with the H-answerback feature of the BS6L selector, the clutch may be tripped not only by the clutch trip-lever (see Paragraph 3.46) but also by the clutch trip-bail, actuated by any one of codelevers 8 to 11, inclusive. This places an additional requirement on the clearance between the clutch lever and the clutch blocking-lever.

When the clutch blocking-lever is tripped by the clutch trip-bail there should be at least .010" clearance between the tip of the clutch lever and the clutch blocking-lever. In addition the maximum clearance should be such that the clutch blocking-lever is free for a slight amount of overtravel if manually actuated from any one of the contact-operating levers in positions 8 to 11, inclusive.

Fig 28

(a) To gauge:

- (1) Remove the codelevers from positions 8 and 11. ←
- (2) Rotate the main shaft by hand until the clutch is tripped.
- (3) Block the selector-magnet armature in its operated position so that the clutch will not be tripped by the clutch trip-lever, but will be tripped solely by the clutch trip-bail.
- (4) Rotate the shaft by hand until the operating levers in positions 8 and 11 are raised to their highest positions by their pullbars and until the tip of the clutch lever is opposite the clutch blocking-lever.

(b) To adjust: Loosen the trip-bail mounting screws and position the bail against the operating-lever yokes.

(c) Gauge further as follows:

- (1) Put back the codelever in position 11.
- (2) Check the overtravel of the clutch blocking-lever by manually pushing up the contact-operating lever in position 8.
- (3) Put back the codelever in position 8.
- (4) Check the clearance and overtravel for positions 9, 10 and 11, removing only a single codelever at a time for the purpose.

3.49 Clutch Blocking-Lever Eccentric-Backstop Post: There are two requirements to be met by the adjustment of the eccentric-backstop post:

- (1) There should be a clearance of Min .050", Max .055" between the blocking-lever eccentric-backstop post and the blocking-lever extension when the clutch-blocking lever rests on the tip of the clutch lever.
- (2) There should be some clearance, not more than .015", between the clutch blocking-lever and the clutch mechanism at any point during a complete revolution of the clutch members. Contact is most likely to occur between the pawl mounting screw and the end of the clutch blocking-lever just above it. To check, see that there is no noticeable motion of the clutch blocking-lever during a complete revolution of the main shaft except that caused by the selector-cam action on the clutch trip-lever.
- (3) To adjust: Release the selector-magnet armature and rotate the main shaft until the tip of the clutch lever passes the end of the clutch blocking-lever. Then rotate the clutch (shaft) backward slightly until the end of the blocking-lever rests on the tip of the clutch lever. Note that the trip-lever and its cam do not engage. Adjust the eccentric-backstop post to meet the required clearances.

If proper adjustment cannot be obtained, the TP115220 eccentric stud may be replaced by a TP135761 eccentric stud which has a reduced diameter at one end.

Note: A minimum of .050" engagement between the blocking-lever and the clutch lever should be accomplished by this adjustment procedure.

Fig 29 ↙

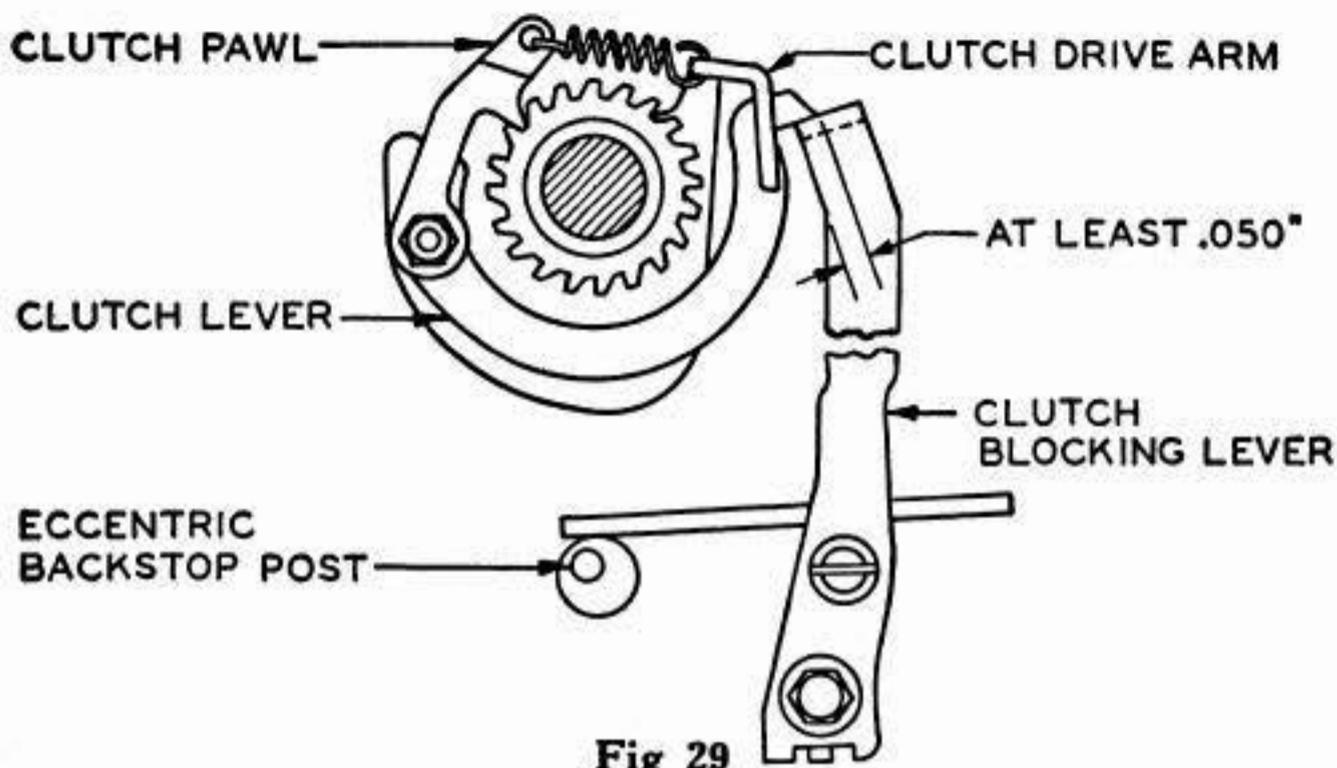


Fig 29

3.50 **Clutch Trip-Lever Spring:** It should require Min 3 oz, Max 4-1/2 oz, to start the lever moving. **Fig 30**

(a) To gauge:

- (1) With the unit in its upright position, rotate the main shaft until the clutch trip-lever is on the peak of its cam.
- (2) Hook the pull-end of an 8-oz scale under the trip-lever at the spring-hole by inserting the scale shaft toward the lever from a point to the rear of the vane pushbar bracket and pull in line with the spring.

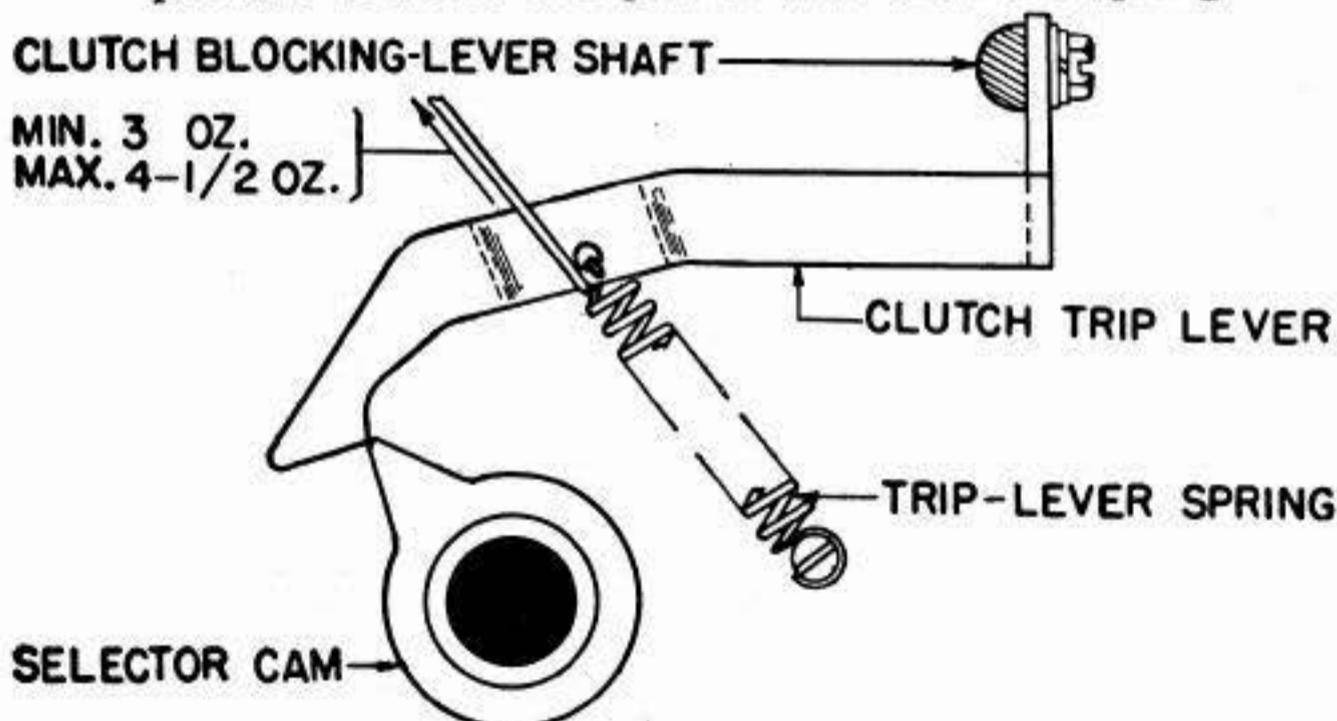


Fig 30

Note: Remount the Blocking and Latching-Lever Assembly.

3.51 Selector-Unit Contact Check:

Note: The parts of the contact assemblies used on the sequential selector are designed so as to require no adjustment after they are assembled. If, however, the springs should become distorted they may be restored to their normal condition by bending them to meet the following requirements.

Remove the contact guard

(a) Each portion of the bifurcated short contact springs should have a tension of Min 1 oz, Max 2-1/4 oz, against its associated stop. **Fig 31**

(1) To gauge: Hook an 8-oz scale as close as possible to and below the contact point of the short contact spring and pull horizontally at right angles to the spring. The contact swinger (middle spring) should be held clear when checking the upper spring.

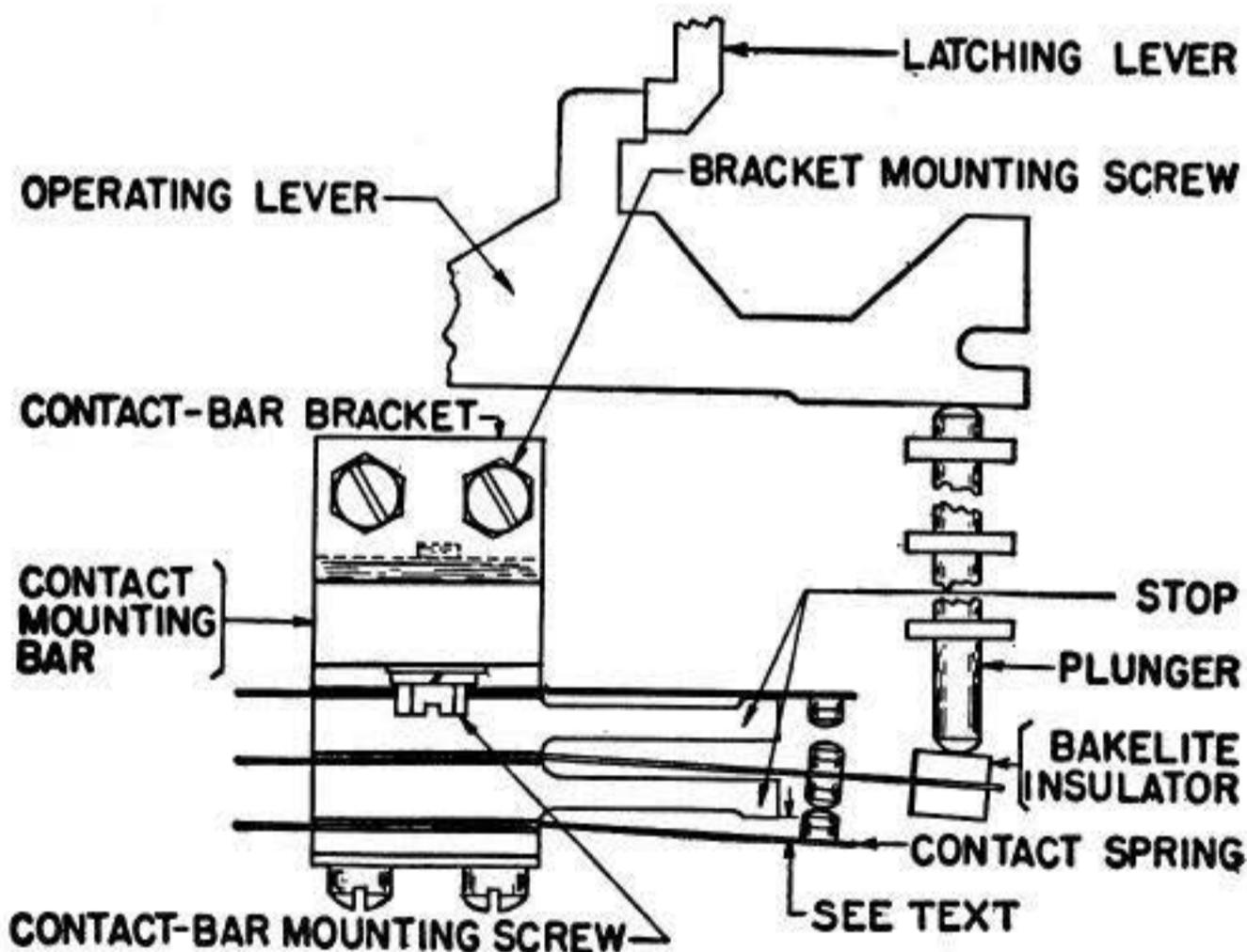


Fig 31

(b) It should require Min 2 oz, Max 3-1/2 oz, to just separate the contacts of the middle contact-spring from the contacts of the upper contact spring. **Fig 31**

(1) To gauge: Hook the scale over the middle contact-spring at the contacts and pull horizontally, at right angles to the spring.

(2) To adjust: Remove the contact-spring assembly and bend the contact spring. Reinstall the assembly and recheck (a).

(c) With the operating lever in its latched position, there should be at least .015" clearance between the contacts of the middle contact-spring and the contacts of the lower contact-spring. **Fig 31**

(1) To adjust, bend the lower contact-spring. Recheck (a).

3.52 Contact Mounting Bar

(a) With the operating levers in their unlatched positions, there should be some clearance between all the lower contact-springs and their associated stops, measured at the outer ends of the stops. On at least one contact pile-up this clearance should not exceed .010". On the remaining pile-ups the clearance should not exceed .025". **Fig 31**

(1) To adjust, loosen the screws which mount the mounting-bar brackets to the side frame and rotate the contact-mounting bar to obtain the clearance. Tighten the screws. Individual assemblies not meeting the requirements should be adjusted by bending the contact springs. Recheck related adjustments.

(b) The plungers should be centered on each bakelite insulator on the contact-springs. **Fig 31**

(1) To adjust, note whether the majority of plungers are off-center and loosen the screws which mount the contact-mounting bar to its brackets and position the mounting-bar assembly. Tighten the screws. If individual contact assemblies are out of alignment, loosen the contact-assembly mounting screws and position the individual assembly. Before retightening the screws, check that the spring contacts line up with each other.

3.53 **Universal Contact-Lever:** (BS3C and BS6L) With the stripper bail in its extreme forward position, there should be Min .007", Max .010" clearance between the lower bifurcated contact springs and their associated stops—measured at the ends of the stops. **Fig 31**

(a) To adjust, loosen the mounting screws friction-tight and position the universal contact lever.

4. MECHANICAL TIMER FOR BS3C AND BS6L

Note: If necessary, to check the requirements in Paragraphs 4.01 to 4.10, inclusive, remove the mechanical timer as follows:

- (1) Disconnect the two external wires from the connecting-block, taking care to note their position so that they may be put back correctly.
- (2) Rest the unit on its top.
- (3) Remove the nearest and the center mounting screws of the side-plate extension at the left. Loosen, but do not remove, the farthest mounting screw.
- (4) Lift the side-plate extension up and out of the way.
- (5) With a 541A wrench, loosen, but do not remove, the mounting screws at the front of the timer (now rear, with the unit on its top), opposite the main shaft.
- (6) Remove the mounting screw at the front of the timer.
- (7) The timer assembly may then be lifted out.

4.01 **Timer-Shaft Endplay:** The timer shaft should have some endplay, not more than .002". **Fig 32**

- (a) To adjust: Position the collar on the timer shaft.

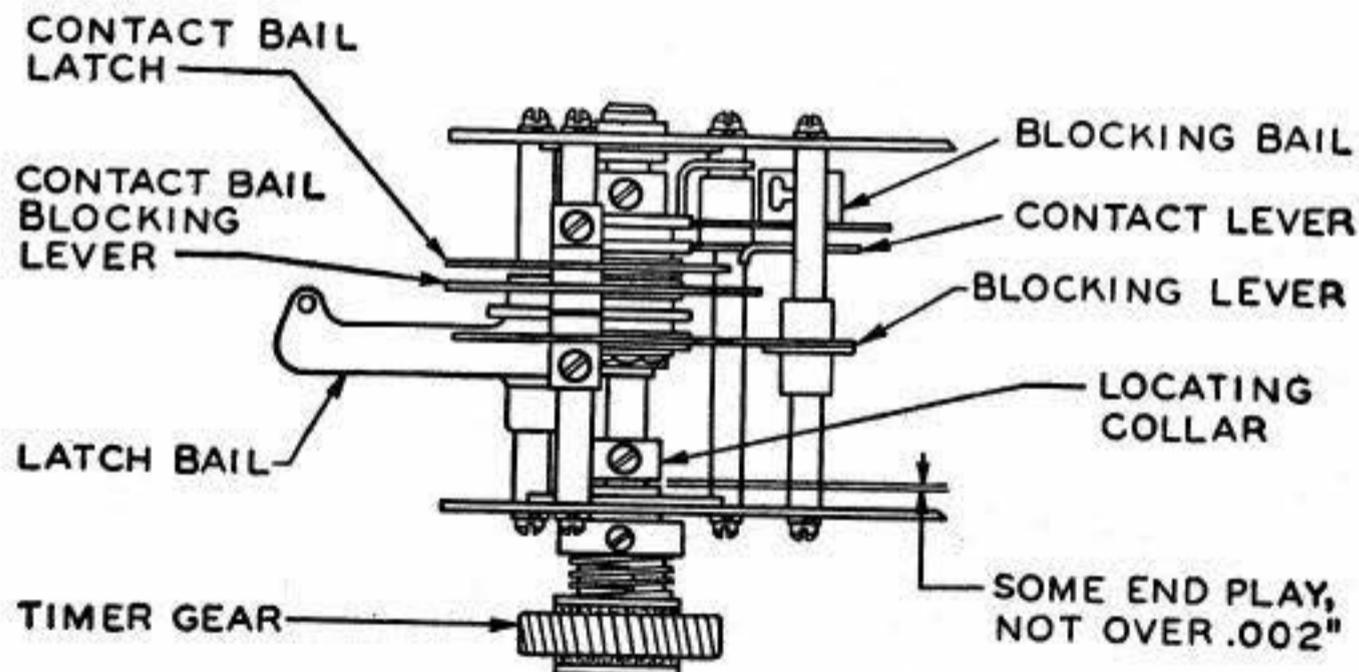


Fig 32

4.02 **Cam Followers** should ride fully on their respective cams on the timer-sleeve. **Fig 32**

- (a) Gauge by eye.
- (b) To adjust: Position the collars associated with the cam-followers.

4.03 **Blocking-Bail Spring:** It should require Min 1/4 oz, Max 3/4 oz to just start the blocking bail moving.

Fig 33

(a) To gauge: Hold the tripbar free in its slot, hook the pull-end of the scale over the blocking bail at the spring hole and pull horizontally in line with the spring.

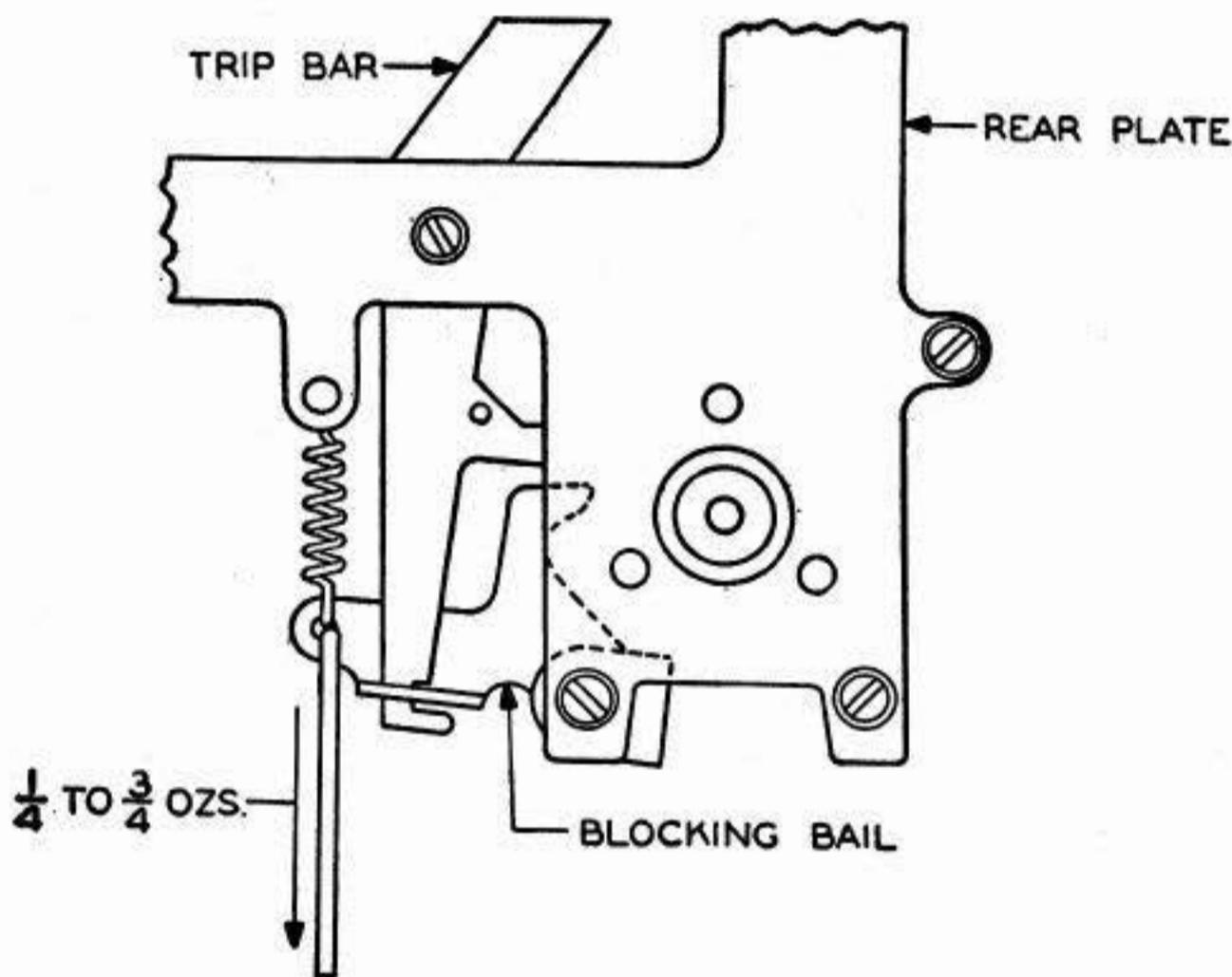


Fig 33

4.04 **Contact-Lever Spring:** It should require Min 14 oz, Max 17 oz, to just start the lever moving.

Fig 34

(a) To gauge: Rotate the timer shaft until the contact lever is on the peak of its cam and unhook the contact-bail spring from the contact lever. Hook the pull-end of the scale over the contact lever at the contact-lever spring hole

and pull horizontally in line with the spring. Rehook the contact-bail spring.

Note: The contact-lever-spring tension may be checked without removing the timer by using the push-end of the scale on the contact lever.

Note: On some older models of the BS3C, a spring tension of Min 10 oz, Max 12 oz, may be found. It is suggested that such springs be replaced by the TP22015 spring with the higher tension.

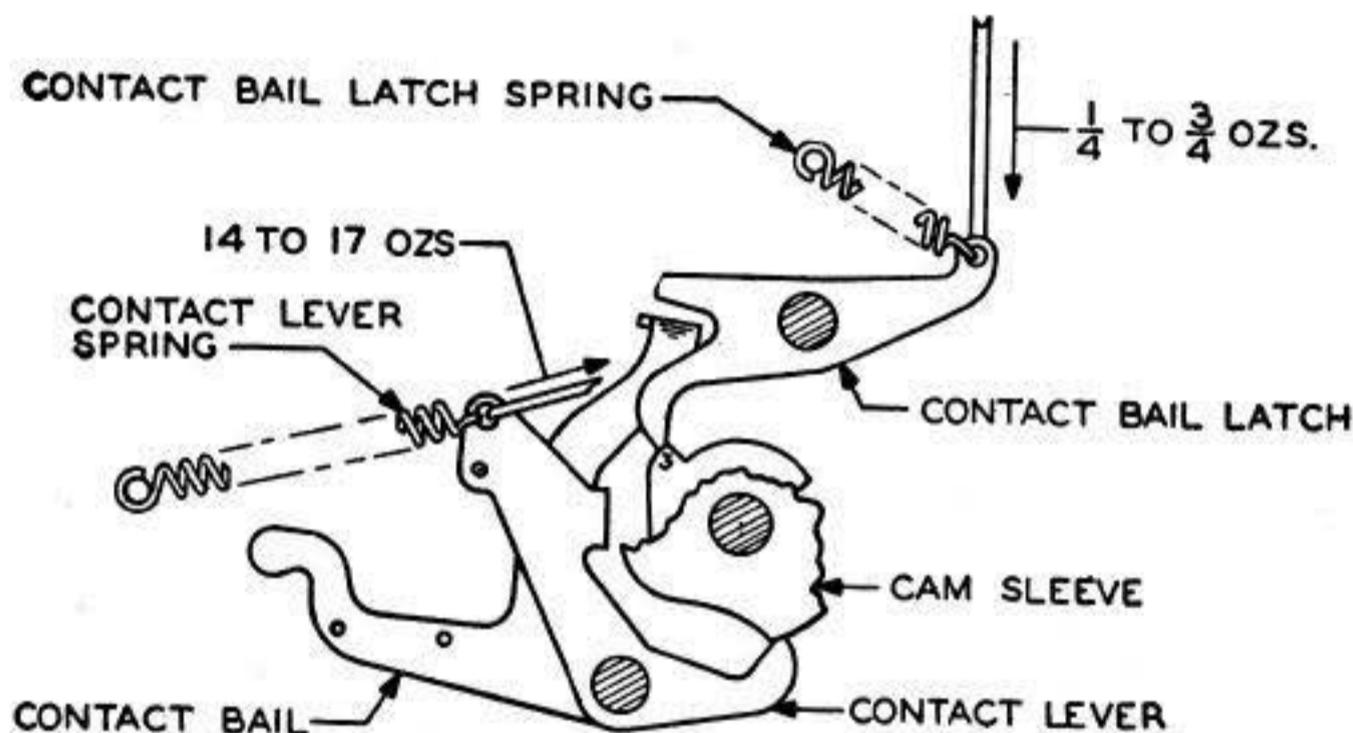


Fig 34

4.05 **Contact-Bail-Latch Spring:** It should require Min $\frac{1}{4}$ oz, Max $\frac{3}{4}$ oz, to just start the latch moving. **Fig 34**

(a) To gauge: Rotate the timer shaft to its stop position, apply the push-end of the scale to the latch at the spring hole and push horizontally at right angles to the long portion of the lever.

4.06 **Contact-Bail Blocking-Lever Spring:** It should require Min $\frac{1}{2}$ oz, Max 1 oz, to just start the lever moving. **Fig 35**

(a) To gauge: Rotate the timer shaft to its stop position and hold the blocking-lever latch clear of the contact-bail blocking-lever. Apply the push-end of the scale to the blocking-lever at the spring hole and push horizontally at right angles to the long portion of the lever.

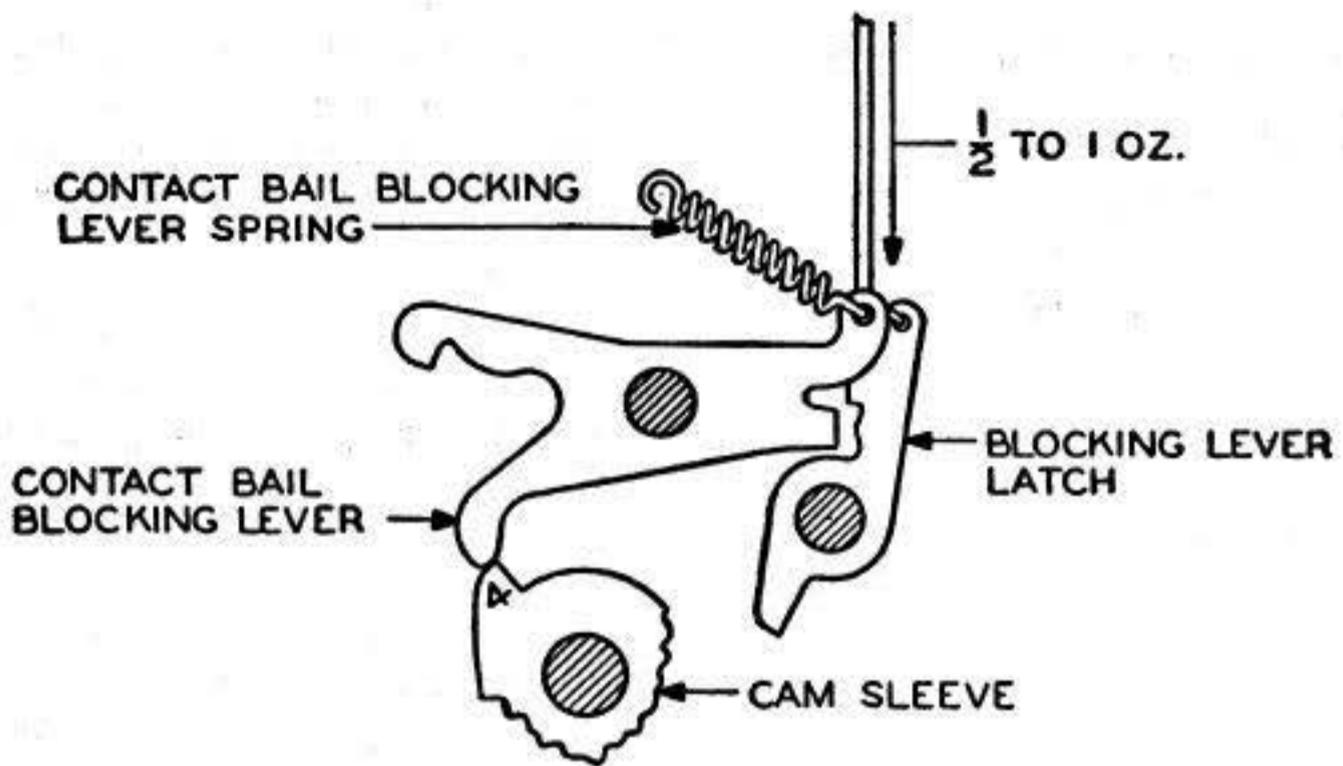


Fig 35

4.07 **Blocking-Bar Operating-Lever Spring:** It should require Min 3/4 oz, Max 1-1/4 oz, to just start the lever moving.

Fig 36

(a) To gauge: Rotate the timer shaft until the operating lever is on the low part of its cam, apply the push-end of an 8-oz scale to the operating lever at the spring hole and push horizontally at right angles to the long portion of the lever. Make sure the blocking bar does not interfere while gauging.

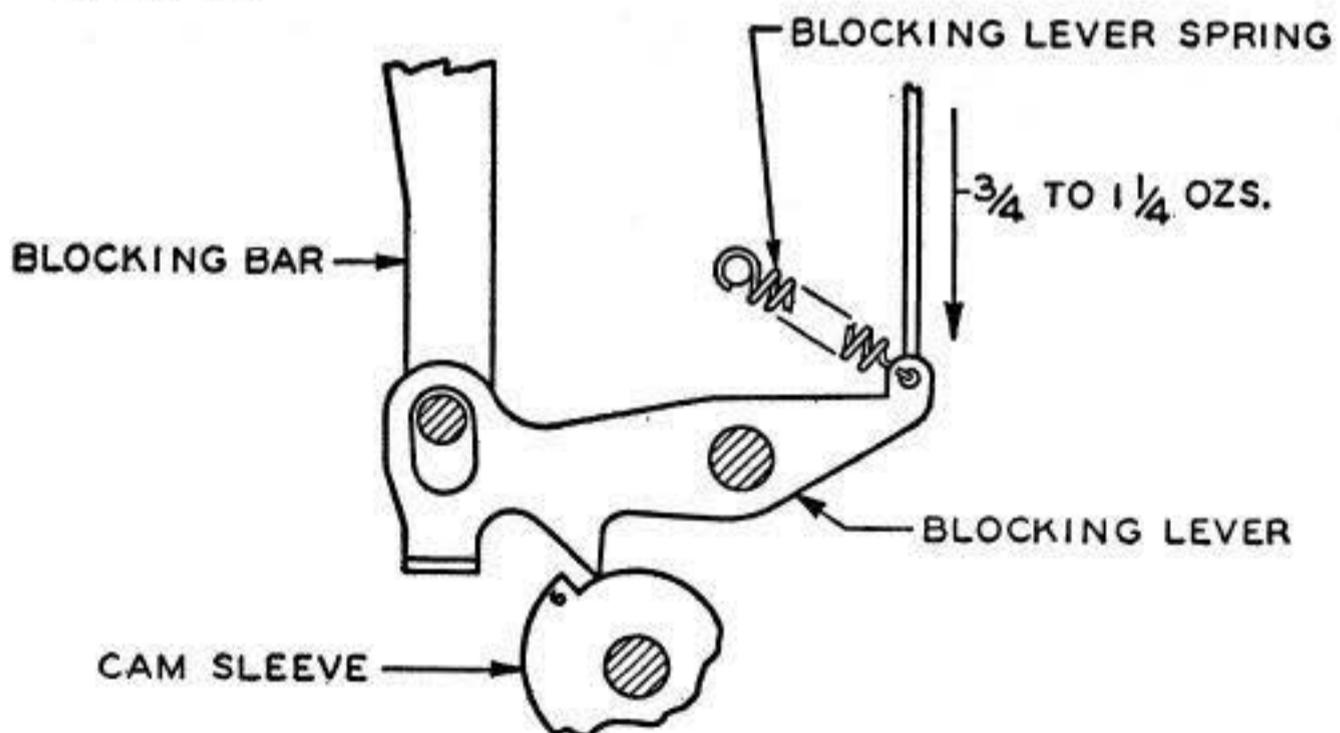


Fig 36

4.08 **Blocking-Lever-Latch Spring:** It should require Min 1/4 oz, Max 3/4 oz, to just start the latch moving.

Fig 37

(a) To gauge: Rotate the timer shaft to its stop position, hook the pull-end of the scale over the latch at the spring-hole and pull horizontally in line with the spring.

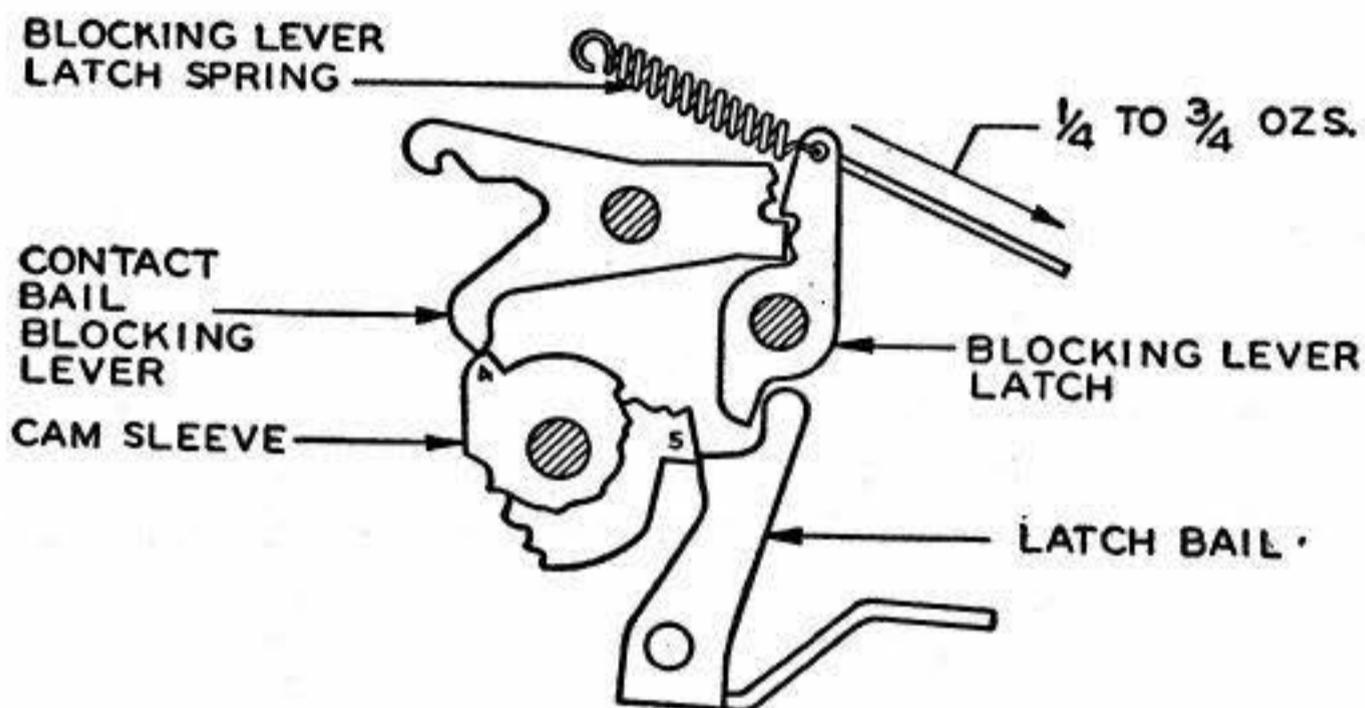


Fig 37

4.09 **Tripbar Spring:** It should require Min $3/4$ oz, Max $1-1/4$ oz, to just start the tripbar moving. **Fig 38**

- (a) To gauge: Rotate the timer shaft to its stop position, apply the push-end of the scale to the top surface of the tripbar and push horizontally in line with the bar.

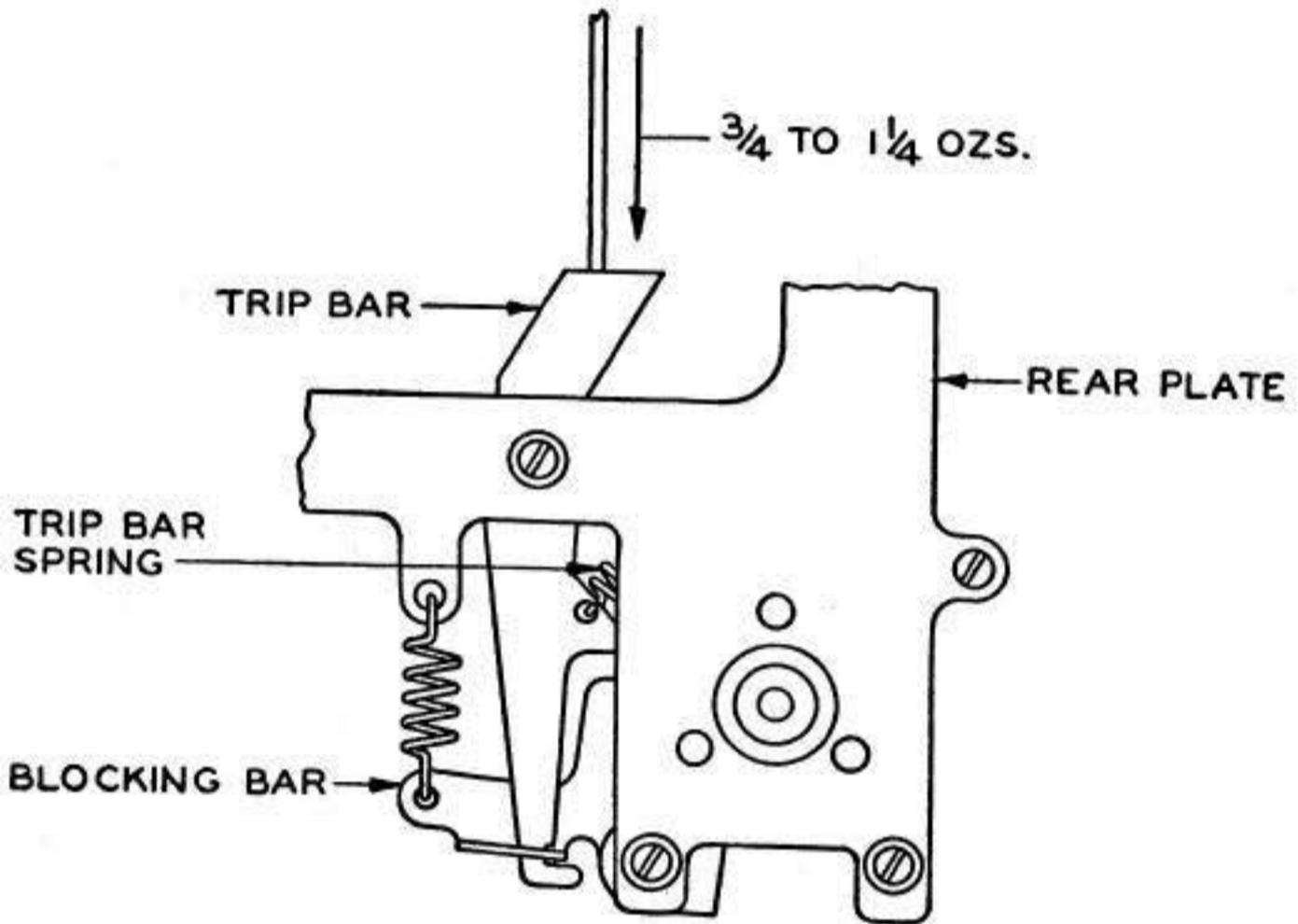


Fig 38

4.10 **Timer Contacts** should meet the following requirements:

- (a) The insulator of the swinger contact spring should be approximately centered with respect to the contact-bail extension. To adjust, loosen the contact-assembly mounting screws and position the assembly. Tighten the mounting screws.

- (b) Hook an 8-oz scale as close as possible to the contact point of the short contact spring and pull horizontally at right angles to the backstop. Each portion of the bifurcated short springs should have a tension of Min 1 oz, Max $2-1/4$ oz against its associated backstop. The contact swinger should be held clear when checking the upper spring. To adjust, bend the contact spring. **Fig 39**

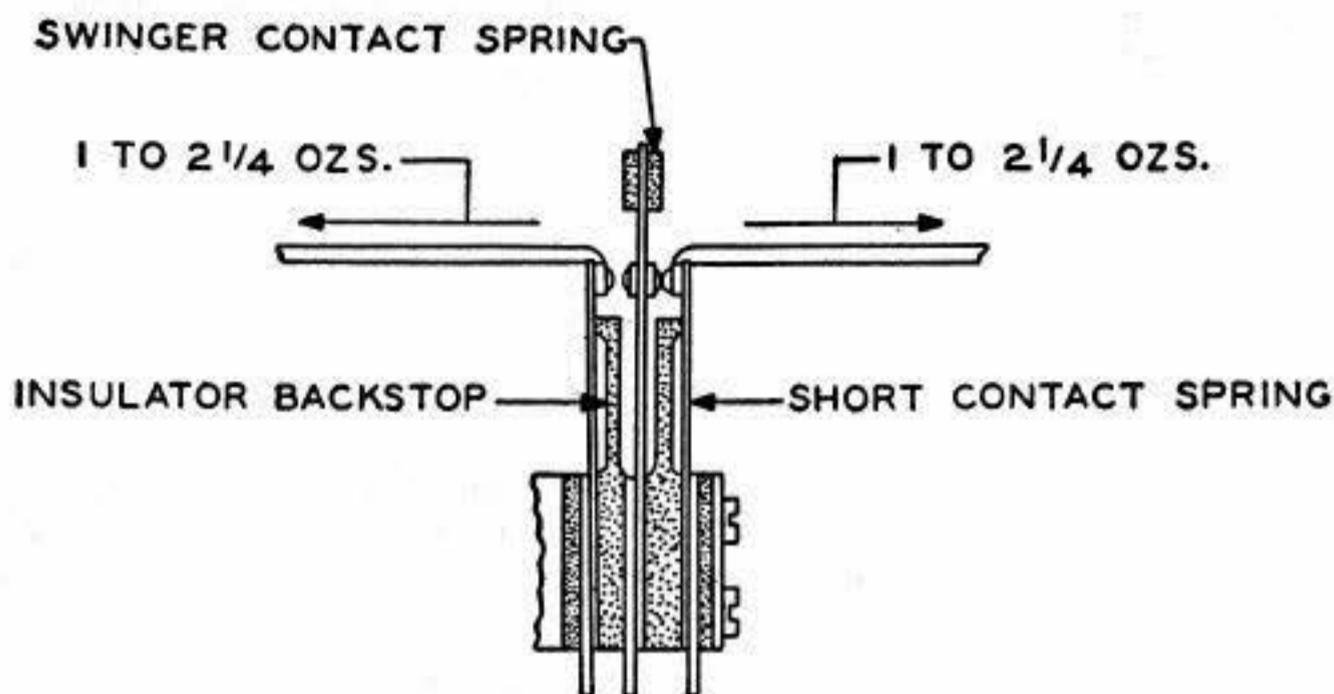


Fig 39

(c) Hook an 8-oz scale to the swinger at the contact point and pull horizontally at right angles to the spring. It should require Min 1 oz, Max 2-1/2 oz to just separate the contacts of the swinger from the contacts of the upper spring. To adjust, bend the swinger contact spring. **Fig 40**

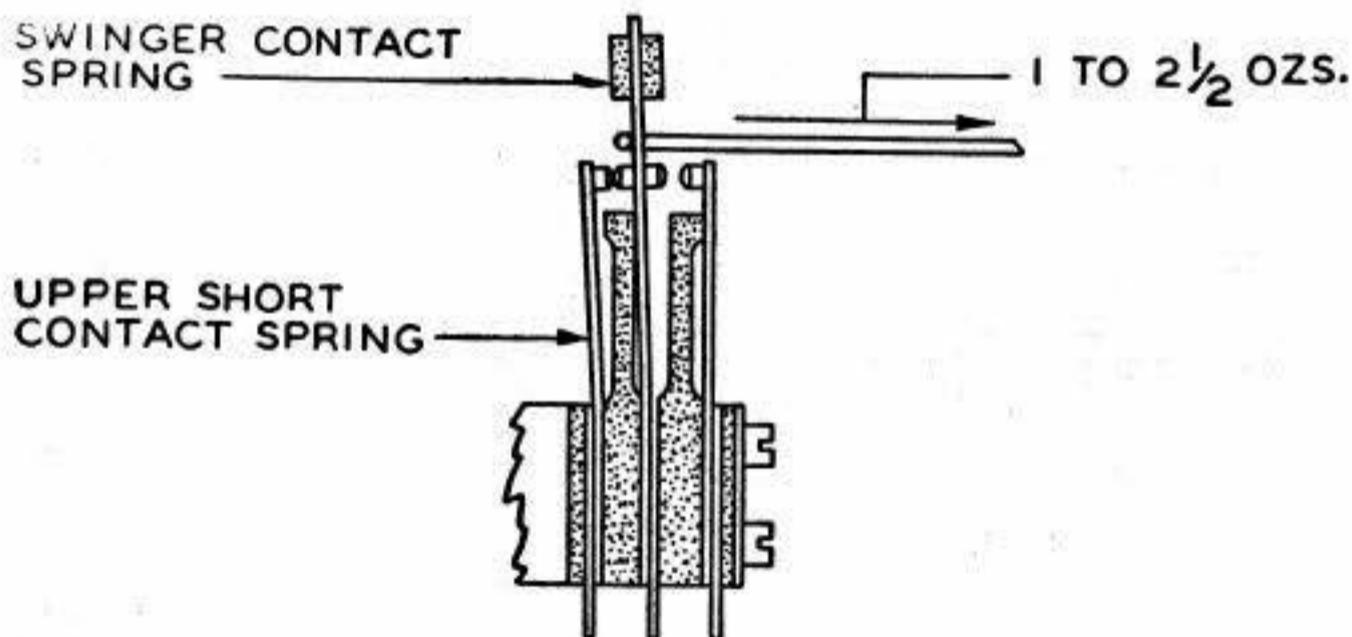


Fig 40

- (d) There should be at least .015" clearance between the contacts of the swinger and the contacts of the lower spring. To adjust, refine (b) and (c) above. **Fig 41**

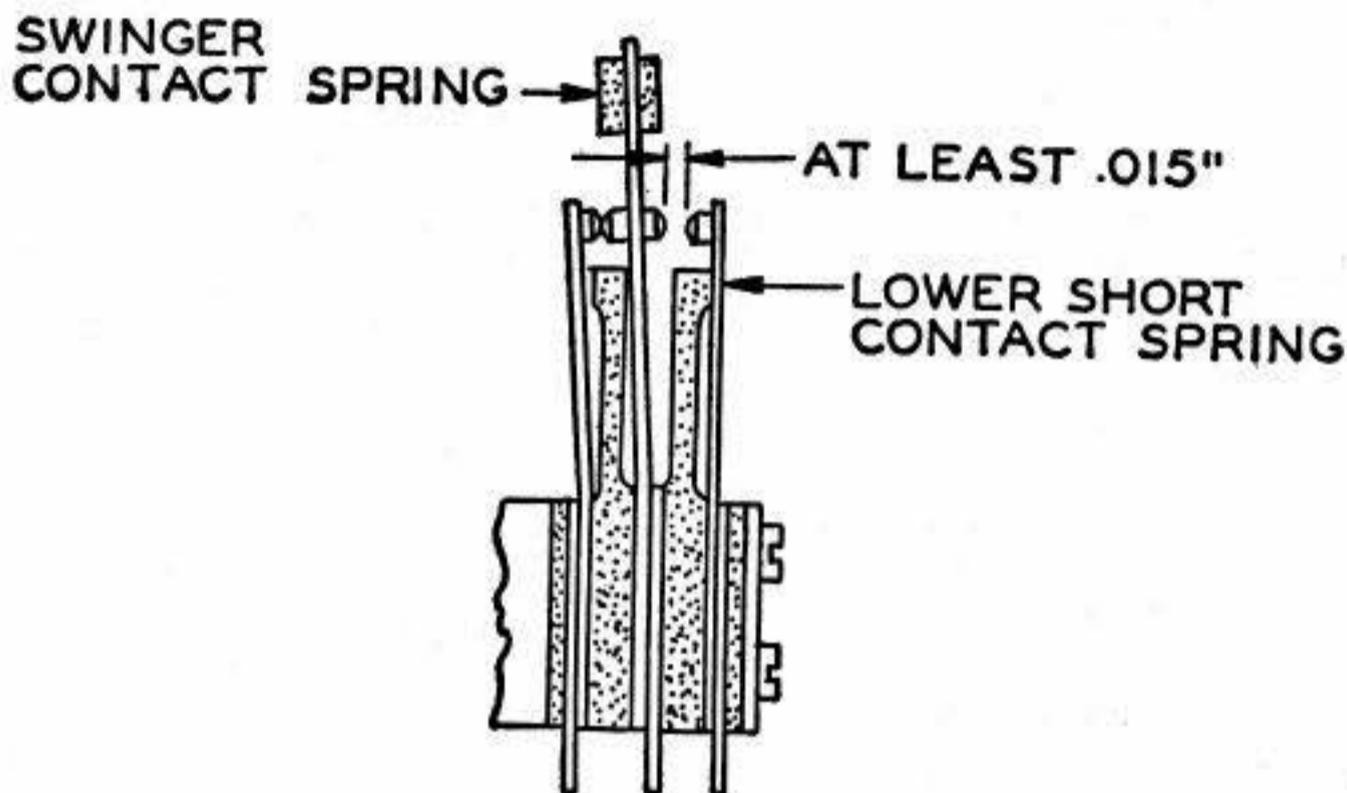


Fig 41

Note: Replace the mechanical timer in the reverse order of the Note directly under the heading of Part 4.

4.11 **Timer Position:** There should be a barely perceptible amount of backlash between the timer gear and the pinion on the main shaft.

(a) Gauge by eye and feel.

(b) To adjust: Loosen the mounting screws with the 541A wrench, press the right-hand end of the timer (as viewed from the rear with the unit resting on its top) down against its mounting screw and partially tighten the right-hand mounting screw. Press down slowly on the left-hand side until the proper backlash is obtained. Tighten all mounting screws.

4.12 **Sensing-Bail** should be in line with the No. 4 cam on the selector-sleeve. **Fig 42**

(a) Gauge by eye.

(b) To adjust: Loosen the two screws which mount the sensing-bail bracket and position the bracket by means of its mounting holes. Tighten the screws.

4.13 **Sensing-Bail Adjusting-Screw:** There should be some clearance, not more than .010", between the sensing-bail and the No. 4 cam on the selector cam-sleeve throughout the entire camming area, with the timer in its stop position.

Fig 42

- (a) To adjust: Loosen the sensing-bail adjusting-screw lock-nut and position the screw. Tighten the lock-nut.

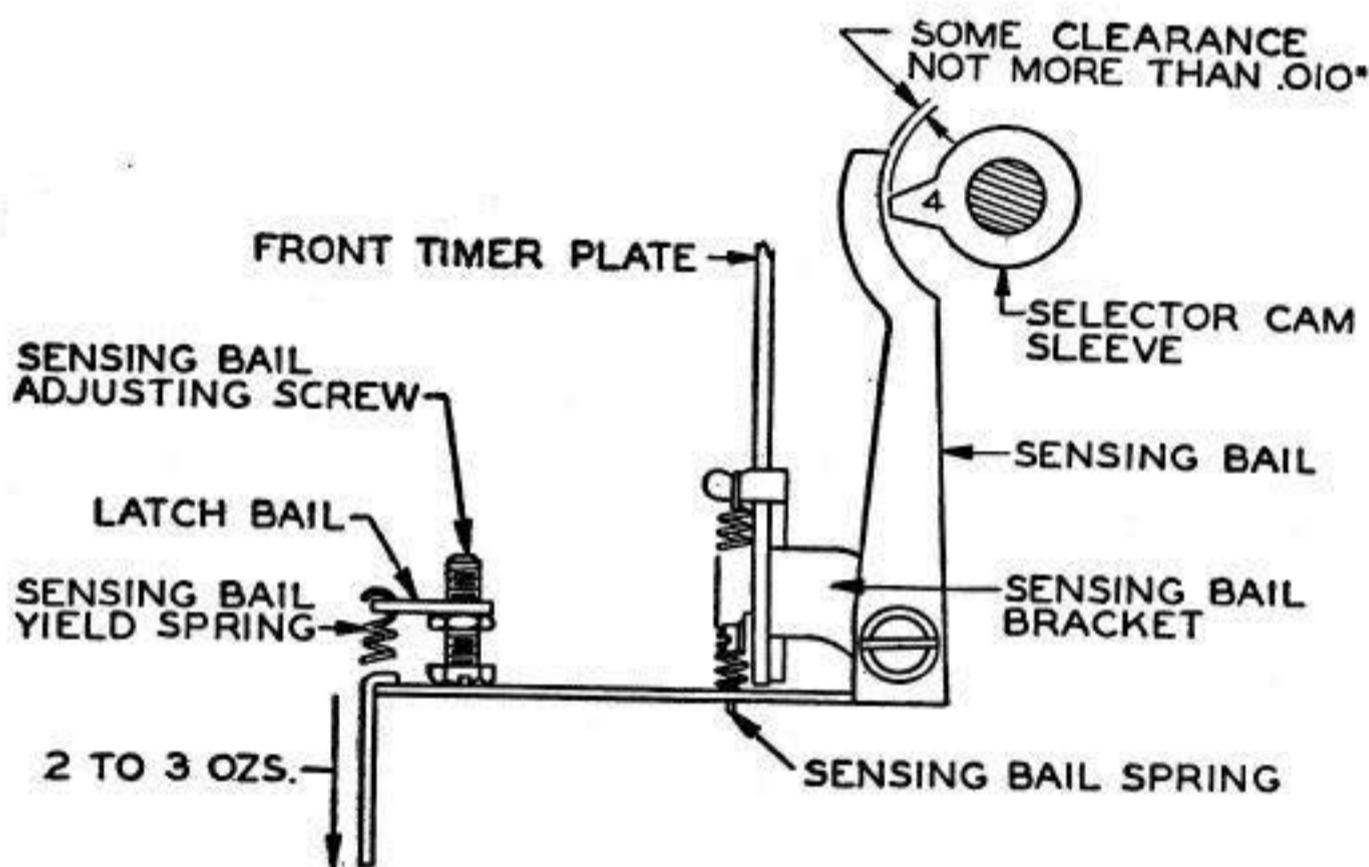


Fig 42

4.14 **Sensing-Bail-Bracket Adjustment:** When the requirements for the sensing-bail adjusting screw cannot be met, it may be necessary to position the sensing-bail bracket by means of its enlarged mounting holes. When the positioning of the sensing-bail bracket does not permit the clearance requirement, it may be necessary to refine the timer position adjustment. Recheck the sensing-bail adjusting-screw adjustment.

Fig 42

4.15 **Sensing-Bail Spring:** It should require Min 2 oz, Max 3 oz, to start the sensing bail moving.

Fig 42

- (a) To gauge: Rest the unit on its front, hook the pull-end of the scale over the end of the sensing bail at the yield-spring hole with the yield spring removed and pull at right angles to the bail. Rehook the yield spring.

4.16 **Sensing-Bail Yield Spring:** It should require Min 5 oz, Max 7 oz, to just separate the sensing bail and the sensing-bail adjusting screw. **Fig 42**

(a) To gauge: Rest the unit on its front and remove the sensing-bail spring. Hook the pull-end of the scale over the end of the sensing bail at the yield-spring hole and pull horizontally in line with the spring at the same time holding the latch bail against its cam. Rehook the sensing-bail spring.

4.17 **Contact Mounting-Plate Adjustment:** With the space-operating lever latched and the contact bail latched against the holding-lever latch there should be a clearance of Min .005", Max .015" between the lower short contact spring and its backstop. To adjust, loosen the four screws holding the contact mounting-plate and position the plate to meet this requirement. Tighten the four plate mounting screws. **Fig 43**

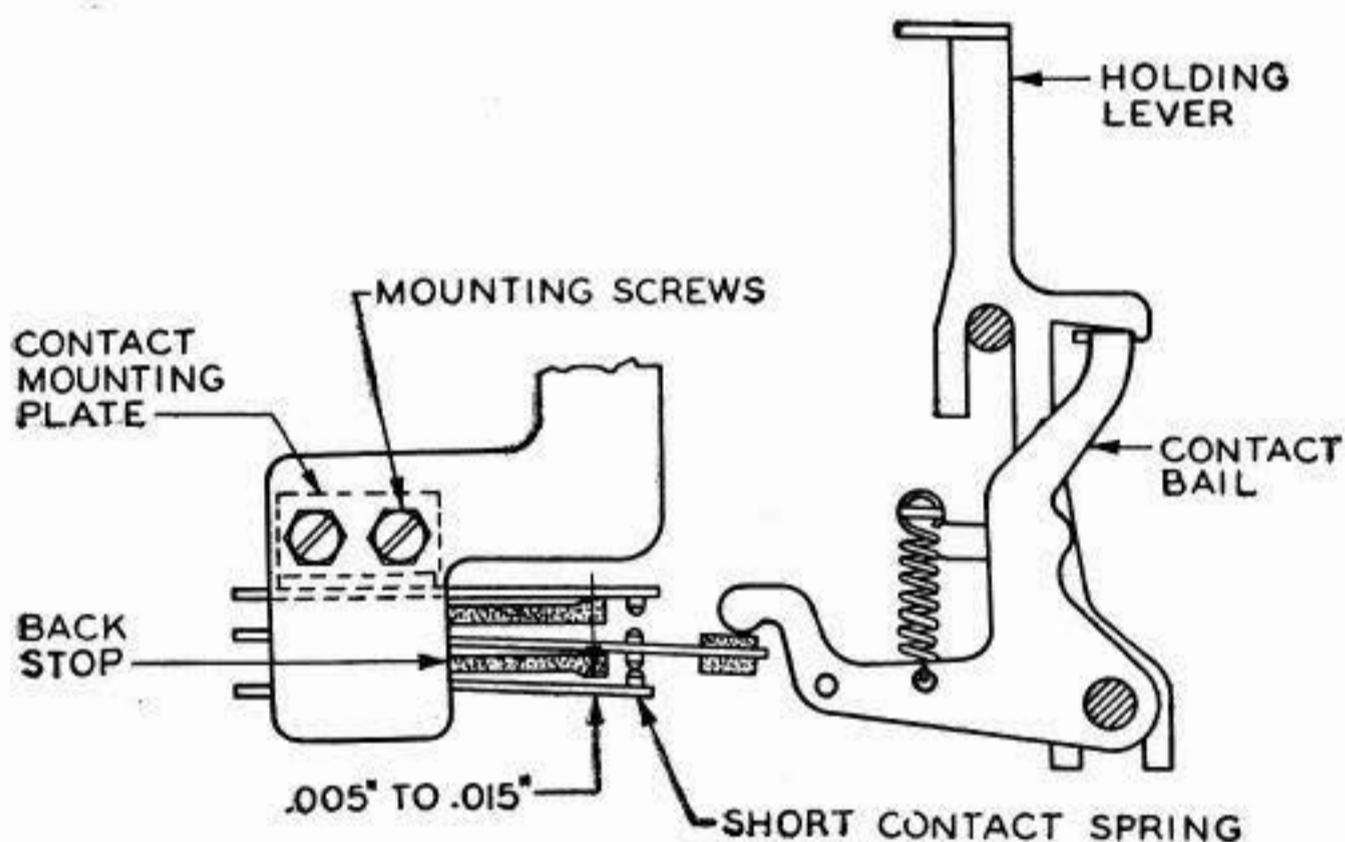


Fig 43

4.18 **Contact Holding Lever:** (BS6L) With the unit in the STOP position and the SPACE operating lever unlatched, there should be some clearance, not more than .010" between the top of the contact-operating bail and the lower surface of the contact-bail-holding lever. **Fig 44**

(a) Adjust by means of the adjustment screw.

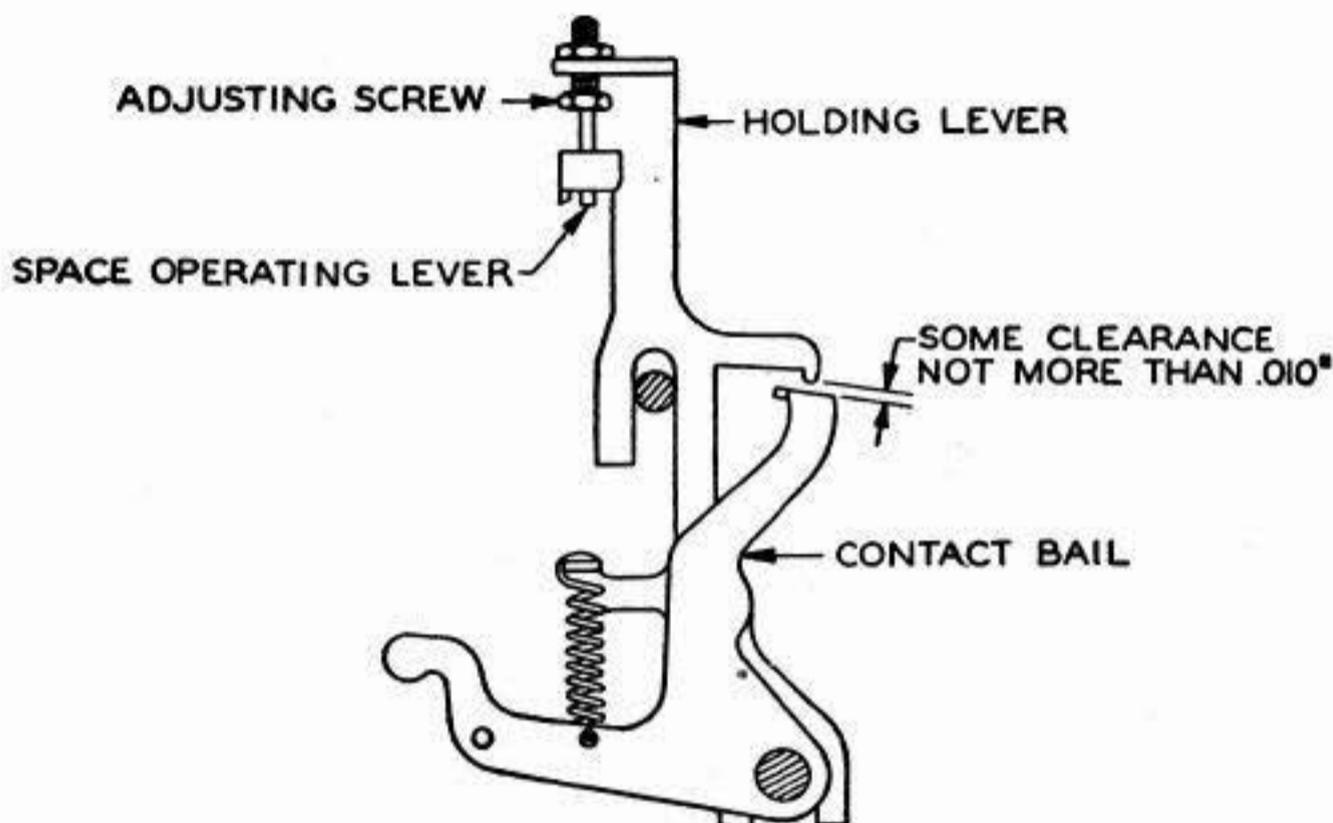


Fig 44

4.19 **Contact-Bail and Holding-Lever Spring:** (BS6L) With the unit in its STOP position and the SPACE operating lever resting against its backstop, place the push-end of an 8-oz scale on the lower projection of the holding lever. It should require Min 1-1/2 oz, Max 2-1/2 oz to just start the lever moving. **Fig 44**

4.20 **Contact-Bail Spring:** (BS3C) It should require Min 1/2 oz, Max 1 oz, to just start the bail moving.

(a) To gauge: Rotate the timer shaft to its stop position, hook the pull-end of the scale over the bail at the spring-hole and pull horizontally in line with the spring.

4.21 **Timer Blocking-Bar: (BS6L)** With any selection, except SPACE, X or BLANK, set up on the SEQUENTIAL SELECTOR, the timer blocking-lever on the high part of its cam, and the codelevers resting on the vanes, there should be some clearance, not more than .010", between the top of the timer blocking-bar and its associated function lever. To adjust, loosen the lock-nut on the timer blocking-bar adjusting screw and position the adjusting screw. Tighten the lock-nut. **Fig 45**

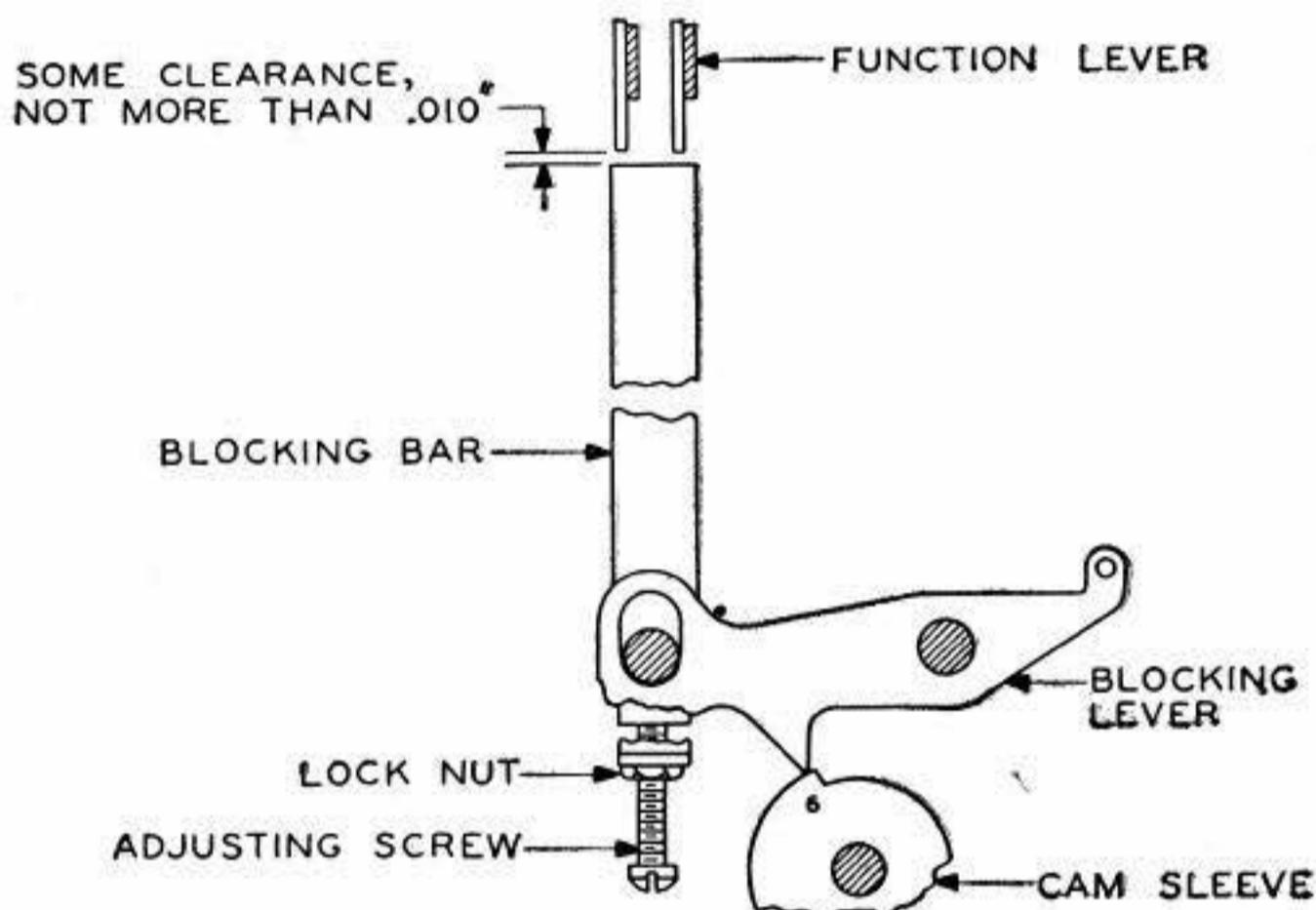


Fig 45

4.22 **Clutch Torque:** It should require Min 20 oz, Max 24 oz, to start the cam moving away from its blocking bail.

Fig 46

(a) To gauge:

- (1) Remove all cam-follower springs with the exception of the blocking-bail spring (No. 1 cam).
- (2) With the felt friction-washers on either side of the gear freshly lubricated, allow the unit to run in its stop position for at least ten minutes.
- (3) Insert the pull-end of the scale through the function levers and hook the scale under the lug of the No. 1 cam and pull upward.

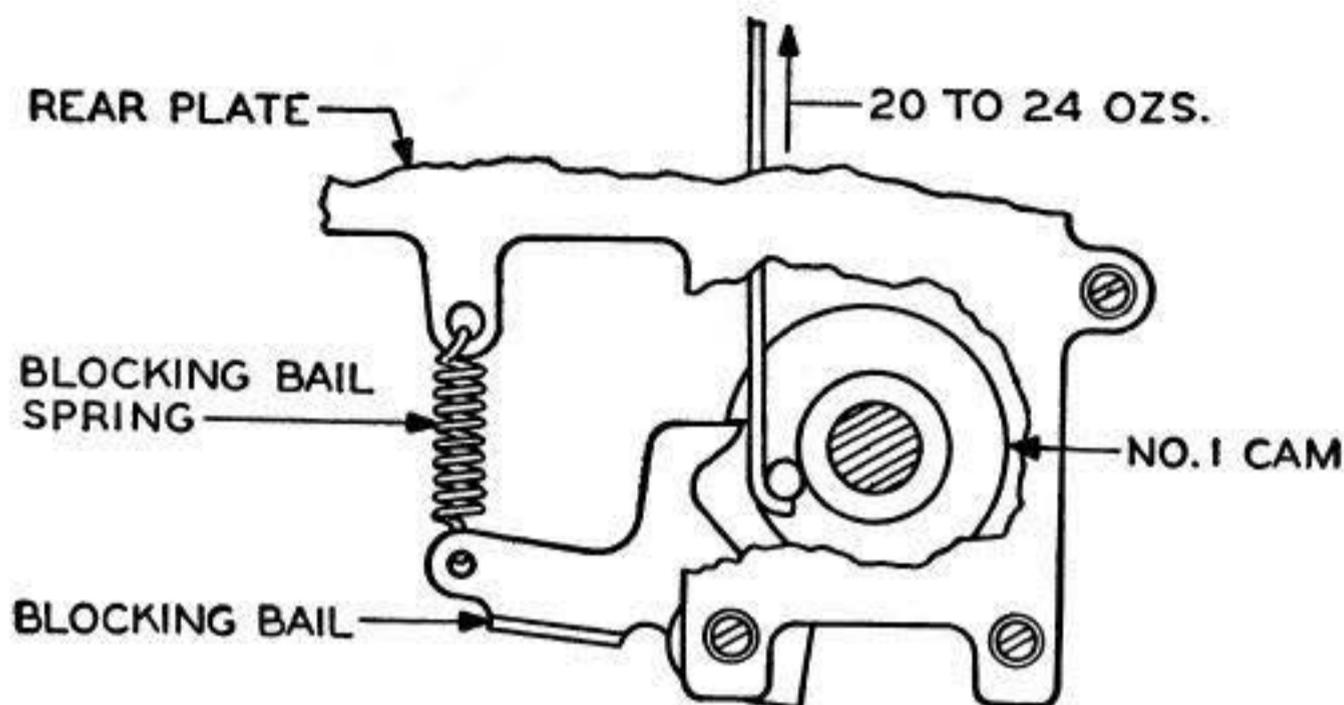


Fig 46

(b) To adjust:

(1) Note the condition of the felt friction-washers.

If the washers are glazed or hardened, replace the washers by removing the timer assembly. To remove the felt friction-washers, turn the retaining-disc counter-clockwise with a screwdriver while holding the shaft. Replace the friction-washers and remount the timer assembly.

(2) If the clutch torque still does not meet the requirement, rotate the timer cam-sleeve until the clutch driving-member mounting screw is easily accessible. Loosen the screw and adjust the collar by means of its enlarged mounting hole to increase or decrease the clutch-spring tension. Tighten the setscrew.

5. H-ANSWERBACK MECHANISM (BS6L)

5.01 **Latch and Bail-Shaft Endplay:** The latch-bail shaft should have some endplay, not more than .006". To adjust, position the triplatch and the triplatch bail by means of the mounting screws.

Fig 47

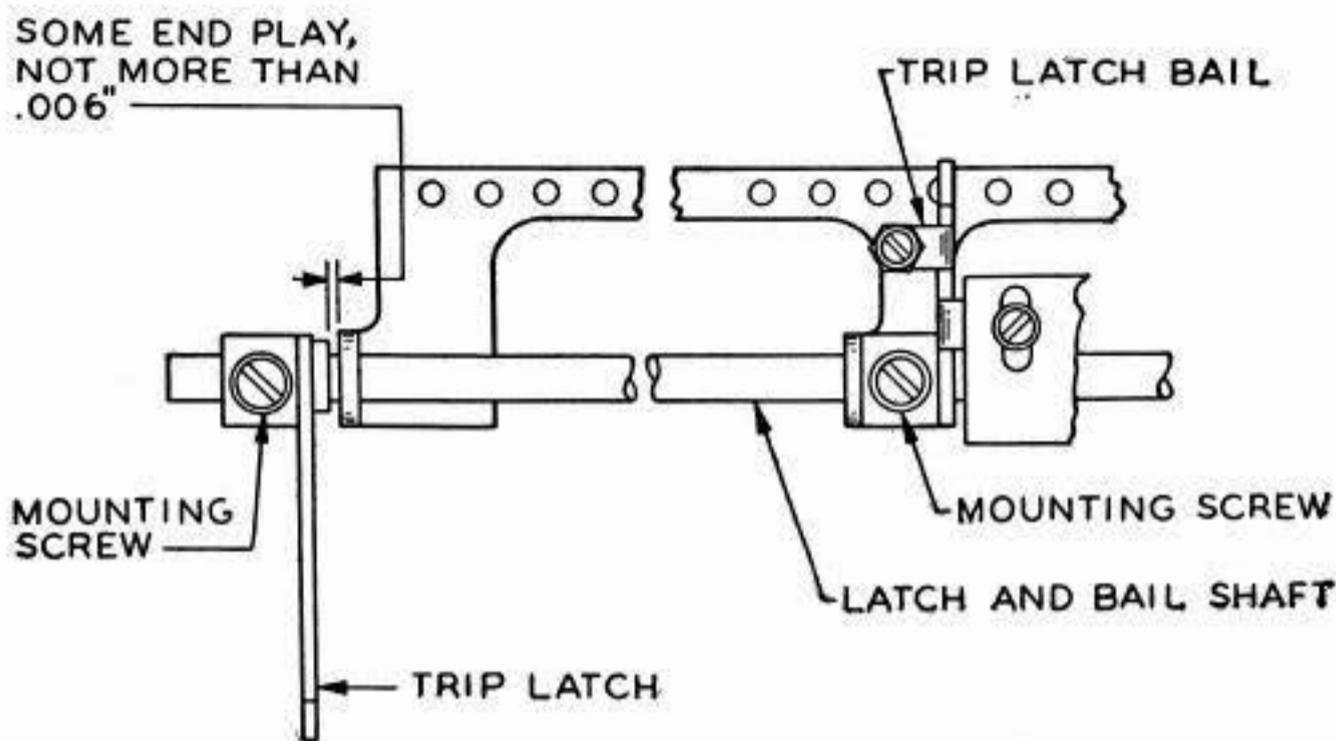


Fig 47

5.02 **Cam-Follower Reset:** With the cam follower resting on the highest part of the cam and the trip and auxiliary latches latched, there should be a clearance of Min .015", Max .025" between the cam-follower lever and the latching surface of the triplatch. **Fig 48**

To adjust: Loosen the clamping screw and position the cam-follower lever to meet the above requirements. Tighten the screw.

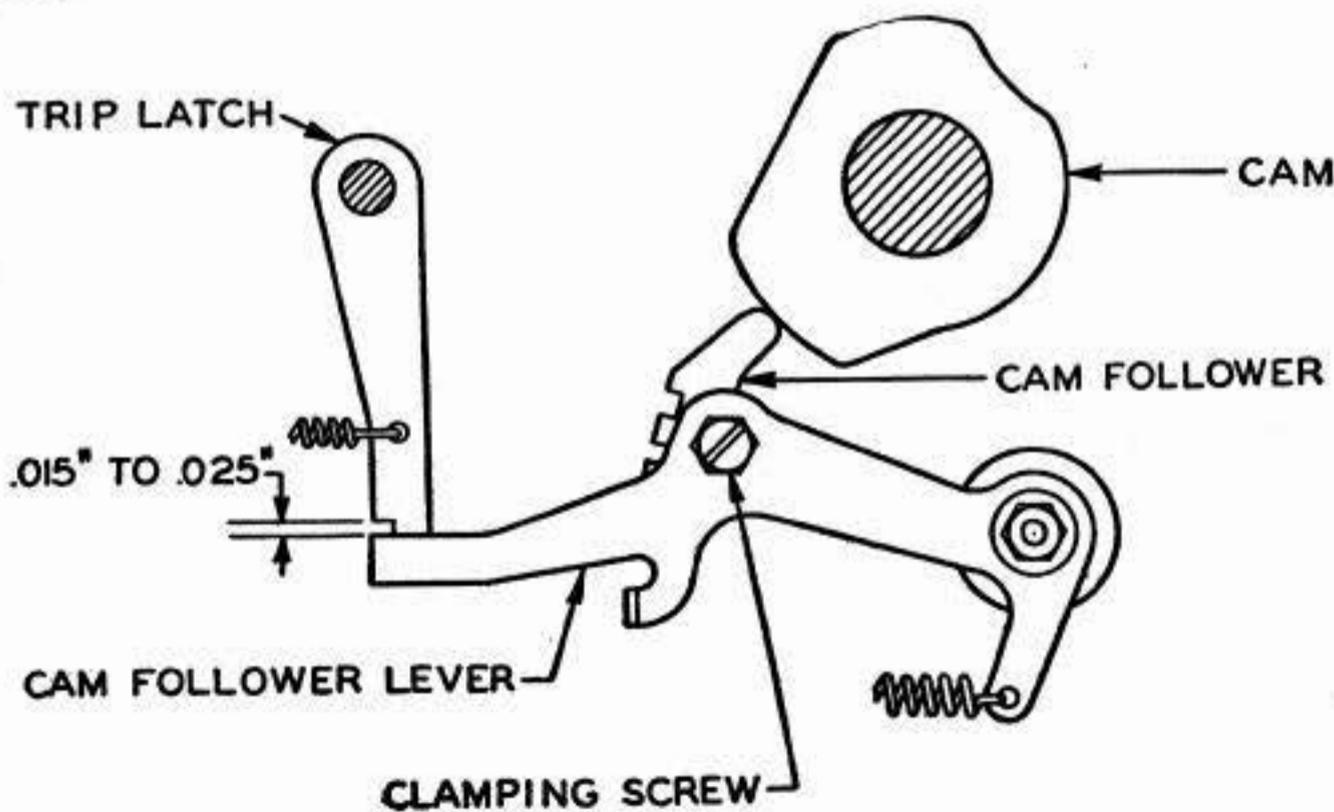


Fig 48

5.03 **Triplatch-Bail Blade:** With each one, in turn, of the 4 transmitter-start-operating levers (8-11, inclusive) in its latched position and with the cam follower on the low part of its cam, there should be a clearance of Min .005", Max .025", between the triplatch and the end of the cam follower at the closest point. To be sure that the closest point is gauged, move the follower manually through its entire travel, holding the auxiliary latch out of the way. **Fig 49**

(a) To adjust:

- (1) Latch operating levers 8 and 11 by pushing them down manually, from the rear of the unit against the triplatch-bail blade.
- (2) Loosen the 2 bail-blade mounting screws, friction-tight.
- (3) Move the blade up against operating lever 8 until the clearance requirement is met.
- (4) Adjust the opposite end of the blade so that it just touches operating lever 11.
- (5) Rotate the main shaft to unlatch levers 8 and 11.
- (6) Latch, in turn, levers 8, 9, 10, and 11, individually, and check the clearance for each one.
- (7) Tighten the blade mounting screws.

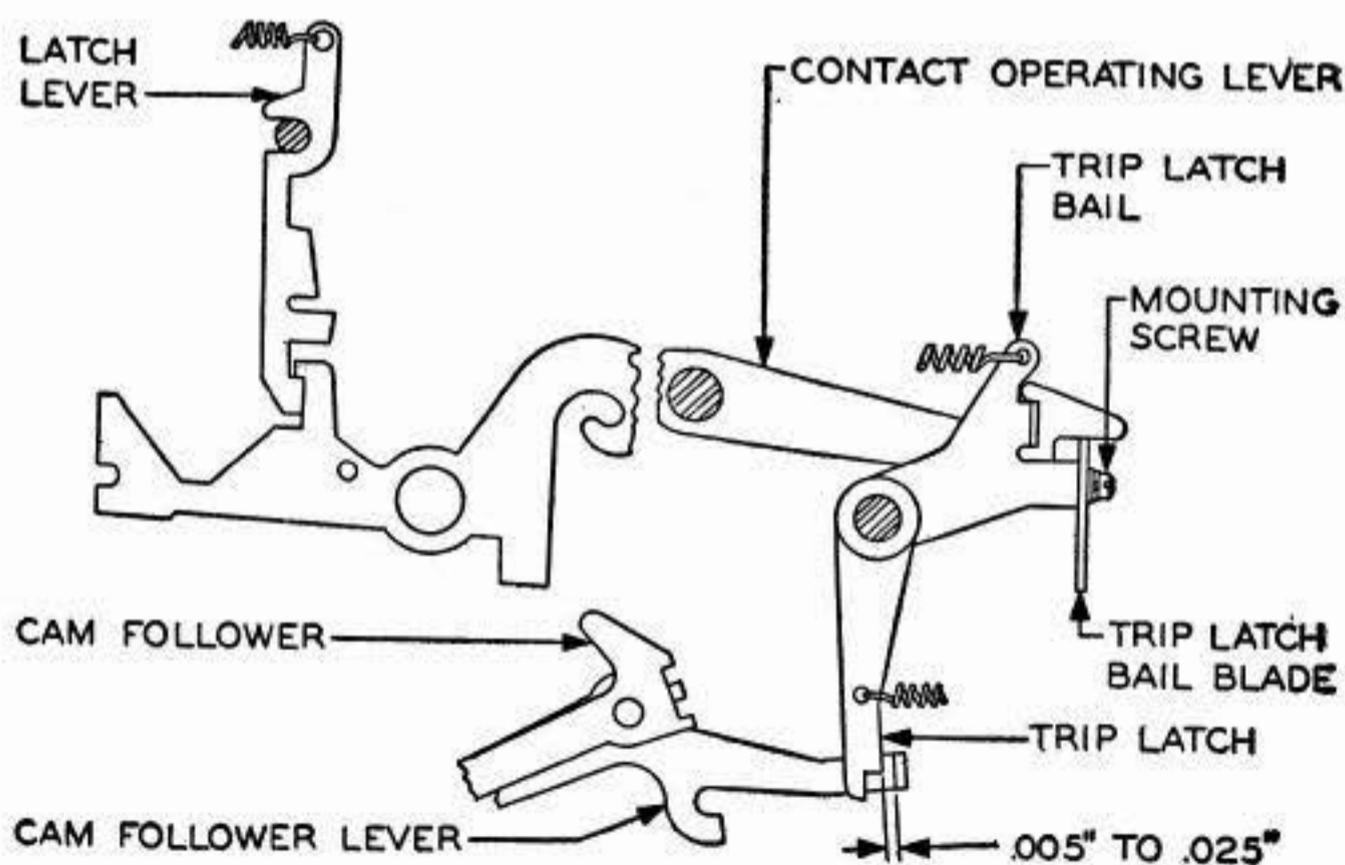


Fig 49

5.04 Transmitter-Start-Levers Blocking-Bail-Screw Adjust-[↙]ment:

With the four transmitter-start function levers fully selected and the H-answerback cam follower latched and the blocking bail against the adjusting screw there should be a clearance of Min .015", Max .025" between the rear edge of the blocking-bail blade and the front edge of the blocking projection of the function lever with the least clearance. To select the function levers, remove the four codelevers and manually raise the space contact-operating lever to its latched position and rotate the main shaft until the mainbail is in its lowest position. Tighten the lock-nut and replace the codelevers. **Fig 50**

To adjust, loosen the lock-nut and position the adjusting screw to meet this requirement. Tighten the lock-nut. [↙]

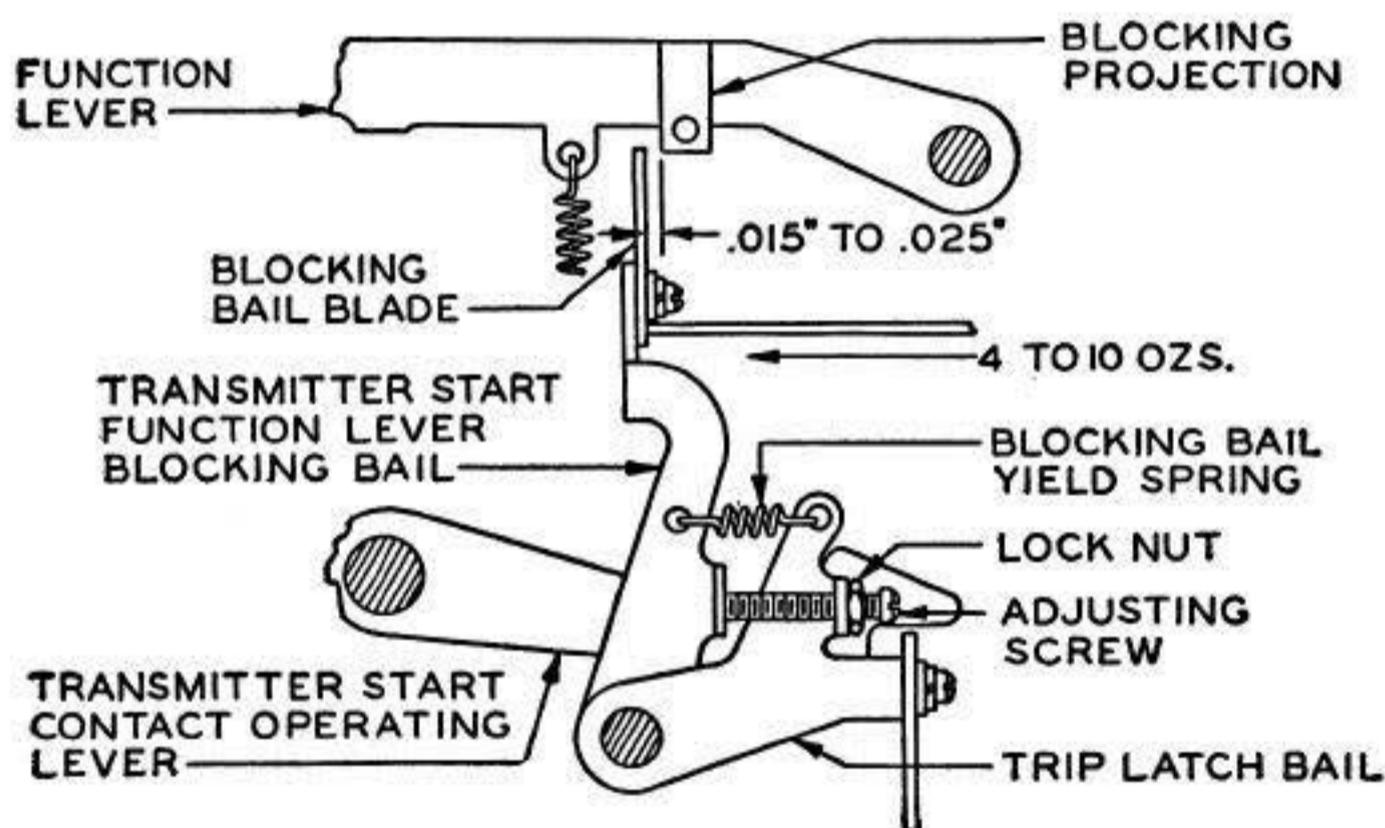


Fig 50

5.05 Transmitter-Start-Levers Blocking-Bail-Blade Adjust-[↙]ment:

With the unit in the stop position, the answerback cam-follower lever unlatched and the four operating levers associated with the transmitter start positions manually raised to their latched position (see 5.03), there should be from Min .015", Max .025" between the blocking-bail blade and the projections on the function levers. To adjust, loosen the two blade mounting screws and position the blade to meet the above requirement. Tighten the two screws. **Fig 51** [↙]

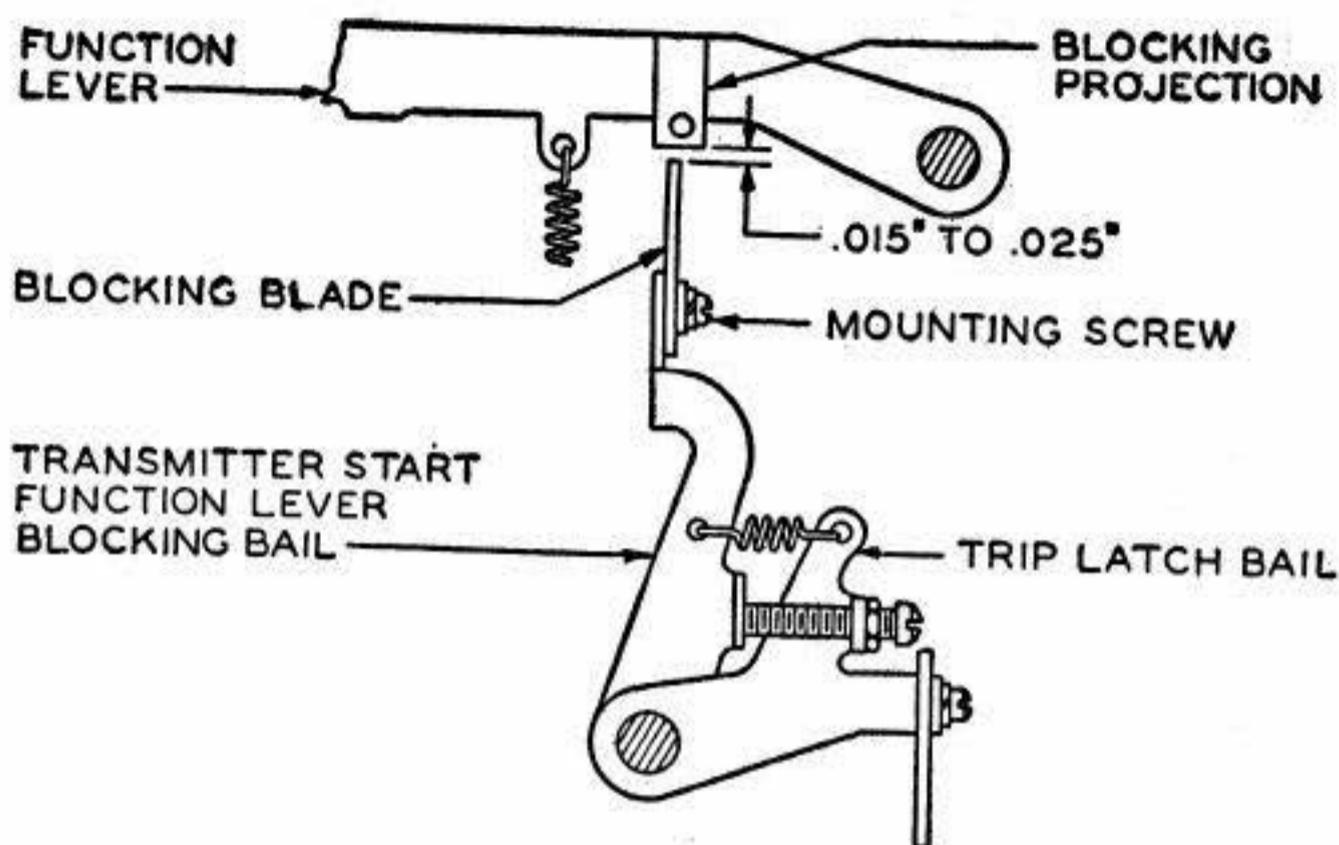


Fig 51

5.06 **Transmitter-Start Contact-Operating-Lever-Yoke Yield Spring:** With the unit resting on its back, hook a 64-oz scale over the spring extension of the yoke and pull horizontally and in line with the spring. It should require Min 40 oz, Max 50 oz to just start the yoke moving.

Fig 52

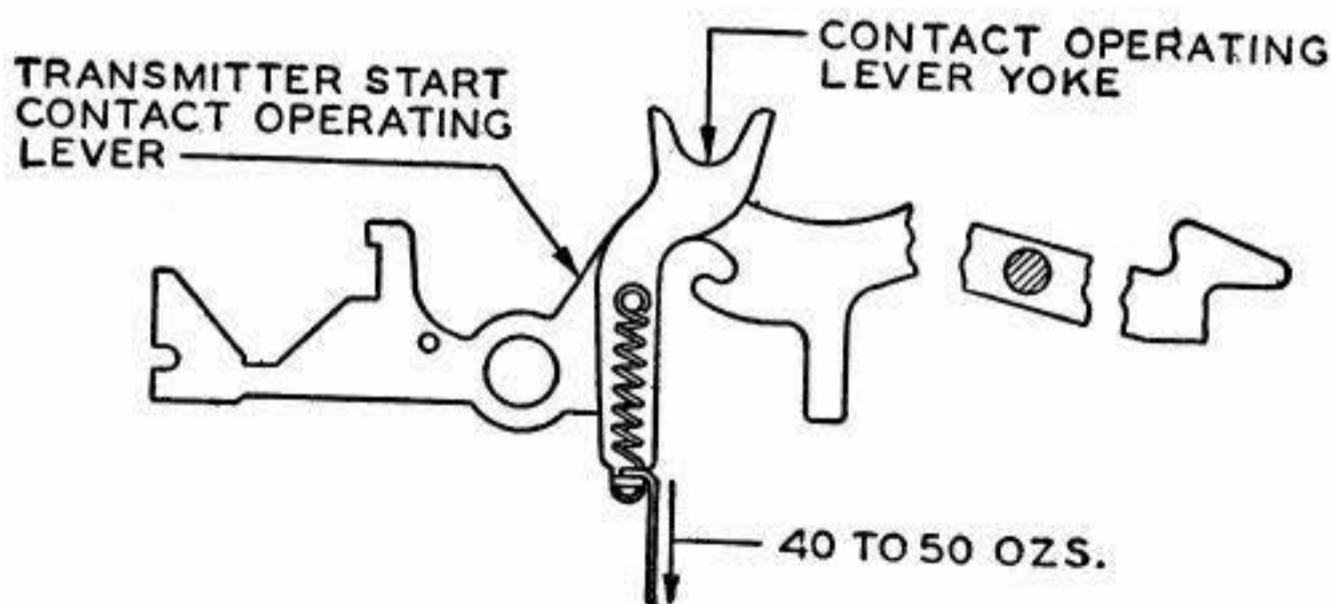


Fig 52

5.07 **Cam-Follower Spring:** With the unit on its front, the cam follower on the highest part of the cam and with the hook end of a 32-oz scale hooked at the end of the cam-follower lever and pulled at right angles, it should require Min 9 oz, Max 11 oz to start the cam follower moving. Hold off auxiliary latch.

Fig 53

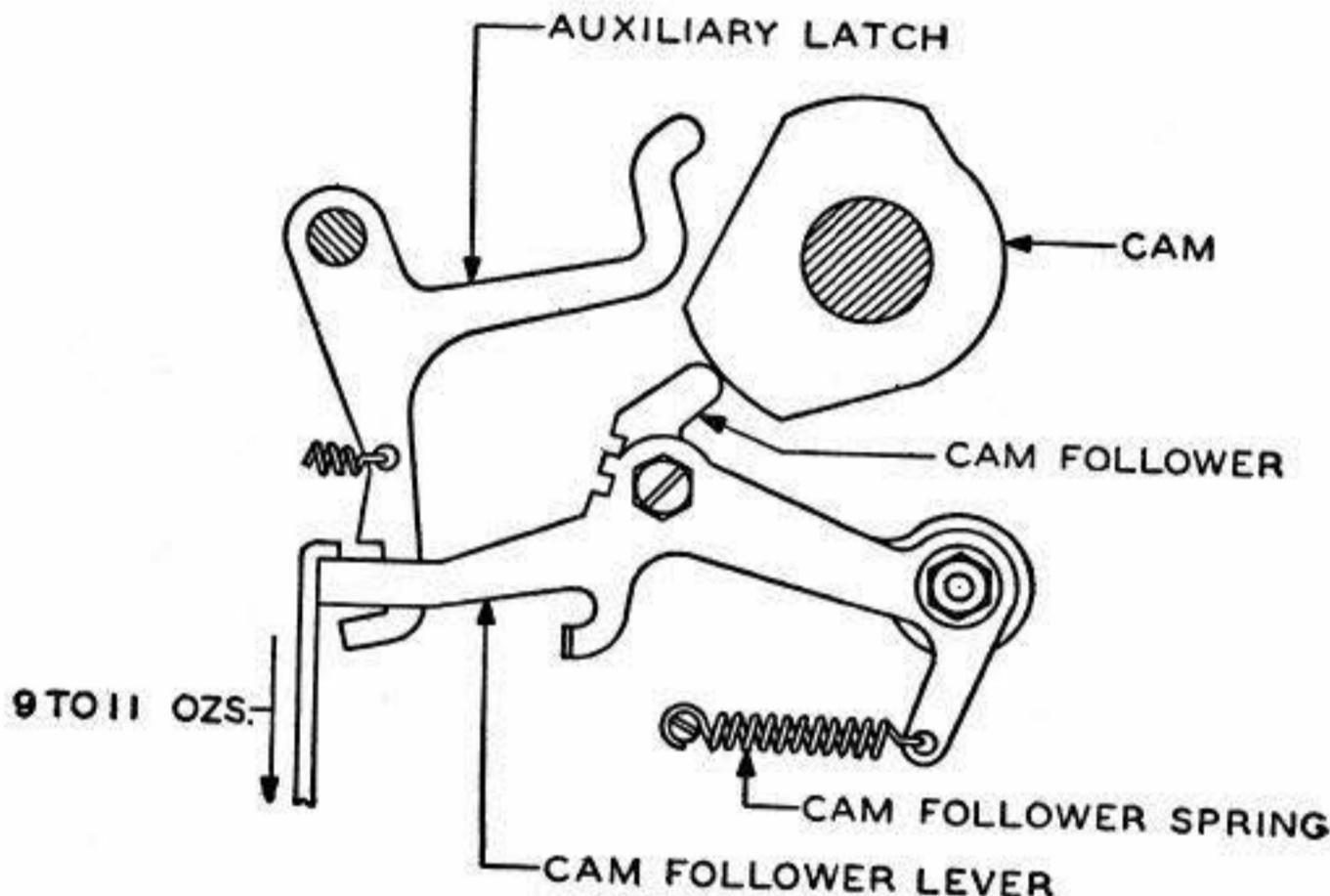


Fig 53

5.08 **Triplatch Spring:** With the unit on its front, the triplatch unlatched, and with the push-end of an 8-oz scale applied at the extreme end of the latch at right angles to the latch, it should require Min 5-1/2 oz, Max 6-1/2 oz to start the latch moving.

Fig 54

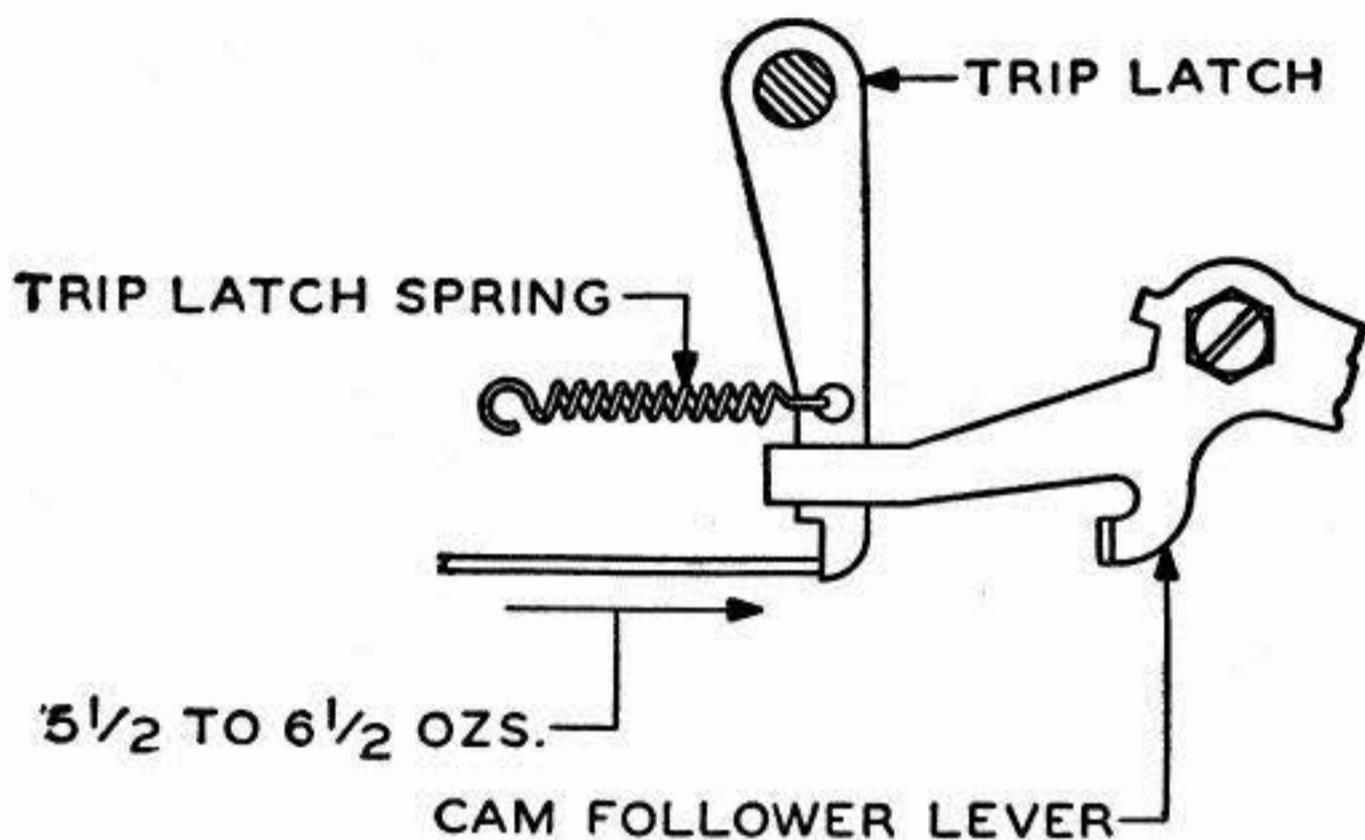


Fig 54

5.09 Transmitter-Start-Levers Blocking-Bail Yield Spring:

With the unit in the normal stop and operating position and with the push-end of an 8-oz scale applied against the blocking bail just below the left-blade mounting screw it should require Min 4 oz, Max 10 oz to start the bail moving. **Fig 50**

Note: If the above spring tension is not found, it may be necessary to reposition the triplatch bail and the triplatch on the shaft by utilizing the clearance in the mounting holes and readjusting the triplatch-bail blade.

5.10 Auxiliary Latch Spring: With the unit in the normal operating position and with the auxiliary latch on the highest part of its cam and the triplatch latched, apply the push-end of an 8-oz scale to the extreme end of the auxiliary latch. It should require Min 3 oz, Max 4 oz to start the auxiliary latch moving.

Fig 55

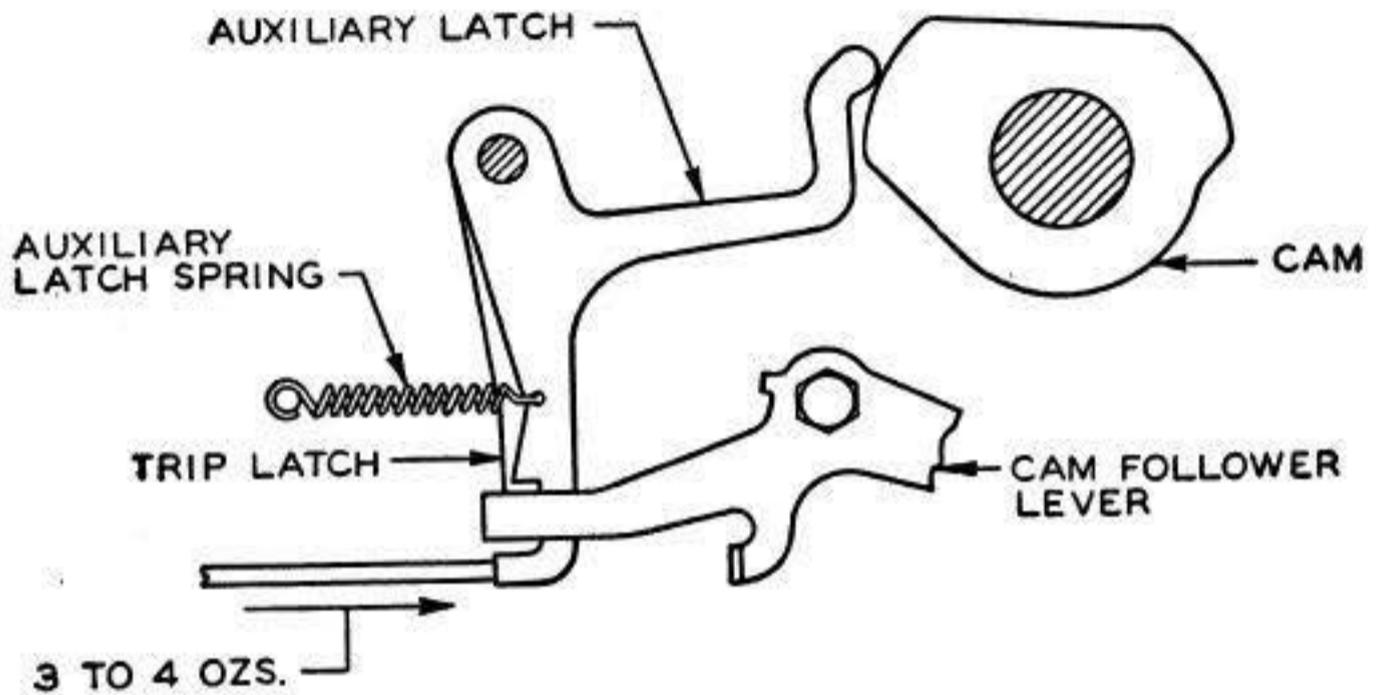


Fig 55

5.11 Printer Cut-on Levers Blocking Bail:

(a) With the selector unit in the STOP position and the SPACE contact-operating lever in its latched position, there should be Min .015", Max .025" clearance between the top of the blocking blade and the bottom of the stop lugs on the function levers. There should also be some endplay, not more than .006", of the blocking blade on its shaft. To adjust, loosen the blocking-blade mounting screws and the eccentric screws, and position the blade vertically for the Min .015", Max .025" clearance. Move the blade mounting arms horizontally for the endplay adjustment. Retighten blade mounting screws and then position eccentric stops against blocking-bail blade and tighten eccentric screws.

Fig 56

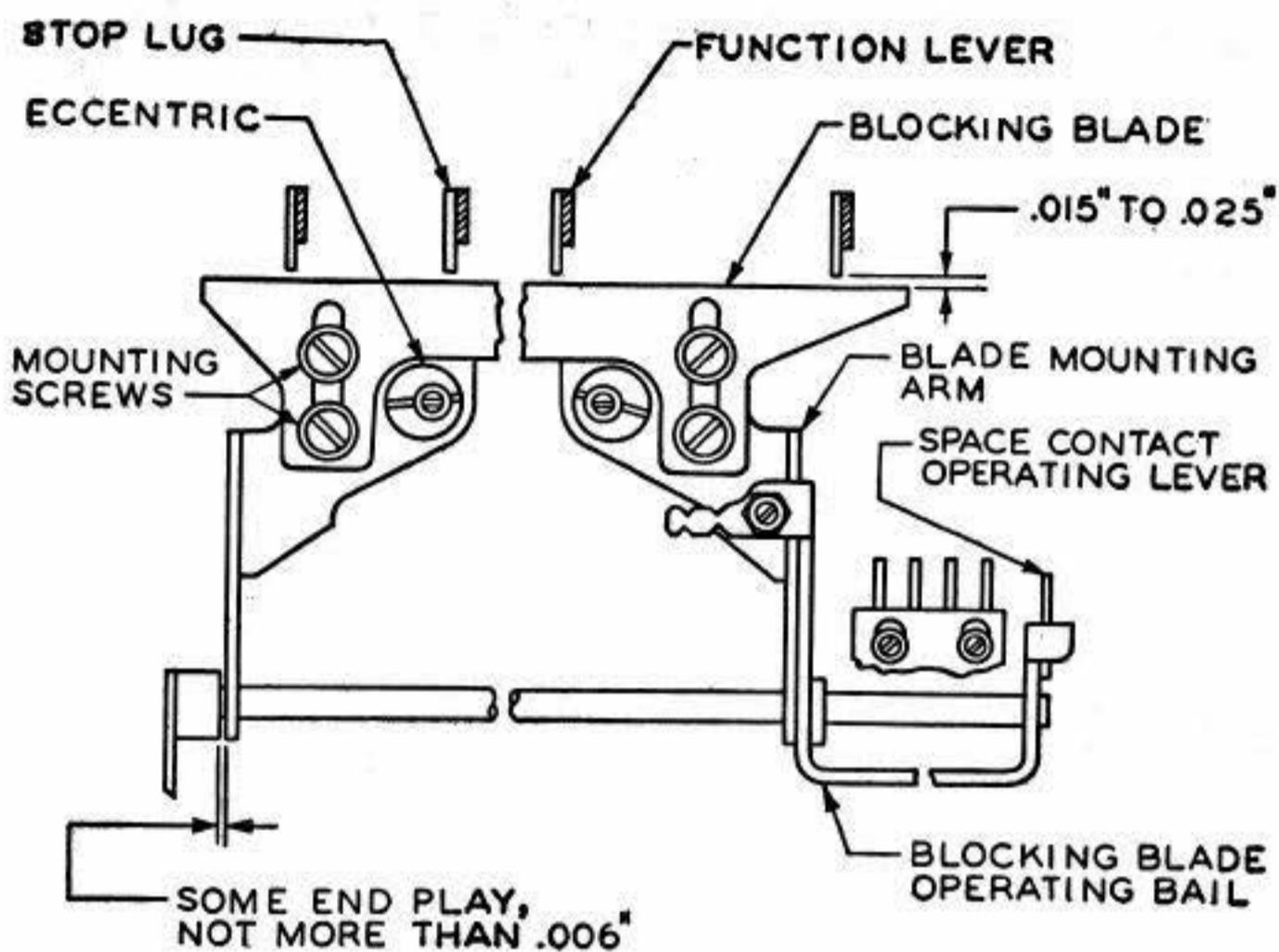


Fig 56

(b) With the SPACE contact-operating lever in its unlatched position and with all the common function levers fully selected, there should be Min .015", Max .035" clearance between the front of the stop lugs on the function levers and the rear of the blocking blade. To adjust, loosen lock-nut, position the blocking-bail blade setscrew and tighten the lock-nut.

Fig 57

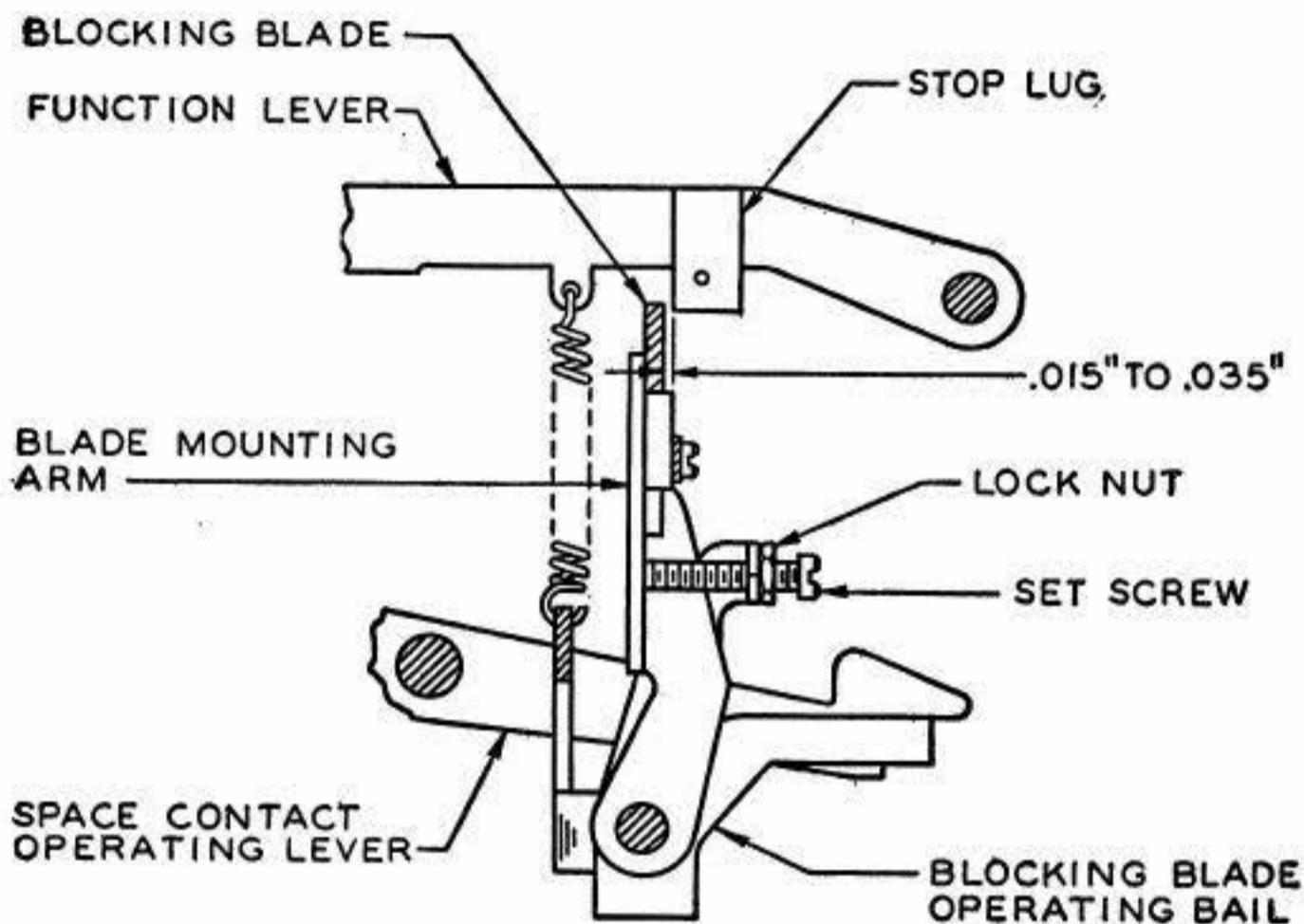


Fig 57

(c) With the selector unit in its STOP position, apply the pull-end of a 32-oz scale on the blocking-blade operating bail just above the setscrew and pull outward in line with the spring. It should require Min 6 oz, Max 14 oz to start the bail moving away from the extension on the SPACE operating lever.

Fig 58

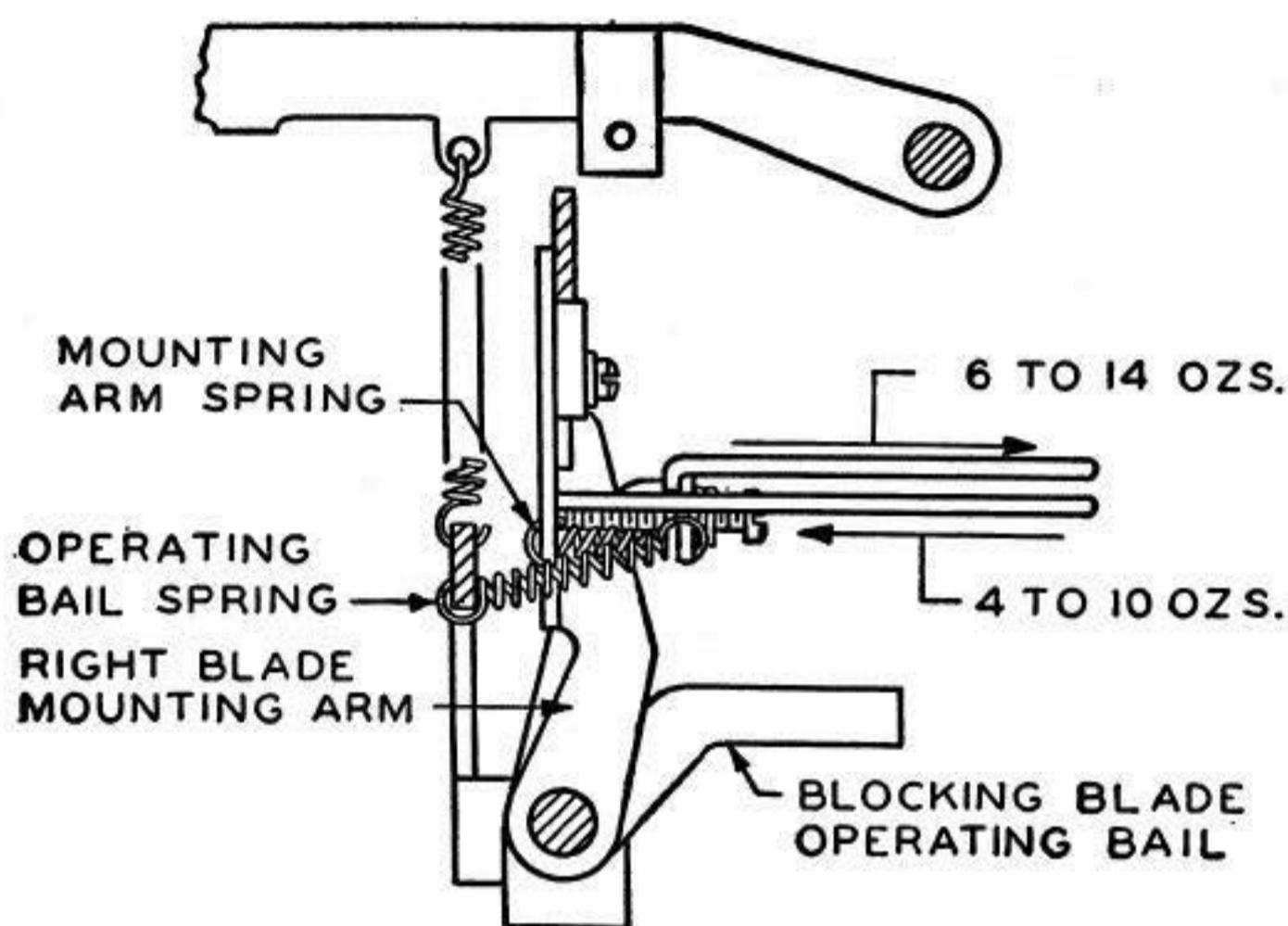


Fig 58

(d) With the push-end of a 32-oz scale applied to the right-hand blocking-bail mounting arm, in line with the spring, it should require Min 4 oz, Max 10 oz to just start the blocking-blade assembly moving away from the blocking-blade-operating bail setscrew.

Fig 58

5.12 **H-Distributor Contacts:** (The following preliminary adjustments under (a), (b) and (c) are to be made with the contact assembly and bracket removed from the unit and with the unit resting on its front.)

(a) Position the short contact spring so that there is a clearance of Min .020", Max .030" between the tip of the spring and the tip of the backstop plate. To adjust, back off the backstop screw and bend the short contact spring to meet this requirement.

Fig 59A

(b) With the short contact spring positioned by means of the backstop screw so that it is approximately parallel with the backstop plate, there should be a pressure between the spring and the backstop screw of at least 8 oz, measured by applying the push-end of a 32-oz scale to the end of the short contact spring. Hold the long contact spring away

from the short contact spring when checking this tension. If necessary, adjust by bending the short contact spring.

Fig 59B

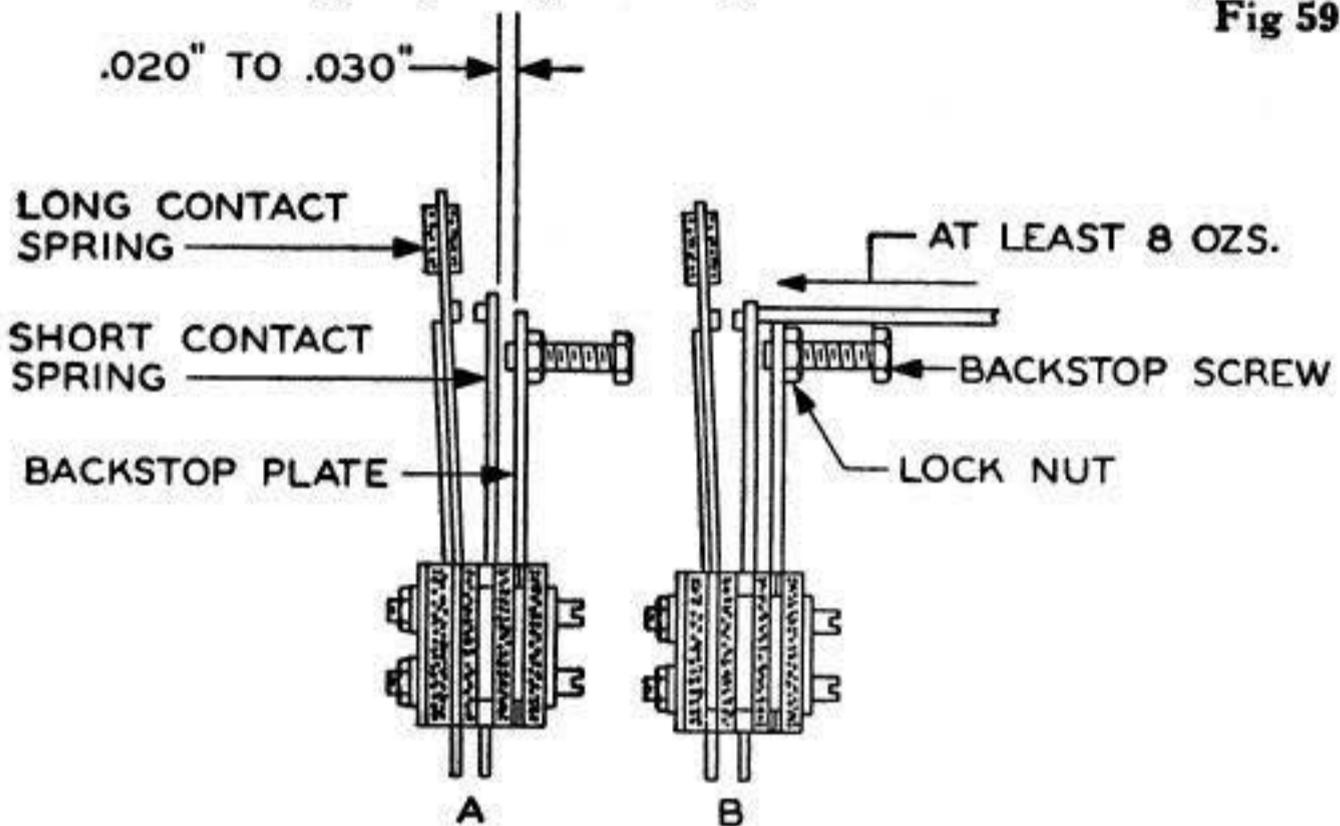


Fig 59

(c) With the long contact spring resting against the short contact spring, it should require a pressure of Min 4-1/2 oz, Max 5-1/2 oz to open the associated contacts when the push-end of an 8-oz scale is applied to the long contact spring just above the contact point. To adjust, bend the long contact spring.

Fig 60

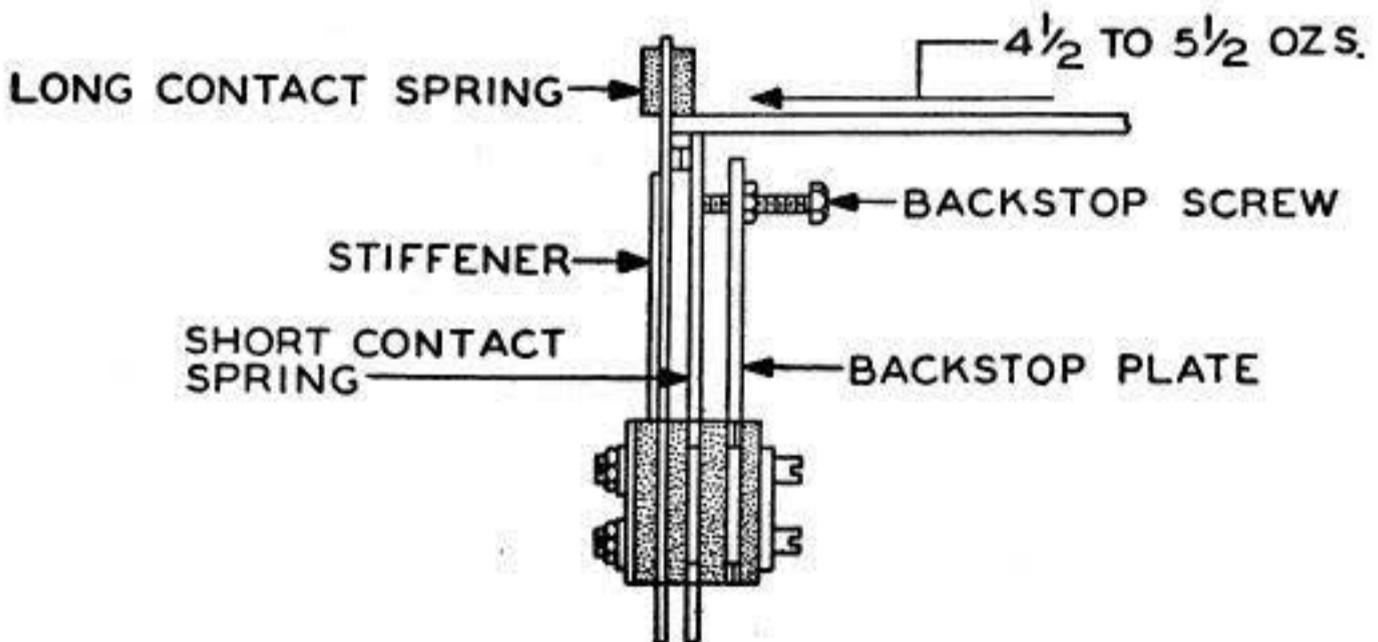


Fig 60

Note: Remount the Contact Assembly and Bracket

(d) There should be a clearance of Min .010", Max .020" between the bakelite tip of the long contact spring and the cam follower when the cam follower is on the MARKING (small lobe) portion for the No. 3 element of the cam. To adjust, loosen the contact bracket mounting screws and reposition the bracket. Tighten the mounting screws. **Fig 61**

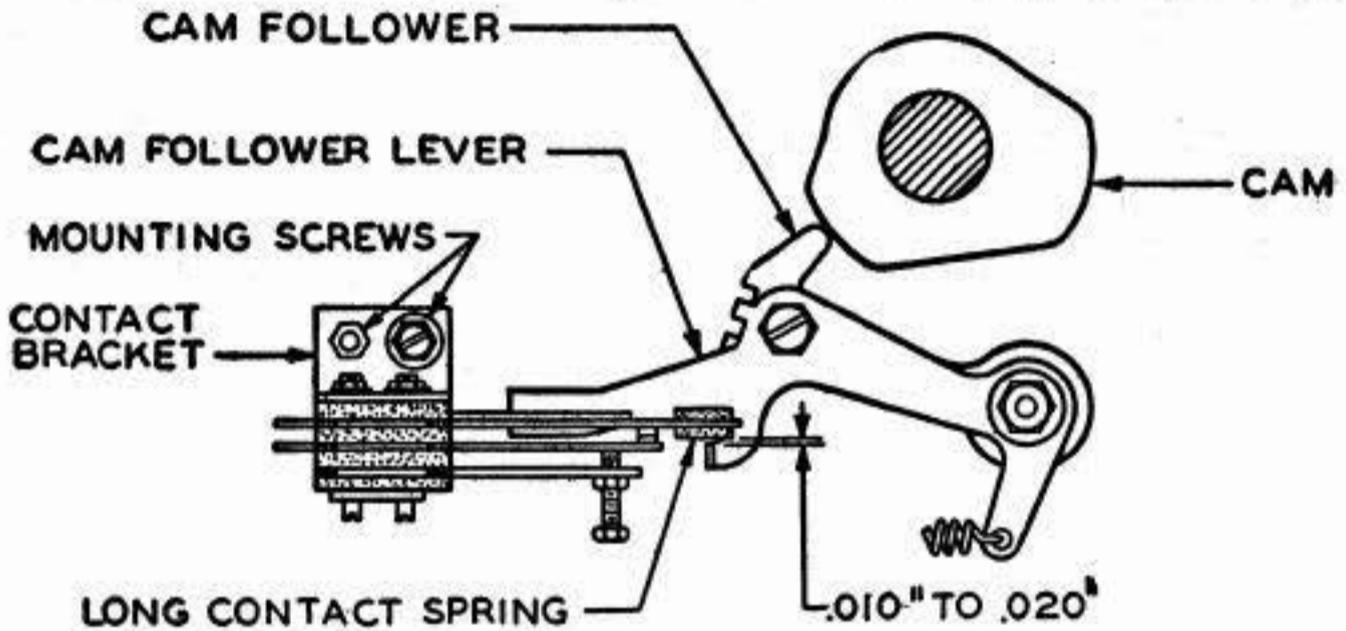


Fig 61

(e) With the cam follower on the low part of the cam there should be a Min .020", Max .025" gap between the contact points. To adjust, loosen the nut and position the eccentric stop-post with the high part of the eccentric furthest away from the follower pivot point. Tighten the post mounting nut. **Fig 62**

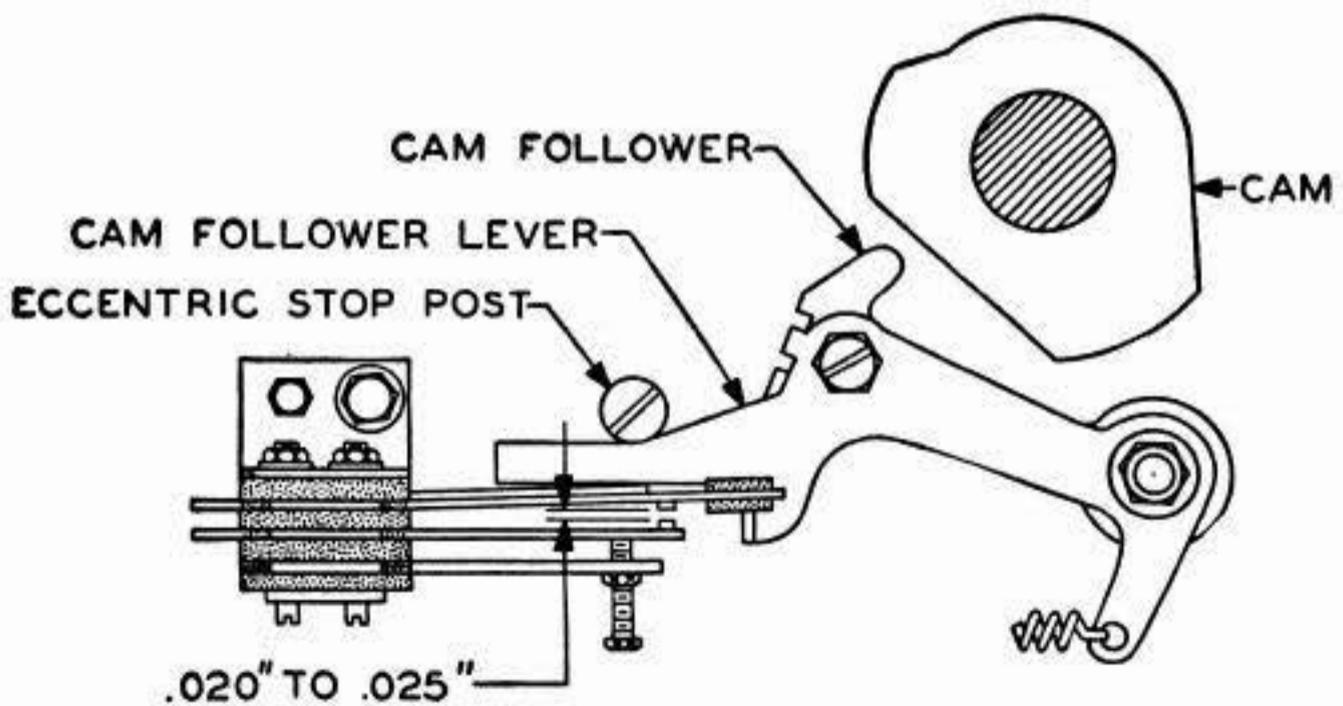


Fig 62

(f) If a 1A Teletypewriter Test Set is available it should be equipped with an appropriate set of gears (see note) and the contact-closure timing refined in the following manner:

Note: To assist in testing BS6L units equipped with H-answerback contacts, special gears as listed below have been provided for the 1A Teletypewriter Test Set for viewing signals generated by the H-answerback contacts:

Sets of Gears for 1A Teletypewriter Test Set

<u>Set of Parts No.</u>	<u>Nominal Speed of Sotus</u>		<u>Test Set</u>	
	<u>Words per Min.</u>	<u>Operations per Min.</u>	<u>Motor</u>	<u>Rotor R.P.M.</u>
TP122226	60	368	Synchro	420
TP122855	60	368	Governed	420
TP122093	75	460	Synchro	525
TP122852	75	460	Governed	525

(1) Run the cam sleeve of the SOTUS continuously by unhooking the auxiliary-latch spring, holding the triplatch operated and blocking the main-shaft-clutch trip-lever in its operated position. **Figs 30 and 55**

(2) The signal transitions of the repeated H-answerback signal (S-S-M-S-M) should appear on the face of the test set as follows:

<u>Element</u>	<u>Transition</u>	<u>Test Set Scale</u>	
		<u>Ele- ment</u>	<u>Scale No.</u>
Start	Mark to Space*	Start	0 (Initial Setting)
Third (Begin)	Space to Mark*	Three	43 (± 5.7 Divisions)
Third (End)	Mark to Space*	Four	57 (± 5.7 Divisions)
Fifth (Begin)	Space to Mark*	Five	71 (± 5.7 Divisions)

*Note: Mark = Light Band
Space = Dark Band

Orient the test set scale so that the start element 0 indication on the scale is in line with the beginning of the transmitter START element (end of the longest

light element). The ends of the light images should appear within ± 5.7 scale divisions on the test-set scale as indicated in the table above. This represents 5% distortion, which would appear as 5.7 scale divisions because of the higher speed of the shaft as explained in the note below.

Note: The rotor speeds of the test set will be seen to be close to 14.3% (1/7) faster than the corresponding nominal speeds of the Sotus. This is required because the H-answerback signal is transmitted by the receiving shaft of the Sotus, which runs (during the portion of its cycle when it is not at rest) at the higher of the two speeds. When, then, for test purposes, this receiving shaft runs free (without the normal interval at rest) the test-set rotor (also running free and synchronously) must also travel at the higher speed. The occurrence of the signal transitions at other than the normal points is caused by the fact that the selector cam peaks of the receiving shaft are spaced farther apart than the corresponding cam peaks of the regular transmitting shafts of the 81D1 system, and hence the signal transitions for this special test operation are correspondingly displaced.

(3) To obtain the correct positions for the signal transitions it may be necessary to refine the adjustment for the clearance between the tip of the long contact spring and the cam follower. This may be done by readjusting the backstop screw for the short contact spring. Recheck the contact gap. If necessary, refine contact-bracket adjustment (d).

6. SELECTOR PANEL (BASE)

6.01 **Motor Position:** There should be a barely perceptible amount of backlash between the motor pinion and the highest point on the counter-shaft gear throughout one complete revolution of the gear.

(a) Gauge by eye and feel.

(b) To adjust:

(1) The edge of the motor base should be approximately parallel to the edge of the motor plate and the base screws approximately in the center of the enlarged holes in the motor base.

(2) Adjust the backlash by moving the motor plate. ↗
 The plate is held by 4 screws, 3 of which are in enlarged mounting holes. The plate pivots around the 4th screw, at the left rear as seen from the front, which does not have an enlarged hole. ↘

6.02 **Selector Position:** There should be a barely perceptible amount of backlash between the main-shaft gear and the highest point on the counter-shaft gear throughout one complete revolution of the counter-shaft gear.

(a) Gauge by eye and feel.

(b) To adjust: Tighten the thumbscrews friction-tight. ↗
 Move the selector to obtain the proper backlash. Tighten the thumbscrews. Move the positioning eccentric against the right side bracket and tighten. ↘

Note: The counter shaft should be approximately parallel to the bearing bracket bars. If difficulty is encountered in making the adjustments of Paragraphs 6.01 or 6.02, the counter shaft should be moved by loosening the top or bottom counter shaft bearing-plate mounting screws. The enlarged mounting holes in this bearing-plate will then permit shifting the plate so as to secure the position required for the counter shaft. Recheck Paragraphs 6.01 and 6.02. ↘

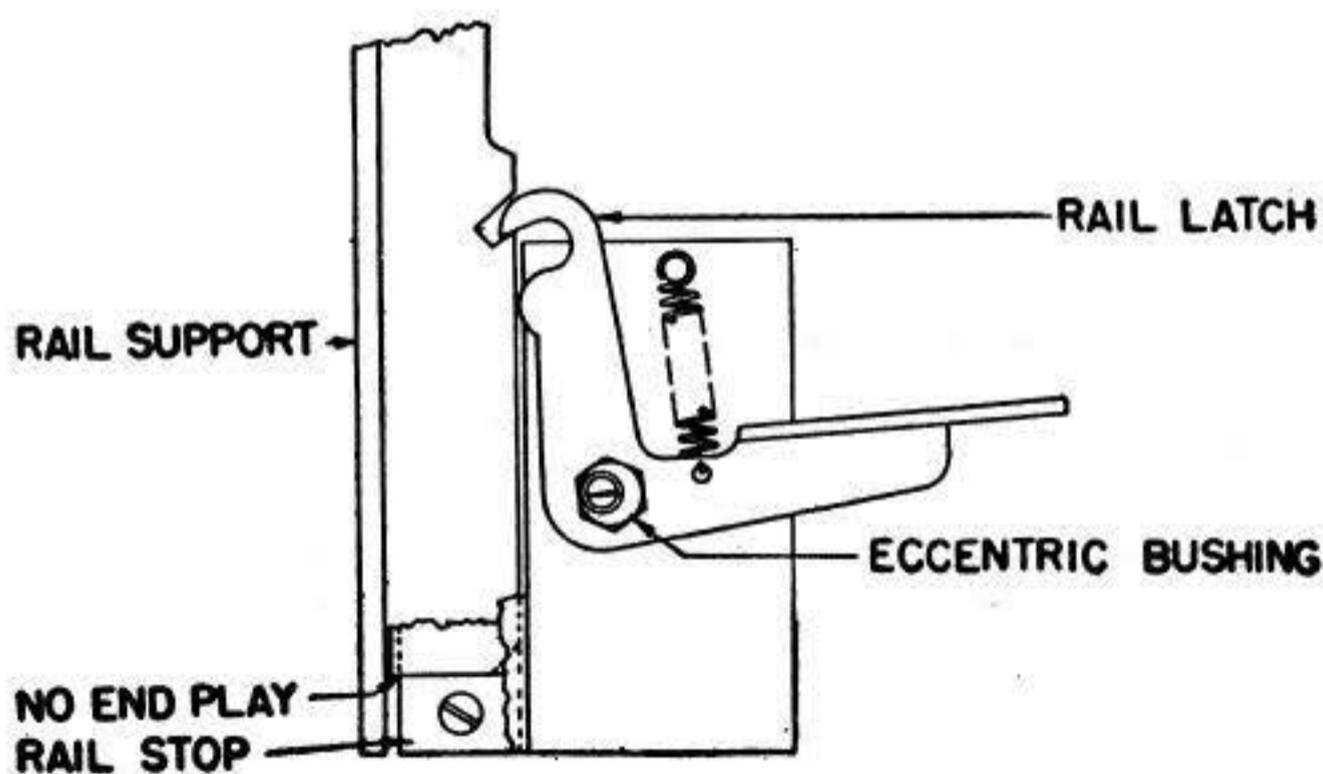


Fig 63

6.03 Panel Slide Latch: There should be no endplay between the rail support and the rail stop with the rail in its latched position. **Fig 63**

- (a) Gauge by eye and feel.
- (b) To adjust: Loosen the eccentric-bushing mounting-screw on each side and rotate the bushing. Tighten the screws.

7. MEASUREMENT OF RECEIVING RANGE

7.01 Method of Checking Range

- (a) Set the left-hand R-Y test indicator lever in its down position (white showing).
- (b) The unit is activated by its reception of the FIGS-H combination, or by moving the sixth vane to its rear position.
- (c) With the unit receiving the R-Y test signals, loosen the index-arm thumb-screw of the rangefinder and shift the index-arm toward O until an error appears on the R-Y test indicator (red showing, left-hand lever in its middle position).
- (d) Reset the indicator. Then move the rangefinder index-arm back slowly until errors no longer appear. This position indicates one limit of the orientation range. Note the position of the index-arm on the scale.
- (e) Determine the opposite end of the receiving range by repeating the foregoing procedure with the index-arm near the opposite end of the scale.
- (f) Distortion tolerances (see Paragraph 11). ←
- (g) Restore the R-Y test indicator to the OFF position (green indicator showing). ←

8. NO-CODE CLIPS

8.01 Purpose: No-code clips should be used to block operation of all function levers that are not equipped with codelevers. ↗ ↘

8.02 Placing:

- (a) With the unit in its upright position, rotate the main shaft to its stop position and disengage all pullbars from their associated function-lever extensions.
- (b) Slide the no-code clip over the narrow part of the function lever just behind the pullbar extension. The open side of the clip should be toward the stud side of the function lever and the curved end should be up and extend toward the pivoted end of the lever. **Fig 64**

(c) Slide the clip against the rear function-lever comb and raise the lever far enough to hook the curved end of the clip over the top edge of the comb. **Fig 64**

(d) If it is desired to have the no-code clip grip the rear function-lever comb more securely, the top of the no-code clip may be closed sufficiently by using long nose pliers.

Note: It may be necessary to loosen the blocking and latching lever assembly mounting screws in order to obtain sufficient movement of the function levers to place the no-code clips.

8.03 **Removal:** Reverse the procedure outlined in 8.02.

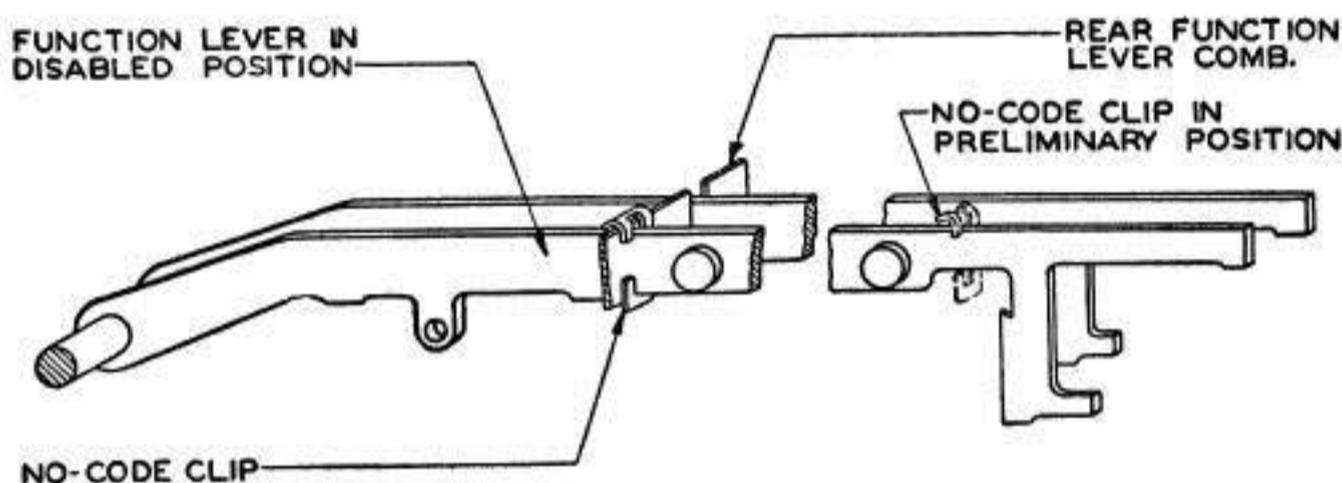


Fig 64

9. BLOCKING-LEVER WEDGES (BS3C AND BS6L)

9.01 At outlying stations of the 81C1 and 81D1 systems, blocking-lever wedges are used in front of the FIRST blocking-lever of a station-code sequence so that the first function lever of such a sequence will be constantly unblocked and ready to drop into engagement with the five vanes when its combination is selected and the sixth vane is in the activated position. The unblocking of the SECOND function lever of a station-code sequence is taken care of by the operating lever of the FIRST character of the sequence. Therefore, only one wedge is used for any station-code combination. Wedges are used in the following positions as indicated on the numbered name-plate in front of and below the blocking levers.

For 81C1 Systems: Positions 1-5-10-12-14-16-18-20-22-24-26-28-30-32.

For 81D1 Systems: Positions 1-4-12-16-20-24-28-31.

9.02 **Placing of Blocking-Lever Wedges:** To place a blocking-lever wedge in any desired position, insert the rear rounded portion of the small hooked wedge-tip against the blocking lever at the lower front comb. Push down and back so that the wedge is retained between the blocking lever and the end of the comb slot. Wedges may be removed by grasping the top tip of the wedge and pulling up and forward.

10. BRIDGES

10.01 Bridges (consisting of bridge-nuts, screws and posts) and multiple bridges are used when it is desired that two or more blocking or operating levers be bridged together for simultaneous operation. The position of the bridges for the 81C1 system (BS3C) may be found in Section P96.035 and those for the 81D1 system (BS6L) may be found in Section P96.061.

11. REFERENCE TO BELL SYSTEM PRACTICES

11.01 The following BSPs contain information applicable to the SOTUS units.

<u>BSP</u>	<u>Section</u>
Cleaning—General	P30.010
Lubrication—General	P33.006
Maintenance, Inspections and Tests	P33.006
Orientation Tests and Distortion Tolerances.....	P30.002
Requirements and Procedures—General	P30.012
Tools and Maintenance Supplies	P30.301
SOTUS—Description	P70.053