

CALCULAGRAPHS
KS-7769 (MODEL 33)
REQUIREMENTS AND ADJUSTING PROCEDURES

1. GENERAL

1.01 This section covers the KS-7769 (Model 33) Calculagraph.

1.02 This section is reissued to revise 2.10, 2.17, 3.17, list of tools, gauges and materials and to correct printing error in 3.01.

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 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 artist's show card brush after being dipped into the oil to a depth of 3/8 inch and then scraped on the edge of the container to remove the surplus oil. There should not be sufficient oil adhering to the brush to form one drop on the end of the bristles.

1.06 The operated position of an operating lever is that position in which the lever is moved to either front or rear and the operating lever is resting against the rubber stop.

1.07 The normal (unoperated) position of the left-hand operating lever is that position in which the lever rests against the rear rubber stop.

1.08 The normal (unoperated) position of the right-hand operating lever of the KS-7769

L1, L5, L6, L8, L9, and L10 Calculagraphs is that position in which the center lines through the right-hand and left-hand operating levers, measured at the knobs, are not out of alignment with respect to each other more than 3/16 inch.

1.09 The normal (unoperated) position of the right-hand operating lever of the KS-7769 L11 to L16 Calculagraphs is that position in which the knob of the right-hand lever is 1-3/8 inches to the front of the left-hand lever knob when the left-hand lever is in the normal position.

2. REQUIREMENTS

2.01 Cleaning: The Calculagraph shall be cleaned when necessary in accordance with approved procedures.

2.02 Lubrication:

(a) The points listed below shall be adequately lubricated with Calculagraph Clock Oil - 152. When lubrication is necessary, one dip shall be sufficient for application to four or five points.

Bearings of Clock Movement

Four Teeth on Gear Associated With Motor Pinion—Fig. 5(A)

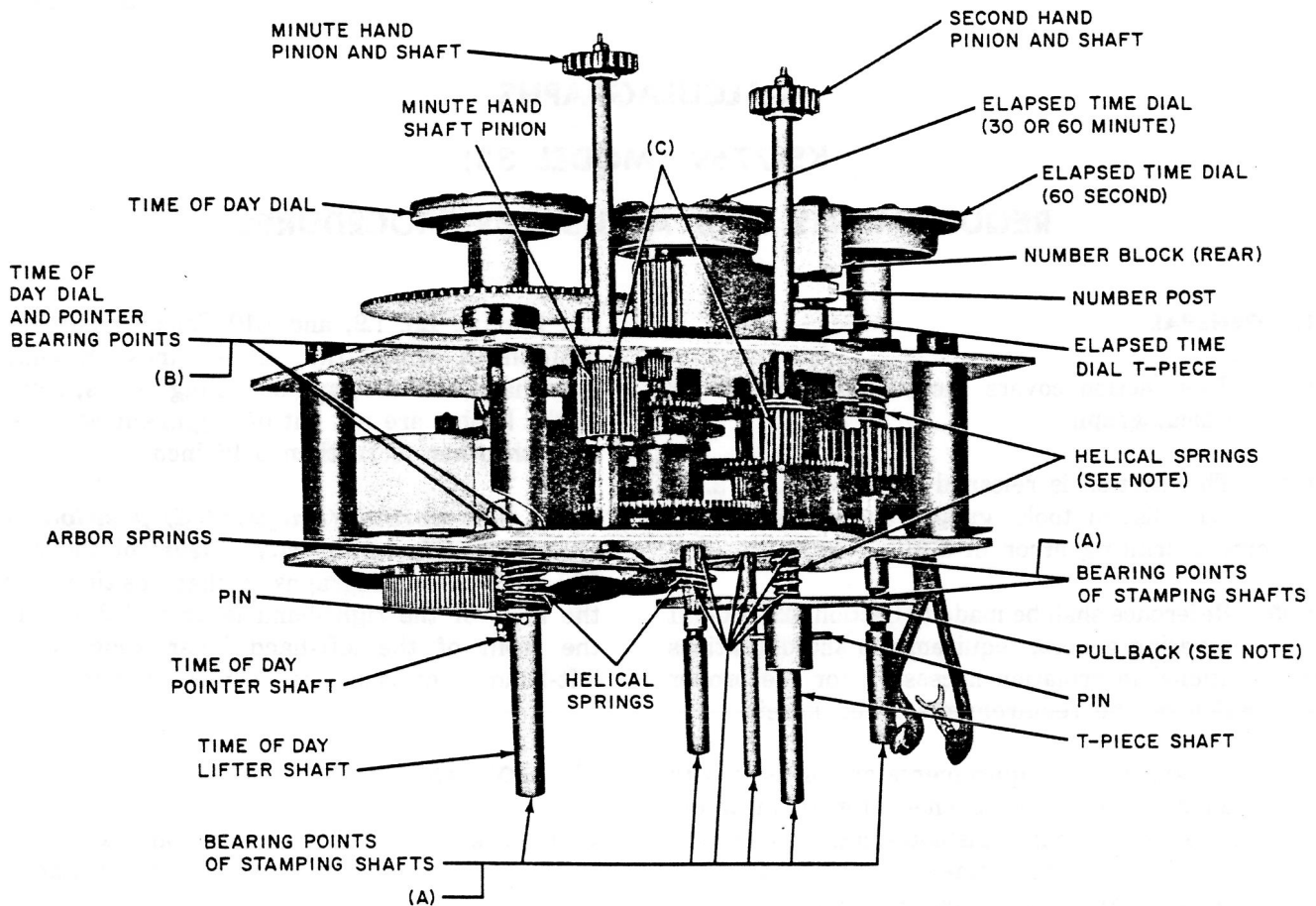
Platen Holder

Bearing Located in Tube—Fig. 3(A)

Gear Bridge and Second-Hand Shaft Bearing—Fig. 3(B)

Pivot Holes for Minute- and Second-Hand Pinion Shafts—Fig. 3(C)

Caution: Do not lubricate or permit the lubricant to get on the hub of the minute



NOTE:

IN LATER MODEL CALCULAGRAPHS, THE PULLBACK AND THE THREE HELICAL SPRINGS ARE REPLACED BY THREE HELICAL SPRINGS OF ANOTHER TYPE, MOUNTED DIRECTLY BELOW THE BOTTOM PLATE OF THE CLOCK MECHANISM, ON THE ARBORS. THE ARBORS OF THE LATER MODEL ARE NOT GROOVED BELOW THE BOTTOM PLATE OF THE CLOCK MECHANISM BUT ARE FURNISHED WITH PINS TO HOLD THE SPRINGS IN PLACE.

Fig. 1—Clock and Stamping Mechanism

or hour hands or minute wheel on post at rear of hands.

(b) The points listed below shall be adequately lubricated with KS-6232 oil. When lubrication is necessary, one dip shall be sufficient for application to two or three points.

Stamping Shafts—Bearing Points—Fig. 1(A)

Time-of-Day Dial Lifter and Pointer Shafts—Bearing Points—Fig. 1(B)

Slidable Pinions—One Tooth on Tooth on Each Pinion—Fig. 1(C)

Ribbon Wind Pawl and Pivots of Ribbon Reverse Mechanism—Fig. 2(A) and 4(A)

Lever Crank—Bearings—Fig. 2(B) and 4(B)

Connecting Link—Bearings—Fig. 2(C)

Ribbon Spool and Ratchet Shaft—Bearings—Fig. 2(D)

Ribbon Reverse Throwout Latch Bearing—Fig. 2(E)

Elapsed-Time Pointer Lifter—Bearing—Fig. 2(F)

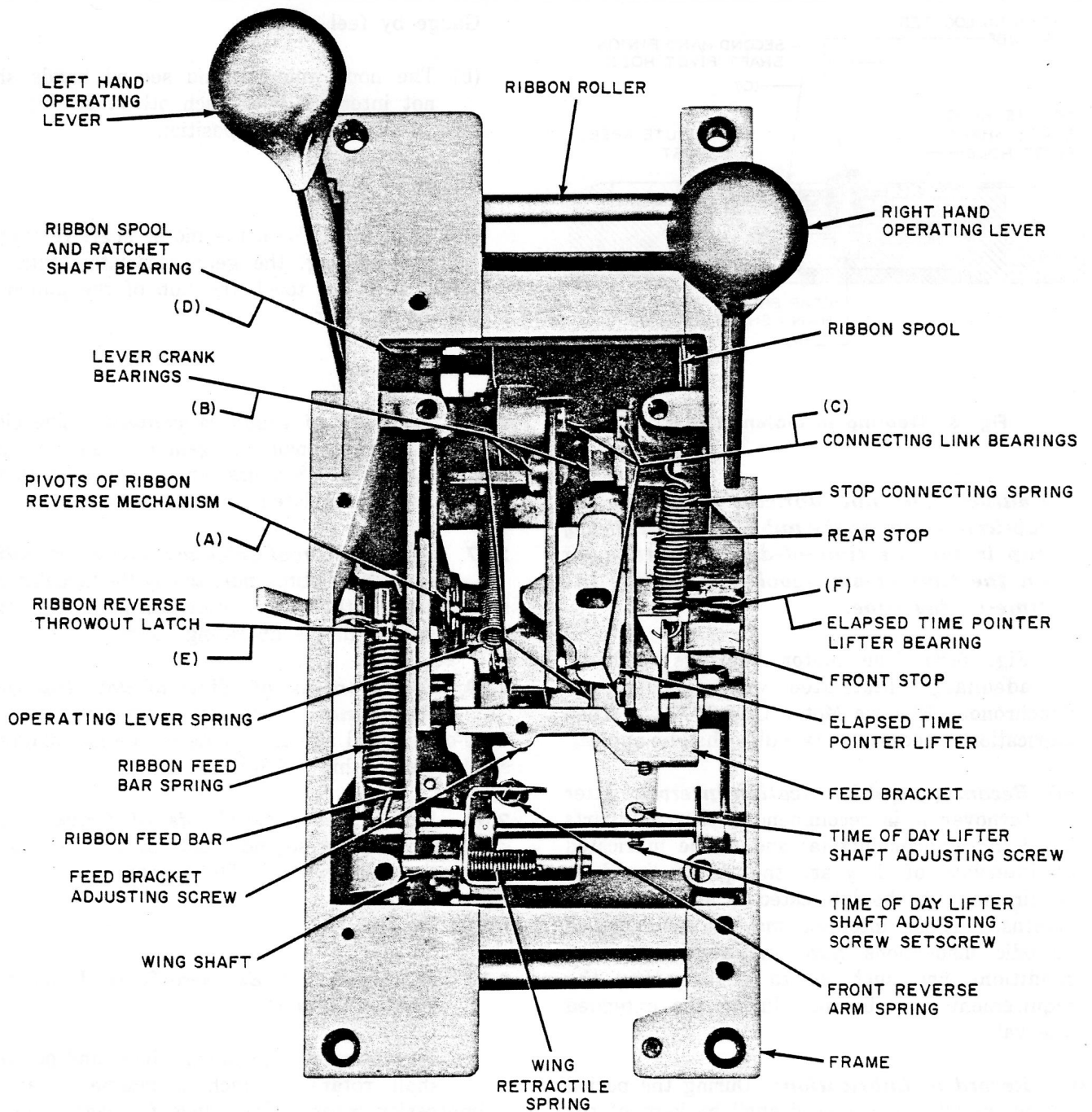


Fig. 2—Lever Cranks, Connecting Links, and Associated Parts (KS-7769 L11 Calculagraph Illustrated)

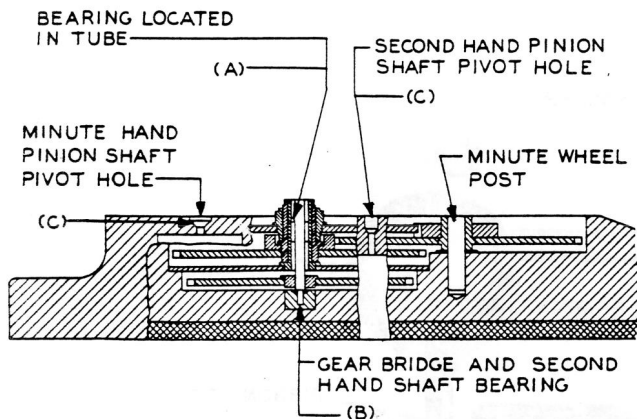


Fig. 3—Gearing in Platen Holder

Caution: Do not lubricate or permit the lubricant to get on the hub of the time-of-day cup inside the time-of-day plate tube, or on the time-of-day spool hub outside the time-of-day tube.

(c) Fig. 5(B)—The motor bearings shall be adequately lubricated with Calculagraph Synchronous Electric Motor Oil—30-134. When lubrication is necessary, two dips shall be applied.

(d) **Recommended Lubrication Interval:** After turnover it is recommended that the parts listed in requirements (a) and (c) be lubricated at intervals of 1 year, the parts listed in requirement (b) be lubricated at intervals of 6 months. These intervals may be extended if periodic inspections have indicated that local conditions are such as to ensure that the requirements will be met during the extended interval.

2.03 Record of Lubrication: During the period of installation a record shall be kept of the lubrication of the Calculagraph and this record shall be turned over to the telephone company with the equipment. If no lubrication has been done, it shall be so stated.

2.04 Ribbon Condition: The ribbon shall have sufficient ink to give a satisfactory print.

2.05 Freedom of Movement

*(a) All moving parts shall be free from bind.

Gauge by feel.

(b) The hour, minute, and second hands shall not interfere with each other, or with the face or crystal in any position.

Gauge by eye.

*(c) Fig. 5(C)—With the motor shaft resting in its bearing, the gear associated with the motor shall not touch the hub of the pinion on the motor rotor.

Gauge by eye.

2.06 Accuracy of Clock Movement: The clock movement shall not gain or lose any time over a period of 48 hours when connected to the power supply regulated for time service.

2.07 Synchronism of Calculagraphs in Operating Room: The time indicated by the Calculagraph shall agree within 1/2 minute with all the other Calculagraphs in the operating room.

2.08 Synchronism of Time-of-Day Dial and the Hands: The time registered by the time-of-day dial and the hands of the Calculagraph shall agree within 1/2 minute.

2.09 Synchronism of Hands of Clock: The minute and second hands of the clock shall be synchronized within ± 20 seconds.

Gauge by eye.

2.10 Movement of Elapsed-Time Dials and Time-of-Day Dial

(a) The stamping mechanism, dials, and pointers shall rotate in such a manner that an impression made by the dials followed after an interval of 15 seconds by an impression from the pointers will register 15 on the 60-second dial and after three succeeding intervals of 15 seconds each will register 30, 45, and 0, respectively. After the fourth interval, the pointer on the 30- or 60-minute dial shall have advanced 1 minute.

(b) With the pointers of the minute and second dials indicating 0, the pointer of the minute dial shall be at or slightly behind the 0 and, after an elapsed time of 60 to 65 seconds, the

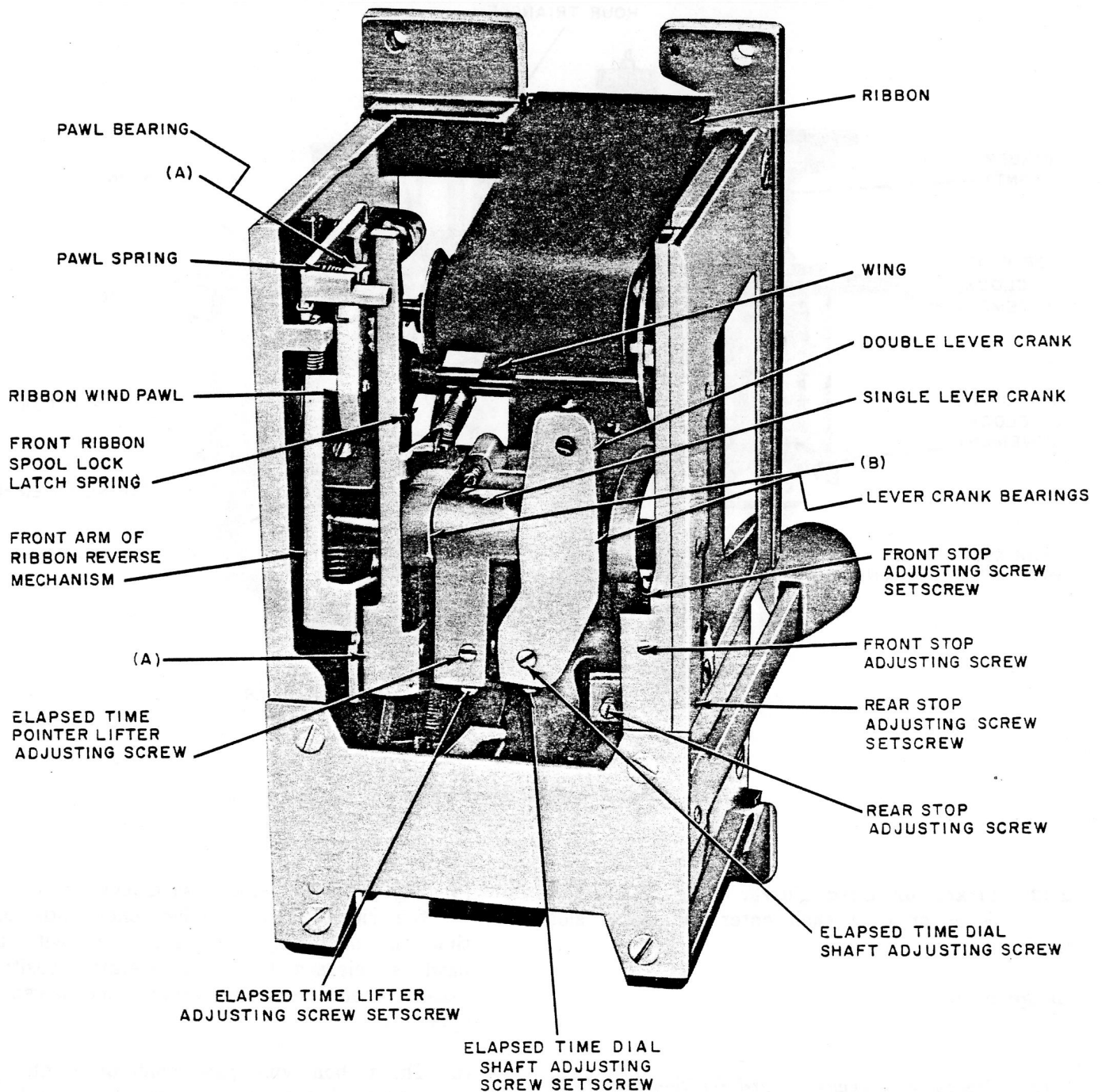


Fig. 4—Ribbon Reverse Mechanism, Lever Cranks, and Associated Parts

minute pointer shall indicate 1 minute. The center of the elapsed time pointer shall be no further from the center of the number line it is indicating that one-half the width of the pointer line.

Gauge by eye.♦

(c) The stamping mechanism after having been operated shall restore to normal unrestrained.

2.11 Operating Lever Movement: The operating levers shall return unaided from their operated to their normal positions.

Gauge by eye.

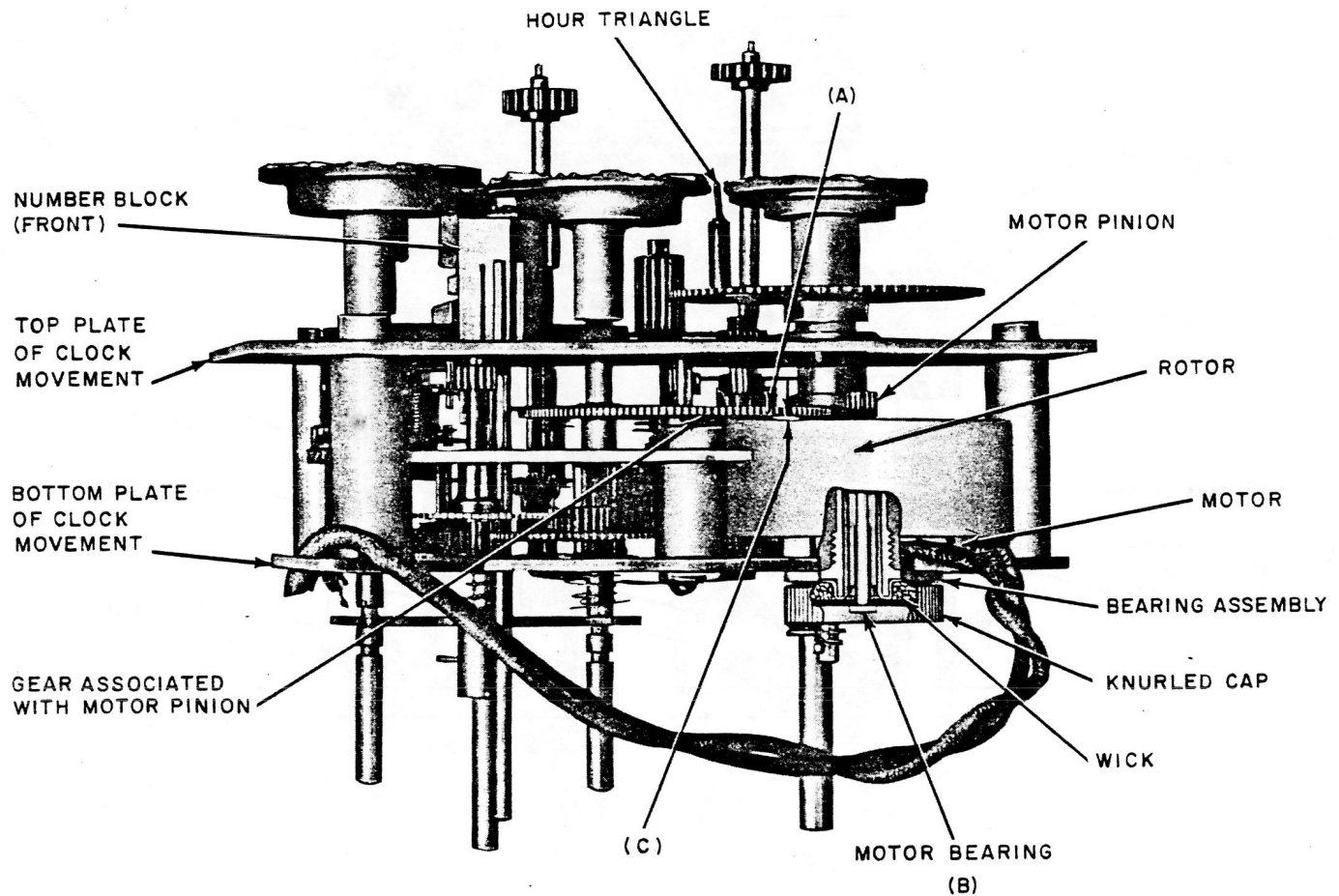


Fig. 5—Motor Mechanism

2.12 Ticket or Card Entry: Fig. 8(A)—The ticket or card shall enter the ticket slot freely.

Gauge by feel.

2.13 Clearance Between Card Guides and IBM Card: Fig. 8—With the IBM card inserted into the ticket slot and one long edge of the card engaging the platen holder, the clearance between the other long edge of the card and both card guides shall be 0.005 inch.

Gauge by eye.

***2.14 Movement of Ribbon Wind Pawl and Ribbon Spool Ratchet**

(a) Fig. 8(B)—The ribbon wind pawl shall move the ribbon spool ratchet one tooth each time the operating lever associated with the pawl is released from the operated position, except when the ribbon reverse mechanism is operated.

(b) The ribbon wind pawl shall drop into the next ratchet tooth before the operating lever touches a 0.050-inch gauge held against the frame adjacent to the rubber stop.

Use the 131A gauge.

***2.15 Ribbon Reverse Mechanism:** The ribbon reverse mechanism actuated by the unwound spool shall reverse the direction of rotation of the ribbon when there are approximately three turns remaining on the unwound spool.

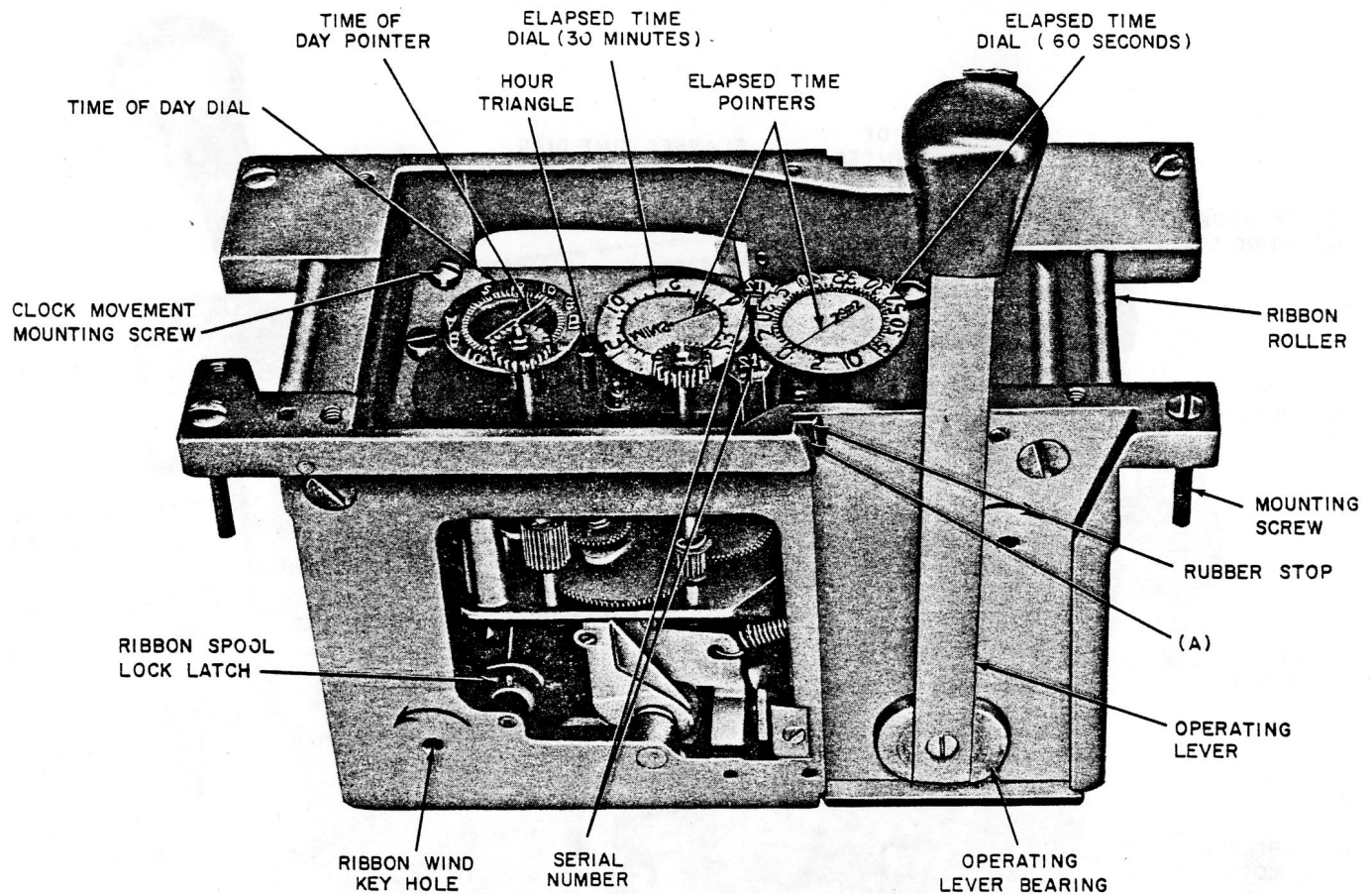


Fig. 6—Stamping Dials and Associated Parts—Calculagraph Equipped With 30-Minute Elapsed-Time Dial

Gauge by eye.

To check the operation of the ribbon reverse mechanism, wind the ribbon on the spool until approximately six turns remain on the unwound spool. Then while operating the ribbon reverse throwout latch to remove the lock on the reversing mechanism, further advance the ribbon by means of the operating lever to guard against premature operation of the reversing mechanism.

***2.16 Tension of Ribbon Spool Brake:** When the operating lever is operated or released quickly, no appreciable slack shall appear in the ribbon.

Note: On release the operating lever shall not be allowed to snap.

2.17 Operating Lever Operation

- (a) The operation of the operating lever shall give a clear, readable impression of the dials

and pointers when the levers are operated against the rubber stops.

(b) With the operating lever positioned 0.065 inches from the rubber stop, the dials, pointers, and associated numbers shall cause smears but not legible prints to appear on a ticket when the ticket is pulled out of the calculagraph. Use the 131A gauge to position the lever. To check this requirement place a ticket in the calculagraph. Remove the 0.065 inch blade (No. 132AA) from the 131A gauge. Position the gauge horizontally against the rubber stop and operate the lever against the gauge with just sufficient force to hold the gauge in place. While holding the lever in this position, pull out the ticket and check for smears.♦

***2.18 Tension of Ribbon Reverse Throwout Latch:** The latch shall hold the ribbon reverse mechanism on the rear spool unoperative when the Calculagraph is removed from the case.

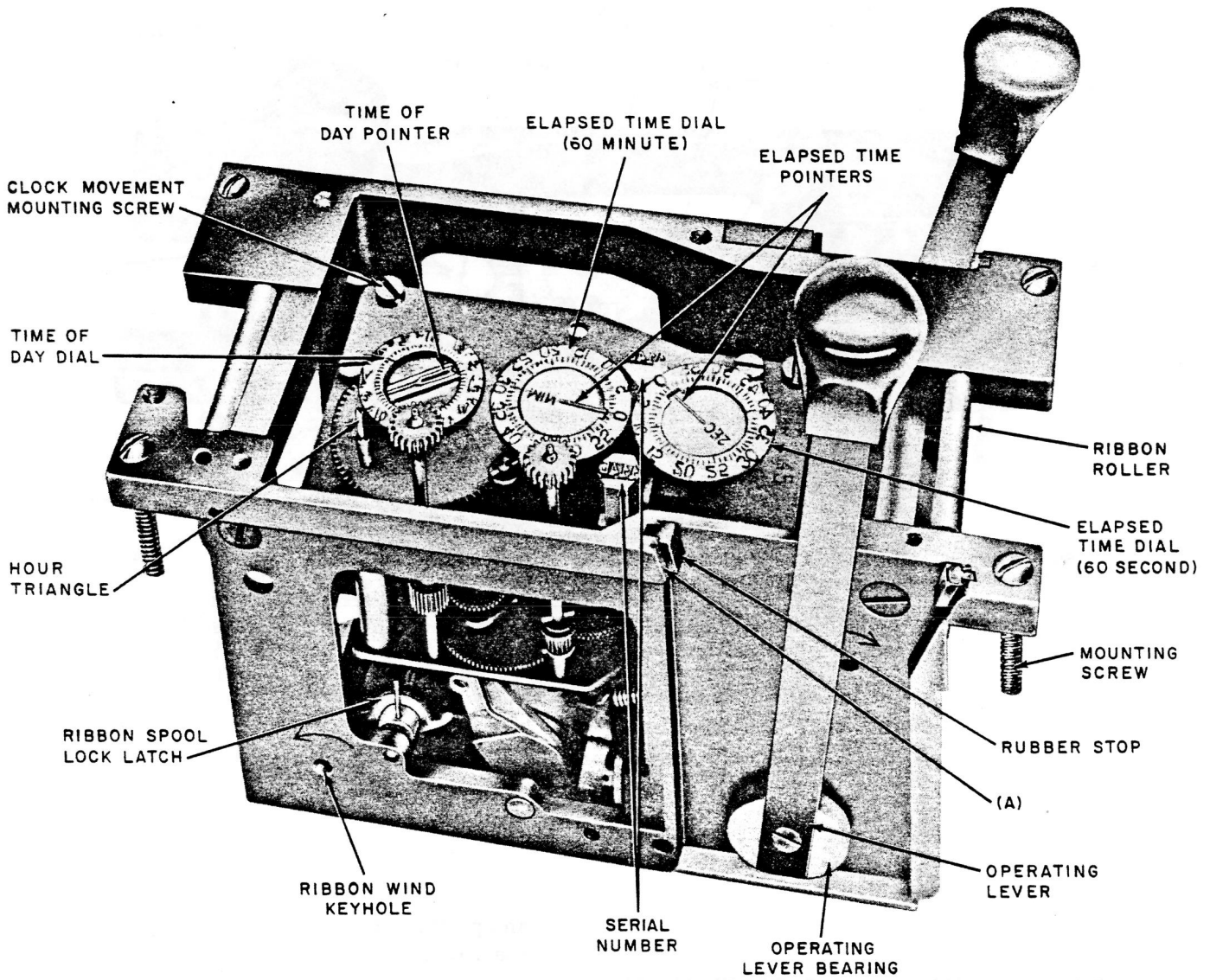


Fig. 7—Stamping Dials and Associated Parts—Calculagraph Equipped With 60-Minute Elapsed-Time Dial (KS-7769 L11 Calculagraph Illustrated)

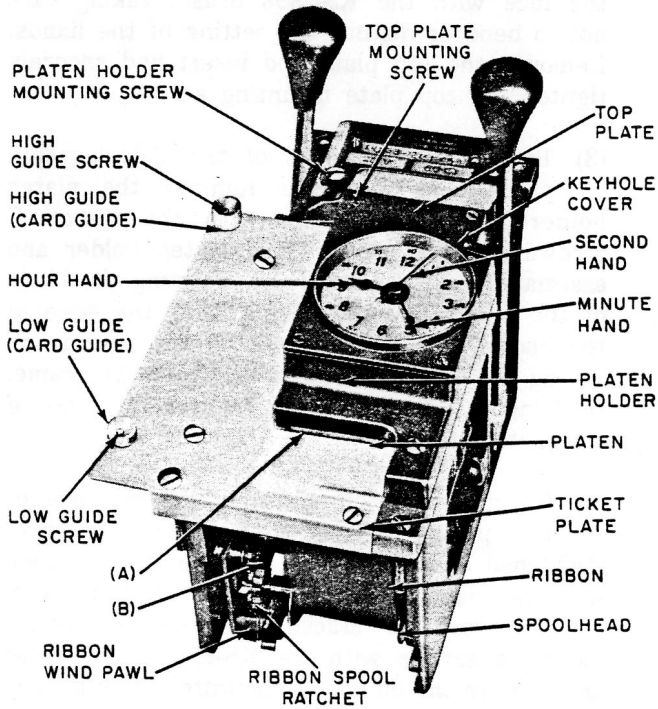


Fig. 8—Ticket Plate, Platen, and Associated Parts (Calculagraph With Offset Handle Illustrated)

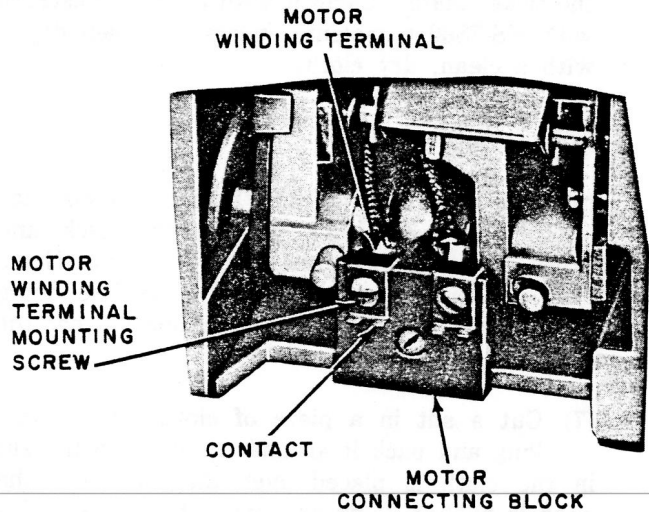


Fig. 9—Connecting Block Mounted on Calculagraph

3. ADJUSTING PROCEDURES

3.001 List of Tools, Gauges, and Materials

CODE OR SPEC NO.	DESCRIPTION
TOOLS	
206	30-Degree Offset Screwdriver
207	90-Degree Offset Screwdriver
→ 277	Wrench, O.E. 1/4-Inch
371	Spring Adjuster
418A	5/16- and 7/32-Inch Open Double-End Flat Wrench
485A	Smooth-Jaw Pliers
573A	3/4-Inch Hex Single-End Box Wrench
KS-2993	Brush
KS-6320	Orange Stick
KS-6854	3-1/2- Inch Screwdriver
KS-7769 L3	Ribbon Winding Key
KS-7769 L4	Hand Setting Key
KS-14164	No. 4 Artists Show Card Brush
R-1005	Jewelers Screwdriver
R-2969	Typewriter Brush
—	B Splicers Scissors
—	Long-Nose Pliers
—	Sharp Knife
—	3-Inch C Screwdriver (or the replaced 3-inch cabinet screwdriver)
—	4-Inch E Screwdriver (or the replaced 4-inch regular screwdriver)

SECTION 030-102-701

CODE OR SPEC NO.	DESCRIPTION
GAUGES	
79C	0-200 Gram Push-Pull Tension Gauge
131A	Thickness Gauge Nest
MATERIALS	
KS-2423 or KS-14666	Cleaning Cloth
KS-6232	Oil
KS-7860	Petroleum Spirits
—	Calculagraph Clock Oil — 152
—	Calculagraph Synchronous Electric Motor Oil — 30-134
—	Duco Household Cement
—	Hardwood Toothpicks, Flat at One End and Pointed at Other
—	Small Flat Piece of Wood
—	Type Cleaner — Norta

3.002 In order to make the adjustments covered herein, loosen the Calculagraph mounting screws with the 4-inch E screwdriver and remove the Calculagraph from the case. After making the necessary adjustments, synchronize the Calculagraph as covered in 3.07, 3.08, and 3.09. Remount the Calculagraph in the case and securely tighten the mounting screws.

3.003 When inserting pins in the shafts, gears, or pinions, take care that they do not interfere with the movement of any part.

3.01 Cleaning (Reqt 2.01)

External Parts

- (1) ◆Clean the external parts of a Calculagraph with a clean, dry cloth.◆
- (2) To clean the face of the clock, remove the top plate mounting screws with the KS-6854 screwdriver and remove the top plate. Clean

the face with the KS-2993 brush, taking care not to bend or disturb the setting of the hands. Remount the top plate and insert and securely tighten the top plate mounting screws.

(3) To clean other parts of the Calculagraph, proceed as follows. Remove the platen holder mounting screws with the 3-inch C screwdriver and remove the platen holder and associated gears as a unit by inserting the blade of the 3-inch C screwdriver under the edge of the platen holder at the end of the platen and prying the platen holder away from the frame. In doing this take care not to burr the edge of the platen holder.

(4) Clean the platen and the undersurface of the platen holder with a cloth slightly moistened with KS-7860 petroleum spirits, then wipe the parts with a dry cloth. If the platen is hard, torn, or cracked, remove the platen mounting screws with the KS-6854 screwdriver and remove the platen. Substitute a new platen, making sure that the platen lies flat in the platen holder and insert and securely tighten the mounting screws.

(5) Remove the ticket plate mounting screws with the KS-6854 screwdriver and remove the ticket plate. Clean it with a cloth moistened with KS-7860 petroleum spirits and then dry it with a clean, dry cloth.

Stamping Dials

(6) The type faces of the stamping dials may be cleaned either with a toothpick and typewriter brush as covered in (7) or with Norta type cleaner as covered in (8). Before doing this, unwind a portion of the ribbon so that the dials are exposed.

(7) Cut a slit in a piece of cloth 4-1/2 inches long and pack it around the dials so the slit in the cloth is placed over the dials and the cloth is pushed down and under the sides. This will prevent dirt from dropping into the clock mechanism. Remove all gummy substance, lint, and dirt from the dials with a clean toothpick and then clean the dials thoroughly with an R-2969 typewriter brush. Do not use petroleum spirits or any other liquid when cleaning the dials as the liquid may carry ink and dirt into

the shaft bearings, causing faulty operation. With the dials satisfactorily cleaned, turn the Calculagraph face down so that the dirt will drop from the cloth. Then with the Calculagraph on its side, remove the cloth.

- (8) Remove the Nortra from its container. Use approximately one half a cake and spread it over the type, pressing it down so that it fills all the indentations in the type. Then starting at one end, roll the Nortra into a ball working it out of indentations as it is rolled up. If necessary, repeat this operation. Make sure that no particles remain in the type. Knead the Nortra thoroughly and place the Nortra in its container for future use.

Stamping Mechanism

- (9) Remove the motor connecting block mounting screw with the 3-inch C screwdriver. Remove the four clock movement mounting screws with the 4-inch E screwdriver and lift the movement out of the frame. Thoroughly clean all bearings of the stamping mechanism, lever, cranks, connecting links, operating levers, clock movement, and pinions by flushing them with KS-7860 petroleum spirits applied with a toothpick. Operate the operating levers a number of times and reflush.
- (10) Remove the petroleum spirits and all the old oil from the parts with a clean cloth wrapped around a small flat piece of wood.
- (11) Allow the parts to dry thoroughly and then lubricate as covered in 3.02.

Motor

- (12) To clean the motor bearing, pull the wires through the bottom plate of the clock movement enough to obtain some slack in the wires between the plate and the motor. Remove the knurled cap from the bearing assembly. Remove the bearing assembly with the 573A wrench, remove the motor from the clock plate, and remove the rotor from the motor. Clean the shaft with a cloth moistened with KS-7860 petroleum spirits taking care not to damage the shaft. Allow the petroleum spirits to dry and coat the shaft with a film of Calculagraph

Synchronous Electric Motor Oil -- 30-134. Lubricate the motor bearing as covered in 3.02. Remount the knurled cap securely in place. Remount the rotor on the stator and remount the parts on the clock plate taking care not to damage the shaft. Engage the pinion on the rotor with the associated gear as covered in 3.06. Hold the motor in place and remount the bearing assembly over the shaft. Securely tighten the bearing assembly against the clock plate with the 573A wrench. Pull the wires back through the bottom plate to take up the slack.

Reassembling

- (13) After the Calculagraph is cleaned and lubricated, remount the clock movement and insert and securely tighten the mounting screws. Rewind the slack ribbon on the spool with the ribbon winding key. Mount and secure the platen holder and ticket plate. Remount the connecting block securely in place. Synchronize the hands with the time-of-day dial as covered in 3.09. Make sure that the pinions of the minute and second shafts properly mesh their associated gears. To do this depress and release the slidable pinions and note whether they engage their associated gears. If they do not, take up the backlash in a backward and forward motion.

3.02 Lubrication (Reqt 2.02)

- (1) Lubricate the various parts with the proper oil applied with the KS-14164 brush. Distribute the oil retained by the brush after each dip as specified.
- (2) To lubricate the motor bearing, remove the ticket plate mounting screws with the KS-6854 screwdriver, remove the platen holder mounting screws with the 3-inch C screwdriver, remove the platen holder, remove the connecting block with the 3-inch C screwdriver, remove the clock movement mounting screws with the 4-inch E screwdriver, and remove the clock movement. Remove the knurled cap and lubricate the motor by wiping the lubricant on the inside of the knurled cap. Securely remount the knurled cap in place.
- (3) To lubricate the bearing points in the platen holder, remove the top plate and crystal

from the platen holder by removing the top plate mounting screws with the KS-6854 screwdriver. Remove the hands from the clockface and then remove the clockface. Lubricate the parts as indicated. Remount the clockface and then remount the hands, being careful not to bend, burr, or damage them. Securely remount the top plate and crystal on the platen holder with the top plate mounting screws.

- (4) After lubricating the parts, remount and secure the clock movement, connecting block, platen holder, and ticket plate.

3.03 Record of Lubrication (Reqt 2.03) (No procedure)

3.04 Ribbon Condition (Reqt 2.04)

- (1) If the ribbon is worn or exhausted of ink, replace it as covered in Section 030-102-801.
- (2) At this time note whether any part requires cleaning and lubrication and if it does, proceed as covered in 3.01 and 3.02.

3.05 Freedom of Movement (Reqt 2.05)

- (1) If binding occurs, clean the bearings or pivots as covered in 3.01.
- (2) If the hands bind on each other or on the crystal or face, remove the top plate mounting screws with the KS-6854 screwdriver and remove the top plate. If the minute hand binds on the second hand, adjust either the minute or second hand until satisfactory clearance is obtained. If the minute hand binds on the hour hand, it may be due to the hour hand not being satisfactorily positioned on the hour tube. In this case, depress the hour hand at the hub so that it clears the minute hand. If the hour hand binds on the face, raise the hand on the hour tube until it clears the face. Take care not to allow the hour hand to bind on the minute hand. If the hands still bind on the face, adjust the hand at fault until a satisfactory clearance is obtained.
- (3) If the second hand binds on the crystal, adjust it until it clears the crystal. Take care not to bend the hand to such an extent that it binds on the minute hand. Reassemble the parts.

- (4) If the clearance between the hub of the pinion on the rotor and the associated gear is not satisfactory, refer the matter to the supervisor, as this may result in failure of the clock to keep accurate time.

3.06 Accuracy of Clock Movement (Reqt 2.06)

- (1) If the clock does not keep accurate time, it may be due to dirty bearings, to faulty connections, or to poor alignment of the motor pinion and its associated gear. If the bearings are dirty, clean and lubricate them as covered in 3.01 and 3.02. If the clock still fails to keep satisfactory time, the trouble may be caused by an unreliable contact between the connecting block springs in the case and the contacts in the connecting block on the Calculagraph. To correct, remove the spring-mounting screws in the container with the 3-inch C screwdriver and adjust the position of the springs as required with the 485A smooth-jaw pliers. Remount the springs securely in place. If the trouble is due to poor alignment between the pinion on the motor and its associated gear, loosen the bearing assembly as covered in 3.01 and shift the position of the motor as required. To ensure good alignment of the parts, the teeth of the gear and pinion should engage at least one half the depth of the teeth but should not engage the full depth. With the teeth satisfactorily aligned, securely tighten the bearing assembly in this position. If the clock still does not keep satisfactory time, refer the matter to the supervisor.

3.07 Synchronism of Calculagraphs in Operating Room (Reqt 2.07)

3.08 Synchronism of Time-of-Day Dial and the Hands (Reqt 2.08)

3.09 Synchronism of Hands of Clock (Reqt 2.09)

- (1) To synchronize a Calculagraph with other Calculagraphs in the operating room, proceed as follows. Take an impression of the time-of-day dial. Note whether the time indicated by the hands agrees with the stamped record.
- (2) If the stamped record agrees with the time indicated by the hands of the clock but the stamped record and hands do not agree with

the other Calculagraphs in the operating room, loosen the keyhole cover mounting screw with the KS-6854 screwdriver and shift the cover off the keyhole. Insert the end of the KS-7769 L4 hand setting key that has the short shank in the keyhole in the top plate and rotate the hands of the clock and the time-of-day dial to the correct position.

(3) If the hands of the clock agree with the time indicated by the other Calculagraphs in the operating room but the stamped record does not, or if the stamped record agrees with the other Calculagraphs but the hands of the clock do not, proceed as follows. Remove the Calculagraph from the case, and depress and hold down the slidable pinion on the minute hand shaft about 1/8 inch. This disengages the hands of the clock from the clock movement and time-of-day dial. Insert the end of the hand setting key that has the short shank in the keyhole in the top plate, set the hour and minute hands about 5 minutes ahead of the time indicated by the stamped record, and then rotate the hands in a counterclockwise direction to the time indicated by the record. Release the slidable pinion, making sure that the minute pinion engages its associated gear in the platen holder as covered in 3.01(13). Operate the Calculagraph under power for 2 minutes and take another impression of the time-of-day dial. If the time indicated by the hands of the clock agrees with the stamped record, restore the Calculagraph to service. If it does not, repeat as covered above until the parts are synchronized. After the Calculagraph is satisfactorily adjusted and restored to service, synchronize it with the other Calculagraphs in the operating room as covered above.

(4) If the second and minute hands are not synchronized with each other within the specified limits, proceed as follows. Insert the end of the hand setting key that has a long shank in the keyhole in the top plate and rotate the second hand to the desired position. To synchronize the minute hand with the hour hand, remove the top plate mounting screws with the KS-6854 screwdriver and remove the top plate. Remove the second hand. Note whether the minute and hour hands fit tightly on their respective hubs. If the minute hand does not, remove it and adjust the circular portion of the

hand as required with the 485A smooth-jaw pliers. If the hour hand does not fit tightly, remove both the minute and hour hands and adjust as required. If a hand cannot be satisfactorily adjusted, replace it. In mounting or positioning the hands, place the hour hand on the tube so the pointer points directly over the numeral 12. Mount the minute and second hands so they also point directly to or are above the same point. Take care when mounting the hands that they do not bind on each other, on the face, or on the crystal. If any part does bind, proceed as covered in 3.05, after which synchronize the hands as covered above. Remount the top plate and insert and securely tighten the mounting screws.

(5) Shift the keyhole cover over the keyhole and tighten the mounting screw securely.

3.10 *Movement of Elapsed-Time Dials and Time-of-Day Dial* (Reqt 2.10)

(1) If the movement of the dials is not satisfactory or if the dials do not return to normal after being operated, it may be due to dirt in the bearings, between a dial and pointer, or to defective helical springs. If the bearings are dirty, clean them as covered in 3.01.

(2) If a helical spring is defective, replace it as covered in Section 030-102-801.

(3) If an elapsed-time pointer shaft binds in an elapsed-time dial cup, proceed as follows. Remove the taper pin that extends through the pullback collar and the shaft with the 485A pliers. Rotate the pullback to clear the other shafts and remove the pullback and spring. If the bind is between the second shaft and second dial, remove the pin from the hub of the thick gear on the shaft with the 485A smooth-jaw pliers and remove the shaft from the clock movement. Clean the shaft, the lower surface and pin of the pointer disc, the dial, and the interior of the cups with a cloth moistened with KS-7860 petroleum spirits. This operation will be facilitated if the cloth is wrapped around a KS-6320 orange stick. After thoroughly cleaning the parts, reassemble the dial and pointer and insert the shaft down through the T-piece, top clock plate, thick gear, and bottom clock plate. Line up the holes in the shaft and gear and

insert the pin through the holes. If the bind is between the minute shaft and the minute dial, remove the pin under the helical spring and washer with the 485A smooth-jaw pliers and remove the washer and spring from the shaft. Remove the pin from the hub of the gear mounted on the minute shaft. To do this, it may be necessary to rotate the minute dial to such a position that the pin may be removed with the 485A smooth-jaw pliers. Remove the dial and shaft and clean them as covered above. Reassemble the parts and insert the shaft down through the T-piece, top plate, gear, and bottom plate. Line up the holes in the gear and shaft and insert the pin through the holes. Mount the helical spring and washer over the end of the shaft and insert the pin in the holes in the shaft. Mount the spring and pullback in place. Insert the taper pin through the pullback collar and shaft.

- (4) In the later model Calculagraphs which do not have the pullback, remove the pin located on the arbor directly below the bottom clock plate and remove the helical spring which rests on this pin. Then, proceed as covered in (3) and remount the springs and pins in place.
- (5) After the parts are satisfactorily cleaned, lubricate the parts as covered in 3.02.
- (6) If the dials still do not operate satisfactorily, do not place the Calculagraph in service but refer the matter to the supervisor.

3.11 *Operating Lever Movement* (Reqt 2.11)

- (1) If the operating lever which controls the operation of the elapsed-time pointers does not return to normal satisfactorily, it is probably due to dirt collecting on the operating lever bearing, or to a weak or distorted operating stop connecting spring or ribbon feed bar spring or the position of the front or rear stops is not satisfactory. If the operating lever bearings are dirty, clean them as covered in 3.01. If a spring is defective, replace it as covered in Section 030-102-801. If the spring is satisfactory, adjust the position of the front or rear stops as follows. Loosen the adjusting screw setscrews associated with the stop to be positioned with the R-1005 or KS-6854 screwdriver. The R-1005 screwdriver is used when the head of the setscrew is below

the surface of the casting. Adjust the adjusting screw as required with the R-1005 or KS-6854 screwdriver until the lever returns to the normal position satisfactorily after having been operated. After the stops have been satisfactorily adjusted, tighten the setscrews securely in place.

3.12 *Ticket or Card Entry* (Reqt 2.12)

- (1) If the clearance between the platen holder and ticket plate or between the platen and the ribbon is not satisfactory, it is probably due to a bent ticket plate or to the platen being old or cracked. Remove the platen holder. If the platen is old or cracked, replace it as covered in Section 030-102-801. If the ticket plate is bent, straighten it as required.
- (2) If the platen is satisfactory, the stamping dials may be partially held operated by dirt. In this case clean the bearings as covered in 3.01.

3.13 *Clearance Between Card Guides and IBM Card* (Reqt 2.13)

- (1) If the clearance between the guide and an IBM card is not satisfactory, slightly loosen the guide mounting screw with the KS-6854 screwdriver. Insert a card in place. Position the guide as required. While holding the guide in this position, tighten the screw securely.

3.14 *Movement of Ribbon Wind Pawl and Ribbon Spool Ratchet* (Reqt 2.14)

3.15 *Ribbon Reverse Mechanism* (Reqt 2.15)

3.16 *Tension of Ribbon Spool Brake* (Reqt 2.16)

- (1) If the operation of the ribbon wind pawl is not satisfactory, take an impression of the elapsed-time dials and pointers. If the impression is satisfactory, the trouble may be due to a broken ribbon feed bar spring, a defective ribbon feed bar mechanism, or a deformed or broken pawl retractile spring. If any of the parts require replacement proceed as covered in Section 030-102-801.
- (2) If the pawl oversteps or understeps, loosen the feed bracket adjusting screw setscrew

with the KS-6854 or R-1005 screwdriver and turn the adjusting screw in or out, as required, with the KS-6854 or R-1005 screwdriver. Turning the screw in will increase the movement of the pawl and turning it out will reduce overstepping of the pawl. Then tighten the setscrew securely. After making this adjustment, see that the operating levers are in their correct location when they are in the normal position.

(3) If the operation of the ribbon reverse mechanism is not satisfactory, it is probably due to the wing not bearing satisfactorily on the spool or to the ribbon clamp not being positioned satisfactorily. If the wing does not bear satisfactorily on the spool, it may be due to the wing being bent. To adjust the rear wing, grasp the wing near the base with the 485A smooth-jaw pliers and adjust the wing as required with the 371 spring adjuster. To adjust the front wing, it may be necessary to remove the ticket plate and adjust the wing as covered above. Then remount the ticket plate.

(4) If the wing is bearing satisfactorily on the spool, the trouble may be due to a broken or weak wing retractile spring, or to a bent wing or pawl pins. If the spring is defective, replace it as covered in Section 030-102-801. If the spring is satisfactory, unwind the ribbon and note the position of the ribbon clamp. If a prong of the clamp extends over the edge of the slot in which the wing rides, it will prevent the reversing mechanism from operating satisfactorily. To correct, remove the clamp and relocate it so that the prongs do not extend over the slot, taking care that the ribbon is securely held in position. Rewind the ribbon. If the wing or pawl pins are bent, straighten them with the long-nose pliers.

(5) If the ribbon spool brake on the rear spool is not tensioned satisfactorily, remove the rear ribbon spool friction spring and substitute a new spring in its place. If the ribbon spool lock latch which acts as a brake on the front spool is not satisfactory, remove the spool and the retractile spring from the lock latch and the frame with the 485A smooth-jaw pliers. Substitute a new spring and remount the spool.

3.17 Operating Lever Operation (Reqt 2.17)

(1) If a clear impression of each dial and pointer or number block is not obtained when the operating levers are operated, it may be due to dirt collecting in the bearings of the lever cranks or elapsed-time pointer lifter, to an unsatisfactory adjustment of the operating lever, to a worn ribbon, or, if the rubber stop is nonmolded rubber, to the rubber stop being too large. If the ticket cannot be pulled out easily or if impressions instead of smears are obtained in checking part (b) of this requirement, this may be due to a worn rubber stop. If the bearings are dirty, clean them as covered in 3.01. If the ribbon or rubber stop is worn, replace as covered in Section 030-102-801. If the nonmolded rubber stop is too large, trim the stop as required with a sharp knife.

(2) If the adjustment of the operating lever is unsatisfactory, loosen the adjusting screw setscrew on the lever crank associated with dials or pointers at fault with the KS-6854 screwdriver or 206 or 207 offset screwdriver as required, and adjust the position of the adjusting screw with the KS-6854 screwdriver. By turning the screw in, a heavier impression will be obtained and by turning it out a lighter impression will be obtained. After a satisfactory adjustment is obtained, tighten the setscrew securely. Recheck and, if necessary, readjust the ribbon feed.

(3) If the impression of both elapsed-time dials and associated number is unsatisfactory proceed as follows: Remove the three top plate mounting screws, lift off the top plate and move the ribbon out of the way. If the number associated with the elapsed-time dials is too light, turn the rear number block out, as required, with the 277 wrench. The 277 wrench can be maneuvered into position for turning the adjusting nut, while holding the number block in place, with P long-nose pliers. If the dials are too light and the rear number is too heavy, turn the rear number block in.

(4) If the impression of the pointers and associated number is unsatisfactory, remove the number block shaft from the frame. Shift the position of the number block on the shaft as required.

SECTION 030-102-701

To do this, grasp the shaft securely with the 485A smooth-jaw pliers and turn the number block with the fingers. Take care in doing this not to burr the shaft. Turn the block out to obtain a darker impression of the number and in to obtain a darker impression of the pointer. Remount the shaft and take another impression of the dials, pointers, and numbers.

- (5) If irregular impressions of the stamping mechanism are obtained, remove the platen holder and note whether the platen is worn or bulged. In either case, replace it as covered in Section 030-102-801. If it is satisfactory, give consideration to banking the surface of the platen holder under the platen at the required points.
- (6) To bank the surface of the platen holder, proceed as follows. Insert a sheet of paper of ordinary thickness in the Calculagraph and operate both levers in the usual manner. After removing the sheet of paper from the Calculagraph, examine the imprint carefully to see which portions of the imprint are not dark or sharp enough to read easily. Cut away and discard

all portions of the imprint that are satisfactory. Retain any portion of the imprint that is unsatisfactory. Remove the platen holder from the Calculagraph and remove the platen from the platen holder as covered in 3.01(3) and (4). Apply cement to the reverse sides of the pieces of paper which have an unsatisfactory imprint. Cement these pieces to the surface of the platen holder which faces the back of the platen. In doing this, be careful to locate these pieces of paper in the same positions on the platen holder as the imprint of the stamping mechanism is located on the platen. Remove the excess cement from the platen holder with a toothpick. Reassemble the platen, platen holder, and Calculagraph. Test the machine to see if the imprint has improved. If it has not, repeat the procedure described above, cementing additional pieces of paper onto those already used in banking the platen holder.

3.18 *Tension of Ribbon Reverse Throwout Latch* (Reqt 2.18)

- (1) Adjust the ribbon reverse throwout latch spring as required with the 485A smooth-jaw pliers.