

UNISELECTOR (P.O. TYPE 1 AND SYSTEM C)

Maintenance Adjustment Instruction

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★2. Introduction.—The uniselectors can be obtained to provide 25 or 50 outlets. Uniselectors of the 25-outlet type have double-ended wipers; each end of the wiper sweeps over the same arc of 25 bank contacts in one revolution. Uniselectors with 50 outlets have single-ended wipers and by coupling two adjacent and opposite wipers, each wiper will, in turn, sweep over 25 bank contacts, thus providing an availability of 50 bank contacts per revolution.

General views of the 3- to 5-level uniselector, showing the names of the parts, are given in Figs. 1 and 2. Similar views of the 6- to 10-level uniselector are illustrated in Figs. 3 and 4.

Details are given of the method of fitting a Type 3 wiper assembly to a Type 1 uniselector frame and its adjustment.

3. Identification of types.—P.O. Type 1 and G.E.C. uniselectors are identical, except for very minor details. There are two types, a small type with 3 to 5 wipers, and a large type with 6 to 10 wipers. The construction of the two types differs in some respects but the adjustments are mainly applicable to both types. Special adjustments for the 6- to 10-level uniselectors are specified in the relative paragraphs of the Instruction. The chief mechanical differences between the large- and small-type uniselectors are the pawl spring arrangements and the interrupter assembly.

★4. Adjustment tolerances.—The terms 'test' and 'readjust' values are defined in B 5100.

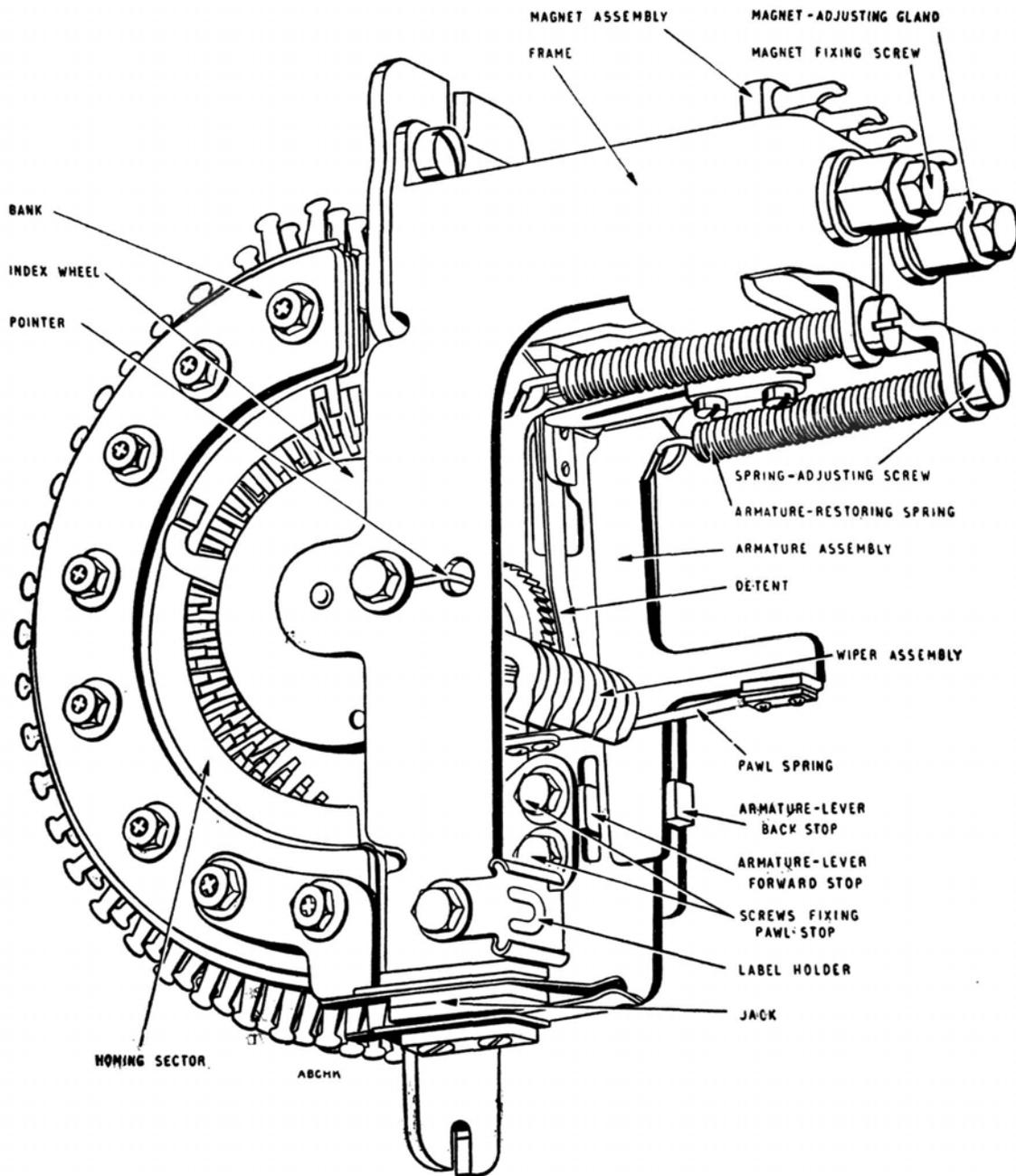


FIG. 1.—3- TO 5-LEVEL UNISELECTOR

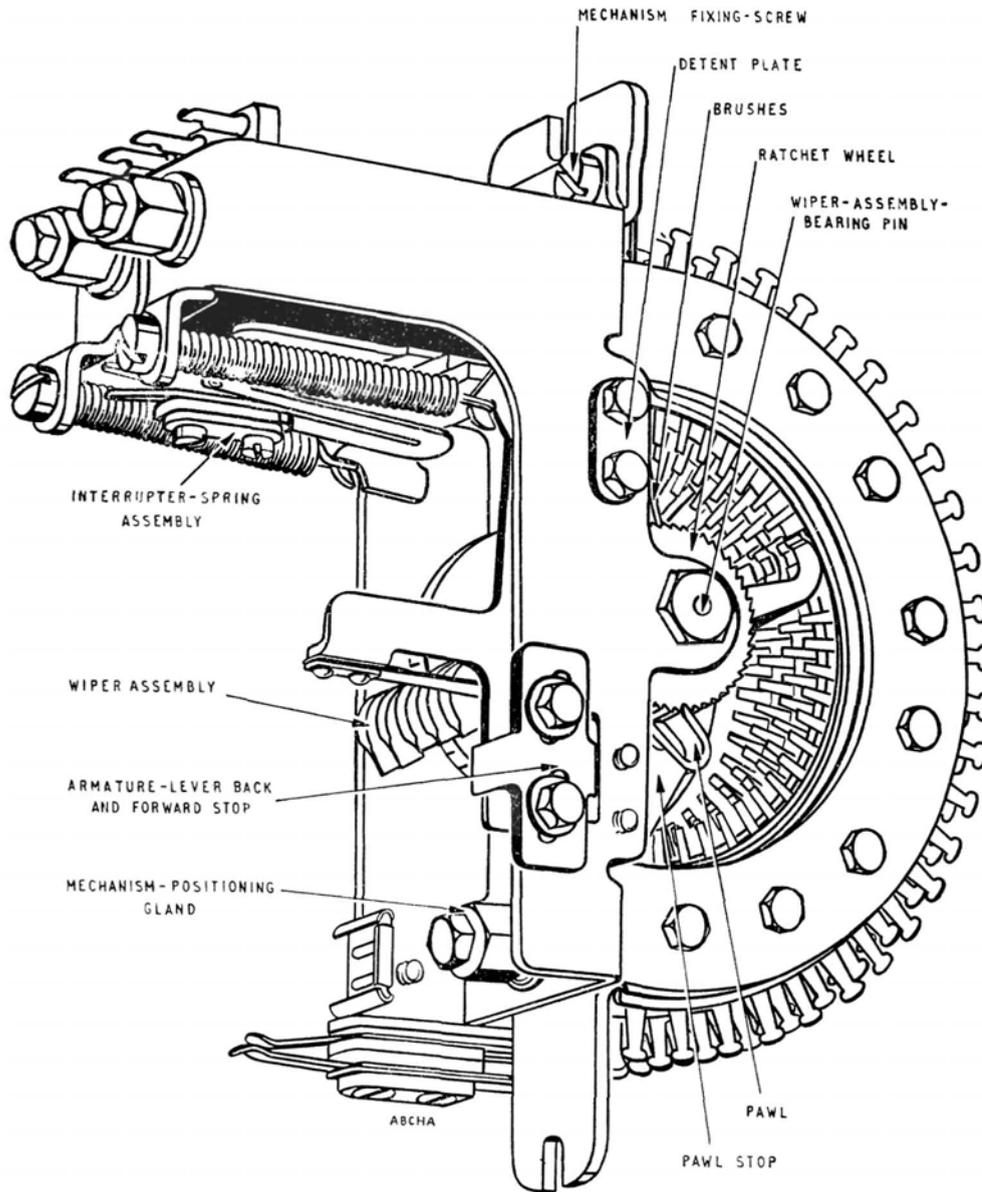


FIG. 2.—3- TO 5-LEVEL UNISELECTOR

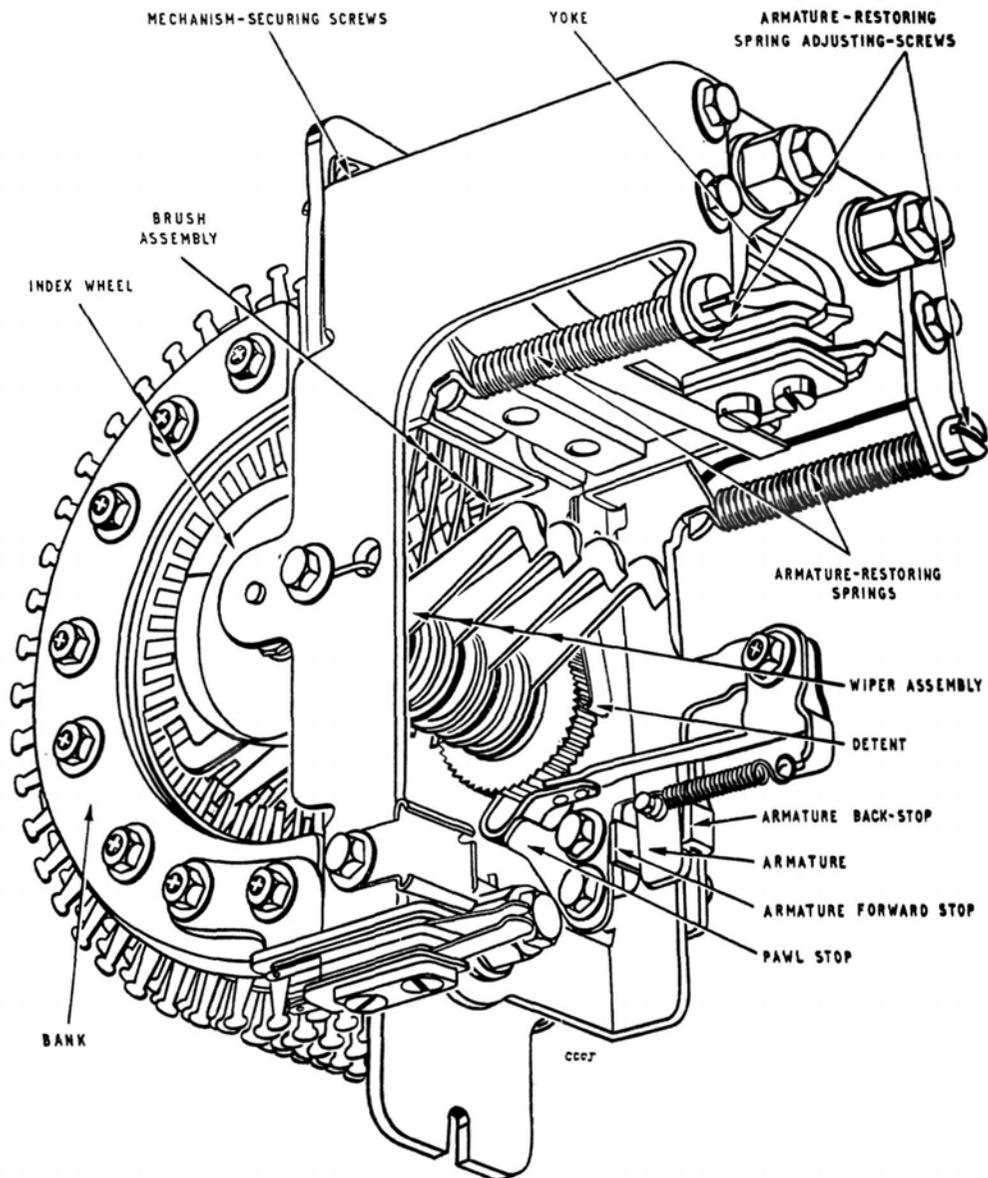


FIG. 3.—6- TO 10-LEVEL UNISELECTOR

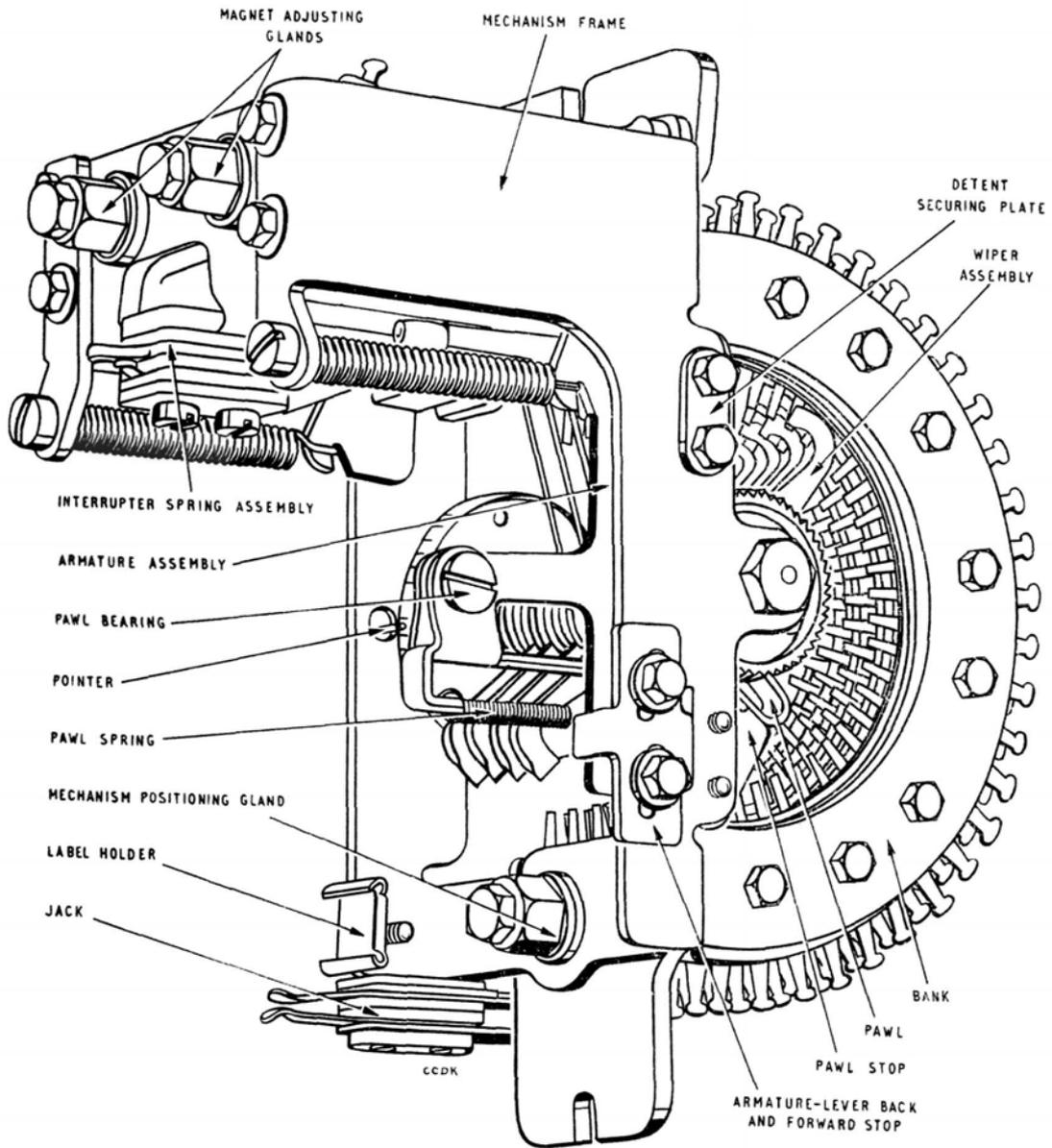


FIG. 4.—6- TO 10-LEVEL UNISELECTOR

MECHANISM ADJUSTMENT

5. Removing mechanism from bank.—Set the wipers on the lower half of the bank and withdraw the two top mechanism-securing screws; then grip the mechanism with one hand, remove the bottom securing-screw, and withdraw the mechanism (see Fig. 5).

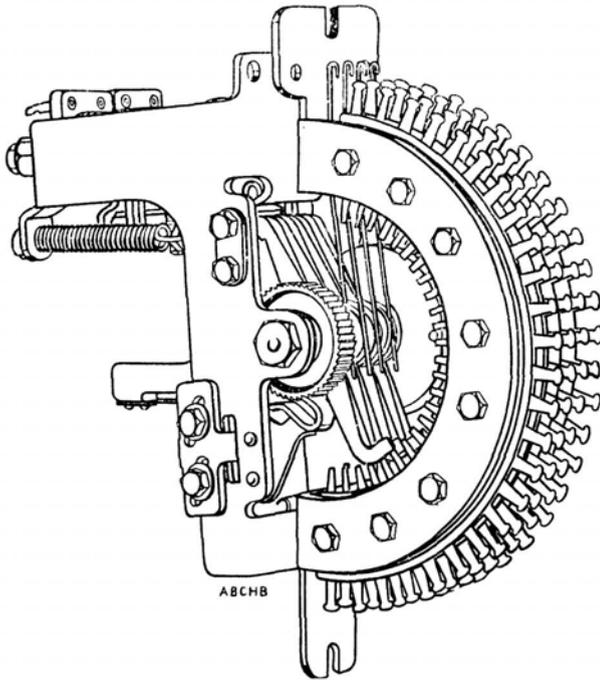


FIG. 5.—REMOVING MECHANISM FROM BANK

★6. Adjustment of brushes.—Adjust the brushes so that they are vertical and parallel (when viewed from the front) and are in line with the 23rd bank contact.

7. Replacing mechanism in bank.—Set the wipers at the approximate position for the 3rd bank contact, as shown in Fig. 6; work the heels of the wipers over the first bank contacts and push the mechanism well home on the bank. Step the wipers a few times, to ensure that the brushes are running in their respective collector rings, and then replace the mechanism-securing screws.

★8. Brush tension.—The tension of each brush on its collector ring should be 35 ± 10 gm (test) 35 ± 5 gm (readjust), measured at the extreme tip (see Fig. 7). The tension should be measured with the wipers standing on the 11th bank contact.

(a) *To increase the tension* of a brush feed, remove the mechanism from the bank and reset the brushes to line-up with the 23rd bank contact.

(b) *To decrease the tension.* Gently lever the particular brush feed away from the collector ring, with the mechanism in position.

9. Position of non-bridging wipers on bank contacts.—The tips of the non-bridging wipers should rest approximately flush with the entering edges of the first bank contacts. Adjust the position as follows:—

(A) *Armature-lever back stop.*

(i) Set the armature-lever back stop and wipers in the position shown in Fig. 8.

(ii) Gradually move the back stop downwards until the wipers have moved to the position shown in Fig. 9. Retighten the armature-lever back stop fixing screws.

(iii) Check that the wiper position is approximately correct on the last bank contact.

If incorrect, make a preliminary adjustment, as described in (D), and recheck and correct the armature-lever back stop adjustment if necessary.

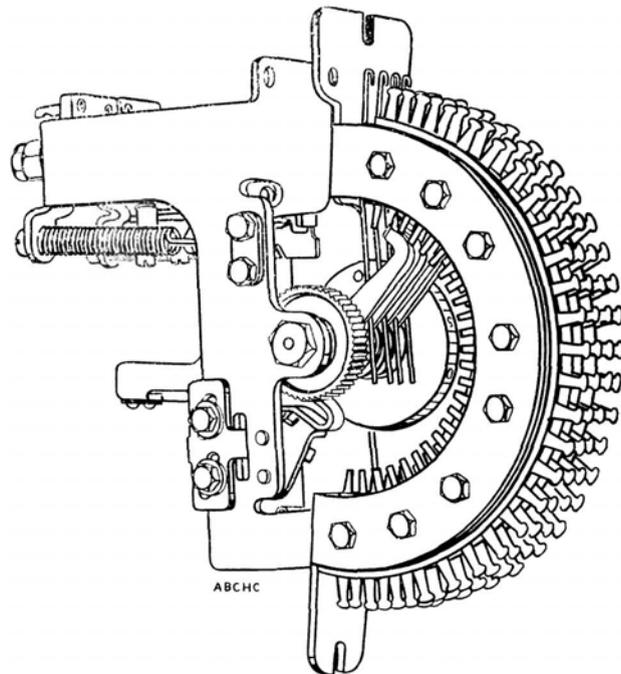


FIG. 6.—REPLACING MECHANISM IN BANK

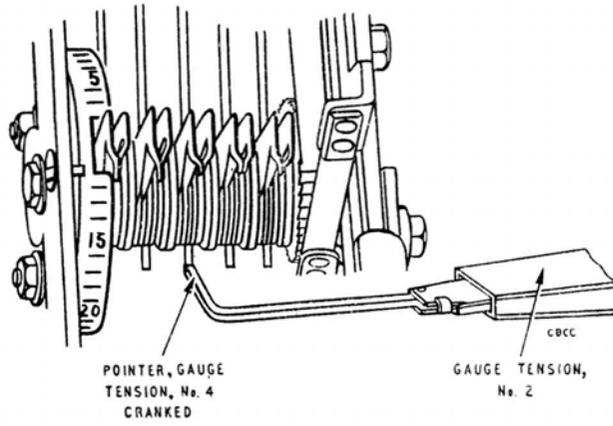


FIG. 7

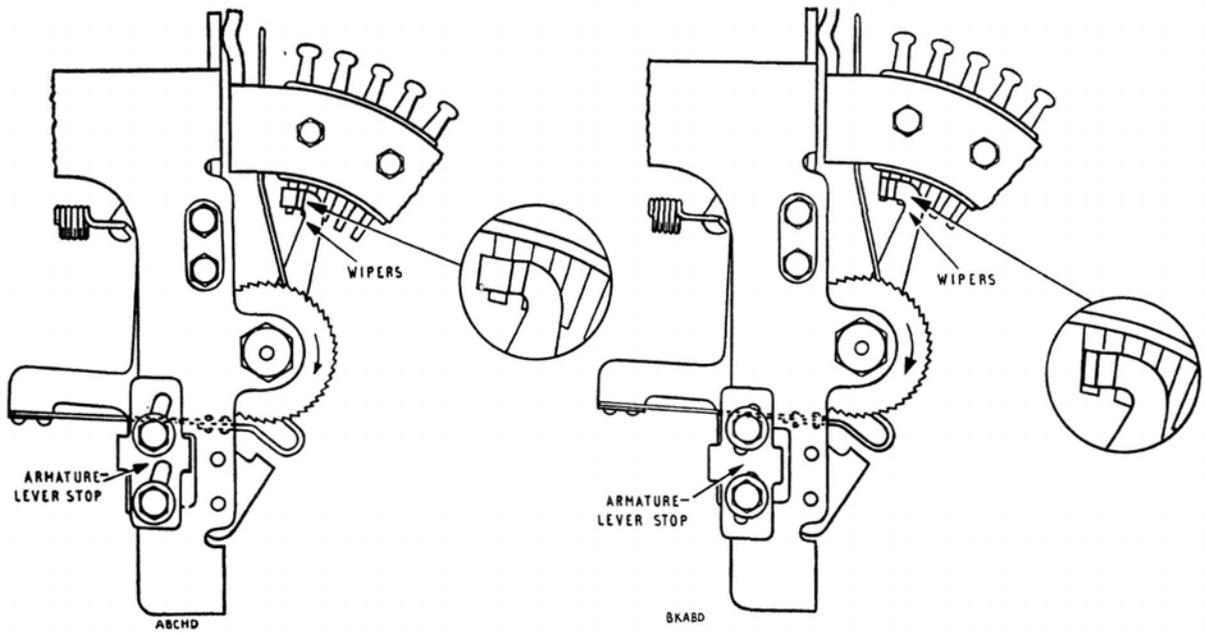


FIG. 8.

★FIG. 9.

★(B) *Detent.*

(i) Adjust the detent so that it drops into each rotary notch without allowing any appreciable backlash in the wiper assembly (see Fig. 10). (Note how its tip rests in the ratchet notch.) Because of variability in the ratchet teeth, slight backlash is permissible on some steps but not on all.

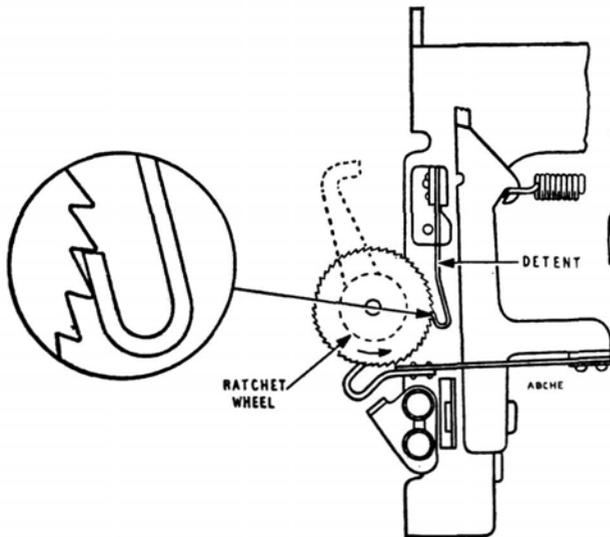


FIG. 10

(ii) Pressure of the detent exerted on the ratchet wheel should be 150 ± 50 gm (test) 150 ± 30 gm (readjust), measured as near the tip as possible (see Fig. 11). It may be adjusted as follows:—

- (a) *To reduce the tension.*—Ease the detent away from the ratchet wheel, using an Adjuster, Spring, No. 3.
- (b) *To increase the tension.*—Remove the detent from the uniselector and reset it.

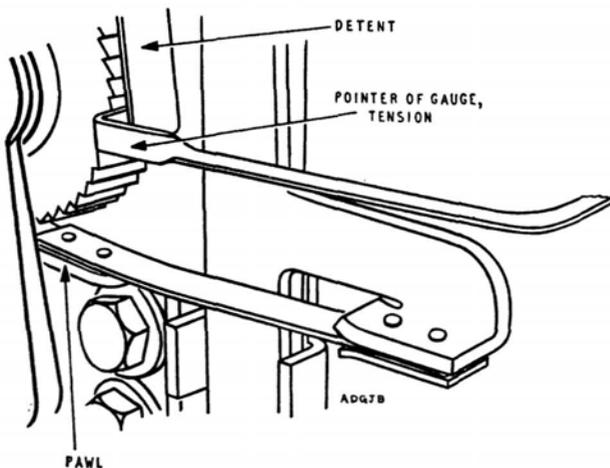


FIG. 11

(C) *Pawl stop.*—Adjust the pawl stop so that, with the armature in its normal position, the pawl is wedged lightly between the pawl stop and the ratchet wheel (see Fig. 12).

(NOTE.—This adjustment must not affect the adjustment of the detent. Slight forward rotational play in the wiper assembly is permissible but it must not be such that the tips of the wipers, when lightly forced forward, move more than half the width of a bank contact.)

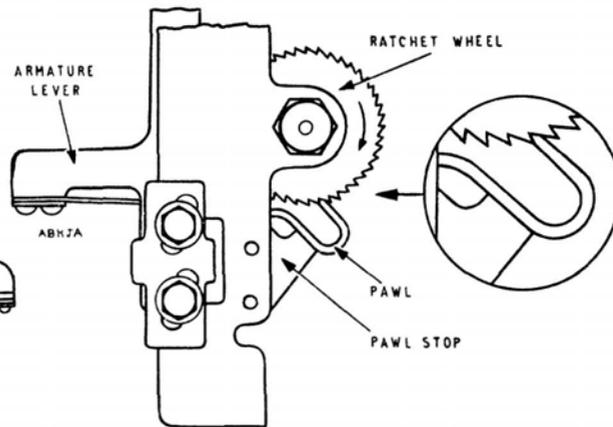


FIG. 12.—ADJUSTMENT OF PAWL STOP

(D) *Mechanism-positioning gland.*—To verify the alignment of the mechanism relative to the bank, rotate the wiper assembly, by hand, to the 25th bank contact. The non-bridging wipers must now occupy the same relative position on this contact as they occupied on bank contact No. 1 (see Fig. 9).

If the wipers do not occupy this position, readjust the position of the mechanism by the mechanism-positioning gland, until the wiper position is correct (see Fig. 13).

10. Position of bridging wipers.—With the armature in its normal position, the tips of the bridging wipers must clear the leaving edges of the previous contacts by 20 mils minimum (see Fig. 14). If the clearance is found to be less than 20 mils, recheck the alignment of the non-bridging wipers on the bank contacts. If the required clearance cannot be obtained with the non-bridging wipers adjusted flush with the entering edge of the contacts, it is permissible to advance (in the direction of rotation) the most forward non-bridging wipers by a maximum of one-third the width of the bank contact.

11. Adjustment of wipers.—Proceed as follows:—

(a) *Wiper entry and flare.*

(i) When the wipers are standing on the 1st bank contacts, the opposite ends should be in alignment with the bank levels, so that they will leave the levels without appreciable side movement. If adjustment is necessary, it must be made at both ends of the wiper assembly.

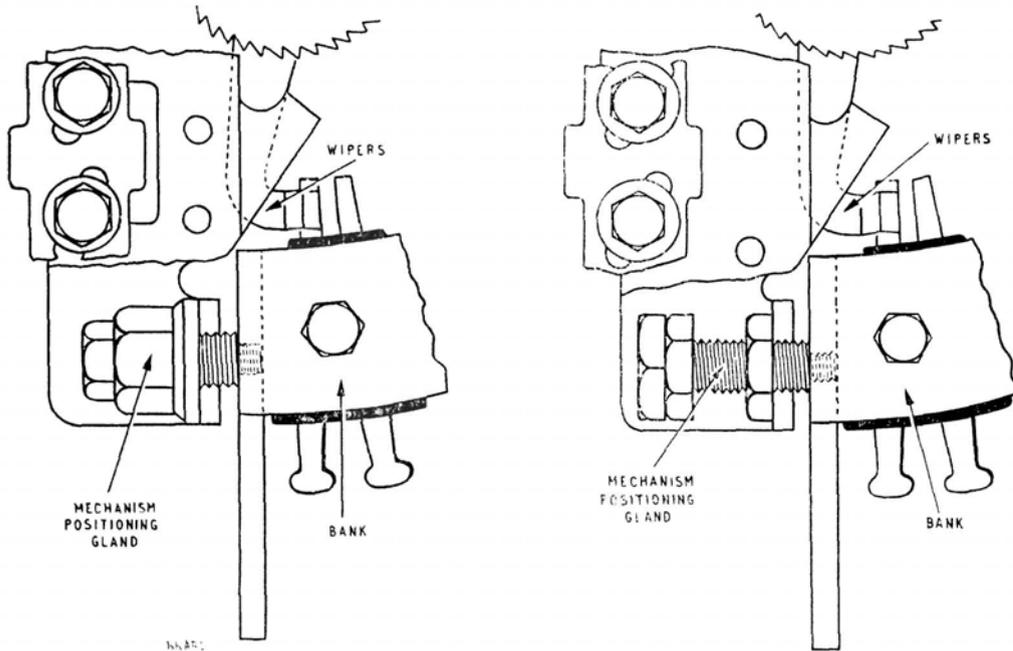


FIG. 13.—WIPER IN CORRECT POSITION ON 25TH BANK CONTACT

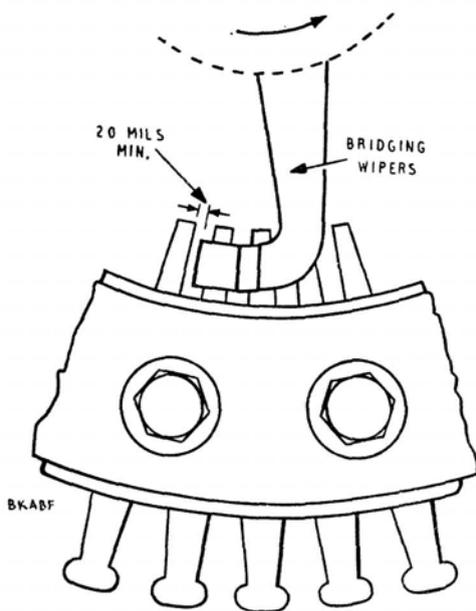


FIG. 14.—CORRECT POSITION OF THE BRIDGING WIPERS

(ii) The position of the mechanism may be adjusted by means of the two top mechanism-securing screws, so that the wipers enter the bank levels without appreciable side movement. The side movement of the wipers in either direction must not exceed 15 mils (the thickness of the bank contacts).

(iii) Each pair of wipers should be flared outwards to the heels from the points marked X in Fig. 15.

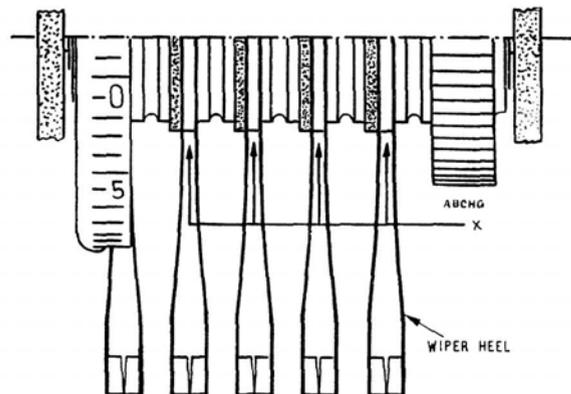
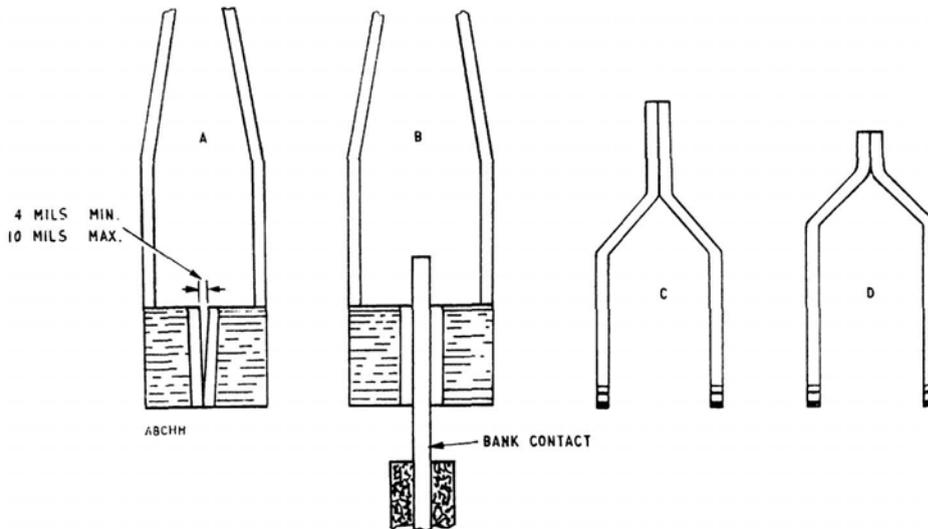


FIG. 15

(b) *Wiper tips.*—Each end of the wipers should be adjusted so that, when not in contact with the bank, the outermost contact points only of each pair are touching. There should be a perceptible gap of 4 mils minimum and 10 mils maximum between the innermost contact points (see Fig. 16). This is to ensure that the wipers make good contact with the bank contacts and that wear of the contact is evenly distributed.

(c) *Wiper tension.*—When the wipers are standing on the 25th bank contacts, they exert a pressure of 30 ± 10 gm (test) 30 ± 5 gm (readjust) on the bank contacts. When checking, insert the gauge at the heel of the wiper, so that the pointer tip engages at the centre-point of the width of the wiper and at the inward set of the wiper tip (see Fig. 17). A Pointer, Gauge, Tension, No. 1 or No. 2 should be used when measuring wiper tensions.



A shows the gap between the innermost contact point of a wiper tip
B Wiper standing on a bank contact
C Bridging wiper
D Non-bridging wiper

FIG. 16

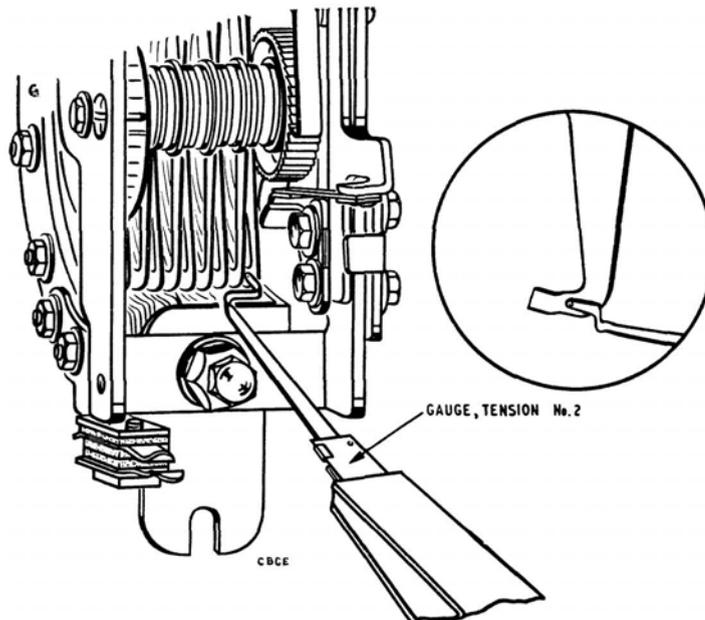


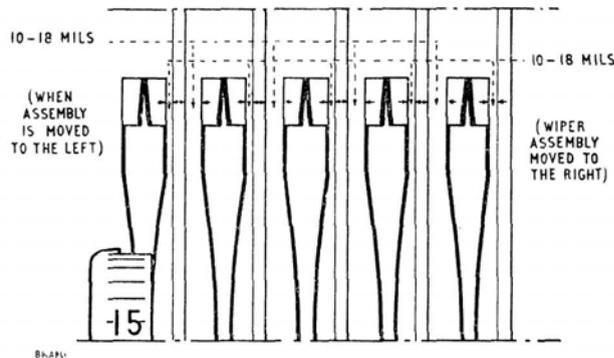
FIG. 17.—MEASUREMENT OF WIPER TENSION

★(d) *Clearance between wipers and brushes.*—When the wipers are standing on the bank contacts and the wiper assembly is moved sideways on the spindle (see Fig. 18) there should be a clearance of 10 mils minimum, 18 mils maximum between the wipers and the brushes. (This clearance is normally measured when the wipers are standing on the 23rd bank contacts.)

(e) *Clearance between wipers and adjacent bank contacts.*—When the wipers are standing on the 25th bank contacts, the heels of the opposite ends should not touch the first bank contacts when the wiper assembly is moved sideways on the spindle.

12. Armature-lever forward stop.—When the armature lever is fully operated by hand (see Note), the armature-lever forward stop should just prevent the pawl from dropping over the second forward tooth of the ratchet wheel (see Fig. 19). A stop correctly adjusted as detailed in par. 9 (A) which fails in this respect must be changed. (The lever back stop and forward stop on early G.E.C. uniselectors are split and can be adjusted to provide this feature.)

NOTE.—As far as possible, avoid the rotation of the wipers by operating the armature-lever by hand, because, under this condition, the armature can be lifted easily off the knife-edge.



★FIG. 18.—CLEARANCE BETWEEN WIPERS AND BRUSHES

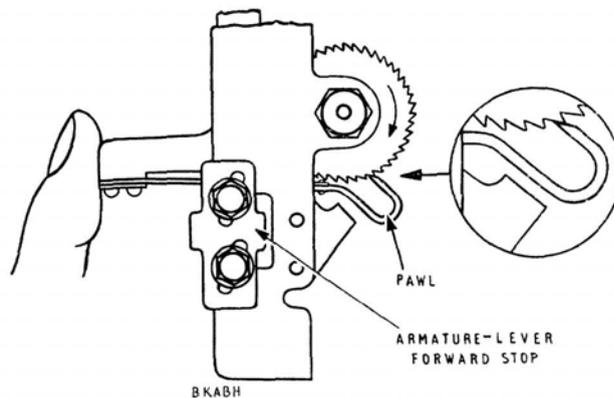
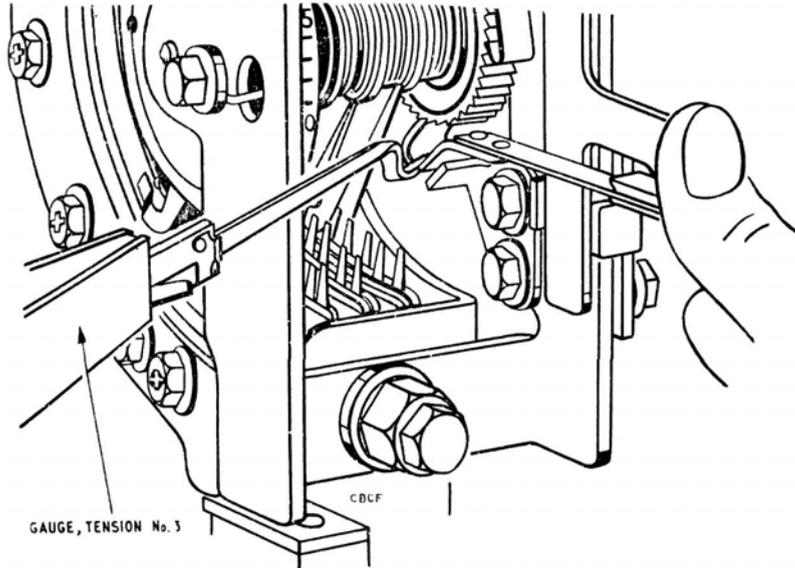


FIG. 19.—CORRECT POSITION OF ARMATURE-LEVER FORWARD STOP

13. Pawl-spring tension.

(a) The tension of a pawl spring of the type shown in Fig. 20 should be 175 ± 50 gm (test) 175 ± 30 gm (readjust). Measure the tension exerted by the pawl on the ratchet wheel, by holding the armature in the operated position and applying the pointer of the gauge to the hooked portion of the pawl (see Fig. 20). Adjust the tension of the pawl spring by means of Pliers, Adjusting, No. 1 as shown in Fig. 21.

(b) The tension of a pawl spring of the type shown in Figs. 3 and 4, which are used on 6- to 10-wiper uniselectors, must ensure that, when the armature is operated, the pawl snaps cleanly into the root of any ratchet tooth. The pawl spring is manufactured to exert the correct tension on the pawl. If it is suspected that the spring has become weakened, fit a new spring. Do not attempt to increase the tension of an unsatisfactory spring.



★FIG. 20

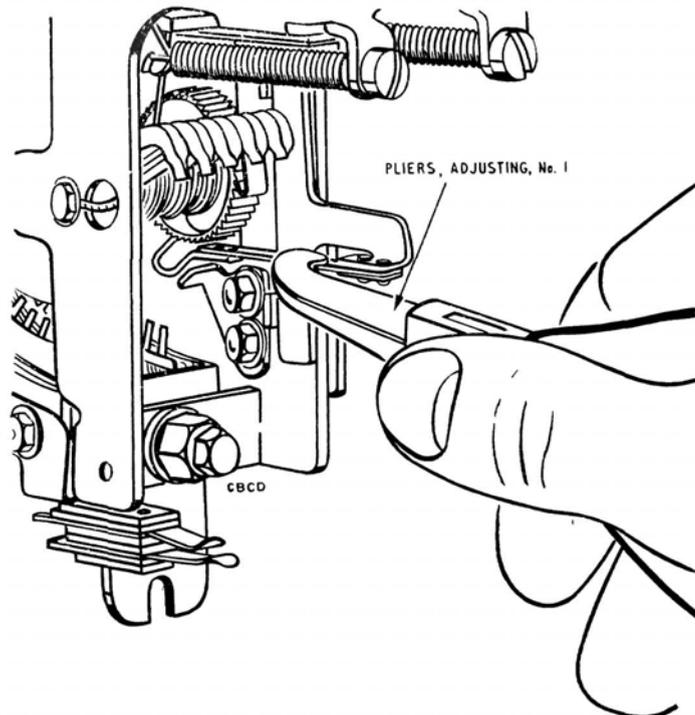


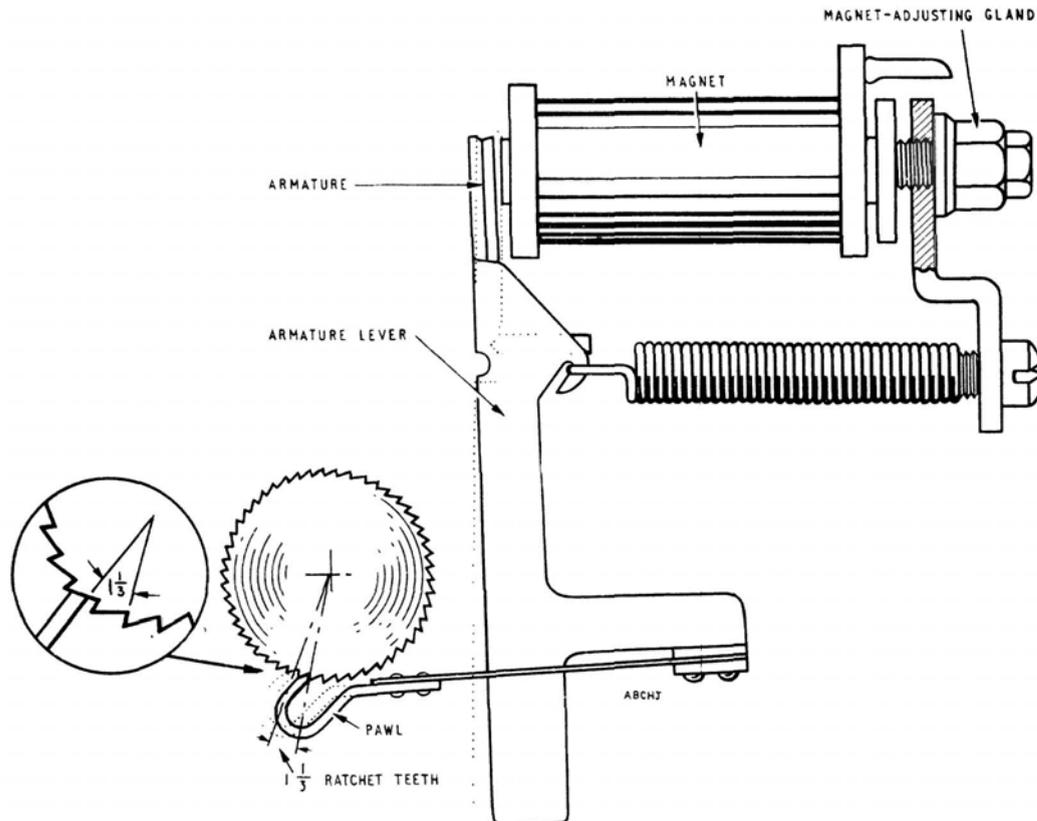
FIG. 21

14. Position of magnets.

(a) The position of the magnets must ensure that, when the armature is operated electrically, the pawl will step appreciably more than one ratchet tooth but not more than $1\frac{1}{3}$ ratchet teeth (see Fig. 22).

(b) The lever spring must be tensioned to give a contact pressure of 150 ± 50 gm (test) 150 ± 30 gm (readjust).

(c) The contacts must break just before the pawl drops over the first forward tooth of the ratchet



★FIG. 22.—MAGNET COILS ADJUSTED SO THAT WHEN THE ARMATURE IS OPERATED THE PAWL STEPS 1 BUT NOT MORE THAN $1\frac{1}{3}$ RATCHET TEETH

(b) Adjust the position of the magnet coils by means of the magnet glands so that, when the armature is operated electrically, the armature strikes *both* magnet cores *simultaneously*. Check the adjustment as follows:—

Insert a 2-mil gauge or a strip of Spring Steel, $\frac{1}{4}$ in. x 2 mils between one magnet core and the armature and insert a 5-mil gauge or a strip of Spring Steel $\frac{1}{4}$ in. x 5 mils between the other magnet core and the armature; when the armature is operated electrically, the 5-mil gauge should be held more firmly than the 2-mil gauge.

Reverse the gauges and repeat the test.

15. Interrupter-spring assembly.

(a) The contacts of the interrupter springs should not be out of alignment by more than one-third ($\frac{1}{3}$) of the diameter of a contact (see Fig. 23).

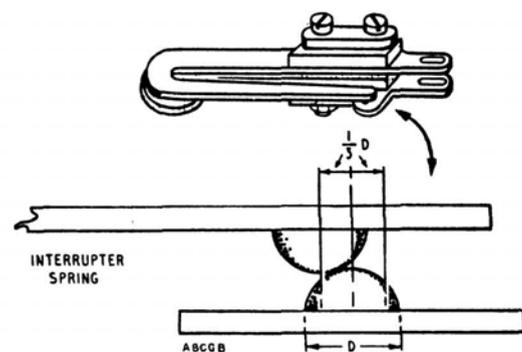


FIG. 23.—ALIGNMENT OF CONTACTS OF INTERRUPTER SPRINGS

wheel. The point of interruption should be adjusted by bending the interrupter-spring operating lever (see Figs. 24 and 25).

16. Armature-restoring springs.—The tension of the two armature-restoring springs must be evenly distributed by adjustment of the spring adjusting screws. The tension must ensure that, on release of the armature, the wipers will step positively on to the next bank contacts when the armature is lightly retarded by hand. *Excessive tension must be avoided.*

17. Running tests.—The following tests should be made at the normal exchange voltage appropriate to the uniselector under test. When testing a homing uniselector, the normal homing earth should be disconnected, by insulating the appropriate contact with an Insulator, Contact, No. 1.

(a) Check the adjustment of the armature-restoring springs to verify that the uniselector will start and the wipers run smoothly, though not to any specified speed, in series with a resistor of the appropriate value as follows :—

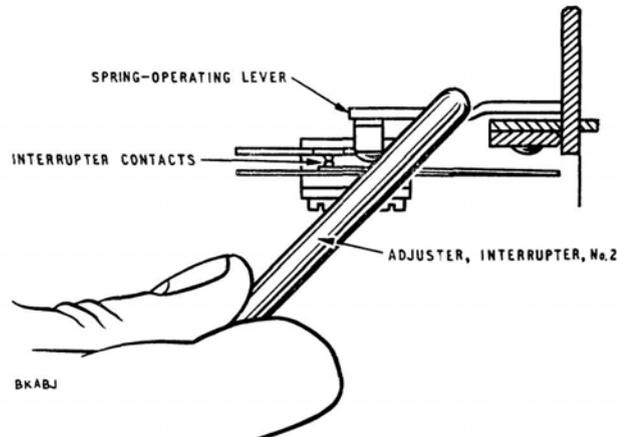


FIG. 24.—ADJUSTMENT OF INTERRUPTER SPRING OPERATING LEVER (3- TO 5-LEVEL UNISELECTOR)

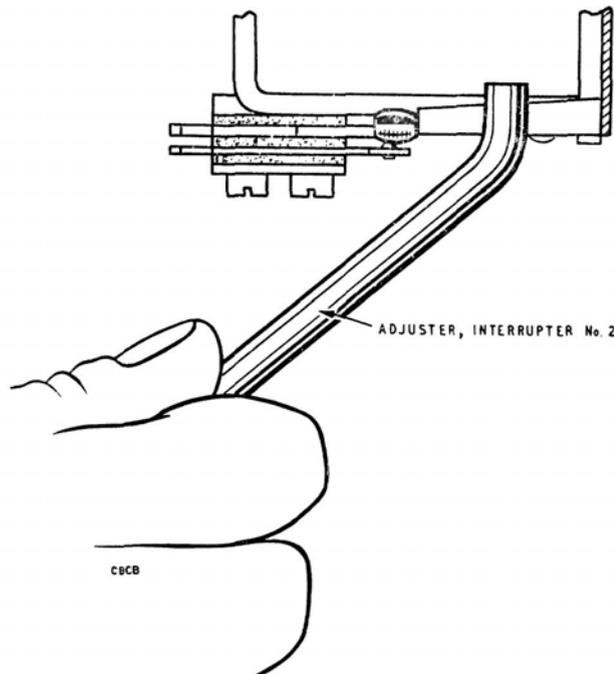


FIG. 25.—ADJUSTMENT OF INTERRUPTER SPRING OPERATING LEVER (6- TO 10-LEVEL UNISELECTOR)

- (i) 60V and 50V uniselectors—20 ohms, using Tester No. 80W.
- (ii) 40V uniselectors—12.5 ohms, using Tester No. 80V.
- (iii) 22V and 24V uniselectors—4 ohms, using Tester No. 80U.

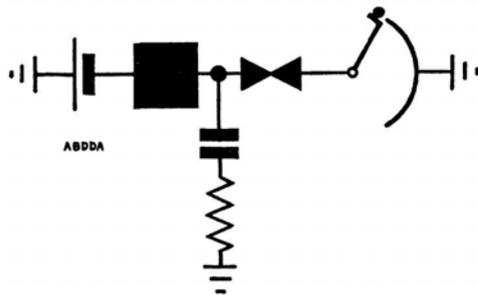
To obtain the required condition, it is permissible to reduce the armature stroke, but the pawl must step between the limits of 1 to $1\frac{1}{2}$ ratchet teeth (see par. 14).

(b) The wipers must rotate smoothly at the speeds specified in Table 1, when the normal exchange voltage is applied, in series with the interrupter springs and the driving-magnet coil.

TABLE 1

Voltage	60V (rev/ min)	50V (rev/ min)	40V (rev/ min)	22V (rev/ min)
Maximum speed of uniselectors	100	100	100	80
★Minimum speed 3 to 5 levels	60	60	60	55
Minimum speed 6 to 10 levels	50	50	50	45

(c) The wipers of all homing uniselectors must 'home' reliably and stop accurately on the 'home' position, when connected as shown in Fig. 26.



★FIG. 26

(d) The final tension of the armature-restoring springs must ensure that the wipers will step as specified in par. 16.

NOTE.—When testing or adjusting a uniselector for running, always verify that the spark quench circuit is effective.

18. Position of pointer.—The pointer must be located as follows:—

- (a) *Homing uniselector.*—To indicate the 'home' position when the wipers are on the home contacts.
- (b) *Non-homing uniselector.*—To indicate the first position when the wipers are standing on No. 1 bank contacts.

19. Adjustments to be made in special cases.—On P.O. Coders to Dgm. AT 2055 and G.E.C.7-Digit Senders to Dgm. AT 2031, the interrupter arm must be adjusted so that, on the return of the armature, the interrupter contacts do not close until immediately after the tips of the non-bridging wipers have left the contacts on which they were resting.

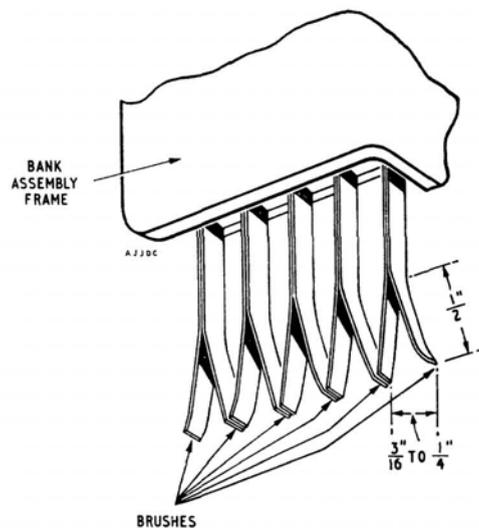
★**20. Method of fitting a Type 3 wiper assembly in a Type 1 uniselector frame.**—The parts required to fit a Type 3 uniselector wiper assembly into a 4- or 5-wiper uniselector are indicated in B 5502.

The following method should be adopted when changing the wiper assembly:—

- (a) If necessary, remove the uniselector from the bank as described in par. 5.
- (b) Remove the wiper assembly bearing pin and pointer from the frame.
- (c) Remove the Type 1 uniselector brushes from the bank.
- (d) Fit the Type 3 brushes by means of the two new screws into position on the bank.
- (e) Fit the wiper assembly into the uniselector frame so that the packing washer is on the bearing pin between the ratchet wheel and the frame.
- (f) Fit the new pointer to the frame, checking that the pointer does not foul the edge of the number wheel.

★**21. Adjustment of assembly.**

(a) *Adjustment of brushes.* The two springs of each pair of brush springs should lie flat against each other from their base to a point $\frac{1}{2}$ in. from the tips. From this point, the tips of the two springs should be set outwards so that there is a space of between $\frac{3}{16}$ in. and $\frac{1}{4}$ in. between the tips (see Fig. 27). Each pair of brushes should be at right angles to the mounting, and adjacent springs must not touch each other.

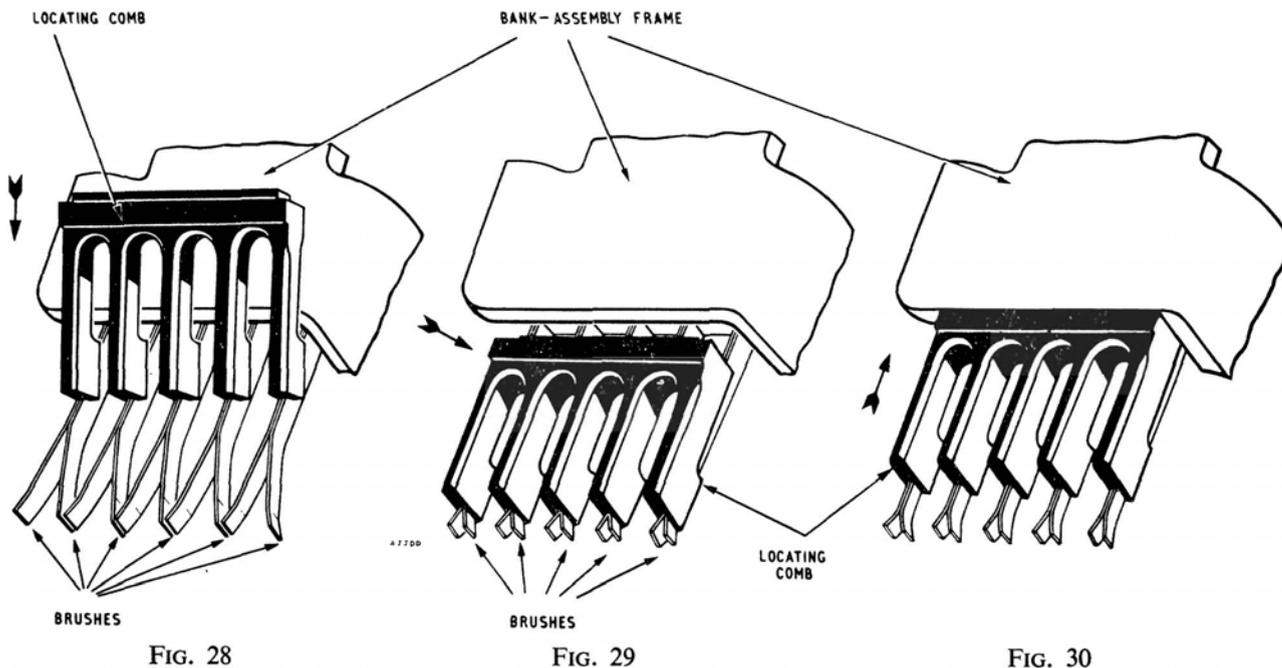


★FIG. 27

(b) *Replacing mechanism in bank.* Place the locating comb over the brushes at a point above the set in the spring (see Fig. 28). Slide the comb downwards until the tips of each pair of brushes have been compressed (see Fig. 29). The reduced rib of the comb should then be inserted behind the bank-assembly frame, by sliding the comb upwards (see Fig. 30).

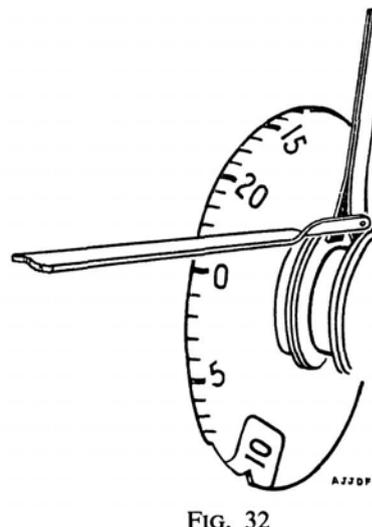
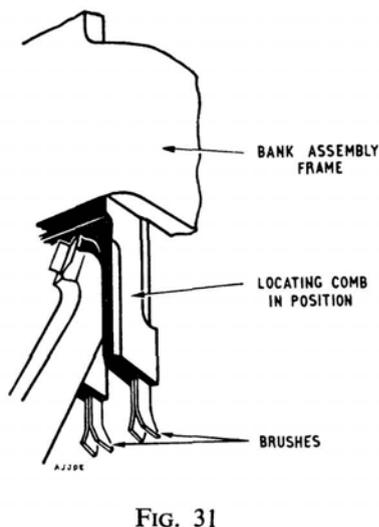
contacts, then push the mechanism well home on the bank, so that the brushes are in engagement with their respective collector rings. Engage the mechanism-fixing screws with the bank, then release and remove the comb. Tighten the mechanism-fixing screws securely, using a box spanner.

NOTE:—Do not attempt to replace the mechanism without fitting a locating comb over the brushes.



Set the wipers on position 3-5, as shown by the index wheel. Pass the heels of each pair of wipers through their respective slots in the comb (see Fig. 31) and move them upwards to engage with the first bank

(c) *Brush tension.* The tension of each brush on its collector ring should be 40 ± 20 gm (test) 40 ± 15 gm (readjust), measured as near to the tip as possible (see Fig. 32).



- (i) *To increase the tension.* Remove the mechanism from the bank and reset the brushes.
(ii) *To decrease tension.* With the mechanism in position, and using an Adjuster, Spring, No. 9, as shown in Fig. 33, gently lever the brush spring away from the collector ring.

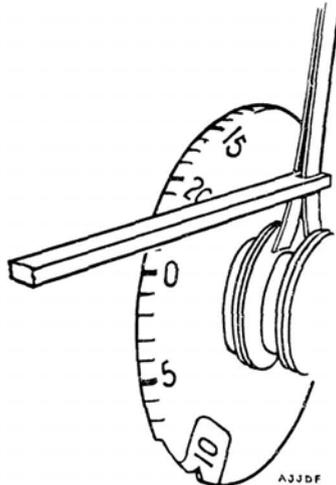


FIG. 33

(d) *Position of non-bridging wipers on bank contacts.* The line of contact of each non-bridging wiper should rest on the bank contacts within the limits of $\frac{1}{8}$ to $\frac{3}{8}$ of the width of a bank contact (see Fig. 34). This should be checked on the first and

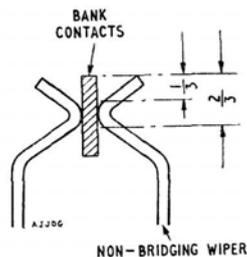


FIG. 34

last bank contacts. To adjust the wiper position, proceed as follows:—

- (i) Set the wipers on bank contact No. 1.
(ii) Using a Spanner, Cranked, No. 11, loosen the wiper-assembly clamping nut on the index wheel.
(iii) Place the reverse end of the spanner into the slot in the index wheel and move the wiper assembly in the required direction, by levering with the spanner, until the wipers rest approximately half-way on the bank contacts. (The relative position of the wipers and bank contacts should be viewed by looking up into the switch from the front.) Tighten the wiper-assembly clamping nut.

(iv) Rotate the wiper assembly by hand to the 25th bank contact. The non-bridging wipers must now occupy the same relative position on this contact as they occupied on the bank contact No. 1. If they do not, adjust the position of the mechanism relative to the bank, by means of the bank-adjusting gland, until the wiper position is correct. Tighten the gland locking nut and recheck the position of the wipers on the first bank contacts.

(e) *Position of bridging wipers.* With the wipers standing on the first row of bank contacts, check, by observation, that the extreme tips of the opposite ends clear the 25th bank contacts. When the uni-selector is mounted on a rack, this clearance may be checked by moving the wiper springs sideways and observing that the flared tips do not touch the bank contacts.

(f) *Adjustment of wipers.*

(i) *Wiper entry and flare.* When the wipers are standing on the 1st bank contacts, the opposite ends should be in alignment with the bank levels, so that they will leave the levels without deflecting in either direction more than the thickness of a bank contact (see Fig. 35). This adjustment must be made at both ends of the wiper assembly.

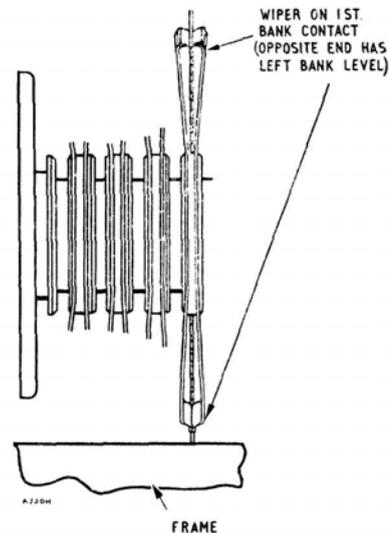


FIG. 35

The position of the mechanism must be adjusted by means of the two top mechanism-securing screws, so that the wipers enter the bank levels without appreciable side movement.

NOTE:—After adjustment, the mechanism-securing screws must be securely retightened by means of a box spanner.

(ii) *Wiper tips.* The wiping surfaces of each pair of wipers should be adjusted to lie flat upon each other when not in contact with the bank contacts. There should be no gap perceptible

to the eye at the outermost contact points. Between the innermost contact points, however, there may be a gap not exceeding 8 mils (test 4 mils (readjust)).

(iii) *Wiper tension.* When the wipers are standing on the 25th bank contacts, they should exert a pressure of 30 ± 10 gm (test) 30 ± 5 gm (readjust) on the bank contacts. To check, insert the gauge so that the gauge pointer tip engages a point just in front of the angular set of the wiper and as near as possible to the tip of the wiper (see Fig. 36).

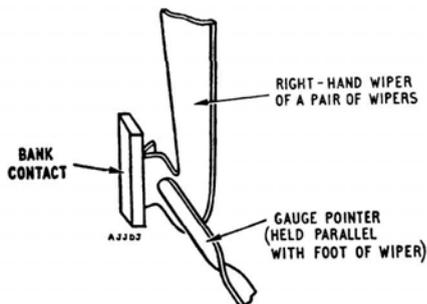


FIG. 36

(iv) *Clearance between wipers and brushes.* When the wipers are standing on the 23rd bank contacts and the wiper assembly is moved sideways on the spindle, there should be a minimum clearance of 10 mils between the brushes and the adjacent wipers (see Fig. 37).

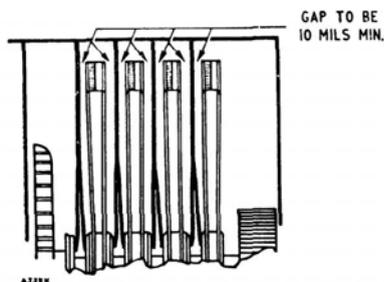


FIG. 32

(v) *Clearance between wipers and adjacent bank contacts.* When the wipers are standing on the 25th bank contacts, and the wiper assembly is moved sideways on the spindle, the heels of the opposite ends must not touch the first bank contacts.

MISCELLANEOUS

22. Dismantling.—If necessary, remove the unselector from the bank, as described in par. 5, and dismantle the mechanism by removing the individual parts in the following order:—

- (a) The wiper assembly from the mechanism
- (b) The coils, yoke and all glands
- (c) The armature-lever back stop and forward stop
- (d) The detent
- (e) The armature-restoring springs, and the armature
- (f) The pawl spring (if coil)
- (g) The interrupter-spring assembly
- (h) The pawl-stop
- (i) The pointer and the label-holder
- (k) The brush assembly.

23. Assembling.—When reassembling the mechanism the various parts should be refitted in the following order:—

- (a) Replace the interrupter-spring assembly.
- (b) On a 6- to 10-wiper unselector, check that the pawl is not worn or binding; then replace its restoring spring.
- (c) Replace the armature on its knife-edge, and fit the armature-restoring springs. Check that the armature lever does not bind on the unselector frame. (The felt inserts in the armature-restoring springs are fitted to damp out vibration, and they should be moistened with Oil, Bearing, No. 16 to ensure that the springs will not rust.)
- (d) Replace the armature-lever back stop and forward stop with the thinner of the two stops in the frame slot.
- (e) Replace the pawl stop. Set the pawl stop well away from the pawl.
- (f) Replace the detent.
- (g) Replace the yoke, coils and magnet glands. Set the coils well back in the frame.
- (h) Replace the wiper assembly. The wiper assembly must be free on its spindle, which—before insertion—should be lubricated with Oil, Bearing, No. 16.
- (j) Replace the mechanism-positioning gland, which should be adjusted so that the thread is two to three turns beyond the inside of the frame.
- (k) Replace the pointer and label-holder. Check that the pointer does not foul the index wheel.
- (l) Adjust the brushes on the bank, as indicated in par. 6.

The adjustment of the mechanism and replacement to the bank are described in pars. 7 to 21.

24. Replacing faulty magnet coils.—When replacing faulty magnet coils, care must be taken to ensure that they are connected correctly, as the older coils of some manufacturers are wound in an opposite direction to that of the newer coils. They should be connected in series so that their pole faces exhibit

opposite polarity. This can be proved as follows:—

Place the magnet pole faces in contact with one another and temporarily wire the coils in accordance with the standard for other uniselectors in the exchange. The normal exchange battery voltage should then be applied. Similarly-wound coils will be strongly attracted and should be wired permanently in accordance with the standard arrangement. If, however, repulsion takes place, indicating dissimilarly-wound coils, the permanent wiring of the new magnet coil should be reversed when placed in the mechanism.

In some earliest type uniselectors, coils of 150 ohms resistance were used instead of the standard 37.5-ohm coil. In such cases, the relative pair of coils should be changed for those of the standard type and the coils connected as indicated above.

25. Piece parts.—A list of parts for the mechanism for replacement purposes is given in B 5502 and B 5503.

26. Lubrication.—Details of the method of lubrication of this uniselector are specified in B 5137. See also par. 23 (c) and (h).

27. Returning uniselectors to stores.—Before returning uniselectors to stores, the wipers should be set on the 21st bank contacts, to protect them from damage.

28. Tools and their uses.—The tools necessary for the adjustment of these uniselectors are listed in Table 2. The tools should be used only for the purposes for which they are intended. Any tool that is in such a condition that screws, nuts or springs would be damaged by its use should be changed.

TABLE 2

Description	Use
★Adjuster, Interrupter, No. 2	For interrupter-arm adjustment etc.
★Adjuster, Spring, No. 3	For detent adjustments
Adjuster, Spring, No. 9	For general wiper and brush adjustments
★Comb, Locating, No. 1	For closing brush feeds where Type 3 wiper assembly is fitted
Gauge, Feeler, No. 1	For general use
Gauge, Tension, No. 2	} For measuring tension of wipers etc.
Gauge, Tension, No. 3	} For disconnecting 'homing' earth
Insulator, Contact, No. 1	Bent duckbill
Pliers, Adjusting, No. 1	Straight duckbill
Pliers, Adjusting, No. 3	} For general brush and wiper adjustment
Pliers, Adjusting, No. 5	Taper-nose
★Pointer, Gauge, Tension, Cranked, No. 4	For use with tension gauge to measure brush-feed tension
★Pointer, Gauge, Tension, Cranked, No. 5	} For use with tension gauges to measure tensions where uniselector is mounted at either end of shelf
★Pointer, Gauge, Tension, Cranked, No. 6	} For general use
Screwdriver, Instrument, No. 1	For interrupter-spring assembly fixing screws etc.
Screwdriver, Instrument, No. 2	} For magnet glands and securing bolts
Spanner, Cranked, No. 1	} For miscellaneous fixing bolts
Spanner, Cranked, No. 2	} For gauging position of magnet coil
★Spanner, Cranked, No. 3	} For miscellaneous fixing bolts
★Spanner, Cranked, No. 11	} For gauging position of magnet coil
Spring, Steel, ½ in. x 2 mils	} For gauging position of magnet coil
Spring, Steel, ½ in. x 5 mils	} For gauging position of magnet coil
Tester, No. 80U (22V and 24V exchanges)	} Resistance for running test (see par. 17)
Tester, No. 80V (40V exchanges)	} Resistance for running test (see par. 17)
Tester, No. 80W (50V and 60V exchanges)	} Resistance for running test (see par. 17)

References:—B 5100, B 5137, B 5502, B 5503
(TPM2/3)

END