

MASTER CLOCKS

KS-1299, KS-1924, KS-1925, KS-1926, KS-1927, KS-1928, KS-1929, KS-1930, KS-1931, KS-6777 AND KS-6778

REQUIREMENTS AND ADJUSTING PROCEDURES

1. GENERAL

- 1.01 This section covers KS-1299, KS-1924, KS-1925, KS-1926, KS-1927, KS-1928, KS-1929, KS-1930, KS-1931, KS-6777 and KS-6778 master clocks.
- 1.02 It is reissued primarily to bring certain requirements and procedures up to date and to change some of the illustrations to agree with the latest manufactured products.
- 1.03 Reference shall be made to Section 020-010-711 covering General Requirements and Definitions for additional information necessary for the proper application of the requirements listed herein.
- 1.04 Asterisk: Requirements are marked with an asterisk (*) when to check for them would necessitate the dismantling or dismounting of apparatus, or would affect the adjustment involved or other adjustments. No check need be made for these requirements unless the apparatus or part is made accessible for other reasons or its performance indicates that such a check is advisable.
- 1.05 One dip of oil for the purpose of this section is the amount of oil retained on a KS-14164 No. 4 Artists Show Card brush after being dipped into the oil to a depth of 3/8" and then scraped on the edge of the container to remove surplus oil. There should not be sufficient oil adhering to the brush to form a drop on the end of the bristles.
- 1.06 Normal position - motor armature is that position in which the motor armature rests against the lower banking spring and the normally closed motor contacts are closed.
- 1.07 Operated position - motor armature is that position in which the motor armature rests against the upper banking spring and the normally closed motor contacts are open.
- 1.08 Normal position - synchronizing armature is that position in which the synchronizing lever rests against the frame stop pin.
- 1.09 Operated position - synchronizing armature is that position in which, with the synchronizing magnet energized and the synchronizing latch disengaged, the synchro-

nizing arm rests against the two point cam of the cannon socket assembly.

1.10 Normal position - circuit closing contacts is that position in which the contact springs rest flat against the hard rubber back stop with the normally open contacts open.

1.11 Operated position - circuit closing contacts is that position in which the shorter contact spring has dropped from the tip of the hard rubber ratchet wheel tooth or cam and the longer contact spring rests on the tip of the tooth or cam. In this position the normally open contacts are closed.

1.12 Time of synchronization as referred to herein has no reference to the actual time of day. It is a period occurring once each hour representing the time within which the synchronizing pulse is received by the clock. On clocks per KS-1924, KS-1928, KS-1930 and KS-6778 this time extends from 12 seconds before to 12 seconds after 15 minutes past the hour. On clocks per KS-1925, KS-1927, KS-1929 and KS-6777 this time extends from 12 seconds before to 12 seconds past the hour.

1.13 One full stroke of the pendulum which consists of two beats is the distance covered by the pendulum when travelling from any given point in its swing back to the same point again moving in the same direction. This includes two reversals of direction of the motion of the pendulum. On clocks per KS-1924, KS-1925 and KS-1926 which have a 60-beat movement one full stroke is accomplished in 2 seconds while on the other clocks which have a 120-beat movement one full stroke is accomplished in 1 second.

2. REQUIREMENTS

2.01 Cleaning

- (a) Contacts shall be cleaned, when necessary, in accordance with the section covering cleaning of relay contacts and parts.
- (b) Other parts shall be cleaned, when necessary, in accordance with approved procedures.
- (c) Where KS-7860 petroleum spirits is used for cleaning, the movement shall be allowed to dry and shall then be lubricated.

2.02 Lubrication

(a) The points of the clock listed in requirements (b), (c) and (d) shall be adequately lubricated with KS-6232 oil. When lubrication is necessary, these parts shall be lubricated as follows:

(b) One dip of oil shall be divided between each 4 or 5 of the following points:

Each shaft bearing of the movement and winding motor.

Every tenth tooth on the escapement wheel.

Both points of contact between the escapement wheel and pallet - Fig. 1 (A).

The point of contact between the motor armature lever pin and the winding lever - Fig. 1 (B).

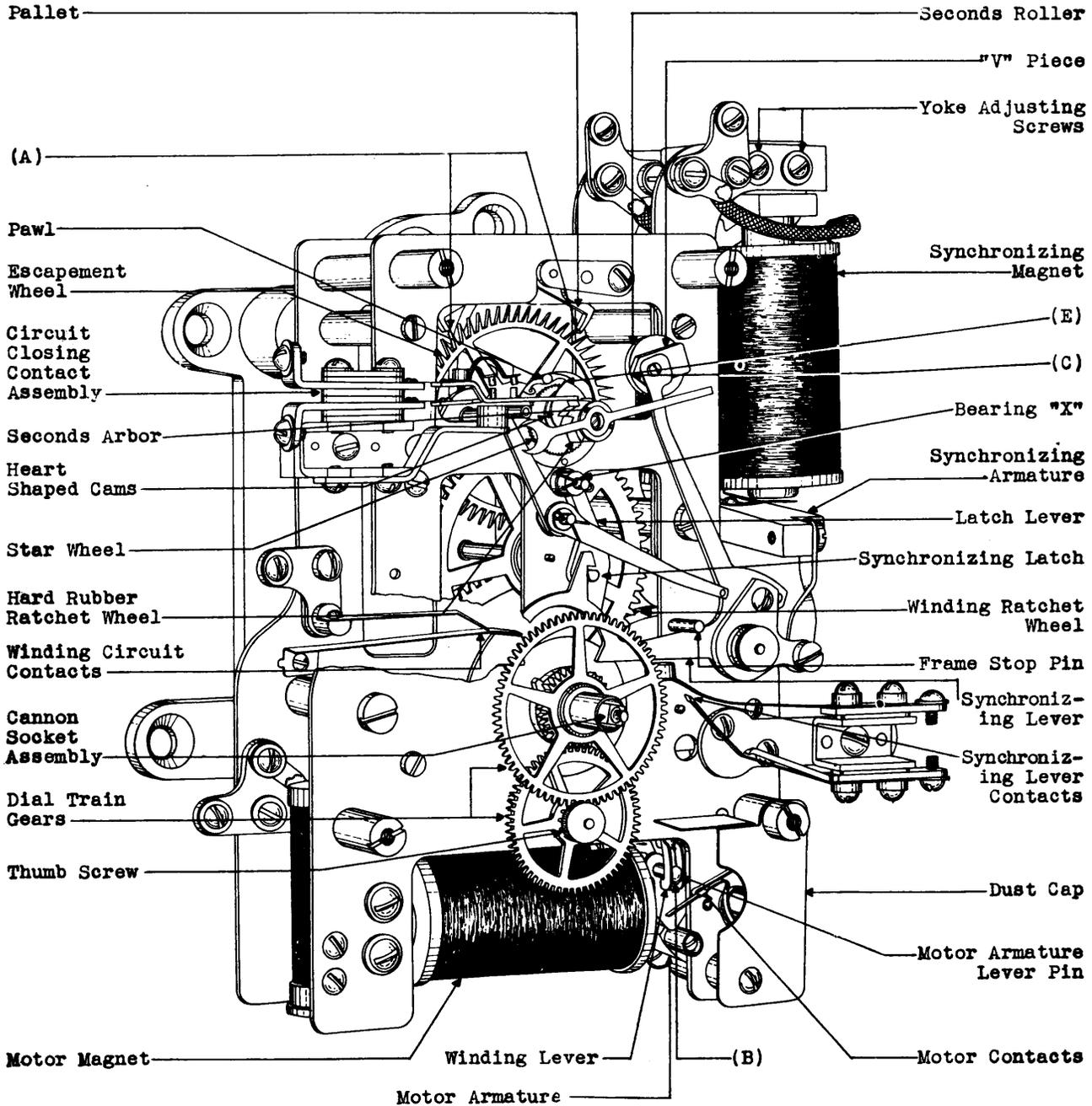


Fig. 1 - General Assembly of typical Mechanism

2.02 (Continued)

(c) One dip of oil shall be applied to the winding ratchet wheel teeth. This oil shall be distributed over the circumference of the wheel.

(d) Clocks per KS-1924, KS-1925, KS-1927, KS-1928, KS-1929, KS-1930, KS-6777 and KS-6778: In addition to the points listed in requirements (b) and (c) one dip of oil shall be divided between each 4 or 5 of the following points:

Each bearing of the synchronizing mechanism - including the seconds roller bearing - except bearing "X" - (Fig. 1).

Point of "v" piece - Fig. 1 (C).

Rim of each of the two heart shaped cams - Fig. 1 (D).

Point of contact between star wheel ratchet and pawl - Fig. 1 (E).

(e) Recommended Lubrication Intervals:

After turnover, it is recommended that the parts of the clock listed above be lubricated at intervals of two years. This interval may be extended if periodic inspections have indicated that local conditions are such that requirement (a) will be met during the extended interval.

*2.03 Mounting - Fig. 2 (A): The clock shall be mounted so that, when the pendulum is at rest, the pendulum rod is parallel to the back of the case and the lowest point of the pendulum lines up with the center line of

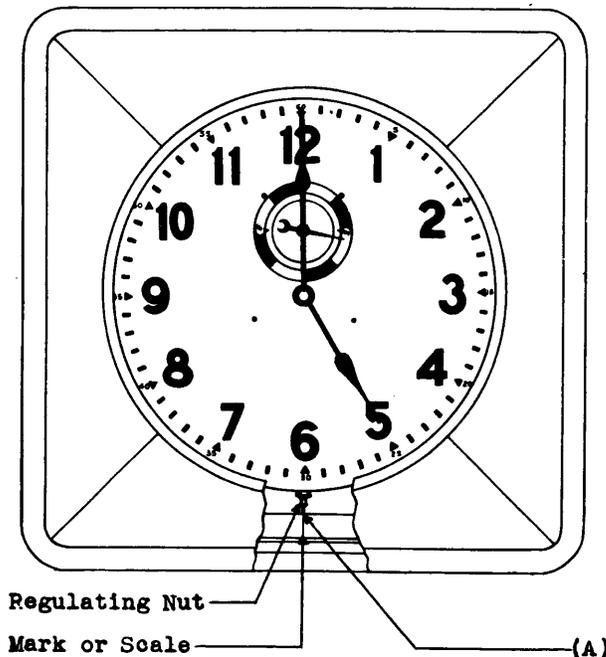


Fig. 2 - Face View (KS-6777 and KS-6778)

the degree scale or the mark on the bottom of the clock case. Gauge by eye.

Circuit Closing Contacts

*2.04 Spring Clearance: There shall be a horizontal clearance between the adjacent circuit closing contact springs of Min. 1/64" Gauge by eye.

*2.05 Contact Alignment: When the contacts are in the operated position, they shall line up so that their centers are not out of alignment more than 25% of their diameters, and the shorter spring shall not rest against the hard rubber back stop beneath it. Gauge by eye.

*2.06 Clearance Between Contact Springs and Ratchet Wheel Teeth - Fig. 3 (A): When the synchronizing mechanism operates, there shall be a perceptible clearance between the tips of the circuit closing contact springs and the teeth of the hard rubber ratchet wheel as the seconds hand is restored to the 60 seconds position. Gauge by eye.

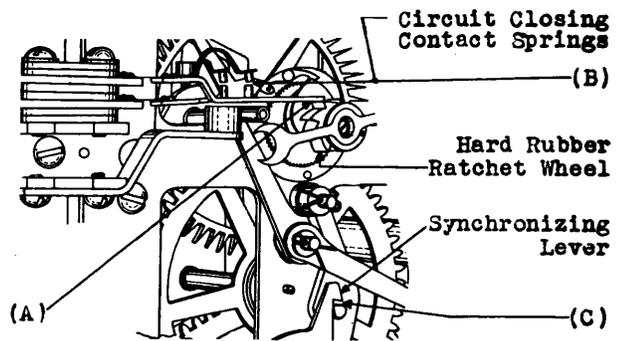


Fig. 3 - Circuit Closing Contacts and Ratchet Wheel

*2.07 Contact Separation - Fig. 3 (B): With the contact springs in the normal position there shall be a separation between each pair of contacts of Min. .012" Use the No. 74D gauge.

*2.08 Contact Closure Time

(a) On clocks per KS-1299, KS-1924, KS-1925, KS-1926, KS-1927, KS-1928, KS-1929, KS-1930 and KS-1931, the contacts which close every 5 seconds to send out pulses to operate the switch-board position clocks shall have a closure of minimum .4 sec. and maximum 1.0 sec. Gauge by eye.

***2.08 (Continued)**

(b) On clocks per KS-6777 and KS-6778, the contacts which close every 7-1/2 seconds to send out pulses to operate the time of day equipment shall have a closure of minimum .35 sec. and maximum .65 sec. Gauge by eye.

2.09 Dial and Hands

- (a) The seconds hand shall not drive or slip backwards. Gauge by eye.
- (b) The hands shall not interfere with each other or rub against the dial in any position. Gauge by eye.

2.10 Accuracy of Clocks

- (a) Clocks per KS-1299, KS-1924, KS-1925, KS-1927, KS-1928, KS-1929, KS-1930 and KS-1931: The clock shall not gain or lose more than 30 seconds per day of 24 hours nor more than 1-1/4 seconds in any one hour.
- (b) Clocks per KS-6777 and KS-6778: The clock shall not gain or lose more than 12 seconds per day of 24 hours, nor more than 1/2 second in any one hour.

Winding Circuit Contacts

- *2.11 Contact Separation - Fig. 4 (A): The contact separation between the winding circuit contact springs, when in their normal position, shall be approximately 1/32" Gauge by eye.
- *2.12 Alignment of Contact Spring and Contact Sector - Fig. 4 (B): With the contact sector about to touch the lower contact spring, the tip of the spring shall be approximately even with the edge of the incline of the contact sector. Gauge by eye.

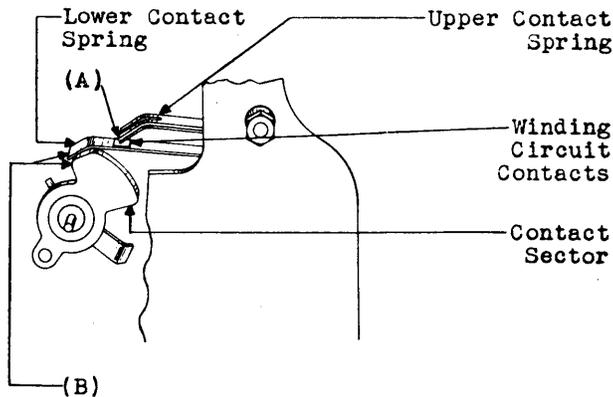


Fig. 4 - Winding Circuit Contacts

*2.13 Contact Alignment: The contacts shall be approximately centered, and the tips of the springs shall be approximately parallel when the contacts are closed. Gauge by eye.

Motor

- *2.14 Electrical Requirement: The motor shall operate to wind the clock on a direct current potential of minimum 18 volts.
- *2.15 Position of Motor Armature

(a) Fig. 5 (A) - When the armature is in the normal position, the front edge of the armature shall be approximately in line with the lower edge of the magnet core. Gauge by eye.

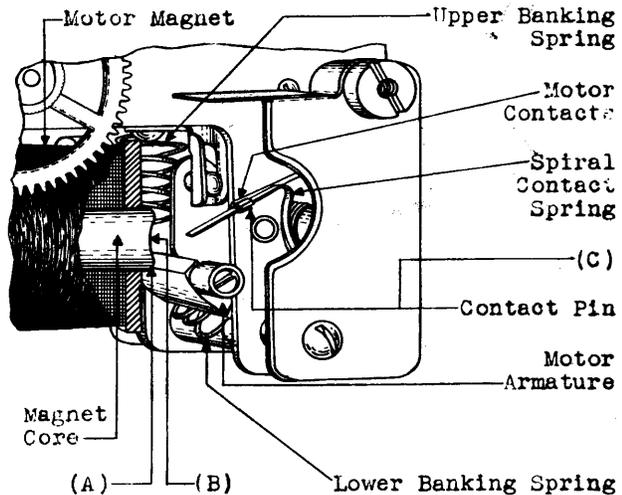


Fig. 5 - Winding Motor

(b) With the motor armature in the operated position, the upper edge of the armature shall be approximately 1/16" below the upper edge of the magnet core. Gauge by eye.

Motor Contacts

- *2.16 Spiral Contact Spring Position - Fig. 5 (B) - When the armature is in the normal position the straight portion of the spiral contact spring shall point to approximately the center of the motor magnet core. Gauge by eye.
- *2.17 Contact Alignment - Fig. 5 (C): The contact pin shall approximately center on the contacting portion of the spiral contact spring. Gauge by eye.
- *2.18 Spring Tension: The spiral contact spring shall be tensioned slightly against the contact pin. Gauge by feel.

*2.19 Contact Separation: With the motor armature in the operated position, the separation between the contact pin and the contact on the spiral spring shall be approximately 1/16" Gauge by eye.

*2.20 Contact Sequence: Both front and rear motor contacts shall open simultaneously when the armature is operated manually. Gauge by eye.

Synchronizing Mechanism - Clocks per KS-1924, KS-1925, KS-1927, KS-1928, KS-1929, KS-1930, KS-6777 and KS-6778

*2.21 Electrical Requirement: The synchronizing mechanism shall function to correct the position of the seconds and minute hands at any time during the time of synchronization when a direct current potential of minimum 18 volts is applied across the terminals of the synchronizing magnets.

*2.22 Armature Air-Gap - Fig. 6 (A): With the armature in the operated position there shall be a clearance between the synchronizing armature and each of the two pole-pieces of
Min. .010"
Use the No. 74D gauge.

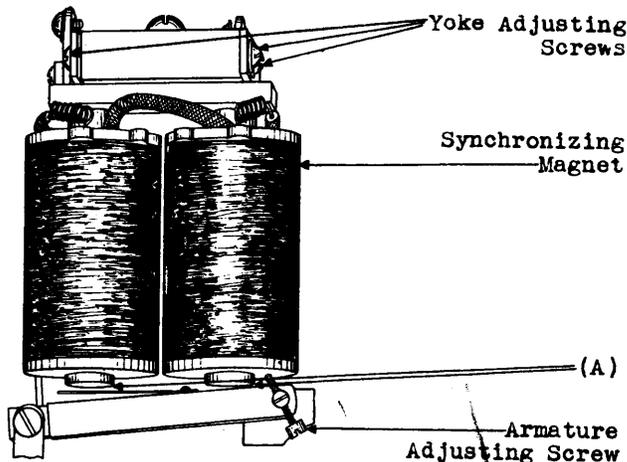


Fig. 6 - Synchronizing Mechanism

*2.23 Synchronizing Lever Operation - Fig. 3 (C)

(a) Clocks per KS-1924, KS-1925, KS-1927, KS-1928, KS-6777 and KS-6778: The synchronizing latch shall be locked at all times except 15 seconds before to 15 seconds after the time of synchronization, and it shall be unlocked during the time of synchronization.

(b) Clocks per KS-1929 and KS-1930: The synchronizing latch shall lock the synchronizing mechanism firmly at all

times except for four minutes of each hour. The period during which the synchronizing latch is open shall start two minutes before and end two minutes after the time of synchronization. Gauge by eye.

*2.24 Clearance between Seconds Roller and Cam: There shall be a very slight clearance between the seconds roller and the heart shaped cam when the synchronizing armature is fully operated. Gauge by eye.

Synchronizing Lever Contacts - Clocks per KS-6777 and KS-6778

*2.25 Contact Separation - Fig. 7 (A) and Fig. 8 (A): With the contacts in the unoperated position the contact separation shall be
Min. 1/64"
Gauge by eye.

*2.26 Contact Alignment: When the synchronizing mechanism operates, the synchronizing lever contacts shall make reliably and the contacts shall be approximately centered. Gauge by eye.

*2.27 Contact Sequence: With the 7-1/2 second circuit closing contacts closed, the operation of the synchronizing lever shall close the synchronizing contacts before the 7-1/2 second contacts are opened. Gauge by eye.

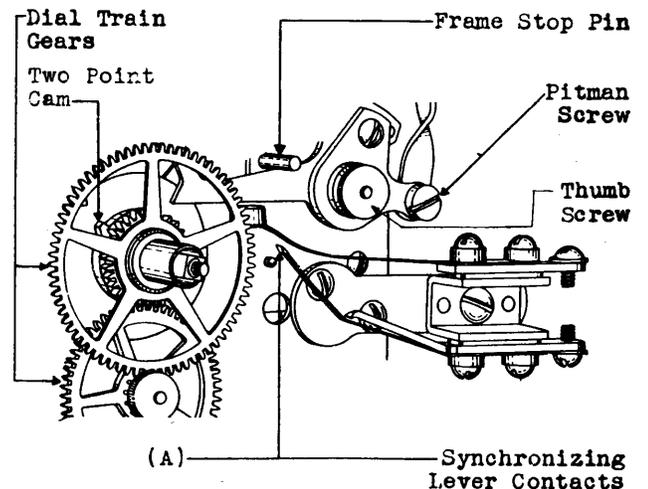


Fig. 7 - Synchronizing Lever Contacts

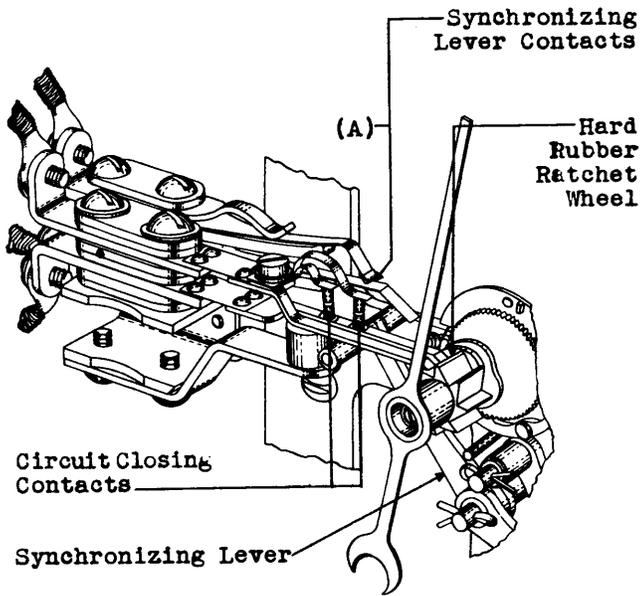


Fig. 8 - Synchronizing Lever Contacts
KS-6777 and KS-6778

3. ADJUSTING PROCEDURES

3.001 List of Tools, Gauges and Materials

<u>Code No.</u>	<u>Description</u>
<u>Tools</u>	
265B	Contact Burnisher
KS-6015	Duck-bill Pliers
-	Tweezers
KS-14164	No. 4 Artists Show Card Brush
-	3-1/2" Cabinet Screw-driver
-	4" Regular Screw-driver
-	6-1/2" P-Long Nose Pliers
-	5" Diagonal Pliers
-	Jewelers' Screw-driver
<u>Gauges</u>	
74D	Thickness Gauge Nest
<u>Materials</u>	
D-98063	Cloth
KS-6232	Oil
KS-7860	Petroleum Spirits

<u>Code No.</u>	<u>Description</u>
-	Small Flat Piece of Wood
-	Toothpicks, Hardwood, Flat at One End and Pointed at the Other

3.002 No attempt should be made to take the clock movement apart except to the extent covered in 3.01.

3.003 Should it be impossible to readjust the clock so that it will meet its requirements due to broken parts or open coil windings, refer the matter to the supervisor.

3.01 Cleaning (Rq.2.01) 3.02 Lubrication (Rq.2.02)

(1) When cleaning is necessary, first, remove the hands. To remove the minute and hour hands, hold both hands firmly at the hub and remove the knurled thumbscrew at the center of the hub of the minute hand. Pull the hands off, grasping them at their hubs and exerting a uniform pressure away from the dial. Then remove the seconds hand if necessary. Some clocks are provided with a large opening in the dial around the seconds arbor making it unnecessary to remove the seconds hand in order to remove the dial. However, when it is necessary to remove the seconds hand this may be done on some clocks by exerting a slight pull on the hand with the fingers while on other clocks the hand is held by means of a screw through its hub, which must be removed with the 3-1/2" cabinet screw-driver or the jewelers' screw-driver before removing the hand.

(2) Remove the dial mounting screws with the 3-1/2" cabinet screw-driver and then remove the dial.

Caution: On those clocks from which the seconds hand has not been removed take care not to damage the seconds hand when removing the dial.

(3) Unfasten the connecting wires by loosening the terminal screws with the 3-1/2" cabinet screw-driver and if necessary, label the wires so that they may be replaced correctly. Dismount the pendulum, taking care that the regulating nut on the lower end is not turned while dismantling. Remove the movement mounting screws with the 4" regular screw-driver and remove the movement from the case.

(4) Remove the dial train gears by removing the thumb screw on the lower gear. If the movement is equipped with a synchronizing mechanism, remove the synchronizing lever by removing the associated thumb

3.01-3.02 (Continued)

screw by hand and removing the pitman screw (See Fig. 7) with the 3-1/2" cabinet screw-driver. Then remove the cannon socket assembly.

(5) Thoroughly clean all bearings, pivots and pivot holes by flushing them with petroleum spirits applied with a toothpick.

(6) Remove all old oil and petroleum spirits from the parts of the clock with a clean D-98063 cloth wrapped around a small flat piece of wood.

(7) Allow the movement to dry and then apply oil to the various parts as required using the R-1575 artists show card brush.

(8) Exercise care when applying the petroleum spirits and oil not to allow them to get on the coils or the armatures. Also see that the case is free from dust, and then reassemble the parts. Take care that the connecting wires are properly connected and that the hands are replaced so that requirement 2.05 is met.

3.03 Mounting (Rq.2.03)

(1) To adjust the position of the clock, loosen the screws at the bottom of the case with the 4" regular screw-driver and plumb the case as required by means of the pendulum and the marks at the bottom of the case.

(2) Secure the case firmly to the wall.

Circuit Closing Contacts

- 3.04 Spring Clearance (Rq.2.04)
- 3.05 Contact Alignment (Rq.2.05)
- 3.06 Clearance between Contact Springs and Ratchet Wheel (Rq.2.06)
- 3.07 Contact Separation (Rq.2.07)
- 3.08 Contact Closure Time (Rq.2.08)

(1) Remove the hands and dial as covered in 3.01.

(2) If the clearance between the adjacent contact springs is not as specified, loosen the circuit closing contact assembly mounting screws with the 3-1/2" cabinet screw-driver and locate the springs as required, taking care not to destroy the contact alignment.

(3) Contacts controlling position clocks and time of day clocks: Manually operate the pendulum until the shorter spring of the contact pair drops from a tooth of the hard rubber ratchet wheel and note the position of the pendulum at which this spring drops. Continue to

operate the pendulum and note that the associated longer spring drops from the hard rubber ratchet wheel within the following limits:

Note: The pendulum travels listed below while not critical should be estimated as accurately as possible in accordance with the definition given in paragraph 1.13.

(a) Clocks per KS-1924, KS-1925, and KS-1926 - Between one fifth of a full stroke and one half of a full stroke after the shorter spring dropped.

(b) Clocks per KS-1299, KS-1927, KS-1928, KS-1929, KS-1930, and KS-1931 - Between two fifths of a full stroke and one full stroke after the shorter spring dropped.

(c) Clocks per KS-6777 and KS-6778 - Between one third of a full stroke and two thirds full stroke after the shorter spring dropped.

Check in this manner on each tooth of the hard rubber ratchet wheel and then if necessary loosen the contact assembly mounting screws with the 3-1/2" cabinet screw-driver and shift the location of the tips of the springs as required. In tightening the screws be sure that requirement 2.04 (a) is met.

Note: If the requirements given in paragraph 2.04 (c) cannot be met by following the above procedures due to a worn condition of the hard rubber ratchet wheel or a ratchet wheel that is not in proper adjustment, refer the matter to the supervisor.

(4) Other circuit closing contacts except contacts controlled by synchronizing lever: Manually operate the pendulum until the shorter spring drops from a tooth of the hard rubber ratchet wheel and note the position of the pendulum at which this spring drops. Continue to operate the pendulum and note that the associated longer spring does not drop from the hard rubber ratchet wheel until the pendulum has completed at least one quarter of a full stroke. Check in this manner on each tooth of the hard rubber ratchet wheel and adjust if necessary as outlined in (3) above.

(5) Manually operate the pendulum until the shorter spring drops from a tooth of the hard rubber ratchet wheel. In this position, the contacts should be operated. If necessary, adjust the contact springs with the tweezers as shown in Fig. 9.

3.04-3.08 (Continued)

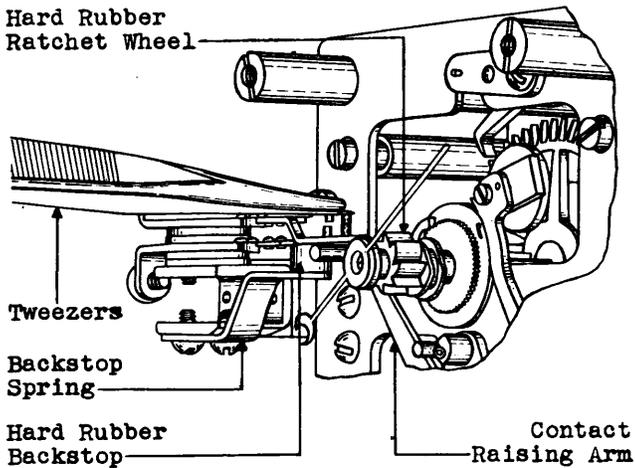


Fig. 9 - Method of Adjusting Circuit Closing Contacts with Tweezers

(6) If necessary to adjust the position of the hard rubber backstop, adjust the back stop spring with the KS-6015 duck-bill pliers.

(7) Manually operate the synchronizing armature and note whether the circuit closing contact springs clear the hard rubber ratchet wheel teeth as the ratchet wheel is restored. The spring clearance is controlled by the operation of the contact raising arm, which in turn, is controlled by the operation of the synchronizing lever. If a satisfactory clearance is not obtained, adjust the pin at the base of the contact raising arm as required with the long nose pliers. Exercise extreme care in making this adjustment so as not to break off the pin.

(8) Clocks per KS-1924, KS-1925 and KS-1926 are equipped with circuit closing contacts which close once every hour and which synchronize other clocks. KS-1927 and KS-1928 clocks may also have program attachments for operating relief bells. The operation of these contacts is controlled by an arm which rests on the edge of the disc on the cannon socket assembly. If the arm fails to drop into the notch in the disc, it is probably due to improper tension of the retractile spring or due to bind. Grasp the spring assembly at the base and rotate it gently a number of times to determine whether or not it is binding on its axis. If it binds, remove the knurled nut and the assembly and clean the pin with a D-98063 cloth which has been moistened with petroleum spirits. Then replace the parts and check to see that the assembly operates properly. If this

does not provide satisfactory operation, remove the retractile spring and clip off a turn with the diagonal pliers and replace the spring. Recheck for proper operation. Also, see that the lower end of the arm which operates these contacts is approximately centered on the edge of the disc on the cannon socket assembly. Replace the dial and hands making sure that requirement 2.05 is met.

3.09 Dial and Hands (Rq.2.09)

(1) Rotate the minute hand clockwise manually 12 complete revolutions and observe whether it rubs on the hour hand, or whether either hand rubs on the dial at any point. If any interference or binding is observed, adjust them with the fingers as required. If the dial is warped, remove it from the clock as outlined in 3.01 and adjust it as required with the hands. If the dial is warped to such an extent that it cannot be straightened replace with a new one.

3.10 Accuracy of Clocks (Rq.2.10)

(1) Clocks per KS-1924, KS-1925, KS-1927, KS-1928, KS-1929, KS-1930, KS-6777 and KS-6778: On these clocks the hands must be placed so that the clock will be synchronized to indicate the correct time when the synchronizing pulse operates the synchronizing mechanism. In order to set the hands properly, first, ascertain the time of synchronization for the particular clock under test, and, as the minute hand is being rotated clockwise manually, listen intently for a click inside the clock indicating the opening of the synchronizing latch. When the click is heard, stop the rotation and rotate the minute hand in a counter-clockwise direction as far as the locking device will permit. The minute hand should now point to the time of synchronization. If not, remove the minute hand as covered in 3.01 and replace it so it points to the time of synchronization.

(2) Turn the minute hand to the number or numeral "12" on the dial and ascertain that the hour hand points directly toward the mark corresponding to a numeral. If not, shift the position of the hour hand as required with the fingers.

(3) From an external source, ascertain at what time the next synchronizing pulse will be transmitted to the clock, and, with the clock stopped, set the hands to indicate the correct time at the next time of synchronization. See that the pendulum is not swinging, and at the instant the synchronizing pulse operates the synchronizing mechanism, start the clock and allow it to run several hours.

3.10 (Continued)

(4) Open the circuit to the synchronizing magnet. Shortly before the following 24th hour, close the circuit to the synchronizing magnet. When the synchronizing pulse for the 24th hour comes observe whether or not the clock has gained or lost more than 30 seconds, (12 seconds for clocks per KS-6777 and KS-6778) and if so, note how much it has gained or lost. If necessary to regulate the clock, loosen the check nut, (located just below the regulating nut) if provided, and turn the regulating nut on the lower end of the pendulum. Be sure to tighten the check nut after the regulating nut has been turned. After the clock has been stopped to turn the regulating nut, time comparisons should not be started for several hours, or until the pendulum has had time to settle into its normal arc. If the clock runs fast turn the regulating nut toward the bottom of the case to slow up the clock and if the clock runs slow turn the nut away from the bottom of the case to speed up the clock. One full turn of the nut will change the time rate per 24 hours of the clock as follows:

Clocks per KS-1924 and KS-1925 40 sec.

Clocks per KS-1927, KS-1928, KS-1929, KS-1930, KS-6777 and KS-6778 (Brass bob wood rod pendulum) 1 min. 50 sec.

Clocks per KS-6777 and KS-6778 equipped with invar steel rod pendulum 2 min. 10 sec.

(5) Clocks per KS-1299 and KS-1931: If the clock gains or loses more than 30 seconds per 24 hours note how much the clock varies. Regulate by turning the pendulum regulating nut. One turn of the nut will affect the rate of the clock 1 minute and 50 seconds per 24 hours.

Note: Any fraction of a complete turn of the regulating nut in clock mentioned in (4) and (5) will affect the time rate in proportion to the above figures.

(6) Clocks per KS-1926: If the clock gains or loses more than 10 seconds per 30 days note how much it varies. Regulate by turning the pendulum regulating nut as described in (4). One turn of the regulating nut will affect the rate of the clock 30 seconds per 24 hours.

Note: Where a clock is equipped with a mercurial pendulum and has a set of weights for fine regulations,

turning the regulating nut as described in (4) two divisions will change the rate of the clock about one second per 24 hours. Adding two one gram weights will make the clock gain about one second per 24 hours, and the smaller weights will affect the rate in proportion. Care must be taken when putting on or taking off weights not to disturb the swing of the pendulum as any change of the arc affects the rate of the clock.

(7) When clocks except clock per KS-1926 are regulated as covered in the above procedures to meet their 24 hour accuracy requirement, they should meet their one hour accuracy requirement also. This can be checked by observing the gain or loss of time in one hour. If the one hour requirement is not met the regulating nut shall be turned as described in (4) until the requirement is met. If this procedure is followed it should be observed that the 24 hour requirement is still met.

Winding Circuit Contacts

- 3.11 Contact Separation (Rq.2.11)
- 3.12 Alignment of Contact Spring and Contact Sector (Rq.2.12)
- 3.13 Contact Alignment (Rq.2.13)

Motor

- 3.14 Electrical Requirements (Rq.2.14)
- 3.15 Position of Motor Armature (Rq.2.15)

Motor Contacts

- 3.16 Spiral Contact Spring Position (Rq.2.16)
- 3.17 Contact Alignment (Rq.2.17)
- 3.18 Spring Tension (Rq.2.18)
- 3.19 Contact Separation (Rq.2.19)
- 3.20 Contact Sequence (Rq.2.20)

(1) Operate and release the "WINDING" key located on the inside of the case manually several times to determine whether the motor will function satisfactorily. If the motor fails to operate, manually close the winding circuit contacts several times. If the motor operates under this condition, it is an indication that either the circuit to the key is open or else the key contacts are dirty. Clean the contacts with the No. 265B contact burnisher. Then check the wiring for loose connections and, where necessary, tighten the connections to the binding posts.

(2) If the motor fails to operate when either the winding circuit contacts are closed manually or when the key is closed, the trouble is probably due to any one or all of the following defects: Corrosion at the contacting points, im-

3.11-3.20 (Continued)

proper adjustment of the winding motor contacts, broken or distorted driving pawl, open magnet winding, or run down battery.

(3) Remove the hands and dial as outlined in 3.01, apply the potential directly to the motor winding terminals and note whether the motor armature responds. See that the battery potential is within the specified limits. If the motor does not function, it is an indication that the windings are open.

(4) If the motor armature operates and releases satisfactorily but does not wind satisfactorily, examine the driving pawl and winding lever. If they are broken or out of adjustment refer the matter to the supervisor.

(5) If the armature does not operate and release continuously when the potential is applied by operating the key, but operates only once on each application of potential it is an indication that the motor contacts do not break when the armature operates. Check this and, if necessary, adjust them as outlined in (6) and (7).

(6) If the motor contacts require adjusting it may be necessary to remove the dust cap in front of the contacts requiring adjusting. The front dust cap is removed by removing the lower mounting screw with the 3-1/2" cabinet screw-driver and sliding the dust cap from the groove in stud "A". Adjust the contacts as required with the tweezers as shown in Fig. 10.

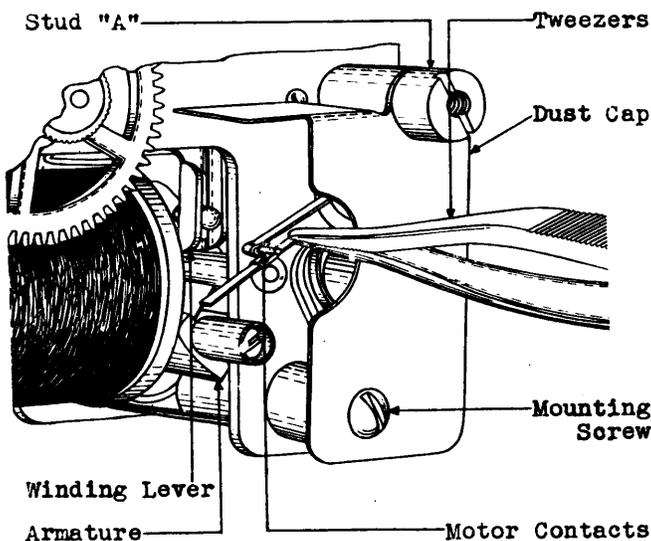


Fig. 10 - Method of Adjusting Motor Contacts with Tweezers

- (7) Ascertain that the armature banking springs are not broken.
- (8) Adjust the winding circuit contact springs as required with the KS-6015 duck-bill pliers.
- (9) Operate the winding key manually and if the motor functions satisfactorily reassemble the parts.

Synchronizing Mechanism

- 3.21 Electrical Requirements (Rq.2.21)
- 3.22 Armature Air-Gap (Rq.2.22)
- 3.23 Synchronizing Lever Operation (Rq.2.23)
- 3.24 Clearance between Seconds Roller and Cam (Rq.2.24)

(1) If the synchronizing mechanism does not function properly remove the hands and dial as covered in 3.01. Manually turn the cannon socket assembly slowly until the pin on the disc on the cannon socket assembly just unlocks the synchronizing latch. With the latch open, manually operate the synchronizing armature. The seconds roller should move the seconds arbor to the position in which the seconds hand indicates 60 seconds. In this position the synchronizing lever should rest on the two point cam of the cannon socket assembly and the seconds roller should barely clear the heart shaped cam as shown in Fig. 11.

(2) If the armature air gap is not as specified, slight adjustments may be made by turning the armature adjusting screw with the 3-1/2" cabinet screw-driver. If a satisfactory adjustment cannot be made in this manner, loosen the yoke adjusting screws with the 3-1/2"

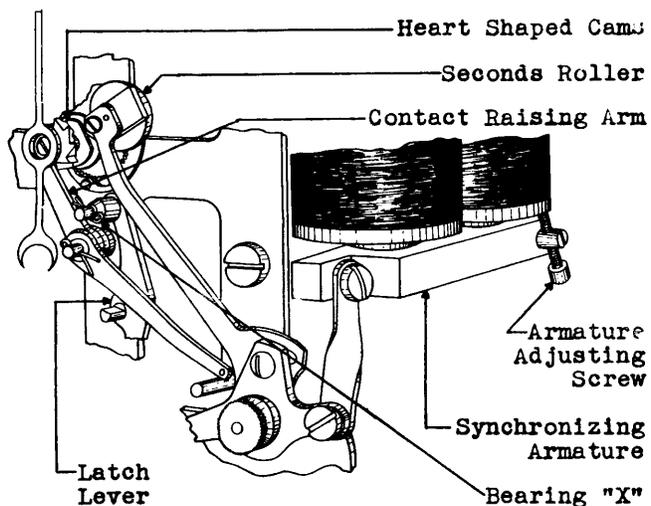


Fig. 11 - Position of Seconds Roller and Synchronizing Armature - Synchronizing Mechanism Operated

cabinet screw-driver. Manually operate the synchronizing armature and, while holding the armature in this position, set the magnets so that they just clear the armature. Tighten the yoke adjusting screws. Take care that the proper armature air gap is maintained and that the armature adjusting screw rests firmly against the head of the rear synchronizing magnet.

(3) If the seconds roller does not clear the heart shaped cam as specified, adjust the synchronizing lever as required at a point about one inch below the seconds roller, using the long nose pliers.

(4) If the synchronizing latch does not function properly, first, ascertain that the latch lever is free to move at bearing "X" (shown in Fig. 11). If this bearing binds, clean it as covered in procedure 3.01. Do not attempt to adjust the latch.

Synchronizing Lever Contacts

- 3.25 Contact Separation (Rq. 2.25)
- 3.26 Contact Alignment (Rq. 2.26)
- 3.27 Contact Sequence (Rq. 2.27)

(1) Manually operate the pendulum until the shorter spring of the 7-1/2 second circuit closing contact pair drops from a tooth of the hard rubber ratchet wheel on the seconds arbor assembly. This will close the 7-1/2 second contacts. Manually turn the cannon socket assembly until the synchronizing latch is unlocked, then manually operate the armature of the synchronizing magnet. Observe that the synchronizing contacts close before the 7-1/2 second contacts are opened. If this requirement is not met, adjust the springs with the KS-6015 duck-bill pliers. When making this adjustment it should be observed the contact clearance requirement is also met.

(6) Reassemble the parts.