

## 157-TYPE INTERRUPTERS REQUIREMENTS AND ADJUSTING PROCEDURES

### 1. GENERAL

1.01 This section covers 157 type interrupters.

1.02 This section is reissued to incorporate material from the addendum in its proper location. In this process marginal arrows have been omitted.

1.03 Reference shall be made to Section 020-010-711 covering General Requirements and Definitions for additional information necessary for the proper application of the requirements listed herein.

1.04 Part 1, "General" and Part 2, "Requirements" form part of the Western Electric Co. Inc Installation Department handbook.

1.05 Requirements are marked with an asterisk (\*) when to check for them would necessitate the dismantling or dismounting of apparatus, or would affect the adjustment involved or other adjustments. No check need be made for these requirements unless the apparatus or part is made accessible for other reasons or its performance indicates that such a check is advisable.

1.06 *One drop of oil* for the purpose of this section is the amount of oil that may be released from a piece of No. 22 bare tinned copper wire after it has been dipped into KS-2245 oil to a depth of 1/4" and slowly removed.

1.07 *One discharge of grease* for the purpose of this section is the amount of Veedol medium cup grease discharged from the No. 353-B lubricator when the piston is fully depressed once.

1.08 *Operated position of the clutch armature* is that position in which the tooth of the clutch armature is engaged by a tooth of the driving disc.

1.09 A red diagonal stripe or red letter on the index tab of a contact spring assembly indicates that the associated cam is silver surfaced.

### 2. REQUIREMENTS

#### 2.01 *Cleaning*

(a) The gear housing, pole pieces, cover, and the interrupter frame shall be free from oil and dust.

(b) The pulsing contacts shall be cleaned, when necessary, as covered in Section 069-306-801.

(c) The driving and driven gears shall be cleaned, when necessary, in accordance with approved procedures.

(d) Where petroleum spirits is used for cleaning, the "A" cam roller bearings and the driving and driven gears shall be allowed to dry and shall then be lubricated.

(e) The cams shall be scrubbed as covered in Section 069-601-801.

(f) The cams shall be scoured as covered in Section 069-601-801 and then scrubbed.

#### (g) *Recommended Intervals*

(1) All cams shall be scrubbed, when necessary, as indicated by trouble data analysis. Cams may require scrubbing at yearly intervals.

(2) Pitted bronze cams shall be scoured and then scrubbed, when necessary, as indicated by trouble data analysis.

#### 2.02 *Operation of "A" Cam Roller* — Fig. 1 (A)

— The "A" cam roller shall be free from bind and shall make a partial revolution at each high spot of the "A" cam.

Gauge by eye and by feel.

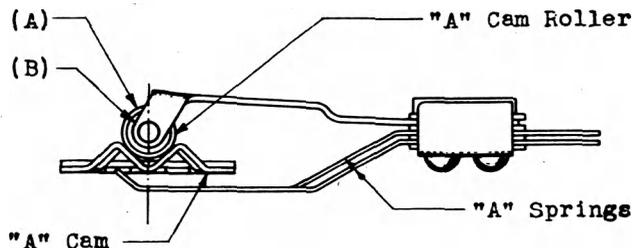


Fig. 1

2.03 Lubrication

(a) Fig. 1 (B) — *The "A" cam roller bearings* shall be adequately lubricated with KS-2245 oil. When lubrication is necessary, one drop of oil shall be applied. The convex surface of the roller and the "A" springs shall be kept free from oil.

(b) Fig. 2 (A) — *The cam shaft bearing on the index wheel end* shall be adequately lubricated with Veedol medium cup grease. When lubrication is necessary, one discharge of grease shall be applied.

(c) Fig. 3 (A) — *The cam shaft bearing on the clutch end* shall be adequately lubricated with Veedol medium cup grease. When lubrication is necessary one discharge of grease shall be applied.

(d) *Driven Gear Shaft Bearings* — Fig. 3 (B) and (C) — The bearings of the shaft on which the driven gear is mounted shall be adequately lubricated with KS-2245 oil. When

lubrication is necessary, four drops of oil shall be applied at each of the points designated.

(e) *Driving and Driven Gear Teeth* — Fig. 4 (A) — The driving and driven gear teeth shall be adequately lubricated with Veedol medium cup grease.

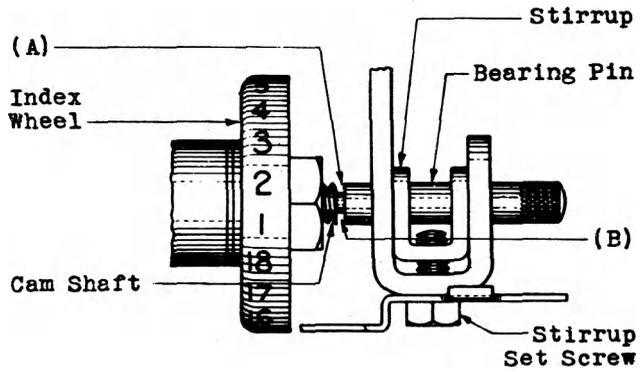


Fig. 2

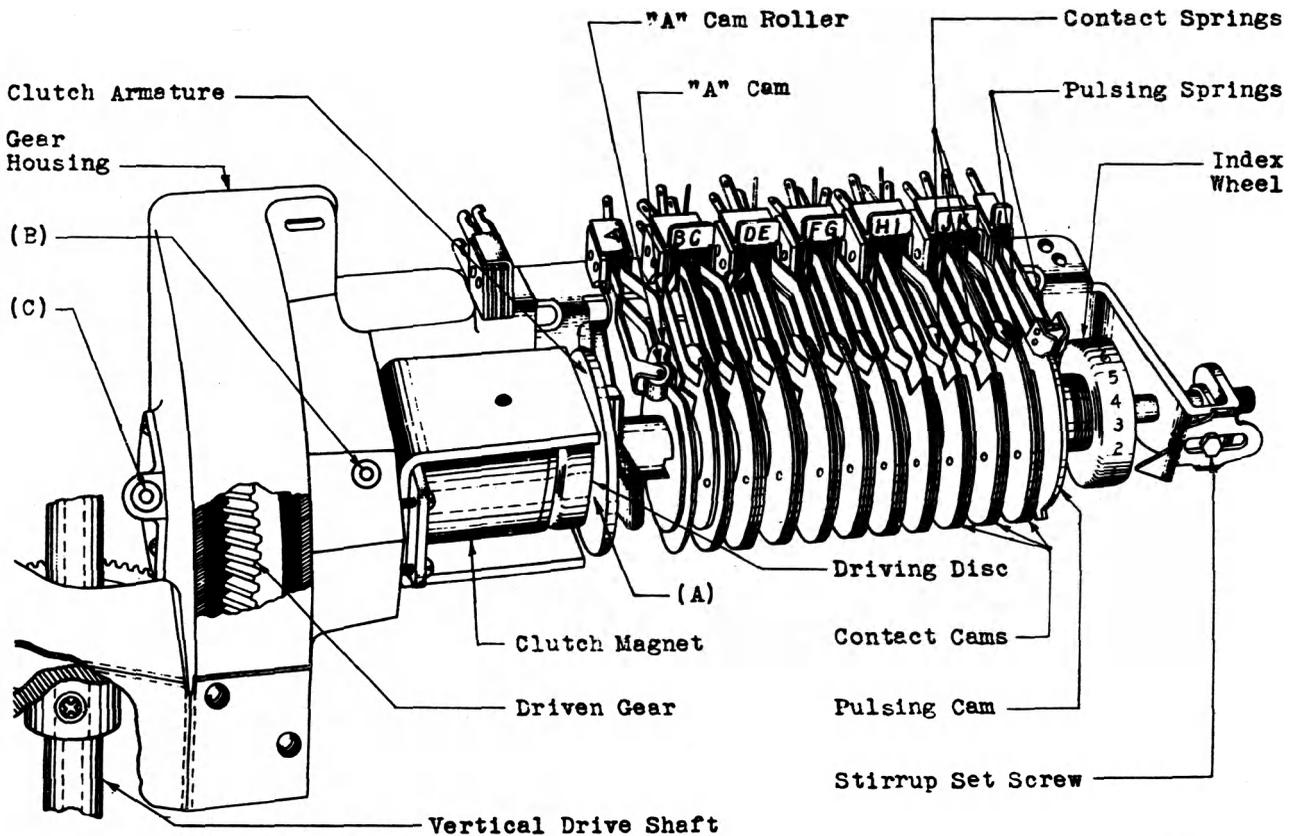


Fig. 3

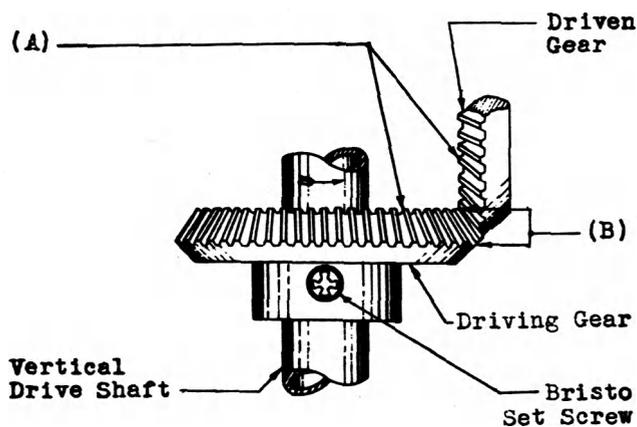


Fig. 4

(f) After turnover, it is recommended that the parts listed in requirements (a), (b), (c), (d) and (e) be lubricated at the following intervals:

- (a) — 6 months
- (b) — 1 year
- (c) — 2 years
- (d) — 1 month
- (e) — 1 month

These intervals may be extended if periodic inspections have indicated that local conditions are such as to insure that these requirements will be met during the extended intervals.

**2.04 Record of Lubrication** — During the period of installation a record shall be kept, by date, of the lubrication of the cam shaft bearings, "A" cam roller bearings, driven gear shaft bearings and the driving and driven gear teeth, and this record shall be turned over to the Telephone Company with the equipment. If no lubrication has been done the record shall so state.

**2.05 Operation of Driven Gear Shaft** — At the time of turnover to the Telephone Company the driven gear shaft shall revolve freely in its bearings. This requirement may be checked for by the Telephone Company if they require it before the Installation Department has meshed the driving and driven gears.

**\*2.06 Meshing of Gears** — Fig. 4 (B) — The gears shall mesh true without binding for approximately their entire width, they shall run freely and smoothly and the back lash shall be eliminated as nearly as practicable.

Gauge by eye and by feel.

**2.07 End Play of Cam Shaft** — Fig. 2 (B) — The cam shaft shall have no end play.

Gauge by eye and by feel.

**2.08 Pointer Adjustment** — Fig. 5 (A)

(a) The end of the pointer shall:

**Test** Not touch its index wheel

**Readjust** Clear its index wheel by approximately 1/16"

Gauge by eye.

(b) The pointer shall center approximately on the initial position of the index wheel when the "A" cam roller is seated in the crimp of the "A" cam.

Gauge by eye.

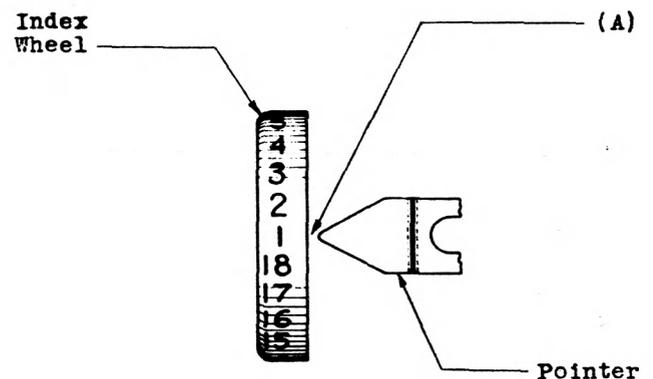


Fig. 5

**2.09 Armature Air-Gap with Magnet Deenergized** — Fig. 6 (A) and (B) — With the magnet deenergized the gap between the armature and the upper and lower ends of the pole-pieces shall be:

**Test** Min .060", Max .080"

**Readjust** Min .065", Max .075"

Use the No. 66-D gauge.

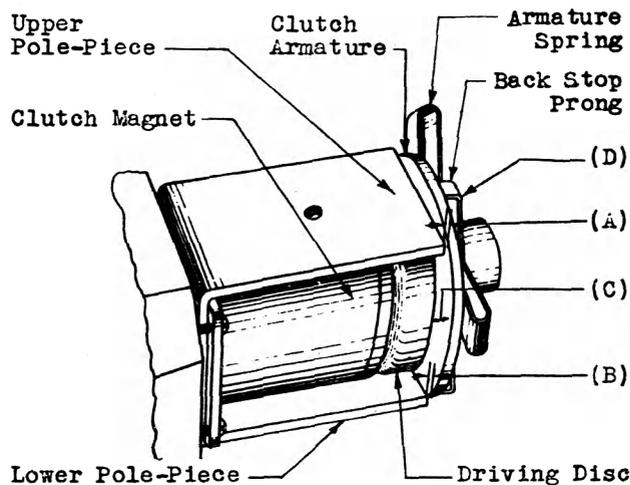


Fig. 6

**2.10 Alignment of Armature and Driving Disc**

Fig. 6 (C) — The face of the clutch armature shall be approximately (within .010") parallel to the face of the driving disc.

Gauge by eye.

**2.11 Tension of Armature Spring** — Fig. 6 (D)

— With the clutch magnet deenergized the clutch armature shall bear as uniformly as practicable against each of the back stop prongs with a pressure of:

**Test** Min 15 grams, Max 35 grams

**Readjust** Min 20 grams, Max 30 grams

Use the No. 68-B gauge.

**2.12 Operate Current for Clutch Magnet**—The clutch armature shall operate on the following clutch magnet current values:

**Test** .159 ampere

**Readjust** .151 ampere

**2.13 "A" Cam Roller Pressure** — Fig. 7 (A)

(a) **Nos. 157-A, 157-B, 157-D and 157-E Interrupters** — With the end play of the cam shaft meeting requirement 2.07, the pressure of the "A" cam roller against the "A" cam measured at a point approximately 1/4" back from the center of the roller, with the roller seated in the crimp of the "A" cam, shall be:

**Test** Min 325 grams, Max 475 grams

**Readjust** Min 350 grams, Max 450 grams

Use the No. 62-B gauge.

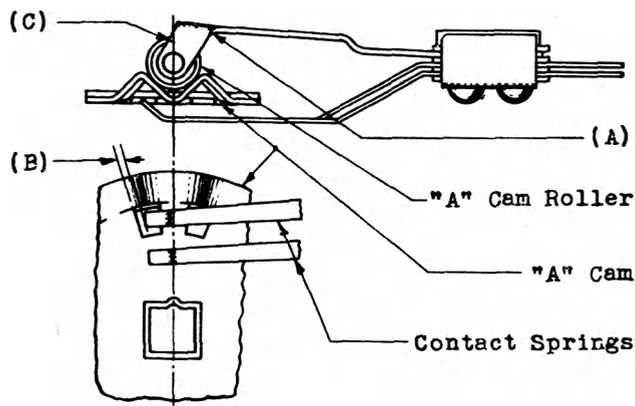


Fig. 7

(b) **Nos. 157-C and 157-F Interrupters** — The pressure of both "A" cam rollers against the "A" cams measured as in (a) shall be:

**Test** Min 275 grams, Max 375 grams

**Readjust** Min 300 grams, Max 350 grams

Use the No. 62-B gauge.

**2.14 Contact Spring Pressure**

(a) Fig. 8 (A): When the contact springs are resting on the metal part of the contact cams in the normal position or on the first cuttings encountered after the interrupter is rotated from the normal position, the pressure of the springs against the cams measured where the springs bend in to make contact with the cams, shall be

**Test** Min 25 grams, Max 60 grams

**Readjust** Min 30 grams, Max 60 grams

Use the No. 68B gauge. In the case of the split contact springs, this requirement applies to the combined pressure of both prongs.

(b) After turnover, as an optional check when the contact springs are resting on the insulation, the pressure of the springs measured as in (a) shall be

Min 15 grams, Max 50 grams

Use the No. 68B gauge.

(c) **Split Contact Springs Only:** Fig. 8 (B):

The contact spring pressure shall be approximately equally distributed between the two prongs. This requirement is met if, with the interrupter in position 1, the two prongs

leave the contact cam approximately simultaneously (difference not to exceed 0.010 inch, 1/2 thickness of contact spring, as gauged by eye) when the contact spring is moved away from the cam by applying pressure to the spring at a point back of the slot.

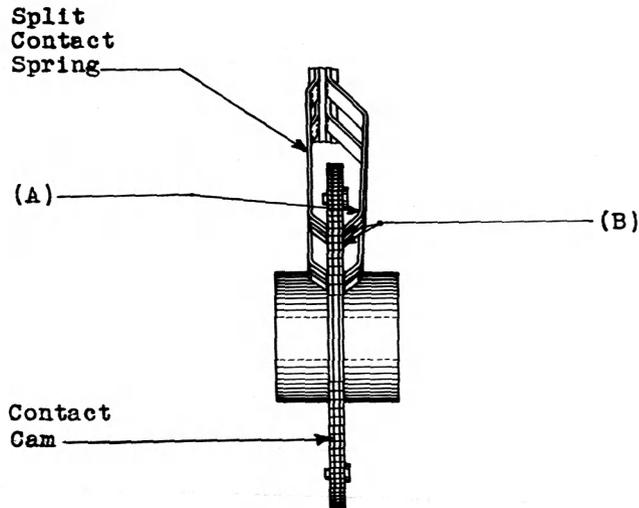


Fig. 8 - Contact Cam and Associated Split Contact Spring

**2.15 Parallelism of Contact Portion of Contact Spring with Face of Contact Cam** — Fig. 8 (B) — The ends of the contact springs shall rest approximately (within .005") flat against the metal surface of the contact cams.

Gauge by eye.

**2.16 Clearance Between Adjacent Contact Springs and Between the Springs and Framework** — Fig. 9 (A) — The clearance under any condition, between adjacent contact springs and between the springs and any part of the framework shall be:

Min 1/64"

Gauge by eye.

**2.17 Clearance Between the Inner Surface of the Contact Springs and the Heads of the Rivets** — Fig. 9 (B) — The clearance between the inner surface of the contact spring and the heads of the rivets when the contact springs are resting on the insulation shall be:

Min 1/32"

Gauge by eye.

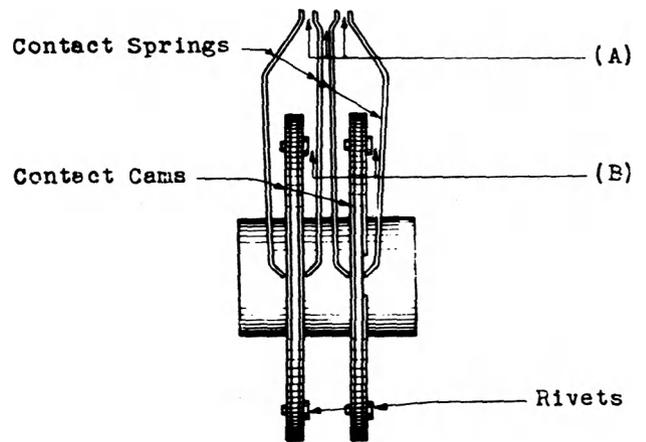


Fig. 9

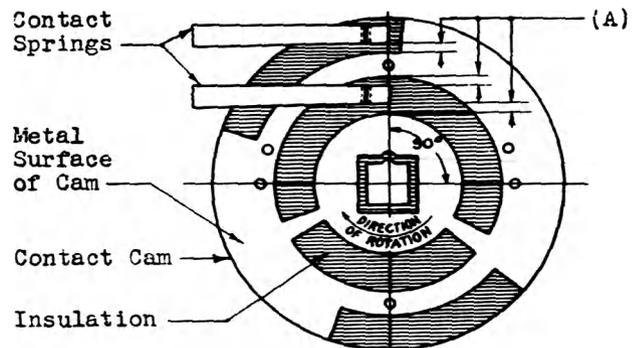


Fig. 10

**2.18 Clearance Between Contact Spring Edges and Adjacent Edges of Notched Out Portions of Contact Cams** — Figs. 10 (A) and 11 (A) — There shall be a clearance in a radial direction between the edges of the contact springs and the adjacent edges of the notched out portions of the contact cams of:

**Test** Min .005"

**Readjust** Min .010"

Gauge by eye.

**2.19 Position of Contact Springs with Respect to the Edges of the Contact Cams** — Fig. 11 (B)

**Test** — The top edge of the outer contact springs shall not extend beyond the outer edge of the contact cam and the bottom edge of the

inner contact springs shall not extend below the inner edge of the cam.

Gauge by eye.

**Readjust**—The clearance between the top edge of the outer contact springs and the outer edge of the contact cam and between the bottom edge of the inner contact springs and the inner edge of the cam shall be:

Min .005"

Gauge by eye.

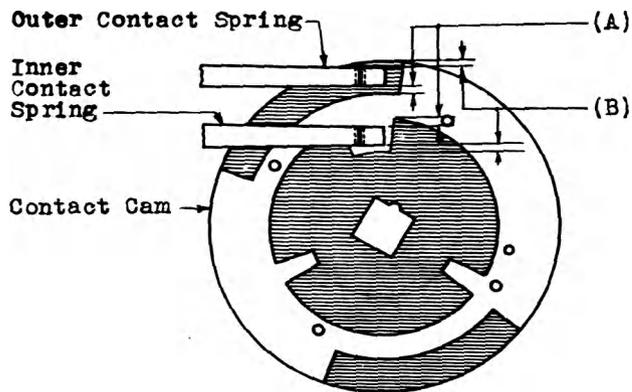


Fig. 11

**2.20 Position of Contact Springs with Respect to the Notches of the Contact Cams**—

Figs. 12 (A) — At the time that the trailing ends of the pulsing springs pass the points located at approximately the centers of the notches of the pulsing cam:

(a) **Nos. 157-A and 157-B Interrupters** — The contact springs shall make contact with the corresponding metal surfaces of the "F", "G", "H", "I", "J" and "K" contact cams.

(b) **No. 157-D Interrupter** — The contact springs shall break contact with the corresponding metal surfaces of the "F", "G", "H", "I", "J" and "K" contact cams.

(c) **No. 157-E Interrupter** — The contact springs shall break contact with the corresponding metal surfaces of the "F", "G", "H", "I" and "J" contact cams.

Gauge by eye.

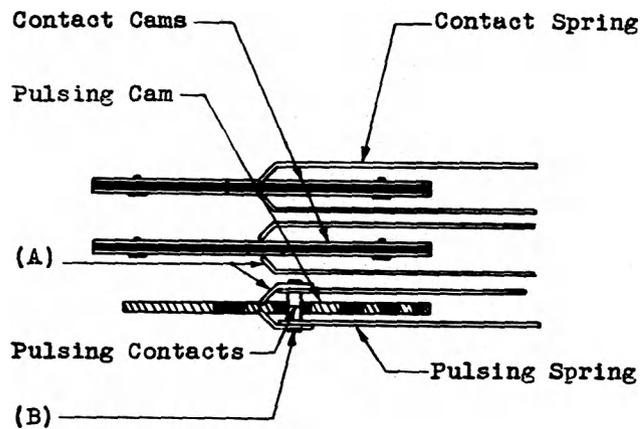


Fig. 12

**2.21 "A" Spring Clearance** — Fig. 7 (B) —

With the "A" cam roller manually centered in the notch of the "A" cam at the stop position, [Fig. 7 (C)], the clearance between the contact end of the "A" cam contact spring and the contact edge just left shall be approximately ( $\pm .010$ ")  $1/32$ ".

Gauge by eye.

**2.22 Pulsing Contact Spring Pressure** — Fig.

12 (B) — The pressure of the pulsing contact springs against each other at the point of contact when in their normal (made) position shall be:

Min 40 grams, Max 60 grams

Use the No. 68-B gauge.

**2.23 Pulsing Contact Separation** — Fig. 13 (A)

— When the trailing ends of the pulsing springs are resting on the face of the pulsing cam the pulsing contact separation shall be:

Min .008", Max .014"

Use the No. 74-D gauge.

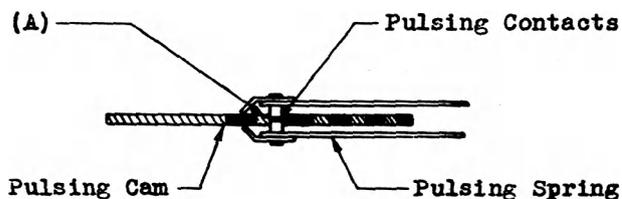


Fig. 13

## 3. ADJUSTING PROCEDURES

3.001 *List of Tools, Gauges, Materials and Test Apparatus*

CODE NO.	DESCRIPTION
<b>TOOLS</b>	
203	Index Wheel Holder
206	Screw-driver — 30° Offset
207	Screwdriver — 90° Offset
215	Spring Adjuster
218-B (or the re-placed 218)	"A" Cam Short-Circuiting Tool
235	Spring Adjuster
236	Wrench — 9/16" Hex. Open-end Offset
256	Spring Adjuster
295	Wrench — 5/16" Bristo Set Screw
353-B or the re-placed 353)	Lubricator
354	Cam Locating Tool
419-A	Test Connector and W1M Cord Equipped with 360 Type Tool
433-A	Motor Floor Stand and Swivel Yoke
434-A	Motor Ladder Bracket
435-A	Vacuum Head
462-A	Spring Adjuster
KS-5402	1/8 H.P. Motor
KS-6015	Duck-bill Pliers
KS-6263 (or the replaced R-1977)	Wrench — 9/32" Hex. Socket
KS-6320	Orange Stick
KS-6851	Flexible Shaft
R-2142	Adjuster
—	No. 5 Sturtevant Vacuum Cleaner (or its equivalent)
—	No. 4 Artists' Sable Rigger Brush

CODE NO.	DESCRIPTION
<b>TOOLS</b>	
—	Brush — 1/4" Round
—	Bell System Cabinet Screw-driver — 3-1/2" per AT&T Co Drawing 46 x 40
—	Bell System Regular Screw-driver — 4" per AT&T Co Drawing 46 x 34
—	Bell System P-Long Nose Pliers — 6-1/2" per AT&T Co Drawing 46 x 56
<b>GAUGES</b>	
62-B (or the replaced 62)	0-700 Gram Gauge
66-D (or the replaced 66-C)	Thickness Gauge Nest
68-B (or the replaced 68)	70-0-70 Gram Gauge
74-D (or the replaced 74-C)	Thickness Gauge Nest
<b>MATERIALS</b>	
KS-2245	Oil
KS-2423	Cloth
KS-7860	Petroleum Spirits
—	Veedol Medium Cup Grease
—	No. 22 Bare Tinned Copper Wire
—	Spare Cleaning Brushes
—	Toothpicks, Hardwood, Flat at One End and Pointed at the Other
<b>TEST APPARATUS</b>	
35-C	Test Set

**3.002 *Removal of Battery Fuse Supplying Clutch Magnet Current*** — When necessary to prevent interference due to the energizing of the clutch magnet while checking or readjusting to meet the requirements specified herein, remove the battery fuse which supplies current to the clutch magnet.

### 3.003 *Methods of Rotating Interrupters Electrically — Nos. 157-A, 157-B, 157-D and 157-E Interrupters*

(a) The No. 218-B "A" cam short-circuiting tool may be used to cause the interrupter to rotate except when cleaning "A" cams as covered in procedure 3.01 (9). Apply the tool between the "A" cam and the "A" springs to cause the interrupter to rotate as indicated for sequence switches in Fig. 14.

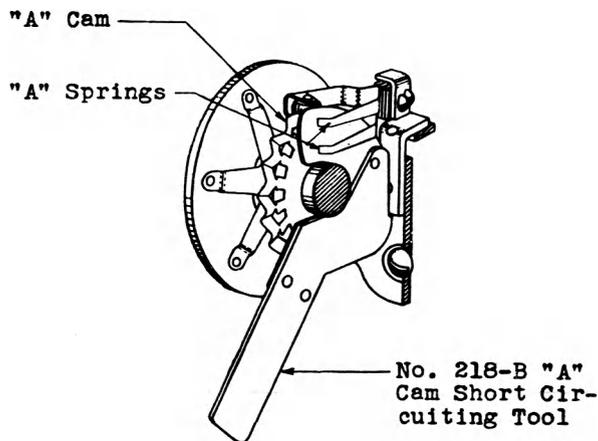


Fig. 14 — Method of Rotating Interrupters Electrically by Means of the No. 218-B "A" Cam Short Circuiting Tool

(b) To rotate the interrupter by means of the No. 419-A test connector and the W1M cord equipped with a 360 type tool, connect the No. 419-A test connector to the "A" cam roller spring and connect the suspender clip of the W1M cord to ground as indicated in Fig. 15.

### 3.01 *Cleaning* (Reqt 2.01)

(1) **Interrupter Frame, Gear Housing, Pole Pieces, and Cover:** Clean the frame of the interrupter, the gear housing, pole pieces, and cover with a moistened KS-2423 cloth before cleaning the cams. Moisten the cloth by dipping a small portion (about one inch) of it in water and then crumpling it up in the hands until the moisture has been distributed to all sections of the cloth.

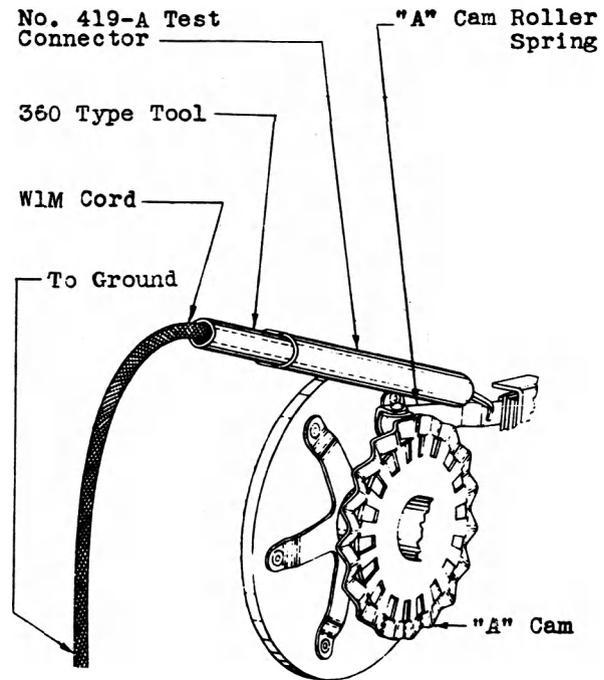


Fig. 15 — Method of Rotating Interrupters Electrically by Means of the No. 419-A Test Connector and W1M Cord Equipped with 360 Type Tool

- (2) **Pulsing Contacts:** Clean the pulsing contacts in accordance with the section covering cleaning of relay contacts and parts.
- (3) **Driving and Driven Gear Teeth:** Remove the gear housing over the gears with the 3-1/2-inch cabinet screwdriver and examine the gears.
- (4) If the gears are coated with dirt or excess grease, clean them while rotating with the 1/4-inch round brush dipped in KS-7860 petroleum spirits. Take care to protect the other apparatus while the cleaning is in progress and to prevent the brush being caught in the gears. Allow the gears to dry, then relubricate them in accordance with procedure 3.02 and 3.03(19).
- (5) Replace the gear housing over the gears.
- (6) **Scrubbing and Scouring Cams:** Scrub or scrub and scour cams as covered in Section 069-601-801.

- 3.02 Operation of "A" Cam Roller** (Reqt 2.02)  
**3.03 Lubrication** (Reqt 2.03)

#### "A" Cam Roller

(1) Before attempting to clean or lubricate the "A" cam roller bearings, make a nest of KS-2423 cloth for the cam roller so that there will be no possibility of the liquid being flipped elsewhere. This can be done by folding the cloth several times lengthwise and inserting one side of the folded cloth between the cam roller and the cam. Loop the cloth under the cam roller and, holding the cam roller free, work the cloth to the back of the switch and at the same time work it upward so that the roller is in the bottom of the loop.

(2) If the "A" cam roller binds, and dust or a gummy substance adheres to the bearings, flush the bearings thoroughly with petroleum spirits applied with the No. 4 artists' sable rigger brush. Take any additional precautions as may be required to prevent the petroleum spirits from splattering on the adjacent apparatus. After the bearings have been thoroughly cleaned with petroleum spirits allow them to dry and then relubricate as follows:

- (3) Apply one drop of KS-2245 oil to the top of the roller with a piece of No. 22 bare tinned copper wire.
- (4) Wipe off any excess oil that may have crept onto the outer surface of the roller or the "A" cam, with KS-2423 cloth.
- (5) Remove the nest of cloth from beneath the "A" cam roller.

#### Cam Shaft Bearings

(6) When the cam shaft bearings require lubrication, use the No. 353-B lubricator. Before doing any lubricating, examine the lubricator, see that it is filled and working properly. If the lubricator fails to eject the lubricant properly when the piston is depressed, it is an indication that the tool is either empty or that there is an air pocket beneath the plunger. In this case it will be necessary either to refill the tool or to remove the air pocket as covered in (12).

(7) **To fill the lubricator** unscrew the nozzle from the reservoir. Then with the 3-1/2" cabinet screw-driver, remove the screw immedi-

ately above. Remove the cap from the rear of the reservoir, grip the rib in the center of the plug in the reservoir with the long nose pliers and exert a pull on the plug to withdraw it from the reservoir.

(8) See that the Veedol medium cup grease is in a container having a minimum depth equal to the length of the reservoir of the lubricator. Take care that the air bubbles have been worked from the grease and that the top surface is approximately flat.

(9) Place the rear end of the reservoir on top of the grease and depress the lubricator until all of the air has been forced from the reservoir through the screw hole at the top and the grease starts to come out.

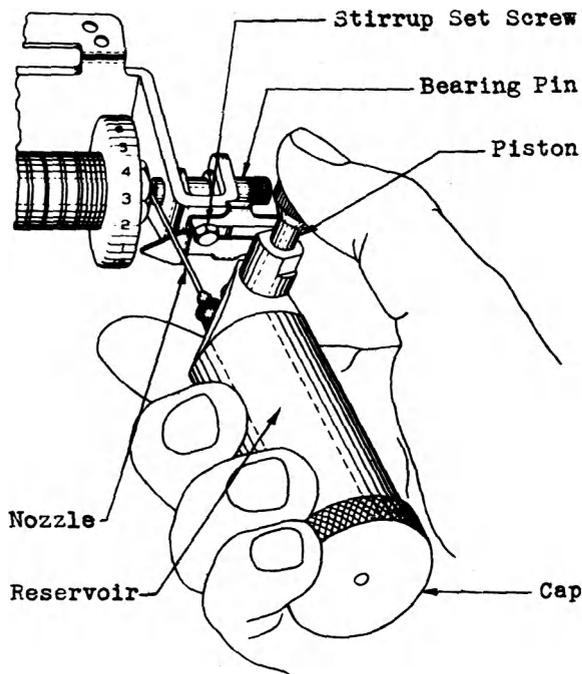
(10) Replace the screw and the nozzle, withdraw the lubricator from the grease and wipe off the excess lubricant. Place the plug in the reservoir with the rib out and, while applying pressure to the plug, operate the plunger repeatedly. This will eject enough lubricant to allow space for the plug as well as remove any air bubbles that may be trapped at the nozzle end of the lubricator.

(11) Replace the cap and tighten it against the plug.

(12) **To remove air pocket** remove the cap and apply pressure to the plug as covered in (10), at the same time operating the plunger until grease begins to flow again.

(13) **Application of Lubricant:** In order to lubricate the clutch end of the cam shaft assembly, loosen the stirrup set screw with the 4" regular screw-driver or with the KS-6263 wrench, depending on whether or not the set screw has a slotted or a hexagonal head, and shift the cam shaft assembly to the right just sufficiently to allow the insertion of the nozzle of the No. 353-B lubricator. Then slightly retighten the stirrup set screw. Rest the end of the nozzle against the bearing surface of the cam shaft and depress the piston to the end of its stroke. Then release the piston.

(14) In removing the lubricator, draw the nozzle over the bearing surface of the cam shaft so that the lubricant will be deposited on the bearing surface.



**Fig. 18 - Method of Lubricating Interrupter Cam Shaft Bearing at the Stirrup End with the No. 353-B Lubricator**

(15) Apply the lubricant also to the bearing surfaces of the bearing pin at the stirrup end of the interrupter in the manner shown in Fig. 18.

(16) After the cam shaft bearings have been lubricated, reset the bearing pin and tighten the stirrup set screw, making sure that the cam shaft assembly is left without end play.

#### **Driven Gear Shaft Bearings**

(17) Depress the self-closing oil hole cover with a toothpick, and apply four drops of KS-2245 oil with a piece of No. 22 bare tinned copper wire to each bearing. Wipe off any oil that may have been spilled on the gear housing with KS-2423 cloth.

#### **Driving and Driven Gear Teeth**

(18) Remove the gear housing with the 3-1/2" cabinet screw-driver.

(19) Apply Veedol medium cup grease with the 1/4" round brush as follows: Thoroughly saturate the brush with the cup grease

but wipe off the excess grease on the surface of the brush by a rotary motion of the brush on the side of the container. Then, while the gears are rotating, paint the grease onto the teeth of the driving gear by short up and down strokes and onto the teeth of the driven gear by short, transverse strokes. When no more grease can be freed from the brush, fill it once more with the grease and repeat the above operation. Then wipe off the excess grease that may ooze out at the sides of the gears with a small piece of KS-2423 cloth and replace the gear housing. Take care to prevent the cloth or brush being caught in the gears.

**3.04 Record of Lubrication** (Reqt 2.04)  
(No Procedure)

**3.05 Operation of the Driven Gear Shaft**  
(Reqt 2.05) (No Procedure)

**3.06 Meshing of Gears** (Reqt 2.06)

(1) Remove the gear housing with the 3-1/2" cabinet screw-driver and examine the gears for their proper alignment.

(2) If the gears do not line up properly, loosen the Bristo set screws holding the driving gear to the vertical drive shaft with a No. 295 wrench and slide the gear up or down, as required, until the teeth of the driving and driven gears engage true for their entire length.

(3) It may also be necessary to shift the interrupter in a horizontal direction in order to meet this requirement. To do this, first, slightly loosen the mounting screws with the 4" regular screw-driver and then tap the interrupter into the correct position.

(4) After the requirement is met be sure the interrupter mounting screws and the Bristo set screws are set up tight.

**3.07 End Play of Cam Shaft** (Reqt 2.07)

**3.08 Pointer Adjustment** (Reqt 2.08)

(1) To check the end play of the cam shaft grasp the index wheel and attempt to move the cam shaft sidewise.

(2) If end play of the cam shaft is detected, or if the pointer is not properly located, loosen the stirrup set screw slightly with the 4" regular screw-driver or the KS-6263 wrench,

depending on whether or not the screw has a slotted or hexagonal head. Locate the pointer as required and press the bearing pin with the finger toward the left so as to remove all end play and tighten the stirrup set screw. In making this adjustment place just sufficient pressure on the bearing pin to remove all end play when the stirrup set screw is tightened, as excessive pressure may introduce bind.

**3.09 Armature Air-Gap with Magnet Deenergized** (Reqt 2.09)

**3.10 Alignment of Armature and Driving Disc** (Reqt 2.10)

(1) If adjustment is made for one of these requirements it will be necessary to check for the other since the adjustment of both of these requirements is dependent upon the setting of position of the back stop prongs. Use the No. 66-D gauge for checking the armature airgap.

(2) In adjusting the armature for its proper position, adjust the back stop prongs with the KS-6015 duck-bill pliers at a point near the interrupter spindle. In making this adjustment, check to see that the armature touches all three of the back stop prongs and also that the gaps between the armature and each of the two pole pieces are approximately equal. Also check the tension of the armature spring as covered in procedure 3.11 and ascertain that the tension is within the specified limits.

**3.11 Tension of Armature Spring** (Reqt 2.11)

(1) Check the tension of the armature springs by measuring the pressure of the armature against each back stop prong with the No. 68-B gauge. If the requirement is not met, retension the armature springs.

(2) In retensioning the armature spring adjust each prong close to the interrupter spindle with the duck-bill pliers. Make an effort to give the springs a uniform tension.

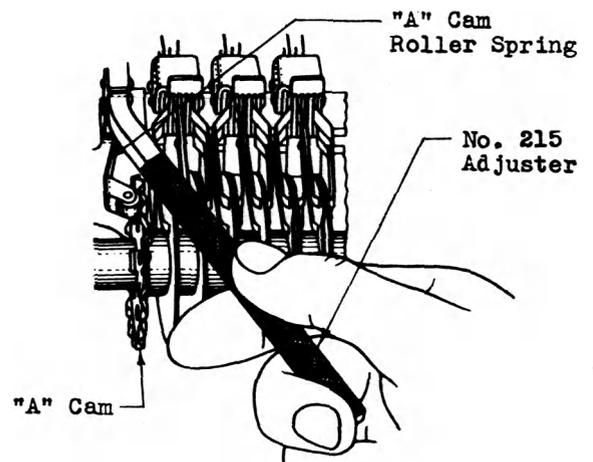
**3.12 Operate Current for Clutch Magnet** (Reqt 2.12)

(1) Connect ground to the inner end of the winding of the clutch magnet through the No. 35-C test set. The inner end of the winding is connected to the upper of the two terminals on the clutch magnet.

(2) Regulate the test set resistance until the specified current is obtained. If the clutch armature fails to operate on the specified current check the armature air-gap (requirement 2.09) and the tension of the armature springs (requirement 2.11). Make any corrections necessary and again see if the clutch magnet armature will operate. If the armature still fails to operate on the readjust current value specified it will be necessary to work to the minimum values of "gap" and "tension" as covered in requirements 2.09 and 2.11, respectively.

**3.13 "A" Cam Roller Pressure** (Reqt 2.13)

(1) If the "A" cam roller pressure is not within the specified limits, apply the No. 215 adjuster to the "A" cam roller spring as shown in Fig. 19 and retension the roller spring to meet the readjust pressure limits.



**Fig. 19 – Method of Using the No. 215 "A" Cam Roller Spring Adjuster**

**3.14 Contact Spring Pressure** (Reqt 2.14)

(1) If the contact spring pressure is not within the specified limits, readjust the springs as follows: Rotate the cam shaft assembly until the spring or springs at fault rest on the metal part of the contact cam.

(2) Readjust the outer springs with the No. 256 adjuster applied as shown in Fig. 20 and the inner springs with the No. 235 adjuster applied as shown in Fig. 21. Adjust close to the point where the spring leaves the assembly clamping plates and insulators.

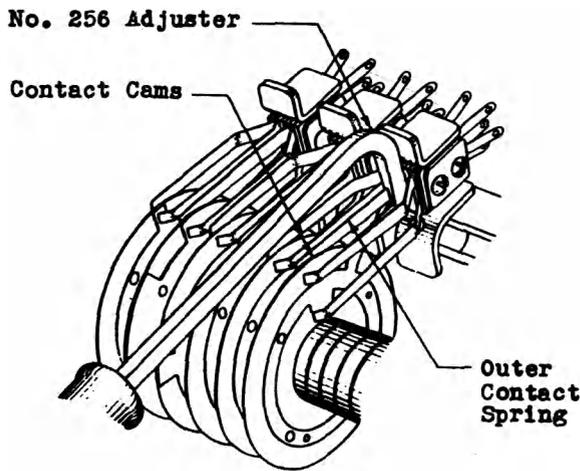


Fig. 20 - Method of Using the No. 256 Adjuster in Adjusting Outer Contact Springs

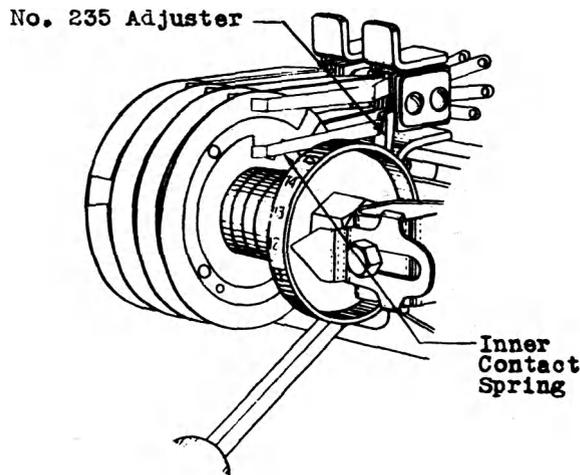


Fig. 21 - Method of Using the No. 235 Adjuster in Adjusting Inner Contact Springs

(3) In readjusting springs take care not to alter the effective length of the spring or to alter the angle at which the spring meets the contact cam sufficiently to change the relative position of the contacting edge of the spring with respect to the associated contact cam. See Fig. 22.

(4) Before adjusting the contact spring pressure on a split contact spring, make sure that both prongs of the spring leave a contact cam cutting approximately simultaneously when the interrupter is rotated slowly by hand. Correct the misalignment by adjusting

the tips of the contact spring with the No. 462A adjuster as shown in Fig. 23. Adjust the prongs so that the angle at which the tips of the springs make contact with the contact cam is approximately 45 degrees. The slots in the adjuster are at an angle of 45 degrees to the contact cam when the handle of the adjuster is parallel to the contact cam. In adjusting an inner prong, move the spring away from the contact cam to place the spring adjuster on the inner prong. In case the two prongs are out of alignment, adjust the prongs as covered in (5) or (6), taking care to maintain this 45-degree angle. Make sure that requirements 2.18, 2.19, and 2.20 are met.

(5) To check for part (c) of the requirement on an outer contact spring, apply the KS-6320 orange stick back of the slot in the spring, push the spring away from the contact cam and observe whether the two prongs leave the contact cam at approximately the same time. In checking the requirement on an inner spring, the No. 235 adjuster may be used to push the spring away from the contact cam. If the requirement is not met because of the misalignment of the prongs, adjust the individual prongs as required with the No. 462A adjuster. Take care to apply the adjuster at least 1/8 inch in front of the base of the slot because of the danger of breaking the prongs. If the requirement is not met because of a twist in the spring, apply the No. 256 adjuster close

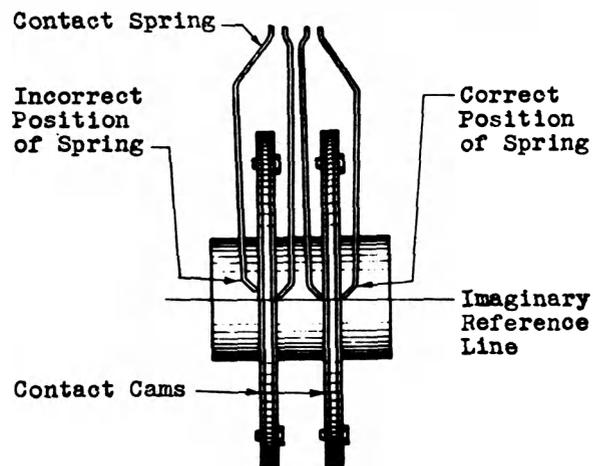


Fig. 22 - Relative Position of the Contacting Edge of the Spring with Respect to the Associated Cam

to the point where the spring leaves the clamping plates and insulators as shown in Fig. 20 and adjust as required. On an inner spring, apply the No. 235 adjuster near the point where the spring leaves the clamping plates and insulators as shown in Fig. 21. Make sure requirements 2.18, 2.19, and 2.20 are met.

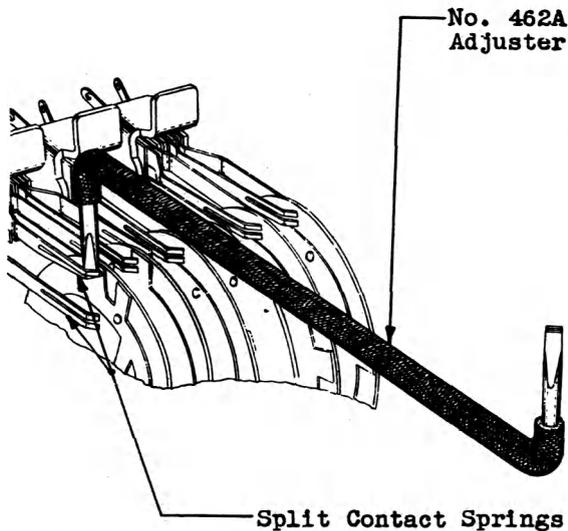


Fig. 23 - Method of Adjusting Prongs of Split Contact Springs

(6) The R-2142 adjuster may be used in place of the No. 462A spring adjuster in equalizing the pressure of the two prongs as covered in (5). To use this adjuster, place the tapered offset portion of the tool between the two prongs of the spring so that the offset portion of the tool is about 1/4 inch in front of the base of the slot. Apply a rotary motion to the handle of the tool in the direction necessary to equalize the pressure.

**3.15 Parallelism of Contact Portion of Contact Spring with Face of Contact Cam**

(Reqt 2.15)

**3.16 Clearance Between Adjacent Contact Springs and Between the Springs and Framework** (Reqt 2.16)

**3.17 Clearance Between the Inner Surface of the Contact Springs and the Heads of the Rivets** (Reqt 2.17)

(1) Inspect the springs for parallelism and clearance and make any corrections necessary by readjusting the outer spring with the

No. 256 adjuster and the inner spring with the No. 235 adjuster, taking care not to put an excessive crimp in the springs. Apply these adjusters as shown in Figs. 20 and 21.

(2) In making these readjustments, take care not to disturb the relation between the contact portion of the springs and their respective contact cam cuttings.

**3.18 Clearance Between Contact Spring Edges and Adjacent Edges of Notched Out Portions of Contact Cams** (Reqt 2.18)

**3.19 Positions of Contact Springs with Respect to the Edges of the Contact Cams** (Reqt 2.19)

**3.20 Position of Contact Springs with Respect to the Notches of the Contact Cams** (Reqt 2.20)

(1) To readjust the springs for their proper clearance and position, it will be necessary to shift the spring assembly. To do this loosen the screw which holds the assembly to the frame with the 4" regular screw-driver, shift the assembly as required and then retighten the screw.

(2) To shift an individual spring, loosen the screw at the rear of the frame which holds the spring assembly to the interrupter frame with the 4" regular screw-driver and slide the spring assembly toward the magnet end of the interrupter to gain access to the assembly clamping screws. Slightly loosen these screws with the No. 206 and No. 207 screw-drivers. If, in some instances, the assembly cannot be shifted far enough to the left to allow the No. 206 and No. 207 screw-drivers to engage the slots of the assembly clamping screws it will be necessary to remove the screw or the screw and washer at the rear of the frame and lift the assembly until the screw-drivers can be engaged in the slots of the assembly clamping screws.

(3) Move the spring in the assembly as required with the long nose pliers and securely tighten the assembly clamping screws and the mounting screw at the rear of the frame. Check the spring to insure that the adjustment has not been disturbed during the tightening operation.

(4) If, in readjusting the springs for clearance and position as covered in the above methods, the spring assembly has been shifted, recheck these requirements and also 2.14 (Contact Spring Pressure), 2.15 (Parallelism of Contact Portion of Contact Spring with Face of Contact Cam), 2.16 (Clearance Between Adjacent Contact Springs and Between the Springs and Framework) and 2.17 (Clearance Between the Inner Surface of the Contact Springs and the Heads of the Rivets).

(5) In readjusting the contact position of the spring for its proper relation to the adjacent edges of the notched out portion of the contact cam it may be necessary to shift the cam. To do this, turn the cam shaft assembly so that the cam reference hole is directly above the shaft, hold the cams on both sides of the cam under adjustment and insert the projecting lug at the end of the driving rod of the No. 354 cam locating tool into this reference

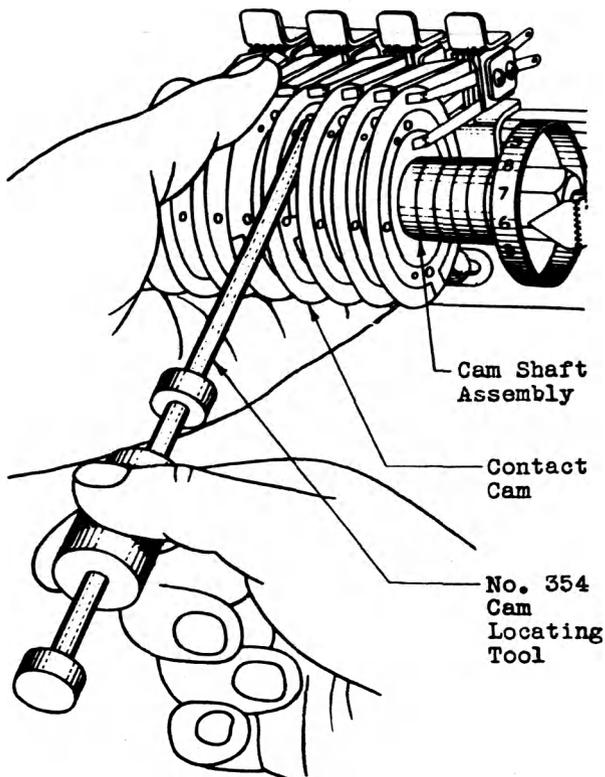


Fig. 24 – Method of Locating Contact Cams with the No. 354 Cam Locating Tool

hole. By means of the sliding hammer tap the cam in a forward or backward direction as desired. Hold the cams and the tool in the manner shown in Fig. 24. In some cases it may be necessary to loosen the clamping nut of the cam shaft assembly very slightly, using the No. 236 wrench and the No. 203 index wheel holder as shown in Fig. 25.

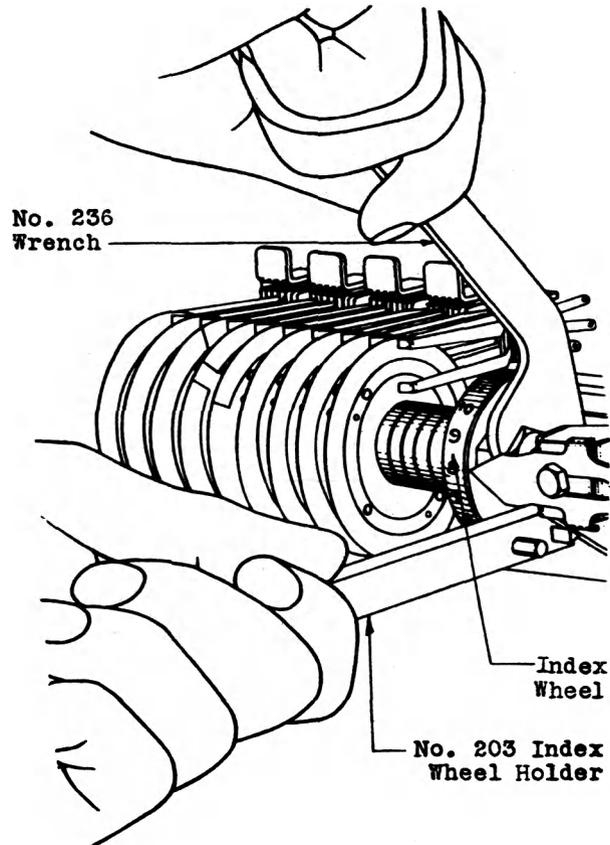


Fig. 25 – Method of Loosening the Clamping Nut of the Cam Shaft Assembly

### 3.21 "A" Spring Clearance (Reqd 2.21)

(1) If upon inspection it is found that the position of the spring with respect to the contact edge of the "A" cam is not in accordance with the requirement, correct the clearance by readjusting the spring with the No. 256 adjuster at the bend of the spring near the clamping plate so as to increase or decrease its length as required.

(2) Check the springs at this time to insure that requirements 2.15 (Parallelism of Contact Portion of Contact Spring with Face of Contact Cam), 2.16 (Clearance Between Adjacent Contact Spring and Between the Springs and Framework) and 2.17 (Clearance Between the Inner Surface of the Contact Springs and the Heads of the Rivets) are being met and make any corrections necessary as covered in procedures 3.15, 3.16 and 3.17.

**3.22 Pulsing Contact Spring Pressure**  
(Reqt 2.22)

**3.23 Pulsing Contact Separation** (Reqt 2.23)

(1) In case the pulsing springs fail to meet either of these requirements, remove the interrupter and replace it with a spare interrupter. Make no attempt to readjust the pulsing contact springs and take great care in checking them for tension and gap in order not to destroy the adjustment.