1. Frame Cover Plates (models F & G) may be removed and replaced in the following manner:

A. Rear Name Plate:
   (1) To remove: Remove four (4) binding screws. Remove Name Plate.
   (2) To replace: Replace Plate in position, aligning Screw holes through rear ends of Frame Cover Plate. Insert (4) Binding Screws (2 on each side). As these Screws (on each side) are tightened, press the rear ends of the Frame Cover Plate downward to insure that the Cover Plate sides will be in their lowest position to clear the Drawband Anchor Screw and Nut on the right underside of the Carriage and the Left Carriage Release Lever Rack Binding Arm with the Carriage Centering Lever on the left side. Test the Carriage for clearance with these parts by moving the Carriage to the right with the Line Space Lever and again with the Carriage Release Lever depressed. As the Space Bar Stop limits between the flanges of the front frame cross member of the Frame Cover Plate, it is essential that the rear ends of the Frame Cover Plate be in their lowest position (before tightening Rear Name Plate Binding Screws) to insure that the Space Bar Escapement Trip Arm (See Space Bar) is not holding the left end of the Escapement Rocker forward disengaging the Loose Dog from Star-wheel engaging position.

B. Frame Cover Plate:
   (1) To remove: Remove Rear Name Plate as outlined above. Remove Frame Cover Plate Binding Screws (1 on either underside of machine just to rear of front rubber feet) removing felt pads. Loosen Ribbon Feed Rod Manual Winding Reversing Extension Set Screw on right underside of frame, removing Rod Extension. Remove Front Plate between top row of keys and the Typebars by removing one binding screw from each end. Center Carriage with Carriage Centering Lever. Spread rear ends of Frame Cover Plate outward as the Cover Plate is maneuvered forward and upward, with the Typebar Cover slightly open to clear Back Spacer Key and with Cover Plate aligned to permit Margin Release Button to move out of hole on the left front edge of the Cover Plate, move the Cover Plate carefully forward until disengaged from machine frame.
   (2) To replace: Feed Frame Cover Plate on Frame from the front, moving rearward carefully as rear ends are spread to clear frame permitting Margin Release Button to enter hole in left front side cover plate and front ends of Space Levers (Space Bar Stops) to enter formed U of the front Cover Plate, as the Plate is returned to position. Replace bottom Binding Screws. Replace Rear Name Plate and replace 4 Binding Screws (See Par. 1A (2) above. Replace Ribbon Feed Rod Manual Winding/Reversing Extension and tighten set screw. Check Space Bar for escapement, after replacing Frame Cover Plate. It may be necessary to adjust Space Bar Stops to prevent Space Bar Escapement Trip Arm from contacting rear of Escapement Rocker (See Space Bar).

C. Paper Table Assembled:
   (1) Remove Pivot Screws, right and left. As the Paper Table is removed, the Paper Table Stop Links may be maneuvered free and the Paper Table removed.
   (2) To replace, reverse above instructions.
MAIN CARRIAGE: Underwood Portables

ABCDEFGLS

1. The Carriage rides between two formed steel rails on a front and rear Carriage Truck equipped with a Pinion controlling the Carriage Truck in a front and rear rail Rack (Anti-Creep Rack).

2. ADJUSTMENTS: Before attempting adjustments, inspect mechanism for clearance with sides of Frame Cover Plate. If the Frame Cover Plate has not been pressed downward while tightening rear Frame Cover Binding Screws, there may be collision of the Drawband Anchor Screw (under right end of Carriage) with the Side Cover Plate (right) or left end of Carriage (under) or Rack Arm (left) with the Carriage Centering Lever when the Carriage is moved to the right with the Line Space Lever.

A. Carriage Rails: The Carriage should fit snug but free in the Carriage rails. The Rear Carriage Rail (attached to the rear of the Shift Frame with seven (7) Binding Screws through slots in the Shift Frame) is adjustable to remove excess play in the Carriage. Loosen (7) Binding Screws, position rail upward or downward to remove or take up excess play, then tighten binding Screws.

Surface of the Carriage Rails should be true and smooth in their entire length. Pits should be stoned smooth to provide a smooth running carriage.

3. TO REMOVE CARRIAGE:

A. Disconnect Drawband, by loosening Drawband Anchor Nut, under right end of Carriage. Remove Drawband end from Anchor Screw and place on Shift Frame Formed Stud (between the Rails, right end of Carriage).

B. Remove Shift Frame Rail Rear Rack (right hand) by removing Screw binding the right end of the Rack to the Rear Carriage Rail (from behind Rear Carriage Rail, right). Remove Rack.

C. Move Carriage to extreme right end of Carriage rails. Insert a screwdriver between Rear Rails (from the left end of carriage) holding pressure against Rear Carriage Truck with the Screwdriver as the Carriage is moved to the left. Rear Carriage Truck may be removed from the right end of the Rear Carriage Rail. Carriage can be lifted out of its rails. Front Carriage Rail Truck may be lifted out.

4. TO REPLACE CARRIAGE:

A. Center Front Carriage Rail Truck in front rail, with Pinion in center of ends of rails and enmesh with Front Rail Rack.

B. Replace Carriage to position against Front Rail, centered on frame.

C. Place Rear Carriage Truck in Rear Rail position, from the right end of the rail, pushing it to the left until it lines up with the Front Carriage Truck, then move the Carriage to the extreme left. Place the Right Hand Rail Rear Rack left end in position under center stud clip and replace Rack Binding Screw. Test uniform position of Front and Rear Trucks by moving Carriage to either end. The Trucks should be uniformly positioned in the rails, otherwise, remove R. H. Rail Rear Rack left and move Trucks in to proper position.

D. Remove Carriage Drawband from Shift Frame Formed Stud and replace on Drawband Anchor Screw (under right end of Carriage) tightening Anchor Nut.
1. The Mainspring Drum Bracket is positioned at the left end of the Shift Frame (below the Carriage). The Mainspring Drum pivoting thereon provides tension for the movement of the Carriage (to the left) in typing through the Drawband connected to the Spring Drum and to the right under end of the Carriage. The Mainspring is contained within the Spring Drum, with the outer end of the spring attached to the inside formed stud of the Barrel of the Drum while the inside end of the Spring is attached to the Drum Winder Hub Shaft. Tension is applied to the Spring by winding the Drum Winder Hub Shaft which tightens the Spring, this tension being retained by the Spring Drum Ratchet Pawl holding the Spring Drum Ratchet (attached to the Drum Winder Hub Shaft).

2. ADJUSTMENTS: The Carriage should operate smoothly in its rails and all obstructions to movement of the Carriage should be eliminated before attempting tension adjustments.

A. Mainspring Tension:
   (1) To increase tension, loosen Spring Drum Ratchet Pawl Screw and with screwdriver inserted in Slot of Spring Drum Winder Hub, turn Hub clockwise. To decrease tension, with screwdriver inserted in Slot of Spring Drum Winder Hub, held securely, loosen Spring Drum Ratchet Pawl and hold Ratchet Pawl out of engagement with Ratchet while you permit the Drum Winder Hub to turn screwdriver, (frictioned by the hand) counterclockwise. Tension should be sufficient to move the Carriage to the extreme left end of its Rails.

   B. Drawband should be properly connected to formed stud on the outside of the Drum Barrel and to the Carriage Drawband Anchor Screw, positioned to lay flat on both connections, without twist between its connections.

3. TO REMOVE MAINSPRING DRUM BRACKET.

Relax all tension on Drum, disconnecting right end of Drawband from under right end of Carriage on Drawband Anchor Screw (by loosening Lock Nut, holding friction against the Mainspring Drum as the Drawband is allowed to wind around the Drum, until all tension is relaxed. Facing machine from the rear (with Rear Name Plate removed) the three holes in the Keylever Fulcrum Bracket Assembled, are for entry of screwdriver as follows: 1st hole on the right—to remove Drum Bracket Binding Screw on the right; 2nd hole on the right—to adjust Spring Tension for winding or relaxing tension on Spring Drum Winder Hub; 3rd hole on the right—to remove Drum Bracket Binding Screw on the left. Remove two Drum Bracket Binding Screws—removing Drum from between left end of Carriage Rails. To replace—reverse the operation.

A. To remove Mainspring: (It is not necessary to remove Drum Bracket from Shift Frame). Remove Spring Drum Cover Plate (prying it off with Screwdriver). Mainspring is available for removal, however, it should not be removed unless broken. New Mainsprings are provided with a clamp to hold the Mainspring while positioning it within the Drum (by pressing the Mainspring from the Clamp). The outside end of Mainspring should be attached to inside Barrel Stud.
RING AND CYLINDER: Underwood Universal Portable (A F G L S)

1. Ring and Cylinder Adjustment on the Underwood Universal Portable is provided for in the forward bearing of the Shift Frame Arms with the Controlling Links, eccentric Controlling Link Eccentric Bearing Nuts being provided for this purpose. Size of the Underwood Universal Portable Platen is 1.250". Before attempting adjustment refer to Ring and Cylinder Forward, page 37, Typewriter Mechanical Training Manual, Volume 1, Standard.

2. ADJUSTMENTS:

A. Ring and Cylinder Adjustment: Forward movement of the Platen (to contact a typebar held against the Segment Ring) may be made, after loosening Controlling Link Bearing (Nut headed) Screws (right and left) and adjusting Controlling Link Eccentric Bearing Nut to position the entire Carriage, or either end of the Carriage forward or rearward in order to bring into contact with a typebar held contacting the Abutment Ring. Tighten Screw when adjustment is made, while holding Eccentric Nut stationery.

B. Platen Parallel: The Right end of the Platen is adjustable to Parallel it with the left end of the Platen. The Right Hand Carriage End Bushing is positioned by the Platen Adjusting Wedge and may be altered (raised or lowered) to Parallel by loosening Platen Adj. Wedge Screw, and Platen Adj. Arm Screw and turning the Platen Adj. Arm Eccentric Screw Nut to position the Platen Parallel. Tighten Adj. Wedge Screw and Platen Adj. Arm Screw while holding Eccentric Nut stationery after Paralleling Platen.
1. The Underwood Universal Portable is of the Carriage Shift mechanism. As the Shift Key is depressed the rear of the left hand Shift Key (after an upward movement of approximately .040") contacts the stud of the left arm of the Shift Bar. Further depression of the Shift Key raises the Shift Bar Arm and the Shift Frame Assembled (including Carriage Rails and Carriage) until this upward movement is arrested by contact of the Shift Stop Plate with the "On-Feet" Stop Screw, left and right, in which position the Platen is in upper case (capital) position.

When the Shift Key is released the Shift Frame and Carriage Assembly and Shift Bar return (drop) to lower case position, the bottom of the Shift Stop Plate contacting the Motion Stop Screw (left and right) while the rear end of the left hand Shift Key moves downward an additional .040" until its formed Stop contacts its limit on the left hand Main Frame End.

The sides of the Shift Frame are controlled for free upward and downward movement and for elimination of end shake (shimmmy), by the controlling Link Fulcrum Screws, left and right. The Left Hand Controlling Link Fulcrum Adj. Screw is adjustable after loosening Lock Nut to remove end shake or for proper fitting adjustment.

When the Shift Lock Key is depressed the Shift Lock Latch enters between the jaws of the Shift Lock Bracket, the formed top of the Latch positioning itself (by friction) under the flat side of the Bracket between the jaws, in which position the Shift Frame (Carriage Assembly) is retained in upper case position until either Shift Key is depressed, the downward movement of the Shift Lever removing the friction of the Shift Lock Latch from the underside of the Bracket and the Latch Spring drawing the latch head rearward out of contact with the Bracket.

2. ADJUSTMENTS: Before attempting adjustments it should be determined that Shift Keylever Bail, Shift Frame Controlling Links and Shift Bar are free on their pivots and that end shake in the Shift Frame is eliminated without binding in either case position. Shift Keylever Bail Springs (right and left) should be properly connected and provide sufficient tension to maintain L. H. Shift Lever formed Stop on its Limit on left hand Main Frame End. Shift Keylevers should operate freely in frontcomb without binding. Determine by test that Ring and Cylinder Adjustment is proper (See Ring and Cylinder).

A. On-Feet Adjustment:

(1) Determine that Platen is of proper diameter of 1.250". If Platen has been ground down more than .010" it should be replaced.

(2) On-Feet position is determined by use of capital letters, which, because of their large size makes possible a more accurate examination of impressions. With Shift Key depressed, strike off lightly capital letters H N K M across the platen. Determine if full and uniform impression of the characters is obtained on both ends of cylinder. If tops of characters are light (ribbon covering type properly, of course) the Platen is too low; if bottoms of characters are light, Platen is too high. If characters on one end of Platen are full and complete while those on other end are light, top or bottom, Platen is not concentric or parallel (See Ring and Cylinder).

(a) To Raise Platen, loosen L. H. and R. H. "On-Feet" Adj. Screw Lock Nuts and uniformly back out (turn counter-clockwise) both adjusting Screws. Test for uniformity by inserting strips of tissue between "On-Feet" Stop and Top of Shift Bar Arm Stop Plates (left and right) with Shift Key depressed, determining by friction pull that Stops are uniform. Tighten On-Feet Adj. Screw Lock Nuts while holding adjusting screw stationery.

(b) To Lower Platen turn On-Feet Adj. Screw clockwise. Make same friction test. Tighten Lock Nuts.

B. Motion Adjustment: Determine that there is nothing preventing Carriage from seating properly on Motion Stops.

(1) Determine by Shifting and releasing, whether small letters are above or below bottoms (cleats) of Capital letters—use HhHh for this test.

(a) To raise small letters, loosen Motion Adj. Screw Lock Nuts and turn Motion Adj. Screws (left and right) uniformly counter-clockwise. To lower small letters, turn Motion Adj. Screws clockwise. Test for uniformity by inserting strips of tissue between bottom of Shift Stop Plates (left and right) and tops of Motion Stops, with Shift Keys inactive, determine by friction pull that Motion Stops are uniform. Tighten Lock Nuts while holding Motion Adj. Screw stationery.

(3) After adjusting Motion determine that with L. H. Shift Key partially depressed but not raising Shift Bar Arms that there is approximately .015" clearance below L. H. Shift Key formed Stop and its limit on L. H. Main Frame End, which is equivalent to .040" between end of L. H. Shift Lever and Shift Bar Arm Stud. The Shift Key formed Stop may be formed to provide this clearance.

C. Shift Lock Latch: With "On-Feet" and "Motion" Adjustments properly made, Shift Lock Latch Plate may be adjusted (moved up or down) on its binding Screws (slotted for adjusting purposes) by loosening Screws and positioning Plate. Test by depression of Shift Keys, both right and left, to determine that proper additional movement is provided in each to unlock and release Shift Lock Latch.
D. **Shift Balance Spring**: The Shift Bar is provided with a coil spring which provides Shift Balance Tension. This tension should not be disturbed unless tension adjustment is absolutely necessary in which case the free end of Spring may be pulled up taut and end formed to increase tension.

E. **Shift Frame** should operate freely (without end shake) between the Controlling Link Fulcrum Adj. Screw (L. H.) and the Controlling Link Fulcrum Screw R. H. Fitting Adjustment is made with Controlling Link Fulcrum Screw (Adjusting) Screw (left hand) after loosening lock nut by adjusting Fitting Nut. Tighten Lock Nut after adjusting, testing in both upper and lower case to determine that there is no bind.
1. Underwood Portables utilize a Platen with diameter of 1.250".

2. ADJUSTMENTS:
   
   A. Platen should fit snugly between Carriage and bushings with a clearance of approximately .0015" between R. H. Platen End Bushing and R. H. Carriage End Bushing. Platen End Bushing may be emeryed or filed down slightly, if platen is too long to provide this fitting.

   3. To Remove Platen: Loosen R. H. Platen Set Screw and remove (move out) R. H. Platen Knob and Short Shaft. Loosen L. H. Platen Knob Set Screw and remove L. H. Platen Knob. With the R. H. Platen Knob short Shaft, abutting the left end of the Platen Shaft, push the Platen Shaft, left end, into the Platen. Lift right end of Platen upward and to the right to remove.

   4. To Replace Platen: Position left end of Platen Shaft inside the left Platen end. Return Platen to Carriage, positioning left end of Platen on Left Hand Carriage End Bushing, while holding rear arm of the Hold Fast Spring Roll downward to disengage Detent from contact position with Ratchet teeth, moving Platen in to the left. Lower right end of Platen into engaging position with R. H. Carriage end Bushing, prying the right Carriage end outward a little to permit R. H. Platen Bushing, to abut with R. H. Carriage End Bushing as they are aligned. Return Right Hand Knob and Shaft through R. H. Carriage end Bushing and Platen Bushing with flat side of Shaft facing upward and Platen Set Screw aligned. As the R. H. Platen Knob and Shaft is moved in, the Platen Shaft and Cam Assembly will emerge from the left end of Carriage. With the R. H. Platen Knob snug against R. H. Carriage End, tighten Platen Set Screw. Push the Left end of the Platen Rod in (to the right as far as it will go) then replace L. H. Platen Knob with Set Screw positioned over flat of Shaft, push up snug to left Carriage End, then tighten L. H. Platen Knob Set Screw securely. Test Variable for operation after assembling.
1. In normal position the Platen is held to the movement of the Ratchet, by compression of the Cam Finger heads on the Friction Disc (exerted by the Cam in the Platen Rod) which is applied to the Ratchet (sandwiched between the Friction Adj. Nut and the Friction Disc). When the L. H. Platen Knob is "pulled out" pressure of the Platen Rod Cam on the Cam fingers is relaxed, which, in turn, relax their head pressure from the Friction Disc thereby freeing the Ratchet which permits the Platen to rotate without transmitting this motion to the Ratchet.

2. ADJUSTMENTS: Test for proper release of Variable Ratchet by pulling Left Hand Platen Knob outward. Test for slippage by marking a tooth of Ratchet and the Left Hand Platen Hub with aligned marks (from Left Hand Platen Knob "in"), turning the Platen several revolutions with Line Space Lever. Check marks for any variation. If in line, Ratchet functions properly, if not, Variable is slipping.

   A. Remove Platen (See Platen). Loosen Friction Lock Nut and adjust (back out or turn in) Friction Adjusting Nut (with L. H. Platen Knob reassembled on Platen Rod through Variable) test by moving L. H. Platen Knob inward that there is no movement of the Ratchet when pressure is applied by the fingers. Test by moving L. H. Platen Knob outward that Ratchet is free and may be turned easily under finger pressure. When properly adjusted tighten Friction Lock Nut.

   L. H. Platen Knob: When installing the Left Hand Platen Knob (after replacing the Platen and with the Right Hand Platen Knob assembled in position) push the left end of the Platen Shaft in (to the right) as far as possible before Assembling the L. H. Platen Knob. Tighten L. H. Platen Knob set screw tightly. If, after assembly, and pulling "out" the L. H. Platen Knob, there is not a definite click of the L. H. Platen Knob as it is pressed "in", there is insufficient movement inward of the Platen Shaft to disengage the Cam from contact with the Cam Fingers. Remove the L. H. Platen Knob and push the Platen Rod to the right as far as possible before replacing the L. H. Platen Knob.
1. The Rear Feed Roller Shaft with Rollers Assembled bear in grooves in the Rear Feed Roller Operating Levers, right and left, and the Front Feed Roller Shaft with Rollers Assembled bear in grooves in the Front Feed Roller Operating Levers. The forward end of the Rear Feed Roller Operating Levers and the rearward ends of the Front Feed Roller Operating Levers are positioned in Cam flats milled in the Feed Roll Shaft. Pressure of Feed Roll Operating Lever Springs on the bearing ends of the operating Levers maintain the opposite ends of the Levers in the Cam flat of the Feed Roll Shaft and serve to tension the bearing end of the Levers (and the Feed Roller Shaft and rollers) against the Platen. The Feed Roll Shaft Control Bracket Lever is attached (by pivot) to the Feed Roller Release Lever. As the Feed Roll Release Lever is drawn forward, the Control Bracket Lever is drawn upward pivoting the Feed Roll Shaft rearward. Ends of the Operating Levers in the Cam flat of the Shaft are moved upward as the edge of the flat moves under them. Pivoting action of the Levers permits the bearing ends of the Levers to move downward as the Cam Operating ends of the Levers move upward. In this action the Feed Roller Shafts and Feed Rollers are moved out of contact with the Platen.

2. ADJUSTMENTS: Before attempting adjustments, the bearing ends of the Feed Roller Shafts should be polished (with crokus cloth) and slightly oiled and the surface of the Feed Rollers should be cleansed with alcohol. New portables, now leaving the factory, are equipped with identical diameter rollers for both front and rear, making them interchangeable.

A. Feed Rollers: If a test of feed roller pressure (by positioning the Feed Roller Shaft assembled against the Platen and by applying uniform limited pressure to each bearing end of the shaft) determines that all four rollers are not uniformly contacting the Platen, Rollers preventing such contact should be slightly emeryed (uniformly) to permit of such uniform contact of the four feed rollers.

(1) Rear Feed Roller Pressure: Feed Roll operating Lever Springs supply the pressure for contact of the Feed Rollers to the Platen. Only limited adjustment is available through forming the long ends of the Springs which are positioned against the Carriage Bedplate. By forming ends downward will slightly increase pressure; upward will slightly decrease pressure. When replacing these springs, they should be properly tensioned when installed to be uniform with spring on opposite side of rear or front Operating Lever.

(2) Front Feed Roller Pressure: See instructions for Rear Feed Roller Pressure above.

B. Throat Opening: To open the paper feed throat, enabling entry of a greater number of sheets of paper, peening the Operating Lever at point of contact with the Cam Flat of the Paper Feed Shaft will tend to increase the throat opening but will also relax some pressure of the Feed Rollers against the Platen. Peening should be done uniformly on both Front or Rear Operating Levers.
LINE SPACE LEVER: Underwood Portables A F G L.

1. With the Line Space Lever in inactive position, Line Space Lever Buffer Spring limiting the Line Space Lever on L. H. Carriage End Formed Stop, the Line Space Pawl is held clear of the Ratchet Wheel Teeth by the Line Space Gauge Pawl Positioning Top which it rides. As the Line Space Lever is moved to the right, the Line Space Pawl rides over this top clearing the Ratchet Teeth until it moves through the "cut out" slot of the Gauge when it drops down into Ratchet Tooth engaging position, being drawn into that position by the Line Space Lever Spring (which performs the dual function of returning the Line Space Lever to the left as the Line Space Pawl is drawn forward out of Ratchet Tooth Engaging position and holding the Line Space Pawl into engagement with the Top of the Line Space Gauge). Throw (to the right) of the Line Space Lever is limited by contact of the Pawl Top on the formed down top portion of the Left Hand Carriage End which acts as a stop. When the Paper Bail is out (forward) from the Platen, the Line Space Lever is fouled by the left arm of the Bail, preventing throw of Line Space Lever.

2. ADJUSTMENTS: Before attempting adjustments determine that the Line Space Lever Spring is properly connected to the stud of the Line Space Pawl and to the stud positioned inside the Left Carriage End Plate, and that the Line Space Gauge Spring is connected and provides proper tension to maintain the Gauge in set position. Inspect Line Space Pawl for proper position. In replacing the Platen the Pawl must be positioned atop the Line Space Gauge Positioning Platform.

   A. Line Space Pawl: When the Line Space Lever Throw to the right is completed, the Pawl Blade Top must contact its Stop (formed down portion of the L. H. Carriage End) as the Hold Fast Roller engages fully between two teeth of the Ratchet Wheel. Adjust by loosening Hold Fast Roll Eccentric Screw and turn Eccentric Nut until this position of the Hold Fast Roller is correct. Hold Eccentric Nut stationery while tightening Eccentric Screw.

   B. Line Space Lever Buffer Spring is provided to limit the return movement (to the right) of the Line Space Lever and to eliminate noise. It should be positioned properly on the Line Space Lever Pawl Carrying Arm Screw.

   C. Line Space Pawl Carrying Arm Screw Lock Nut must be tight and Pawl must be free on Carrying Arm Screw.

   D. Line Space Lever Pivot Screw Lock Nut must be tight and there must not be any bind of the Line Space Lever on its Pivot.

3. TO REMOVE:

   A. Line Space Pawl may be removed by removing Line Space Pawl Carrying Arm Screw Lock Nut and back out screw. Disconnect the Line Space Lever Spring from the Pawl Arm.

   B. Line Space Lever may be removed by removing Line Space Pawl Carrying Arm Screw Lock Nut, and Screw and Line Space Lever Pivot Screw Lock Nut and the Pivot Screw.
MARGIN STOPS AND LINE LOCK: Underwood Portables (F & G).

1. Margin Stops: The Left Hand Margin Stop Controls the left margin by contact of the Margin Stop forming with the Stop Blade of the Margin Stop Lever.

Line Lock: The Right Hand Margin Stop functions to trip the Bell Pawl and ring the warning bell and to operate the Line Lock controlling the right margin. As the R. H. Margin Stop contacts the Bell Pawl it rides over the Pawl as the Pawl Arm of the Pawl Bellcrank moves downward and the other arm of the Bellcrank to which the Bell Clapper is attached is cocked. As the R. H. Margin Stop clears the top of the Bell Pawl spring action of the Bellcrank causes the Clapper to contact the bell. Seven spaces later the R. H. Margin Stop has contacted the Blade of the Margin Stop Lever moving the Lever to the left in which position the center protrusion (Line Lock Protrusion) of the Margin Stop Lever contacts the arm of the Marginal Stop Keylock Lever, moving the Locking Arm of the Lever in under the Escapement Loose Dog Pivot Screw Head, preventing the Escapement Rocker from rocking and blocking the Typebar Universal Bar, thereby locking the keys preventing Carriage escapement.

Marginal Release: When the Marginal Stop Release Button is depressed the Marginal Stop Keylock Release Lever, to which the Marginal Stop Release Wire is connected, contacts and raises the left end of the Margin Stop Lever, removing the Stop Blade from pressure of the R. H. Margin Stop. This release removes the pressure of the Link Lock Protrusion of the Margin Stop Lever against the Marginal Stop Keylock Lever which disengages the Lever Arm from behind the Escapement Rocker Top Pivot, permitting tripping of the Escapement and movement of the Carriage.

2. ADJUSTMENTS:

A. MARGIN STOPS:

(1) Both Margin Stops must be free to slide along the Margin Stop Bar and the Spring of the Stops must draw the Stop into locked position in the Margin Rack. New Margin Stops may be filed out (inside) to permit of a free but snug fit. The Stop Spring may be removed and spread to increase tension, if necessary.

(2) Banking and Overthrow (Left Hand Margin Stop): The Margin Stop Bar is not adjustable end-wise to position the Margin Stops for elimination of Banking or Overthrow. If the Margin Stop is set at 10 but when the Carriage is returned (to the right) the Carriage Stops at 11 periodically or regularly, the Stop Blade of the Margin Stop Lever (left) should be filed at point it is contacted by L. H. Margin Stop. If the L. H. Margin Stop is set at 10 but when Carriage is returned sharply (to the right) the Carriage stops at 9, periodically or regularly, the Stop Blade of the Margin Stop Lever should be peened at point it is contacted by L. H. Margin Stop. Margin Stop Lever should be removed for such adjustment.

B. LINE LOCK:

(1) Bell Ringers: The Bell Pawl should contact the rear of the flat formed edge of the R. H. Margin Stop in which position when released the Pawl will ride clear of the Stops diagonally formed under body. Adjust by forming Pawl Bellcrank Bell Pawl Pivot shoulder rearward. Determine that Bellcrank Spring is connected and provides proper tension and that Pawl Bellcrank is free on its pivot.

(2) Marginal Stop Keylock Lever Spring should be properly connected and Keylock Lever free on its pivot and its rear lever formed properly for contact by Center (Line Lock) Protrusion of the Margin Stop Lever.

(3) Margin Stop Lever should be free on its pivot and slide freely on rear edge of rear Carriage Rail, with Margin Stop Lever Spring connected and providing proper tension to maintain the Lever against its Right Hand Stop. When contacted by R. H. Margin Stop the Lever should move to the left where its Line Lock Protrusion contacts the rear Lever of the Keylock Lever.

C. MARGIN RELEASE:

The Margin Release Wire (rear end) should be properly connected to Marginal Release Bellcrank, with Bellcrank Spring properly connected and Rear Arm of Bellcrank should be positioned under left end of the Margin Stop Lever in position to transmit motion of the Margin Release Push Button to the left end of the Margin Stop Lever to raise it, disengaging the R. H. Margin Stop from contact with the Right Stop Blade of the Lever, when that end of the Lever drops from contact position.
RACK, PINION AND STARWHEEL: Underwood Portables A F G L.

2. ADJUSTMENTS: The Rack, Pinion and Starwheel must all be of the same Pitch in order to function properly.

A. Rack. The Rack should be true in its entire length and Rack Teeth should engage Pinion as deep as possible without bottoming and without causing a rasping noise as the Carriage is moved to the right. Adjustment of engagement of Rack Teeth with Pinion Teeth is made by forming Limit Arm of the R. H. Carriage Release Lever for earlier or later limit on R. H. Carriage End Plate formed top edge. By forming Limit Arm upward withdraws Rack Teeth from mesh with Pinion; downward enters Rack Teeth deeper into Pinion.

(1) End Shake in Rack may be eliminated by forming Carriage End Tips (where Rack ends limit) to remove end shake, or ends of New Rack may be ground down to clear if over-length. After adjusting determine that Rack does not bind.

B. Pinion: The Pinion should be correctly installed on its fulcrum and operate freely, controlled by the Pinion Pawl (of the Starwheel) with Pinion Pawl Spring retaining the Pawl contacting Pinion Teeth. Too much tension of Pinion Pawl Spring will cause a noise in returning Carriage to the right; too little may result in skipping.

C. Starwheel: The Starwheel operates on Ball Bearings on the Escapement Bracket Plate which is attached to the Shift Frame. The Pinion Pawl (pivoting on the Starwheel) holds the Pinion to the movement of the Starwheel (Carriage moving to the left in typing) by the pressure of the Pinion Pawl Spring exerted on the Pawl. Starwheel should be free on its bearing and perfectly true. If the Teeth of the Starwheel are not true with the body of the Wheel, there will be differential in trip on various out of line teeth in the Escapement Action which will contribute to crowding, piling or skipping.

3. TO REMOVE:

A. Rack: The Rack Pivots on Pivot Screws entering the Carriage End Plate and a center pivot entering the Carriage Bedplate just forward of the Feed Roll Shaft (on Bracket attached to Bedplate with two binding screws). To remove Rack: Remove Main Carriage (See Main Carriage). Remove Rack Pivot Screw (right and left) move Rack to left to disengage Center Pivot from Bracket bearing. Rack may be removed, by maneuvering Rack Release Lever Engagement ends through Bedplate slots.

B. Pinion: Remove Carriage. Remove Front Carriage Rail. Remove Pinion Pivot Screw. Pinion may be removed. In replacing Pinion, be careful to seat Pinion Pawl on teeth of Pinion before tightening screw, determining that Pinion Pawl Spring is properly connected.

C. Escapement Wheel: Remove Escapement Bracket, by removing four binding Screws entering Bracket through rear of Shift Frame. Remove Starwheel Adjusting Screw (be careful not to lose Ball Bearings).

4. TO REPLACE: Reverse above removal instructions.

1. It is the function of the Universal Bar to trip the Escapement Rocker (move the Loose Dog off the Starwheel Tooth) when contacted and moved into engagement position by the Cam Shape of the Typebar Heel. The Universal Bar Blade is positioned in the groove in the rear of and around the segment, is guided by the Universal Bar Guide in the Segment Slot and pivots on and is supported by the Escapement U-Bar Rocker Arms in the rear. The front edge of the blade limits on the Escapement Groove forward edge, its forward position limited by such engagement. The Universal Bar Spring provides the tension for maintaining the U-Bar Blade in its forward limit position.

2. ADJUSTMENTS:

   A. **Universal Bar Guide** is adjustable to centrally enter Segment Universal Bar Guide Slot, by loosening Binding Screws and positioning Guide.

   B. **Universal Bar Rocker Arms** are responsible for positioning the U-Bar Blade flush and parallel with Segment in the U-Bar Groove. Both Arms must provide proper position, otherwise the U-Bar may be contacting Segment on one side and be clear of Segment on the other, which would be noticeable by difference in individual Trip of the outside end Type Bars. Rocker Arms are also responsible for positioning U-Bar Blade centrally in Segment. Rocker Arms may be formed to provide these adjustments.

   C. **Universal Bar Spring** should be connected and provide just enough tension to return U-Bar to Segment Groove Limit position. Too much tension will affect touch and action of the machine — too little will cause sluggish action. Adjustment of tension is made by forming U-Bar Spring Support forward to increase tension, rearward to decrease tension.

3. TO REMOVE UNIVERSAL BAR: Remove Segment and Typebars. Remove Rocker Arm Pivots. Disconnect Universal Bar Spring. Universal Bar may be maneuvered out of front of machine.

4. TO REPLACE UNIVERSAL BAR: Reverse above instructions.
1. The Escapement Action in the Underwood Portables, A, C, D, E, Universal, Typemaster Universal, Champion, Typemaster Champion, Leader and Student Models, is actuated by an Upper Universal Bar as it is contacted and moved by the cam shape of the Typebar heel. As the Keylever is depressed the Sub-Lever draws the lower end of the Typebar forward (through the connecting Typebar Link) pivoting the typehead toward the Platen. As the cam shape of the Typebar heel contacts the Universal Bar Blade which is positioned in the rear of and in a specially formed slot in the Segment (when the typehead is about 1½" from the Platen) the Universal Bar is moved rearward, its Upper and Lower Case Trip equalizes its contacting the Spring Sub-Plate. Sub-Lever, standard themselves forward (through the connecting Typebar Link) flush in the Universal Bar Upper and Lower Case Trip Equalizer. By turning Trip Adjusting Screw clockwise, trip will occur when Typebar is farther from Platen: counter-clockwise, trip will occur when Typebar is nearer to the Platen. Trip Adjustment Screw is accessible for adjusting through large center hole in the Keylever Spring Plate (after removing Rear Name Plate). Adjustment of trip uniformly in both upper and lower case is made by forming Universal Bar Upper and Lower Case Trip Equalizer.

The Underwood Portables follow the pattern of the standard Underwood in many ways. The Keylever, Sub-Lever, Link, Typebar, Upper Universal Bar, Dogs Assembled (Escapement Rocker) and Rocker Arms. The Escapement Rocker is positioned horizontal in what could be referred to as the 9 o'clock position, instead of vertical in what is referred to as the 6 o'clock position, for compactness, but in all other respects operates as does the vertically positioned Rocker. The Trip is accomplished by contact of the Universal Bar Upper and Lower Case Trip Equalizer on the Escapement Rocker Trip Dog located on the Dog end of the Rocker while the Space Bar pulls the left end of the Rocker forward for the Space Trip. The rear of the Universal Bar is supported by and pivots on the Rocker Arms in a similar manner to the standard Underwood with the exception that the Rocker Arms function for no other purpose, themselves pivoting on formed bracket of the Keylever Spring Sub-Plate.

The Rocker Compression Spring, located between the Dog end of the Rocker and the Shift Frame provides the tension for returning the Loose Dog to Starwheel Tooth engaging position while the Rocker Limit Screw positions the Loose Dog for its central position on the Starwheel tooth.

2. ADJUSTMENTS: Before attempting adjustments it should be determined that the Keylevers, Sub-Levers, Typebars and Universal Bar are free on their pivots: Universal Bar is positioned fully flush in the Segment opening (See Universal Bar) with Universal Bar Spring connected and providing proper tension and Universal Bar Guide centrally positioned in the Segment Guide Slot.

A. Escapement Trip:
(1) Master Trip Adjustment: Moving a typebar from either end and center of the typebasket to the Platen, Trip should take place when the face of the type on the typebar is even with the rear edge of the Type Guide top. Adjustment is made by adjusting (turning) Trip Adjusting Screw, which, in turn, positions the Escapement Trip Dog for contact by the Universal Bar Upper and Lower Case Trip Equalizer. By turning Trip Adjusting Screw clockwise, trip will occur when Typebar is farther from Platen: counter-clockwise, trip will occur when Typebar is nearer to the Platen. Trip Adjustment Screw is accessible for adjusting through large center hole in the Keylever Spring Plate (after removing Rear Name Plate). Adjustment of trip uniformly in both upper and lower case is made by forming Universal Bar Upper and Lower Case Trip Equalizer.

(2) Individual Trip Adjustment: Refer to Universal Bar for proper positioning of the Universal Bar Blade in the rear Segment groove (Par. 2B). The Escapement Trip should be uniform and the same in both upper and lower case. If not, the Escapement Rocker Trip Dog contact blade edge should be formed to provide uniform contact on face of the upper and lower case trip equalizer in both cases.

B. Loose Dog: Loose Dog should be free on its fulcrum Screw with "wobble" reduced to a minimum. The Loose Dog "step" is permitted by the Loose Dog Retarding Arm through contact of its limit on the Rocker Frame. The Retarding Arm Spring provides the tension for movement of the Loose Dog "step" after releasing the Starwheel Tooth and should be connected and provide proper tension.

The Loose Dog should be positioned centrally on the Starwheel Tooth, adjustment being made with the Rocker Limit Screw, accessible through the third hole from the right in the Keylever Spring Plate (facing machine from rear) after removing Rear Name Plate.

Skipping may be caused by too much wobble in the Loose Dog on its pivot or too much space between the two dogs. The Loose Dog Rocker contact surface may be emeryed down to reduce clearance between the two dogs. "Wobble" may be overcome by replacing Loose Dog with one providing better fit on its Pivot. If the face of the Loose Dog is worn, it will contribute to skipping and should be replaced.

C. Escapement Rocker Compression Spring should provide sufficient pressure to return the Rocker Loose Dog to Starwheel engaging position after escapement trip. The Spring is positioned on Shift Frame Stud and Loose Dog Retarding Arm Pivot. Tension adjustment is made by spreading the spring or replacing with new. Broken or insufficient tension of this spring may cause crowding and/or skipping.
3. TO REMOVE:

A. Escapement Rocker: Remove Main Carriage (See Main Carriage). Remove Rigid Dog Fulcrum Screw. Escapement Rocker may be removed from the machine. Be careful not to lose Escapement Compression Spring. To replace, position Compression Spring on Shift Frame Stud. Replace Escapement Rocker to position. Insert Rocker Fulcrum and tighten. Replace Carriage.
1. When the Space Bar is depressed the rear Arm of the L.H. Space lever draws the Space Bar Connection forward. The Escapement Trip Arm of the Space Bar Connection is positioned behind the left side of the Rigid Dog (Escapement) Rocker and as the Connection moves forward the Escapement Trip Arm of the Connection draws the left side of the Escapement Rocker forward, while the right side of the Rocker, bearing the Loose Dog and Stationary (Rigid) Dog moves forward, disengaging the Loose Dog from its position on the Starwheel Tooth, permitting one trip escapement. The Space Bar Spring returns the Bar and Connection to inactive position when the Space Bar is released.

2. ADJUSTMENTS: Before attempting adjustments it should be determined that the Space Shaft is free on its pivots with end shake reduced to a minimum (Space Shaft Brackets may be formed to provide this fit); Space Bar Spring properly connected to R.H. Space Lever and under front Comb in dent of position; Space Bar Connection free on the Space Bar Connection Stud and Escapement Trip Arm of the Space Bar Connection clearing (not limiting) the Escapement Rocker.

A. Up-Stop: The front U-shaped form of the Frame Cover Plate provides the Up-Stop and Down-Stop for the Space Bar Stops. In normal position the bottom of the Space Bar should be level with the top outer (higher) edges of the Front Frame Cover Plate, in which position the front ends of the Space Levers (covered with rubber pads) should uniformly contact and limit on the inside top edge of the Front Cover Plate formed U.

B. Down-Stop: The Space Trip Should take place when the top of the Space Bar is level with the top of the Front Frame Cover Plate outer (higher) edges. There should be approximately one-sixteenth inch further depression of the Space Bar, after the Trip takes place before the Space Bar Stops contact the lower edge (down-stop) of the front Frame Cover Plate lower edge. Adjustment is made by forming the Space Bar Stops.

C. Space Bar Spring should be properly connected and provide proper tension to return Space Bar to inactive position (up-stop) when Space Bar is released.

3. TO DISASSEMBLE:

A. Space Bar may be removed from its Levers by removal of two binding screws at each end (under) Space Bar.

B. Space Shaft may be removed by bending Shaft Pivot Brackets outward.

C. Space Bar Spring may be inserted on Space Bar Shaft, with Shaft removed from its Bracket.

D. Space Bar Connection may be removed, by removing Space Bar Connection Screw, moving Escapement Trip Arm to the left from behind Escapement Rocker and forward slightly so that the front end of the Connection may be disengaged from stud on the L.H. Shift Lever, then draw rearward and out.

4. TO ASSEMBLE:

Reverse above instructions.
1. **Ribbon Feed**: The Ribbon Feed is actuated by the Ribbon U-Bar (when a Keylever is depressed) through the Ribbon Feed Connection which is moved forward in the rocking action of the Ribbon U-Bar Shaft. The front end of the Ribbon Feed Connection is provided with a tooth which engages the Ribbon Drive Shaft Gear, the tooth of the Connection being formed to permit return (rearward) movement of the Feed Connection without transmitting this motion to the Drive Shaft Gear, which is held stationary by the Ratchet Pawl of the Drive Shaft Bearing Bracket. The teeth end of the Feed Connection is held engaged to Drive Shaft Gear by the Feed Connection Spring. As will be noted in the drawing the Drive Shaft Gear moves in one direction only, feeding the ribbon on the up-stroke of the Typebar. This movement of the Drive Shaft is transmitted to the Drive Shaft worms which are attached (by binding screw) to each end of the Drive Shaft, the Drive Shaft Worm on the Feeding Spool side being engaged enmesh with the Spool Shaft Gear, thereby transmitting the movement of the Drive Shaft to the Spool Shaft and Spool on the feeding spool side.

**Ribbon Reverse**: When the Ribbon unwinds from the spool on one side, the eyelet in the end of the ribbon contacts the Ribbon Arm moving the top of this arm outward drawing the Ribbon Arm Connection Wire (which is attached to the lower part of the Arm) upward, drawing with it the rear of the Ribbon Reverse Pawl while the tooth (forward) end of the Pawl is thrown into the teeth of the Shaft Worm Gear. Constant rotation of this Gear (and Shaft) causes the Reverse Pawl to ride over the Shaft Worm Gear drawing the Gear and that end of the Shaft rearward to engage the Shaft worm on the empty spool end into mesh with the empty Spool Shaft Gear, the Shaft pivoting in the center (on the Drive Shaft Bearing Bracket), the opposite end (including Worm Gear) being freed from mesh with Spool Shaft Gear on full spool side.

If the Drive Shaft Knob is held in the exact center of the slot, both Worm Gears will clear Ribbon Spool Shaft Gears freeing the Ribbon Spools for manual winding on either spool.

It will be noted that unless an eyelet is positioned in each end of the ribbon (about 5 inches in from each end) the ribbon reverse mechanism cannot function.

2. **ADJUSTMENTS**: Before attempting adjustments it should be determined that proper ribbon (with eyelets) and proper Ribbon Spool is correctly installed and threaded (through forks) of Ribbon Arms (through Ribbon Guide) and that Ribbon Arm Springs are properly connected and Ribbon Arms are free on their pivots. The Ribbon Feed Connection Spring must be properly connected, otherwise the teeth of the connection may not position properly in the Drive Shaft Gear to rotate the Shaft for Ribbon Feed.

A. **Ribbon Feed**:

1. **Ribbon Universal Bar** must be free on its pivots. U-Bar Bracket Binding Screws are positioned in slots for adjusting purposes.

   a. **Ribbon U-Bar Spring** must be properly connected and provide sufficient tension to return U-Bar and Ribbon Feed Connection to inactive position when Keylever is released.

   b. **Ribbon Feed Connection Tooth** must be in good condition and Connection Spring must be connected and provide proper tension to maintain teeth of the Connection enmesh with Feed Shaft Feed Gear.

   c. **Ribbon Drive Shaft** must be free on its bearing in the Drive Shaft Bearing Bracket, permitting the Shaft to teeter for engagement of either end Worm Gear with Spool Shaft Gears.

   d. **Ribbon Feed Shaft Worm Gears** must be positioned for proper mesh with Spool Shaft Gears and Worm Gear Set Screws must be tight.

   e. **Drive Shaft Throw Cams** (left and right) function to hold the Drive Shaft level and the Worm Gear on either end enmesh with the Spool Shaft Gear, operating as a Detent. The forward ends of the Cams must be aligned to limit on Sub-Frame Casting, held in limit position by tension of Drive Shaft Throw Cam Springs. It is the function of these Cams to provide a bearing and to retain the free ends of the Ribbon Feed Drive Shaft in controlled position until that position is changed by the automatic ribbon reverse mechanism.

   f. **Ribbon Spool Shafts** must be free on their bearings with very little up-down movement, approximately .006" between top of Spool Shaft Gear and bottom of Spool Shaft lower bracket. Adjustment may be made, after loosening Spool Shaft Collar Set Screw, by pressing upward on Spool Shaft Gear, holding in this position while tightening Collar Set Screws. In this position the teeth of the Spool Shaft Gears will position parallel with the center of the Ribbon Drive Shaft Worm Gear (when engaged) in which position it functions accurately providing proper mesh with the Worm Gear.

   g. **Ribbon Arms** (right and left) must be free on their pivots and Spring properly connected and provide sufficient tension to return Arm to upright limit position when released by eyelet in Ribbon end.

   h. **Ribbon Reverse Pawl** (right and left) must clear Feed Shaft End Gears by about .025" with Feed Shaft End Gear in forward position (Worm Gear enmesh with Spool Shaft Gear on opposite side) and Ribbon Arm limiting on its Bracket with Connection Wire of proper form and length to provide for this clearance. Connection Wire may be formed or straightened, if necessary, to provide this clearance. Care should be taken that such forming does not prevent contact of Reverse Pawl tooth with Feed Shaft End Gears at time of ribbon reverse.

3. **DISASSEMBLY**:

A. **Ribbon Spool Shaft**: Loosen Collar Set Screw beneath Spool Cup. Spool Shaft assembled may be removed through bottom of machine.

---

**DISCLAIMER**: The content provided is a partial transcription of a document related to Underwood RIBBON FEED, likely from an old typewriter manual. The full context and precision of the technical details may not be entirely accurate or complete due to the limitations of the transcription process. Readers are encouraged to consult the original source for the most accurate and comprehensive information.
B. Drive Shaft Assembled:

(1) Remove Drive Shaft Throw Cam, right and left, after disconnecting Springs, by removing Cam Pivot Screw. Shaft may be drawn out of Drive Shaft Bearing Bracket.

(a) Worm Gears: Loosen Binding Screw. Move Gears off ends of Shaft.

(b) Drive Shaft Bearing Bracket and Ratchet Pawl Assembly: Disconnect Ribbon Feed Connection Spring. Remove two Binding Screws attaching Bracket Assembly to Sub-Lever Sub-Frame.

(c) Ribbon Feed Connection: Disconnect from Ribbon Universal Bar Arm by spreading connector.

Disconnect Spring. Feed Connection may be removed from machine.

C. Ribbon Universal Bar:

(1) Disconnect Springs.

(2) Loosen Bracket Binding Screws, sliding Brackets outward.

(3) Remove Ribbon Throw Connection Adjusting Clip by removing Binding and Adjusting Screw, disconnecting Clip from Bellcrank Wire.

(4) Disconnect Ribbon Feed Connection (See 3B(1)(c) above.)

(5) Ribbon Universal Bar may be removed from base of machine.

4. ASSEMBLY: Reverse above instructions.
1. The Ribbon (Bichrome) Cover mechanism of the typewriter governs the positioning of the Ribbon Carrier and the Ribbon at the printing point synchronized with the arrival of the typebar type. The Ribbon Cover is actuated by the Ribbon Universal Bar when contacted by a Keylever (not the Space Bar). As the Ribbon Universal Bar Blade is moved downward by the Keylever, the Ribbon Throw Bellcrank Connection (link) pulls the front arm of the Bellcrank downward, the rear arm moving the Ribbon Throw Toggle Actuating Link to the left. This motion is transmitted to the Ribbon Throw Toggle Arm which is attached (rivet pivot) to the Ribbon Carrier Actuating Lever, which in turn, raises the Ribbon Carrier and the Ribbon to the Printing position. Whether the Ribbon will be raised to print on the top (black) or the bottom (red) or cut out entirely (in order to type directly on duplicator stencils) depends upon the position of the Color Selector Lever in the Color Selector Lever Bracket.

The Ribbon Carrier Actuating Lever Fulcrum Assembly is a floating pivot for the Ribbon Carrier Actuating Lever. When its Stud (fulcrum) is positioned (by the Color Selector Lever being set in Black position) in the right end of the oval shaped slot in the Actuating Lever, movement by the Ribbon Throw Toggle Actuating Link and Ribbon Throw Toggle Arm positions just the top half of the ribbon in printing position. When set in stencil position the fulcrum is over the open center section in which position the fulcrum is free (no friction) and the Actuating Lever is not pivoted, therefore the left end (Ribbon Carrier Connection) is not raised and the Ribbon does not cover the type. When the Color Selector Lever is set in Red (top) position, the fulcrum moves to the left end of the oval shaped slot, providing the Actuating Lever a fulcrum for highest movement of its left end connection with the Ribbon Carrier thereby raising ribbon to Red (bottom half) position.

2. ADJUSTMENTS:

A. Ribbon Position: Before attempting Ribbon Cover Adjustments, test the Ribbon position with Carriage in normal non-shift position the top of the Ribbon should be parallel with the top of the Line Finder Frame (about .055" above flat top of the Type Guide). The left end of the Ribbon Carrier Actuating Lever limits on the Shift Frame Front Rail Brace Finger (covered with a cloth spat for quietness) located behind and slightly to the right of center of the Segment. This finger may be formed to provide this Ribbon position (upward raises ribbon: downward lowers ribbon). With Color Selector Lever in Stencil (white) position and typing with the Underline ___ key, if positioned properly the underline will not print.

B. Ribbon Throw: With ribbon positioned correctly as indicated in Paragraph 2A above, with Color Selector Lever set in Black (bottom) position, typing with the diagonal / and underline ___ keys, there should be no bleeding of colors (when using two colored ribbon). Shifting Carriage to capital (upper case) position, with Color Selector Lever set in Red (top) position, typing with the underline ___ key, underline should print clearly. The Ribbon Bellcrank Connection (link) Bracket on Ribbon Universal Bar Blade is adjustable to raise or lower the height of ribbon throw (to cover tops of letters cutting off or prevent bleeding or bottoms of letters cutting off). Adjust by loosening Bracket Binding Screw just friction-tight and loosen Bracket Adjusting Screw, positioning right end (Bracket Connection End) up or down to provide more or less height to the Ribbon Carrier and Ribbon.

NOTE: When properly adjusted, with Color Selector Lever seated in any of its three positions, depression of a Keylever should position the Ribbon Throw Toggle Arms (upper and lower) to form a straight line in which position maximum ribbon throw is obtained for that adjustment of the Ribbon Throw Bellcrank Connection Bracket.

C. Ribbon Carrier: The Ribbon Carrier must be free on its pivot, hugging the back of the Type Guide in both upper and lower case positions and travel vertically with a minimum of side play. The Carrier is provided with Side Guide Lugs, which may be formed to eliminate side play on the Type Guide.

D. Color Selector Lever Positioning Mechanism: With Color Selector Lever set in red (top) position the Ribbon Carrier Actuating Lever Fulcrum Arm limits on the upturned formed Stop of the Ribbon Throw Bracket synchronized with the fulcrum positioning in the left extreme end of the oval slot of the Ribbon Carrier Actuating Lever. With Color Selector Lever set in Black (bottom) position, the Ribbon Carrier Actuating Lever Fulcrum must position in the extreme right end of the oval slot of the Ribbon Carrier Actuating Lever. Friction of the Color Selector Lever on its Bracket maintains the mechanism in proper position. The Color Selector Lever may be formed to provide proper friction to retain it in set position in its Bracket.

3. DISASSEMBLE:

A. Ribbon Carrier may be removed, after removing Platen (see Platen) by disconnecting Carrier from Ribbon Carrier Actuating Lever, moving the Carrier up to disengage lugs from Type Bar Guide, and out.

B. Ribbon Throw Assembly: Open Ribbon Throw Bellcrank Spring Clip, disconnecting Right end of Ribbon Throw Toggle Actuating Link. Remove Ribbon Actuating Lever Fulcrum Arm Link Screw. Remove Platen (see Platen) disconnecting Ribbon Carrier from Ribbon Carrier Actuating Lever. With Carriage to extreme left, remove two binding screws attaching Throw Assembly to lower part of Front Rail. The assembly may be raised up out of the machine.

4. ASSEMBLY:

Reverse above instructions.
1. As the Back Space Key is depressed, the rear end of the Back Space Key Lever moves upward drawing the Back Space Link (Lever) upward while the Back Space Bellcrank left Arm is drawn forward and its rear arm and the Back Space Actuating Link (to which it is attached) move to the left. The Back Space Stop pivots on the Pinion Screw with its jaws positioned astride of the Back Space Pawl Stud which is also positioned in the Jaws of the Back Space Actuating Link which functions to control the movement of the Back Space Pawl in upper or lower Case. The Back Space Pawl pivots on the Back Space Pawl Carrier which has free bearing on the rear edge of the Pinion Wheel being maintained in that position by the Back Space Pawl Carrier Retainer. The Back Space Pawl Carrier, Back Space Pawl and Back Space Stop are attached to the Shift Frame and move up and down with the Shift Frame when the Carriage is shifted. Movement of the Back Space Actuating Link is transmitted to the Back Space Pawl in either case position because of the Back Space Pawl Stud position in the Jaws of the Actuating Link.

Movement to the left of the Back Space Actuating Link, when the Back Space Key is depressed, is transmitted to the Pawl Stud which moves the Back Space Pawl into mesh with the Pinion Wheel (position of the Back Space Pawl between the proper teeth of the Pinion for one-space Back Space being determined by the Back Space Pawl Carrier Arm contact with the Back Space Pawl Carrier Arm Limit Post) and then draws the Back Space Pawl Carrier Arm around as the Pinion Wheel is rotated clockwise (by the Back Space Pawl) moving the Carriage to the right through contact of the Pinion Wheel in the Carriage Rack. The Pinion Pawl permits the Pinion to back up with the Carriage Rack in this operation without transmitting this motion to the Starwheel which is prevented from movement by the Escapement Wheel Detent Dog.

The “throw” of the Back Space Pawl is limited by contact of the Rack Tooth Engaging Blade of the Back Space Stop with the Rack teeth, as the rear extension (top edge) of the Stop moves in behind the Rack to prevent its becoming disengaged from the Pinion.

When the Back Space Key is released the Back Space Pawl Carrier rear arm returns to its Limit Post with the Back Space Pawl sliding over the Pinion Teeth in this movement. As the Actuating Link moves further to the right the Back Space Pawl is withdrawn from the Pinion teeth (the Back Space Pawl Stud in the Jaws of the Actuating Link performs this function).

2. ADJUSTMENTS: Before attempting adjustments determine that all parts are free on their fulcrums (pivots); there is no lost motion between the end of the Back Space Lever and the Back Space Actuating Link and that the Back Space Actuating Link starts moving to the left as the Back Space Key is first depressed. Determine that the Back Space Pawl Carrier Spring is connected and provides sufficient tension to retain the Carrier Arm, against its limit post and that the Back Space Keylever Spring is connected and provides sufficient tension to retain the Back Space Key upright and Actuating Link and Back Space Pawl in proper position. Determine that the Back Space Pawl Carrier is positioned properly on Pinion Wheel and that it is retained in position by the Back Space Pawl Carrier Retainer.

A. The Back Space Keylever Spring provides the tension for returning the Back Space Actuating Link to its rest position (left end of Link Slot) limiting on Actuating Link Bracket (Stud) and as this position of the Link is essential to seat the Back Space Pawl clear of the Pinion Wheel, it is essential that the Back Space Keylever Spring be connected and provide sufficient tension to retain the mechanism including connections in this position.

B. The Back Space Pawl Carrier Limit Arm engagement with its Limit Post positions the fulcrum of the Back Space Pawl for proper engagement between the Pinion Teeth for single Space Back Spacing.

(1) If Back Spacer is overthrowing (spacing more than one space) form Limit Post downward.

(2) If Back Spacer is underthrowing (not back spacing one space) form Limit Post upward.

C. The Back Space Actuating Link left end of slot must just Limit on Back Space Actuating Link Bracket Stud. Bracket may be formed slightly to provide such contact with Link Limiting properly. There should be approximately 1/8" movement (to the left) of the Back Space Actuating Link (when the Back Space Key is depressed) before the Limit Arm of the Back Space Pawl Carrier moves off its Limit Post.
TYPEBARS, SEGMENT, LINKS, SUB-LEVERS AND KEYLEVERS: Underwood Portables ACDEFGLS.

1. The Typebars of the Underwood Portables are motivated by the Keylevers through the connecting Sub-Levers and Links. The Typebars bear embossed numbers from No. 1 to No. 42 (left to right). The Links are all formed differently and are not embossed with position numbers. In removing, a specially drilled board should be used to position the links in order and with Sub-Lever connecting ends downward. The Sub-Levers are embossed with numbers from No. 51 to No. 92, locating their position from the left to right. Keylevers, for each of the four banks, may be uniform in size and shape differing only in the position of the Stud which actuates the Sub-Lever, for this reason the Keylevers are not interchangeable. Keylevers are embossed with numbers from No. 51 to No. 92 corresponding to the Sub-Lever numbers. Keylever tension springs are provided on the Keylever Spring Sub-Plate, Keylever Spring Adjusting Screws for the purpose of adjusting individual keylever (touch) tension.

2. ADJUSTMENTS:

A. Typebars should be adjusted (by forming) to enter Type Guide centrally without rubbing or Binding on either side of the Guide Slot, and should be formed to contact the Segment Abutment Ring at the time the type face (of the typebar) contacts the Platen with 1 sheet of paper inserted (See Ring and Cylinder). Types should be aligned properly (See Alignment-Typewriter Mechanical Training Manual, Volume 1, Standards).

B. Sub-Levers should be aligned to draw the Typebars (through connecting Links) forward without binding Typebar and without collision with adjoining Sub-Levers or Links. This type of aligning is performed with T-Slot Bender.

C. Keylevers: The Keycup on the Keylevers should be level for each bank (row of keys). Adjustment is made with Peening Pliers, peening the lower edge of the Keylever, raises the Keycup; peening the top edge of the Keylever, lowers the Keycup. It should be determined that Keylever Springs provide proper tension to hold Keylever in "up" position and that nothing is preventing the Keylever from reaching this "up" position before peening. Keylever Spring tension should be uniform across the keyboard. A Keylever weight should be used for this purpose, with Typebars, Links and Sub-Lever connected. It is essential that the Typebars be free in the Segment Slot before weighing up the Keylevers.

3. TO REMOVE:

A. Typebar or Bars: Enter thin Screwdriver in Fulcrumbar Slot of Segment, behind the end of Fulcrum Stop Stud and pry forward on end of Stud to move it forward (out of Fulcrum Wire Slot) on both ends of Segment. Place follow-up Segment Fulcrum Wire in Segment Slot, moving Segment Fulcrum Wire around until typebar to be removed is positioned at union of the two Fulcrum Wires. Spread Fulcrum Wires slightly to free Typebar. Depress Keylever as the Typebar is moved forward (out of Segment Slot). Unhook Typebar from Link. To remove all Typebars (which is not necessary in cleaning a typewriter), move Segment Fulcrum Wire out sufficiently to make it accessible to the fingers when it may be removed and the Typebars removed in proper order No. 1 to No. 42. Typebars should be strung on wire or laid out in numerical order for ease in replacing.

B. Connecting Links: Links are of different size and shape and for accuracy and ease of replacing in proper position it is recommended that they be removed and placed downward in drilled board in proper numerical order with end of Link contacting Typebar, positioned upward. Link Hooks No. 1 to No. 21 inclusive face left on Sub-Lever, right on Typebar. Link Hook No. 22 to No. 42 inclusive face right on Sub-Lever, left on Typebar.

C. Sub-Levers: Loosen Sub-Lever Fulcrum Rod Set Screws (under machine at either end of Sub-Lever Sub-Frame). Insert Follow-up Sub-Lever Fulcrum Rod in Sub-Lever Sub-Frame Slot, moving Sub-Lever Fulcrum Rod out opposite side of machine until Sub-Lever to be removed is positioned at union of two Sub-Lever Fulcrum Rods. Spread Fulcrums slightly and disengage Jaws of Sub-Lever from Keylever Stud as the Sub-Lever is removed. To replace, reverse these instructions.

D. Keylevers: Remove Keylever Lock Plate (from rear of Carriage Frame) by removing three (3) binding screws. Back out Keylever Spring Tension Adjusting Screw of Keylever involved, slightly to relax tension. Press rear end of Keylever downward to disengage from its rear fulcrum and draw forward to disengage Keylever Stud from Jaws of Sub-Lever. Keylever may be drawn forward out of machine. To replace, reverse these instructions.

E. Segment: Remove Typebars (See Par. 3A above). Remove two Segment Binding Screws. Pull Segment out slightly while entering Screwdriver with wide blade behind Segment to disconnect Ribbon Guide Connection from the Ribbon Carrier Actuating Lever. The Ribbon Guide may be raised to disconnect its lugs from the Type Guide as the Segment is removed.
TYPE GUIDE

ABUTMENT

FULCRUM WIRE STOP STUD

TYPEBAR LINK

TYPEBAR

TYPE BAR FULCRUM