

DESCRIPTION OF OPERATION OF NO. 26

TELETYPEWRITER

This section describes the operation of the No. 26 Teletypewriter. It has been issued principally for use in training Bell System teletypewriter repairmen. It is reproduced from material originally prepared for other purposes with such modifications as seem desirable to facilitate its use in conjunction with other Bell System practices in the proposed training work. The basic operating principles are described but no attempt has been made to include recent improvements and changes.

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GENERAL

The Model 26 Teletype Type Wheel Page Printer is a machine designed for interchanging printed messages between two or more stations. A sending-receiving station consists of a keyboard transmitting unit and a typing unit (Illustration 1). Receiving-only stations use a base unit in place of a keyboard transmitting unit.

The keyboard transmitting unit (Illustration 2), besides providing a base for the typing unit, is used to transmit electrical impulses of the five unit code to the receiving mechanism of the typing unit at each station. These received signals will cause each typing unit connected to the circuit to print a copy of the message sent by the keyboard operator.

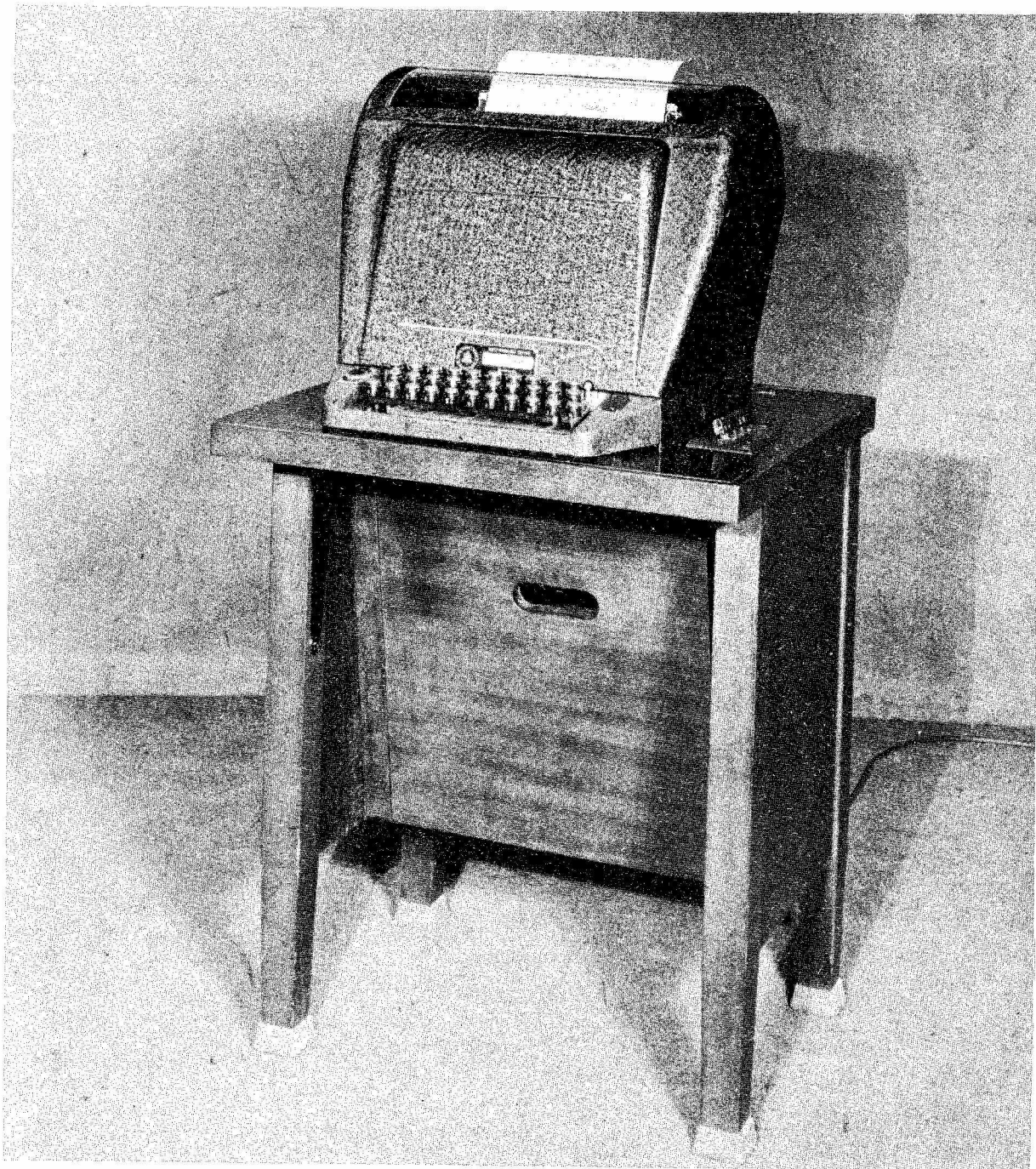
Signaling Code

The signaling code used to transmit characters is the "Start-Stop" five unit code which consists of five selecting impulses used in various combinations of current and no current intervals. To maintain synchronism between all stations on the circuit, each group of five selecting impulses is preceded by a start impulse and followed by a stop impulse. Impulses which energize the selector magnet are designated as "marking" and those which do not are designated as "spacing." The code used is shown graphically in Fig. 1.

KEYBOARD TRANSMITTING UNIT

The keyboard transmitting unit (Illustration 2) consists essentially of a set of key levers, selector bars, transmitting contact mechanism, transmitting cam assembly,

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clutch, and gears which are driven by the main shaft gear of the typing unit. The transmitting cam assembly is normally held stationary because the clutch members on the driving shaft are held apart by the clutch throw-out lever (Fig. 2).

When a key lever is depressed, the clutch throw-out lever is moved out of engagement with the driven member of the clutch and the driven member is permitted to move into mesh with the driving member, causing the transmitting cam assembly to revolve. At the

end of the revolution, the driven member of the clutch is disengaged from the driving member by the clutch throw-out lever and the cam assembly is brought to a stop until a key lever is again depressed.

Beneath the key levers are five selector bars and a universal bar extending across the width of the keyboard (Fig. 2). The selector bars are provided with saw-tooth shaped notches (Fig. 3) according to the requirements of the signaling code. The selector bars rest on rollers and are guided at each end so that

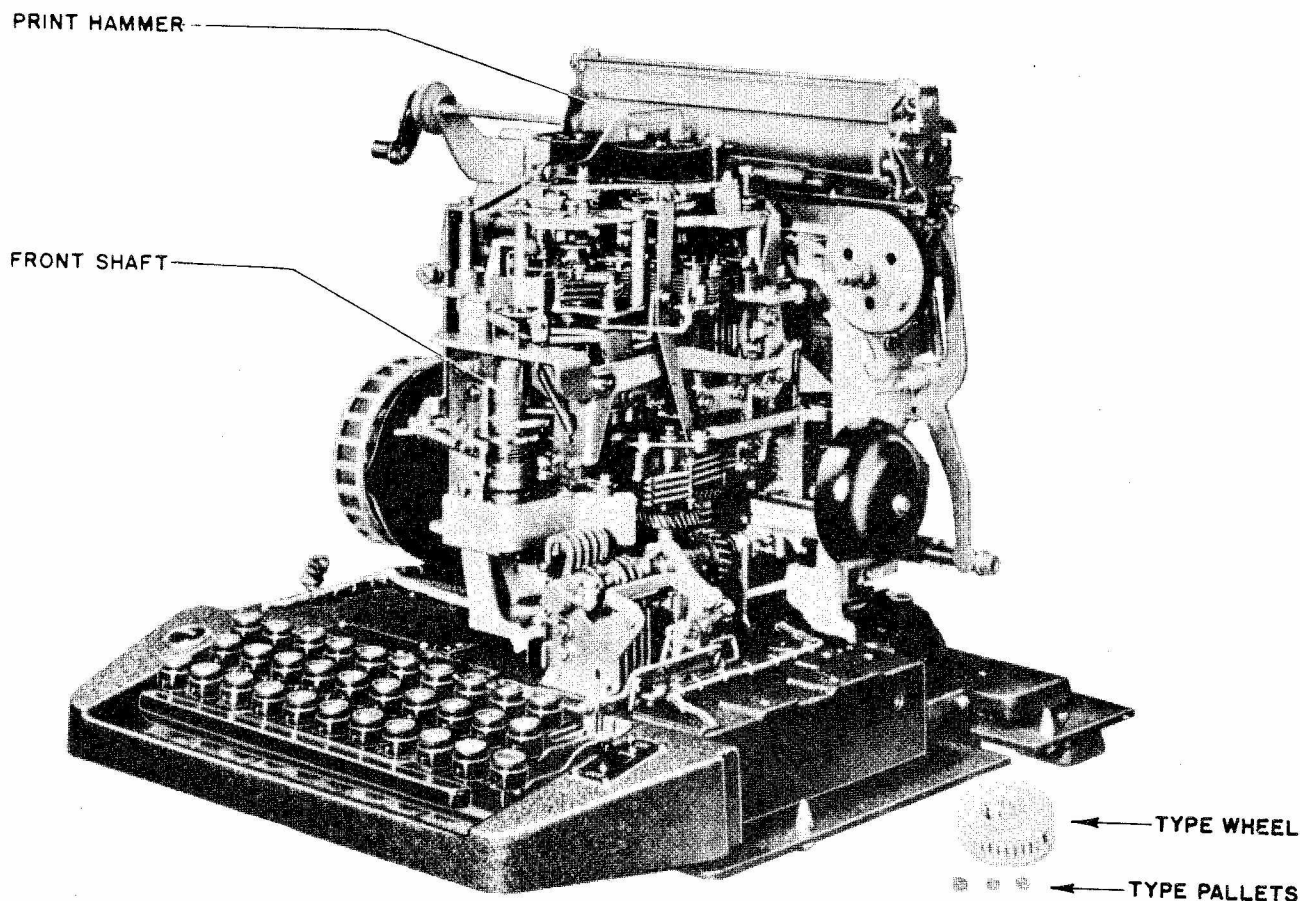


ILLUSTRATION 1

they may be easily moved endwise. When a key lever is depressed, it strikes the slanting sides of the selector bar notches and moves certain bars either to the right or to the left depending upon whether the impulses corresponding to the bars are to be "spacing" or "marking" impulses.

The universal bar is pivoted at each end in such a manner that it will be rotated by the depression of any key lever. As the universal bar rotates, the trip-off pawl is moved forward against the lower end of the intermediate pawl. The rear extension of the intermediate pawl will then move the clutch throw-out lever out of engagement with the driven clutch member. Thus, whenever a key lever is depressed, the selector bars are positioned and the transmitting cam assembly starts to rotate (Fig. 2).

The right extremity of each selector bar engages a vertical locking lever and positions it to correspond with the signal impulses to be transmitted (Fig. 3). Each locking lever controls the motion of a contact lever, either by allowing the contact lever to close its

contact when the cams revolve or by restricting the motion of the contact lever. If the upper end of the locking lever is positioned to the left, corresponding to a "spacing" impulse, the locking lever engages the contact lever and prevents it from rising into the indent of its cam as the cam revolves, thus holding the circuit open for that impulse (Fig. 3-A). If the upper end of the locking lever is positioned to the right, it does not restrict the movement of the contact lever (Fig. 3-B). Then as the cam rotates, the contact lever rises into the indent of its cam, thereby allowing the contact to close and send out a "marking" impulse. As the cam assembly rotates, a combination of "marking" and "spacing" impulses is transmitted.

The start-stop cam (Fig. 2) controls a contact lever which actuates the start-stop contacts. These contacts are opened at the beginning of each revolution of the cam assembly to transmit the "start" impulse (spacing) and remain open during the transmission of the five selecting impulses. After the fifth impulse has been transmitted, the start-stop contacts will again close, transmitting the "stop"



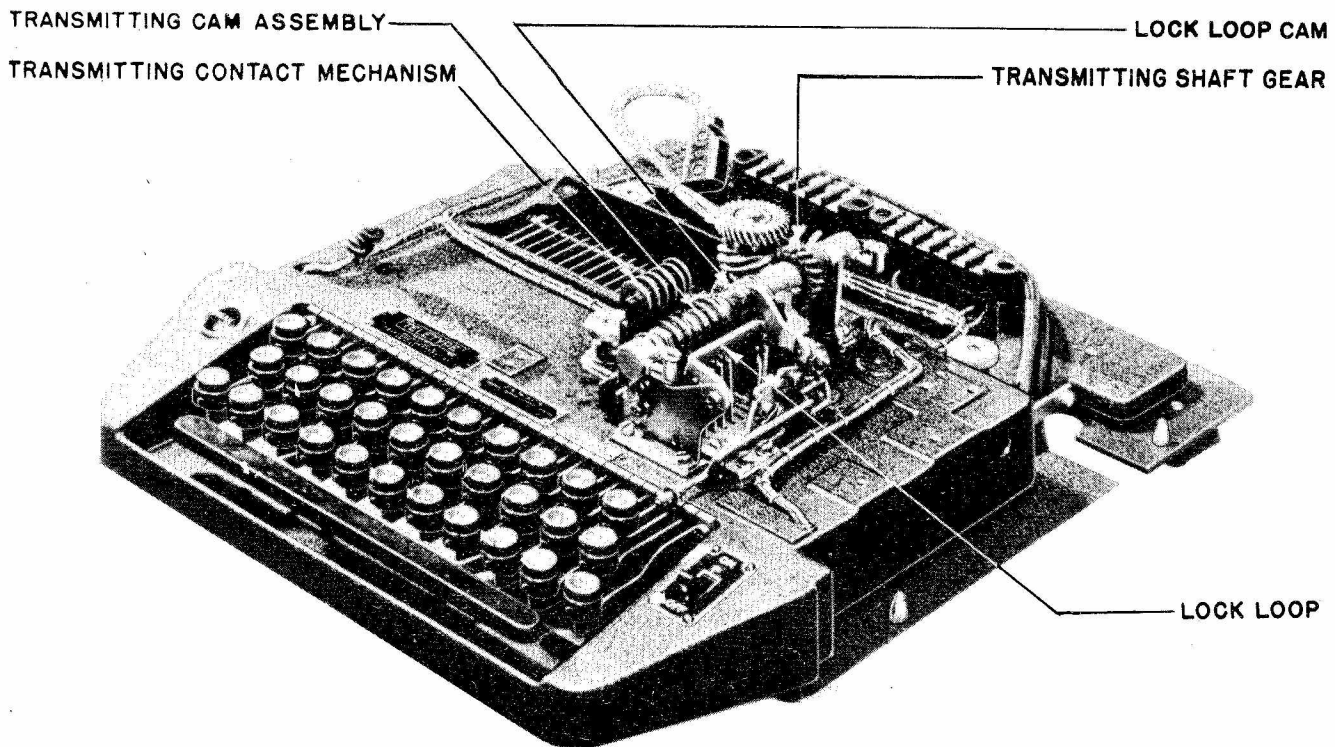


ILLUSTRATION 2

impulse (marking). At the end of the revolution of the cam assembly, the clutch throw-out lever cams the driven clutch member out of mesh with the driving clutch member and prevents the cam assembly from rotating further. The start-stop contacts will remain closed until the cam assembly is again started rotating by a key lever being depressed. The lock loop (Fig. 3), which is raised by the lock loop cam at the end of each revolution of the cam assembly, is used, while in its down position, to engage the upper projections of the locking levers, thus preventing a change in the selection while the cam assembly is rotating. This arrangement makes it impossible to depress another key lever until the signal for the previous character has been transmitted.

The keyboard is equipped with a space repeat device (Fig. 2) which permits continuous transmission of the space code combination. When the space key lever is depressed, the space repeat rod attached to the space key lever extension will rotate the intermediate pawl, which in turn will hold the clutch throw-out lever out of engagement with the projection on the driven member of the clutch as long as the space key lever is held depressed. Thus the transmitting cam assembly will rotate continuously until the space key lever is released.

#### TYPING UNIT

The type pallets of the Model 26 typing unit (printer) are guided in grooves in the type wheel so that the selected type pallet may be moved mechanically toward the platen. The type pallet to be selected is determined by the setting of five code discs, which are actuated by line signals through the medium of the selector mechanism. The code discs are so arranged that notches on their outer edges will be lined up, permitting a selected stop pin to move into the path of the stop arm located on the type wheel shaft. Thus, the type wheel will be stopped so that the selected type pallet will be positioned opposite the printing hammer which moves the pallet toward the platen. The various functions (line feed, space, carriage return, figures shift, letter shift, etc.) are also accomplished mechanically. A motor drives the type wheel shaft, main shaft, and front shaft, which supply power to all mechanically operated parts.

The main shaft and the type wheel shaft gears are located near the lower ends of the shafts and are in mesh with the motor pinion. The front shaft gear, located near the lower end of the shaft (Fig. 4) is in mesh with a gear on the main shaft just above the main shaft driving gear.



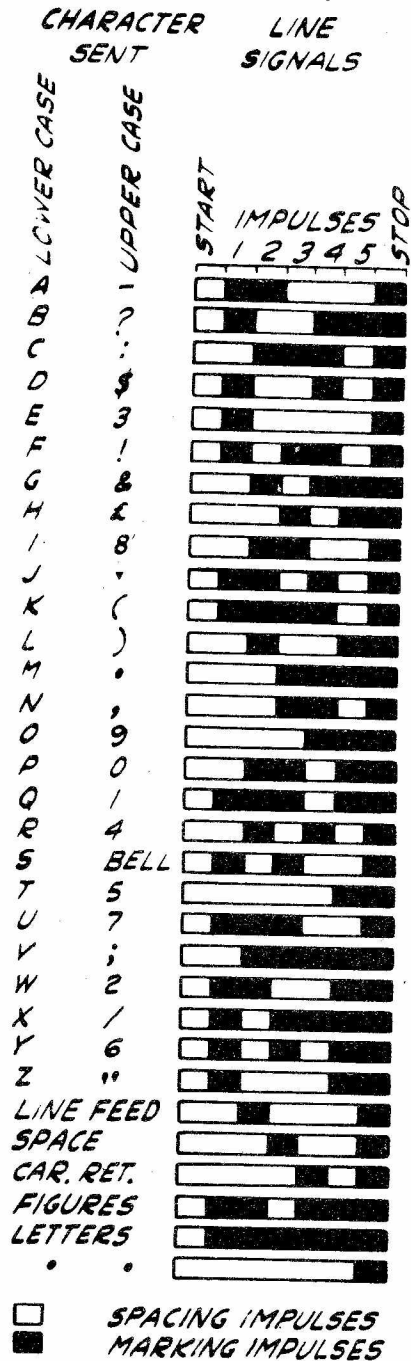


Fig. 1

Front Shaft Assembly

The front shaft cam sleeve consists of the type wheel lifting bail cam, transfer bail cam, and the main shaft clutch throw-out lever cam (Fig. 4). The cam sleeve is driven through the medium of a jaw clutch.

Shortly after the fourth impulse of a selection has been received, a sixth cam

(front shaft clutch throw-out lever cam) on the selector cam sleeve strikes the upper arm of the front shaft clutch throw-out lever, moving the stud on the lower arm of the lever out of engagement with the groove in the front shaft driven clutch member. This will permit the spring to move the clutch driven member into engagement with the clutch driving member and the cam sleeve will rotate. Just before the cam sleeve completes one revolution, the stud on the lower arm of the clutch throw-out lever will engage the inclined portion of the groove in the clutch driven member, camming the driven member out of engagement with the driving member and stopping the cam sleeve.

Main Shaft Assembly

The selector cam sleeve is fitted over the upper end of the main shaft and is driven through the medium of a friction clutch (Fig. 5). The internal channel of the upper cam on the main shaft cam sleeve actuates the operating bail and the periphery of the cam operates the printing bail. Directly beneath the upper cam is the type wheel lifting bail auxiliary cam. The lower cam is the function bail cam.

Just before the front shaft cam sleeve comes to rest, the clutch throw-out lever cam strikes the main shaft clutch throw-out lever arm and cams the lever out of engagement with the main shaft clutch driven member, allowing the clutch to engage and rotate the cam sleeve. Just before the main shaft cam sleeve completes one revolution, the clutch throw-out lever cams the driven member out of engagement with the driving member and stops the cam sleeve.

Selecting Unit

The purpose of the selecting unit is to receive the signals from the transmitting station and distribute them mechanically, thereby setting up various combinations on the swords. These combinations will determine the character to be printed or the function to be performed. The selector mechanism (Figs. 6 and 7) is controlled by the selector magnet which receives the code impulses from the line. Normally, the armature of the selector magnet is held against the magnet and the stop arm is against the stop lever, which in turn is held by the trip latch. Because the stop arm, which is a part of the selector cam sleeve, is engaged by the stop lever, the cam sleeve is prevented from rotating. For the purpose of illustration, suppose that the code signals for the letter "E" are to be received. Upon the reception of the "start" impulse (a no-current impulse), the armature is moved away from the magnet by the armature lever spring, imparting motion to the trip latch plunger (Fig. 6) which in turn causes the bell crank to move the trip latch out of engagement with the stop lever and allow the selector cam sleeve to

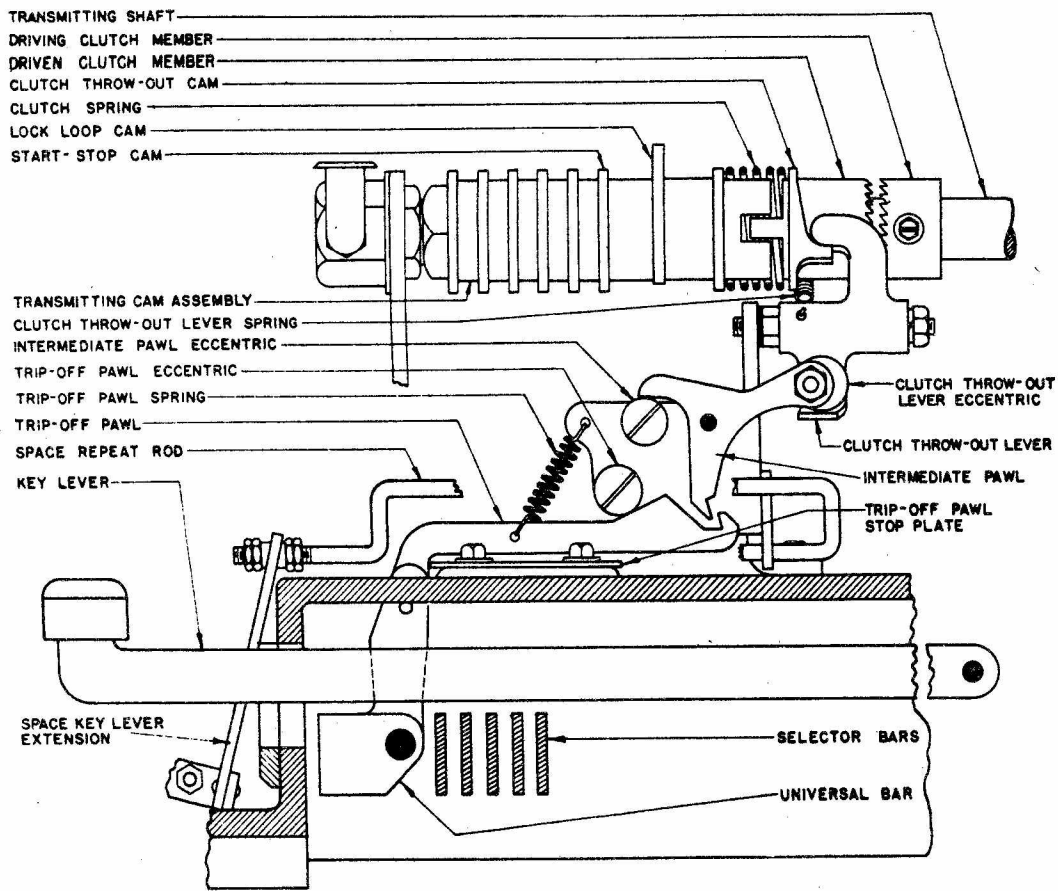


Fig. 2

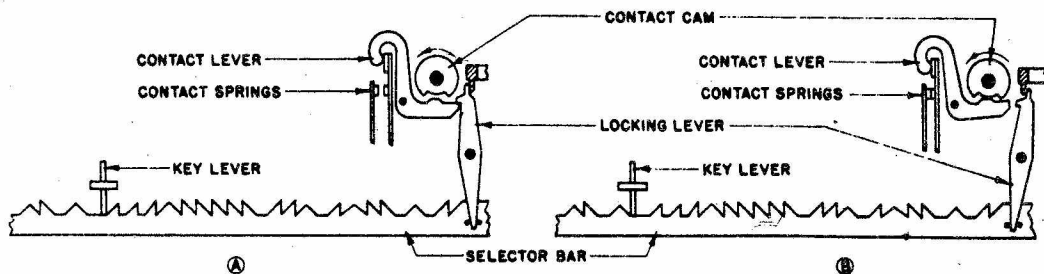


Fig. 3

rotate with the main shaft. As the cam sleeve rotates, the armature lever cam (Fig. 7) on the cam sleeve moves the armature momentarily against the selector magnet. The first impulse for the letter "E" will be a "marking" or current impulse, which will hold the armature against the magnet. With the armature in this position, the selector arm will be held to the rear so that the rear extension of the arm will be in the path of the rear sword arm. Further rotation of the selector cam sleeve

will cause No. 1 selector cam to rotate No. 1 selector lever counterclockwise. This motion of the selector lever will move the No. 1 sword to the left against the selector arm. The rear extension of the arm will block the travel of the rear sword arm and the sword will be rotated clockwise about its pivot point "A" so that the right end of the sword will be near the front stop post. When the No. 1 cam passes No. 1 selector lever, the selector lever spring will cause the selector

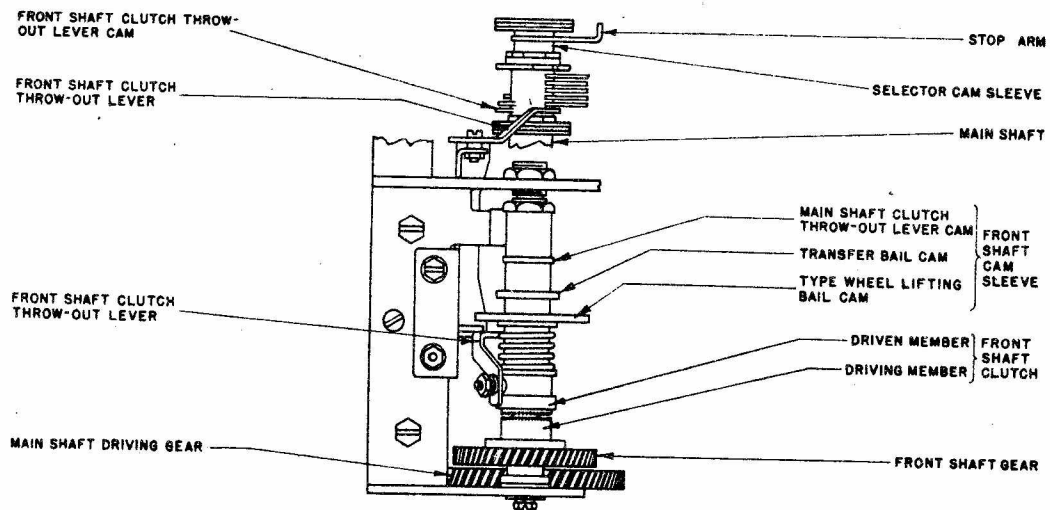


Fig. 4

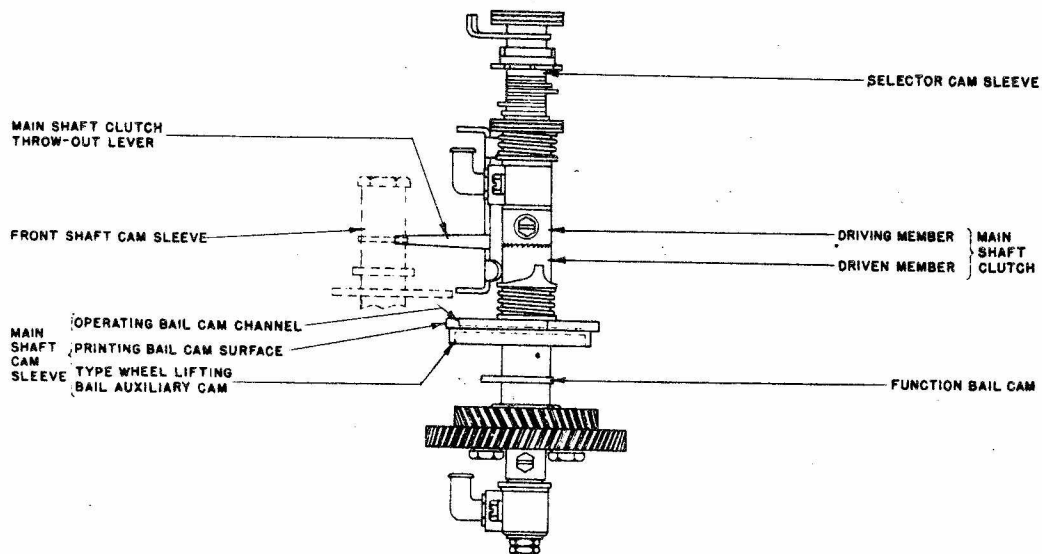


Fig. 5

lever to move No. 1 sword to the right against No. 1 transfer lever. The armature lever cam will again move the armature momentarily against the selector magnet, but, as the second impulse for the letter "E" will be a "spacing" or no-current impulse, the armature lever spring will move the armature away from the magnet, moving the selector arm forward. As the No. 2 selector cam passes No. 2 selector lever, the No. 2 sword will be moved to the left, the front extension of the selector arm will block the movement of the front sword arm, and the sword will rotate counterclockwise until its right end is near the rear stop post. When the selector cam has passed the selector lever, the selector lever spring will cause

the selector lever to move the sword to the right against the No. 2 transfer lever. As the No. 3, 4, and 5 impulses will be the same as No. 2 (spacing), corresponding parts will be positioned the same as for No. 2. The swords will be positioned for the letter "E" as follows: No. 1 sword will be against the front stop post and in contact with the No. 1 transfer lever at a point in front of the transfer lever pivot. The No. 2, 3, 4, and 5 swords will be against the rear stop post and in contact with their respective transfer levers at a point to the rear of the transfer lever pivot. While the swords are being positioned, the transfer levers are prevented from rotating by the transfer lever lock arm.



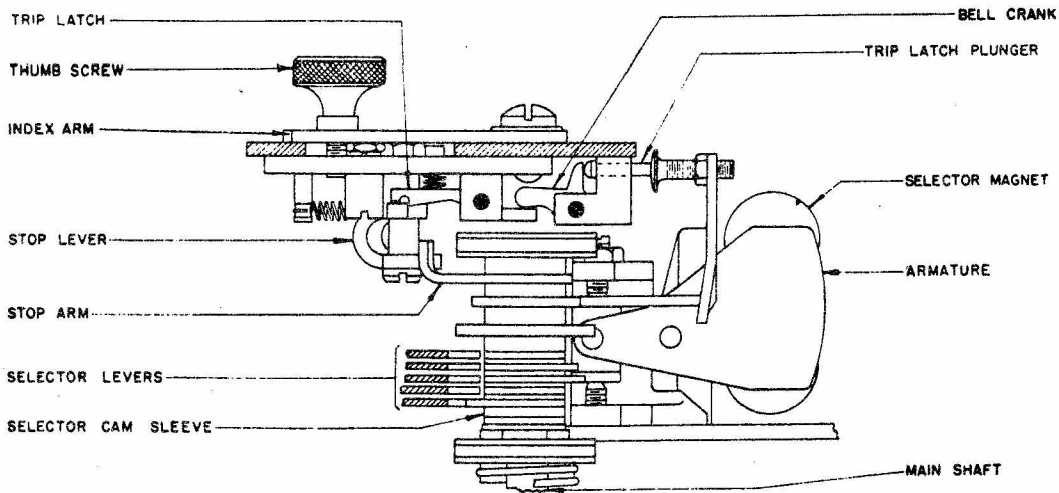


Fig. 6

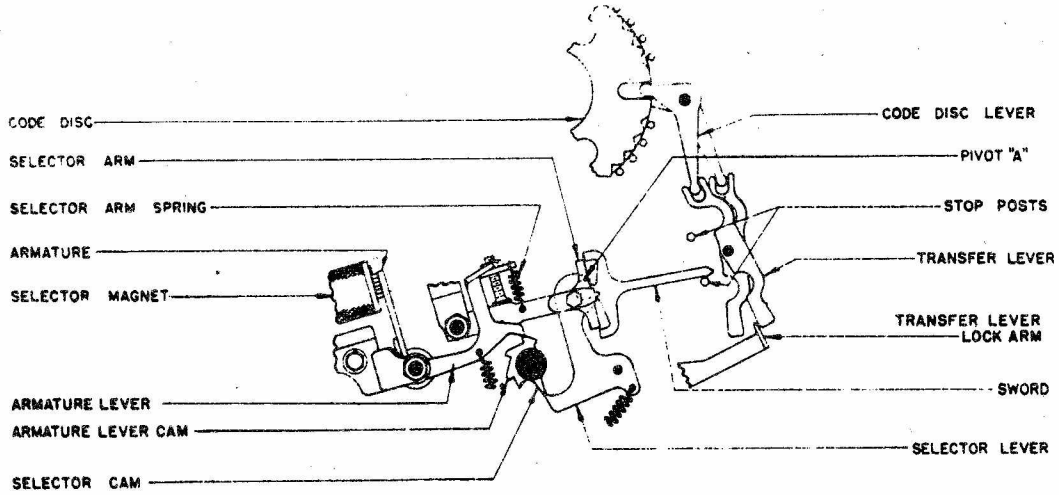


Fig. 7

Locking Cam

The locking cam (Fig. 8) has five low and five high portions on its periphery against which the locking lever is held by its spring. During that part of each impulse when a selector cam is operating its selector lever, the locking lever is against a low portion of the locking cam. The selector arm will then be firmly held in position by the rear arm of

the locking lever engaging the locking wedge on the selector arm. The selector arm will be locked until the sword is moved to the left and rotated about its pivot. When the locking lever is riding on a high portion of the locking cam, the rear arm of the locking lever will be held away from the locking wedge and the selector arm will be free to move in response to the next impulse. Because the armature lever cam starts to move the armature

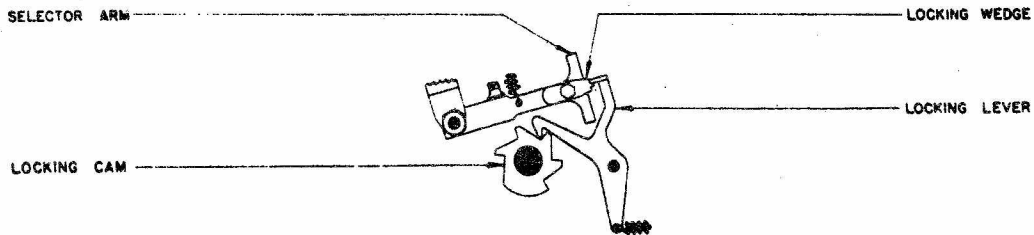


Fig. 8

toward the selector magnet before the locking lever releases the selector arm, the selector arm spring is provided as a yield between the armature lever and the selector arm.

### Transfer

After the swords have been positioned to correspond to the selection just received, the new selection must be transferred from the swords to the code discs. As described previously, just after the reception of the fourth impulse of the selection, the front shaft cam sleeve will start to rotate. As the transfer bail cam, which is a part of the front shaft cam sleeve, rotates, the transfer bail cam roller rides to the high part of the transfer cam. The transfer bail will be rotated clockwise, moving the transfer levers lock arm out of engagement with the transfer levers and moving the transfer yield springs against the selector levers (Fig. 9). The pressure exerted by the yield springs on the selector levers will rotate the selector levers clockwise, forcing the swords against the transfer levers. The transfer levers will rotate, the direction of rotation depending upon whether the swords exert pressure against the

### Type Wheel Shaft and Stop Unit

The type wheel shaft assembly consists of a driving gear, shaft, function arm assembly, friction clutch, type wheel stop unit, type wheel stop arm, and the type wheel. The type wheel stop unit consists of code discs, stop pins, and the tension springs.

The five code discs have a series of notches on their outer edges. Perpendicular to the code discs and spaced around their circumference are thirty-two stop pins. These pins are located in slots in three guide discs, two below and one above the code discs. Tension springs hold the pins against the edges of the code discs and, to minimize friction, small rollers are placed on the pins at the points of contact with the code discs. The code discs are rotated in a counterclockwise direction to a "marking" position and in a clockwise direction to a "spacing" position. With the code discs set in any combination, their notches will be lined up to permit one stop pin to move toward the center of the unit into the path of the type wheel stop arm, thus determining the character to be printed or the function to be operated.

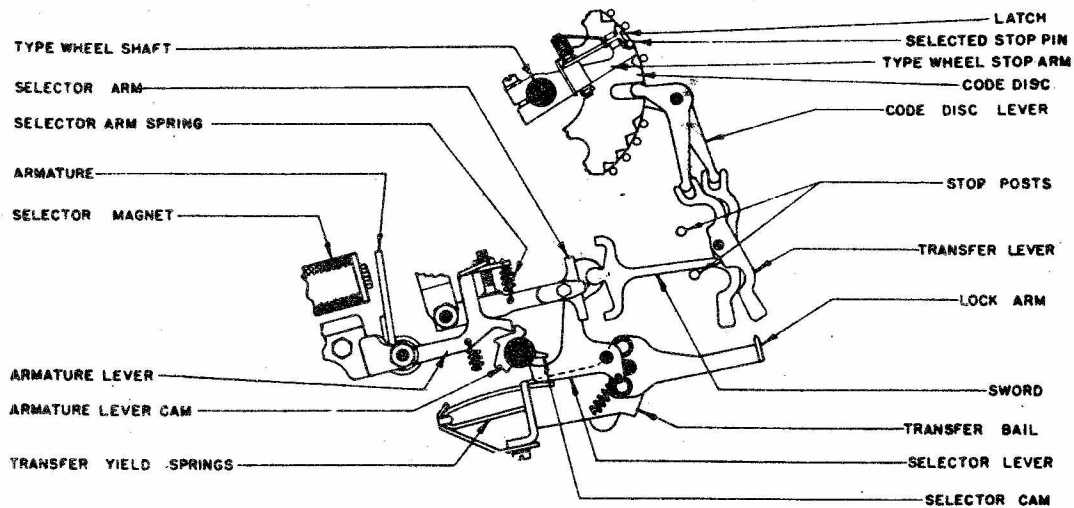


Fig. 9

transfer levers at points in front of or to the rear of the pivot. The motion of the transfer levers will be transmitted to the code discs by the code disc levers. In assuming their new positions, the code discs will move the previously selected stop pin out of engagement with the stop arm on the type wheel shaft and permit the shaft to revolve until the stop arm engages the newly selected stop pin. The type wheel will be stopped so that the character to be printed will be in the path of the printing hammer.

With five code discs there are thirty-two possible combinations with which any one of the thirty-two stop pins may be selected and the type wheel stopped in any one of the thirty-two positions. Twenty-six of the positions are used for printing characters and the remaining six are used for operating the various functions as described under "Functions" on Page 11.

The type wheel shaft is driven through the medium of a friction clutch. The type

wheel is attached to the type wheel shaft so that it cannot rotate on the shaft but so that it may be moved up and down to provide visible printing and also to print upper and lower case characters. The type wheel drive arm is clamped to the type wheel shaft in a position to bring the selected character nearest the platen. While the character is being printed, the stop arm is resting against the selected stop pin and the type wheel shaft is held stationary.

After the transfer operation has been completed, the main shaft clutch throw-out lever cam on the front shaft cam sleeve moves the throw-out lever out of engagement with the driven member of the main shaft clutch, allowing the driven member to mesh with the driving member. As the main shaft cam sleeve rotates, the printing bail cam follower arm roller drops off the peak of its cam. The movement of the cam follower arm rotates the printing bail counterclockwise and the printing hammer

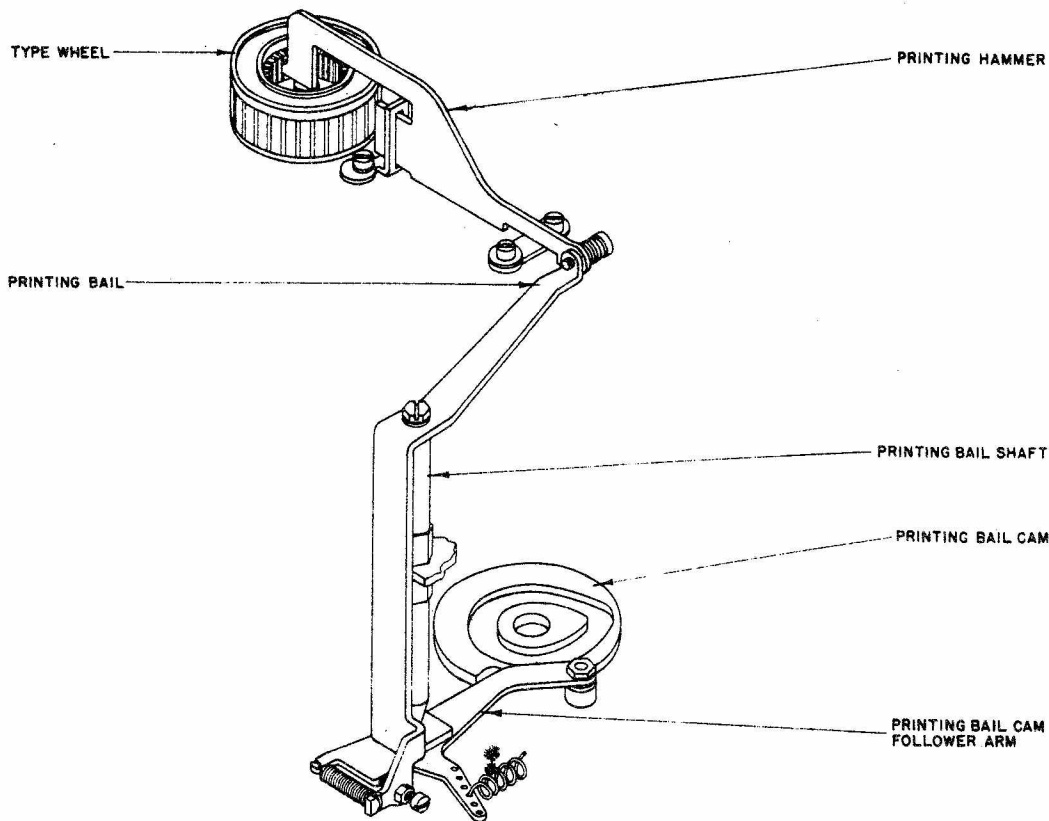


Fig. 10

### Printing

The printing bail is pivoted on the printing bail shaft which is mounted in a vertical position on the left front portion of the selector mechanism mounting plate (Fig. 10). The printing hammer is pivoted to the upper arm of the printing bail. Counterclockwise rotation of the printing bail moves the printing hammer against the selected type pallet and the momentum imparted to the pallet causes the pallet to print the selected character. The counterclockwise rotation is imparted to the printing bail by the printing bail cam follower arm as its roller moves from the peak of the printing bail cam.

is moved against the type pallet, printing the character. A garter spring located within the type wheel returns the type pallet to its unoperated position.

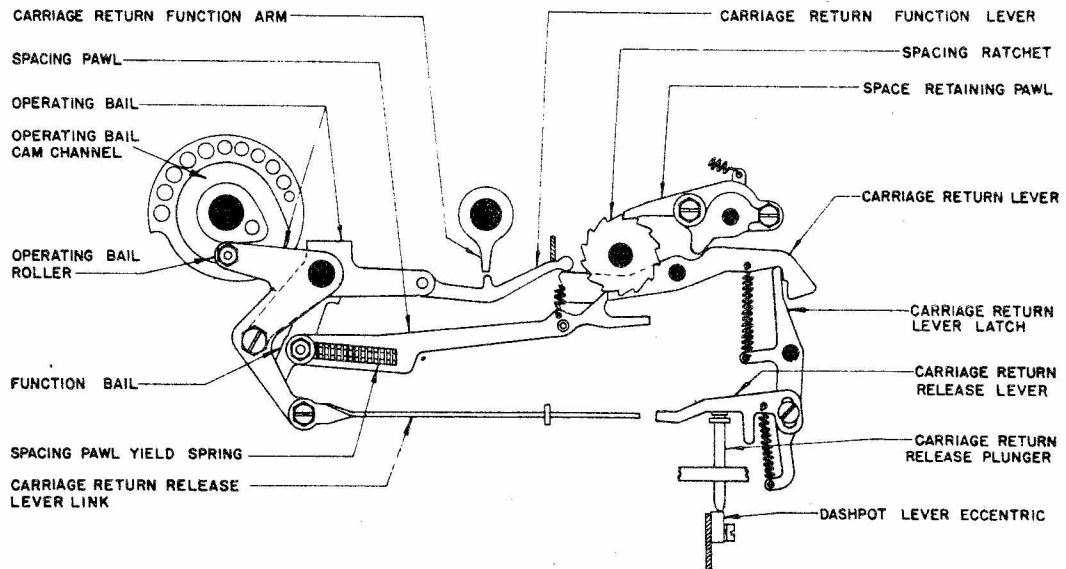
### Spacing

Spacing after a character has been printed or spacing between characters is provided by moving the platen. The platen (carriage) is supported by two "L" shaped rails, one located below the platen at the front and the other above and to the rear. A spacing rack mounted on the lower side of the platen is in mesh with a spacing gear located on the upper end of the spacing shaft. On the lower end of the spacing shaft is the spacing ratchet which



is rotated by the spacing pawl (Fig. 11). The forward end of the spacing pawl is attached to the function bail.

When the function bail cam is at rest, the function bail roller is near the lowest part of its cam. As the function bail cam

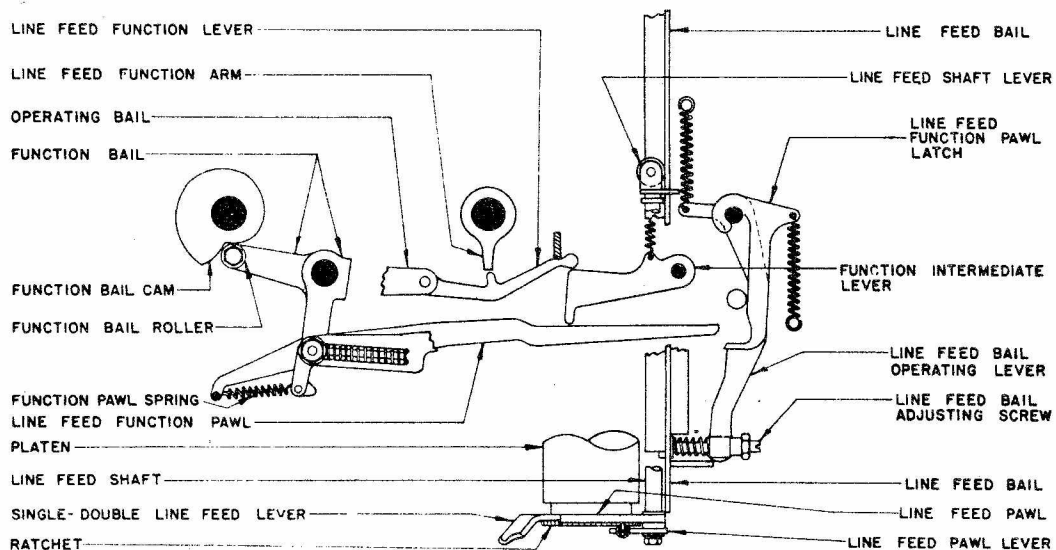


CARRIAGE RETURN FUNCTION

Fig. 11

The lower left extension of the function bail is equipped with a roller which rides on the function bail cam (Fig. 12).

When the function bail cam revolves, the function bail starts to rotate, moving the spacing pawl toward the rear and into engagement with a tooth on the spacing



LINE FEED FUNCTION

Fig. 12

ratchet (Figs. 11 and 12). Actual rotation of the spacing ratchet will start immediately after the printing of a character. The spacing ratchet and shaft will then be rotated sufficiently for a tooth on the ratchet to slightly overtravel the space retaining pawl, spacing the platen one character space. Just before the function bail cam comes to rest, the function bail roller moves into the low part of the cam and the spacing pawl is returned to its forward position.

When the carriage is spaced to the extreme left, the carriage stop plate, located above the spacing rack, moves against the right margin adjusting screw, and the carriage cannot be moved any farther. Any additional characters will be printed over each other and the rotation of the function bail will be taken up by the spacing pawl yield spring.

### Functions

Functions are operated through the medium of function levers and function arms (Fig. 11). The function levers are pivoted on the rear of the operating bail and the function arms are located on the lower end of the type wheel shaft. Eight function levers and arms are provided for use as follows, starting at the bottom:

1. Operate motor control mechanism or operate contacts for locking the keyboard with a break signal.
  2. Ring signal bell or operate motor control mechanism.
  3. Line spacing (line feed).
  4. Letters shift.
  5. Figures shift.
  6. Lower case space cut-out
  7. Upper case space cut-out
- } To suppress spacing during the operation of functions.
8. Carriage return.

Because a gradual action is desirable for the operation of the first five functions as listed in the foregoing, they are operated by the function bail (Fig. 12) through the medium of associated function levers, function arms, function pawls, function pawl latches, and function intermediate levers. When the operating bail roller is on the low part of its cam, the function levers are held away from the function arms. When the operating bail is rotated by its cam, the function levers are moved toward the function arms and if the type wheel shaft is positioned by a function stop pin, a function arm will be lined up with the

extension of a function lever and the rear of the selected function lever will be moved farther to the right than the unselected function levers. Five function intermediate levers are pivoted to the rear of the function levers so that the one associated with the selected function lever will be caused to rotate counter-clockwise, in turn moving the rear end of a function pawl to the right. The function pawls pivot on a shaft mounted on the function bail and are held against the function intermediate levers by springs. As the function bail cam roller rides to the peak of its cam, the function pawls will move to the rear, and the one corresponding to the selected function lever will engage the latch on the associated operating lever, and the function will be operated. The function bail will then return the function pawls to their forward position.

### Carriage Return Function

When the carriage return function lever (first from the top) is moved against its function arm, the rear end of the lever rotates the carriage return lever into its latched position with the carriage return lever latch (Fig. 11). With the carriage return lever in its latched position, the spacing pawl and the space retaining pawl are cammed away from the spacing ratchet. The spacing shaft and the ratchet will then be free to rotate and the carriage will be returned to the beginning of the line by the carriage return spring, drum, and drawstrap. In the meantime, the function levers will be moved away from the function arms.

One end of the dashpot lever is engaged with the dashpot plunger and the other end projects into the path of the carriage. Just before the carriage has returned to the beginning of a line, a projection on the carriage stop plate strikes the upper end of the dashpot lever, driving the plunger into the dashpot, thereby absorbing the shock.

To insure complete return of the carriage, the carriage return lever remains latched until after the carriage has returned to the beginning of a line. Near the end of the stroke of the dashpot lever, an eccentric on the lever moves the carriage return release plunger against the carriage return release lever. The forward end of the release lever will then be in the path of the carriage return release lever link. When the link moves to the rear on the next rotation of the operating bail, it will move the carriage return release lever to the rear, and the carriage return lever latch will be disengaged from the carriage return lever. The carriage return lever will then return to its normal (unoperated) position, permitting the spacing and space retaining pawls to move into engagement with the spacing ratchet.

### Line Feed Function

The line spacing (feeding) of the paper is accomplished by rotating the platen, the paper being held against the platen by four pressure rollers. The platen is rotated by the line feed pawl and the ratchet, located at the right end of the platen. The line feed pawl is actuated by the line feed bail operating lever, line feed bail, and line feed shaft with its associated line feed shaft lever and line feed pawl lever (Fig. 12).

When the line feed function lever (third from the bottom) moves against its function arm, the intermediate lever is rotated against the line feed function pawl, and, as the function pawls are moved toward the rear by the function bail, the line feed function pawl is engaged by its latch. Shortly after the line feed function pawl is engaged by its latch, the function levers are moved away from the function arms by the operating bail and the function intermediate lever is returned to its unoperated position.

As the function pawls continue to move toward the rear, the line feed function pawl rotates the line feed bail operating lever. The right end of the line feed bail operating lever has the line feed bail linked to it by means of the line feed bail adjusting screw. Attached to the left end of the line feed shaft is the line feed shaft lever with the roller on this lever located in the path of the line feed bail. Motion of the line feed shaft is transmitted to the line feed pawl through the line feed pawl lever which is attached to the right end of the line feed shaft. Normally, the front end of the line feed pawl rests against the single-double line feed lever above the line feed ratchet. As the pawl

moves, the line feed pawl spring will pull the pawl downward into engagement with a tooth on the line feed ratchet and the platen will be rotated. The function pawls will then be returned to their forward position, allowing the line feed bail operating lever and bail to return to their unoperated positions. The line feed detent lever spring will return the line feed pawl and shaft to their unoperated positions. After each line feed operation, the detent lever roller locates itself between two teeth on the line feed ratchet, holding the platen firmly in position during each line of printing. When the single-double line feed lever is in its upper position, the line feed pawl will be permitted to engage the ratchet at a position which will advance the platen a single line space. With the lever in its lower position, a double line space will be obtained.

### Type Wheel Oscillation

The type wheel is normally below the printing line so that the printed characters are visible. Before a character is printed, the type wheel must be raised to bring the selected type pallet up to the printing line. When the front shaft cam assembly starts to rotate, the lifting bail roller, riding to the peak of the lifting bail cam, raises the rear extension of the lifting bail (Fig. 13). This motion is transmitted through the medium of the lifting bail yield spring to the type wheel guide which engages the type wheel collar and controls the vertical position of the type wheel. The type wheel guide moves upward until the shift stop arm engages a notch in the shift plate. Additional travel of the lifting bail is taken up by the yield spring. When the main shaft cam assembly starts to rotate, the type wheel lifting bail auxiliary cam on the main shaft cam sleeve holds the lifting bail operated until the character is

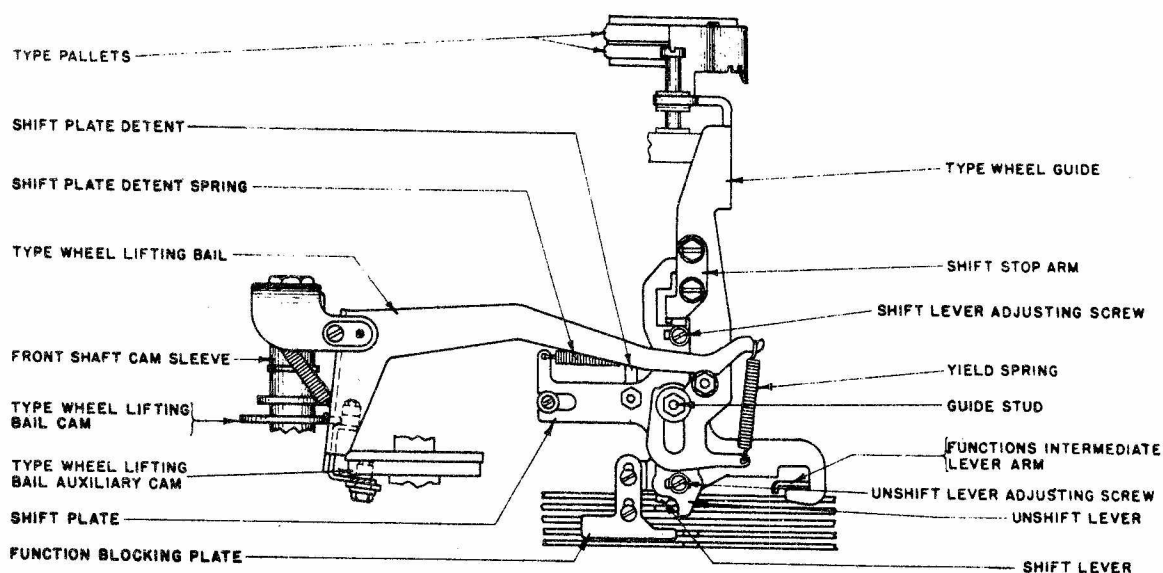


Fig. 13



printed. Then the type wheel is lowered gradually until the printed character is visible.

#### Shift and Unshift Functions

The height to which the lifting bail will raise the type wheel is determined by the position of the shift plate. The shift plate is moved toward the front or rear of the printer by the rotation of the shift or unshift levers, the lower ends of which are in the path of the projections on the shift and unshift function pawls respectively.

When the shift function lever (fifth from the bottom) is moved against its function arm, the rear end of the lever rotates the shift function intermediate lever against the shift function pawl (Fig. 14). This pawl will be moved to the right at the same time the function bail cam moves the function pawls toward the rear, and the shift function pawl will be engaged by its latch. The operating bail roller will then ride to the low part of its cam and the function levers will be moved away from the function arms. As the function pawls continue to move toward the rear, the projection on the shift function pawl will engage the lower end of the shift lever and move it toward the rear. The shift lever pivots about the fixed guide stud. The forked upper end of the shift lever engages the shift lever adjusting screw, which is mounted on the shift plate. As the lower end of the shift lever is moved to the rear, the upper end of the lever will be moved forward, in turn moving the shift plate forward. When the lifting bail moves the type wheel guide upward, the shift stop arm will engage the upper notch in the shift plate and the type wheel will be in the "figures" position.

The unshift lever also pivots about the guide stud. The unshift lever adjusting screw, which is mounted on the unshift lever near its

lower end, engages a fork in the shift plate. When the lower end of the unshift lever is engaged and moved to the rear by the unshift function pawl, the unshift lever will move the shift plate to the rear. When the type wheel guide is raised, the shift stop arm will be stopped by the lower notch in the shift plate and the type wheel will be in the "letters" position. The shift plate detent and detent spring hold the shift plate in either position.

#### Lower Case and Upper Case Space Cut-out Functions

To suppress spacing during the operation of the functions, the spacing pawl latch, pivoted on the same shaft as the function intermediate levers, is provided to hold the spacing pawl out of engagement with the spacing ratchet. Two sets of space cut-out function arms with associated levers are provided so that spacing may be suppressed in both upper and lower case of certain selections or in either upper or lower case of other selections.

When the upper case space cut-out function lever (second from the top) is moved against its function arm, the rear end of the function lever rotates the function intermediate lever through the medium of a yield lever and spring (Fig. 15). An arm of the intermediate lever, striking a post mounted to the underside of the spacing pawl, cams the pawl away from the spacing ratchet and as the pawl moves toward the rear, the end of the pawl is positioned opposite the spacing pawl latch. The operating bail roller will then ride to the low part of its cam, and the function levers will be moved away from the function arms and the intermediate lever from the spacing pawl. The spacing pawl will then be held away from the spacing ratchet by the spacing pawl latch until the pawl returns to its forward position.

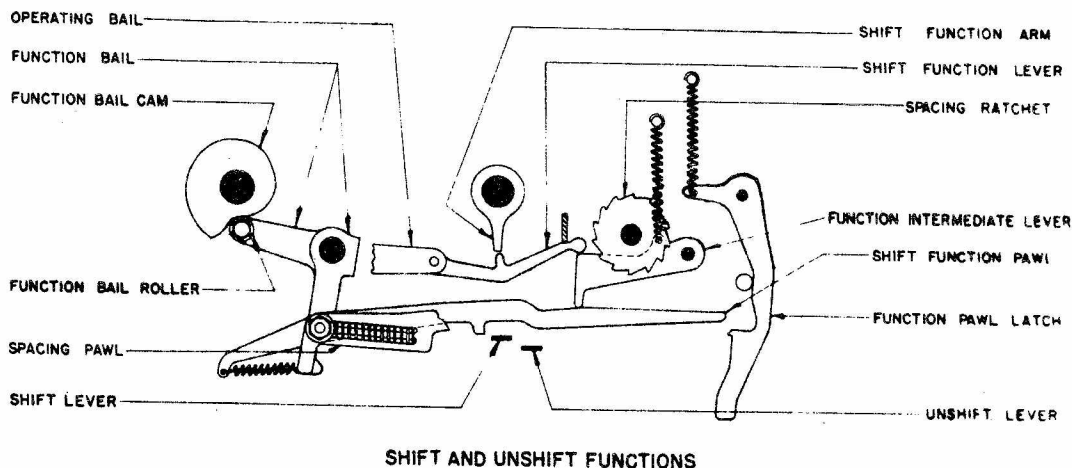
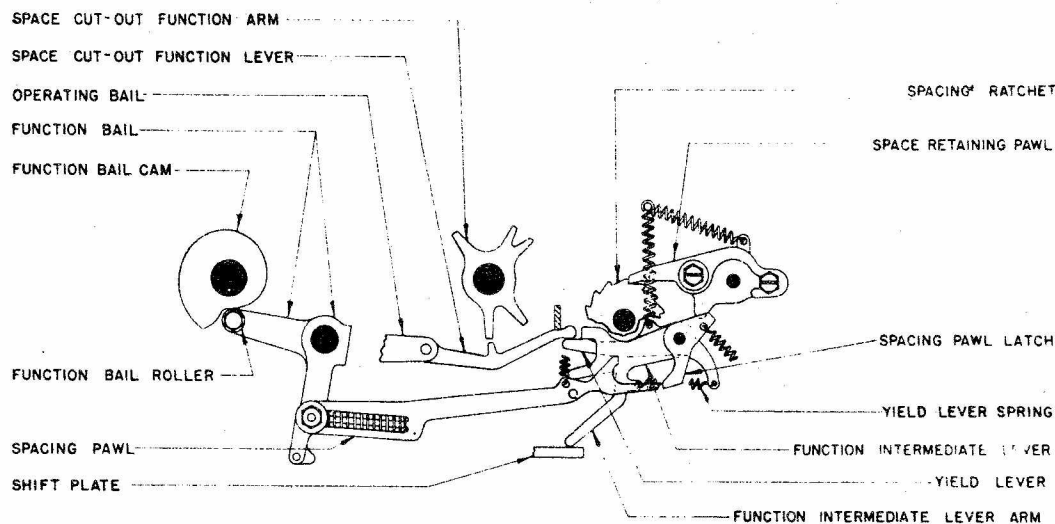


Fig. 14



SPACE CUT-OUT FUNCTIONS

Fig. 15

In a similar manner the lower case space cut-out function lever (third from the top) with its associated arms and levers will suppress spacing in the lower case of functions.

The operation of the signal bell on the upper case of the "S" selection requires the suppression of spacing. When the "S" selection is set up and the type wheel stop arm is against the selected stop pin, the space cut-out function arms will be so positioned that a function arm will be opposite the upper case space cut-out function lever. If the shift plate is in the figures position (forward), the blocking arm of the shift plate will permit the operation of the function intermediate lever and spacing will be suppressed. If, however, the shift plate is in the letters position (to the rear), the blocking arm will prevent the operation of the function intermediate lever, and the spacing pawl will rotate the spacing ratchet. When letters, figures, line feed, or carriage return function is selected, the space cut-out function arms will be so positioned that a function arm will be opposite both the upper and lower case space cut-out function levers. Both levers will operate their respective yield levers and regardless of the position of the shift plate, either the upper or lower case function intermediate lever will operate to suppress spacing.

#### Signal Bell Function

When the bell function lever (second from the bottom) moves against its function arm, the intermediate lever is rotated against the function pawl, and as the function pawls are moved toward the rear by the function cam, the bell function pawl is latched by its latch

(Fig. 16). As the function pawls continue traveling toward the rear, the operating lever is rotated, moving the bell hammer away from the bell. When the function bail roller rides to the low portion of its cam, returning the function pawls to their forward position, the operating lever is pulled to its unoperated position by its spring, ringing the bell.

Note: On some printers, the left end of the operating lever is used to actuate the motor stop contacts.

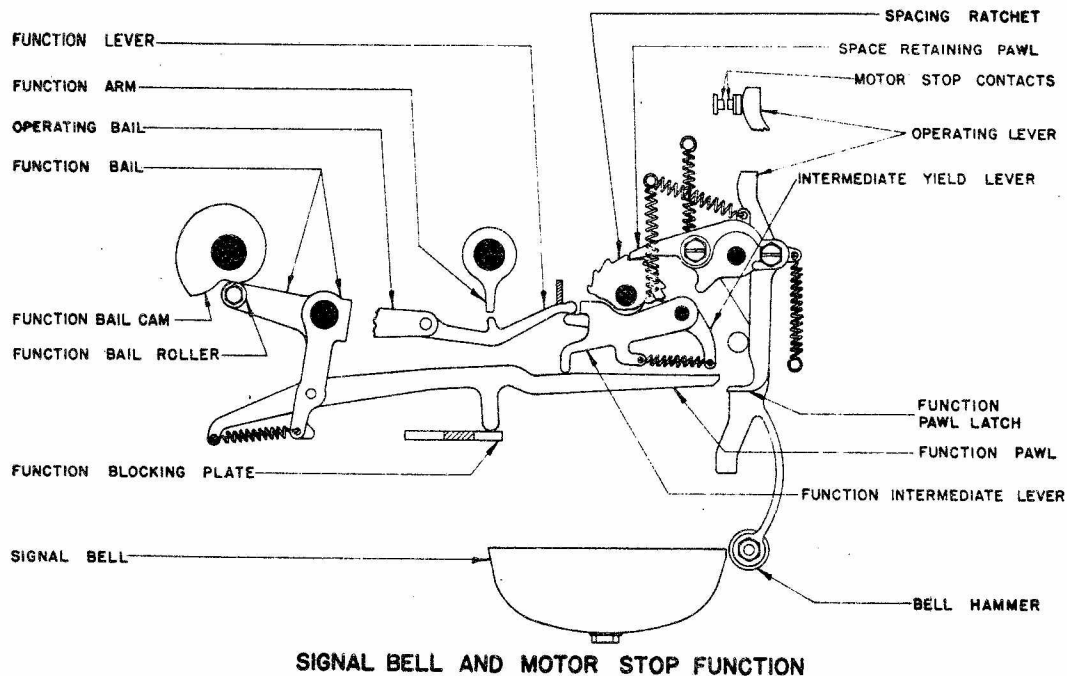
#### Motor Stop Function

On those printers equipped with the motor stop contacts, the operating lever operates the motor stop contacts (Fig. 16). These contacts in turn operate a motor stop mechanism (not shown).

Note: On those printers which are arranged to operate both the signal bell and the motor stop contacts, the No. 1 function position (first from the bottom) is used for the motor stop function.

#### Function Blocking Plate

To prevent the operation of the signal bell or motor stop function on the lower case of these selections, the function blocking plate is provided on the lower end of the shift plate (Figs. 13 and 16). With the shift plate in the lower case position, the blocking plate will be opposite the extensions on the function pawls used to operate the signal bell and the motor stop functions. When the function intermediate levers are moved against



SIGNAL BELL AND MOTOR STOP FUNCTION

Fig. 16

their pawls by the function levers, the pawls will be blocked by the function blocking plate, thus being prevented from engaging with their latches and operating levers. The motion of the function levers is taken up by the intermediate yield levers and spring.

#### Break-Lock Function

On those printers equipped with the break-lock function, the keyboard transmitting contacts will be short-circuited and a transmitter-distributor may be stopped when one or more blank signals are received or when the line is opened. This is accomplished by closing one pair of contacts which are connected in multiple with the keyboard transmitting contacts and simultaneously opening another pair of contacts which may be connected in series with the stop magnet circuit of the transmitting-distributor. Transmission cannot be resumed until the "letters" key is depressed which permits the contacts to be restored to their normal positions.

When the break-lock function lever (first from the bottom) moves against its function arm, the rear end of the lever rotates the function intermediate lever against the break-lock function pawl and as the function pawls move toward the rear, the break-lock function pawl engages the latch on the break-lock lever (Fig. 17). As the function pawls continue to move toward the rear, the break-lock lever will be rotated, closing the "make" and opening the "break" contacts. The right end of the break-lock lever will move into

engagement with the break-lock lever latch and the contacts will be held in their operated position.

The forward end of the break-lock lever latch extends over the break-lock release lever which is attached to the "letters" key lever on the keyboard. When this key lever is depressed, the upper end of the release lever moves the break-lock latch, allowing the break-lock lever and the contacts to return to their normal positions.

#### Margin Bell

Before the platen carriage reaches the end of its travel, it operates the margin bell as a warning to the operator that the end of the line is near. The margin bell adjusting bracket, located on the left end of the spacing rack, will depress the margin bell hammer pawl, moving the bell hammer away from the bell. When the carriage has been spaced beyond the bell hammer pawl, the pawl and bell hammer will be released and the bell hammer spring will pull the hammer against the bell.

#### Ribbon Feeding

The lower end of the ribbon feed operating lever is held against the function bail by the ribbon feed pawl spring (Fig. 18). The upper end of the ribbon feed operating lever engages the right end of the ribbon feed lever through the medium of the ribbon feed operating link. Pivoted at the left end of the ribbon feed lever is the ribbon feed pawl which



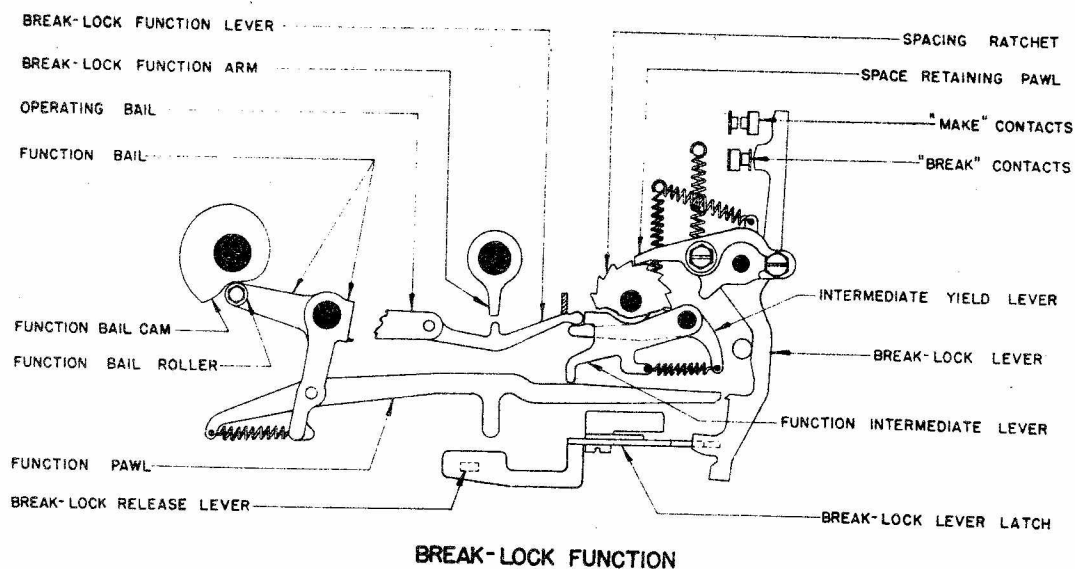


Fig. 17

engages one of the ribbon feed ratchets. The upper portions of the ratchet shafts are designed to mount the ribbon spools.

With each operation of the function bail, the lower end of the ribbon feed operating lever is moved toward the rear. The upper end of the operating lever will then rotate the ribbon feed lever, moving the ribbon feed pawl against a tooth on the ratchet, rotating the ratchet, shaft, and ribbon spool. The ribbon feed check pawl is provided to prevent turning of the ratchet while the feed pawl is advancing to the next ratchet tooth.

#### Ribbon Reverse

The ribbon reverse lever has four arms, and is pivoted on the ribbon bracket, in front of the type wheel (Fig. 18). The arms in the rear which are used for guiding the ribbon are the reverse arms, and the two front arms are the operating and detenting arms. Assuming that the ribbon is being wound on the left spool and that the right spool is almost empty, an eyelet in the ribbon will engage the right reverse arm. The ribbon reverse lever is then rotated counterclockwise as shown in Fig. 18 and will be held there by the detent spring. The operating arm on the reverse lever will be in the path of the right vertical lug on the ribbon feed pawl. With the succeeding operation of the ribbon feed lever, the right lug on the pawl will be moved against the reverse lever operating arm and the pawl will be rotated so that it will move out of engagement

with the left feed ratchet and into engagement with the right feed ratchet. Because the screw at the rear end of the feed pawl extends downward into the ribbon feed check pawl, the check pawl will also be moved against the right feed ratchet. The ribbon will then be wound on the right spool. The reversing takes place in a similar manner on the left side when the eyelet in the left end of the ribbon engages with the left reverse arm.

The ribbon feed ratchet friction drag springs are provided to prevent the "free" spool from unwinding too rapidly.

#### MOTOR SPEED CONTROL

In order to maintain the transmitting and receiving stations at the proper speed, each motor (excepting synchronous motors) is equipped with a governor attached to one end of the motor shaft (Fig. 19).

The governor contact arm has a contact mounted on one end and is fastened to a bracket by a flat spring at the other end. The contact arm spring holds the contact against a companion contact until the centrifugal force of the contact arm overcomes the tension of the spring. When the contacts open, a resistance is connected into the motor circuit which tends to reduce the speed of the motor. The closing and opening of the contact holds the motor speed constant to the value of the tension at which the spring is set. The spring

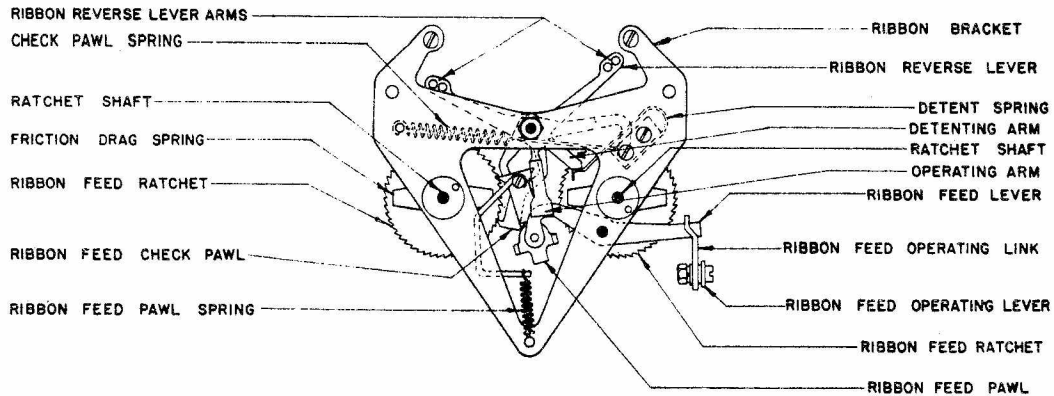


Fig. 18

tension (which determines the motor speed) is adjusted by turning the speed adjusting wheel which projects through the cover of the governor.

The governor is equipped with a speed target consisting of alternate black and white spots. A tuning fork with shutters attached to the ends of the tines is used to visually check the motor speed. With a properly adjusted spring tension, the spots on the target appear to be stationary when observed through the shutters of the vibrating tuning fork. No speed setting is required on printers equipped with synchronous motors, since they are constant speed motors.

### SYNCHRONISM

In order that the signals sent out by the transmitter may be interpreted correctly by the receiving units, it is necessary to keep the receiving units in synchronism with the transmitted signals. It is not practical to maintain several units at exactly the same speed. In a short time even a slight difference in speed would cause the transmitting mechanism and the receiving units to be out of unison so that when the transmitter sends the first impulse of a signal, the selector cam sleeve of a receiving unit might be in position to receive the second impulse.

This condition is avoided by having the selector cam sleeve rotate faster than the transmitting cam sleeve and using the start and stop impulses to maintain synchronism in the following manner:

As previously described, the reception of the start impulse starts the selector cam sleeve on the receiving unit revolving. At that moment, the selector cam sleeve is in unison with the transmitting cam sleeve. The selector cam sleeve revolves one-seventh faster than the transmitting cam but the selector cam sleeve is so constructed that the distance traveled from the position where the cam sleeve starts to move a selector lever to the position where it starts to move the next selector lever is one-seventh greater than the distance traveled by the transmitter cam sleeve from where it can control the transmission of one impulse to where it can control the next. In other words, for a certain travel of the transmitting cam sleeve, the corresponding travel for the selector cam sleeve is one-seventh greater but as the selector cam travels one-seventh faster, it will reach its second position at the same time the transmitting cam sleeve reaches its second position.

The selector cam sleeve completes its revolution before the transmitting cam sleeve, but the transmitting cam sleeve sends out the stop impulse which stops the selector cam sleeve until the transmitting cam sleeve again sends out the start impulse. Normally, when the selector cam is one-seventh faster than the transmitting cam sleeve, the selector cam sleeve is at rest one-seventh of the transmission time. If the speed of the selector cam sleeve is faster or slower than the proper speed, the cam remains at rest more or less, respectively. Of course, there will be a slight error in the relative position of the selector cam sleeve in the various positions, but the mechanism is so constructed to provide for this and, due to the fact that the selector cam sleeve starts each revolution in unison with the transmitting cam sleeve, this error does not become accumulative.

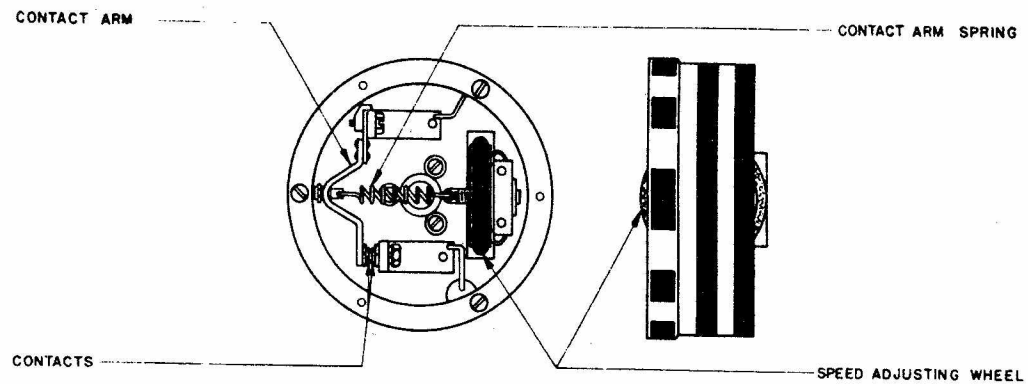


Fig. 19

ORIENTATION

In order to properly operate the selector mechanism, it is necessary to place the starting point of the selector cam sleeve in the most favorable position. This is accomplished by means of the range finding mechanism, which is used to orient or take a range.

Mounted on the stop lever plate (which is a part of the range finding mechanism) are the stop lever and the trip latch which may be rotated, thereby varying the relation between the start of the selector cam sleeve and the time the selector cams operate the selector levers (Fig. 6). A graduated scale indicates the setting of the stop mechanism, and the thumb screw holds it in place after having been set.