

Bulletin No. 167  
Issue 1  
March, 1941

# TELETYPE

PRINTING TELEGRAPH SYSTEMS

Bulletin No. 167

DESCRIPTION AND ADJUSTMENTS  
TAPE PERFORATOR  
(FIVE UNIT)

**TELETYPE**  
CORPORATION  
SUBSIDIARY OF  
*Western Electric Company*  
CHICAGO, U.S.A.





**“ The Iron Horse”  
GPE - 5-Unit Perforator (Bell 14A)  
Above example of Western Union  
configuration for weather symbols.  
Unit is housed in a sound-absorbing  
apparatus cabinet. Circa 1941**

CHANGES IN LUBRICATION SPECIFICATIONS  
WHICH APPLY TO ALL TELETYPE APPARATUS

The following lubricants have been standardized for use on all types of Teletype apparatus. These lubricants supersede those referred to in preceding Teletype specifications. The lubricants can be ordered from Teletype as follows:

88970	1 Qt. of KS-7470 Oil
88971	1 Gal. of KS-7470 Oil
88973	1 Lb. of KS-7471 Grease
*88975	KS-8319 Grease Gun
97116	4-oz. Tube of KS-7471 Grease

The above grease is recommended instead of oil for lubricating motors equipped with ball bearing. The 88975 grease gun should be used for injecting grease into the bearings of Teletype ball bearing motors. The gun may be used also for applying grease to other parts of the apparatus and no other grease container need be carried. If this grease gun is not available, the oil listed in the foregoing should be substituted for lubricating ball bearing motors.

\* Instructions for Filling the Grease Gun

1. Unscrew the lubricant tube from the cap casting of the grease gun.
2. Insert fresh lubricant through the open end of the tube with the fingers. Apply gradually to eliminate air pockets.
3. Tamp the lubricant down solidly in the tube by pounding the closed end solidly against the palm of the hand. Continue to add lubricant until the tube is completely filled and the metal follower rests against the perforated tube cover.
4. Fill the cap casting with lubricant flush to the bottom side of the tube threads.
5. Screw the lubricant tube into the cap casting part way only. Then insert a pencil or rod through the perforated tube cover and exert pressure against the metal follower so as to expel any entrapped air past the tube threads. When lubricant begins to ooze through the threads, tighten the lubricant tube securely in the cap casting.
6. Operate the handle back and forth for several strokes or until lubricant is pumped from the nozzle. The gun is then ready for use. If the lubricant does not flow from the nozzle in a solid stream, it is an indication that all air has not been expelled from the lubricant tube. Invert the gun and pound the cap casting end against the palm of the hand to jar the lubricant into the pump cylinder.

\* Instructions for Lubricating Motor Ball Bearings

The motor bearings are packed with grease before the motor leaves the factory and under ordinary operating conditions need no additional lubrication for

approximately two months. At the regular lubricating intervals one or two strokes of the plunger of the gun should apply sufficient grease to each bearing. To lubricate, press the nozzle of the gun against the ball roller and force the grease into the hole by pushing on the plunger of the gun. Care should be taken that the bearings are not overloaded. Overloading will result in the grease oozing out of the end castings and being forced into the motor or being thrown on other parts of the mechanism. After lubricating, the motor should be run for a few minutes and then any excess grease that has been forced out of the ends of the castings should be wiped off. Each time that the gun is used for lubricating a motor bearing, the plunger should first be depressed slightly to make sure that grease will be delivered.

CHANGE IN BULLETIN 167, ISSUE 1,  
ADJUSTMENTS OF TAPE PERFORATOR (FIVE-UNIT)

The changes outlined in this correction sheet apply only to perforators equipped with an adjustable end-of-line indicating mechanism, as indicated by the two asterisks preceding the title of the adjustment.

Page 5

Add the following adjustment after **\*\*Release Rod Holding Pawl Spring Tension:**

**\*\*Stop Screw Bracket Yield Spring Tension (Figure 7A)\***

Unhook the stop screw bracket yield spring from the spring bar. Hook a 32-oz. scale in the spring eye and pull up vertically. It should require from 15 to 19 ozs. to extend the spring to 1-5/8" as measured from the top of the formed section of the stop screw bracket to the eye of the spring. The end of the scale used to measure the length just mentioned should rest against the top of the formed section of the stop screw bracket. Rehook the spring.

Page 6

Substitute the following in place of **\*\*Release Rod Holding Pawl Stop Screw Adjustment (Figure 9):**

**\*\*Release Rod Holding Pawl Stop Screw and Bracket Adjustment**

There should be from .065" to .080" clearance between the engaging peak of the release rod holding pawl and the release rod when the pawl is held against its stop screw and the stop screw is held against its post.

To adjust, loosen the stop screw bracket mounting screws, loosen the stop screw lock nut, and adjust the screw to meet the foregoing requirement. Check to see that after the stop screw lock nut is tightened, a flat on the stop screw will bear against the stop post. Also, check to see that the spring washer assembled on the stop screw bracket mounting screw nearest the stop is around its bushing. This may be determined by moving the stop screw bracket after its mounting screws have been carefully tightened. The bracket should be free to move with an appreciable amount of friction.

Hold the stop screw bracket as far as it will go away from the stop post, position the contact screw bracket so that the contact screw is in alignment with the contact on the contact operating lever, and tighten the stop screw bracket mounting screws. Recheck the clearance between the engaging peak of the release rod holding pawl and the release rod.

Page 10

Substitute the following in place of **\*\*Indicator Gear Stop Plate Adjustment (Figure 6):**

**\*\*Indicator Gear Stop Plate Adjustment - See Note (A)**

The adjustable plate on the indicator gear provides for varying the starting position of the gear so that the lamp contacts will be closed on the 64th to 70th character perforated. When it is desired to close the contacts on the 70th character, move the plate in a counterclockwise direction, and when it is desired to close the lamp contacts on the 64th character, move the plate in a clockwise direction.

\* Adjust as follows: With the idler pinion fully in mesh with the tape feed roll pinion, position the stop plate so that the 7th tooth, for 65 characters, or 2nd tooth, for 70 characters, etc., on the indicator gear is fully in mesh with the idler pinion. With the stop screw bracket held against its stop post, and with the release rod holding pawl held against the stop screw, move the stop plate toward the release rod holding pawl so that there is from .010" to .025" clearance between the formed projection on the stop plate and the pawl.

With power on the perforator, fully depress and slowly release the carriage return key lever. Operate a key lever, other than the carriage return key lever, the desired number of times to see that the lamp lights on the proper character.

**Note:** If readjustment of the stop plate is necessary, remove power from the perforator.

After the correct position of the stop plate has been determined, carefully move the plate as far as it will go toward the center of the gear and securely tighten the adjustable plate clamping screws. Recheck this adjustment several times, with power on the perforator, normally operating the carriage return key lever.

CHANGES IN BULLETIN 167, ISSUE 1  
DESCRIPTION AND ADJUSTMENTS  
TAPE PERFORATOR  
(5 UNIT)

Page 11

PUNCH MAGNET YOKE CONTACT SPRING ADJUSTMENT (Figure 18)

Change the clearance requirement in Paragraph (b)  
to read ".020" to ".030" instead of ".015" to ".020."

REPEAT RELAY ADJUSTMENTS (Figure 19)

Change the clearance requirement in Paragraph (b)  
to read ".015" to ".018" instead of ".012" to ".015."

Change the spring tension requirement in Paragraph (c)  
to read "2-1/4 to 3 ozs." instead of "1-1/2 to 1-3/4 ozs."

Change the spring tension requirement in Paragraph (d)  
to read "1-3/4 to 2 ozs." instead of "1 to 1-1/2 ozs."

CHANGES AND ADDITIONS  
TO BULLETIN 108 (ISSUE 2)  
DESCRIPTION AND ADJUSTMENTS  
OF THE FIVE UNIT TAPE PERFORATOR  
AND  
BULLETIN 167 (ISSUE 1)  
DESCRIPTION AND ADJUSTMENTS  
TAPE PERFORATOR (FIVE UNIT)

PAGE 5, Bulletin 108  
PAGE 5, Bulletin 167

LOOP STOP SKINS ADJUSTMENT

Add the following to the first sentence in this adjustment:

"..... except in the case of the power loop."

PAGE 9, Bulletin 108  
PAGE 7, Bulletin 167

PUNCH MAGNET CONTACT SCREW ADJUSTMENT

Add the following additional requirement to this adjustment:

"When the LETTERS keylever is fully depressed, there should be at least .002" clearance between the power loop and the loop stop."

\* \* \*



CHANGES IN  
BULLETINS 108, ISSUE 2, and 167, ISSUE 1  
DESCRIPTION AND ADJUSTMENTS  
OF THE FIVE UNIT TAPE PERFORATOR

In order to prevent disengagement of the loops from the ball cranks during shipment, the 122-23 loop bearing (left) has been provided with a tapped hole and fitted with a 1035 adjusting screw and a 34-9 nut. This screw may be adjusted to hold the loops toward the right and prevent their disengagement from the ball cranks. The following adjustment applies to perforators so equipped:

BULLETIN 108, PAGE 5 - immediately preceding the LOOP SPRING TENSION  
(Figure 6)

BULLETIN 167, PAGE 4 - immediately preceding the LOOP SPRING ADJUSTMENT  
(Figure 7)

Add the following adjustment:

LOOP ADJUSTING SCREW ADJUSTMENT

There should be some clearance, not more than .015", between the outer surface of the power loop and the end of the adjusting screw at the ball crank end. To adjust, turn the adjusting screw to meet the requirement and position the lock nut.

NOTE

When making this adjustment a moderate force should be applied to the loops in the direction to make this clearance a maximum. Avoid bending or forcing the loops which may result in a false adjustment.

\* \* \*

CHANGES IN ADJUSTMENT BULLETINS

- 164, Issue 1 - Tape Perforator, Page 5
- 147, Issue 2 - Montyping Reperforator, Page 11
- 148, Issue 3 - Perforator Transmitter, Page 16
- 165, Issue 3 - Typing Reperforator, Page 2-14
- 166, Issue 2 - Perforator Transmitter, Page 18
- 171, Issue 2 - Typing Reperforator, Page 14
- 173, Issue 1 - Reperforator Transmitter Distributor, Page 25
- 193, Issue 1 - Reperforator Transmitter Distributor, Page 22
- 203, Issue 1 - Reperforator Transmitter Distributor, Page 2-15
- 167, Issue 1 - Tape Perforator, Page 6

Bulletins 173, 193, and 203 - PRPUNCH TAPE TENSION LEVER STUD ADJUSTMENT  
Bulletins 147, 148, 165, 166, and 171 - TAPE TENSION LEVER STUD ADJUSTMENT

Change these adjustments to read as follows:

The tape tension lever stud should be centrally located with respect to the feed roll pins. This requirement should be measured as follows:

- (a) Take up the feed roll end play towards the star wheel and the tension lever end play towards its adjusting nut. The edge of the lever slot may touch the feed roll pins on the side of the pins nearest the ratchet but there must be clearance on the other side.
- (b) Take up the feed roll end play away from the star wheel and the tension lever end play away from the tension adjusting nut. The edge of the lever slot may touch the feed roll pins on the side farthest away from the ratchet but there must be clearance on the other side.

To adjust, add or remove shims between the shoulder on the tape tension lever stud and its mounting bracket.

Bulletins 164 and 167 - TAPE TENSION LEVER STUD ADJUSTMENT

Insert the above adjustment immediately before the TAPE TENSION LEVER SPRING TENSION ADJUSTMENT.

\* \* \*

### CHANGES IN ADJUSTMENT BULLETINS

- 108, Issue 2, Five Unit Tape Perforator, Page 5
- 164, Issue 1, Seven Unit Tape Perforator, Page 4
- 167, Issue 1, Five Unit Tape Perforator, Page 5

#### Release Rod Holding Pawl Eccentric Adjustment

In the bulletins listed above the following adjustment should be inserted in place of the present adjustment.

a. With the release rod latched in its operated position by the release rod holding pawl, there should be from .010" to .030" clearance between the tops of the teeth on the idler gear and the tops of the teeth on the tape feed roll pinion. Check this clearance throughout a complete revolution of the gear and pinion.

To adjust, position the release rod holding pawl eccentric.

b. Rotate the indicator gear approximately 1/4 turn and hold it in this position. With the carriage return key lever fully depressed and the release rod holding pawl in the notch in the release rod, there should be at least .004" clearance between the release rod holding pawl and the holding surface of the notch. If necessary, readjust the holding pawl eccentric within the limits of its adjustment to obtain this clearance.

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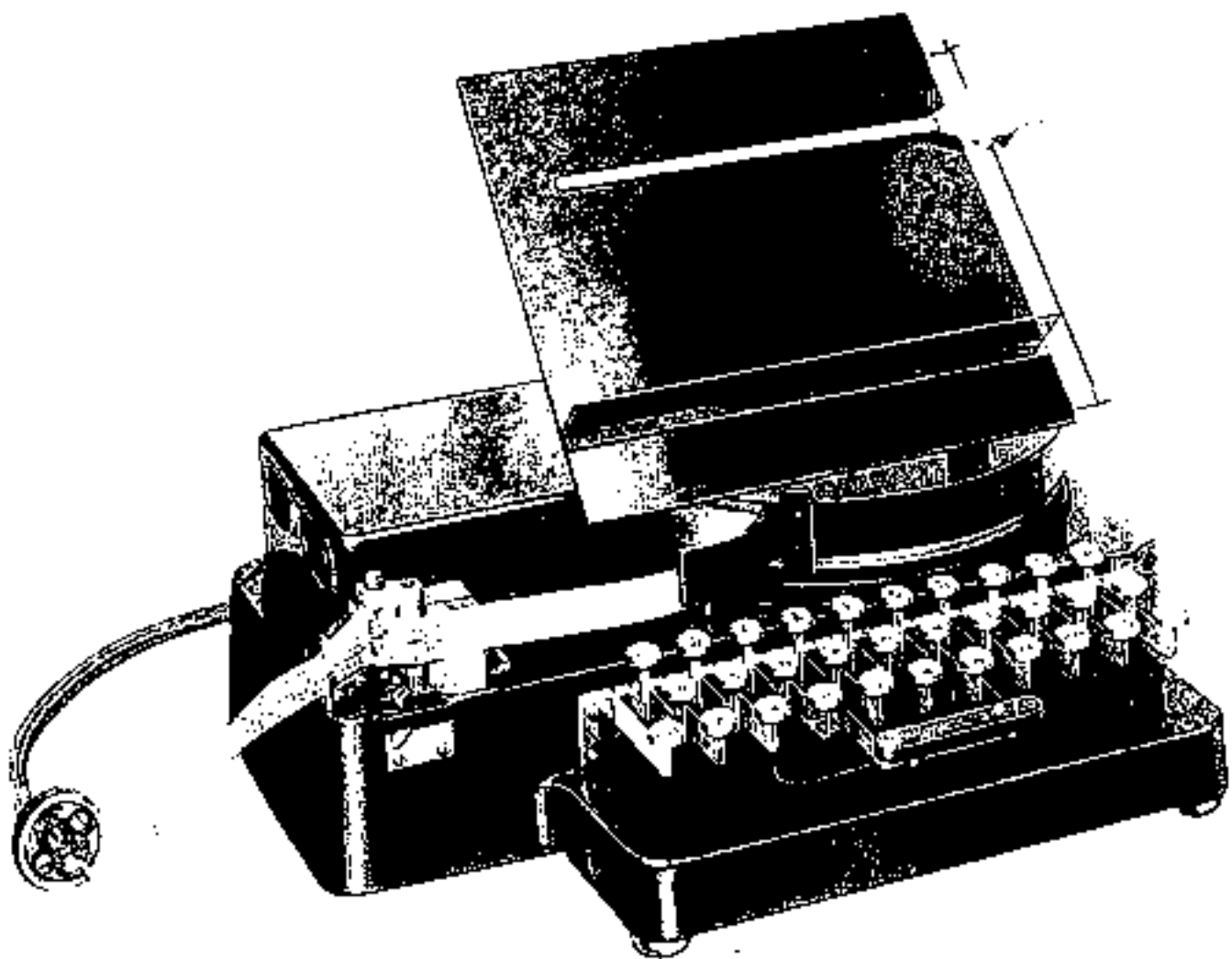
# TELETYPE

PRINTING TELEGRAPH SYSTEMS

## DESCRIPTION AND ADJUSTMENTS TAPE PERFORATOR (FIVE UNIT)







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## DESCRIPTION OF THE FIVE-UNIT TAPE PERFORATOR

### General

The Five-Unit Tape Perforator is a unit of apparatus that is used to prepare perforated tape for automatic telegraph transmission. Combinations of holes are perforated in the tape, which correspond to the key lever depressed. The perforator taps with the code combinations thus recorded may be fed automatically through a tape transmitting device, operating a printer unit at a distant point.

The Five-Unit Tape Perforator is a self-contained magnet (solenoid type) operated, portable unit. It consists essentially of a set of keys and key levers; perforating, tape feeding, and end-of-line indicating mechanisms. The unit is equipped with a power cord and attachment plug for making connections to a source of direct current power supply.

NOTE: In all the figures of this bulletin, fixed pivot points are designated by solid black circles.

### Signaling Code

The signaling code used to transmit characters is the "Five-Unit Code," which consists of five selecting impulses used in various combinations of spacing and marking intervals. The large holes in the tape represent marking impulses, whereas the impulse positions on the tape that are not perforated represent spacing impulses. The small holes are feed holes, which are used to feed the tape through the perforator and the transmitting device. Figure 1 shows how the code combination for each character or function appears when perforated in the tape.

### Perforating Mechanism

The perforating mechanism (Figure 2) consists essentially of a set of punches for perforating the tape; a pair of punch magnets and a punch hammer for operating the punches; a set of punch bars and bell cranks; and loops and combs attached to each key lever used in selecting the punches (Figure 3). The five punch bars are fitted in guide slots in the punch hammer, just behind the punches and in line with them (Figure 2). The right end of each punch bar is attached to a bell crank and the opposite end of each bell crank engages a notch in a loop extension. Each character or function key lever has a comb with notches arranged so that its particular code combination will be selected and perforated. The combs are cut out in such a manner that the depression of a key will cause the comb to strike the top edge of one or several of the loops, moving them downward (Figure 3).

In addition to the five loops controlling the five punch bars, there is a sixth or power loop (Figure 3) which is operated by the depression of any key. The downward movement of this loop closes the punch contacts (Figure 2), energizing the punch magnet, and thus operating the punch hammer.

The depression of a loop causes the punch bar connected to it to be moved away from a punch so that when the punch hammer is operated by the magnet, the tape will not be perforated at this position; but when a loop is not depressed, the punch bar connected to it will be allowed to remain in the path of a punch and a hole will be perforated. A feed hole is perforated with each forward movement of the punch hammer.

For instance, if the "K" key lever is depressed, only the #5 punch bar will be moved away from its punch. All the other punch bars, however, will be driven against their punches, causing the first four impulses to be perforated in the tape (Figure 1).

### Tape Feeding Mechanism

The tape feed roll is located to the left of the punches (Figure 2). Spaced at equal intervals around the tape feed roll is a series of projecting feed pins which mesh with the feed holes punched in the tape. A tape tension lever holds the tape against the tape feed roll, keeping the feed holes in the tape in constant mesh with the tape feed roll pins.

During the forward movement of the punch hammer, the tape feed pawl, which is attached to the punch hammer, engages a tooth on the tape feed roll. When the punch hammer moves back, the tape feed roll will revolve, advancing the tape one character space. A star wheel affixed to the lower end of the feed roll and a detent insure equal spacing of the tape (Figure 4).

### End-of-Line Indicating Mechanism (Nonadjustable) - See Note (A)

The end-of-line indicating mechanism is intended for use in connection with page printer reception. When sixty-four or sixty-five combinations have been perforated in the tape, a red lamp, under the keyboard, is lighted by the closing of contacts. These contacts are closed by the action of the indicator gear (Figure 5). This gear meshes, through an idler gear mounted on a lever, with the tape feed roll pinion on the tape feed roll. Whenever the tape feed roll moves the tape forward one space, the indicator gear is advanced one tooth.

Mounted on the indicator gear is a pin "A" (Figure 5). When the indicator gear is advanced sixty-four or sixty-five teeth from its starting position, pin "A" will move the lamp contact lever so that its contact spring will touch the lamp contact screw, lighting the lamp.

The advancing of the indicator gear winds up an indicator return spring, one end of which is attached to the indicator gear. When the operator depresses the "Carriage Return" key, the key lever strikes a ball crank which moves the release rod to the left. This throws the indicator idler gear out of mesh with the tape feed roll pinion and the indicator gear is returned to its starting position by the indicator return spring.

Since the "Carriage Return" key may not be held depressed long enough to allow the indicator gear to completely return to its starting position, a release rod holding pawl is provided to insure that the gears stay out of mesh while the indicator gear is returning. This holding pawl moves into a notch in the release rod when the release rod is in its left-hand position. When the indicator gear is almost returned to its starting position, pin "B" (on the indicator gear) moves the holding pawl out of the notch in the release rod and permits the gears to again mesh.

### End-of-Line Indicating Mechanism (Adjustable) - See Note (A)

The adjustable end-of-line indicating mechanism (Figure 6) is similar to the non-adjustable end-of-line indicating mechanism described in the foregoing except for the following:

- (A) When the perforator is used to transmit to tape printers, wires to the lamp circuit are disconnected (See Figure 20).



The adjustable end-of-line indicating mechanism has an adjustable stop plate mounted on the indicator gear. A projection, extending downward from this stop plate, is used instead of pin "B" to move the release rod holding pawl out of the notch in the release rod.

The adjustable stop plate moves the release rod holding pawl against an adjustable stop screw which determines the stop position of the indicator gear. The adjustable stop plate may be positioned so that the lamp contacts close on any operation from the sixty-fourth to the seventieth.

#### Backspace Lever

A backspace lever is provided for moving the tape backwards for the correction of errors (Figure 4). When the backspace lever is being moved from left to right, it engages a pin projecting from the tape feed pawl and cams the tape feed pawl out of engagement with the tape feed roll ratchet. Toward the end of the travel of the backspace lever, the backspace pawl (which is mounted on the backspace lever) engages a tooth of the star wheel, rotating it backwards one space. The "Letters" key may then be depressed, causing five holes to be perforated over the previous perforation. This combination may be passed through the tape transmitting device without causing any character or letter to be printed on the receiving printer. However, if a character in the upper case is corrected, it will be necessary to strike the shift key (Figures) again, because the "Letters" combination will unshift the receiving printer.

#### Repeat Mechanism

The repeat mechanism provides a means of continually perforating a desired code combination in the tape. With any key lever and the repeat push button simultaneously held depressed, the code combination corresponding to the key lever depressed will continue to be perforated until the repeat push button is released.

When any key lever is held depressed, the punch magnet circuit is completed through the punch magnet contacts (Figure 20). The operation of the punch magnet permits the magnet yoke contacts to close, completing a circuit through the winding of the repeat relay if the repeat push button is depressed. The operation of the repeat relay breaks the punch magnet circuit. The punch magnet yoke is released, opening its contacts, which open the repeat relay circuit. The repeat relay releases its armature, closing the punch magnet circuit, thus setting up a repeated cycle of operation. Repeat action will continue as long as any key lever and the repeat push button are simultaneously held depressed.

## ADJUSTMENTS OF THE FIVE-UNIT TAPE PERFORATOR

The following adjustments are arranged in a sequence that would be followed if a complete readjustment of the perforator were undertaken. This fact should be kept in mind when a single adjustment is to be made.

The spring tension values given in this bulletin were derived from measurements made with Teletype spring scales. These spring scales are calibrated for use in a vertical "pull" position. When used in any other position, the reading is an indicated value. Therefore, in order to obtain the proper spring value readings, the spring scales which are included in the Teletype printer catalog tool list should be used.

NOTE: Adjustments marked with two asterisks (\*\*) apply only to perforators equipped with the adjustable end-of-line indicating mechanism, and replace similar adjustments marked with one asterisk (\*) which apply only to perforators equipped with the nonadjustable end-of-line indicating mechanism. All other adjustments apply to perforators equipped with either the adjustable or the nonadjustable end-of-line indicating mechanism.

### Loop Spring Adjustment (Figure 7)

With the perforator resting on its right-hand side, hook an 8 oz. scale over each loop approximately at its center, and pull in a direction away from the key levers. It should require from 1-1/2 to 2 ozs. to start the punch bar loops moving away from the key levers and 2-1/2 to 3 ozs. to move the power loop away from the key levers.

Adjust the punch bar loop and power loop springs by bending.

### Key Lever Spring Adjustment (Figure 7)

The opening between the ends of all key lever springs, excepting the "Space" key lever spring, should measure 1-5/8". The "Space" key lever spring should measure 2" across the opening between the ends.

Adjust by bending.

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NOTE: After making a single adjustment, check related adjustments.

### Loop Stop Shims Adjustment

When the "Blank" key lever is fully depressed, there should be from .002" to .030" clearance between the loops and the loop stop.

Adjust the position of the loop stop by means of shims. See Figure 7.

### \*Release Rod Holding Pawl Spring Tension

Unhook the release rod holding pawl spring from its post. Hook an 8 oz. scale in the spring eye and pull up vertically. It should require from 1-1/4 to 2-1/2 ozs. to extend the spring to 1" measured from the top of the release rod holding pawl to the outside loop of the spring. Replace the spring.

### \*\*Release Rod Holding Pawl Spring Tension

Unhook the release rod holding pawl spring from its bracket, hook an 8 oz. scale in the spring eye and pull up vertically. It should require 1/2 to 1-1/2 ozs. to extend the spring to 3/4" measured from the top of the release rod holding pawl to the outside loop of the spring. Replace the spring.

### Release Rod Holding Pawl Eccentric Adjustment (Figure 8)

With the release rod latched in its operated position by the release rod holding pawl, there should be some clearance, not over .010", between the tops of the teeth on the idler gear and the tops of the teeth on the tape feed roll pinion. Check this clearance throughout a complete revolution of the gear and pinion.

To adjust, position the release rod holding pawl eccentric.

Rotate the indicator gear approximately 1/4 turn and hold it in this position. With the carriage return key lever fully depressed and the release rod holding pawl in the notch in the release rod, there should be some clearance, not less than .004", between the release rod holding pawl and the holding surface of the notch. If necessary, readjust the holding pawl eccentric within the limits of its adjustment to obtain this clearance.

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NOTE: After making a single adjustment, check related adjustments.

Release Rod Holding Pawl Stop Screw Adjustment (Figure 9)

There should be .105" to .120" clearance between the engaging peak of the release rod holding pawl and the release rod when the pawl is held against its stop screw and the stop screw is resting against its post.

To adjust, loosen the stop screw bracket mounting screws, loosen the stop screw lock nut, and adjust the screw to meet the foregoing requirement. Position the stop screw so that a flat on the stop screw rests against the stop post before tightening the stop screw lock nut. Hold the stop screw against its stop post, position the contact screw bracket so that the lamp contact screw is in alignment with the contact on the lamp contact spring, and tighten the screws which mount both brackets. See Figure 6 for location of parts. Recheck the clearance between the engaging peak of the release rod holding pawl and the release rod.

Idler Lever Spring Tension

Unhook the release rod spring. With the indicator gear in its returned position, hook an 8 oz. scale over the release rod bell crank at the "Carriage Return" key lever and pull upwards at right angles to the key levers. It should require from 5 to 8 ozs. to start the idler lever moving. Replace the release rod spring. See Figure 8 for location of parts.

Release Rod Spring Tension

With the indicator gear in its returned position, apply the push end of an 8 oz. scale to the right end of the release rod (through the hole in the casting), and push in line with the release rod. It should require from 1 to 3-1/2 ozs. to start the release rod moving. See Figure 8 for location of parts.

NOTE: While taking this tension, hold the idler gear away from the feed roll pinion just enough to disengage the two.

Lamp Contact Lever Spring Tension

Unhook the lamp contact lever spring from its post. With the perforator upside down, hook an 8 oz. scale in the spring eye and pull up vertically. From 6 to 7-1/2 ozs. should be required to extend the spring to 1-7/8". Replace the spring on the spring post.

Tape Tension Lever Spring Tension Adjustment (Figure 10)

Hook an 8 oz. scale over the end of the slotted extension of the tape tension lever and pull at right angles to the lever. It should require from 5 to 5-1/2 ozs. to start the lever moving away from the tape feed roll.

To adjust, loosen the tape tension lever shaft lock nut and turn the spring, by rotating the tape tension lever shaft to obtain the required tension.

Tape Feed Roll Dotent Roller Eccentric Preliminary Adjustment (Figure 11)

With the punch hammer in the operated position, insert the tape feed roll positioning gauge (Catalog No. 73517) into the punch block so that the projection of the

NOTE: After making a single adjustment, check related adjustments.

gauge stops against the tape feed hole punch. Under this condition a pin of the tape feed roll should line up with the center hole on the gauge.

To adjust, remove the indicator gear and adjust the position of the tape feed roll by means of the detent lever eccentric. See Figure 12 for location of parts.

#### Tape Feed Roll Detent Lever Spring Tension (Figure 12)

Remove the cover plate which covers the opening in the casting for the backspace lever. Hold the backspace lever in the operated position and insert the push end of a 12 lb. scale through the opening in the casting. Apply the scale to the arm of the detent lever where the spring is hooked as close to the spring as possible, and push parallel to the spring toward the rear of the perforator. It should require from 3 to 4 lbs. to start the lever moving.

#### Backspace Pawl Spring Tension (Figure 13)

Insert an 8 oz. scale through the opening in the casting. Hook the scale over the right end of the backspace pawl and pull towards the front of the perforator at right angles to the pawl. It should require from 1-1/4 to 2 ozs. to start the backspace pawl moving. Replace cover plate.

#### Backspace Lever Spring Tension (Figure 13)

Hook an 8 oz. scale over the backspace lever near the cover plate and pull at right angles to the backspace lever. It should require from 1 to 1-1/2 ozs. to start the backspace lever moving.

#### Tape Feed Pawl Eccentric Adjustment (Figure 14)

When the punch bars are just touching the punches, the tape feed pawl should engage a tooth on the tape feed roll ratchet without overtravel.

Adjust the tape feed pawl eccentric to meet this requirement.

#### Tape Feed Pawl Spring Tension (Figure 14)

Hook an 8 oz. scale in the notch of the tape feed pawl. With the tape feed pawl resting against the tape feed roll, pull the scale parallel to the lower mounting strip of the celluloid tape chute. It should require from 2 to 3 ozs. to start the tape feed pawl moving away from the tape feed roll.

#### Punch Magnet Contact Screw Adjustment

The punch magnet contact should be adjusted so that the contacts close with sufficient operating margin when any key lever is depressed.

To adjust, back off the contact screw, depress a key lever, and advance the contact screw enough to just make contact. In this manner, depress every key lever and determine which key lever gives the contact spring the least travel. With this key lever depressed, turn the contact screw just enough to close the contacts. Then give the contact screw one full additional turn and tighten the lock nut.

---

NOTE: After making a single adjustment, check related adjustments.



### Plunger Rod Adjustment

Connect the perforator to the proper power supply.

The plunger rod should be adjusted so that all the punches are driven through the tape with proper operating margin. This adjustment may be made as follows: Place a piece of tape between the die plates. Loosen the lock nut and back off the plunger rod head until perforations in the tape are incomplete when the "Letters" key is depressed. Advance the plunger rod head slowly until all the perforations are just punched cleanly in the tape. Then give the plunger rod head an additional one-third turn and tighten the lock nut against its head. See Figure 2 for location of parts.

### Punch Hammer Spring Tension (Figure 14)

With the punch hammer in the unoperated position, hook a 12 lb. scale over the punch hammer, just above the plunger rod head, and pull towards the front of the perforator and in line with the punch hammer spring. It should require from 5 to 6 lbs. to start the punch hammer moving.

### Bell Crank Adjustment

The end of each punch bar should be in alignment with the left edge of its corresponding punch when no key levers are depressed.

Adjust by bending the bell cranks to the left or right. To do this, hold the loop extensions in their unoperated position with the thumb and grasp the end of the bell cranks with a pair of long nose pliers. See Figure 2 for location of parts.

### Tape Tension Spring Adjustment

The tape tension spring should hold the tape upward firmly against the guide on the die block, without buckling the tape. Check this tension by pressing the edge of the tape against the spring. When the pressure on the tape is released, the spring should return the tape so that it is firmly against the top of the guide.

Adjust by bending the tape tension spring. See Figure 2 for location of parts.

### Tape Feed Roll Detent Roller Eccentric Final Adjustment (Figure 15)

Refine the tape feed roll detent eccentric adjustment, if necessary, so that the perforations in the tape meet the standard spacing of ten holes to the inch. This may be checked by perforating a length of tape consisting of a series of nine "Blanks" followed by a "Letters" combination and checking it against the tape gauge (catalog No. 2215).

NOTE: If this adjustment is changed, recheck the "Tape Feed Pawl Adjustment."

### \*Indicator Gear Return Spring Tension Adjustment (Figure 16)

Rotate the indicator gear as far as it will go in a counterclockwise direction.

NOTE: After making a single adjustment, check related adjustments.

Loosen the indicator gear shaft retaining nut and rotate the spring retaining plate in a clockwise direction until the spring is wound tightly. Then rotate the spring retaining plate one turn in a counterclockwise direction and tighten the nut.

If the indicator gear return spring is wound too tightly, it will bind and the indicator gear will not return to its initial position when the "Carriage Return" key lever is depressed. If the indicator gear return spring is not wound tightly enough, the indicator gear will be slow in returning, and perhaps will not have force enough to disengage the release rod holding pawl out of the notch in the release rod.

**\*\*Indicator Gear Return Spring Tension Adjustment (Figure 17)**

In order to check this adjustment, it is necessary to remake it. Rotate the indicator gear in a counterclockwise direction until the idler gear is in mesh with the last tooth on the indicator gear. Loosen the indicator gear shaft retaining nut and rotate the spring retaining plate in a clockwise direction until the spring is wound tightly. Then rotate the spring retaining plate one turn in a counterclockwise direction, set the lamp contact lever stop so that the end of the lamp contact lever will rest approximately midway between the ends of the formed section of the stop, and tighten the nut.

If the indicator gear return spring is wound too tightly, it will bind and the indicator gear will not return to its initial position when the "Carriage Return" key lever is depressed. If the indicator gear return spring is not wound tightly enough, the indicator gear will be slow in returning, and perhaps will not have force enough to disengage the release rod holding pawl out of the notch in the release rod.

**\*\*Indicator Lamp Contacts Adjustment (Figure 16) - See Note (A)**

The indicator lamp should light on the sixty-fourth or sixty-fifth character perforated.

To adjust, return the indicator gear to its starting position (with the pin on the gear resting against the end of the lamp contact lever) by operating the release rod. Connect the perforator to the proper power source, adjust the lamp contact screw so that when a character key lever is operated sixty-five times, the lamp lights on the sixty-fifth character, and give the screw an additional 1/4 turn.

**\*\*Indicator Lamp Contacts Adjustment (Figure 17)**

In order to check this adjustment, it is necessary to remake it. Adjust the lamp contact screw so that the contacts just close when the idler gear is in mesh with the last tooth on the indicator gear. Then advance the screw 1/4 turn and tighten the lock nut.

- (A) The indicator gear is not always fully returned to its starting position; therefore, the lamp may light one character early.

NOTE: After making a single adjustment, check related adjustments.

**\*\*Indicator Gear Stop Plate Adjustment (Figure 6) - See Note (A)**

The adjustable stop plate on the indicator gear provides for varying the starting position of the gear so that the lamp contacts will close when sixty-four to seventy characters have been perforated. To check the adjustment, fully depress the carriage return key lever and release it slowly. With the perforator connected to the proper power source, count the number of character key lever operations required to light the indicator lamp. If it is desired to light the lamp earlier, it will be necessary to move the stop plate in a clockwise direction; and if it is desired to light the lamp later, the stop plate must be moved in a counterclockwise direction.

To adjust, loosen the stop plate mounting screws and position the plate. After the correct position of the stop plate has been determined, carefully move the plate toward the center of the gear as far as it will go and tighten the mounting screws securely. Recheck the adjustment several times, operating the carriage return key lever in a normal manner.

**Tape Reel Tension Lever Spring Tension**

Loosen the three tape reel assembly mounting screws and remove the tape reel assembly from the perforator. Hook an 8 oz. scale over the tape tension lever at the right angle, bend to the rear of the pivot screw, and pull toward the right rear corner of the perforator. It should require from 1-1/2 to 2-1/4 ozs. to start the lever moving. Replace the tape reel assembly. See Figure 2 for location of parts.

**Method of Starting Tape in Perforator**

Tear the tape squarely and insert it between the die plates of the punch block. Pull the tape tension lever away from the tape feed roll, and push the tape forward until the end of the tape is in position between the tape feed roll and the tape tension lever. Now press the tape tension lever against the tape feed roll, which will cause the projecting pins in the tape feed roll to grip the tape. Strike the "Blank" key a number of times and the tape will feed forward.

**Punch Magnet Yoke Contact and Bracket Assembly Adjustment (Figure 18)**

- (a) The spring hole in the magnet yoke suspension spring arm should be in the plane of the rear surface of the magnet yoke when the yoke is in the middle of its travel.

To adjust, loosen the magnet yoke contact bracket mounting screws and position the bracket. Tighten the mounting screws.

- (b) The magnet yoke suspension spring should appear to be vertical as viewed from the front of the perforator; and the tension of the spring should just balance the weight of the magnet yoke.

To adjust, loosen the suspension spring arm mounting screws and position the arm. Tighten the mounting screws.

- (A) The indicator gear is not always fully returned to its starting position; therefore, the lamp may light one character early.

NOTE: After making a single adjustment, check related adjustments.

Punch Magnet Yoke Contact Spring Adjustment (Figure 18)

- (a) With the magnet yoke attracted, hook an 8 oz. scale to the rear contact spring, at the contact point, and pull at right angles to the contact spring. It should require 2 to 3 ozs. to just open the contact points.

To adjust, bend the rear contact spring.

- (b) There should be .015" to .020" clearance between the contact points when the magnet yoke is in the unoperated position.

To adjust, bend the front contact spring. Recheck (a).

REMOVE THE RELAY GUARD TO CHECK THE FOLLOWING ADJUSTMENTS:

Repeat Relay Adjustments (Figure 19)

- (a) With the contact spring held away from the armature, there should be .002" to .010" clearance between the pole piece and the armature.

To obtain this clearance, it may be necessary to back off the armature stop nut all the way and pull the armature away from its pole piece. See Figure 19-A.

NOTE: Care should be taken to keep the armature parallel to the pole piece.

- (b) When the armature is held against the pole piece, there should be .012" to .015" clearance between the armature and the stop nut. To adjust, position the stop nut. See Figure 19-B.

- (c) Hold the armature contact spring off and hook an 8 oz. scale over the backstop contact spring, at the contact point, and pull at right angles to the contact spring. It should require 1-1/2 to 1-3/4 ozs. to start the contact spring moving away from the fibre insulator on the relay spool.

Adjust by bending the backstop contact spring. See Figure 19-C.

- (d) With the armature held against the pole piece, apply the push end of an 8 oz. scale to the armature contact spring, at the contact point, and push at right angles to the contact spring. It should require 1 to 1-1/2 ozs. to start the contact spring moving away from the fibre stud on the armature.

Adjust by bending the armature contact spring. See Figure 19-C.

- (e) When the armature is held against the stop nut, there should be some clearance, not more than .002", between the armature contact spring and the fibre stud on the armature.

To adjust, bend the stop lug on the backstop contact spring. See Figure 19-D.

- (f) Recheck (c).

- (g) When the armature is held against its pole piece, there should be .006" to .010" clearance between the contact points. See Figure 19-C.

NOTE: After making a single adjustment, check related adjustments.

LUBRICATION SPECIFICATION

The lubricants listed in Specification S-5288 should be used to lubricate the keyboard tape perforator.

Unless otherwise specified, one or two drops of oil at each of the places indicated will be sufficient. Use oil for lubrication at all of the places listed below, except where the use of grease is specified.

A. Locations on the Bottom of the Perforator

1. Key levers - key lever shaft and rear comb slots.
2. Loops - bearings.
3. Backspace lever - pivot and at pawl bearing screw.
4. Tape feed roll star wheel and pinion.
5. Tape feed roll detent - roller and bearing screw.
6. Lamp contact lever pivot.
7. Release rod - bearings.
8. Release rod ball crank - pivot and at point of contact with key lever.
9. Release rod holding pawl pivot and point of contact with release rod.
10. Indicator gear return spring.
11. Idler lever - pivot and idler gear.
12. All helical tension spring loops.

B. Locations on the Top of the Perforator

1. Tape feed roll - bearings, ratchet teeth.
2. Tape tension lever bearing.
3. Punch block - all hole, punches, guide pins.
4. Tape feed pawl - pivot and spring loops.
5. Punch hammer oil hole.
6. Punch bars - retaining slots in punch hammer and pivots on bell cranks.
7. Bell cranks - bearings and at points of engagement with loop extensions.
8. Punch magnet plunger rod - at magnet bracket.
9. Punch hammer spring front loop.
10. Punch magnet yoke - at ends of solenoid (one drop only; avoid excess).
11. Tape reel tension lever - pivot.
12. Tape reel hub oil hole.
13. Key lever front guide comb slots.
14. Space bar loop - bearings and at point of engagement with its key lever.
15. Magnet yoke suspension spring loops.





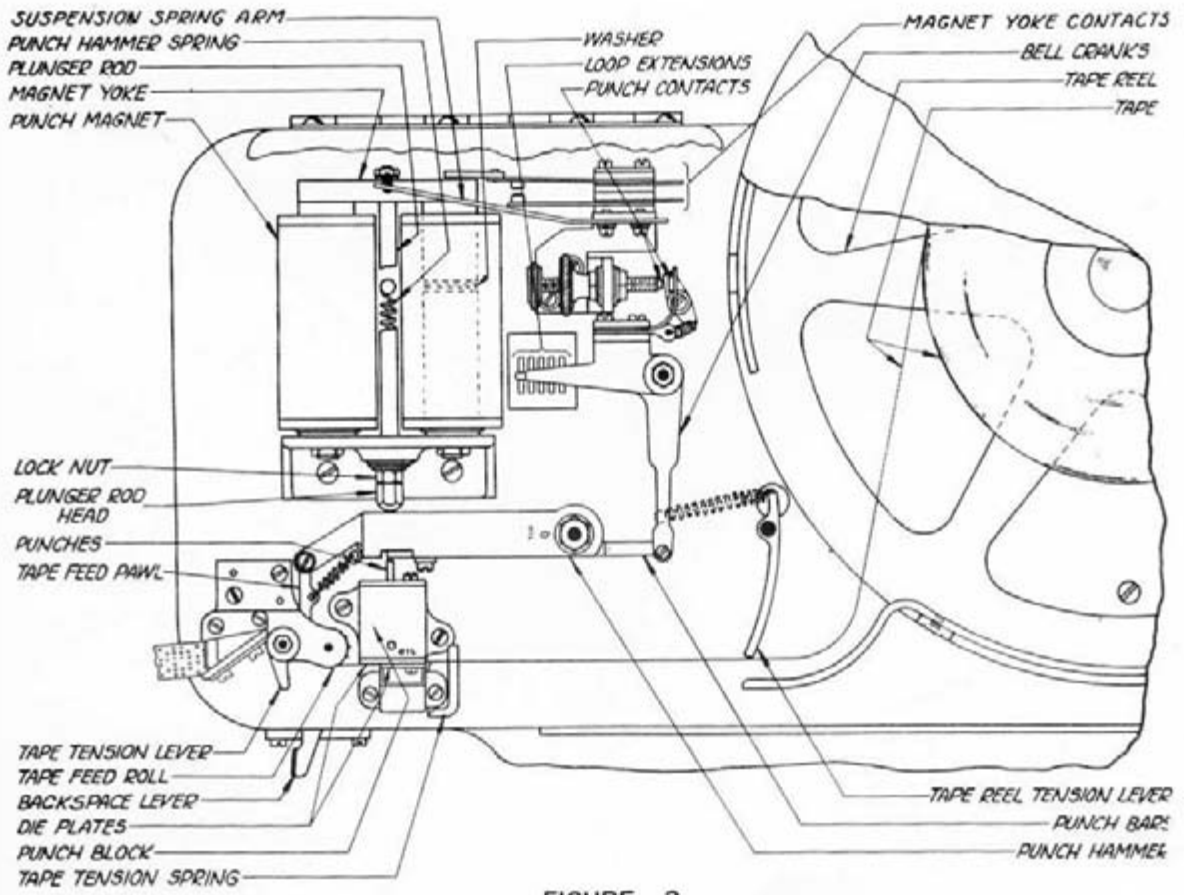


FIGURE 2

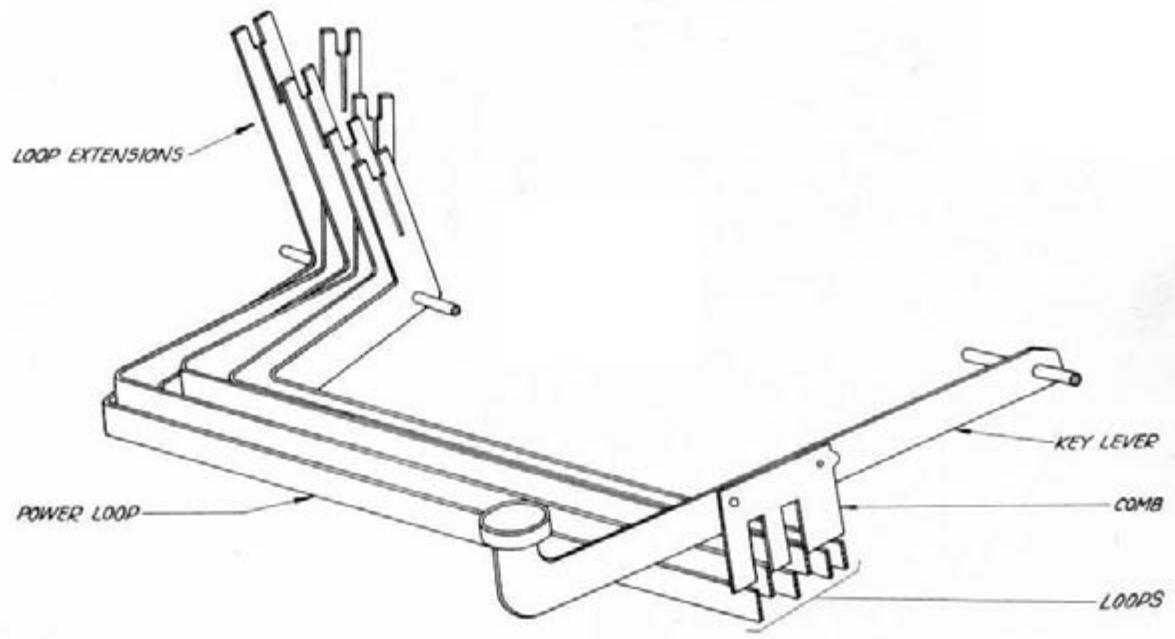


FIGURE 3

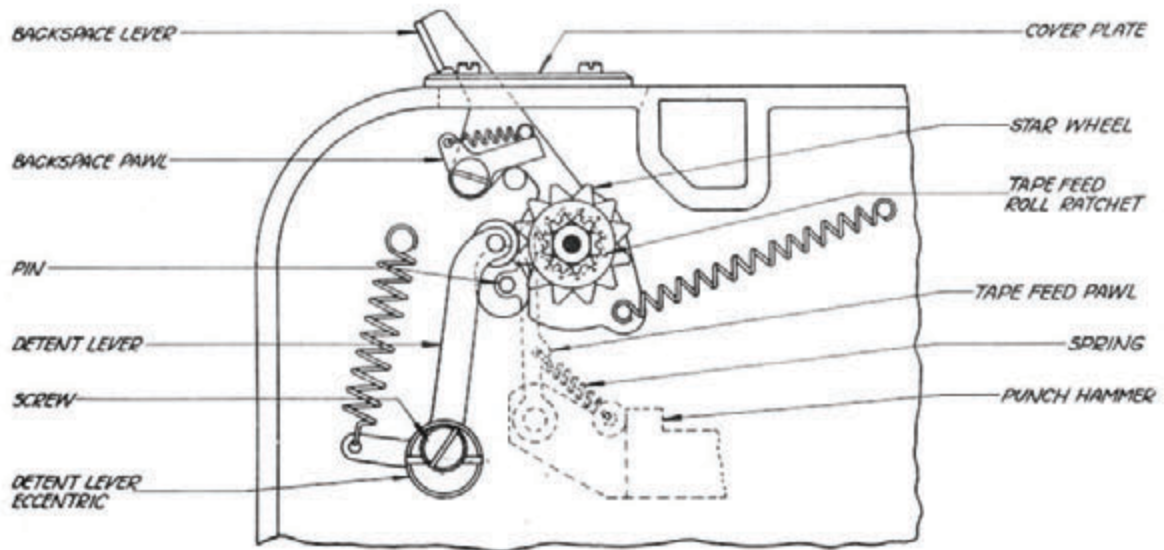


FIGURE 4

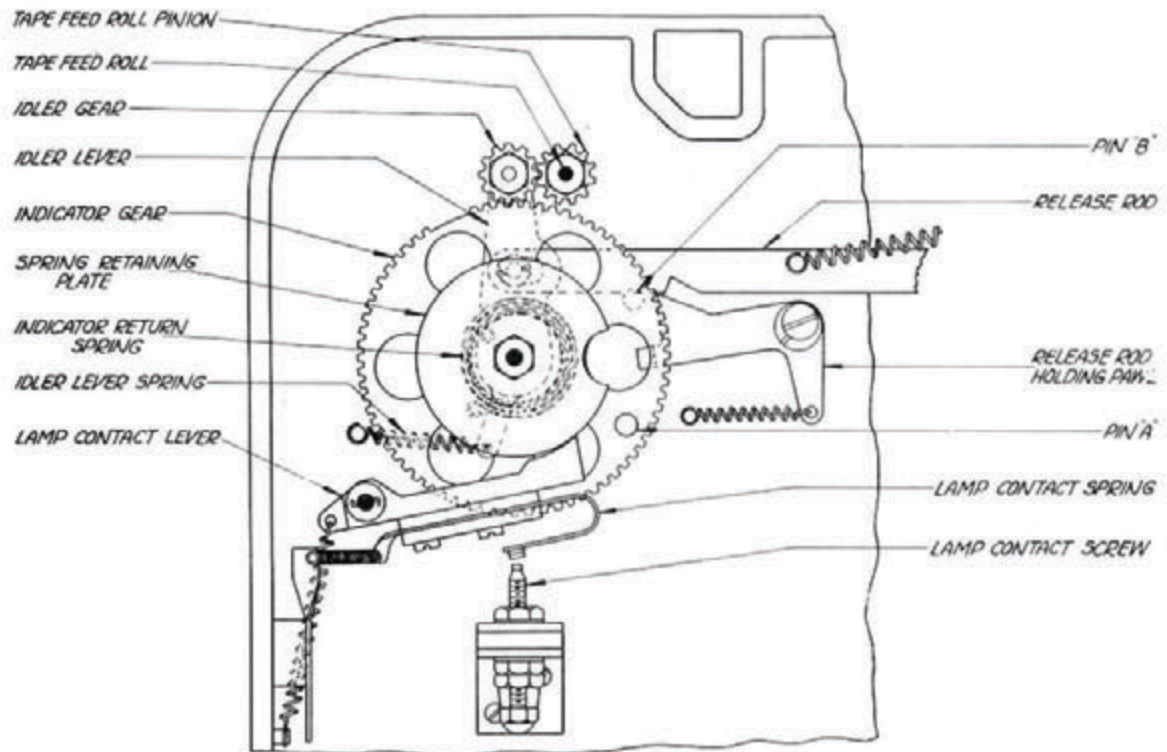


FIGURE 5

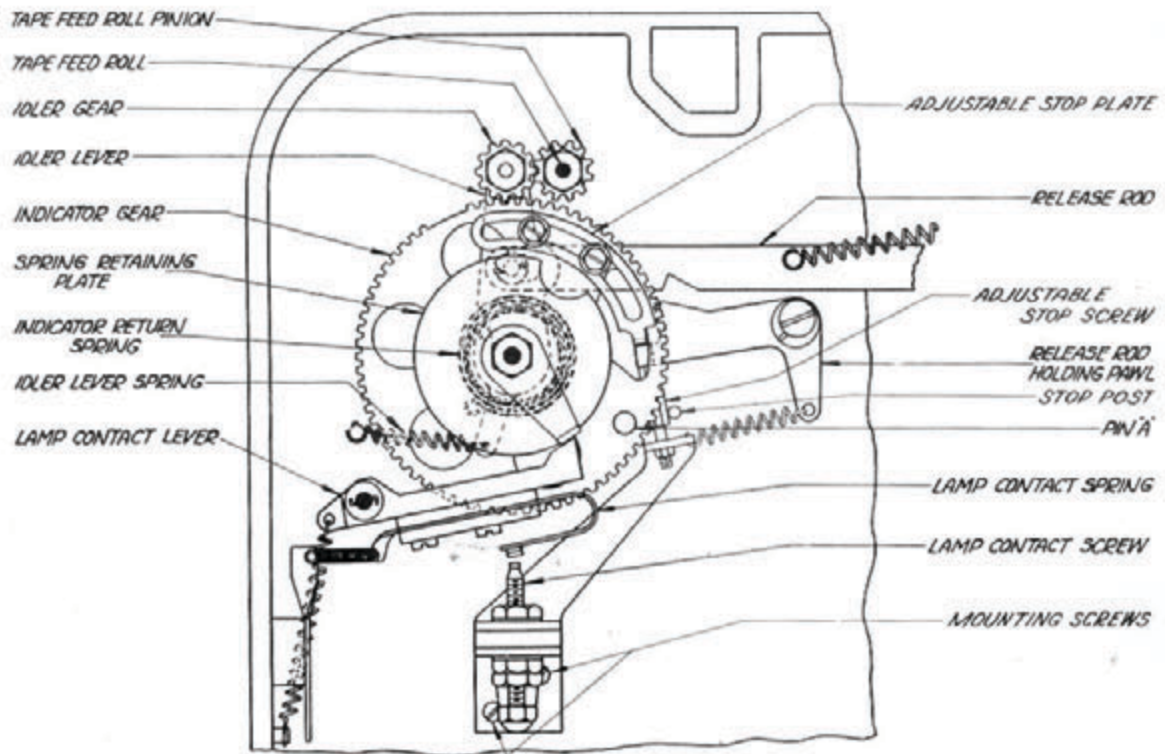


FIGURE 6

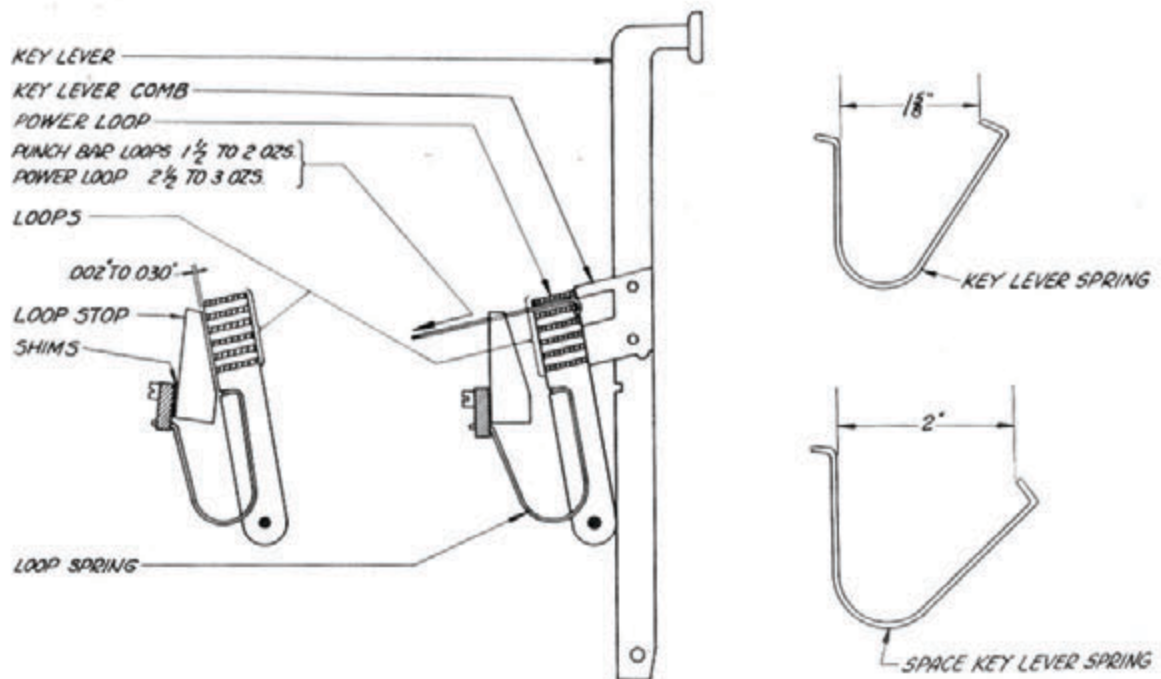


FIGURE 7



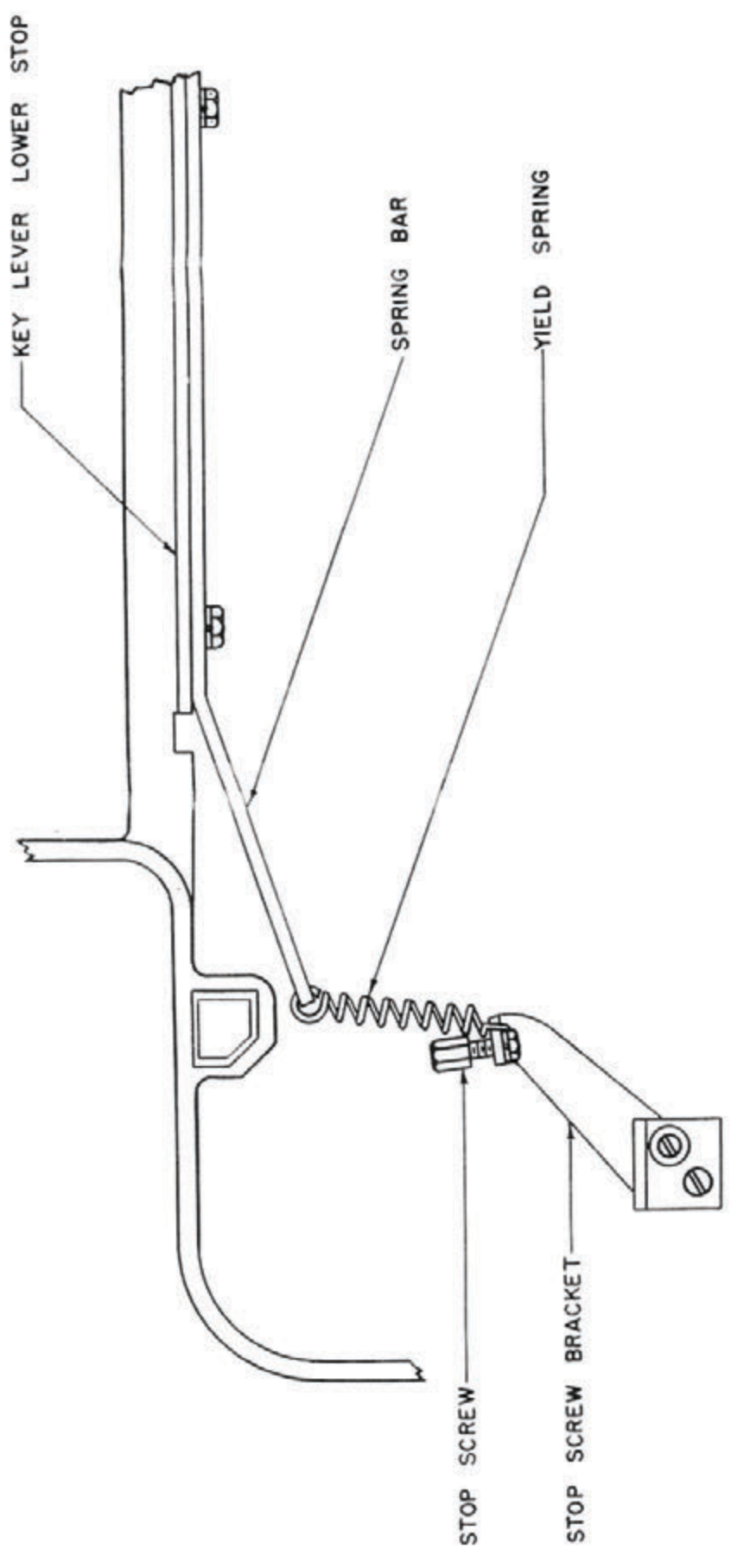


FIGURE 7A

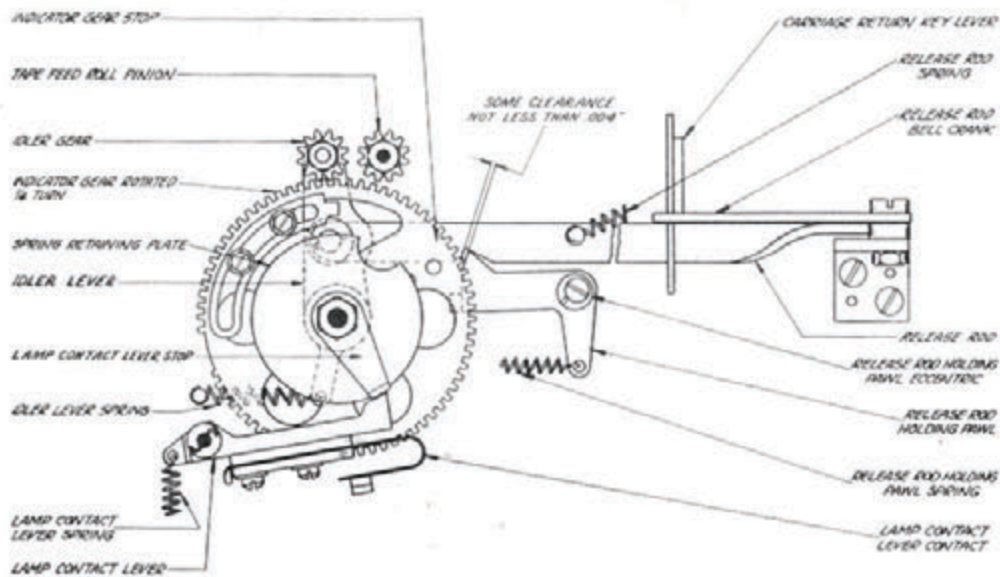


FIGURE 8

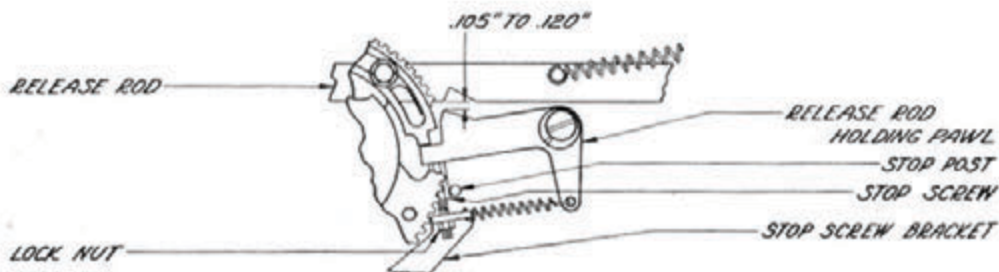


FIGURE 9

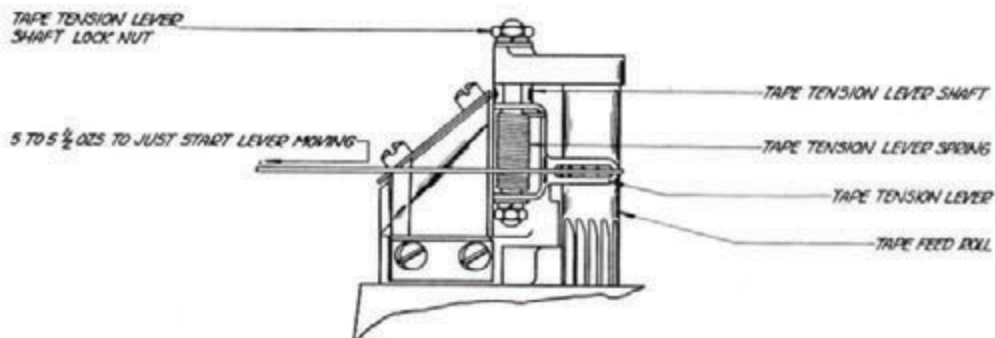


FIGURE 10

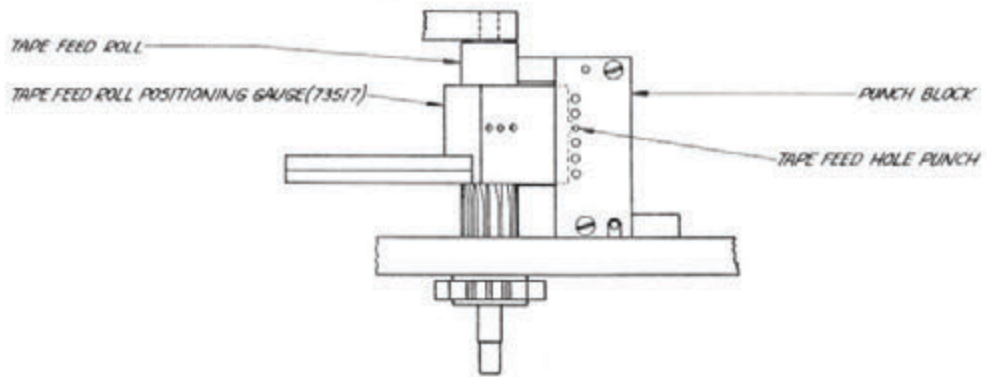


FIGURE 11

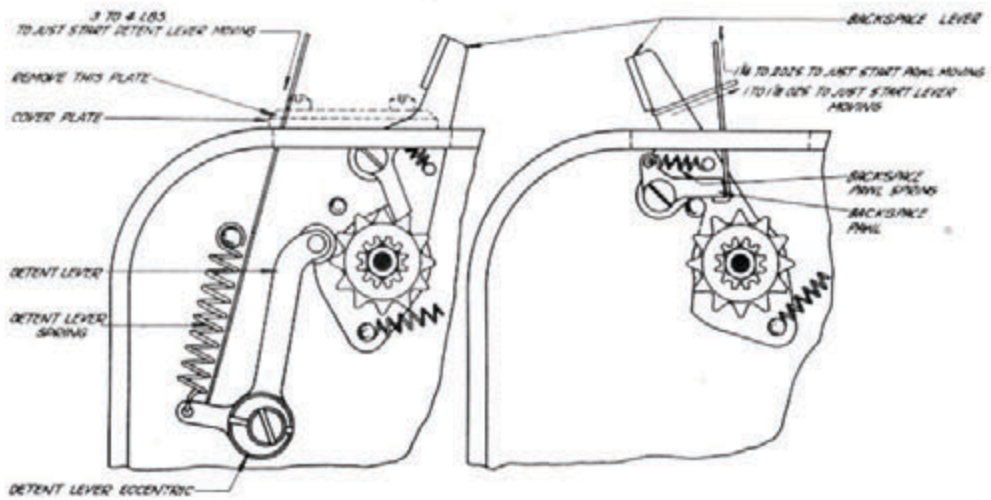


FIGURE 12

FIGURE 13

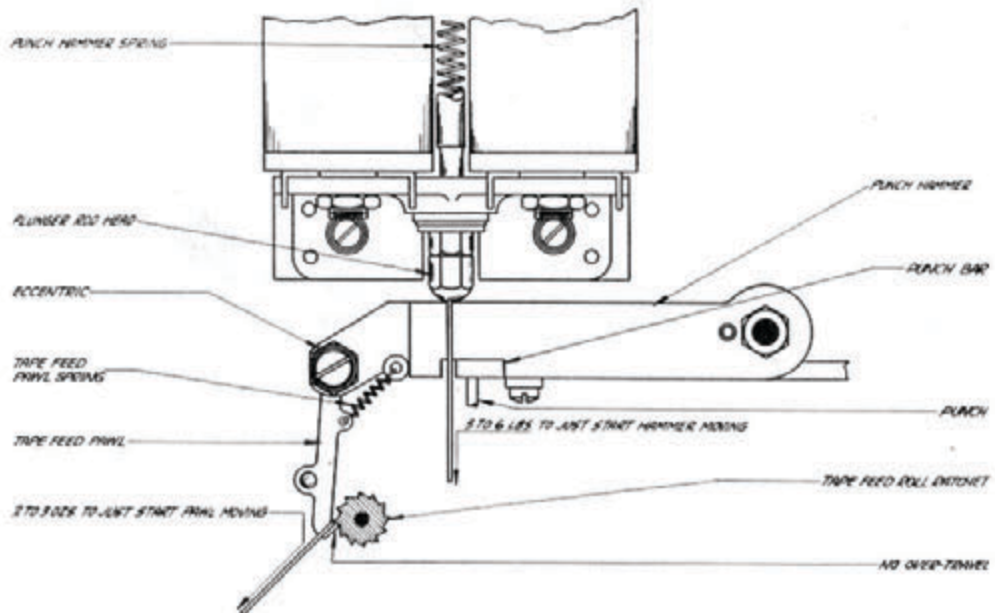


FIGURE 14

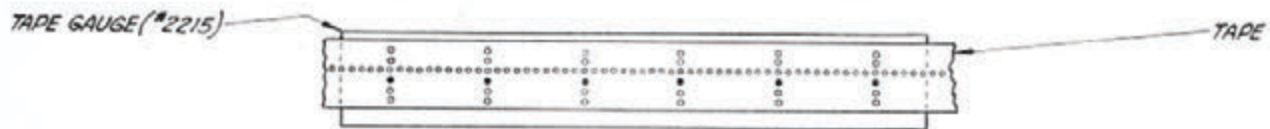


FIGURE 15

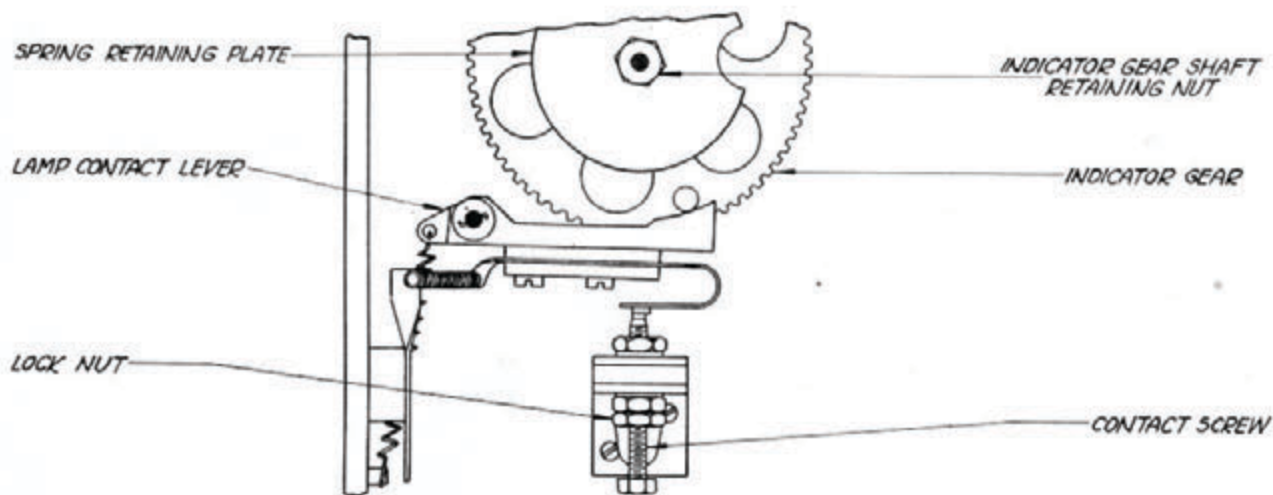


FIGURE 16

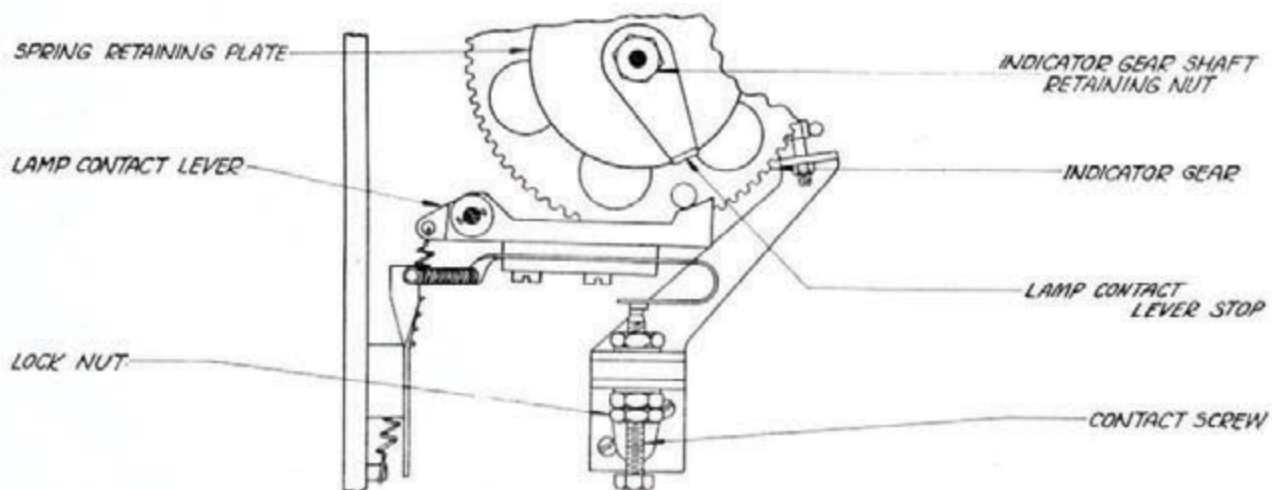


FIGURE 17



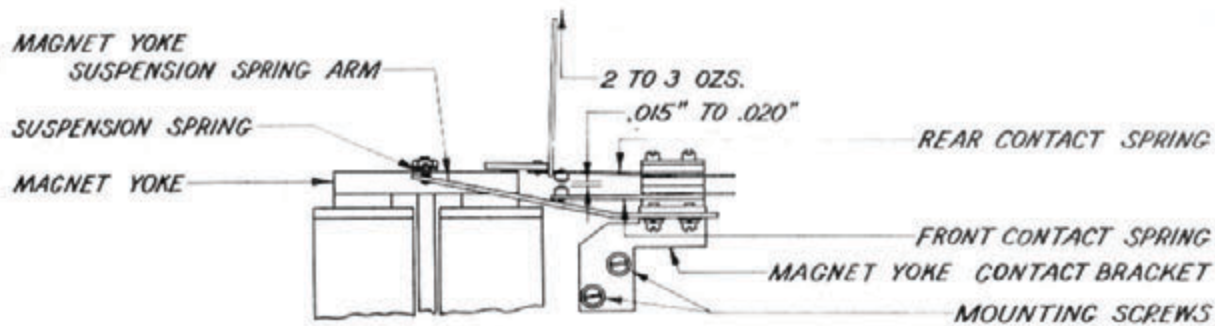


FIGURE 18

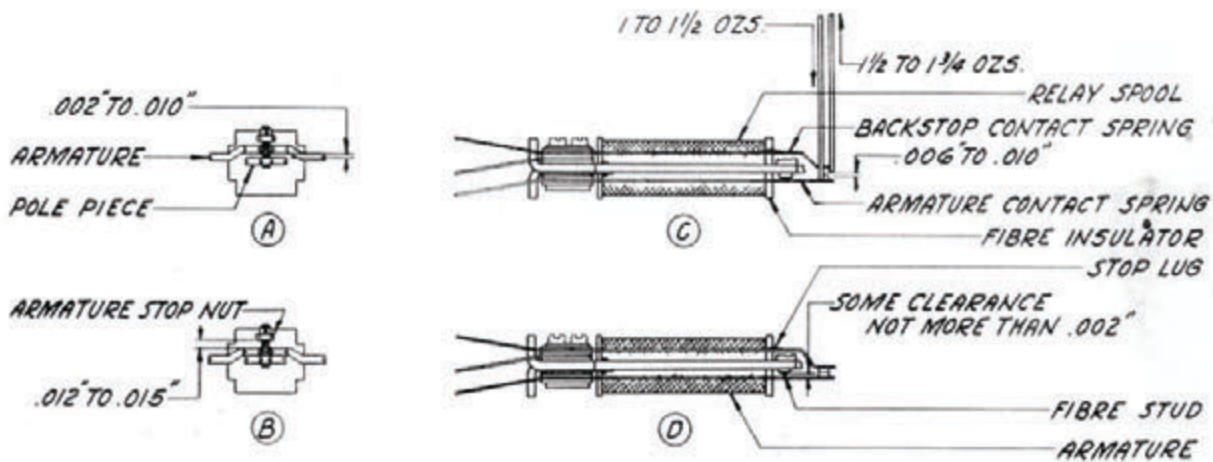
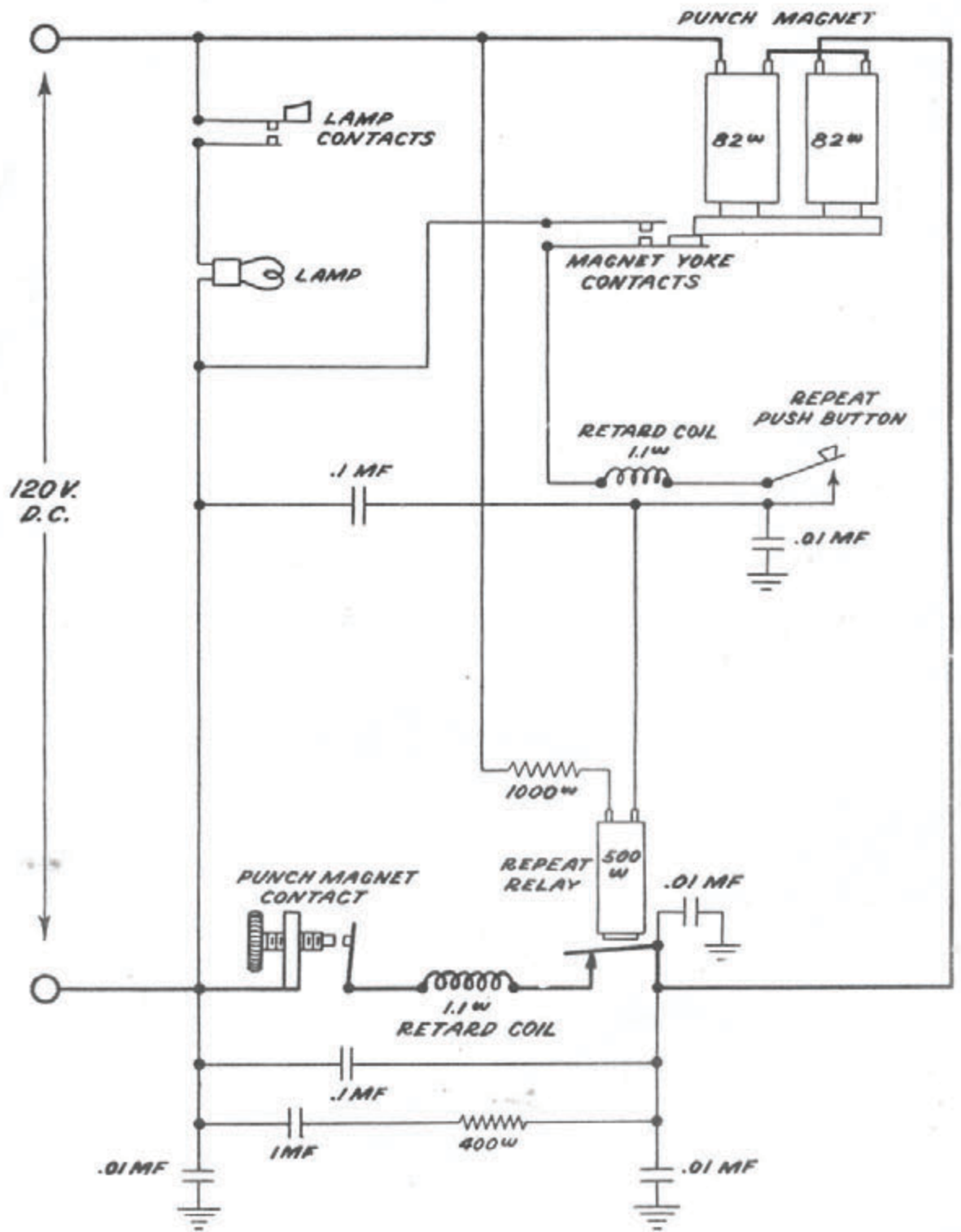


FIGURE 19



SCHEMATIC DIAGRAM

FIGURE 20