

R.A.P. X-70263-01 ISSUE 2-B

Issue No.	Date of Issue	Approved	
		B.T.L.	D. & R.
2-B	5/15/28	WHM	GWK
A. T. & T. CO. STANDARD			

REQUIREMENTS AND ADJUSTING PROCEDURES
FOR
CENTRAL OFFICE AND PBX APPARATUS

PANEL DISTRICT, OFFICE, INCOMING AND
FINAL SELECTOR ELEVATOR APPARATUS
(NO. 11 TYPE AND D-85387 MULTIPLE
BRUSHES, NO. 2 AND NO. 9 TYPE BRUSH
RODS, NO. 1 TYPE TRIP RODS, NO. 8
TYPE INDICATORS AND NO. 1-A GUIDES)

AMERICAN TELEPHONE AND TELEGRAPH COMPANY
Department of Development and Research
Bell Telephone Laboratories, Inc.

REASON FOR ISSUE

These Requirements and Adjusting Procedures (R.A.P.) are issued to replace specification X-70263-01, Issue 1 for the following reasons:

- | | |
|---|---|
| <p><u>1.</u> To bring the information up-to-date and to issue it as an R.A.P. (Class D).</p> <p><u>2.</u> To add a method and illustration to cover the lubrication of the connecting</p> | <p><u>3.</u> To change and add Adjusting Procedures.</p> <p><u>4.</u> To revise the tool list.</p> <p><u>5.</u> To change and add requirements as covered on Sheet 1 attached hereto.</p> |
|---|---|

plate and rollers which form a part of the multiple brush trip lever assembly. (Information for W.E. Co. covered by CO-160584, Issue 1.)

CHANGES IN ADJUSTING PROCEDURES FROM X-70263-01, ISSUE 1

<u>Paragraph No.</u>	<u>Change</u>	<u>Paragraph No.</u>	<u>Change</u>
-	The title is changed to include the No. 8-A indicator and No. 1-A guide.	2.13, M-1) and M-2)	Were 3.12, M-1 and M-2. Reworded.
1.001	Was 1.1. Revised to cover the 8-A indicator and No. 1-A guide and reworded to agree with the latest standard form.	2.13, M-3	Added.
1.002	Added.	2.14	Was 3.13. Revised to cover .075" travel adjustment.
1.003	Revised to give new code number for the dental mirror which was R-1623, now is 376-A.	2.15	Was 3.15. Revised to cover brushes with double contact sleeve springs.
1.006	Revised to include tools, gauges and materials to cover the lubrication requirement and the .075" travel adjustment on bridging sleeve springs. Reworded to agree with latest standard form.	2.16	Was 3.16. Reworded.
2.01	Added.	2.22	Was 3.20. Reworded.
2.02, M-1	Was 3.1, M-1. Reworded.	2.23, M-1) and M-2)	Was 3.21, M-1. Reworded.
2.03, M-2	Was 3.2, M-2. Reworded.	2.23, Figs. G, H, I, J, K and L)	Added.
2.05	Was 3.4. Title changed.	2.24, M-4.	Added.
2.05, M-1 to) M-4, Incl.) and M-6)	Were 3.4, M-1 to M-4, Incl. and M-6, respectively. Reworded.	2.25, M-1) and M-2)	Were 3.24, M-1 and M-2. Reworded.
2.06, M-1	Was 3.5, M-1. Reworded.	2.25, Figs.) M and N)	Added.
2.06, Fig. B	Added.	2.26, M-1) and M-2)	Were 3.22, M-1 and M-2, and 3.23, M-1 and M-2. Combined and reworded.
2.09, M-1) and M-2)	Were 3.8, M-1, M-2, M-3 and M-4. Reworded.	2.27, M-1	Was 3.26, M-1. Reworded.
2.10, M-1) and M-2)	Were 3.9, M-1 and M-2. Reworded.	2.27, Fig. 0	Added.
2.11, M-2	Was 3.10, M-2. Reworded.	2.28, M-3, M-5) and M-6)	Added.
2.12, M-2	Was 3.11, M-2. Reworded.	2.28, M-4, M-7) and M-8)	Were parts of 3.27, 3.28, 3.29 and 3.30. Combined and reworded.
		2.29, M-1 to) M-5 Incl.)	Part added and part 3.31, M-1 and M-2. Reworded.
		2.30	Title reworded.

<u>Paragraph No.</u>	<u>Change</u>	<u>Paragraph No.</u>	<u>Change</u>
2.30, M-1) and M-2)	Were 3.32, M-1 and M-2. Reworded.	2.351, M-1, M-2.) M-5 to M-10 Incl.)	Added.
2.31, M-1 to) M-5 Incl.)	Partly added and partly 3.33, M-1. Reworded.	2.352, M-1 to) M-4 Incl.)	Added.
2.33, M-1) and M-2)	Added.		Other paragraphs renum- bered as required.

CHANGES IN REQUIREMENTS FROM X-70263-01, ISSUE 1

<u>Paragraph No.</u>	<u>Change</u>	<u>Paragraph No.</u>	<u>Change</u>
3.001	Was 2.002. Reworded.	3.16	Was 2.16. Revised to in- clude special adjustment at the reference terminal.
3.002	Added.		
3.01	Added to cover lubrication	3.17	Was 2.17. Changed to in- sure point of contact in- side rounded corner of ro- tating lever.
3.02	Was 2.1. Reworded to specify "gauge by feel".		
3.03 and 3.04	Was 2.2 and 2.3, respec- tively. Reworded to agree with latest available in- formation.	3.21 and 3.22	Added.
3.07	Was 2.6. Title reworded.	3.26	Was 2.22 and 2.23. Com- bined to simplify.
3.08	Was 2.7. Reworded to cov- er stud gap on every ter- minal.	3.28	Was 2.27, 2.28, 2.29 and 2.30. Limits revised to bring up to latest avail- able information combined with a new requirement covering "Y" commutator brush spring location.
3.09	Was 2.8. Reworded to cov- er sleeve shoe touching tip or ring terminal.	3.29 and 3.30	Were 2.31 and 2.32. Re- worded to agree with latest form.
3.11, 3.12) and 3.13)	Was 2.10, 2.11 and 2.12, respectively. Revised to agree with the latest form.	3.31	Was 2.33. Changed to specify two points on bank for checking clearance.
3.14	Was 2.13. Revised to cov- er .075" travel adjustment. 2.14 omitted.	3.32	Was 2.34. Reworded to agree with latest form.
3.15	Was 2.15. Revised to cov- er brushes with double contact sleeve springs.	3.33	Added.

SECTION 1 - GENERAL

1.001 The Requirements and Adjusting Proce-
dures specified herein cover panel dis-
tribut, office, incoming and final selector
elevator apparatus (No. 11 type and D-85387
multiple brushes, No. 2 and No. 9 type brush
rods, No. 1 type trip rods, No. 8 type indi-
cators and No. 1-A guides) and replace speci-
fication X-70263-01, Issue 1.

1.002 Reference shall be made to R.A.P.
X-70000-01 covering General Requirements,
Definitions and Information, for additional in-
formation necessary for the proper application
of this R.A.P..

1.003 Tools KS-2632 (Reading Glass) and 376-A
(Dental Mirror) may be used in connec-
tion with the visual inspections specified on
attached Sheets 1 to 7 inclusive and corres-
ponding adjusting procedures.

1.004 Whenever it is found necessary to move
a brush rod, trip rod or multiple brush
off normal in order to check for or readjust
to meet any of the requirements in this R.A.P.;
the associated selector circuit should be made
busy by inserting a make-busy plug in the make-
busy jack of the circuit. If necessary, a
small wedge may be placed between the down-
drive clutch armature and the associated lever
arm in order to prevent it from operating and
restoring the brush rod to normal if the magnet
is operated.

1.005 A visual inspection shall be made be-
fore checking or readjusting any mul-
tiple brush to insure that the reference ter-
minal and the associated tip and ring terminals
of the same circuit group of terminals by which
the brush is to be set are correctly aligned
horizontally and vertically with respect to the

other terminals in the bank. Selector multiple brushes on standard coded banks and the front side of "D" specification banks have their tip springs on the left-hand side of the brush assembly. Brushes used on the rear of "D" specification banks have their tip springs on the right-hand side and their ring springs on the left-hand side of the brush assembly.

1.006 List of Tools, Gauges, Test Apparatus and Materials required for the apparatus covered by this R.A.P.

<u>Tools</u>		<u>Tools (Cont.)</u>	
<u>Code No.</u>	<u>Description</u>	<u>Code No.</u>	<u>Description</u>
35	Screw-driver - 3-1/2" (Part of Tool 221)	-	Bell System 3-1/2" Cabinet Screw-driver per A.T.&T.Co. Drawing 46-X-40
206	Screw-driver 30 Degree Offset	-	Bell System 6-1/2" Cabinet Screw-driver per A.T.&T.Co. Drawing 46-X-40
207	Screw-driver 90 Degree Offset	-	Bell System P-Long Nose Pliers - 6-1/2" per A.T.&T.Co. Drawing 46-X-56
220	Wrench 3/16" Hex. Socket (Part of Tool 221)	-	Orange Stick
325	Trip Magnet Armature Ex- tension Adjuster	-	Pen Knife
326	Trip Magnet Armature Ex- tension Holder	68	<u>Gauges</u> 70-0-70 Gram Gauge
327	Trip Finger Adjuster	80	.015" - .035" and .025" .045" Double-end Double Step Thickness Gauge
328	1-A Guide Adjuster	85-B	.010" Thickness Gauge
329	1-A Guide Holder	85-C	.020" Thickness Gauge
331	Spring Adjuster	86	.005" and .008" Double-end Right Angle Offset Thick- ness Gauge
376-A or (the replaced R-1623)	Dental Mirror	89	1/16" and 1/64" Round Thickness Gauge
380-A or (the replaced R-55760)	Brush Spring Adjuster		<u>Test Apparatus</u>
396-A	Rack Locating Tool	E-1	Lamps (2 Required)
R-1575	Camel's Hair Brush	13	Lamp Sockets (2 Required)
KS-2631	Screw-driver - 4-1/2"	357	Tool (Spring Contact Clip)
KS-2632	Reading Glass	365	Tool (Suspender Clip)
-	Bell System Double Grip Screw-driver per A.T.&T.Co. Drawing 46-X-201	893	Cord (Equipped with No. 360 Tool at Both Ends)
		-	Dry Cells (4 Required)
			<u>Materials</u>
		KS-2423	Twill-jean Cloth
		-	Western Electric Lubricating Compound No. 3
		-	J.P. Carbon Tetrachloride
		-	Wedge

SECTION 2 - ADJUSTING PROCEDURES

- 2.01 LUBRICATION (Rq.3.01) position to trip the lowest brush on the selector.
- M-1 Lubrication of Trip Rod Rotating Levers and Trip Armature Extensions Raise the brush rod associated with the trip rod rotating lever to be lubricated so that it is in
- M-2 Operate the trip rod manually so as to open up a space between the rotating lever and the trip armature extension. Dip an

R-1575 camel's hair brush in Western Electric Lubricating Compound No. 3, removing the excess lubricant from the brush before withdrawing it from the container, and apply it to the trip rod rotating lever and the trip armature extension as shown in Fig. A.

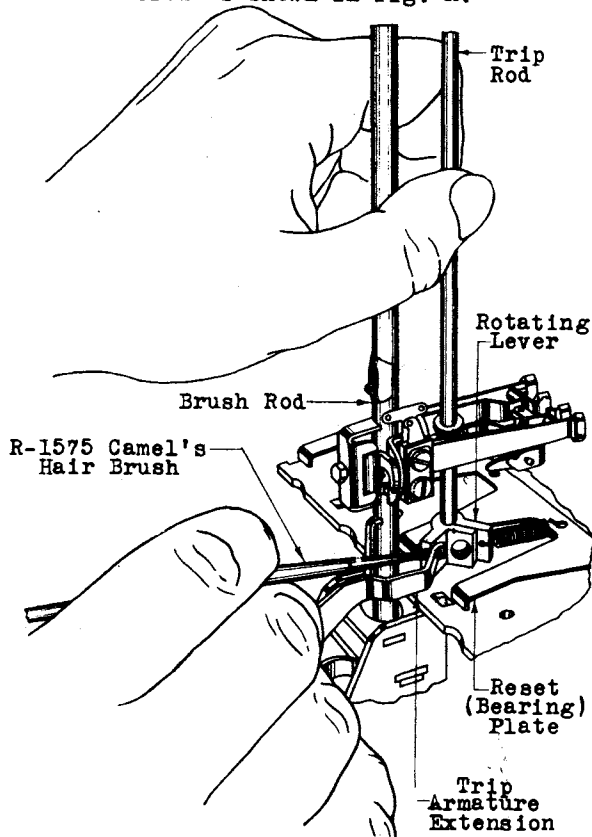


Fig. A - Method of Lubricating Trip Rod Rotating Levers and Trip Armature Extensions

M-3 Take care that the lubricant does not get on the racks or cork rolls of the drive. After applying the lubricant it is advisable, if service conditions permit, to allow the parts lubricated to remain idle for approximately 15 minutes to permit the carbon tetrachloride to evaporate.

M-4 Lubrication of Reset Levers, and Reset (Bearing) Plates If the reset lever, or the reset (bearing) plate with which it comes in contact shows signs of wear or if the reset lever snags against the reset (bearing) plate as the multiple brush restores to its normal position, apply Western Electric Lubricating Compound No. 3 to the surface of the reset (bearing) plate where the reset lever comes in contact with it and 1/2" of the under surface of the reset lever at the end of the lever where it comes in contact with the reset (bearing) plate as follows:

M-5 Dip an R-1575 camel's hair brush into

the container holding the lubricant and making sure to remove the excess lubricant from the brush before withdrawing the brush from the container, apply the lubricant to the surfaces referred to in M-4. After applying the lubricant it is advisable, if service conditions permit, to keep the reset lever from rubbing on the reset plate for 15 minutes to allow the carbon tetrachloride to evaporate.

M-6 If necessary, clean the surfaces referred to in M-4 with a dry cloth per KS-2423. If it is found that due to the presence of a gummy or sticky deposit the surfaces cannot be cleaned with a dry cloth, the cloth may be saturated with C.P. carbon tetrachloride. If it is found necessary to use carbon tetrachloride for cleaning purposes, do not apply the lubricant until the cleaning fluid has evaporated.

2.02 RACK TONGUE POSITION (Rq.3.02)

M-1 If the rack tongue does not assume its correct position in the brush rod, it is either distorted or the brush rod is twisted. If the rack tongue is distorted, straighten it with a pair of long-nose pliers. If the brush rod is twisted, loosen the multiple brushes and the commutator brush with the No. 220 socket wrench and turn the rod to its correct position; then relocate the multiple and commutator brushes in accordance with the requirements for this apparatus specified herein or in the R.A.P. covering commutator brushes.

2.03 RACK COUPLING PIN ENGAGEMENT (Rq.3.03)

M-1 With the brush rod coupled to the rack, raise the rod away from the rack as far as permitted by the play of the rack tongue in its slot, and notice that the rod drops back against the shoulder of the rack due to its own weight when released. When checking for this requirement, make sure that no multiple brush is tripped.

M-2 If the rod appears to bind on the rack coupling pin, that is, if the rod does not return to the shoulder of the rack when raised and released as specified in M-1 above, first make certain that this is not caused by a binding or bowed brush rod. (See paragraph 2.05.) If the brush rod is not binding or bowed uncouple the rack and examine the coupling pin to see that it is not bent; also see that there are no short bends in the lower end of the brush rod. Check to see that there are no burrs or dirt in the hole in the brush rod, and that the hole is large enough to permit the rack coupling pin to enter freely.

2.04 CLEARANCE BETWEEN ROTATING LEVER AND TOP CLUTCH LOCATING PLATE (Rq.3.04)

M-1 To obtain this adjustment, slightly loosen the set screw with the 3-1/2" cabinet screw-driver and shift the rotating lever until the desired gap is obtained. In resetting the rotating lever see that it is as nearly horizontal with the retractile spring as possible.

M-2 See that the retractile spring has sufficient tension to restore the rotating lever firmly back to normal and check the operation of the retractile spring by manually operating and releasing the trip magnet armature.

2.05 FREEDOM OF MOVEMENT OF (Rq.3.05)
BRUSH ROD

M-1 Check to see that there is no interference caused by the commutator brush local cable form coming in contact with a commutator or the form snagging on an adjacent brush frame.

M-2 To check the freedom of movement of the brush rod, first raise the brush rod to its highest position, that is, with an up stop collar touching the under side of its associated bearing locating plate, and trip one multiple brush. Care should be exercised when raising a brush rod which has a tendency to bind. Do not force the rod upward, but first check to see that the bind is not caused by multiple brush being tripped below its normal tripping position. If all the brushes are reset and still the brush rod binds, it should be corrected as covered in the following methods. Failure to observe this warning may result in either bending the trip finger out of alignment or bending or breaking the hard rubber roller on the trip lever assembly.

M-3 Hold back the pawl of the associated clutch with an orange stick at the same time placing a finger under the frame of the lowest multiple brush below the mounting screw so as to support the brush rod in its descent.

M-4 Lower the brush rod slowly and evenly. The brush rod should follow the movement of the finger without sticking or binding during its entire travel; that is, until the reset lever of a tripped brush touches the reset plate. It is not necessary that the tripped brush be reset by the combined weight of the rod and rack alone. (See Requirement 3.28 (b), on Sheet 6 for brush reset requirement.)

M-5 If a bind sufficient to prevent the brush rod from meeting this requirement occurs at or near the top of the brush rod travel, the cause may be a misaligned clutch, or a binding No. 1-A guide, or both. To determine the true cause, uncouple the rack and raise the brush rod as high as it will go. If the bind is still present, it may be caused by the No. 1-A guide and the guide should be inspected and when found out of adjustment, corrected as specified in paragraph 2.06. If the bind has disappeared, it may have been caused by a misaligned clutch or a bowed brush rod. A visual check will generally serve to determine whether the clutch or the rod is at fault.

M-6 If the clutch is out of alignment loosen the mounting screw at the bottom of the clutch with the Bell System double grip screw-driver and swing the bottom of the clutch in the proper direction necessary to bring the coupling pin on the rack into line with the hole in the brush rod. Make sure that the

clutch meets all the requirements for alignment specified in the R.A.P. covering Nos. 1, 2, 3, 4, 5 and 6 type clutches, and then securely retighten the mounting screw. The commutator brush and all the multiple brushes on the rod must now be rechecked for height and the brushes on the No. 0 and No. 1 banks should be rechecked for horizontal centering, as the adjustment for alignment may have changed the position of the clutch. If it has been found necessary to realign the clutch, the requirements covering the horizontal location of the trip finger and those covering the location of the trip armature extension with respect to the rotating lever should be rechecked.

M-7 If the brush rod binds only in spots throughout its travel, the binding may be caused by interference between the bearings and bumps or spots of paint or shellac on the brush rod. Stop the rod on one of the binding spots and check each bearing, in turn, for play in a straight front to rear direction by grasping the rod in the fingers directly below the bearing plate and moving it backwards and forwards. If the bearing does not show a perceptible play, examine the rod carefully to determine the cause of the bind. Spots of paint or shellac may be removed by scraping the rod with the blunt edge of a knife taking care not to nick the rod.

M-8 A uniform bind throughout the travel of the brush rod is probably caused by excessive multiple brush or commutator brush spring tension. Check the tensions of the multiple brush springs and the commutator brush springs and where they are found to be excessive or close to the maximum requirements reduce them slightly. Try to apportion the adjustment so as to set each spring approximately at its mean requirements rather than to reduce any one spring to its minimum requirements. Refer to paragraph 2.11 and to the R.A.P. covering commutator brushes when it is necessary to make the above check or adjustment.

M-9 Such binds as are caused by kinks and bends in the brush rod will also be noticed as occurring only in certain spots during the travel of the rod. If there is front to rear play in every bearing, and if there is no bind due to heavy brush tension, interference with the No. 1-A guide or a misaligned clutch, examine the rod carefully to ascertain whether it is straight throughout its entire length. If kinks or bends are located, straighten the rod by grasping it in the fingers above and below the bent portion and bowing the rod in a direction to correct the bend. Be careful to leave the rod straight and not to produce any kinks in it. After straightening the rod, check for requirement 3.09. (Horizontal Centering of Multiple Brushes), 3.12 (Brush Intrusion), 3.14 (Bridging Sleeve Spring Location), 3.15 (Non-bridging Sleeve Spring Location), 3.16 (Tip and Ring Spring Location) and 3.31 (Clearance Between Multiple Brush Frames and Bank Terminals). If the fault cannot be discovered in any other way, remove one pair of bearings at a time and replace them. With a bearing removed in this manner,

that part of the rod that is bowed will be plainly shown by its position with respect to the bearing supporting plate.

M-10 To insure that a brush rod does not bind in a bearing see that the bearings meet requirement 3.07.

2.06 1-A GUIDE LOCATION (Rq.3.06)

M-1 To adjust a brush rod guide which binds against the trip rod in the ascent or descent of the brush rod, bend the guide with a No. 328 adjuster, placing the No. 329 holder with its slot down over the back end of the guide and over the rod to secure it firmly as shown in Fig. B.

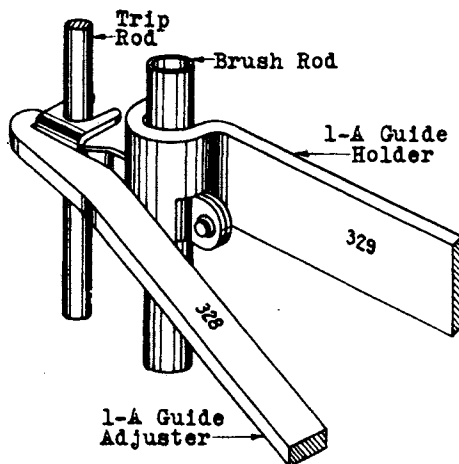


Fig. B - Method of Adjusting 1-A Guide

M-2 Should the trip rod appear bent so as to cause the guide to bind in only one or two points, straighten the trip rod at these points.

2.07 BRUSH ROD BEARING GAP (Rq.3.07)

M-1 In order to insure that the bearing is not binding on the rod, there should be a perceptible movement of the rod at each bearing. To check for this, grasp the rod in the fingers directly below the bearing and move it first from side to side and then from front to rear. By so doing, the play if present, can be detected.

M-2 Bearings open more than .005" should be closed by tapping the bearing half into the correct position with the 3-1/2" cabinet screw-driver. Bearing halves should always be dressed to the left and to the rear. Do not pry against the adjacent bearing. A light held just below the bearing locating plate will be found of considerable help in checking for open bearings.

M-3 Before separating the halves of a bearing, make sure that the bind is not caused by the misalignment of the bearing

halves. (See M-1). This is generally due to the front and rear displacement of one half of the bearing with respect to the other half. This may be corrected by lightly tapping the bearing halves with the screw-driver handle.

2.08 STUD GAP (Rq.3.08)

M-1 The No. 86 thickness gauge may be used for the purpose of checking this stud gap. The stud gap may also be checked visually by forcing the inner spring outward with an orange stick and noting the amount of travel on the inner spring before the outer spring starts to move.

M-2 If the stud gap required readjustment, the multiple brush should be examined to see that it is in accordance with the figure accompanying requirement 3.08 on Sheet 3 for the purpose of determining what condition is responsible for the lack of stud gap. Unless the sleeve springs are distorted, the adjustment should be made by bending the outside springs between the points indicated on the drawing, using the No. 331 spring adjuster. Extreme care should be used in making the necessary corrections. The adjuster's efforts should be to restore the spring to its original correct condition and not to add additional distortion.

2.09 HORIZONTAL CENTERING OF MULTIPLE BRUSHES (Rq.3.09)

M-1 If there is no clearance between the back of one sleeve shoe and a tip or ring terminal, and a large clearance between the back of the other sleeve shoe and its associated tip or ring terminal; this condition will usually be caused by the whole brush assembly being twisted sideways. To correct this loosen the multiple brush clamping screw slightly with the No. 220 socket wrench and twist the brush assembly so that both sleeve springs will be approximately equidistant from the adjacent sleeve terminal. Then retighten the multiple brush clamping screw.

M-2 If it is found impossible to obtain the desired clearance by following M-1 and either or both of the sleeve spring shoes still make contact with the tip or ring terminals it will generally be found that the gap between the sleeve spring at fault and the adjacent tip or ring spring at the first bend of the sleeve spring will be much greater than the normal one. To correct this condition, apply the 380-A spring adjuster to the sleeve spring close to its base and push it toward the contact end of the spring while exerting a slight twisting pressure that will bow the spring outward. It may be necessary to repeat this operation to obtain the perceptible clearance.

2.10 TIP AND RING SPRING CLEARANCE (Rq.3.10)

M-1 To check for this clearance, raise the brush rod until the brush is in line with the reference terminal and press the brush first to the right and then to the left until the back of the sleeve spring touches the tip or ring terminal and observe the clearance be-

tween the tip and ring springs and their associated terminals. In checking on the reference terminal to insure a 1/64" clearance on any other terminal in the bank, allowance should be made for any lateral offset of the bank terminals.

M-2 To adjust for this clearance, examine the brush to see if it is in accordance with the figure accompanying requirement 3.10 on Sheet 3 for the purpose of determining what condition is responsible for this lack of clearance and the necessary means to be used in correcting it. Pay particular attention to the clearance between the sleeve springs and the outside springs at the point where the first bend occurs on a sleeve spring.

M-3 If the tip, ring or sleeve springs are not distorted but the stud gap is larger than required, the stud gap may be reduced to .008" by bending the tip or ring spring between the points indicated in the figure accompanying requirement 3.08 on Sheet 3 using a No. 331 spring adjuster.

M-4 After adjusting for this requirement, check and readjust if necessary, for stud gap, horizontal centering, parallel contact and other features that may have been disturbed.

2.11 BRUSH SPRING TENSION (Rq.3.11)

M-1 Multiple brush contact spring tension should be measured at the point indicated in the figure accompanying requirement 3.11 on Sheet 3. The No. 68 gram gauge may be used in checking this tension.

M-2 Spring adjusting for tensioning should be done with the 380-A spring adjuster close to the point where the spring leaves the pileup clamping plates and insulators.

M-3 When making any adjustment of brush springs, care should be taken not to reduce the clearance between the sleeve springs and the hard rubber rollers and also to prevent any distortion or kinking of the springs, thereby affecting their relation with the corresponding terminals. Note that with the multiple brush tripped the hard rubber rollers do not touch the sleeve springs.

2.12 BRUSH INTRUSION (Rq.3.12)

M-1 Inspect for the brush projecting in from the edge of the terminals, on the top, bottom and reference terminals.

M-2 If failure to meet this requirement is general on one bank, it is an indication that the bank is out of adjustment. Where there are only individual cases, a check should be made to see whether or not the brush rod is bent in or out and, if so, the brush rod should be straightened. If, however, the brush rod is straight and this condition exists, the brush rod should not be bent to correct it. It is sometimes possible to correct the above conditions by moving the brush rod bearings. The multiple brush itself

should not be readjusted to meet this requirement, but the multiple brushes should be checked for requirements 3.09, 3.10, 3.11, 3.14, 3.15, 3.16, and 3.31 if it has been necessary to straighten the rod. It is satisfactory if in isolated cases a brush only approximately meets the requirement at the top or bottom of the bank provided it meets it at the reference terminals and provided a check is made with other brushes to insure that the failure to meet the requirement is not due to misalignment of the bank.

2.13 PARALLELISM OF BRUSH SPRINGS (Rq.3.13)

M-1 Check to insure that the contacting surfaces of the springs are not out of parallel with the reference terminal more than .005" for the full width of the fiber shoe and not more than .0025" for one-half the width of the fiber shoe. To facilitate in checking this requirement, use should be made of the No. 38-B lamp or a regular 110 volt extension lamp. Hold the lamp so that the light shines upward from beneath the terminal. By looking down on the terminal, the amount that the brush spring may be out of parallel with the terminal can be easily discerned.

M-2 To bring the brush springs with the limits specified in requirement 3.13, adjust the springs at a point in front of the rubber separators with the No. 331 spring adjuster. Any distorted spring should be corrected at this time.

M-3 Caution Deviation from parallel should be kept as small as possible to prevent the snagging or chattering of the brushes.

2.14 BRIDGING SLEEVE SPRING LOCATION (Rq.3.14)

M-1 To adjust for the bridging sleeve spring location make busy the circuit associated with the brush rod on which the brush to be adjusted is mounted as well as the circuits associated with those brush rods immediately adjacent to it.

M-2 Raise the brush rod until the multiple brush under test is approximately two-thirds of the way up the bank, and make sure that the weight of the brush rod assembly rests on the clutch pawl.

M-3 With the brush in this position, make sure that the contacting surface of either sleeve spring is not tilted from the vertical plane of the contacting portion of the bank terminal enough to interfere with the proper bridging of the brush springs. A tilted brush spring is shown in Fig. C. If any springs are found tilted away from the terminals in this manner, they should be straightened with the 380-A spring adjuster, and the springs should then be rechecked for requirement 3.13 (Parallelism of Brush Springs).

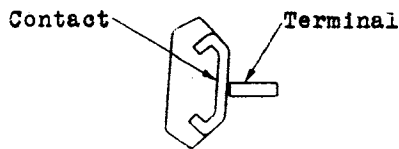


Fig. C - Tilted Brush Condition

LOWER SLEEVE SPRING

M-4 Insert the spring of the No. 396-A rack locating tool into the rack notch corresponding to rack index number 45. With the rack locating tool in the position shown in Fig. D, exert a slight downward pressure on the horizontal arm to snap the stud into its associated notch. Lower the brush rod until the shoulder of the rack locating tool rests tightly down against the clutch pawl.

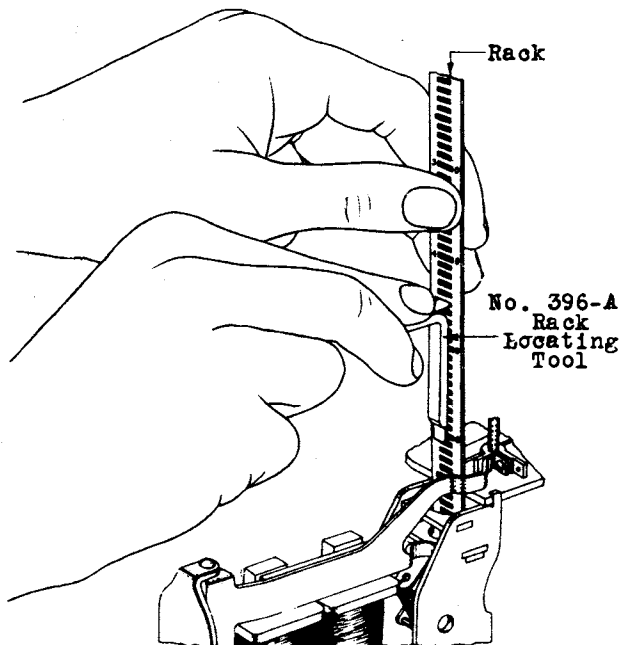
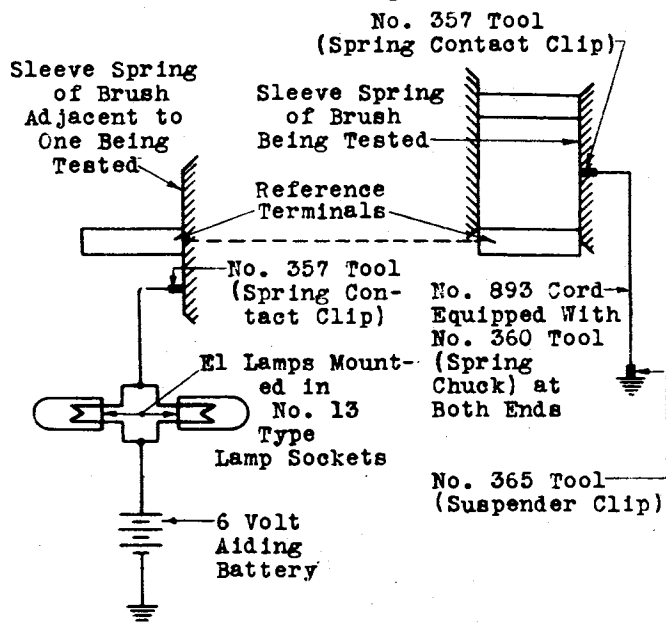


Fig. D - Method of Inserting the No. 396-A Rack Locating Tool Into the Rack

M-5 If the adjustment is to be made on an individual brush only, raise a brush rod adjacent to the one being worked on, so that the rack index number 49 shows just above the clutch sighting plate. If the adjustment is to be applied on a number of brush rods, or if it is more convenient, make the circuit busy and raise an end selector to this position instead of raising the one adjacent to the selector containing the brush under test.

M-6 With the rod raised to the position referred to in M-5, trip the brush associated with the same bank as the brush under

test. In accordance with the wiring of the testing circuit as shown in Fig. E, connect the negative side of the test battery to ground and connect the No. 357 spring contact clip to the sleeve spring of the brush just tripped. This is done for the purpose of making the reference terminal busy to any hunting selector. If the lamps light, it is an indication that the reference terminal is busy. Break the circuit by removing the clip and test the terminal from time to time until the terminal is idle. Then securely attach the No. 357 spring contact clip. If the reference terminal is permanently made busy, it will be necessary first to attach the No. 357 spring contact clip to the sleeve spring and then remove the strap wire from the terminal at the distributing frame which is associated with the reference terminal. Connect the end of the No. 893 cord equipped with the No. 365 tool to ground and with the No. 357 tool connect the other end of the cord to the sleeve spring of one of the other brushes on the same rod as the one being adjusted. If the brush being adjusted makes contact with the reference terminal, the lamps will light.



This circuit when connected as shown, automatically makes the reference terminal busy.

Fig. E - Lamp Circuit to be Used with the Rack Locating Tool No. 396-A when Adjusting the Lower Bridging Sleeve Spring

M-7 To determine whether or not the sleeve spring is set within the limits specified raise or depress the spring by means of an orange stick approximately .005", depending on whether the lamps do or do not light, respectively. If the lamps go out when the spring is raised or light when the spring is depressed this distance, it is an indication that the spring is in adjustment. Fig. F shows how the spring may be raised in this manner. If the spring is found to be outside the limits specified as determined by the above test it will be

necessary to adjust it as covered by the following methods.

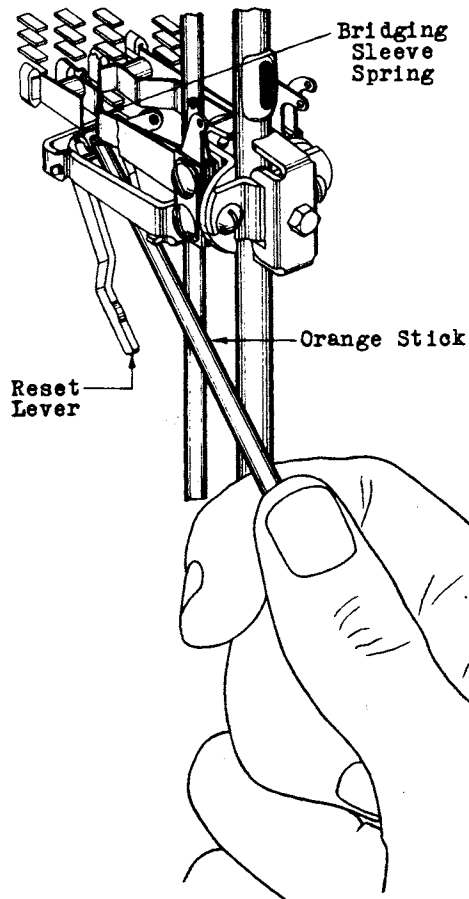


Fig. F - Method of Raising Bridging Sleeve Spring to Check Vertical Adjustment

M-8 Adjustment of 11-D Brush The 11-D brush is manufactured with the correct relation between the sleeve springs and the tip and ring springs to permit making the adjustment for the .075" contact travel without raising or lowering an individual spring in the spring assembly. Accordingly, if the brush is not in adjustment, loosen the multiple brush clamping screw with the No. 220 socket wrench sufficiently to permit the adjustment to be made. Tap the shank of the socket wrench up or down as required until the sleeve spring just makes or breaks contact with the reference terminal as indicated by the flickering of the test lamps, at the same time centering the brush as accurately as possible in its horizontal position. Due to the greater forward and backward movement permissible in the brush rods at the No. 0 and No. 4 banks, take care when adjusting the brushes on these banks to hold the brush rod as near as possible to its normal vertical position in order not to affect the height of the brush setting. The frame of the brush should not be tapped in making this adjustment as this will be likely to mar the finish or distort some

part of the brush assembly.

M-9 Adjustment of 11-A Brush This brush has been replaced by the 11-D brush and the relation between its sleeve springs and the tip and ring springs makes it necessary in adjusting for the .075" contact travel to raise or lower the lower sleeve spring as follows. Determine the lower sleeve spring by eye and loosen the lower screw associated with the spring assembly containing the spring, with the No. 206 or No. 207 offset screw-driver. Lower or raise the spring with the No. 380-A spring adjuster until it just makes or breaks contact with the terminal as shown by the flickering of the test lamp.

M-10 If the tip or ring spring associated with this assembly has been thrown out of adjustment by this operation check it approximately at this time by noting that the top edge of the contact portion of the tip or ring spring lines up approximately with the bottom edge of the respective tip or ring terminal above the reference terminal. If the spring does not line up with the terminal in this manner, make it do so by adjusting it with the No. 380-A adjuster, taking care not to throw out the sleeve spring adjustment.

M-11 Tighten the spring assembly clamping screws.

M-12 Recheck the sleeve spring adjustment since the tightening of the screws may change the location of the springs slightly. If necessary, readjust as covered in M-8 for the 11-D brush.

HIGHER SLEEVE SPRING

M-13 Adjustment of 11-A and 11-D Brushes Raise the brush rod until the rack index number 52 shows just above the clutch sighting plate, making sure that the weight of the brush rod assembly rests on the clutch pawl. Check to see that the top edge "C" of the contacting portion of the higher sleeve spring does not extend above the centerline of terminal No. 53. If the top edge "C" of the contact portion of the higher sleeve spring extends above the center of the terminal, loosen the lower spring assembly clamping screw with the No. 206 or No. 207 offset screw-driver and lower the sleeve spring as required with the No. 380-A spring adjuster. Check tip or ring spring associated with the assembly to see if it has been thrown out of adjustment by this operation. If it is, center it approximately on the No. 52 terminal using the method similar to that covered above.

M-14 Tighten the spring assembly clamping screws.

M-15 If it was found necessary to remove a strap wire to make the reference terminal idle this wire should be soldered to the proper terminal before disconnecting the lamp circuit.

M-16 Remove the No. 396-A rack locating tool from the rack, disconnect the lamp cir-

cut and lower to the normal position all brush rods which were raised in making this adjustment.

M-17 Remove the busy condition imposed on the selector circuits specified in M-1.

2.15 NON-BRIDGING SLEEVE SPRING (Rq.3.15)
LOCATION

M-1 Raise the brush rod until the rack index number 49 shows just above the clutch sighting plate, making sure that the weight of the brush rod assembly rests on the clutch pawl.

M-2 No. 11-B and No. 11-E Brushes To locate the sleeve springs of these brushes in accordance with the requirement, loosen the multiple brush clamping screw and move the brush as a whole on the brush rod as covered in 2.14, M-8. The non-bridging sleeve spring is in its ideal adjustment when the centerline of the spring coincides with the centerline of the reference terminal.

M-3 After making sure that the tip and ring springs meet their requirements and that the brush is located as accurately as possible horizontally, tighten the multiple brush clamping screw.

M-4 Nos. 11-C, 11-F, 11-G and D-85387
Brushes (Double Contact Sleeve Springs)

To locate the sleeve springs of these brushes in accordance with the requirement, attempt to meet the requirement by loosening the multiple brush clamping screw with the No. 220 socket wrench and raising or lowering the brush as a whole, as covered in 2.14, M-8.

M-5 If this method will not permit the brush to meet the requirement for both sleeve springs, locate the brush on the rod so that the centerline of the contact portion of one of the sleeve springs is as near as possible coincident with the centerline of the reference terminal. Raise or lower the other sleeve spring individually to bring it into the specified position, by loosening the lower screw of the spring assembly with the No. 206 or No. 207 offset screw-driver and raising or lowering the sleeve spring as required with the No. 380-A spring adjuster.

M-6 Check the location of the tip or ring spring in this same assembly in accordance with the requirement for the location of the tip and ring springs. If adjustments are required, shift the spring with the No. 380-A spring adjuster.

M-7 Retighten the assembly clamping screws and again recheck the location of the sleeve spring to see that it is in the required position.

2.16 TIP AND RING SPRING LOCATION (Rq.3.16)

M-1 To check for this requirement the brush rod should be in such a position that the rack index number 49 shows just above the clutch sighting plate with the weight of the

brush rod assembly resting on the clutch pawl. Note the setting of the tip and ring springs. If the upper edge of the contact portion of the springs shows at least .015" (three-quarters thickness of terminal), above the upper edge of the terminal, and the lower edge of the contact portion of the spring shows at least .015" (three-quarters thickness of terminal) below the lower edge of the terminal, the adjustment may be assumed to be satisfactory for any terminal in the bank.

M-2 Before adjusting for this requirement, first determine that the sleeve springs have their correct setting. If this setting is incorrect, readjust the sleeve springs as covered in paragraphs 2.14 and 2.15. If, after this adjustment, it is found that the tip and ring springs fail to meet the limits specified in M-1 above, adjust the springs at fault as follows:

M-3 Loosen the lower assembly screw with the No. 206 or No. 207 offset screw-driver and raise or lower the spring with the 380-A spring adjuster until there is at least .015" contact metal of the spring showing above or below the reference terminal. Tighten the assembly screw if it has been loosened. Check the adjustment of the sleeve spring in the same pileup and readjust it, if necessary.

2.17 POINT OF CONTACT BETWEEN TRIP (Rq.3.17)
ARMATURE EXTENSION AND
ROTATING LEVER

2.18 VERTICAL LOCATION OF TRIP (Rq.3.18)
ARMATURE EXTENSION WITH
RESPECT TO ROTATING LEVER

2.19 PARALLELISM OF CONTACT BETWEEN (Rq.3.19)
TRIP ARMATURE EXTENSION AND
ROTATING LEVER

2.20 LOCATION OF SHARP EDGE OF TRIP (Rq.3.20)
ARMATURE EXTENSION

2.21 CLEARANCE BETWEEN TRIP (Rq.3.21)
ARMATURE EXTENSION AND RACK

2.22 CLEARANCE BETWEEN TRIP (Rq.3.22)
ARMATURE EXTENSION AND
ADJACENT MULTIPLE BRUSH FRAMES

M-1 In adjusting for requirements 3.17, 3.18, 3.19, 3.20, 3.21, and 3.22 bend the trip armature extension with the No. 325 adjuster while holding it with the No. 326 holder as outlined in 2.23, M-2, taking care that requirements 3.23 and 3.24 can still be met.

M-2 In adjusting to meet requirement 2.18, above, it may also be necessary to raise or lower the rotating lever. The rotating lever should not be lowered so that requirement 3.04 cannot be met.

2.23 CLEARANCE BETWEEN END OF TRIP (Rq.3.23)
FINGER AND SLEEVE SPRINGS

M-1 To check for this clearance locate the brush rod so that the trip lever of the associated brush is just below the trip finger being checked. Operate the trip armature electrically when gauging the operated clearance. Use should be made of the No. 89 round thickness gauge in checking for this requirement.

M-2 To change the position and the angular travel of all the trip fingers on a trip rod to meet this requirement, one or a combination of the following methods may be used.

(a) Bend the trip armature extension as shown in Figs. G and H so as to engage the rotating lever nearer to its center and thus increase the swing of the lever.

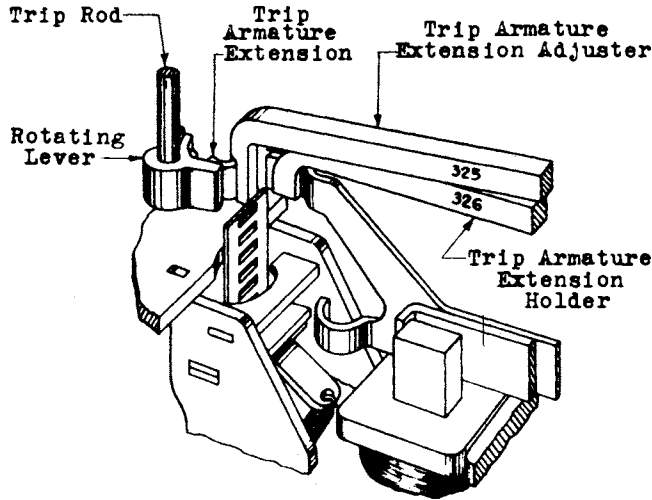


Fig. G - Method of Bending Trip Armature Extension

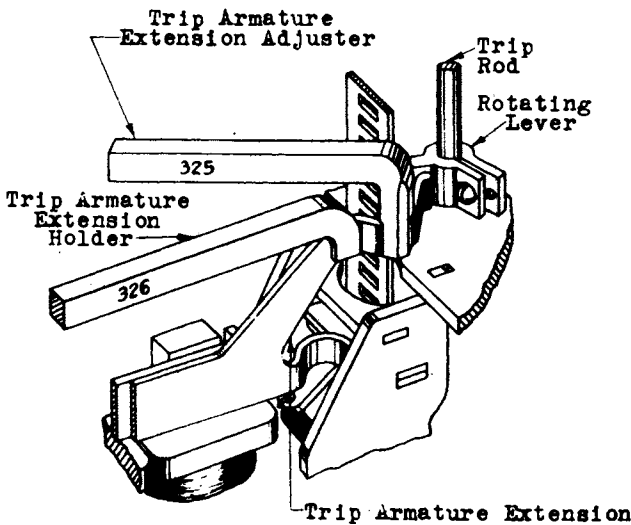


Fig. H - Method of Bending Trip Armature Extension

(b) Bend the trip armature extension directly over the semi-circular stop to change the position of the trip finger swing without changing the amount of swing as shown in Fig. I. Use the No. 326 holder for holding the trip magnet armature while bending it with a No. 325 adjuster.

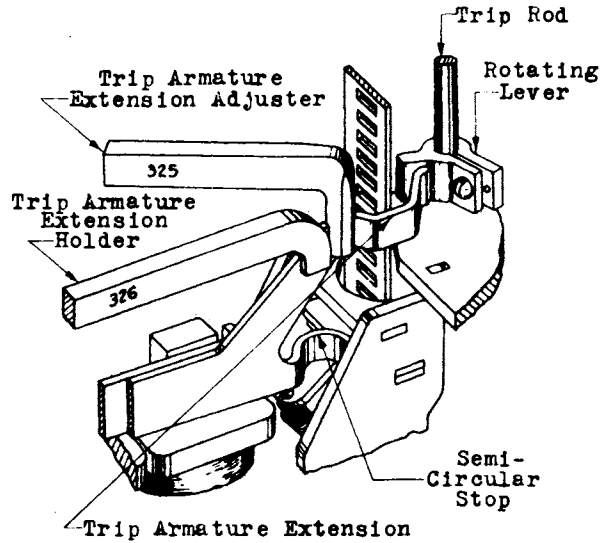


Fig. I - Method of Bending Trip Armature Extension

(c) Bend the semi-circular portion of the trip armature extension as necessary with long nose pliers as shown in Fig. J, care being taken not to bend it to such an extent as to cause interference between the trip armature extension and the rack or the reset lever of the adjacent multiple brush.

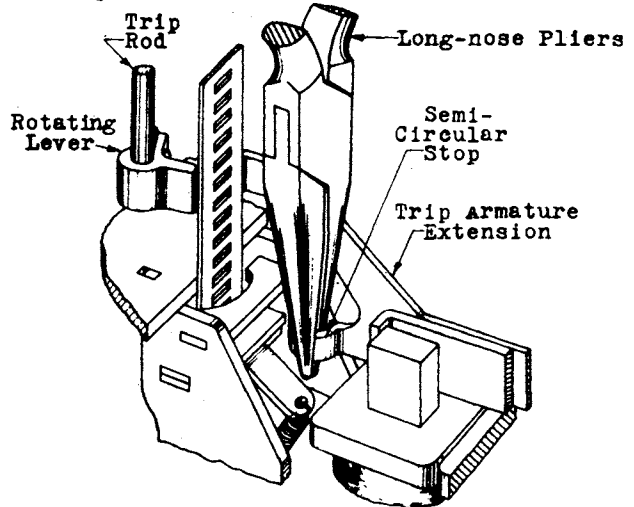
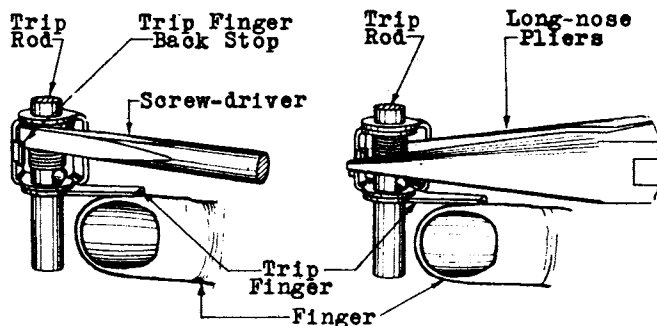


Fig. J - Method of Bending Semi-circular Stop of Trip Armature Extension

(d) When the rotating lever is not located on the trip rod in a position to allow the proper swing of the trip lever, loosen the rotating lever clamping screw slightly with the 3-1/2" cabinet screw-driver and relocate the rotating lever on the trip rod. Tighten the clamping screw after relocating the rotating lever.

M-3 If the normal position of one trip finger is out with respect to the others, bend the trip finger back stop. The back stop may be bent to the right by means of the blade of the 3-1/2" cabinet screw-driver placed between it and the trip rod as shown in Fig. K. It should be bent forward with a pair of long nose pliers as shown in Fig. L. Care should be exercised in making this adjustment to prevent injury to the trip finger.



Figs. K and L - Methods of Bending Trip Finger Back Stops

2.24 HORIZONTAL CLEARANCE BETWEEN TRIP FINGER AND TRIP LEVER (Rq.3.24)

M-1 With the trip rod in its normal position raise the brush rod until the brush is in the position in which the trip lever of the associated brush would be engaged by the trip finger if the trip finger were operated. Then note the clearance between the trip finger in its normal position and the trip lever of the brush. Gauge the gap with a No. 89 round thickness gauge.

M-2 Next lower the brush rod sufficiently to permit the trip rod to be fully operated and then raise the brush rod to the position referred to in the previous paragraph and again note the clearance between the trip finger and the brush trip lever.

M-3 If readjustment is necessary and the trouble is found to exist on all of the trip fingers of the trip rod, the position or the angular travel of all the trip fingers should be changed as outlined in 2.23, M-2, care being taken to see that the requirement covering the clearance between the end of the trip fingers and the sleeve springs can still be met.

M-4 If the trouble is not due to a general misalignment of all the trip fingers, check the location of the multiple brush to see that it meets requirement 3.09 (Horizontal Centering). If the brush is set correctly,

the normal position of the individual trip finger in question should be changed as outlined in 2.23, M-3. After making this adjustment, see that requirement 3.23 can be met.

2.25 TRIP FINGER RETURN TO NORMAL (Rq.3.25)

M-1 To check for the trip finger return to normal, pull the trip finger back about 30° and allow it to return very slowly to normal.

M-2 Adjust a trip finger which binds by inserting the edge of the No. 35 screw-driver between the horizontal flanges of the trip finger frame and yoke, either top or bottom, and then twisting the screw-driver slightly as shown in Fig. M. Where it is found necessary to free the trip fingers in this manner, care should be taken not to bend the trip finger frame or yoke to such an extent as to cause excessive end play, because of its effect on trip finger height adjustments.

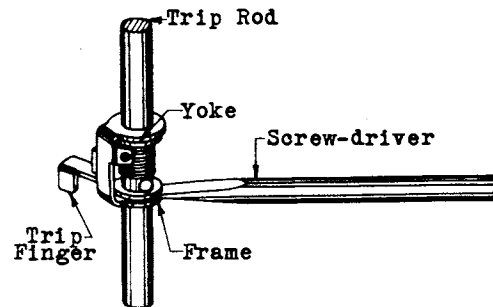


Fig. M - Method of Adjusting Binding Trip Finger

M-3 If the top and bottom flanges are spread too far, causing a bind, they should be pinched together with a pair of long-nose pliers as shown in Fig. N.

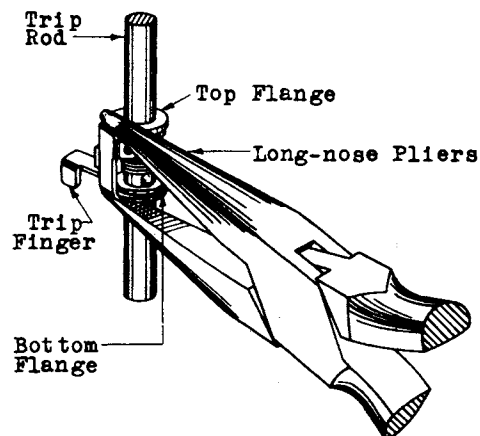


Fig. N - Method of Adjusting Binding Trip Finger

2.26 FREEDOM OF MOVEMENT OF (Rq.3.26)
TRIP ROD

M-1 To check for the freedom of movement of the trip rod, operate the trip magnet manually by grasping the trip magnet armature and the core further from the fulcrum between the thumb and forefinger, squeezing them together and then allowing the armature to release slowly under pressure.

M-2 If it is noted that the trip rod is sluggish when operated and released in this manner first make sure that requirements 3.04 (Clearance Between Rotating Lever and Top Clutch Locating Plate), 3.17 (Point of Contact Between Trip Armature Extension and Rotating Lever), 3.20 (Location of Sharp Edge of Trip Armature Extension) and 3.30 (Clearance Between Trip Rod Stop Collar and Bottom of Bearing Plate) have been met, then check the freedom of movement of the bearings and make sure that the trip rod does not bind at its lower end due to dirt in the mounting hole. Loosen the stop collar with the 3-1/2" cabinet screw-driver, lift out the trip rod and clean out the trip rod mounting hole in the top clutch locating plate when the bind is due to dirt at this point. After the hole has been cleaned out replace the trip rod and adjust the stop collar as covered in paragraph 2.30.

M-3 If the cause of the sluggish return of the trip rod is a weak retractile spring, replace the spring.

2.27 VERTICAL CLEARANCE BETWEEN (Rq.3.27)
BOTTOM OF HORIZONTAL FLANGE
OF TRIP FINGER AND TRIP LEVER

M-1 To obtain this clearance bend the trip finger very slightly up or down as required with a No. 327 trip finger adjuster as shown in Fig. 0.

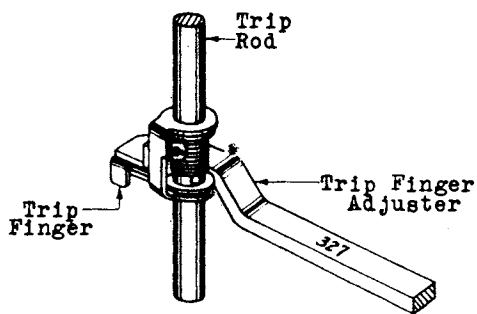


Fig. 0 - Method of Adjusting Clearance Between Bottom of Trip Finger Flange and Trip Lever

M-2 Care should be taken that this adjustment does not throw the horizontal flange out of square with the trip rod.

M-3 At the time this requirement is being checked a visual check should be made

for excessive trip finger end play, that is, excessive gap between the top or bottom horizontal flange of the trip finger frame and the yoke. If the trip finger is adjusted near the minimum or maximum height adjustment, see that the requirement is met with the end play of the trip finger taken up in either direction.

2.28 DOWN STOP COLLAR LOCATION (Rq.2.28)

M-1 The stop collars now in use are of two types; the old type of which two up and two down stop collars are used for each brush rod, and the new type of which only one up and one down stop collar is required. The procedure used in adjusting stop collars of either type is essentially the same.

M-2 First make sure that the commutator brush springs are in the correct adjustment as specified in the R.A.P. covering this apparatus.

M-3 "Y" Commutator Brush Spring Clearance
To adjust for this clearance, loosen the down stop collar clamping screws (if one of the new type) with a No. 220 wrench. If the rod is equipped with old type down stop collars, loosen the clamping screws with the KS-2631 screw-driver. Raise the brush rod approximately 1/8" and push the down stop collar or collars down on the bearings. Then tighten the clamping screws just sufficiently to support the weight of the brush rod. Grasp the brush rod just below the commutator brush frame and tap the down stop collar or collars up by carefully raising and lowering the brush rod until the bottom edge of the "Y" commutator brush spring clears the top edge of the reference hole in the "Y" commutator segment by .020". With the down stop collar or collars in this position, tighten the clamping screws sufficiently to prevent the collar or collars from slipping on the brush rod. Scribe a line on the brush rod at the top of the down stop collar and, in subsequent adjustments, make sure that the top of the down stop collar is not raised above the scribed line.

M-4 Multiple Brush Reset If the multiple brush will not reset under the conditions specified in the requirement, loosen the multiple brush clamping screw with the No. 220 wrench and lower the multiple brush, taking care that there is the specified clearance between the multiple brush frame and the top of the down stop collar. If it is found necessary to lower the multiple brush, relocate the brush springs as required as covered in 2.09, 2.14, 2.15 and 2.16. If the multiple brush resets properly under the conditions specified, and there is not the specified clearance between the down stop collar and the multiple brush frame, lower the down stop collar or collars. When checking to see that the reset lever resets with a snap with the proper gauge inserted between the down stop collar and the bearing plate, make sure that the reset lever does not ride off of the side of the bearing or reset plates when the brush resets.

M-5 If the reset lever is sluggish or fails to restore fully to its normal position,

this may be caused by friction between the rollers and the connecting plate on the trip lever assembly. To remedy this condition lubricate the surfaces of the rollers which come in contact with the connecting plate with W.E. lubricating compound No. 3. To do this raise the brush rod and trip the multiple brush. Dip an R-1575 camel's hair brush in the lubricant, remove the excess lubricant from the brush before withdrawing the brush from the container and apply the lubricant as shown in Fig. P. After the lubricant has been applied restore and trip the multiple brush a few times manually to insure that the lubricant will reach the entire surfaces of the rollers where they come in contact with the connecting plate.

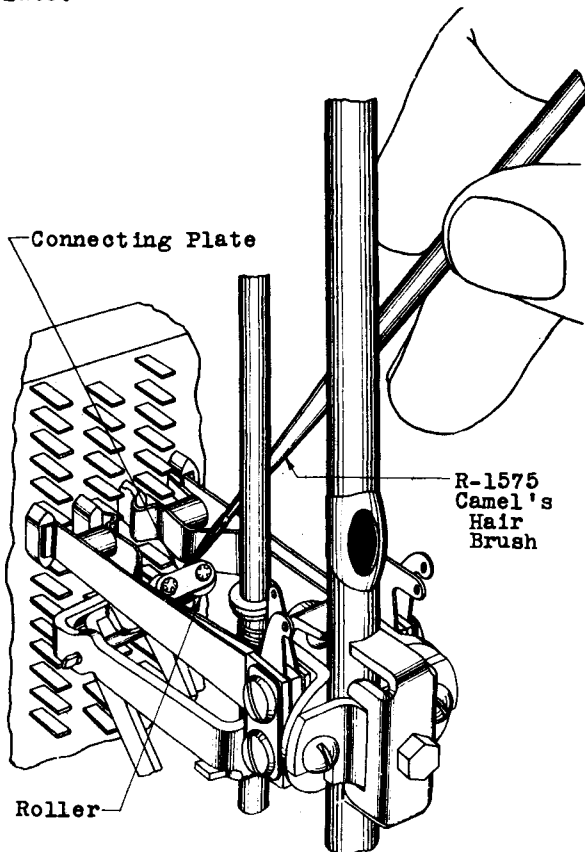


Fig. P - Method of Lubricating the Connecting Plate and Rollers on the Trip Lever Assembly

M-6 If the reset lever smags against its associate reset (bearing) plate when the brush restores lubricate the reset lever and the reset (bearing) plate as covered in 2.1, M-4.

M-7 Clearance Between Each Multiple Brush Frame and Cross-Member If the lack of clearance is general for all brushes on the rod, correct by lowering the down stop collar or collars. If the lack of clearance is not

general, raise the brush and lower the springs as covered in M-4. In any case, if an adjustment is necessary, recheck for the brush reset and adjust for it, if necessary.

M-8 Location of One Old Type Down Stop Collar with Respect to Bearing When the final location of the old type down stop collars has been obtained as outlined above, lower the brush rod until one of the down stop collars rests against the bearing plate. Loosen the clamping screw of the other down stop collar, slide it down snugly against its associated bearing and fasten it in place.

M-9 See that the clamping screws of all the down stop collars are securely tightened.

2.29 CLEARANCE BETWEEN BRUSH ROD UP STOP COLLARS AND BOTTOM OF BEARING PLATE (Rq.3.29)

M-1 To make the adjustment, raise the brush rod until the rack index number 101 shows just above the clutch sighting plate, making sure that the weight of the brush rod assembly rests on the clutch pawl.

M-2 With the brush rod in this position, if a new style up stop collar is used, check to see that the top surface of the collar is at least $1/32$ " but not more than $1/16$ " from the underside of the bearing locating plate.

M-3 To adjust the new style up stop collars shift them on the rod as required using the No. 220 socket wrench to loosen and tighten the clamping screw.

M-4 If the old type up stop collars are used, see that one of the collars is the same distance away from the bearing plate as set forth above for the new style collar.

M-5 To adjust the old type up stop collars shift one of them on the rod as required using the KS-2631 screw-driver to loosen and tighten the stop collar clamping screw. Raise the brush rod until the adjusted collar touches against the underside of the bearing plate. Then, securely fasten the other old type up stop collar so that its top surface fits snugly against the underside of the associated bearing plate. Check the setting by lowering the brush rod and raising it under power as far as it will go. See that with one stop collar resting against the bearing plate, the gap between the other stop collar and its associated bearing plate should not be more than approximately .005". Remove the up drive power and notice that the rack index number 101 shows just above the clutch sighting plate with the weight of the brush rod assembly on the clutch pawl. With the rod in this position, raise the rod by hand and note that there is at least $1/32$ " but not more than $1/16$ " of travel in the rod before the stop collars engage with the bearing plate.

2.30 CLEARANCE BETWEEN TRIP ROD (Rq.3.30)
STOP COLLAR AND BOTTOM
OF BEARING PLATE

M-1 To adjust for this clearance slacken the stop collar clamp screw with the KS-2631 screw-driver if the clamp screw is of the old style, or with a No. 220 socket wrench if the clamp screw is of the new style, and insert the .015" step of the No. 80 thickness gauge between the bearing plate and the top edge of the collar. Raise the collar until the thickness gauge is snug against the under side of the plate, then secure the collar.

M-2 The adjustment should insure the collar sufficient clearance from the bearing plate, so that the rod will be free to turn in its bearings and will not be great enough to disturb the trip finger adjustment when the rod is lifted while the brush is being tripped. Note that with the trip rod in its normal position, the stop collar does not touch the bearing clamp and when the trip rod is allowed to return to normal slowly after being operated and raised, that the stop collar does not catch in the slot in the bearing plate.

2.31 CLEARANCE BETWEEN MULTIPLE (Rq.3.31)
BRUSH FRAMES AND BANK
TERMINALS

M-1 If it is found that the multiple brush frames fail to clear the No. 10 and No. 49 bank terminals of the No. 0 bank or the No. 99 terminal of the No. 4 bank on old style apparatus not equipped with a bearing plate above the No. 4 banks by the required amount as specified in requirement 3.31, make a check to determine if this condition is caused by a bowed rack.

M-2 Uncouple the rack and brush rod and raise the rod away from the rack, supporting the rod in the raised position. Remove the rack from the clutch, and if it is bowed, straighten it by bending with the fingers, taking care to leave no kinks in it.

M-3 Replace the rack and recouple it to the brush rod.

M-4 If the necessary clearance is not now visible, the brush rod should be inspected for kinks, bows or a bent condition at the rack tongue slot. Any bowing or kinking of the rod should be removed as covered in paragraph 2.05. If the required clearance is still unobtainable, the bearing closest to the faulty part of the rod may be moved so as to get the required clearance. Care should be taken however, not to move the bearing enough to prevent the brush from meeting the requirements for brush intrusion, 3.12 and freedom of movement of brush rod 3.05.

M-5 If the required clearance cannot be met on the No. 4 banks on old frames which are not equipped with a bearing plate between the No. 4 bank and the commutators the trouble is due to a bent or bowed brush rod. This condition should be corrected as outlined in paragraph 2.05.

2.32 SMOOTH BRUSH TRAVEL (Rq.3.32)

M-1 See that the brushes are so centered that they reliably clear all the terminals of the banks when in a reset condition, as the selector travels up and down.

M-2 Trip the brush and run it to its top-most position under power. Watch the brush reset lever and if it jiggles or vibrates, the brush in question should be checked further. Trip it and run it up and down slowly by hand and note if any of the spring contacts catch slightly on the terminals at any part of the bank. A heavy tension on the clutch pawl spring will sometimes cause the zero brush reset lever to vibrate. This can be eliminated by holding the down-drive armature operated enough to remove the pawl while the rod is being driven up.

M-3 An attempt should be made to correct chattering or snagging by adjusting the springs causing the trouble so that their contact surfaces are as parallel as possible to the contact surfaces of the bank terminals. The 380-A spring adjuster may be used for this purpose.

M-4 If the brush still chatters or snags it should be removed and replaced.

2.33 LOCATION OF 8-A INDICATOR ON (Rq.3.33)
FINAL FRAMES

M-1 To adjust an indicator which is not within the limits covered in requirement 3.33 loosen one of the screws on the pointer with the KS-2631 screw-driver and raise or lower the pointer as required.

M-2 After the desired adjustment has been obtained securely tighten the pointer mounting screws.

2.34 FINAL INSPECTION

M-1 After all adjustments have been made check to make sure that all screws and nuts are securely tightened.

2.35 MULTIPLE BRUSH REPLACEMENTS

2.351 TO REMOVE A MULTIPLE BRUSH

M-1 The circuit associated with the selector to be worked on, also the ones on either side of it shall be made busy except when the brush to be changed is on an end rod, in which case only two circuits shall be made busy. See requirement 1.004.

M-2 Cover the clutches on the side of the frame being worked upon with a piece of canvas to protect against falling solder or screws.

M-3 Raise the brush rod until the brush to be removed is approximately in the middle of the bank and mark the brush rod as an aid in properly locating the new brush.

M-4 Unsolder the wires at the brush terminals.

M-5 If the brush to be removed is on the No. 0 bank, uncouple the rack and return it to normal. Hold the brush and rod and loosen the multiple brush clamping screw with No. 220 socket wrench and then slide the brush off the lower end of the rod. Carefully pull back the right hand springs just far enough to permit the trip rod to pass between the reset roller and the sleeve spring and remove the brush.

M-6 If the brush to be removed is on any other bank except the top one, raise the brush to its highest position, remove the bearing directly above the brush with the 6-1/2" cabinet screw-driver, loosen the brush clamping screw with the No. 220 socket wrench, the latch screws with the 3-1/2" cabinet screw-driver and remove the latch.

M-7 Move the brush up on the rod until the springs are above the bank terminals and swing it to the left until the brush frame is free of the brush rod. As it will be necessary to bow the rod outward slightly to clear the brush frame extreme care shall be exercised not to distort or kink the rod. Pull the right hand springs out to permit the trip rod to pass between the roller and sleeve spring as the clamp end of the brush is tipped downwards.

M-8 Trip the brush and, bringing the contact end of the springs forward, remove the brush from between the rods by twisting the brush in a clockwise direction so that it is at right angles with the above position, and then drawing it out by moving the contact ends of the springs to the left.

M-9 If the brush to be removed is on the top bank raise the brush rod to its highest position and remove the latch as covered in paragraph M-6.

M-10 Then move the brush up on the rod until the springs clear the bank terminals and remove the brush from between the rods as covered in paragraph M-8.

2.352 TO PLACE A MULTIPLE BRUSH

M-1 If the brush to be placed is on the No. 0 bank loosen the brush clamping screw with the No. 220 socket wrench. Raise the rod so that the multiple brush may be slipped up over the bottom end. Carefully pull back the right hand springs just sufficiently so that the trip rod will pass between the reset roller and the sleeve spring and place the brush. In placing the brush, see that the contact springs are between the proper bank terminals, slide the brush to approximately its proper

location on the brush rod and lightly tighten the clamping screw sufficiently to hold it in place. Couple the rod and rack.

M-2 If the brush is to be placed on any other bank but the top one, loosen the brush clamping screw with the No. 220 socket wrench and remove the latch from the brush by loosening the latch screws with the 3-1/2" cabinet screw-driver. Now trip the brush, and holding it by the contact end with the flat side of the tip spring up, pass the brush between the rods to the left of the one on which it is to be mounted. These operations are the reverse of those given in paragraph 2.351, M-7.

M-3 After the entire brush has passed between the rods turn the contact end up and reset the brush by reversing the operation as given in paragraph 2.351, M-6. Pull back the springs to allow the trip rod to enter the brush. Keeping the brush above the bank terminals pull the brush rod out slightly and turn the brush so that it will engage the rod. With the springs between the proper bank terminals, slide the brush down to approximately its correct position on the rod and assemble that latch to the brush frame. Tighten the latch screws and lightly tighten the clamping screw. Replace the bearing.

M-4 If the brush is to be placed on the top bank, loosen the brush clamping screw with the No. 220 socket wrench and remove the latch by loosening the latch screws with the 3-1/2" cabinet screw-driver. Raise the brush rod to the top position, and set the brush in place by passing the brush springs down over the top terminals, spreading the springs so that they pass easily over the terminals. Slide the brush down on the rod to approximate its correct location and attach the latch and tighten the clamping screw sufficiently to hold it in place.

M-5 Solder the wires to the brush terminals. The proper colors can be ascertained by referring to a similar brush on an adjacent rod.

M-6 Lower the brush rod to the notch in the rack corresponding to the bottom terminal and see that the multiple brush is approximately centered on the first set of multiple bank terminals. Tighten the clamping screw just tight enough to prevent the brushes from dropping but loose enough to enable final adjustment to be made by lightly tapping up or down on the brush.

M-7 Adjust the brush when placed in accordance with the requirements and methods specified herein.

Attached:

R.A.P. X-70263-01. Sheets 1 to 7 Incl.,
Issue 2-B

SECTION 3 - REQUIREMENTS

REASON FOR ISSUE COVERING CHANGES IN REQUIREMENTS
FROM X-70263-01, ISSUE 1

1. To add a requirement (3.01) to cover the lubrication of trip rod rotating levers and clutch trip armature extensions, and multiple brush reset levers and reset (bearing) plates. (Class B).
insure that the point of engagement shall be inside the rounded corner at the front edge of the rotating lever. (Class D).
2. To change the requirement covering stud gap (3.08) to specify that there shall be a perceptible stud gap on every terminal on the bank in addition to the definite limits of Test at least .005", Readjust at least .008" at the reference terminal. (Class D).
9. To add a requirement covering the clearance between the trip armature extension and the rack (3.21). (Class D).
3. To remove from the methods and to cover in the requirement for the horizontal centering of multiple brushes (3.09) the check which should be made if one sleeve shoe touches its adjacent terminal. (Class D).
10. To add a requirement covering the clearance between the trip armature extension and adjacent multiple brush frames (3.22). (Class D).
4. To change the requirement covering bridging sleeve spring location (3.14) to include the .075" travel requirement. (Class D).
11. To combine the requirements covering trip rod return to normal and trip rod operation (3.26). (Class D).
5. To omit the requirement covering sleeve spring stagger.
12. To change the requirement covering the clearance between the down stop collar and multiple brush frame on both old and new style collars (3.28, (c1 and c2)). (Class D).
6. To change the requirement covering non-bridging sleeve spring location (3.15) to include brushes with double contact sleeve springs. (Class D).
13. To add a requirement covering the clearance between the "Y" commutator brush spring and the reference hole in the associated "Y" commutator segment (3.28 (d)). (Class D).
7. To change the requirement covering tip and ring spring location (3.16) to specify an adjustment for the reference terminal. (Class D).
14. To change the requirement covering clearance between each multiple brush frame and cross member (3.28 (e)). (Class D).
8. To change the requirement covering the point of contact between trip armature extension and rotating lever (3.17) to
15. To change the requirement covering clearance between multiple brush frames and bank terminals (3.31). (Class D).
16. To add a requirement covering the location of the 8-A indicator on final frames (3.33). (Class D).

DEFINITIONS AND GENERAL INFORMATION

- | | |
|---|---|
| <p>3.001 <u>Multiple Brush Contact Spring Pressure</u> is that which it is necessary to overcome to start a tripped brush contact spring away from its associated bank terminal when the gauge is applied at a point on the spring approximately 1/4" from the end of the spring.</p> | <p>3.002 <u>Additional General Information Reference</u> shall be made to R.A.P. X-70000-01 covering General Requirements, Definitions and Information, for additional information necessary for the proper application of the requirements listed on these sheets.</p> |
|---|---|

REQUIREMENTS
FOR

PANEL DISTRICT, OFFICE, INCOMING AND FINAL SELECTOR ELEVATOR APPARATUS
(NO. 11 TYPE AND D-85387 MULTIPLE BRUSHES, NO. 2 AND NO. 9 TYPE BRUSH
RODS, NO. 1 TYPE TRIP RODS, NO. 8 TYPE INDICATORS AND NO. 1-A GUIDES)

REQUIREMENTS

3.01 Lubrication

(a) Before the installer starts the operation test, the following points shall be lubricated with one application of Western Electric Lubricating Compound No. 3.

- (1) On Trip Rod Rotating Levers and Trip Armature Extensions, the surfaces of these parts where they come in contact with each other.
- (2) On Multiple Brush Reset Levers, the underside of the lever for a distance of approximately 1/2" from the end.
- (3) On Reset (Bearing) Plates, the surface with which the reset lever comes in contact.

(b) Care should be taken that none of the lubricant gets on the racks or the cork rolls of the drive.

(c) Trip rod rotating levers and trip armature extensions, reset levers and reset (bearing) plates which show signs of wear and reset levers which stick when resetting, together with their associated reset (bearing) plates, shall be lubricated, if required, at the discretion of the Telephone Company.

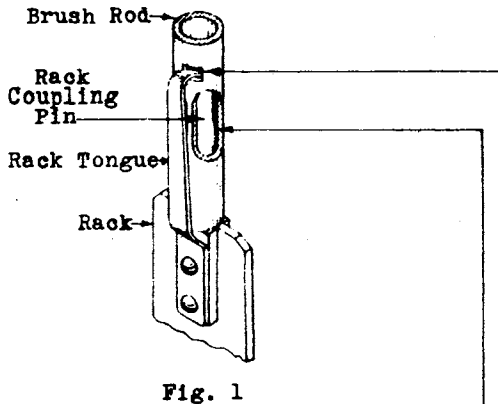


Fig. 1

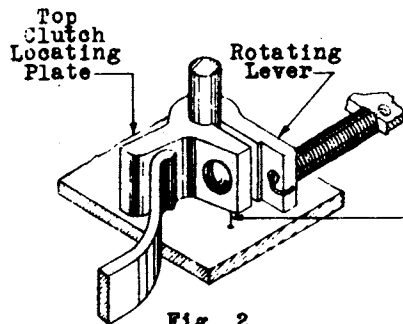


Fig. 2

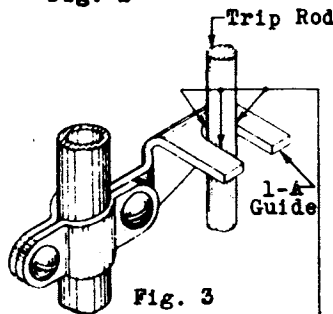


Fig. 3

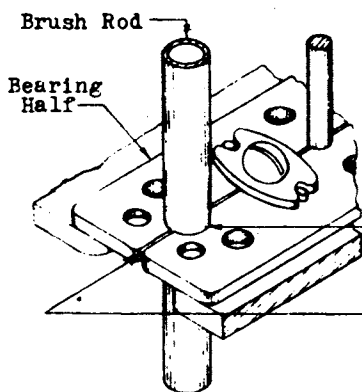


Fig. 4

3.02 Rack Tongue Position The rack tongue shall have sufficient tension to hold it against the rack coupling pin and shall engage with the slot in the brush rod in such a manner as to prevent any twisting motion in the rack being transmitted to the rod. There shall be a perceptible clearance between the rack tongue and all sides of the slot in the brush rod. Gauge by eye and by feel.

3.03 Rack Coupling Pin Engagement The rack coupling pin shall be sufficiently free in the brush rod to allow the rod to rest on the shoulder of the rack and to prevent any twisting motion of the rack being transmitted to the rod. Gauge by eye.

3.04 Clearance Between Rotating Lever and Top Clutch Locating Plate This clearance shall be at least .020". Gauge by eye.

3.05 Freedom of Movement of Brush Rod A brush rod shall be sufficiently free in its bearings to return to normal due to its own weight plus the weight of the rack when lowered slowly from any position except the brush restoring position with the pawl lifted and with any brush tripped.

3.06 1-A Guide Location Throughout the length of travel of the brush rod, the prongs of the 1-A guide may touch the front or rear of the trip rod, but shall not bind at these points and the closed side of the 1-A guide shall clear the trip rod reliably with any brush tripped, but the trip rod shall be wholly within the prongs of the guide. Gauge by eye.

3.07 Brush Rod Bearing Gap The bearing halves shall be placed as closely together as possible without causing the brush rod to bind and the gap between the bearing halves at both front and rear of the bearing shall not be more than .005". Gauge by eye.

REQUIREMENTS FOR

PANEL DISTRICT, OFFICE, INCOMING AND FINAL SELECTOR ELEVATOR APPARATUS
(NO. 11 TYPE AND D-85387 MULTIPLE BRUSHES, NO. 2 AND NO. 9 TYPE BRUSH
RODS, NO. 1 TYPE TRIP RODS, NO. 8 TYPE INDICATORS AND NO. 1-A GUIDES)

Bending of tip or ring springs for stud gap to be done between these two lines

REQUIREMENTS (CONT.)

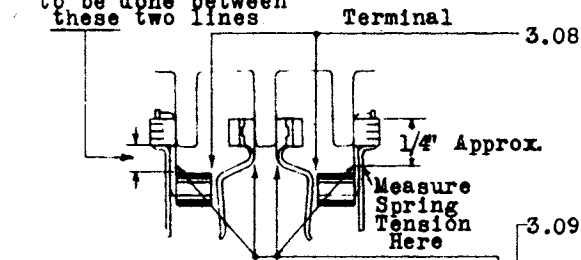


Fig. 5

3.08

Stud Gap With the brush tripped and centered on the reference terminal of the bank, the stud gap shall be:
 Test - At least .005"
 Readjust - At least .008"
 and there shall be a perceptible stud gap at every other terminal of the bank. Use the No. 86 gauge.

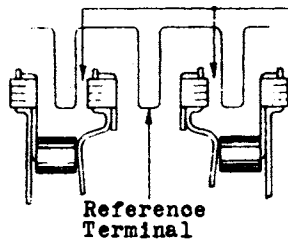


Fig. 6

3.09

Horizontal Centering of Multiple Brushes With the multiple brush in the reset position at the reference terminal of the bank, there shall be a perceptible clearance between the sleeve spring shoes and the tip and ring terminals. If one shoe touches its adjacent terminal, this requirement shall be considered as having been met if the perceptible clearance can be obtained in the following manner. Move the springs of the brush to the left or right until the back of the other shoe touches its adjacent terminal. Then release the pressure slowly and allow the brush to assume its normal position. Gauge by eye.

3.10

Tip and Ring Spring Clearance With the brush in its reset position and the brush rod resting on the pawl for any position of the bank, there shall be a clearance of at least 1/64" between either the tip or ring spring and its associated terminal, when the brush is held so that the back of the further sleeve spring is touching its adjacent tip or ring terminal. Gauge by eye.

3.11

Brush Spring Tension With the brush tripped and centered on the reference terminal of the bank the tension of each spring shall be:
 Test - Min. 25 grams, max. 60 grams
 Readjust - Min. 30 grams, max. 45 grams
 Use the No. 68 gauge.

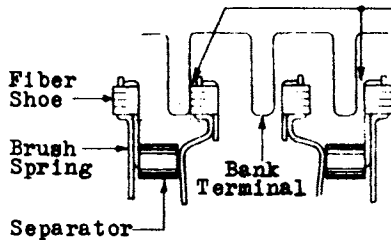


Fig. 7

3.12

Brush Intrusion The contacting surfaces of the springs shall project in from the end of the terminal not less than half and not more than the full width of the shoe when the brush is tripped on any terminal of the bank. The intrusion requirement shall be met at the top, bottom and middle of the bank. It will be satisfactory however if this requirement is slightly exceeded at the top or bottom of the bank in isolated cases, provided these cases are not due to any general misalignment of the bank. Gauge by eye.

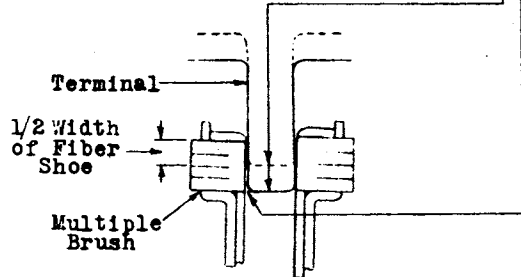


Fig. 8

3.13

Parallelism of Brush Springs When the brush is tripped on the reference terminal the contacting surfaces of the springs of the brush shall be approximately parallel to the contacting surfaces of the terminal. Any divergence from this parallel condition shall not exceed .005" when the brush engages the bank terminal the full width of the fiber shoe. If the brush engages the bank terminal less than the full width of the fiber shoe, the amount that the spring and terminal may be out of parallel is proportional to the amount of brush intrusion, being .0025" when the brush spring engages the terminal only one-half the width of the fiber shoe. Gauge by eye.

REQUIREMENTS FOR

PANEL DISTRICT, OFFICE, INCOMING AND FINAL SELECTOR ELEVATOR APPARATUS
 (NO. 11 TYPE AND D-85387 MULTIPLE BRUSHES, NO. 2 AND NO. 9 TYPE BRUSH
 RODS, NO. 1 TYPE TRIP RODS, NO. 8 TYPE INDICATORS AND NO. 1-A GUIDES)

REQUIREMENTS (CONT.)

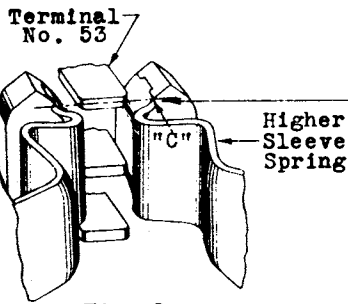


Fig. 9

3.14 Bridging Sleeve Spring Location

- (a) Lower Spring With the brush rod raised so that the rack index number 49 shows just above the clutch sighting plate and with the weight of the brush rod assembly resting on the clutch pawl, the upward travel of the lower sleeve spring from the rest position to the point of break with the reference terminal shall be $.075" \pm .005"$. Use the lamp circuit and the No. 396-A rack locating tool with the $\pm .005"$ tolerance gauged by eye and feel.
- (b) Higher Spring With the rack index number 52 showing just above the clutch sighting plate and with the weight of the brush rod assembly resting on the clutch pawl, the top edge "C" of the higher sleeve spring shall not be above the center line of terminal No. 53. Gauge by eye.

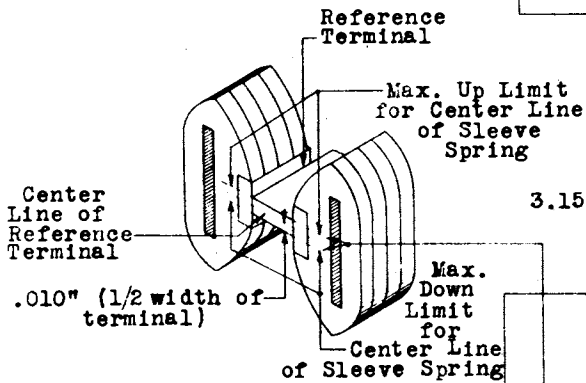


Fig. 10

3.15 Non-bridging Sleeve Spring Location

- With the rack index number 49 showing just above the clutch sighting plate and with the weight of the brush rod assembly resting on the clutch pawl;
- (a) On No. 11-B and No. 11-E Brushes, the center line of the sleeve spring shall not be more than $.010"$ below nor more than $.010"$ above the center line of the reference terminal. Gauge by eye.
- (b) On Nos. 11-C, 11-F, 11-G and D-85387 Brushes, the center line of either sleeve spring shall not be more than $.010"$ below nor more than $.010"$ above the center line of the reference terminal. Gauge by eye.

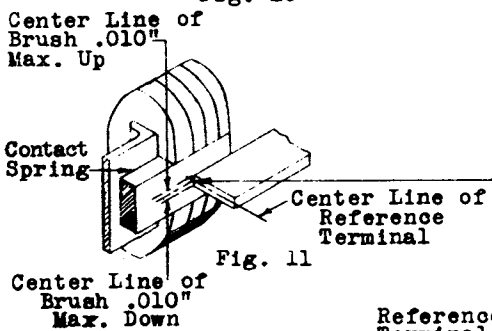


Fig. 11

3.16 Tip and Ring Spring Location

The upper edge of the contact portion of the spring shall not be below the upper edge of the terminal and the lower edge of the contact portion of the spring shall not be above the lower edge of the terminal when the rack is resting on the pawl for any position on the bank. If the vertical spacing of the multiple bank terminals is within requirements, this requirement may be checked as follows: With the pawl engaging the notch in the rack corresponding to the reference terminal, the upper edge of the contact portion of the multiple brush spring shall be at least $.010"$ (1/2 thickness of terminal) test, $.015"$ (3/4 thickness of terminal) readjust above the top edge of the reference terminal and the lower edge of the contact portion of the multiple brush spring shall be at least $.010"$ test, $.015"$ readjust, below the bottom edge of the reference terminal. Gauge by eye.

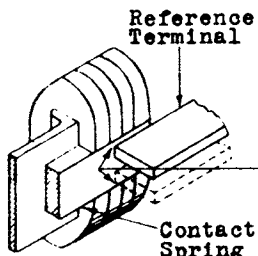


Fig. 12

3.17 Point of Contact Between Trip Armature Extension and Rotating Lever

With the armature in its normal position the point of engagement between the rounded surface of the tip of the trip armature extension and the rotating lever shall be inside the rounded corner at the front edge of the rotating lever. Gauge by eye.

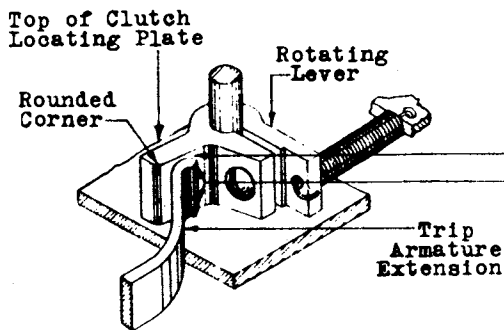


Fig. 13

3.18 Vertical Location of Trip Armature Extension with Respect to Rotating Lever

The tip of the trip armature extension shall not project above or below the rotating lever. Gauge by eye.

REQUIREMENTS FOR

PANEL DISTRICT, OFFICE, INCOMING AND FINAL SELECTOR ELEVATOR APPARATUS (NO. 11 TYPE AND D-85387 MULTIPLE BRUSHES, NO. 2 AND NO. 9 TYPE BRUSH RODS, NO. 1 TYPE TRIP RODS, NO. 8 TYPE INDICATORS AND NO. 1-A GUIDES)

REQUIREMENTS (CONT.)

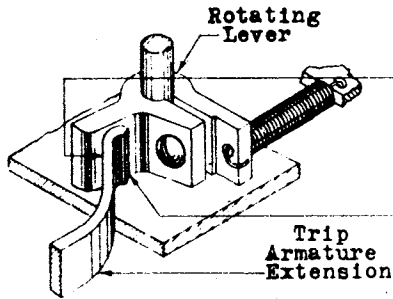


Fig. 14

- 3.19 Parallelism of Contact Between Trip Armature Extension and Rotating Lever The trip armature extension shall present an approximately parallel surface to the rotating lever surface. Gauge by eye.
- 3.20 Location of Sharp Edge of Trip Armature Extension With the trip armature in its fully operated position, the sharp edge at the end of the rounded portion of the trip armature extension shall not come into contact with the rotating lever. Gauge by eye.

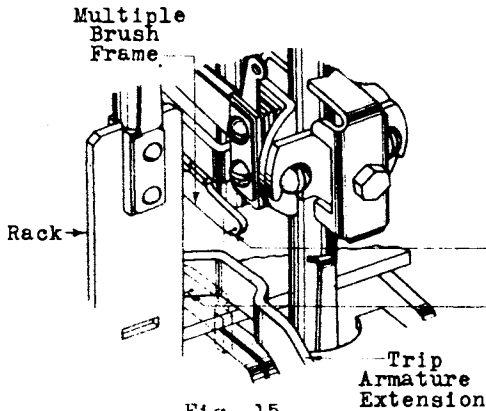


Fig. 15

- 3.21 Clearance Between Trip Armature Extension and Rack With the trip armature extension fully operated there shall be a reliable clearance between the trip armature extension and the rack for all positions of the rack. Gauge by eye.
- 3.22 Clearance Between Trip Armature and Multiple Brush Frame
 (a) With the trip armature in the normal position, the trip armature extension shall clear the frame of the multiple brush to the right of it. Gauge by eye.
 (b) With the trip magnet fully operated, the trip armature extension shall clear the frame of the multiple brush directly above it. Gauge by eye.

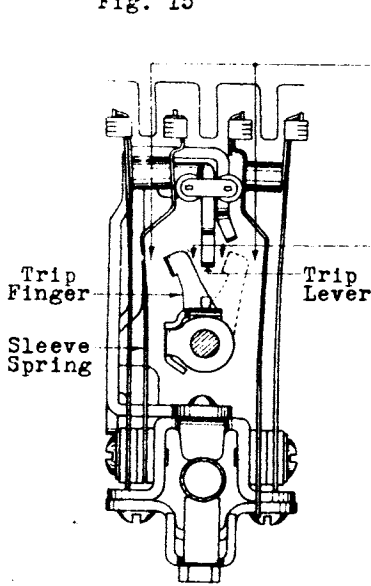


Fig. 16

- 3.23 Clearance Between End of Trip Finger and Sleeve Springs With the multiple brush in the normal (reset) position and with the trip finger in either the operated or the non-operated position, this clearance shall be min. 1/16". Use No. 89 gauge.
- 3.24 Horizontal Clearance Between Trip Finger and Trip Lever With the trip finger in the operated or the non-operated position, there shall be at least 1/64" clearance between the trip finger and the associated multiple brush trip lever, the brush being in the normal (reset) position. Use No. 89 gauge.
- 3.25 Trip Finger Return to Normal Trip fingers shall not be sluggish when allowed to return very slowly from the trip position to the normal position. Gauge by feel and by eye.
- 3.26 Freedom of Movement of Trip Rod There shall be no tendency for the trip rod to fail to operate or be sluggish in operation or in returning to its normal position when the trip magnet armature is slowly operated manually and slowly released. Gauge by eye and by feel.

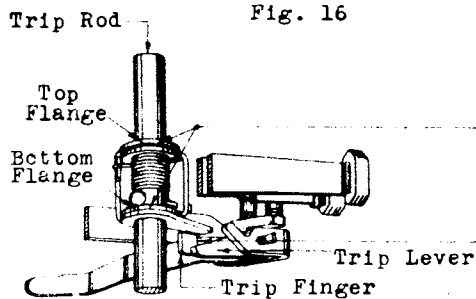


Fig. 17

- 3.27 Vertical Clearance Between Bottom of Horizontal Flange of Trip Finger and Trip Lever With the trip finger engaging the trip lever and with the trip rod down against the top channel of the friction roll drive, this clearance shall be:
- | | |
|-----------------|-----------------------|
| <u>Test</u> | - Min. approx. 1/64"; |
| | Max. approx. 1/16". |
| <u>Readjust</u> | - Min. 1/64"; |
| | Max. 1/16". |
- Use the No. 89 gauge.

REQUIREMENTS
FOR

PANEL DISTRICT, OFFICE, INCOMING AND FINAL SELECTOR ELEVATOR APPARATUS
(NO. 11 TYPE AND D-85387 MULTIPLE BRUSHES, NO. 2 AND NO. 9 TYPE BRUSH
RODS, NO. 1 TYPE TRIP RODS, NO. 8 TYPE INDICATORS AND NO. 1-A GUIDES)

REQUIREMENTS (CONT.)

3.28 Down Stop Collar Location

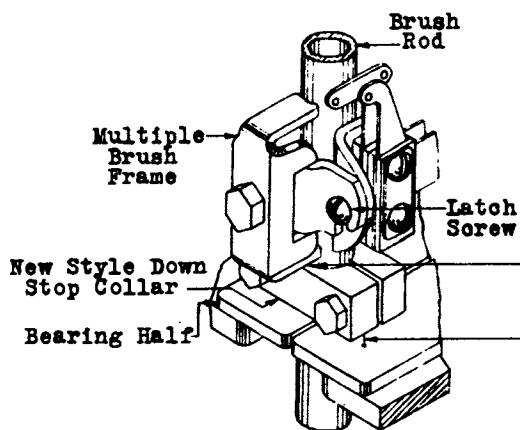


Fig. 18

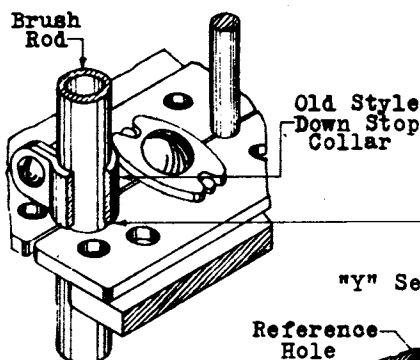


Fig. 19

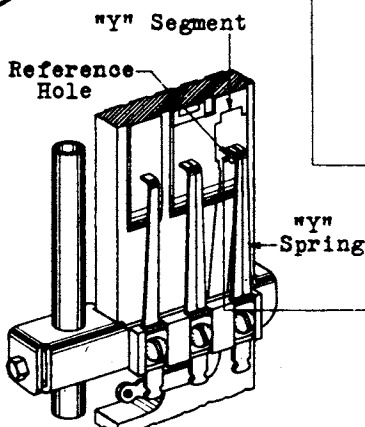


Fig. 20

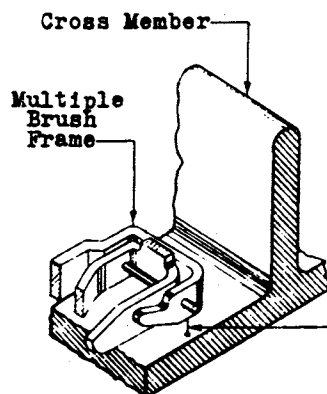


Fig. 21

- (a) Location of Down Stop Collars with Respect to Bearings The down stop collars shall rest upon the brush rod bearings when the brush rods are in the normal or lowest position.
 - (a1) In the case of old style collars, only one collar need rest on the brush rod bearings in the normal position but the clearance between the other collar and the bearings shall be:
 - Test - Not more than .006"
 - Readjust - Not more than .005"
 - Gauge by eye.
 - (b) Multiple Brush Reset When the brush rod is lowered under power, any tripped brush shall reset with a snap with a
 - Test - .010" (85-B thickness gauge)
 - Readjust - .020" (85-C thickness gauge)
 - placed below the nearest down stop collar.
 - (c) Down Stop Collar and Multiple Brush Frame Clearance This clearance shall be:
 - (c1) For old style collars
 - Test - At least .004"
 - Readjust - Approximately 1/32"
 - (c2) For new style collars
 - Test - At least 1/64"
 - Readjust - Approximately 3/32"
 - Gauge by eye.
 - (d) "Y" Commutator Brush Spring Clearance With the brush rod in its normal (down) position, there shall be a clearance between the lower edge of the contact portion of each "Y" commutator brush spring and the top edge of the reference hole in the corresponding "Y" segment of:
 - Test - At least .015"
 - Readjust - At least .020"
 - Gauge by eye.
 - (e) Clearance Between Each Multiple Brush Frame and Cross Member With the brush rod in its normal (down) position this clearance shall be:
 - Test - Perceptible
 - Readjust - At least 1/64"
 - Gauge by eye.

REQUIREMENTS
FOR

PANEL DISTRICT, OFFICE, INCOMING AND FINAL SELECTOR ELEVATOR APPARATUS
(NO. 11 TYPE AND D-85387 MULTIPLE BRUSHES, NO. 2 AND NO. 9 TYPE BRUSH
RODS, NO. 1 TYPE TRIP RODS, NO. 8 TYPE INDICATORS AND NO. 1-A GUIDES)

REQUIREMENTS (CONT.)

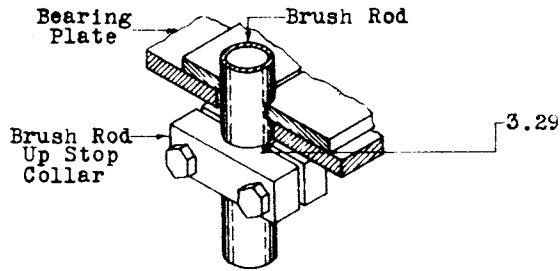


Fig. 22

3.29 Clearance Between Brush Rod Up Stop Collars and Bottom of Bearing Plate With the weight of the brush rod assembly resting on the clutch pawl and with the rack index number "101" showing just above the clutch sighting plate, this clearance shall be min. $1/32$ ", max. $1/16$ ". Gauge by eye.

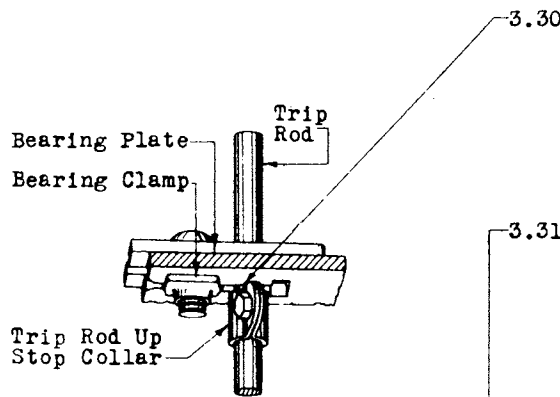


Fig. 23

3.30 Clearance Between the Trip Rod Stop Collar and the Bottom of the Bearing Plate This clearance shall be:

Test - Min. .008", max. .025"
 Readjust - Min. .010", max. .020"

Gauge by eye.

Bank Terminal

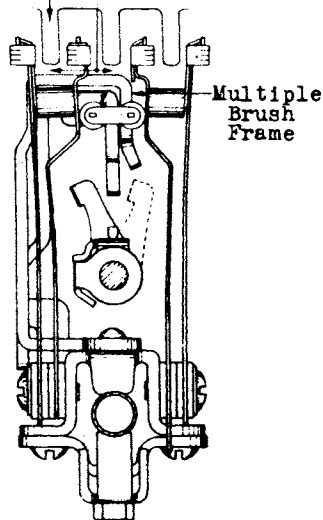


Fig. 24

3.31 Clearance Between Multiple Brush Frames and Bank Terminals With the rack index numbers 10 and 49 respectively, showing just above the clutch sighting plate and with the weight of the brush rod assembly resting on the clutch pawl, this clearance shall be at least $1/32$ " on No. 0 banks. On old type frames only which do not have a bearing plate above the No. 4 bank, this clearance shall also be met at the top terminal of the No. 4 bank when the brush rod is raised so that the rack index number 99 shows just above the clutch sighting plate and the weight of the brush rod assembly rests upon the clutch pawl. Gauge by eye.

3.32 Smooth Brush Travel With the brush tripped and as the selector travels up and down in normal operation, each brush shall meet the following condition:

- (a) It shall run smoothly over the bank terminals without chattering.
- (b) It shall not snag against the bank terminals.
- (c) It shall not ride off the bank terminals.

3.33 Location of 8-A Indicator on Final Frames With the rack index number 49 showing just above the clutch sighting plate and with the weight of the brush rod assembly resting on the pawl, the indicator pointer shall coincide approximately with the mark on the indicator strip between Nos. 48 and 50. Gauge by eye.

REQUIREMENTS
 FOR

PANEL DISTRICT, OFFICE, INCOMING AND FINAL SELECTOR ELEVATOR APPARATUS
 (NO. 11 TYPE AND D-85387 MULTIPLE BRUSHES, NO. 2 AND NO. 9 TYPE BRUSH
 RODS, NO. 1 TYPE TRIP RODS, NO. 8 TYPE INDICATORS AND NO. 1-A GUIDES)