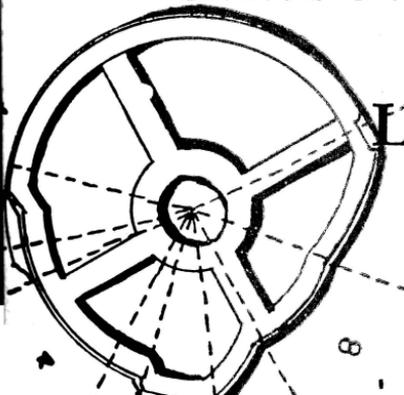
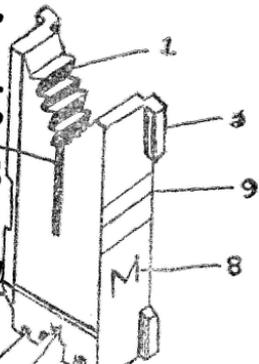


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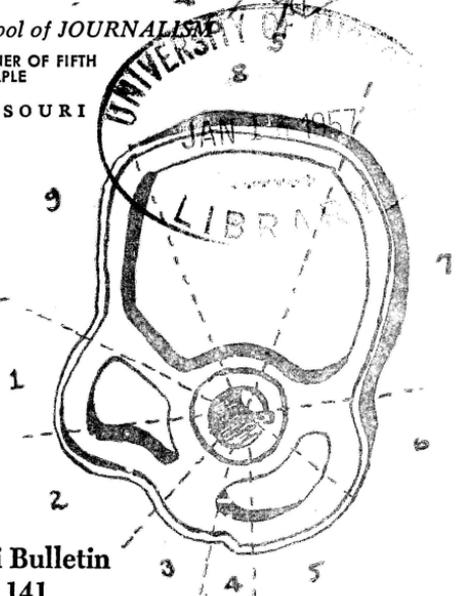
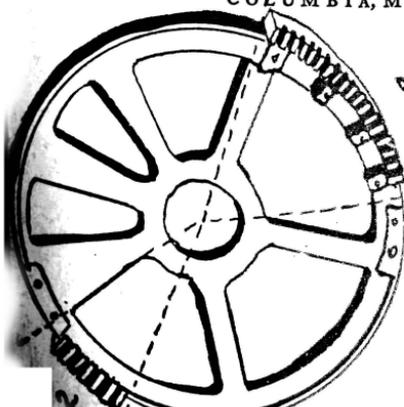
for

Linecasting Machines

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COLUMBIA, MISSOURI



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Preface

THIS SECOND EDITION of the Maintenance Check List is compiled to provide a quick ready reference of common ills and cures of linecasting machinery. It also includes care and adjustments of the machines as recommended by the Mergenthaler Linotype Company.

There has been no attempt to make this book difficult by introducing subjects beyond the scope common to all machines. On the contrary, the end in mind is that the work be a useful tool to any man with casual machine knowledge who desires to solve his own problems. It is interesting to speculate on how much money is paid out each year by shop owners to have high priced machinists come in to correct problems that they could well solve themselves, given something to work with. It is hoped that to these men the book will provide a convenient, practical source of help and information.

As in all such works as this, much has been left unsaid. Time and money are, of course, prohibitive factors and a necessity for selection was inevitable. Any suggestions for future inclusions, comments, or criticisms will be appreciated by the author.

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PART I

Matrices Will Not Fall

PART I SECTION A

Faulty Matrices

If the fault occurs in the lighter matrices of the font, it would be advisable to check the matrices, before blaming the machine.

1. *Dirty Matrices*: They can't clear the escapement verge fast enough, so the return stroke of the verges catches them. When mats show an accumulation on the edge of the ears at the casting side, they need cleaning. These lugs should be kept shiny. Clean every three months with rotary brush, or eraser, or by rubbing edges of the lugs on cardboard. Clean only the lugs to avoid damage to sidewalls of the mats.
2. *Damaged Matrices*: The operator or the machine can do the damage here.
 - A. Check the setting of the assembler slide clamp adjusting screw to avoid tight lines.
 - B. Check lockup of mold with mat line.
 - C. Check lift and transfer from distributor box to combination bar.
3. *Sprung Matrices*: If mats are sprung at the combination, they might look uninjured to the eye, but will not release from the magazine properly. "Mike" them across the upper lugs, if there is no mat anvil handy. Reading should be .75". Stand mat on edge and tap upper lug with brass or plastic hammer to correct.
 - A. Check transfer from first to second elevator.
 - B. Check transfer from second elevator to distributor box.
 - C. Check transfer from distributor box to combination bar.
4. *Not Enough Matrices in Magazine*: The mats behind the one dropping give added push. Keep more sorts of the thin mats in the magazine.

PART I SECTION B

Faulty Keyboard Mechanism

If the long keyrods (Reeds) above the keyboard don't operate when the key button is depressed, the trouble may lie in the keyboard. An exception to this will be when the keyrod has bounced once then stuck in an "up" position. Many times, however, the keyrod will respond, yet the trouble may still be located in the keyboard.

1. *Keyboard Rollers*: If they are worn, hard, or glazed, they will not lift the cam high enough. Replace them, or try rubbing them with coarse glass paper, or medium fine emery, and moistening with benzine. Wash rollers every three or four months with warm water and soap.
2. *Cam Yokes*: May bind or be restricted in their strokes.
 - A. If the end of the yoke is dirty or gummy, remove yoke and wipe with rag soaked in white gas. Use same rag around end of 6-point reglet to clean guide slot in keyboard.
 - B. Check to see that the hook on the end of yoke hasn't been smashed or bent. Yoke must fulcrum freely on wire. Straighten carefully. If it still seems to bind on the wire, perhaps wire is bent at that point. This happens when plunger frame is shut on a yoke not hooked on the wire. Push wire along about 1/4" to allow bent part to fall between yokes.
3. *Cam Teeth*: If they are worn smooth, or filled with gum, they'll slip. Clean with a toothbrush and white gas. Sharpen by holding yoke in upright position and scraping teeth with file in direction of hook on yoke. Don't overdo it, and never file sharp biting teeth on the cams.
4. *Cam Frame Too Low*: Cams can't clear stop pins when key button is depressed. Always fit cam frame properly before tightening it on machine.
5. *Worn Stop Pin on Cam Stop Strip*: If notch wears in stop pin, cam may be unable to fall. Remove section of stop pins (cam stop strip) and flatten out pin with file.
6. *Trigger Not in Weight*: Remove cam frame, wire triggers, replace cam frame, and pull wire. Check to see if trigger wire has been bent.
7. *Cam Stop Strips Set Wrong*: If the stops of the strip are rubbing sides of cams, the latter may not drop. Loosen screws in cam stop strip and tap until stops are centered in cams.
8. *Plungers Binding on Cam Yoke*: Plungers should clear cam yoke by about .010".

9. *Weight Bound by Banking Bar*: This will generally happen in replacing weights on oldstyle machines. Might try loosening bar slightly and lifting weight up, but it's touchy as others will drop. If they do, take bar off, reset weights in support strips, holding them with strip of wood or elastic bands. Then slide banking bar under notch in weights and carefully lift them until bar can be seated. (Weights are enclosed in a removable bracket on newer models, thus eliminating this problem.)

PART I SECTION C

Faulty Keyrods and/or Releasing Levers

A characteristic of this trouble will be the keyrod or lever bouncing up as the keybutton is depressed, then sticking.

1. *Bent or Burred Guide Slots*: Raise magazine to uppermost position. Ease small screwdriver between rod or lever and guide slot to straighten the latter.
2. *Bent Upper Keyrod Guide or Upper Releasing Lever Guide*: Whole guide may be bent in an arc, binding one or more rods or levers. Gentle pressure will straighten this, if direction of bend can be located, thus freeing rod or lever.
3. *Releasing Levers not Aligned With Magazine Escapement*: Place bottom magazine in operating position. Examine alignment from rear of machine. Loosen screws on either end of upper releasing lever guide, tap guide to re-align levers. Improper alignment may cause levers to stick between escapement pawls, thus causing damage when magazines are changed.
4. *Bent Lever or Rod*: May be able to straighten them while they are on the machine with a pair of duck-bill pliers, but in serious cases it is best to remove them.

PART I SECTION D

Faulty Escapement Mechanism

These parts are well protected and normally give little trouble, although cleanliness is necessary. Never try to yank defective or wrong font matrices over the pawls. Remove them from the rear of the magazine. Clawing up into a magazine with a heavy hooked wire is a common source of damage.

1. *Dirt, Gum, Graphite, or What Have You in the Escapement*: Remove escapement frame. (Don't forget to raise rods, if they hook into escapement pawls as on oldstyle Model 5, or single auxiliary magazines working through bail box arrangement.) Flush escape-

ment out with toothbrush and carbon tetrachloride. For a more thorough job, turn escapement over, remove pan, unhook springs, remove plunger retaining plate, and draw pawl verge rod. Remove each escapement mechanism, cleaning parts and shining on graphite board. Clean slots in escapement frame with rotary wire brush or toothbrush and white gas, or carbon tetrachloride. Check for nicks and burrs. *Remember plungers, verges, and verge pawls vary.* Don't mix them up. If the removal of only one mechanism is desired, obtain another pawl rod. Push the pawl rod in the frame out with it until desired escapement is reached. Then separate rods at that point and remove escapement.

2. *Escapement Verge Spring Loose or Weak:* Remove escapement. Turn upside down and remove protecting pan. Strengthen spring if necessary and tuck it back under pawl with pencil or small screwdriver.
3. *Worn Escapement Pawls:* Notch worn where lug of matrices hit. Might try a little doctoring with a file upon removal, but replacement is best.
4. *Plunger Binding on Pawl Verge:* Remove plunger and graphite end of it with a soft pencil.

PART I SECTION E

Faulty Alignment With Upper Assembler Entrance Partition. If the magazine support blocks and bracket mechanism have been manhandled at any time, these parts may be sprung or forced out of place, necessitating re-alignment. A change of point size and/or magazine may show up bent or poorly aligned entrance partitions, as larger matrices will bind, and thin matrices will tip sideways, binding on the corner of the magazine channels.

1. *Seating of Magazines Too Low:* Lug of matrix catches on edge of upper partition, preventing escape from magazine. If not caused by a faulty change of magazine, reset front locating blocks on oldstyle machines to raise lower edge of magazine about 1/32" above upper partition edge. To identify these blocks raise magazines to upper position, stand at rear of machine. Have someone depress magazine shift lever. The sliding mechanism on either side rides on four adjustable blocks—two at the front for magazine alignment with entrance partition, two at rear for aligning magazines vertically with distribution gate. On the newer machines (Blue Streak Models) magazine height is set by adjusting the magazine bracket adjusting screws located

on either side of their respective magazines at the front. Distance between magazines, measured from top of one magazine to the top of the one under it should be 2-1/2".

2. *Bent Assembler Entrance Partition*: Straighten gently with flat-nose pliers.
3. *Upper Assembler Entrance not Aligned*: Loosen screws at either end and tap to re-align.
4. *Magazine not Aligned Horizontally*: Reset locating blocks for horizontal alignment at either side of magazine frames.

PART II

Transposition Troubles

PART II SECTION A

Transposition Troubles

A common cause of transpositions is lack of proper rhythm on the part of the operator, but if the cause is mechanical, the following may be checked.

1. *Worn, Oily, or Hard Rubber Rollers*: To relace, loosen set screw on end of cam frame and remove roller. On oldstyle machines tap off oil ring; on newer machines a quarter-turn will loosen ring, then split old roller with knife. Graphite steel shaft and slide on new roller. (Some start roller, fill it with water and work it on, allowing water to escape; others use tube which roller fits in to facilitate replacement.) Don't twist roller. Check for equal diameter by laying on flat surface and looking to see if light comes through in places. Before replacing on machine, wipe hole in cam frame clean, put roller through, oil end of roller shaft, then place in position and tighten set screw.
2. *Dirty Magazine, Escapement Channels, or Matrices*:
 - A. To clean magazine: Run out matrices. Remove magazine from machine. Place on workbench and remove mat guard strip at rear. Place a piece of white paper and shine light on it so that reflected light passes through magazine. Clean with long handled, stiff bristled brush, checking to see that no bristles break off and stick in magazine. Recommended cleaning dry, although in a serious case, soaking brush in carbon tetrachloride will facilitate removal of dirt. Some clean magazine with white gas, then powder brush very lightly with graphite and run through magazine to cut gas residue, but there seems to be no particular point to such trouble, and graphite and gas are definitely not beneficial to matrices. If

inside of magazine is oily, use alcohol on brush, then allow to dry. A new magazine should always be cleaned before using, and it may be necessary to clean it fairly frequently in the beginning.

B. To Clean Escapement Channels: Remove escapement from machine and clean channels with rotary brush, or a tooth brush and carbon tetrachloride or alcohol.

C. To Clean Matrices: Rotary wire brush put out by the Mergenthaler Linotype Company is best, but cleaning of lugs may be done with eraser, or by rubbing on cardboard. Soft wire hand brush such as is used on suede shoes may also be used if care is taken not to rub casting face of matrices. Any liquid cleaner containing chromic acid is damaging to matrices. There are liquid cleaners on the market, but they are not especially helpful because:

1. Matrices have to be wiped individually with soft cloth after soaking.
2. Dumping matrices into a container injures sidewalls.
3. Liquid unnecessarily cleans whole mat, and repeated use may break down sidewalls. If matrix picks up oil, wipe off with soft cloth. The part of the mat that needs cleaning is the edge of the lugs only, unless matrix has picked up oil or graphite. To protect sidewalls, never clean the casting edge of the matrix.
3. *Dull or Dirt Filled Keyboard Cam Teeth*: Clean cams with toothbrush and white gas. May touch teeth up with fine three-cornered file, then turn teeth slightly by holding yoke in normal position, turning teeth of cam up and scraping teeth in direction of hook on yoke. Don't cut sharp teeth on cam. Oil cam with clock or keyboard oil—one drop on pin—spin cam and replace.
4. *Assembler Entrance Partitions Incorrectly Shaped*: Mats should hit the assembler belt at less than a 45 degree angle. Bend bottoms of partitions to obtain this.
5. *Assembler Entrance Partitions Not Adjusted*: Straighten if bent sideways. Make distance between outside left partition and the next one quite narrow, or mats bounce from side to side as they fall.
6. *Assembler Chute Finger Not Adjusted*: The new style finger that guides matrices by their lugs should be set to slow larger mats slightly, thus protecting sidewalls of right hand mat in the assembling elevator. The older type finger is set the height of "W" of font in use from chute rails. The points on the finger should be just above lugs of mat that is stood on a horizontally held point of star wheel. (Matrices jump up when hitting oldstyle fast star, and are knocked down by these ends.)
7. *Sluggish Keyboard Rolls*: Check tension of the keyboard roll belt and main drive belt. Check friction clutch on end of rear roller, bending in points of spring to increase tension.

8. *Sluggish Assembler*: Check tension of assembler belt, and main drive belt. Check for loose screws, matrix delivery belt dragging on chute rail springs, or binding in parts.
9. *Matrix Delivery Belt*: Keep light tension on the belt. Adjust by lock nut on upper right pulley. Put belt on machine, rough side out. Check chute rail springs to see that they are parallel, and the upper corners do not dig into belt.
10. *Star Wheel Worn or Improperly Adjusted*: Adjust spring tension so that star can be stopped with forefinger. On new machines the star wheel tension is obtained by removing star wheel from shaft and turning the separate end of the shaft with pliers—clockwise to tighten. Intertype star tension is adjusted by loosening the lock nut at the rear and turning in or out on the knurled knob. On oldstyle Linotypes the assembler block must be removed from the machine and the spring stretched slightly or filed down. When points of the star become rounded, it should be replaced. Check measure of assembler slide with a slug held between assembler slide finger and star, adjusting to about an 8-point thin less than slug measure by means of screw in assembler slide clamp.
11. *Escapement Verge Pawls Not Fully Returning*: Clean mechanism and check pawl spring tension. (See Part I, Section D, No. 1.)
12. *Dirty or Worn Assembler Slide*: For quick cure, flush slide off with white gas. Should be cleaned by removing from machine and washing with gas and cloth. If slide is worn in spots from long setting of one measure, try smoothing out with fine file or oilstone.
13. *Assembler Slide Improperly Adjusted*: Brake spring and/or return spring weak, allows heavier mats to kick slide too far left. Thin matrices then fall to right in assembling elevator and allow on-coming matrix to ride over them. Replace spring, or tighten a bit.
14. *Keyboard Rollers Bulged in Places*: Rollers should be of even diameter throughout their length. Lay on flat surface and see if light shines underneath them at any point.
15. *Keyboard Cam Yokes*: (See Part I, Section B.)

Note: A decided improvement in the assembling of oldstyle machines with fast star wheels may be had by replacing the chute rails with an attachment that brings the assembling belt directly to the star. The mechanism can be attached in about fifteen minutes and a belt is included. Rouse Company and Star Parts Company are makers of this attachment. On many older machines where the chute rails are such that "e's" and "t's" barely touch the belt before assembling, this attachment is a blessing. Cost about \$14.

PART III
Doublet Trouble
PART III SECTION A
Faulty Keyboard

Operator hits the key button and gets half a dozen matrices. This is strictly a mechanical fault. Dirt and gum are the big trouble makers, but burrs or bent parts in the keyboard may also be present.

1. *Temporary Cure:* Remove cam yoke. Top row of keys operate rear cams, second row of keys front cams, third row, rear, etc. To remove yoke, lower plunger frame, tap key, turn keyboard rollers down and in. Hooked end of yoke will rise permitting removal of cam. Insert end of gas can into trigger and give it a couple of squirts, working key lever until gas dries out. Replace yoke.
2. *Permanent Cure:* Clean keyboard whenever necessary. About once every three or four months is standard. To clean keyboard:
 - A. If machine is of Blue Streak series, swing open keyboard by:
 1. Locking keyboard
 2. Removing keyboard driving belt
 3. Disconnecting assembling elevator
 4. Loosening large knurled bolt under left rear of keyboard
 5. Swinging open keyboard
 - B. Wiring triggers:
 1. Run wire through hole in end of cam yoke frame just above the wires that protrude between the roller driving gears.
 - C. Remove protecting pans and em, en, and thin knobs at right end of keyboard.
 - D. Remove cam frames:
 1. Remove large bolt from either end of cam frame and remove frame gently as a unit.

Note: On Intertypes in which keyrods are not supported by a banking bar, do not remove both cam frames at once or rods will fall.
 - E. Remove weights or key bars:
 1. On oldstyle machines remove banking bar at rear of keyboard, then take out weights individually. Keek them in order.
 2. On later series of machines, remove two screws that hold in the weight bracket. These screws are located from the front on the supports on either side of the keyboard about half way to lower part of keyboard.
 3. Remove weights in bracket from rear.

- F. Remove spaceband lever.
- G. Draw out key lever rods from right side of keyboard.
- H. Pull levers from keyboard, keeping them in order and stringing them on the rods.
- I. Clean levers where they enter keyboard and emerge with graphite on a cloth or rotary wire brush.
- J. Shine rods with graphite on a cloth.
- K. Clean weights in white gas.
- L. Shine ends of triggers on rotary brush and check wire.
- M. Wash cams in gas, and oil with clock oil. A paper clip straightened and dipped into the oil makes a good oiler. Keep cams in order.
- N. Wash rollers in warm water and soap.
- O. Check all slots and guides for burrs and nicks.
- P. Clean keybuttons with eraser, or alcohol. Change any necessary ones by pulling off old one and pressing new one on gently with pliers.
- Q. Re-assemble in following order:
 - 1. Key levers
 - 2. Lock them
 - 3. Weights
 - 4. Cam frames
 - 5. Draw trigger wires (top wire)
 - 6. Re-insert spaceband lever
 - 7. Replace protecting pans and operating lever knobs
 - 8. Swing keyboard shut
 - 9. Replace belt and connect assembling elevator
 - 10. Unlock keyboard levers
 - 11. Test all keys

PART IV

Assembler Slide Troubles

PART IV SECTION A

Chattering or Vibrating Assembler Slide

Loose screws, wear, and dirt are the three main causes of assembler troubles.

1. *Brakes Not Holding:* Return spring may be too strong. Should be set to barely return slide. Brake spring stretched. Replace. Oil or graphite on the slide may also cause this condition. Wipe slide clean with gas soaked cloth to remedy condition.
2. *Corners of Brakes Worn:* Remove brakes and turn them over presenting new corners to slide. Pressure from brake release set

screw on brake releasing lever. (Releasing lever is the long piece extending behind assembler slide to assembling elevator.) Clearance of screw should be about $1/64''$.

Note: It must not touch releasing lever when full thirty pica line is assembled.

Screw holding brake lever may be binding at the shoulder. Binding of brake lever and manual releasing lever. Any pressure preventing brake spring to pull lever to the right, bringing brake corners against slide, will cause chattering. Worn slide or oily slide. Loose screws.

3. *Failure To Seat Assembling Elevator:* If operator does not fully seat elevator to return assembler slide releasing lever, brakes will not hold.

PART IV SECTION B

Slide Fails To Return Fully

Slide should return easily. Locate the real trouble rather than start tightening return spring.

1. *Brakes Not Releasing or Return Spring Unable To Bring Back Slide:* Loose screw in brake releasing lever, or loose assembler slide roll stud. (Located behind assembler slide at assembler slide stop.) Dirty, gummy, or worn slide may be cleaned up with gas and a rag. Reset assembler slide releasing screw to just clear releasing lever by $1/32''$ at normal. (Located under right end of releasing lever.) Return spring too weak, or assembler slide roller not turning may cause this trouble.

PART IV SECTION C

Faulty Assemblage of Matrices

Faulty assembling of matrices can be a heckler for both operator and machinist. Following are a few of the causes.

1. (See Part II.)
2. (See Part IV.)
3. *Assembling Elevator:* Check the four pawls at the right end of elevator. Upper two movable ones should have square corners and same spring tension. Lower two must not be bent and should be just clearing assembler block rails. Adjust elevator by gibs and take up all possible play. Star must extend in past the pawls. Renew star, if necessary. Check fibre buffer in right end of front plate. Replace it, if worn. All front and back rails should be no more than width of mat apart. Check, holding screw in bottom of front plate before testing. To change gate clearance: On new

machines reset adjusting screws, on old ones file or replace elevator gate banking screws. Check for play in assembling elevator gate. If roller and stud at left are worn, replace them. If gate is worn around rod, peen it in. On quadder machines, gate should close about .010" after elevator is raised, and so hold mats steady as elevator is raised clear of assembler slide.

Note: Do not oil assembling elevator gibs. Shine up with graphite and cloth. Graphite lubrication is enough. Balancing spring should be set to allow about a three pound lift to elevator, or weak enough to let elevator seat and return assembling slide releasing lever.

PART V

Matrices Pied by the Line Delivery

PART V SECTION A

Faulty Releasing Wire

If releasing wire is set too high, line delivery will start before the assembling elevator is fully raised and secured by the latch. If it is set too low, the line delivery won't release.

1. *To Set Releasing Wire:* Remove front plate of assembling elevator by removing large screw at bottom of elevator. Releasing wire sets on adjusting screw in back plate. Turn down adjusting screw, lowering wire until line delivery cannot be tripped. Raise assembling elevator until it is caught. Turn up on adjusting screw, raising wire until line delivery slide is tripped. Pawl should be lifted about 1/64" above catch on line delivery short finger.

PART V SECTION B

Line Delivery Not Fully Returning

If line delivery does not fully return after delivering the matrices to the first elevator, it will catch on the second tooth of the retaining pawl about a quarter of an inch further to the left than it should.

1. *To Reset Oldstyle Line Delivery (Adjusting From the Rear):* The lever at the front is pinned to the large shaft on this style.
 - A. Tie up spaceband lever pawl (grabber).
 - B. Remove spacebands and take off box:
 1. Disconnect upper spaceband lever from box by depressing

- lever and raising slit screw.
2. Remove large bolt holding box to machine.
 3. Ease box gently off the machine.
- C. Place a six-point slug between line delivery retaining pawl and protrusion on short finger of line delivery.
- D. Loosen two bolts on roller casting at rear of machine. (This is on end of lower of the two large shafts that have rollers working from the No. 10, delivery and transfer cam.)
- E. Run machine around until line delivery roller at rear is opposite high point of cam. This will be just as plunger tries to go down for cast.
- F. Push roller to cam, hold it tight and tighten the two bolts.
- G. Allow machine to come to normal, then test. If line delivery does not come back to allow short finger to clear holding pawl by about 1/64", repeat using more space between pawl and finger
2. *To Reset the New Line Delivery (Adjusting From the Front):*
- A. Run machine around until line delivery roller is on high point of No. 10 cam. (Just as pot plunger starts down for cast.)
 - B. Loosen two bolts that clamp line delivery lever to shaft at front of machine.
 - C. Tap lever to right until protrusion on short finger of delivery is about 1/64" to right of releasing pawl.
 - D. Tighten bolts on lever.
 - E. Run machine to normal and test.

Note: Slamming assembling elevator up, long finger set too close, bent short finger, broken end on long assembling elevator duplex rail, and opening assembling elevator gate when elevator is raised, will cause jams at this point.

PART VI

Faulty Spaceband Box Action

PART VI SECTION A

Spacebands

Many times faulty action of the spaceband box may be found in the bands themselves. It is best never to mix new bands with old ones, nor to allow injured bands to remain unrepaired in the box. Check the bands in cases of irregular box action. All bands should hang the same distance in the box. They should have square, flat-edged ears, and the sleeve should slide freely the full length of the wedge.

1. *Binding of Sleeve and Wedge*: Injured sleeves or wedges will not allow the latter to drop fully. These bands will act as short bands, swinging forward too soon over the chute plate when released, thus jamming in the box. Check by sliding sleeve the length of wedge. Recasting with line stop set too wide will sometimes cause this damage as band may catch on left vise jaw. Sleeve and wedges may be interchanged on the same type bands by driving pin at bottom of wedge, thus permitting removal of sleeves.
2. *Bands of Different Lengths in Box*: Mixing old bands with worn ears with new bands. The long bands will not swing clear of the chute plate, causing jamming, while short bands clear plate too soon. Old bands will hang lower in the box as wear on the ears increases.
3. *Worn Lugs on Bands*: Band lugs, or ears, wear in two ways. A shallow arc wears up into the bottom of the lug, and the bottom edges become rounded, permitting box pawls to slip from under it rather than lifting band. Bottom edge of band ears must be kept flat and square for proper box action. Careful correction with fine flat file will restore worn sleeves. Excessive wear will necessitate changing of the sleeves.
4. *Bands Placed Backward in Box*: Careless operators may sometimes do this. It creates two major troubles—improper functioning of the box, as bottom of band wedge cannot clear chute plate properly; and damage to the mats. The casting edge of bands should “mike” a plus to the opposite edge. Turning the band around allows metal to force between matrix and band, breaking sidewalls. Remove any band that does not “mike” a plus on the casting edge.
5. *Dirty Bands*: Bands must be kept clean, if they are to function properly and prevent damage to matrices. If they are dirty, the wedge will stick to the sleeve, and if metal is allowed to accumulate at the casting point on the sleeve, matrix sidewalls are destroyed. Clean bands after every eight hours usage, using a white pine board and a light sprinkling of graphite. Do not rub bands 'round and 'round. Use back and forth motion the long way of the wedge, as the sharp edges of the band must be preserved to prevent metal from wedging between matrix and band at casting. This is a frequent point of neglect in many shops. The new Linolized bands will not pick up metal as rapidly, but cleaning should not be neglected, if only for lubrication purposes.

Note: *Spacebands recently on the market have broader sides on the wedge than do the older bands, preventing the interchanging of sleeves and wedges of these two types. However, the sleeves and wedges*

of bands of the same thickness and type may be interchangeable. The five types of bands may be identified by the lines marked on the lower part of the wedge as follows:

- 1 line, thick, range .0375" to .1035"
- 2 lines, extra thin, range .028" to .0943"
- 3 lines, extra thick, range .046" to .146"
- 4 lines, special taper, range .0369" to .1219"
- 5 lines, wide range, range .0345" to .1194"

PART VI SECTION B

Spaceband Box Action

The action of the spaceband box at the keyboard is essentially the same as the key mechanisms, and is heir to all their troubles. It should be noted also that the spaceband cam is slightly different in shape than the other keyboard cams, and that the weight is aided in supporting the spaceband lever by the addition of a light spring, either on the weight, or at the point where the lever enters the weight. Increased or decreased tension on this small spring will create a considerable difference in "feel" of the spaceband lever to the operator. If tension is too weak, a double response of bands, or a condition of the band beating double response of bands may result. (For other keyboard conditions see Part I, Section B.)

PART VI SECTION C

The Spaceband Rod

This piece must exert a straight up and down push against the upper releasing lever (cross piece at top of keyboard rods).

1. *Faulty Setting of Rod:* Remove pin connecting rod to releasing lever and drill new hole in lever.
2. *Bent Rod:* If rod is rubbing or binding on keyboard rod, straighten gently with flat-nose pliers.

PART VI SECTION D

The Spaceband Box Releasing Lever

This is a fairly well protected piece, but may give trouble in the following ways.

1. *Lever Broken in the Middle:* This lever is really three pieces—

two lengths attached to a short center rod, upon which the lever fulcrums. A slight break between one of the lever lengths and the tube is hard to spot, but will cause erratic box action. Test by grasping each end of the lever and gently try bending up and down. If there is play, you'll feel it. Solder will hold for a repair job. This lever is removed from some machines by pulling pin from front, others from behind and through the reeds. Examination is necessary.

PART VI SECTION E

The Spaceband Box

Many spaceband box troubles may lie in the box itself. Following is a list of box parts that require proper adjustment.

1. *Spaceband Box Pawl Levers*: Dirty, bent, or worn pawls are frequent causes of improper action. However, there may also be other troubles at this point.
 - A. *Play Between Pawl Levers and Hinge Pin*: The connection must be tight, or pawl action will not be regular.
 - B. *Pawls Binding, or Pawl Springs Weak*: Open gate and pull a pawl to the right. When released, it should snap back to its original position in the box.
 - C. *Pawls Extend Too Far Under Spaceband Lug*: Open gate, depress pawl lever and raise slowly by hand, checking this point. Pawls should extend not more than $1/32$ " inside stopping surface of rail hooks. Correct with oil stone, keeping original shape of pawl.
 - D. *Pawl Height May Vary in the Box*: One lug of the band releases over hooks before the other lug. Correct pawl with oilstone. Do not grind to a sharp point, but leave a blunt surface of about a point on the pawl. Don't bend pawls.
 - E. *To Clean Pawls*: Polish on fine emery and graphite. Clean channels in which pawls work with gasoline and graphite the channels. Do not use oil.

PART VI SECTION F

Inclined Box Rails

Wear is the most common cause for trouble here.

1. *Nicks or Roughness in Rails*: Smooth with oil stone. Replace rails if badly worn.
2. *Bent Rails*: Ends may be bent if care is not used in removing band box from machine. Straighten with pliers and smooth with fine emery.

PART VI SECTION G
Setting of Center Bar

This bar prevents two bands from lifting at once. Do not allow it to become gummed up and dirty.

1. *To Reset Center Bar:* Loosen screw at top of plate. Move center bar to right, then gradually bring back until pins just cover last half of ear of second band in the box. If box rails are worn so that bar touches spaceband box gate, grind down the end of bar. This bar is brittle, so if necessary to refit a pin, don't force it. 1/16" and 1/8" are the common sizes.

PART VI SECTION H
Key Lever Adjusting Screw (Slotted Screw)

This screw should be set so that pawls fall 1/16" below box rails.

1. *Adjusting Screw Jumps off Lever:* Faulty setting of screw, worn end on lever, or box pawl levers not dropping freely will cause this condition. Pawl levers drop by their own weight.

PART VI SECTION I
Chute Plate

Tongue of chute plate should be set so that the bottom of the bands will clear slightly before lugs are raised over the inclined rail stops. Bottom of plate should be bent in to allow the bands a minimum clearance. This plate may be reset for various thicknesses of bands. This prevents a "flutter" of the bands as they fall.

PART VI SECTION J
Spaceband Box Chute

The slotted tongue at the bottom of the chute should cause spacebands to strike slightly to the left of the center of the star wheel. If the two retaining points on either side of the tongue are badly worn they will cause retarding of the bands. Square them off with a file.

PART VII Line Delivery Troubles

PART VII SECTION A

Line Delivery Travel to First Elevator Is Sluggish

Poor maintenance is the most common source for this trouble. However, the fault may lie in the following.

1. *Line Delivery Long Finger Set Too Close*: This will tend to bind exceptionally full lines of matrices. Open it up another six points and move the rule on the assembling elevator to correspond if this is necessary.
2. *Excessive Pressure or Dryness of the Line Delivery Friction Plate*: This is the small square of brass behind the long finger block that bears on the face plate, or machine frame above the line delivery slideway. A small amount of oil on the finger rubbed on the face plate will in most cases correct this condition. Pressure screw should be flush with the brass casting.
3. *Split Washer on Vacuum Tube Closed off Too Much*: The vacuum tube is the cylinder on the machine column just above the No. 10 cam. The speed at which air is allowed to escape from the split washer at the top regulates speed of line delivery travel to first elevator. By loosening the screw on top of cylinder the washer may be adjusted. It should be set to allow the line delivery to carry short lines without slamming across, and long lines without hesitation. Occasionally remove plunger from the cylinder and rub oil on edge of leather with finger.
4. *Line Delivery Slideway Dirty*: Keep slideway clean by flushing with a little high test gas. Powder lightly with graphite. Do not oil this slideway as oil may be transferred to matrices and will collect dirt.

Note: *Both long and short fingers must be square.
Test by using edge of intermediate channel as a guide.*

PART VII SECTION B

Line Delivery Is Not Tripped by Assembling Elevator

This is an infrequent condition, but one worthy of note.

1. *Slamming up the Assembling Elevator*: The novice operator will frequently jam the machine at this point. *If this happens do not lower the assembling elevator gate.* Move assembling elevator latch to left, allowing elevator to drop slightly. Push line delivery short finger to right. Now raise elevator again and the line delivery will trip.

2. *Starting Pin in Assembling Elevator*: Pin may be broken off, bent, or set too low. The operator may be at fault here for improperly clearing a jammed line at this point. Remove pin with pliers and replace, checking setting. (See Part V, Section A for setting.) If wire is bent, straighten gently.
3. *Line Delivery Not Fully Returned*: (See Part V, Section B.)
4. *Loose Screw in Assembling Elevator Releasing Bar (Line Delivery Tail Piece)*: The screw that holds this piece to the line delivery short finger block may work loose, binding against the spaceband chute.

PART VII SECTION C

Long Finger Does Not Close ("Take Up") on Matrices

The long finger on the line delivery moves independently of the rest of the mechanism. As the delivery starts across to the first elevator the long finger should remain stationary until the matrices are against it.

1. *Friction Plate Spring too Weak*: The purpose of the friction plate and spring (inside long finger block) is to retard the movement of the long finger. If this spring has been cut or replaced by another type there may not be pressure enough on the face of the machine frame.
2. *Excessive Oil on Face of Machine Where Friction Plate Rides*: This will cause slippage of long finger and it will move with rest of delivery when delivery is tripped.
3. *Guide Rod Bent or Gummy*: The guide rod is pinned to the long finger block and extends through the short finger block. If it tends to bind in any way in the short finger block, the long finger will not "take up" on the matrices.
4. *Bent Long and/or Short Finger*: These are most frequently bent by the operator sending up a line before the delivery has fully returned, thus catching matrices between the short finger and the spaceband throat. The resultant springing of these parts, and, perhaps, the guide rod is in many cases difficult to correct without replacement of parts.

Note: *In such cases check to be sure that the release plunger in short finger block works freely.*

PART VII SECTION D

Long Finger Hits Back Rails of Assembling Elevator

The most frequent cause of this is wear.

1. *Wear on Long Finger Block:* Excessive wear on edge of long finger block where it contacts slideway will permit friction plate spring to push outward on blocks, forcing lower end of long finger in to hit back rails of assembling elevator when it is raised. Replacement of block is necessary. Be careful when driving pin in guide rod and in removing guide rod. Check to see that long finger "takes up" after replacement on machine.

PART VII SECTION E

Assembling Elevator Doesn't Drop on "Hanging the Elevator"

This is caused by the line delivery tail piece not tripping the latch on the assembling elevator.

1. *Line Delivery Returns Too Far to the Right:* Line delivery should come back behind pawl $1/64$ ". (See Part V, Section B.) If it comes farther, assembling elevator latch may not be released when "hanging the elevator." Also damage may be done to the space-band box throat.
2. *Assembling Elevator Releasing Bar (Tail Piece on Line Delivery) Attached Incorrectly to Short Finger Block:* There are two holes in the short finger block for tail piece attachment. On thirty pica machines the left hand hole should be used.

PART VII SECTION F

Matrices Do Not Go Smoothly Into First Elevator

See under first elevator slide (Part VIII, Section A)

PART VIII SECTION G

Line Delivery Short Finger Doesn't Travel Past Pawls
In First Elevator Head

This is characterized by matrices dropping off the right end of the first elevator head as it descends to the vise cap.

1. *Faulty Setting of Banking Screw:* This screw is located on left end of machine frame. Line delivery head piece banks against it as delivery moves to left. It should be set to allow short finger of line delivery to move $13/32$ " into first elevator head, or behind pawls in first elevator head.

2. (*Oldstyle Intertypes*) *Long Finger Measure Set too Wide*: In this case finger banks against left hand jaw preventing line delivery from fully entering first elevator head.

PART VII SECTION H

Machine Doesn't Start When Line Delivery Is Sent Across

There are other causes, but the one related to the line delivery is the line delivery roller not tripping the starting pawl on the No. 10 cam.

1. *Faulty Line Delivery Travel*: (See Part V, Section B.)
2. *Faulty Setting of Starting Pawl*: Pawl should be set exactly 15/16" from right edge of cam, standing at rear of machine. Adjust by screw in pawl.
3. *Faulty Setting of Plate on Starting Pawl*: This plate is contacted by line delivery roller. It should be set so that delivery roller will knock starting pawl just clear of upper stopping lever. (Piece that starting pawl rests on when machine is in normal.) Adjust by screw in left side of plate and tighten holding screw.
4. *Faulty Setting of Upper Stopping Lever Under Starting Pawl*: Upper stopping lever should be set so that starting pawl rests on it 1/4" in from the right. Loosen small square headed bolt at top of casting in which vertical starting lever shafts rests and tap upper starting lever into position. Test by backing off machine slightly and then bringing it to normal so that starting pawl rests on the upper stopping lever.

Note: There is a hole in the shaft for the set bolt that should position stopping levers properly.

PART VII SECTION I

Machine Starts Before Mat Line Is Past First Elevator Pawls

In so far as the Line Delivery is concerned, the reasons for this situation are the same as in Section G.

PART VII SECTION J

Line Delivery Long Finger Not Clearing Band Justification

This will occur on long lines, the finger hitting the bands in the right end of the vise jaws.

1. *Set Screw Loose in No. 10 Cam*: This is the large screw that holds the cam in place on the main shaft. If it loosens, the key may wear allowing the cam to slip slightly on the shaft thus throwing the

timing of the line delivery return a little too late for the justification action of the bands.

Note: On machines with a quadder attachment there is a small toothed clamp on the back of long finger block that engages a toothed section on the line delivery slide as the delivery moves clear of the assembling elevator. This holds the long finger locked in position until the delivery slide returns, thus preventing it from jumping to the left when just a few mats are sent up for quadder action. Do not try to force such a delivery slide finger open or closed when line delivery is not in normal position as the clamp is delicate.

Note: To remove delivery from the machine:

1. Remove block containing banking screw. This is located at the left end of the slideway and is held by a single bolt.
2. Allow first elevator to descend to the vise cap.
3. Trip line delivery and allow it to come partially across, then by reaching behind machine frame, insert screwdriver between link and link spring and twist, forcing link free of line delivery. Allow end of link to rest in teeth of mold disk.
4. Bend up long finger to clear left hand vise jaw and remove slide from machine.

PART VIII

The First Elevator

PART VIII SECTION A

Matrix Line Does Not Transfer Smoothly Into First Elevator

Dirt, gum, and burrs in the elevator jaws are frequent causes of trouble here. Jaws should be wiped daily with a soft cloth and occasionally a very light powdering of graphite may prove beneficial. Burrs should be removed with a fine file and smoothed with graphite and cloth. Other causes may be:

1. *Faulty Alignment of First Elevator Channels and Line Delivery Intermediate Channels:* May be corrected by raising or lowering the elevator. Turn connecting link (cylinder at bottom of elevator slide, connecting it to elevator lever) until channels in elevator head are slightly lower than line delivery intermediate channels. Check to see that pin fitting in notches at bottom of link are not

bent and that lock nut (left hand thread) at top of link is tight after setting.

Note: Besides allowing an adjustment for the elevator head and the line delivery intermediate channel, the connecting link spring (inside cylinder) absorbs overmotion of the first elevator lever in aligning of mats horizontally for casting and at transfer position from first to second elevator. It cannot, though, be used to change adjustments at these points.

To insure proper connecting spring pressure the settings of the eyebolts at either end of the link are as follows: 3/4" from the bottom of the top eyebolt to the cap, and 13/16" from the top of the bottom eyebolt to the lower cap. These settings must be obtained with the connecting link off the machine. To remove it, run first elevator to vise cap and pull pins in link. Reset eyebolts, replace link, run to normal and then by turning link, align first elevator with delivery channels. Check to see that caps are screwed tightly on either end of link, or adjustment will change during operation.

2. *Faulty Spring Pawls in First Elevator Head:* These pawls retain matrices at right end of line as elevator descends to the vise cap. They must be free to move. Tension must be the same and they should be directly opposite from one another. If they are bent or broken, replace. To remove the elevator front jaw pawl, insert a thin screwdriver through the small round hole, upper right, in elevator slide, and loosen the two screws in jaw. Insert pawl and tighten screws, being sure that screw ends do not protrude through pawl plate in front jaw channel.
3. *Too Much Space Between First Elevator Head and Line Delivery Intermediate Channel:* Clearance here should be .004" to .007", or about the thickness of a heavy piece of paper. Obtain by gibs on top front of vise frame, guiding elevator slide. These gibs are set to provide a sliding fit only of the slide.

Note: Whenever the set of the gibs is changed, lift elevator to transfer position by hand before running machine. This will locate any possible binding of the slide and prevent the damage that may occur if the machine is run under power.

4. *Line Stop Bent, or Out of Its Channel:* This is the curved piece sliding between the elevator jaws. Its purpose is to support mats on the left when line delivery banks and elevator goes to the vise

- cap. Straighten it, and be sure that it is properly seated in the elevator jaws.
5. *Line Delivery Spring Weak*: May be slow in pushing back line stop on quadder machines. (See Part VII, Section A, No. 5.)
 6. *Loose Front Jaw on Elevator Head*: Remove jaw, tighten two screws holding front jaw. In replacing back jaw be sure to put longest of two screws on the left.
 7. *Back Jaw Replaced Out of Line or Sprung*: When back jaw is removed from the machine, a small scratch across it and the separating block will aid relocation. If jaw has been bent, paper shims may be placed between it and the separating block until matrices have a sliding fit in the elevator head.
 8. *Worn Back Jaw*: Replace. Jaws may be rebuilt by the Mergenthaler Linotype Company, Star Parts, and various others.
 9. *Worn Matrix Adjusting Bar*: This is the plate on the first elevator front jaw that supports the matrix line in light face position. It may be noted that the lower lug of the matrix is under the duplex (retractable) rail. This fit must be close. Remove adjusting bar, turn it over and replace it so that unworn side supports matrix line. If necessary round off the right end of bar so that matrices may enter elevator head freely.
 10. *Elevator Rubbing End of Line Delivery Channel*: This may occur where a new jaw is put on elevator or a new plate on intermediate channel. If gib setting is right, cut new part down slightly with a fine file and rub with graphite and cloth.
 11. *Broken Duplex Rail Spring*: Replace, checking to see that duplex rail lever functions properly.

PART VIII SECTION B

Matrices Fall From First Elevator on Stroke to Vise Cap

This is not uncommon to machines that have had excessive wear or abuse.

1. *Line Delivery Does Not Travel Far Enough to Left*: Reset banking screw at left end of delivery slideway. Short finger of delivery should travel 13/32" inside elevator head, or so that finger is just behind pawls.
2. *Faulty Pawls in First Elevator Head*: (See Part VII, Section A, No. 2.)
3. *Matrix Line Too Tight Between Vise Jaws*: This creates a "spring" in the line that may throw off the last matrix. Matrices should have a free sliding fit between the jaws. Check for sprung jaw,

correct by shimming between back jaw and separating block on left end of elevator head.

4. *Line Delivery Still Moving to Left When Machine Starts:* If travel of line delivery is correct—(See Part V, Section B, No. 1; Part VII, Section G, No. 1.)—the adjustment of plate on left side of starting pawl on No. 10 cam may be wrong. To correct:
 - A. Place machine in breakdown position by pushing in clutch handle and turning cams backward with driving clutch arm until second elevator partially descends. This brings starting pawl on No. 10 cam into view.
 - B. Turn in on adjusting screw (one with head behind plate) on plate at left side of pawl and tighten holding screw of plate.
 - C. Turn machine to normal.
 - D. With power off, send line delivery across.
 - E. Check to see that line delivery roller just kicks pawl off lever (upper stopping) on which it rests when machine is in normal (See Part VII, Section G for further checks on this mechanism.)
5. *Sprung Elevator Jaws:* (See Part VIII, Section A, No. 7.)

PART VIII SECTION C

First Elevator Does Not Fully Seat on the Vise Cap

This fault combined with a poorly set or worn vise automatic will damage matrix lugs, causing poor justification and front squirts on the left end of the matrix line.

First elevator jaws should be wiped daily with a soft cloth. If gum has adhered to the outsides, remove it with white gas, as this may retard descent of elevator on full lines. Never insert a screw driver or other hard object between the jaws. If metal from a squirt is binding the duplex rail, place a linotype slug against it and tap loose with a light hammer.

1. *Tight Lines:* Vise jaw settings and assembler do not correspond, excessively worn star wheel, faulty adjustment of banking screw on assembler slide clamp. To check assembler slide clamp setting: (See Part II, Section A, No. 10.) To clear tight line:
 - A. Be sure mold is back from matrix line. Turn cams back if necessary.
 - B. Raise elevator with left hand and remove a few matrices from right end of elevator head.
 - C. Check to see that remaining line of matrices is neither twisted nor bound in the elevator head.
 - D. Run machine on around pushing pump stop firmly to left.

2. *Duplex Rail Extensions Catching on Inside Edge of Vise Cap:*
This may be caused by broken duplex rail spring, bent or binding duplex rail lever, or smashed or bent duplex rail banking pin. Turn machine back to normal and correct condition. It may be necessary to take apart elevator head. To do so:
 - A. Open vise frame.
 - B. Remove backjaw. (Left screw is longer than right one.)
 - C. Remove separating block.
 - D. Unscrew duplex rail lever studs to relieve springs.
 - E. Remove front jaw from slide.
 - F. Remove front jaw duplex rail cap (on bottom of jaw).
 - G. Remove duplex rail levers from jaw.
 - H. Remove duplex rail.Assemble in reverse order.
3. *Center Screw Improperly Adjusted:* This screw, located on top of the slide nearest elevator jaws, determines distance lower lugs on casting edge of matrix line clear mold lips or rails. This distance should be .010" between center screw and vise cap when elevator is lifted for horizontal alignment of matrices. The lift occurs after the mold comes forward, and directly after the justification lever drops from first justification. There are two standard ways for checking this setting:
 - A. With feeler gauge:
 1. Pull plunger pin.
 2. Assemble 30 pica line of matrices.
 3. Send across, stopping machine as justification lever drops after first justification.
 4. Select .010" feeler gauge and insert under center screw. Adjust center screw to allow sliding fit of gauge.
 - B. Without feeler gauge:
 1. Pull plunger pin, lower mold slide lever, and disconnect ejector lever.
 2. Place two matrices about 30 picas apart in first elevator head.
 3. Run first elevator to vise cap.
 4. Pull mold disk forward, so that mold rail locks over matrix ears.
 5. Turn down on center screw, raising elevator slide until matrix ears are tight against mold rail.
 6. Back off center screw one eighth turn.

Note: The thread on this screw is such that one eighth turn drops elevator head .010", allowing proper matrix clearance with the mold.

On machines using two-letter display mold this clearance is cut down to .005".

4. *Broken Duplex Rail Spring*: (See Part VIII, Section A, No. 11.)
5. *Obstruction Preventing Mold Disk From Turning*: This may be characterized by a complete "freezing" of the machine at any point in the descent of the first elevator to the vise cap. Possible causes:
 - A. Loose mold cap screw protruding into teeth of mold disk.
 - B. Ejector lever link disconnected, allowing ejector blades to protrude through a mold.
 - C. Back knife binding on a mold, liner, or mold disk locking stud screw.
 - D. Partially ejected slug in mold. (This will occur when operator has cleared ejector and returned machine to normal, then attempts to run it around again to eject slug.)
 - E. Filling piece, or "flipper", not in position when casting with display mold.
 - F. Looseness or excessive wear on quarter turn segment on No. 3 cam.
 - G. Loose set screw in mold turning bevel pinion. (This is the bevel gear and square block activated by the toothed segments on the No. 3 cam. It is located at the left rear of the metal pot. Machine may be turned slightly forward to facilitate removal of protecting cover.)
 - H. Metal wedged between knife and disk, ejector guide and disk, or up under flange of disk.
 - I. Mold disk galled and binding on stud. (Lack of lubrication at this point may cause this condition.)
6. *Knife Wiper Faulty*: Check knife wiper daily for loose screws. Wear will permit old style wipers to bind under side knives, new style wipers to bind on top of knives. (Characteristic stop on faulty old style wiper will be about half way to the vise cap. On new style—down stroke wiper—first elevator will move only a short distance.) Back machine to normal and check for trouble—bent flag on top of wiper, loose screw, worn or injured stop pin, bent wiper lever.
7. *Matrix or Other Obstruction on Vise Cap or Between Vise Jaws and Cap*: This should cause an automatic stop of the machine. If obstruction is on the vise cap, raise first elevator by hand and clear. If obstruction can not be seen, back machine to normal, open vise frame to locate and clear.
8. *Mold Turning Cam Shoe Not Adjusted*: Flat shoes on side of No. 3 cam must be set to clear square block about .002". This mechanism squares up mold disk after it turns, aligning it with vise frame studs for a smooth lockup. Adjustment of the shoes on the No. 3 cam is as follows.
 - A. Remove protecting plate.

- B. Pull cams back slightly.
- C. Remove one of the screws that hold the shoe to No. 3 cam, and reset the screw bushing in the cam. Replace holding screw and repeat with the other screw.
- D. "Mike" shoe and cam to be sure that the shoe is parallel to cam.
- E. Run machine forward by hand until shoe is opposite square block.
- F. Test .002" clearance with a feeler gauge.
- G. Pull back cams and repeat adjustment until correct.

Note: Never throw shoes so far away from cam that there is danger of them binding on the square block when machine is turned over.

- 9. *Loose Screws in Mold Cam Quarter Turn Segment:* These are the toothed segments on the No. 3 cam that turn the mold disk. If they become loose they will bind on the bevel gear behind the square block.
- 10. *Bent or Sprung First Elevator Back Jaw:* (See Part VIII, Section A, No. 7.)
- 11. *Metal Binding Action of Vise Automatic:* Vise automatic (rod protruding through the vise cap) must be free to move down with descent of first elevator. It may be removed from machine by unhooking spring. When replacing be sure the lower end is behind the stop lever that goes across to the clutch.
- 12. *Mold Disk Pinion Not Engaged:* The mold selector pinion must be engaged on the driving shaft flange pin. Pull cams to normal and turn pinion until pin slips into hole in pinion. To check pin looseness, pull forward on pinion, exposing pin. To remove pinion insert screwdriver into hole on pinion handle and remove screw. Spring inside should be strong enough to snap pinion onto pin when released by operator.
- 13. *Loose Duplex Rail Cap Screw:* These screws are located under the first elevator front jaw. Tighten.
- 14. *First Elevator Gibs Binding Slide:* These four flat gibs, located on either side of the first elevator, serve to guide the elevator slide and to hold the mat line square with the mold. The two upper gibs should be set to allow about .004" between the line delivery channel and the first elevator jaws. There should be no side play in the elevator slide. The two lower gibs guide the slide at transfer. A little slack may be desirable in these lower gibs, but in general set them to kiss elevator slide when latter is raised to transfer.

Note: Always test gib setting by raising elevator to transfer and lowering before running machine.

15. *Back Knife Binding on Mold, Liner or Locking Stud Screw:* Back knife should be set to trim full 30 pica slug at type high or .918" with type on slug, .875" if slug is blank. On a machine with not over .001" warp in mold disk, and molds on which the posts are not sprung, the setting of the back knife may be accomplished as follows:

- A. With machine in normal open the vise frame.
- B. Remove the best mold and clean it thoroughly.
- C. Replace it, seating it properly in the mold disk pocket.
- D. Disconnect mold slide lever, and ejector lever link.
- E. Draw mold disk forward.
- F. If adjustment of knife is very poor, loosen back knife holding screws slightly.
- G. At this point several alternative methods may be used:

- 1. Pat a red lead and oil mixture on back of mold and spin mold in front of knife. Set knife to remove red lead without binding on mold or disk.
- 2. Spin mold in front of knife. Upon holding a strong light above knife a shadow line will show up between knife and mold. This shadow is the clearance between knife and mold. Adjust knife until it disappears, but knife does not bind mold.
- 3. Insert a piece of tissue (French folio) between knife and mold. Using it as a clearance gauge, adjust knife.
- 4. With experience it is possible to obtain this preliminary setting by observation and feel alone.

Note: Knife should brush mold lightly, but not bind. After tightening holding screws, always check to see that knife does not bind against mold.

- H. After this preliminary setting cast 30 pica slug with type the full length and "mike" it for .918".
- I. Make final slight adjustment without loosening holding screws. Sometimes this can be done by simply inserting screwdriver into slot in knife and tapping lightly.
- J. Check slugs from all molds.
- K. Tighten lock nuts on back knife adjusting screws.

Note: On an older machine that has a warped mold or sprung mold posts, setting the back knife to trim all molds the same is a difficult procedure.

- L. Check disk for warp by shining a light under upper mold gib and spinning disk.
- M. Check molds for warp by removing them, cleaning them, and running a straight edge down their backs while holding them against a strong light.

N. Mold support gib settings may be checked by attempting to insert a piece of heavy paper between gib and front edge of mold disk.

O. Mold disk must also be checked for play at the hub.

1. Remove all molds from machine. Clean and test for squareness. Correct faulty mold posts.

2. Remove upper and lower mold disk support gibs, and mold disk.

3. Clean mold slide facing and stud to obtain metal-to-metal fit with mold disk.

4. Replace upper and lower mold disk support gibs to just brush mold disk. There should now be very little play in disk.

5. If disk is not warped set back knife as described above. If light held under upper gibs shows warped disk, proceed as follows:

a. Cast a full thirty pica slug on each mold.

b. "Mike" them.

c. Build up behind low molds with makeready tissue (about .002" thickness) until all molds trim the same.

d. Move in back knife until type high trim is obtained.

Example: Mold 1 trims .918"

Mold 2 trims .920"

Mold 3 trims .922"

Mold 4 trims .918"

In this case molds 1, 2, and 4 would be built out by inserting French folio between the back of the mold and the mold disk until all molds trim to mold 3, or .922". Then back knife would be moved in until type high trim is obtained.

Note: Care should be taken when changing liners to allow them to protrude from the mold enough to be caught on the fingernail. When the machine locks up for casting, the liners are pushed into position. The locking studs on the mold disk must be tight at all times. Grasp them between thumb and index fingernails and check. If studs are loose, correct as follows:

P. With machine in normal position disconnect mold slide lever and ejector lever link.

Q. Open vise frame and pull mold disk forward.

R. Remove mold disk support gibs on left side of disk.

S. Remove three long screws, or rear nut on Intertype, holding mold disk stud and take off mold disk.

T. Lay disk face down on a spread cloth and remove screw from back of locking stud.

- U. Tap out locking stud keeper and replace with new one.
V. Tighten screw into locking stud.
16. *Justification Shoe Under, Instead of Over, Justification Lever:* This was caused by opening vise frame with machine turned too far forward. The frame should never be opened when mold disk is forward. To correct, open vise frame and lower until justification bar can be raised so that shoe is over justification lever. Shut frame and allow machine to return to normal.
 17. *Matrices Twisted or Jammed in First Elevator Jaws:* Improper setting of line delivery long finger, or too short a matrix line may cause this. To correct, push line delivery back to normal position, open vise frame and remove or straighten matrices.
 18. *Matrix Line Too Long for Vise Jaw Setting:* Operator trying to get "tight lines" through, incorrect assembler slide setting, or incorrect vise jaw setting will cause this. To correct, raise first elevator slightly. Remove a few matrices from right end of elevator. Check the rest to see that none are twisted or jammed. Seat elevator on vise cap, allow machine to come to normal.
 19. *Tight Brake on Mold Driving Shaft:* This is the shaft that turns the mold disk, located along the left side of the machine. At the rear of this shaft there is a clamp lined with leather which is the brake. The setting of this brake should be just strong enough to stop the first elevator at any point in its descent to the vise cap when the clutch is pushed in.

PART IX

The Vise Automatic

PART IX SECTION A

Vise Automatic Failure

The purpose of the vise automatic is to stop the machine when overset lines are sent into the first elevator. In preventing smashed matrices and squirts, it is one of the most important safeties on the machine and should be kept in excellent working order at all times.

1. *Faulty Setting of Adjusting Screw in First Elevator Head:* This screw is located at the top of the first elevator slide furthest from the jaws. It depresses the vise automatic stop rod that protrudes through the vise cap as the first elevator seats on the vise cap. Adjustment should be such that the cylindrical mold disk stop dog, that is pushed forward by the advance of the mold disk, clears

the sharp lip on stop rod by less than 1/64". Machine should stop if first elevator is held from seating on the vise cap by less than .010" inserted under center screw. (If parts are new it is possible to stop machine on a hair space.) At this point the mold disk should not have advanced more than 1/2".

2. *Changing Driving Leathers:* Vise automatic action should be checked whenever driving leathers are changed, or any adjustments reset in the driving mechanism.
3. *Metal or Obstruction Binding Action of Automatic:* If stop rod is bound in down position no safety exists. If it is bound in up position the machine will stop continually before first elevator seats on the vise cap.
4. *Broken Spring in Plunger, or on Vise Automatic Rod:* Action of vise automatic should be checked before operating by depressing stop rod and mold disk stop dog with finger to see if they are free.

To remove stop dog spring:

- A. Open vise frame.
- B. Remove screwed end of mold disk stop dog.
- C. Remove spring.

To remove mold disk stop dog:

- A. Remove stop dog spring.
- B. Loosen set screw at top of dog.
- C. Remove dog.

Note: In replacing dog always turn down on set screw before inserting spring. Otherwise spring will be crushed, binding action of dog when set screw is tightened.

To remove stop rod, unhook spring holding it in machine.

Note: In replacing the stop rod be sure the lower end is behind the vise automatic stop lever that leads across to the clutch.

5. *Worn Sharp Edge on Stop Rod:* This allows stop dog to slip over the edge when mold thrusts it forward. Remove stop rod, tap out sharp edge and replace.
6. *Loose Screws:* These may be in the automatic or the clutch assembly proper. Tighten.
7. *Improper Setting of Clutch:* This allows main cam section to go on around, throwing mold up against matrix line before machine comes to a stop. Mold disk must not advance to the matrix line on vise automatic stops. The settings are checked as follows:
 - A. Turn off machine in normal position.
 - B. Pull back on main cams slightly.
 - C. Pull clutch handle forward as far as it will go.

- D. Locate sliding collar on drive shaft behind machine bearing.
E. Clearance between machine bearing and collar should be $15/32''$ with clutch handle pulled way out. (Machine in running position.)
F. Check by inserting $15/32''$ drill between bearing and collar.
G. Locate forked lever that works against collar from other side.
H. Clearance between forked lever and collar should be about $1/32''$.

Note: This latter setting does not affect vise automatic operation, but if the $15/32''$ setting is changed, the other must be altered.

This $15/32''$ setting is obtained by varying the thickness of the clutch leathers. If the leathers are too thin, this distance becomes greater and less if the leathers are too thick. To correct:

- I. Push in clutch handle at front of machine.
J. Remove screw and loosen bolt in clutch arm in drive wheel and remove clutch arm.
K. Emery down leathers if they are too thick, build them up with thin cardboard underlay if they are too thin.
L. Round off edges of leathers, be sure to drive all screw heads below surface of leathers, and clean leathers by scraping with knife.
M. Replace on machine, pull out on clutch handle and test setting.

Note: Some machines have an adjustment on the end of the clutch rod (rod protrudes from end of drive shaft). Any thickness of leathers may be used in such case. Remove screw in clutch arm link collar that goes through rod end and turn in end of rod to decrease setting.

The $1/32''$ setting between collar and fork lever when machine is in operating position is obtained by adjusting the screw in the lower stopping lever. Set it as follows:

- N. Pull cams back slightly.
O. Pull out on clutch handle at front of machine. (This places clutch mechanism in operating position.)
P. Locate lower stopping lever. (This is the piece in behind the extension of the forked lever that pushes forked lever in against the sliding collar on the drive shaft when machine stops.)
Q. Reach under drive shaft and grasp fork lever beside point where lower stopping lever touches it.
R. Pull on fork lever until fork *just touches* collar on drive shaft.
S. With thumb and forefinger note play in lower stopping lever. This play should be about $1/32''$, or a slight shake only.

T. Adjust screw in lower stopping lever until this clearance is obtained between the lower stopping lever and the forked lever.

Note: The forked lever is a pivoted piece. If proper clearance is obtained between the lower stopping lever and the fork lever, it will exist between the fork lever and the collar on the drive shaft. If there is no clearance between lever and collar, then clutch leathers cannot exert full driving pressure against drive wheel. If clearance is excessive, then forked lever must move too far before clutch is thrown out of engagement.

8. *Bent or Binding Stop Rod:* Remove by unhooking spring that holds it in machine and correct condition. Place lower end behind the lower crossing stop lever.
9. *Vise Automatic Stops at Transfer:* This will occur as mold advances to eject the slug. It may be caused by a flattened roller on the bell crank lever (piece on lower right of stop rod that draws the stop rod down clear of the mold disk dog at ejection). Other causes may be a broken pin on right side of automatic stop rod, bell crank lever broken, bent, or under pin on side of stop rod instead of over it. Remove the stop rod or the bell crank lever and correct the condition.

PART X

The Vise Frame and Justification

PART X SECTION A

The Vise Jaws

These jaws set the measure at which the matrix line is to be cast. They should be kept clean by wiping daily with a soft cloth, as metal or gum sticking to the jaws will produce slugs with metal overhanging at the top ends, and also may affect the type high settings or .918" trim.

1. *Worn Vise Jaws:* Edges of the jaws are rounded, or a groove worn along the side of the jaw where mold locks up. This produces slugs with a spit of metal off the ends of the type. Using liners that have been punched is a major cause of this trouble. The liner, working back and forth in the mold as the machine locks up for casting, will wear both the left vise jaw and the mold itself. If a liner has been punched out once, throw it away.

Vise jaws may be reground, but when replaced on the machine the

- forward movement of the mold slide should be reset to compensate for the grinding. (See Part X, Section B, No. 1 for forward movement of mold slide.)
2. *Overhang, or Underhang of Character on Left End of Slug:* Loosen the clamp screw at the upper left end of vise frame and adjust bushing, turning in on bushing if type overhangs slug. Vise jaw should be set to allow about a quarter to a half point shoulder at end of slug. Tighten clamp screw securely.
 3. *Overhang or Underhang of Character on Right End of Slug:* Loosen lock nut and adjust screw at right bottom of right hand jaw. Indentation of line on slug should be about one quarter to one half point. Tighten lock nut. On machines without quadders, it's necessary to check the setting of the pump stop safety whenever the setting of the right hand jaw is changed. To do this assemble a line of matrices and bands, send them through, and stop the machine just before casting. At this time the pump stop safety should be retracted from under the plunger block not more than 1/64". Adjust by screw in the end of the pump stop lever that is pushed by right end of right hand vise jaw at justification. Turning screw toward jaw will increase clearance of safety.
 4. *Vise Jaws Not Unlocking After Casting:* This will tend to make first elevator stick in its rise to transfer, causing it to bounce upward. Check for free movement of left jaw and proper setting of vise jaw closing wedge (long wedge and spring down left side of vise frame). The top of the wedge is made to just fit the side of the wedge block at the right. Obtain this setting by the adjusting screw at the very bottom of the wedge, under the pin that attaches wedge to vise closing lever (long lever running to No. 4 Cam at the rear of the machine.)
 5. *Metal Squirts in Under the Vise Frame:* Front squirts should always be thoroughly cleaned from machines, as metal will hinder proper jaw action. Be careful not to injure any of the mechanisms, and to test by opening and closing jaws to full measure before operation. In serious cases remove vise jaw mechanism from machine for cleaning. To remove left hand jaw and block:
 - A. With linotype in normal position, unhook vise jaw wedge spring (long spring at left of vise frame).
 - B. Remove pin holding wedge to vise closing lever.
At this point method will vary according to style of machine. On machines on which the left vise jaw measuring bar runs *through* the vise frame:
 - C. Remove handle that is screwed to extreme right end of bar, allowing it to be drawn through left end of vise frame with removal of vise closing mechanism. Or if squirt binds removal of bar

turn up to disconnect bar from mechanism and remove only the latter.

Where vise jaw measure runs along the top of the vise frame:

D. Remove stud from extreme left end of measuring bar, disconnecting it from vise closing mechanism.

E. Remove four bolts holding closing mechanism to vise frame and remove mechanism.

F. Open vise frame and remove left locking stud.

G. Remove left vise jaw and block.

To remove right hand vise jaw:

H. Place machine in normal with vise frame open.

I. Remove knife block. (Two large bolts hold it.)

J. Remove right hand vise frame locking stud.

K. Remove first elevator back jaw support. (Located on top of vise cap.)

L. Remove right vise jaw and block.

M. Replace all of above in reverse order.

Note: To retime vise frame locking studs, turn them way in, close vise frame, turn studs out until frame is securely locked, replace timing studs in vise frame. After re-assembling, cast a line to be sure type is the right measure and check action of pump stop safety.

PART X SECTION B

Failure of Lines To Justify

This condition is characterized by front squirts at the left end of the matrix line, bands not driving to equal heights at second justification and casting, and unequal spacing between the words on the slug.

1. *Improper Alignment of First Elevator With the Mold:* This will cause matrix ears to bind on mold lip as the latter moves forward to lockup. Test as follows:

A. Open vise jaws to 30 pica measure.

B. Insert new pi matrix between jaws of first elevator.

C. Run machine around until mold disk moves forward. (At this point the roller that is in the track on the No. 9 Cam will be on the first hump in the track.

D. Turn off power and see if matrix slides freely the length of the first elevator head.

If matrix binds, check setting of center screw. (See Part VIII, Section C, No. 3. (This will allow proper clearance between matrix ear and lip of the mold.

Now check for the forward movement of the mold disk as follows

- for oldstyle machines (with eccentric roller in mold slide lever.)
- E. Return machine to normal position.
 - F. Open vise frame, remove first elevator back jaw, and close vise jaws.
 - G. Close vise frame and run machine until first elevator drops to vise cap.
 - H. Open vise frame and insert sheet of newsprint or 24-pound bond between vise jaws and mold. (.003"—.004")
 - I. Draw pin from bottom of pot lever, disconnecting pot from lever, and pull plunger pin.
 - J. Turn cams around by hand until mold slide roller in track at side of No. 9 Cam (gear cam) is on the second shoe. At this point the pot plunger is about one inch from dropping to cast.
 - K. Loosen lock nut at side of mold slide roll, insert punch in hole of eccentric and adjust for sliding fit of paper between vise jaws and mold.

Note: This clearance shows up as three- to five-thousandths clearance between the matrix line and the mold just before justification and casting. It is necessary to prevent wear on the back lugs of matrices and to prevent squirts on the right end of the matrix line.

On new machines with the forked or double mold slide lever, the setting may be obtained as follows:

- L. Proceed as in case of oldstyle machines. (See Part X, Section B, No. 1.)
- M. This type has no eccentric, so to change the existing setting, loosen lock nut on adjusting screw (located about half way up mold slide lever from rear of machine) and turn screw in to throw mold forward, decreasing clearance.

Note: Some check this mold slide setting by using three sheets of newsprint or a .010" feeler gauge and check on the first shoe of the track in driving cam. (Geared cam No. 9) However this is not so positive. Also, some set the resilient or double lever adjustment by running machine until mold disk moves forward, and check for about a .005" shake in the mold slide by grasping disk and pulling it forward, then placing matrix on first elevator head so that lugs touch mold disk, then pushing disk back. This, also, is not so positive.

In all cases when mold slide lever roll is on the second shoe on the track of cam, the pot mouth-piece must not be touching the back of the mold.

Clearance should be about $3/32$ ". Test by rocking pot. If there is no clearance there is an improper adjustment of the front nuts on the pot lever eyebolt (connecting piece between pot and pot lever). To check this, run the machine to casting position. There should be $3/16$ " between back eyebolt nut and pot lever. Now note pot spring when machine is in normal. There should be $3/32$ " between coils. If the rear setting is correct, obtain the front one by the front nuts on pot lever eyebolt, if they have been changed.

These two settings, forward movement of mold disk and relationship of matrix ear to mold lips are very important to prevent matrix damage, uneven justification, and matrices jumping from light to bold face.

2. *Bad Matrices:* These will prevent proper justification. Remove them from the font.

Note: *If one end of the vise jaws is closer to the mold than the other, shims may be placed between the shoulder of the female vise frame locking stud and the locking stud bearing. This will allow the vise jaws to be aligned facewise with the mold.*

3. *Weak Justification Lever Spring:* Two large springs may be seen under the machine from the rear. The justification spring is the left one. If all other things are correct, its tension may be checked as follows:
 - A. Assemble a 30 pica line of matrices.
 - B. Start machine around, then push in the clutch.
 - C. Turn machine on around slowly by hand until justification bar rises.
 - D. If matrix line does not spread, try forcing up justification bar with a light lever.
 - E. If slight pressure will make it rise, turn down on nut at top of spring.
4. *Worn Pump Lever Cam and/or Cam Roller:* This may cause pump lever to bind on the pump stop, thus restricting action of the right hand jaw. There should be from $.010$ " to $.015$ " clearance between the pump stop and the catch block on the plunger lever. To reset this loosen the two hex headed screws holding the bracket to the machine column. Place a piece of thin cardboard between the stop and the block, move bracket up to this setting and retighten screws. Do not grind the top off the pump stop. The corners on the pump stop must be kept square and, for the safety

of the operator and the machine, cleanliness and proper adjustment are essential. Adjust as follows:

A. Assemble a full line of matrices and bands.

B. Send it through, stopping machine when bands rise for justification.

C. Adjust screw in pump stop lever that touches end of right hand jaw so that stop block on plunger will clear pump stop by not over $1/32$ ".

D. See that pump stop returns a full $1/8$ " under stop block when machine is in normal.

Make it a point to space out and justify all pi lines. For the protection of the matrices do not send loose lines through machine at any time.

5. *Oil, or Graphite on Top of Justification Bar:* Bands will have a tendency to twist and skid, thus causing poor justification and front squirts. Keep the top of bar clean, dry, and *never* grind notches on the top of it. This old trick defeats its supposed purpose by grinding and bending the bands.
6. *Bent Justification Lever:* Probably caused by opening vise frame in the wrong machine position and allowing justification bar to drop, then trying to force machine around. Justification bar should be about $1/2$ " below spacebands when first elevator has dropped to the vise cap. Grind off the top of the lever fork, or use oversized justification lever roller.
7. *Loose Matrices or Metal Squirt Binding Justification Bar:* Open vise frame and grasp justification bar, pulling upward to check for full stroke. See if left end of bar can be raised even with right end. Metal may be binding this action. Clear obstruction. In serious cases it may be necessary to remove the justification rods from the machine before the metal obstruction can be reached.
8. *Any Nick, or Burr, or Screw in the First Elevator Head That Prevents Matrices From Sliding Freely:* Check first elevator head by sliding a new matrix the entire length of the jaws.
9. *Loose Lines:* Matrices will twist or not be fully justified causing front squirts and damaged sidewalls.
10. *Tight Lines:* Lines slightly overset but forced to cast will cause damaged lugs. The type will appear out of alignment horizontally when printed.

PART XI The Mold Disk Lockup

PART XI SECTION A Mold Disk Locking Stud Troubles

This is characterized by a fluttering and bouncing of the mold disk as it moves forward to lockup, a bottle shaped wearing of the studs on the disk, and in serious cases a crunching and slamming as the mold disk locks up for casting or ejection. Faults in this part of the machine should be corrected immediately as they are very damaging to the machine, and are the direct cause, many times, of slugs off their feet, or otherwise improperly trimmed by the side knives.

1. *Lack of Lubrication*: This will cause wear on the studs. Use about two drops of oil daily in the locking stud blocks.
2. *Loose Screws in the Square Block, or Beveled Gear*: This will cause the mold disk to bounce as it moves forward to lockup. To correct, back the machine slightly, remove protecting plate over end of mold disk turning shaft. Tighten screws in plates on sides of square block and the one that holds bevel gear and square block to shaft.
3. *Mold Turning Cam Shoes on No. 3 Cam Not Properly Adjusted*: (See Part VIII, Section C, No. 8.)
4. *Loose Gear Segment on No. 3 Cam*: Tighten.
5. *Worn or Loose Mold Disk Pinion Driving Pin*: This is the pin that slips into the hole in the mold selector pinion, thus timing mold disk to the turning mechanism at rear of shaft. Replace it as follows:
 - A. Allow machine to go forward, spinning mold disk until small end of tapered pin holding collar to shaft is in view.
 - B. Tap out the tapered pin.
 - C. Insert screwdriver into end of mold disk selector pinion and loosen screw holding pinion to end of shaft.
 - D. Remove screw, spring and pinion.
 - E. Slide off collar and remove timing pin.
 - F. Replace timing pin, peening it in, replace collar and tapered pin, selector pinion, spring and screw.Allow machine to come to normal.
6. *Mold Driving Pinion Too Loose or Too Tight*: This is located on the rear of the mold turning shaft. It should be just tight enough to stop first elevator from coasting to the vise cap

when the clutch is pushed in (Do not test with gummy driving clutch leathers.)

Note: *This is a point of neglect on machines, probably because of its out of sight position. However it is very important as it saves wear on the locking studs and square block mechanism, and prevents the cams from slamming on around throwing the mold disk forward on tight lines stops. If there is flutter in mold disk just before it moves forward for lock up, or the disk moves more than 1/2" forward on vise automatic stops (tight lines) check this brake setting and/or drive clutch.*

7. *Mold Slide Support Screw Improperly Adjusted:* This screw is located under the lower support gib at left of mold disk. If all other things are correct, adjust it by turning backward on cams until mold disk moves forward and locks up. Then set support screw for a kiss touch under lower gib. Some insert a piece of tissue between screw and gib, then turn up on screw until tissue binds. If both locking studs and mold support screw are off, proceed as follows:

A. Remove a mold from the machine and turn the opening in the disk to ejection position, thus exposing the mold slide.

B. Grasp lower mold disk support gib and lift, and insert a strip of newsprint between the lower right side of the mold slide and the machine column.

C. Lower left side of mold disk, and paper will bind. Loosen lock nut on support gib and turn up until paper can just be withdrawn. When mold disk locks up for ejection, the ejector blades should have .004" to .007" clearance on the left or smooth side of the mold opening. After the support screw is set, the locking studs may be aligned, in most cases, by the dowls that hold them.

D. If, however, the studs tend to bind in the blocks, tap dowel pins out of blocks, then:

E. Attach blocks to vise frame, but do not tighten.

F. Ease machine around until mold disk comes forward.

G. Tighten stud blocks evenly.

H. Lower mold slide lever and disconnect ejector lever.

I. Push mold slide back and forth, checking for bind in studs.

If you wish new dowel holes, fill in hole in vise frame with iron rod, or tap threads and fill with screw, flush to the frame; then drill new holes using stud block hole as guide.

Note: *Changing the stud blocks may be a very difficult job. Factors to consider are: ejector clearance with mold, mold disk support screw setting,*

mold disk slide, first elevator slide gibs, first elevator back jaw, adjusting bar and front jaw, and possibly center screw.

8. *Loose Locking Studs:* Remove left hand mold disk support gibs, plate and front and disk. Lay disk face down on clean cloth and remove screw holding stud. Replace keeper with new one, and replace parts, noting that:
 - A. Mold disk stud and hole in hub of disk are clean with metal to metal fit.
 - B. Both left hand support gibs brush, but do not bind front edge of mold disk.
9. *Loose Locking Stud Blocks:* Tighten evenly, then test to see that mold disk does not bind on lock up.

PART XI SECTION B

Mold Wipers

To preserve matrices and to prevent lines from casting over type high, it is important to keep the front and back mold wipers in good condition.

1. *Weak Spring:* Renew or stretch them.
2. *Neglected Back Mold Wiper:* This permits metal to begin adhering to back of mold. As the metal builds up a shiny base on the slugs, back squirts and slugs over type high, because of metal wedged in under the back knife, are the results. Check back mold wiper by:
 - A. Roughening up felt twice a week and rubbing in castor oil, or a little Linotype mold polish.
 - B. Noting if felt is worn, throw it forward by inserting circular pieces of heavy cardboard behind it.
 - C. Noting if felt is pressed against back of molds enough to allow 1/8" clearance between cotter pin and wiper bracket.
3. *Neglected Front Mold Wiper:* This allows the metal spray to adhere to front of mold, injuring matrices and causing slugs to cast over type high, or some letters to cast slightly higher than others on slug. Check:
 - A. Felt wipers being held squarely against the mold.
 - B. Sufficient spring pressure to hold wiper firmly.
 - C. Use of graphite—never oil, or mold polish—twice a week.

PART XI SECTION C

Mold and Liner Troubles

A good clean slug is dependent to a great extent upon good molds and liners.

1. *Sprung Mold Post*: Caused by dropped mold; hammering on it; using display mold without the safety spur at side, then forgetting to use filling piece or "flipper," replacing molds improperly. To check it:
 - A. Remove mold from disk.
 - B. Clean back of mold with brass rule and mold polish.
 - C. Test back lips with straight edge against a light, noting if top half aligns with bottom.If posts are only slightly sprung, it may be possible to tap them back into line. However, to change mold posts tap pins, or, if necessary, bore new holes with No. 52 drill.
2. *Warped Mold*: Caused by excessive heat. Probably running machine with mouthpiece too hot; leaving it locked up; or improperly breaking in a new mold. Characteristics will be shiny spots between the ribs of the slug, improper knife trimming, sticking at ejection.
3. *Worn out Mold*: The rounding of the edges of the mold cell opening. This may be caused by improper cleaning. The resultant slug will be formed with a feather edge along the back where metal has forced its way between the rounded edge and the mouthpiece. The back knife will not touch this feather, and the side knives will fold it back as the slugs come through. The slugs will not stand on their feet properly until they have been scraped on the bottom. No cure except a new mold.

Note: To clean a mold. Remove mold from the disk. Then, keeping cap and body together scrape front and back with brass rule and finish up with mold polish. This will prevent edges from becoming rounded. When necessary to clean inside of mold, do so by rubbing the long way of the cap and body, never across.

4. *Temper Gone From Mold*: This is caused by overheating or improperly breaking in mold when it is new. Characteristic is difficult ejection. Molds are tempered with soft core and are fairly easily damaged by varying extremes of temperature. To properly break in a new mold, recast slowly about fifty or sixty full length slugs, allowing about four seconds or so between casts. This will allow the mold to become accustomed to the heat, and will also build up a gray greasy deposit of metal residue in the mold which is con-

ductive to easy ejection, if it is not excessive.

5. *Burred, Scratched, Bent or Punched Liners*: Characteristics are faulty appearing side knife trim, feathers on slug, difficulty in ejection, and pancaking of metal between liner and mold. Clean up burs with a fine file, but don't use bent or punched liners in the machine. The lockup of the mold springs them back and forth, damaging mold, pot mouthpiece, and vise jaws.
6. *Metal Accumulation on Back of Mold*: This causes faulty lockup, improper trimming of back knife, and may build up to back squirts. Check mold wiper and setting of back knife. (See Part VIII, Section C, No. 15.)

PART XI SECTION D

Mold Disk

Warped or injured mold disks are the result of operator or machinist neglect.

1. *Mold Disk Refusing To Turn*: Ejector blade protruding into mold cell opening; metal binding in disk teeth or behind rim. back knife, or mold slide; mold disk gibs binding disk; back knife digging into mold, disk or loose locking stud screw; or dry galled stud may be some of the causes of this condition.
2. *Worn Mold Cap Screw Holes*: If new screws do not hold, tap out the screw threading with a 16-24 tap, and insert oversized 16-24 screws.
3. *Cracked Mold Disk*: This will generally be a rim crack at the ends of the mold pocket opening. Don't blame the manufacturers, this one is on you. May be caused by improper replacement of mold, then the 900 pound lockup or the ejection pressure cracks the disk. Excessive tightening of the three mold cap screws may also crack the disk, as will forcing molds into pockets of a new disk.
 - A. To properly tighten mold cap screw:
 1. Tighten two end screws with about three pounds pressure.
 2. Tighten center screw to cap of mold with only a few ounces of pressure.

Note: Do not tighten center screw first as it will force cap of mold back. Never tighten these screws with heavy pressure.

- B. To properly replace a mold:
 1. Be sure pocket and front of disk is clean.
 2. Seat mold in pocket, bringing screws in snugly, but not tight.
 3. Turn down mold cap screws to seat mold in pocket.
 4. Tighten screws holding mold to disk.

5. Slack off, then retighten mold cap screws.
- C. To fit molds into a new disk: At time of purchase, a new mold disk may be a bit tight for the molds in use.
1. Lay mold disk face up on a soft cloth.
 2. Check mold for burrs or protruding mold post screws.
 3. Start mold into pocket and note points of bind. Never force a mold into a pocket—it should fit snugly, but not be jammed, or a cracked disk may result.
4. *Mold Disk Not Coming Forward the Proper Distance:* (See Part X, Section B, No. 1.)
 5. *Warped Mold Disk:* Excessive heat, or forcing the center of the three mold cap screws down will warp and buckle the disk.

PART XII

Pot, Pot Plunger Troubles

PART XII SECTION A

Mouthpiece and Pot Throat

The production of a good slug is the ultimate purpose of the Linotype, and an improperly functioning pot mechanism will defeat this aim, plus contributing to squirts and chances for machine damage.

1. *Metal Leak From Pot Mouthpiece:* This cause of back squirts, improper lockup, and slugs above type high may result from the following causes:
 - A. Pot too full: Metal in pot should reach to about one half to three quarters of an inch from the top of the inside rim of pot at all times. The action of the pot is similar to the tilting forward of a pitcher—if it is too full, metal will dribble out of the mouthpiece holes just before the cast. The result may be honeycombed slugs at casting. Also the heat of the throat burners will tend to deteriorate the throat of the pot. If pot is run below the capacity of the thermostat to maintain temperature, a back squirt may result.
 - B. Leak around a screw or joint: This is a hard one to spot as the leak is smeared over the mouthpiece by the machine lockup. To correct:
 1. Remove mouthpiece.
 2. Square off back of mouthpiece and face of pot with new oilstone.
 3. Coat back of mouthpiece with oil.
 4. Coat screws with graphite and oil paste. (Never red lead,

as it makes mouthpiece difficult to remove.)

5. Replace.

For steps in removal and refitting of a mouthpiece.

6. Run first elevator to the vise cap. Do not turn off the heat.

7. If machine has a built-in quadder, disconnect the link at the bottom of the vise frame. There will be one link on the newer quadders, (Serial number 61506 and up), two on the older type with the toggle lock pressure mechanism. Do not permit control rod to drop.

8. Draw vise frame stop pin at lower right of vise frame and allowing first elevator to extend, lower vise frame until it catches on second stop and is horizontal to the floor.

9. Remove a mold, lower mold slide lever, and disconnect ejector.

10. Spin mold opening in front of mouthpiece, and insert a screw loosener through opening into mouthpiece screws. Use a five pound hammer to loosen screws, and give them a good rap.

11. Now pull mold slide forward, and using a long screwdriver remove the mouthpiece screws. To remove a broken off screw drill into screw, tap in an "easy out," and twist out screw with wrench. If only one or two screws will not loosen, cut away mouthpiece with chisel (it's soft) and remove stubborn screws with vise grips.

At this point is it wise to clean the pot throat:

12. If you don't have a pot throat cleaner, use an old coping saw. Bend lower end slightly. Remove pot plunger. Insert cleaner into pot mouthpiece opening and vigorously saw out all metal accumulation. Be sure cleaner reaches to the well. Feel in well with pot hook for a check.

13. Prop a container under the pot throat, replace the plunger and flush out the throat by pumping the plunger up and down.

14. Remove container and square off front of pot throat opening with new oil stone. Be careful not to grind down the pins that support the mouthpiece.

15. Take new mouthpiece and lay it face down on a clean board. Drive a headless nail through the end holes. Lift off mouthpiece and drive nails until they are lower than thickness of the mouthpiece. Now lay mouthpiece on nails to hold it. Surface back of mouthpiece with oil stone until it is perfectly square. This may be judged by the shine you put on it.

16. Coat back of mouthpiece with machine oil (not red lead).

17. Set mouthpiece on face of pot throat and, using new screws coated with graphite and oil paste, (never red lead) attach mouthpiece snugly, but not so that it cannot be tapped one way or the other.

At this point the pot mouthpiece may need a slight adjustment.

18. Take mold and remove cap. Insert liners for thirty pica slug on body of mold and attach body to mold disk.

19. Push mold slide back into place, and raise and shut vise frame. Reconnect quadder lever link, if it has been disconnected.

20. Open vise frame, pull mold slide forward by hand onto studs, and pull metal pot forward. The end holes of the mouthpiece should fall inside the liners, and the bottom of the mouthpiece holes should be along the top of the mold body. If holes are too high, the top of them will be blocked off on thin slugs; if they are too low, the bottom of them will be blocked off by the body of the mold.

21. Remove mold body and tighten mouthpiece screws, beginning in the middle and working to the ends.

To check lockup of the machine from this position:

22. Clean back of a good mold and replace it on the machine.

23. Stir a red lead and oil mixture to the consistency of cream.

24. Pull mold slide forward and daub—don't rub—a thin coating of the red lead on the back of the mold, positioning it in front of the mouthpiece.

25. Push mold slide in and shut the vise frame.

26. Draw mold slide forward onto the studs.

27. Using a lever from behind the machine, bump the pot up against the mold.

28. Release the pot, push back the mold slide, and open the vise frame.

29. Inspect the red lead print on the mouthpiece.

Note: The pot moves by rocking on the ends of its legs. If it has to rock too far forward before contacting mold (legs too far back) only the top of the pot mouthpiece will hit the mold. If it has to rock too little to contact the mold (legs too far forward) only the bottom of the pot mouthpiece will contact the mold. As each leg is individually adjustable, it is possible to get different prints at each end of the mouthpiece. As the adjusting screws are threaded through the legs, banking against a bushing, the legs will move in opposite direction from which the screw is turned.

Ex. 1. If the front screws are turned in, the pot leg moves forward.

Ex. 2. If the top screws are turned in the pot leg moves up.

One of the frequent causes of breakage in the pot legs or the bushing, when attempting to set the pot, is to forget to loosen a screw at right angles to the one being adjusted, thus preventing

the leg from moving freely on the bushing. The resultant twist or bind in the leg will crack it when the machine is run under power. So the golden rule is this:

Before adjusting front or back screws, always back off on the bottom one.

Before adjusting top or bottom screws, always back off on the front or back one.

Procedure, then, is as follows, for a red lead test showing, let's say, an even print along the bottom of the mouthpiece only.

30. The legs are too far forward, turn out on front screws about one half turn. You can't bring the back screws in until front ones are backed off to allow slack.

31. *Slack off bottom screw at least half a turn.* This will not throw off the up and down adjustment as the pot legs set on the top screws.

32. Now, bring in the back screws with *finger pressure only*. All screws must touch bushing, but don't clamp them as this may result in breakage.

33. Take another red lead test and adjust accordingly. A square lockup must be obtained by adjustment; it cannot be done by increasing lockup pressure.

2. *Dross or Corrosion in the Pot Throat:* This may be caused by impure metal, excessive throat temperature, or metal pot not kept filled to the proper level. (See Part XII, Section A, No. 1. for cleaning mouthpiece and throat.)
3. *Improper Pot and Mold Lockup:* Characteristics of this may be a shiny base on slugs, metal accumulation on the back of the mold, slug over type high, back squirts, smear of metal across mouthpiece after casting, spit over one half to three quarters of an inch on the back of the mold after casting. The causes are many.
 - A. (See Part XII, Section A, No. 1.)
 - B. Mold warped, or mold post sprung.
 - C. Warped mold disk.
 - D. Pot mouthpiece not true.
 - E. Pot legs not adjusted.
 - F. Pot legs or pot leg bushing cracked.
 - G. Flattened bearing in the pot cam roller. This is caused by insufficient lubrication. The pot cam lever should be removed about every six months and the rollers repacked with grease. Do so as follows.
 1. Run machine around until metal pot moves forward.
 2. Remove the pot lever support spring.
 3. Let the machine come to normal.
 4. Prop the pot forward with a block of wood.

5. Disconnect the eyebolt at the bottom of the pot.
 6. Loosen set screw in shaft at top of pot lever, insert punch in the hole in the shaft for grip, and draw shaft—careful, the lever will fall out underneath.
 7. Remove cam roller, and grease bearings. To replace bearings in oldstyle machines where bearings are not in a cage, lay roller flat, stand bearings inside it, stuff center space with paper to hold bearings. Then insert the whole back into the lever, Replacing the pin will drive out the paper.
- H. Lockup pressure not correct: This is caused by improper adjustment, or cracked pot lever spring. To check:
1. Run machine around until plunger starts down to cast.
 2. At bottom of pot lever there should be 3/16" between the rear nut and the back of lever. Set this at this point in the machine cycle.
 3. Return machine to normal and look at the pot lever spring. There should be 3/32" between the spring coils in this position. Obtain this by adjusting the two front nuts. However, as this is a factory set adjustment, it should not need attention unless someone has tampered with it.
 4. To check for a cracked pot spring, remove it from the machine, as sometimes the crack will not be visible to a casual glance.
- I. Flattened roller: Keep all rollers oiled and turning. If a roller skids, it will wear flat. Replace.
- J. Loose screws in pot legs: All pot leg screws must touch the bushings, but don't turn them in tight with a wrench. Finger pressure only is advised.

PART XII SECTION B

Faulty Plunger and Well

This may show up by producing weak, honeycombed slugs, bubbling around the plunger at the cast, plunger slamming to the bottom of the well, insufficient plunger stroke, or sticking of the plunger in the well. Excessive wear, or insufficient maintenance of the machine are the major reasons for troubles.

1. *Plunger Spring Weak*: May produce poorly faced, weak bodied slugs. Run a line of matrices and bands around, when they cast, stop machine. Force plunger spring another notch toward the end of the plunger lever. (With the new plunger springs, set them one notch back from end notch in lever.) To change the plunger spring, bring the machine to the same position, work off old spring, attach

new spring at the bottom, then, using hook down through machine frame, pull up new spring until end can be slipped over the plunger lever. Work fast as a machine in lockup position will draw temper from the molds, if left standing for any time.

2. *Pot Well Worn*: This is characterized by a bubbling on the top of the metal when the machine casts. Loss of compression shows up as a poorly faced, weak bodied slug. Wells wear mostly at the front and back near the bottom, forming an oval, but insertion of an oversized plunger may save work of rerounding the well. Do not clean plunger so often, and put graphite on it to attempt to build it up.
3. *Cracked Well*: If excessive bubbling of metal, confined to one section of the pot, is seen, this may be the trouble. A weld job may hold. This can be caused by wrongly forcing out stuck plungers, or running a very strong machine with a dirty well and plunger turned backward. Plunger must be put into well with notch on rod facing the rear as this safety allows plunger to slip clear of lever, should it bind for any reason.
4. *Dirty Well or Plunger*: Plunger should sink freely into the well as the pot rocks forward and up. If it binds, the plunger roll is forced off the cam, increasing the plunger spring tension. Then, when the spring overcomes the bind, plunger drops, splashing metal out of the mouthpiece before the lockup. This will cause back squirts, poor face on slugs, and improper lockup.
To clean plunger:
 - A. Use a stiff brush on it daily, unless machine is very old. Don't breath the dust; it's poisonous.To clean well which has a heavy dross coating:
 - B. Bail out the pot until the well is exposed.
 - C. Remove the plunger.
 - D. Scrap out the well. A well scraper may be made from a segment of a 2" washer welded to a rod.
 - E. When dross ring is scraped out, coat plunger with a fine oil-mix valve grinding compound and work it in the well.
 - F. Cast a few blank slugs to rid pot of the compound.
5. *Plunger Not Making Full Stroke*: This may be caused by a ring of dross in the well. Scrape. Check adjusting vent in the plunger. This should be open about 1/16". If plunger is without one, drill a hole through the bottom of the plunger with a No. 53. drill.
6. *Plunger Slamming on Down to Bottom of Well on Stroke*: Excessive wear will cause this. The well wears elliptically and it may be necessary to ream the well and fit with an oversized plunger. The plunger should make a full stroke, so the pump stop block on the lever comes to within about 1/2" from the cap of the pot. How-

ever, the plunger should not hit the bottom of the well.

7. *Plunger Blocking off Holes in Well:* Wear on the ump cam or the cam roller will permit plunger to sag in the well. If it blocks off well intake holes, faulty slugs will result. To test: Insert pot hook in well holes when machine is in normal. You will be able to feel the plunger, if it is too low. Remedy by putting on an oversized cam roller, thus lifting the plunger.
8. *Plunger Making Stroke After Cast:* If plunger sticks in the well and main driving pinion is excessively worn, the machine will buck a little as it breaks away from casting. This will cause plunger to splash a little metal out of the mouthpiece, thus causing a faulty lockup, etc., the next time the machine goes around. Check stroke of plunger in well, and check the driving pinion by shutting off the machine and wriggling the clutch arm, noting the play where driving gear meshes with No. 9 cam, or driving cam. This gear should be replaced when teeth are worn down to 1/16" across the top, or excessive wear on the driving cam will result.

PART XII SECTION C

Inoperative Pump Stop

For the protection of the operator and the matrices, this is one of the most important safeties on the machine. It should be kept in working condition at all times.

1. *Broken Pump Stop Spring:* This is a thin wire spring at the rear of the pump stop mechanism. Replace it.
2. *Loose Screws:* Tighten.
3. *Screw in Short Arm of Pump Stop Lever Not Adjusted:* This screw, touching the right hand vise jaw, should be set to allow not over a 1/32" clearance between the block on the plunger lever, and the stop block, at casting. Test by sending in a line of matrices and bands, and observing clearance. Check also, to see if the pump stop rests against the banking pin at normal, or at least 1/8" in under the stop block.
4. *Wear in Pump Lever Cam or Cam Roller:* This will allow plunger to sag, thus binding the action of pump stop. Clearance between stop and block should be about .004". Obtain by loosening the two hex nuts on the pump stop block, and lowering the block. In some cases it may be necessary to grind down the stop slightly, but preserve the square edge at all times.

PART XIII Side Knives

PART XIII SECTION A Setting the Knives

In some shops the setting of the side knives is a constant source of grief, in others a source of pride. There are certain definite steps to be followed in this setting, if one is unfamiliar with the machine. They are as follows:

1. *Testing Locking Studs for Wear:* If the studs are worn to allow play in the disk at ejection, there may be a variable trim to the slugs. Check by running the machine around until the mold disk advances, then pull forward on the mold selector pinion and try to turn the mold disk back and forth. If there is play in the studs, you may see it by this action. Test also at ejection position.
2. *Taking Side Wobble Out of Right Hand Knife:* With the machine in normal position, locate the two screws on top of the knife block. Their purpose is to act for a guide for the right hand knife bracket and if they do not provide a sliding clearance for the bracket, the right hand knife will give a variable trim to the slugs. Reset clearance as follows:
 - A. Shut knife block to smallest point size.
 - B. Loosen locking nut on one of the screws.
 - C. Tighten that screw.
 - D. Open knife block to largest point size. (The dial will open, but the knife will be held shut by the screw.)
 - E. Ease off on the screw until the knife block snaps open.
 - F. Carefully tighten the nut.
 - G. Repeat with the other screw. (This is all that is necessary on the oldstyle blocks.)
 - H. On the newer knife blocks, two additional support screws will be found under and above the end of the sliding bracket. Adjust these to bring support to bear against the bracket, but do not bind the action.

Note: The other adjustment must be made first.

3. *Setting the Left Hand Knife:* This knife should be set to trim the overhang from along the top edge of the smooth side of the slug. It must not gouge the slug. At the front of the vise frame will be found four square head bolts. The two *outside* ones hold the left knife. Set knife as follows:
 - A. Assemble a thirty pica line of matrices and bands.

- B. Lock spaceband grabber.
 - C. Cast a slug.
 - D. Loosen the two outside square bolts 1/2 turn.
 - E. Make adjustment with the long bolts going through the right hand side of the knife block, banking against the left knife.
 - F. Tighten the bolts on the outside of vise frame, lower one first.
 - G. Recast the line of matrices.
 - H. Examine the smooth side of the slug, testing overhang with fingernail.
 - I. Re-adjust left knife until correct.
4. *Setting Right Hand Knife Parallel to Left Knife:* If the slug trim is more than .0002" off, the slugs will start curving in the galley. To set the right hand knife parallel:
- A. Assemble a thirty pica line of matrices and bands.
 - B. Lock the spaceband grabber.
 - C. Cast a slug and "mike" it at the top of the ribs.
 - D. Open the vise frame.
 - E. Loosen two bolts holding right hand knife to machine.
 - F. Loosen lock nuts on the micrometer screws.
 - G. Reset the micrometer screws.
 - H. Tighten the bolts holding the right hand knife.
 - I. Cast a slug and "mike" it.
 - J. When correct tighten locking nuts on the micrometer screws.
5. *Bring Trim to Point Size:* Point size of the different knife settings is determined by the ring of hardened screws in the dial against which the right hand knife bracket is held. These hardened adjusting screws are held in position by small set screws around the rim of the dial piece. As each adjusting screw is brought to position against the right hand bracket, its respective set screw is located through a slotted guide at the right of the block. The adjusting screw itself, is located through a hole in the right hand end of the knife block.
- To set, then:
- A. Bring knife block to point size desired.
 - B. Cast and "mike" a slug.
 - C. Open the vise frame.
 - D. Loosen set screw.
 - E. Adjust hardened screw through end of the block.
 - F. Loosen lock nuts on the micrometer screws.
 - G. Cast another slug and "mike" it.

PART XIII SECTION B

Faulty Trimming of Side Knives

Certain characteristic troubles occur in the setting of side knives.

1. *Left Hand Knife Not Close Enough*: This will either show up as an overhang on the smooth side of the slug next to the type, or a bump on the lower ribs where the slug twists as it clears the mold to escape the right side knife. Type will be off its feet.
2. *Left Hand Knife Too Close*: Will gouge the smooth side of slug.
3. *Right Hand Knife Not Close Enough*: Slug will not be to point size. Rib may "mike" thicker near bottom of the slug.
4. *Right Hand Knife Too Close*: More than the rib of the slug will be trimmed. Rib may have a bump at the lower part.
5. *Ends of Slug "Mike" One Reading, Center Another*: Knives are warped or poorly ground. May be able to make a very slight difference by drawing side of screwdriver down edge of knife, kerning edge over a bit.
6. *Ends of Slug "Mike" Differently*: Right hand knife is not set parallel to the left knife.
7. *Knives Ground Down Too Much*: If the knives are ground down more than $1/32$ " they should not be put on a machine. The slugs will twist as they leave the mold, causing bumps on the lower ribs, slugs will be off their feet.

Note: *Side knives are a matter of adjustment, rather than replacement; however, loose locking studs, poorly set mold slide support screw, loose or improperly set mold support blocks, burred liners, warped molds, or disk have a bearing on the finished slug. Many times a slug will "mike" true, yet the knives will seem to be trimming one end more than the other. Metal pancaking between liner and mold, faulty replacement of liners, or injured liners will cause this. Warped molds will create shiny spots between the ribs on a slug.*

PART XIV

Ejection Troubles

PART XIV SECTION A

Wrong Ejector Blade, Liner, Mold, or Knife Incorrectly Set
These are operator mistakes. To correct: Push in the clutch, back cams slightly, lift dog on ejector lever free of pawl on No. 9 cam, geared cam, then pull back ejector lever, run machine to normal, and correct the condition. Remember, there is no safety to throw out the clutch on an ejector stop. Push clutch in yourself—right now!

PART XIV SECTION B

Metal Temperature

Metal is too hot. Blade forcing into the slug acts to wedge slug into mold. Free ejector dog, pull back ejector lever, and run machine to normal. Loosen screws in mold cap and remove slug with pliers. Don't go to rear of machine and try to knock slug out with ejector lever.

PART XIV SECTION C

Ejector Blades Hitting Mold

Ejector blades should clear mold about .004" to .007" to body of mold. Note if blades are bent, or sprung. Check mold slide support screw. (See Part XI, Section A, No. 7) Note if mold keeper is correctly positioned in mold. If mold body has been taken apart (two lower screws under four screws holding mold to the disk.) the light-face lip may set too low. In such a case, the tops of light-face positioned capitals will be trimmed at ejector, and the ejector may hit the mold. Remove mold from machine, loosen the two screws in the body and tap keeper (light-face part) up into mold body.

PART XIV SECTION D

Slug Hesitates at Ejection

This is not an uncommon trouble, and the causes are many. Dirt, gum, or burrs on the knife block support plate (flap inside knife block), or lower knife block liner (bottom block that sup-

ports the end of the slug as it is pushed through the knives); or rough, worn leather on the galley slug adjuster (long metal flap overhanging knife block to prevent slugs from turning upside down as they enter galley), or bent slug adjuster are sources of temporary trouble. However, if the condition seems more deeply seated, the following may be examined.

1. *Burred Mold Liners*: Injured liners will cause escaping metal to set up a resistance against slug ejection.
2. *Accumulation of Metal Along Sides of Mold*: Faulty setting of back knife, improper action of the back mold wiper, or worn mold will create this condition. If there is a fin of metal along the base of the slug after ejection, the mold may be rounded on the back. This fin causes resistance to ejection.
3. *Temper Gone From Mold*: Excessive heat will draw temper from the mold. Leaving the machine in locked up position for a period of time, or leaving the machine in normal for long periods without turning down the mouthpiece may also draw temper from molds.
4. *Wrong Setting of Side Knives, or Any Other Operator Mistakes In Setting Up the Machine*: Reset.
5. *Dull or Nicked Knives*: Keep an extra set on hand, and send dull knives to the Mergenthaler Linotype Company for resharpening. Knives must be ground to within .0001" for accuracy, and they are also finished so they will not pick up lead.
6. *Inside Rim of Driving Pulley Slippery*: Wipe out pulley with white gas and a clean rag. May hold a piece of emery against the inside rim of the pulley as it revolves, but *never* use belt dressing, or anything to make the clutch leathers stick. The clutch should slip if accidents occur, otherwise serious damage may result.
7. *Clutch Settings Wrong*: (See Part IX, Section A, No. 7.)
8. *Weak Clutch Spring*: Driving leathers will not be forced against pulley with enough power. Clutch spring should register a 16 pound pull. To test, hook a scale on the clutch arm link and pull, machine in normal. Remove spring as follows:
 - A. Remove screw and loosen clamping bolt holding clutch arm to drive shaft.
 - B. Remove clutch arm.
 - C. Remove bushing on end of drive shaft and spring may be removed.

Note: A standard length spring of 4 1/2" should give the proper pressure and, if a new spring does not correct the slippage, the trouble is elsewhere. However, the temptation is strong to stretch the spring, and increase the machine pulling power. If

you must stretch it, do not increase the length past 5" and be sure to stretch all coils equally. Remember, the more power, the less safety.

9. *Oily Leathers in Driving Clutch Arm:* Replace. (See Part IX, Section A, No. 7 for correct clutch settings.) Be sure that brass screw heads are well below the surface of the leathers, and round over the edges of the leathers with emery. While you are about it, oil the pins in the links of the clutch arm. A little wear in these much neglected oiling points will throw off the whole clutch adjustment.

Note: If you wish to replace these pins, be sure to file the old one off flush with links before tapping them out. The links are extremely brittle, and are easily fractured by pressure.

10. *Hollow Slugs:* Excessive heat, worn pot well, plugged throat, or mouthpiece holes will create this, causing ejector to stick in slug.
11. *Support Plate in Knife Block Improperly Set, or Plate Spring Too Strong:* Open vise frame with machine in normal. Remove large bolts above and below knife block. Remove knife block from vise frame. Remove upper and lower knife block liners (pieces on either end of the block, holding plate). Remove plate and examine for burrs, wear, breakage of the lugs. Tighten screw holding the brass spring, and set spring to exert a firm, but not strong pressure against the plate, making bottom segment of the spring slightly stronger than the upper. Replace plate, being sure that ends of the spring are under the studs. Replace liners, and put the whole back on the machine.
12. *Ejector Not Coming Far Enough Forward:* If the slugs have been ejecting in the past, don't worry about this one. Ejector should come 1/32" past the lower knife block liner. To check:
- A. Open knife block.
 - B. Hold open knife block flap.
 - C. Run machine around, and stop it as ejector moves forward.
 - D. If ejector comes past point where slug starts to slide into gallery, that's it.
 - E. If not, go to the rear of the machine and locate ejector lever (upright lever on left of the large geared cam).
 - F. Locate screw on pawl that is hooked by dog on the geared cam.
 - G. Back off on the screw to make ejector come further forward. This simply allows the dog to hold on to it longer.

Note: The dog must release the ejector lever before the transfer and delivery cam, to the left, No. 10 returns ejector. Otherwise the ejector lever would break. Do not make ejector come forward more

than $1/32''$ past liner.

13. *Sprung Ejector Blade*: From normal, turn machine backward until second elevator drops. Open vise frame, and shove the ejector blade forward through the mold opening. Blades must clear mold by $.004''$ to $.007''$. Examine them for breakage, or twists.
To replace blades, see Part XIV, Section F, for removal of mold slide.
14. *Knifewiper Incorrectly Set*: This condition will occur on the old-style machines. The wiper does not drop low enough, and drags the end of the slug.
15. *Ejector Blades Not Square With Face of Mold*: Wear on the controller and the controller rod will create this condition. As short measures are used more frequently than long, the wear will take place at the top of the controller (the twisted piece of metal going up into the mold slide from underneath, and held there by a long thin rod located behind the right pot leg.) To check: From normal turn the cams backward until the second elevator drops. Shove ejector lever slightly forward. Open the vise frame and examine the blades. They should be square with the face of the mold. As controller and rod wear together, they should both be replaced. Pull back ejector blades, remove rod and controller will drop out. Slide up new one and replace rod. Test for binds by trying ejector movement from the rear of the machine.

PART XIV SECTION E Broken Ejector Lever

This is an infrequent condition, but worthy of mention as it may be difficult to locate the cause.

1. *Ejector Blades Coming Too Far Forward*: This means that the No. 10 Cam will return the blades as the dog on the No. 9 Cam is still pulling the lever forward. Adjust the forward movement of the ejector blades by the upright screw on the pawl on ejector lever. The blades should move $1/32''$ past the lower knife block liner.
2. *Worn Pin in Ejector Lever Link*: The ejector lever link is the piece connecting the ejector lever (upright to left of geared No. 9 Cam) to the rear of the mold slide. If the guide pin in the link at the mold slide end is bent, broken or worn, the link may protrude to the left of the mold slide. As the slide moves forward, this end will be forced against the column of the machine, breaking either the ejector lever, or the rear top end off the mold slide. In either case it is difficult to weld, and if the trouble is not located, breakage will continue.

PART XIV SECTION F

Ejector Lever Slams on Main Cam Shaft at Ejection

In the lower front part of the mold slide there is a cushion plunger and spring to prevent this from happening. Loosening of the bushing holding them will allow this slamming. To correct, it is necessary to remove the mold slide. Run the first elevator to the vise cap. Lower vise frame until horizontal to the floor. Remove the ejector controller and guide rod. Lower mold slide lever, and disconnect ejector lever link. Withdraw mold slide by straddling vise frame and grasping the slide to left and right of disk. Correct the condition and replace the parts in reverse order. If replacement of the controller is troublesome, connect up the ejector lever link with the rear of the mold slide and pull back, thus aligning the blades. Now draw the mold slide forward slightly and replace the controller. Excessive wear on the guide pin of the controller may be caused by the controller not being set at the right height when blade selection is made. Loosen screws in the controller lever segment, or the latch, or a bent latch, or rod will cause this lack of alignment of the controller rod with the link stop and slots along the inside of the mold slide. (The segment is the notched piece at the front of the machine into which the latch fits when blade measure is selected.)

PART XV

Distribution Troubles

PART XV SECTION A

Distributor Shifter Troubles

The shifter must be allowed to make its full stroke with a minimum of friction. With the machine in normal, draw it slowly back and forth. Any drag or bind should be found and corrected. Following are some of the causes for a faulty distributor shifter.

1. *Dirty, Gummed, or Burred Slide or Slideway:* Don't use oil here. It will collect dirt and gum. Wash slide and slideway with white gas and cloth, then graphite it lightly. Remove all burrs with a very fine file.

2. *Distributor Shifter Sticking Back, Then Banging*: Dirt, gum, or burrs on slide or slideway. Loose screws in shifter, sprung lever or lever link, or bent arm on the shifter slide will cause this condition. Bad matrices, faulty transfer from the second elevator to the distributor box bar, injured distributor box bar, or loose second elevator head may also cause this condition.
3. *Distributor Shifter Adjusting Screw Improperly Set*: This screw regulates how far into the distributor box the shifter moves. It is located at the left front section of the distributor beam, and the shifter banks against it. Set to allow the face of the matrix pusher to move up to, but not over, matrix lift in the distributor box. If it is not correct, the last thin matrix may not be lifted, or matrix lift may bang pusher as it rises.
4. *Weak Spring in Distributor Shifter Matrix Buffer (Pusher)*: This may prevent last few matrices from being pushed through the box to lift, but it's a rare bird. If the spring pressure is there at all, the trouble is probably something else.
5. *Loose Screws*: Tighten.
6. *Face of Shifter Not Square With Matrix Line, or Second Elevator and Distributor Box Bar*: Probably shifter arm is bent. Remove and Restraighten carefully.
7. *Shifter Won't Come Fully Back as Cams Turn*: Something binding slideway action, or broken cam rider spring. This is located in the casting at the bottom of the lever.

PART XV SECTION B Distributor Box Troubles

Cleanliness of the box, with a lack of burrs, loose screws, binds and excessive wear are imperative for proper box action. It is a fairly delicate mechanism, and should be treated as such.

1. *Matrix Lift Not Adjusted*: Matrices should be lifted so that the bottom corner of the upper rear lug clears the corner of the box rail by not over $1/32$ ". To test:
 - A. Pull back shifter and put a matrix on the second elevator bar.
 - B. Let shifter push it into box, then turn screws, watching lift of matrix.
 - C. Adjust lift by screw on the side of the upright lift lever, rear side of box. Turning in on the screw will lower the lift.
2. *Second Elevator Bar Not Aligned With Distributor Box Bar*: On newer machines there are two adjusting screws, located in the upper second elevator guide, to contact the rear edge of the second elevator bar plate. On older machines it may be necessary to place

shims between the distributor shifter slideway and the distributor beam to obtain alignment.

Note: The rear end of the distributor box bar is loose to allow horizontal alignment with the second elevator.

3. *Spring Pawl in Second Elevator Bar Not Working:* This little pronged pawl, located nearest the box in the elevator bar, prevents long lines from moving too far to the right at first to second elevator transfer. However, if it does not fully retract when the second elevator bar goes back to the distributor box, it may hold the elevator bar out of alignment with the distributor box bar. Bent plunger, or obstruction, binding action, may cause trouble.
4. *Distributor Box Not Placed Properly on Machine:* On older machines, the pins holding the box may be worn. This will allow the box to sag slightly, thus causing matrices on the rails to be out of alignment with the combination bar. To test:
 - A. Place a pi matrix in the box.
 - B. Turn screws until matrix is about 1/2" from the end of box rails.
 - C. Raise rear screw by pushing up on catch holding right rear bracket.
 - D. Note alignment of matrix teeth with combination bar teeth. It must be a perfect transfer.
 - E. Turn screws forward, guiding matrix with finger, until timing of gears on left end of screw can be accomplished. (Look for timing pin and notch in the gears, left end of screw.)
 - F. Shut down the rear screw and turn matrix forward until it is off the box rails.
 - G. Now turn screws backward until matrix goes back about 1/4" onto the box rails. It should do so without lifting, dropping, or binding in any way. Use these two tests when fitting new pins in the box.

Note: When removing the box from the machine, always turn the clamp as far forward as it will go, so that the box may be brought down squarely from the machine. If it is pulled out at an angle, the upper front box rail will be sprung. Never let go of the box until it is securely clamped into position. If it is dropped it is invariably injured.

5. *Injured Font Distinguisher:* This is an invaluable instrument when many fonts of matrices are in use, but it can't stand abuse, and will not function once someone has tried to bang a wrong font through the box with the distributor shifter. To replace a font distinguisher point on Linotype.
 - A. Remove the box from the machine.

1. Pull cams back until second elevator drops.
2. Open gate (distributor entrance channels).
3. Push in on the font distinguisher, and turn it 1/4" turn clockwise.
4. Hold box with right hand and turn clamp clockwise as far as it will go.
5. Gently ease box toward front of the machine until pins clear the beam, then take it out, straight down.
- B. Unscrew the distinguisher stud, and loosen the screw holding the spring to the box.
- C. Remove stud, spring and distinguisher point.
- D. Place new point on knob end of stud.
- E. Insert point and stud into box.
- F. Turn up point to align with guide.
- G. Insert other end of stud through box and screw together.
- H. Retighten spring under screw on box, push distinguisher all the way in, and turn clockwise, to hold point inactivated.
- I. Replace box on the machine, and turn the knob counter clockwise until point is upright, and the knob snaps out against the adjusting screw.
- J. Select matrix of the point size setting, and reset adjusting screw (pushing against the stud) to allow clearance of the font distinguisher point and font slot in the matrix.
6. *Matrix Backward in the Distributor Box:* If there is no font distinguisher on the machine, the bar point (knife point on the end of the distributor box bar) should prevent matrix from passing through, if it is larger than an eight-point thin. To clear:
 - A. Pull back distributor shifter and lock it.
 - B. Lower entrance channels.
 - C. Insert a lead pencil (never a screwdriver or other hard object) into the box, and push all matrices onto the second elevator bar.
 - D. Pull back on cams until second elevator drops.
 - E. Remove matrix.
7. *Bent or Worn Bar Point:* This is the knife point on the end of the distributor box bar. To test:
 - A. Remove the box from the machine.
 - B. Insert a matrix in the box, pushing it up against rail shoulders with a pencil.
 - C. Now look down on top of the box, and raise the lift.
 - D. Note how bar point aligns with the slot down side of matrix.
 - E. Straighten with duck-nosed pliers.If the end of the bar point is worn, two thin matrices may lift together and bind in the screws. Replace the bar point.
8. *Box Bar Wrong for the Point Size of Matrices in Use:* There are three lengths of distributor box bars, with bar point lengths to fit.

As the total overall length of bar and point is the same in all cases, the shorter the bar, the longer the point. Larger matrices are too fat to lift on the short bar points as they will bind on the bar. This point should be remembered if purchase of larger sizes of matrices is contemplated.

Note: *In connection with this, box rails also vary.*

The Parts Catalogue shows five-sixteenth, three-eighth, and five-eighth inch rises on the upper box rails to correspond to the point lengths.

9. *Worn, Bent, or Sprung Distributor Box Rails:* Rails wear over a period of four or five years. The two points of wear are at the vertical shoulder, where matrices bank before being lifted, and on the slope. If the vertical is worn, matrix is pushed further in than it should be, and will cause excessive wear on the distributor screws. Also the clearance between the end of the bar point and the vertical will increase past .040", thus allowing two thin matrices to lift at same time. This bends the lugs of the second thin matrix in the screws. Wear on the slope will show up as shallow pits. Keep slopes flat, and smooth as wear here shows that the screws, also, are developing pockets.
In replacing rails, check the following:
 - A. Replace them as a set. The bottom rails also wear.
 - B. The matrix must contact all four vertical shoulders.
 - C. The upper rails must be exactly the same height. Test with small square, or a good matrix held against the back rail. Tap rails until square.
 - D. Bend out spring on front rail slightly, and check to see that no screws or pins bind the passage of the matrix through the box.
 - E. At point where matrix teeth engage combination bar there must be no bind. Run a matrix to this position, check for paper clearance between rails and matrix, wriggle it to see that there is tooth clearance.
10. *Worn Matrix Lift:* Wear here takes place on the edge, allowing lift to slip out from under matrices. Replace. Wear in the cam on end of rear screw, shaft of lift, and lift cam stud will prevent lift from contacting bottom of matrix squarely, and also throw off the timing, thus allowing wear on the screws, themselves.

PART XV SECTION C

Distributor Screws

Normally the main source of trouble here will be wear and improper lubrication. Pockets will be worn just above the distributor box matrix lift, and this will cause bending of matrices.

Causes of the pockets are distributor box faults. (See Part XV, Section B.) Other faults in the distributor screws may be:

1. *Worn Gears, or Loose Pins:* The three screws are timed to hold a matrix to right angles to distributor bar. As the matrix travels the lower screw advances the lower end of the matrix .010". In case of excessive wear, this timing is lost.
2. *Matrix Guard Rubbing Matrices:* This long curved piece of metal between the upper and lower front screws, prevents changes of magazine while matrices are travelling the beam. Without it, distribution would be next to impossible, as the upper lug of the matrix would hit the lower front screw, thus throwing the matrix. The guard should be set to clear the matrices .020". On the older machines that do not have adjusting screws for this, the operating lever should be bent to allow 1/32" between it and the stud that operates it. (Locate on right side of machine.) Of course, the guard must clear the screws at all points.
3. *Oil in the Distributor Screws:* Use of wrong oil, or excessive oiling will allow oil to work out onto the screws. The matrices pick it up and distribute it throughout the magazines. This is a common cause of matrices sticking in the magazine. Clean screws with a cloth soaked in benzine, on a reglet. Oil the screw bearings with one drop of clock oil weekly. Do not use machine oil. Do not neglect all oiling entirely.

PART XV SECTION D Distributor Clutch Troubles

The older machines ran four pitch screws (four matrices to the inch) that functioned from a sliding stop bar along the top of the entrance channels, but since 1917 the two pitch screw, functioning from a spiral stopping mechanism located under the pulley wheel, has been in use. In this mechanism the lower screw is free of the gear at the left end (rear), but is held in time with the gear by a small spring connecting the gear to the lower spiral, which is pinned to the screw, and two stop pins. As gear is turned, it drags the lower screw around. The spirals may be compared to thin cross sections of ordinary screws, running with their threads in mesh. If a matrix or any other resistance binds the action of the lower distributor screw, the lower spiral is retarded, and the two spirals bind, stopping the screws. The continuing action of the drive pulley pulls the stop blocks apart on the clutch, itself (left of pulley wheel),

and the clutch spring (in view to left of clutch leather) pull the clutch leather away from the pulley wheel.

In starting the distributor, pulling the knurled knob to the left (rear) allows the stop blocks to snap back into time, and turning the knurled knob an eighth (not more) turn backward breaks the bind in the spirals, thus allowing the timing spring to pull the lower screw around until the timing pins meet.

If the channel entrance gate is lowered, the stop is similar to the old four pitch screw stops. The spirals and stop blocks do not function as a stopping mechanism. The pointed upright screw in the stopping lever simply forces up against the eccentric collar (left of clutch), pushing the clutch as a unit away from the pulley wheel. In such a stop, when the gate is closed, the mechanism should take off instantly, as a spring, located at the end of the clutch shaft pushes the clutch back against the pulley.

As the whole driving power of the clutch depends on the small spring connecting the spiral and the floating lower screw gear under the pulley wheel, it may be seen that dirt, loose screws, faulty spring tensions, wear, binds, or faulty lubrication will prevent proper action, as the slightest resistance on the lower screw should be sufficient to stop it. Following are a few of the things that may cause trouble.

1. *Loose Screws: Tighten.* Adjust spring tension on clutch by the movable collar to the left of the clutch leather. Collar should be far enough to the left to trap the spur when the gate is lowered. Springs should be stretched just enough to hold the stop blocks together when the gate is lowered, causing a spur stop.
2. *Clutch Leather Gummy or Oily:* Scrape it with a knife. To remove the clutch:
 - A. Remove the knurled knob.
 - B. Remove the weighted lever with the pointed screw stop. Careful, some models have a spring behind the lever.
 - C. Remove the bracket from the machine beam.
 - D. Remove the clutch. Some models have a stop screw in the shaft that prevents the clutch from sliding off, so if such is the case, separate the adjusting collar and the clutch, and remove the screw.
3. *Dirty Spirals and Gears:* Put distributor belt on without crossing. Flush out parts and bearings with kerosene and allow the mechanism to run backward. When clean, wipe off threads and parts,

- and apply one drop of clock oil to the oil holes.
4. *Floating Screw Binding the Clutch Shaft:* The end of the clutch shaft in the machine has a groove cut around it. The shaft is held in the beam by one screw whose end is guided in the groove. If the end of the screw touches the shaft, a bind will result.
 5. *Weak or Loose Springs On Clutch Flange Collar:* This allows the stop blocks to jump apart. The running of the distributor will then be slow and ragged. Loosen screw on adjusting collar, and push it to the left until the spur will be trapped when the gate is lowered, and increase the spring tension only enough to prevent stop blocks from springing apart on such a stop. On a spiral stop, or binding of the lower screw, the stop blocks must spring apart easily, so don't make these springs strong.
 6. *Worn, or Loose Spring Hooks on Spiral and Gear:* Locate these hooks on the spiral and gear under the drive pulley. Grasp them with finger nails and test for looseness. If they are loose, worn, or bent, they will cause trouble. Don't cut spring for more power or replace it with a stronger one. If it has been damaged, replace it. If it is not damaged, the fault is not in the spring. Thin matrix damage may be traced to this spring being overly strong, or a combination of worn gears, and strong clutch springs.
 7. *Faulty Lubrication:* Never use machine oil. One drop of clock oil in each of the oil holes is enough. But don't go to the other extreme as this mechanism, like all mechanisms of the machine, needs lubrication.
 8. *Faulty Distributor Box:* Troubles here may, of course, show up in the clutch. (See Part XV, Section B, Parts 1, 4, 7, 9, 10.)

PART XV SECTION E

Channel Entrance Troubles

Channel entrance gate stops may be broken down into two types—matrices falling flat on the entrance partitions and dropping into the wrong magazine slots, or matrices clogging the entrance channels.

1. *Matrix Teeth Worn, or Injured:* In such cases matrices may drop too soon, thus distributing wildly. Examine for excessive wear (a font is good for about eight years), and tooth damage. Try "miking" the matrix across the two upper lugs. If the reading is over .75", a faulty transfer may be responsible. This springs the combination wider than it should be. Close the matrix up with a plastic or brass hammer. Might mark the identification side of the matrix with a red pencil, to see if it is a repeating offender.

2. *Channel Partitions Bent*: If only a few letters distribute wildly, or fall flat, the fault may lie in the partitions. Straighten them with flat-nosed pliers, reaching deep into the gate.
3. *Distributor Beam Incorrectly Adjusted*: This allows faulty distribution the length of the beam. Combination bar should hold the bottom of the matrix .043" from the top of the partitions. Adjusting bolts for the combination bar are found on the top of the beam, and the holding bolts are at the rear. Loosen the holding bolts slightly and, pressing the combination bar against the adjusting screws, set the beam for the right height. To test the beam for sideway alignment, put a lower case *t* in the box and turn the screws steadily by hand.
On four pitch screws (carries four matrices to the inch) the *t* should drop, centered between the partitions of the gate; on two pitch screw (carries two matrices to the inch) *t* should just tick the right hand partition as it falls. If you feel that the partitions may be out of alignment, try other matrices at various places along the beam.

To move the beam back and forth:

- A. Loosen the two holding bolts at the front of the machine.
- B. If you desire to pull the beam toward distributor clutch, turn in on the banking screw located on the right end of the beam from the front of the machine.
- C. If you desire the beam to move other way, back off on this banking screw, and place a piece of two-by-four against the beam and tap it.

Note: Only change beam adjustment if all else fails. Trouble on machines generally is not in the large castings, but rather in the smaller parts. Remember a few thousandths inch beam adjustment makes a lot of difference.

4. *Loose Screws*: Check for them, and tighten lock nuts.
5. *Channel Entrance Partitions Incorrectly Aligned With Magazines*: Matrices may clog up gate, causing a few to distribute wildly along the top of the gate. (See Next Section.)
6. *Excessive Vibration in the Machine*: This may be caused by worn driving pinion, faulty foundation, machine running dry, poor breakaway from lockup (probably incorrect temperature), loose bolts in main cam shaft, improperly set mold turning brake, and the like, will cause this condition.
7. *Left End (Rear) of Distributor Beam Too Low*: If floor is level, (test with a level on top of distributor beam), slide a piece of zinc photoengraving plate (.065") under the legs at the driving

- clutch end of the machine. This will tend to keep the matrix lugs against the threads of the screws, not allowing them to run ahead.
8. *Ragged Running Screws*: This will, of course, cause faulty distribution. Loose belt, faulty lubrication, faulty clutch adjustments, binding matrix guard, or wear and misadjustment of distributor driving clutch will cause this trouble. Belting too tight will also create this condition.

PART XV SECTION F

Matrices Clogging Entrance Channels

The alignments of the distribution mechanism may be thought of as follows. Gate entrance partitions must be correctly positioned under combination bar. Lower part of gate partitions must be correctly aligned with magazine channels. Gate must be set at the right height to magazine. Gate must be set at the right distance from the magazine.

Section E in this Part has covered the alignment of the beam and gate. The alignment of the lower part of the entrance partition should be so that the partition is set in line with the right edge of the channel separation in the magazine.

Ex. The right hand partition of the lower case *t* channel should align with the right side of the *t* and *e* division, or in line with the left side of the *e* channel. This will allow the ear on the partition to guide the matrix properly into the magazine.

To check this: Stand on the second elevator shaft and peer over the distributor beam, raising the entrance gate flap to see the alignment. Re-align with duck-bill pliers.

The gate should be set for height so that the lower edge of the gate is aligned with underneath edge of the bottom of the magazine, and the distance from magazine to gate should be one thirty-second of an inch.

The distance from the magazine to the gate is set by two banking screws at either side of the gate, but the means of adjusting the gate height varies with different models of machines. On newer machines there are adjusting screws on either gate bracket at the side of the gate, on some there is an eccentric stud to position the gate, and on some the magazine height may be

varied. Examination on the particular machine may be necessary. In spite of these adjustments, however, there may still be distribution bugs. Following are a few:

1. *Sprung Magazine*: Matrices slide in the channels with .010" lug clearance. If the magazine plates have been bent, clogging will result. If edge has been bent, try returning to original position by removing safety from magazine, and inserting a piece of soft wood as a lever to straighten the plate.
2. *Faulty Matrices*: Swollen, bent, worn, burred, or gummy.
3. *Worn Magazine Channels*: Scalloping along the edge of the magazine plates. Might help it by squaring off the rear of the magazine with a file. Lay file along both edges, keep it cutting square.
4. *Burrs on the Rear of the Magazine*: Two easy ways to cause this damage are to slam gate shut while there are still matrices in it, or try to change magazines with a matrix caught between the magazine and gate. Either way injures magazine and matrix damage. Remove the burrs from the magazine with a very fine file.
5. *All Matrices Distribute but One Character*: Try bending the partitions, or varying the gate setting, of the character on the end of the magazine. Sometimes changing magazines, or a radical change of point size will cause this situation. Remember, a slight adjustment will generally correct the condition. Don't throw everything out of whack trying to fix it. It's not a question of everyone out of step, but Joe. Joe's out.

PART XVI Transfer Troubles

PART XVI SECTION A

First Elevator Not Rising to Full Height

Machine will stop, but damage may already be done.

1. *Recasting Block Not Thrown Out of Way*: Lock spaceband grabber and press down on first elevator head with the left hand, and throw recasting block out of the way with the right. Allow the head of the elevator to come up, unlock the grabber, and allow it to come across slowly.
2. *Squirt*: Back machine by turning clutch arm. Open vise frame and clear.
3. *Transfer Finger Bent*: Back machine and clear. Bend finger straight and run machine until finger moves in to transfer. Remove finger and replace.

4. *Obstruction Binding Turning of Mold Disk:* (See Part VII, Section C, No. 5.)

Note: Whenever this happens, there is a good chance that the bolt and block on the lower right bottom of the elevator slide has been bent. Check the transfer from first to second elevator. (See Part XVI, Section B, No. 12.)

PART XVI SECTION B

Faulty Transfer From First to Second Elevator

This is one of the major causes of sprung and injured matrix combinations. A complete font may be ruined if this adjustment is not held true, with resulting wild distribution of matrices. Following are some of the reasons for a faulty transfer:

1. *Metal or Dirt on Adjusting Screw:* This screw is located at the bottom right of the first elevator slide. Keep it clean, as it halts and positions the rise of the first elevator.
2. *Screw in First Elevator Slide Stop Bent:* This is the screw holding adjusting screw stop block to elevator slide. If it is bent, first elevator's position at transfer is not accurate. Remove it and stop block, and check.
3. *Matrices Binding in First Elevator Jaws:* (See Part VIII, Section A, No. 7.)
4. *Matrix Retaining Pawls Too Strong, or Unequal in Tension:* (See Part VIII, Section A, No. 2.)
5. *Bent Transfer Slide Finger:* Finger must center between front and back pawl of first elevator. Square it by using edge of intermediate channel as a guide.
6. *Second Elevator Bar Plate Gummy, or Burred:* This will hold off the head. Clean with gas and a rag, remove burs with fine file.
7. *Obstruction When Second Elevator Seats in Channel:* Check and remove.
8. *Bent Spaceband, or Matrix With Burred Teeth:* Pull back grabber and lock it. Push all matrices and bands either over to the second elevator or back into the first elevator. Pull clutch, returning the machine to normal. Open the vise frame and check.

Note: Never pull the clutch on a transfer stop, before getting the line either all in the first elevator, or over to the second. If the line is only half transferred, and machine is forced, damage will occur.

9. *Second Elevator Not Seating in Intermediate Channel:* If second

elevator "bounces," run machine to normal. Then set the nut on bolt at lower end of second elevator lever so that the bolt can be still turned, but not pushed back and forth. Tightening of this nut forces the second elevator head down into the intermediate channel. Keep bolt loose enough to turn when machine is in normal.

10. *Sprung Back Jaw on First Elevator:* (See Part VIII Section A, No. 7.)
11. *Loose Screws:* Tighten.
12. *First Elevator Not Aligned Properly With Second Elevator:* Here is a standard test that very easily determines the alignment.
 - A. Remove the line stop from the first elevator.
 - B. Run machine around until after casting.
 - C. Lock the spaceband grabber.
 - D. Open the vise frame and insert a new pi matrix at right end of first elevator jaws.
 - E. Allow first elevator to rise.
 - F. When machine stops, insert a piece of white paper in the intermediate channel between the second elevator and the spaceband grabber.
 - G. Shine a light on it, and peer through the left end of the first elevator head to note the alignment.

Note: The teeth of the matrix and the teeth of the second elevator should exactly mesh. There should be a line of light between the two all around the combination. If the line is broken the transfer is faulty.

- H. Determine whether matrix is too high, or too low; second elevator too far forward, or too far to the rear.
- I. Adjust the matrix height by first elevator banking screw at the lower right of the elevator slide.
- J. Adjust second elevator head by bushing screws inside the holding screws on the front plate of the intermediate channel (the piece that the plate on the second elevator banks against). Set one bushing screw and replace holding screw, then set the other, keeping the plate parallel with the intermediate channel. Turning in on the adjusting screw allows the second elevator head to come forward.
- K. When correct, you should be able to transfer a line of matrices from first to second elevator by hand with *absolutely no feeling of matrix teeth engaging the combination bar.*
13. *Intermediate Bar Improperly Set:* This bar is located under the block in which the first elevator locks at transfer. Its purpose is to push down spacebands that do not drop of their own weight. If it is set too low it will smash matrix teeth, if too high it will allow matrices to jam at transfer. Check setting as follows:

- A. Lock spaceband grabber.
 - B. Run machine around until the second elevator seats at transfer.
 - C. Locate pawl on right end of intermediate bar.
 - D. Push it up as high as it will go. When in this position, the tip of the pawl should align with the left tip of the second elevator bar. To reset:
 - E. Loosen two bolts on the side of the transfer block holding intermediate bar.
 - F. Locate the two adjusting screws on top of the transfer block against which the intermediate bar banks. Push up on the intermediate bar, holding it against the adjusting screws, and reset adjusting screws until the pawl setting is right. Move intermediate bar to right to just clear the second elevator bar.
 - G. Tighten lock bolts.
14. *First Elevator Slamming at Transfer:* This may happen occasionally, or be a continuous occurrence. Check tension on mold turning brake. (See Part VIII, Section C, No. 19.) It is possible that through wear the transfer block, or head, is no longer correctly adjusted to the first elevator head. Relocate as follows:
- A. Remove the adjusting strip that contains the operating blocks for the first elevator duplex rail (these blocks retract the movable rail in the elevator head at transfer).
 - B. Lock the spaceband grabber.
 - C. Run the machine around until it stops at the transfer position.
 - D. Loosen three bolts that hold the transfer block (located on top).
 - E. Reset the small screws at the back of the block, allowing block to come forward until facing on the intermediate bar just touches first elevator front jaw evenly.
 - F. Replace the adjusting piece so that the blocks retract duplex rail in first elevator to a flush position.
 - G. Lock all bolts, and adjust transfer. First elevator should now rise without noise.
- Note: If intermediate bar is not centered to transfer channel, the first elevator slide or the side facing on the vise frame may be worn.*
15. *Intermediate Bar Pawl Broken:* Replace by removing intermediate bar.
16. *Worn First Elevator Jaw:* Both matrix lugs should touch bottom of slideways in front and back jaws. To test: Select a new matrix and put it in the first elevator jaw, shine a light to the right of the jaw and peer through the left end of the elevator head.
17. *Transfer Finger Not Properly Adjusted:* When the machine is in normal, the transfer finger should be 5 5/8" from the left edge of

the intermediate channel. This allows it to go about 1/32" behind the safety latch that prevents the transfer, if second elevator does not fall.

Reset the transfer finger as follows:

- A. Locate the No. 10 cam at the extreme left rear on main shaft.
- B. There are two rollers following the rims of this cam. Locate the roller following the *inside rim*.
- C. Loosen the lock bolts on this roller casting.
- D. Go to the front of the machine and insert the end of a screw driver between the transfer finger block, and the left end of the safety catch.

(This is to allow the slight overthrow necessary to get the transfer finger behind the latch after transferring the matrices and bands.)

- E. Now, be sure that the clearance is held, go to the rear of the machine, push roller against the cam and lock the bolts.

- F. Check spaceband grabber. The notch that grabs the bands should be 1/8" past the point where the box rails slope.

To reset the grabber:

- G. Locate the turnbuckle that joins the transfer lever and spaceband grabber lever.

- H. Loosen the lock nuts on the turnbuckle.

- I. Insert a punch in turnbuckle and turn until spaceband grabber notch is 1/8" behind the slope of the box rails.

- J. Tighten lock nuts on the turnbuckle.

Note: Resetting the spaceband grabber by the turnbuckle will not affect the transfer finger, but resetting the transfer finger will change the grabber position. Screw in second elevator lever that trips the transfer safety lever should be set to allow 1/32" clearance of the lever and the transfer finger block.

- K. Now bring the machine to a position in which the spacebands are pushed under the spaceband grabber. Set buffer screw in the transfer finger block that contacts the buffer in the spaceband lever to obtain 1/8" clearance between the transfer finger and the end of the slot in the spaceband grabber pawl.

18. *Transfer Finger Not Moving to Right Far Enough When Transferring Matrices:* In the position of transferring matrices, the slot in the transfer finger should come even with the right end of the first elevator jaws. This allows the right edge of the finger to push matrices 1/8" past first elevator jaws. To reset in this position:

- A. Go to the rear of the machine. Note that the transfer roller is depressing a plunger in first dip in the inside rim of No. 10 cam. This plunger, or buffer, is forced against an adjusting screw in the safety pawl.

- B. Reset adjusting screw, turning it away from the plunger to al-

low the transfer finger to come further across.

PART XVI SECTION C Spacebands Not Transferring Properly

Check intermediate channels and box for dirt or burrs, and see that guides on left of box have not been bent.

1. *Transfer Pawl Lever Too Strong, or Too Weak*: Replace.
2. *Spaceband Pawl Not Riding Center of Intermediate Channels*: Loosen screw on top of the lever, holding the pawl. Run machine to position of transferring spacebands. Tighten screw.
3. *Cracked Bushing Inside Spaceband Lever*: Remove pawl, replace bushing.
4. *Spaceband Pawl Not Coming Far Enough to Right in Returning Bands*: Should come 1/8" past points of the box rails. Adjust by the turnbuckle that joins the transfer lever and the grabber lever.
5. *Worn Pin in Spaceband Pawl*: Replace.
6. *Transfer Finger and Grabber Pawl Not Meeting Properly*: Edge of slot in the transfer finger should come to 1/8" from the end of the slot in the grabber pawl. Adjust by buffer screw in transfer slide.
7. *Transfer Finger Not Straight*: Check, using edge of the intermediate channel as a guide. Also check for twist in finger.
8. *Worn Turnbuckle, or Pins*: Check for play. Replace. Oil these pins when doing machine maintenance.
9. *Bent Rails in Spaceband Box*: Straighten, or replace.

PART XVII Driving Clutch Troubles

PART XVII SECTION A Clutch Settings

Clutch troubles show up in various ways—hesitating at ejection and break away from casting, clutch leathers constantly riding the drive pulley, hesitation at the start of the machine cycle, ragged turning of the main cams, bouncing of cams and clutch arm when machine stops a cycle. As the clutch can take quite a beating before bothering operation, the driving mechanism is one of the most neglected parts of the machine. As a result, "sets" develop that take considerable time and effort to eliminate

without total replacement of parts, and they are aggravated, not cured, by use of belt dressing on the drive wheel, overpacking of clutch leathers, excessive stretching of the clutch spring, and other such devices.

The proper settings for the entire starting and stopping mechanism are as follows:

Pawls on No. 10 cam 15/16" from edge of cam.

Pawls rest 1/4" from right on upper stopping lever (machine in normal, or in position to stop with spaceband grabber locked back.)

Manual starting lever (used in manually starting of machine) should knock pawls off upper stopping lever 1/16".

Manual starting lever should be set 1/64" away from pawl in normal machine position. There should be 1/32" between stud on lower of two clutch shafts coming in from clutch handle at front of machine and the lower part of the manual starting lever.

There should be about 16 pounds tension in the clutch spring.

With cams turned slightly back and clutch handle pulled away out the following settings should be checked.

15/32" between the collar on the clutch shaft and bearing of machine.

1/32" between the fork lever and the collar.

As the obtaining of these settings is given under machine adjustments, there is no need to reproduce them here.

PART XVII SECTION B

Clutch Slips

These reasons are self explanatory, or considered elsewhere in this book, so they are listed briefly.

1. Dirty Molds.
2. Burred Liners.
3. Clutch Leathers Oily, or Worn.
4. Oil on Inside Rim of Drive Pulley.
5. Drive Belt Loose.
6. Loose Screws.
7. Improper Clutch Settings.
8. Worn Toggle Pins in Clutch Arm.
9. Safety Pawl Not Clearing Upper Stopping Lever.
10. Dirt, Grease, or Metal Chips Obstructing Clutch Action.
11. Improper Pot Temperature.
12. Knives Incorrectly Set or Dull.
13. Rollers on Main Cams Not Turning, or Main Cam Shaft Dry.

(To correct, run wire down grease cup and pour in kerosene to clear.)

Note: *If machine mechanism will not coast freely when switch is turned off, it needs lubrication.*

14. *Mold Slide Going Too Far Forward*: This may break the track in the mold slide cam (geared cam) over a period of time.

PART XVII SECTION C

Main Cams Running Ragged

This may be noted on quite a few older machines. It may result in faulty matrix distribution, squirts, poor slugs, and certainly contributes to the general wear and tear on the machine.

1. *Driving Pinion in Main Cam Shaft Worn to Less Than 1/16" Across the Teeth*: To replace:
 - A. Take off driving belt.
 - B. Remove screw going through the sliding collar on clutch shaft. (May find a cotter pin holding this screw in shaft.)
 - C. Remove tapered pin holding gear to drive shaft.
 - D. Force shaft away from the gear. If it is hard to loosen, soak with kerosene or liquid wrench, and knock apart with a pig of type metal.
 - E. Insert a new gear in the drive shaft and tapered pin holding the gear to the shaft.
 - F. Insert end of gear into machine bearing, timing it with the main cams so that in normal position of the machine, the clutch arm is parallel to the floor.
 - G. Replace the collar and pin on the end of the gear.
 - H. Replace the long screw through the collar on the shaft, drawing out on the clutch rod to be sure that the screw goes through hole on end of clutch rod inside drive shaft. (Remember that the collar operates the rod by means of the screw.)
 - I. Replace the cotter pin and driving shaft.
2. *Motor Pinion Worn*: Replace, setting height of pinion so that three sheets of newsprint may be passed between the pinion and the driving pulley without being shredded. Reset with the bushings through which the motor mount bolts pass.
3. *Loose Belting*: Tighten.
4. *Lack of Lubrication*: (See Part XIV.)

PART XVII SECTION D

Clutch Arm Dragging on Drive Wheel (Pulley)

This causes wear on pins in clutch arm, leathers, and key holding clutch arm in position on the drive shaft.

1. Overpacked Leathers.
2. Worn Pins in Toggles of Clutch Arm.
3. Loose Screws in Clutch Leathers.
4. Clutch Not Parallel to Floor in Normal Machine Position.
5. Holes in Ends of Clutch Rod Worn.
6. Improper Clutch Settings.

PART XVII SECTION E

Cams Bouncing When Machine Stops

Adds to wear and machine vibration. Cams should complete cycle and stop smoothly and quietly. If machine is geared up to fast speed, be sure mold turning brake is tight enough.

1. Improper Clutch Settings.
2. Overpacked Leathers.
3. Wear in Clutch Parts.
4. Sticky Leathers, or Drive Pulley.
5. Drive Wheel Dry, Binding Drive Shaft: (If it galls and binds, the entire stopping mechanism may be torn out of the machine.)
6. Wear on Driving Gear.
7. Clutch Spring Improper Tension.

PART XVII SECTION F

Machine Runs Away

This may never occur in your shop, but it can result in considerable damage.

1. Drive Pulley Galled, and Binding on Drive Shaft.
2. Line Delivery Not Fully Returning.
3. Manual Starting Lever Stuck in Line of Pawls on No. 10 cam.
4. Machine Adjustments Faulty.
5. Worn Stopping Pawl or Stopping Lever.
6. Loose Screws.
7. Gummy Flange on Drive Pulley.
8. Screw Through Collar on Drive Shaft, Missing, Broken or Loose.

PART XVII SECTION G
Clutch Refuses To Engage

Causes for this may be as follows:

1. *Broken Clutch Spring: To Replace.*
 - A. Remove screw and loosen bolt on clutch arm.
 - B. Remove arm.
 - C. Unscrew bushing in end of drive shaft.
2. *Loose Screws.*
3. *Line Delivery Cam Roller Not Knocking Stopping Pawl off Upper Stopping Lever.*
4. *Forked Lever Binding Collar on Drive Shaft.*
5. *Clutch Leathers Oily.*
6. *Delivery Slide Lever Cam Roller Slipped on Line Delivery Shaft.*
7. *Clutch Flange Screw Out of Clutch Rod.*

For more clutch information see Part VII, Section H, No. 2, 3, 4; Part VIII, Section B, No. 4; Part IX, Section A, No. 2, 7; Part XIV Section D, No. 6, 7, 8, 9.

PART XVIII
Matrix Damage

PART XVIII SECTION A
Damage to the Combination

1. *Faulty Transfer From the 1st to the 2nd Elevator:*

To Test: Remove line stop, lock spaceband grabber, put pi matrix in 1st elevator head, run machine to transfer, put piece of white paper in transfer channel to left of 2nd elevator, shine light on it and look through left end of 1st elevator to note alignment.

To Correct: If matrix is too high or too low, reset banking screw at lower right end of 1st elevator slide. If matrix seems too far to one side or the other, correct with screw bushings (the holding screws go through them) on the 2nd elevator banking plate at the transfer channel.
2. *Burred or Nicked 2nd Elevator Bar:*

To Test: Run fingernail along the bar rails to locate damage.

To Correct: Use very fine three cornered file, finish up with 'graphite and a cloth.
3. *Defective Lower Rail on Distributor Box Bar:*

To Test: Try transferring a Cap W slowly by hand from 2nd elevator to distributor box bar.

To Correct: Rail should be replaced if split or broken.

4. *Faulty Transfer From 2nd Elevator to Distributor Box Bar:*

To Test: Examination. Slowly transfer by hand a thin space, pi matrix and a Cap W.

To Correct: Check 2nd elevator head for loose screws. On older machines shim behind distributor shifter guide, or distributor box for re-alignment. If distance between 2nd elevator bar and box bar is too great, relocate 2nd elevator upper guide. On newer machines there are adjusting screws at the point at which the 2nd elevator seats to allow centering the 2nd elevator head to the distributor box bar.

5. *Distributor Box Setting Too Low, or Rails Improperly Adjusted:*

To Test: Put a matrix into the distributor box. Turn the screws slowly, carrying the matrix out onto the combination bar. Then turn the screws backward. The matrix should not jump when it hits combination bar going forward, nor bind or be high when sliding back onto the rails. Check box rails for same height by holding matrix in them with box off the machine and see that the matrix has a sliding fit only between them. A good check for box and combination bar alignment is to put a matrix into the box and turn the screw, lifting matrix out onto rails until an instant before it engages combination bar. Then lift the back screw and examine position of matrix teeth in relation to teeth on the combination bar.

To correct: If distributor box pins are worn, hold it as high as possible when replacing it on the machine. Adjust for sliding fit of matrix between box rails by opening or closing rails gently with finger pressure. Loosen screws holding rails and tap up or down until they set at the same height in the box. Test this with a square or by holding a matrix between the rails.

6. *Injured or Dirty Combination Bar:*

To Test: Run a string of caps through the machine. They'll jump when passing injured or gummy parts of the combination bar.

To Correct: Remove burr carefully with a fine file. Wash combination bar with a cloth and white gas.

Note: All transfer points must be in perfect alignment or damaged and sprung matrices combinations will result, causing matrices to distribute "wildly," stick in the magazine, and refuse to drop.

To check the combination of a matrix, "mike" it across the upper lugs. The reading should be .75" Close it up with a light tap from a brass or plastic hammer as a steel hammer would injure the matrix.

Damage to Front Upper Lug

1. *Matrix Burred or Flattened by Upper Distributor Screw:*

To Test: Put a matrix in the distributor box. Turn the screws slowly, noting height that upper lug of matrix lifts above the box rails. Should be about $1/32''$, not over. Remove the box from the machine, hold it upright, and push a matrix through it with a pencil and raise lift. See that the lift has a sliding fit between the lower rails. Check lip of lift for wear, and see that the matrix hits all four corners before it is lifted. Check box for loose screws, and upper front box rail to see that the pins on the guide spring don't bind the matrix. Check for a kink in distributor box bar point, and also for worn cam lift, and excessive wear on the screws.

To Correct: Adjust lift by adjusting the screw on the upper arm. Adjust for sliding fit of lift with pliers, bending rails gently. Replace lift, if worn. Straighten bar point with duck bill pliers. Adjust rails by loosening holding screws and tapping lightly.

Damage to Front of Matrix

1. *Scatched by Distributor Matrix Guard:*

To Test: Run matrix along screws by hand. Clearance to guard should be $.020''$.

To Correct: Properly seat magazines when changing them. Check spring on the right end of the guard. Lubricate matrix guard shaft and adjust eccentric screw that activates guard lever (lever that moves guard in and out) to clear lever by about $1/32''$.

2. *Scatched by Pins in Distributor Box Upper Front Rail Guide Springs:*

To Test: Remove box from machine. Check by sliding any straight edge over the pins inside of upper front rail.

To Correct: Cut pin down with fine file.

Damage to Lower Front Lug of Matrix

1. *Sheared by First Elevator Duplex Rail:* Matrix is the last one in a tight line, vise jaws gummy, 1st elevator jaws sprung, assembler slide improperly adjusted for tight lines, 1st elevator jaw keeper worn, faulty vise automatic, or lack of tension on mold turning shaft brake.

To Test: Set clamp to length of a slug. Open slide. Insert a slug between the star wheel and the slide finger. Turn in on the adjusting screw at the top of the clamp until the star is stopped by the slug. Remove slug and turn in the added distance of about an 8-point thin space.

A. Vise Jaws Gummy—wipe off with white gas on a cloth. Brush lightly with graphite.

B. First Elevator Jaws Sprung—open vise jaws and slide matrix the length of the jaws. It should go smoothly without binding. See if the matrix will wiggle back and forth between the jaws. It should be held snugly with a minimum of play. Try shimming back jaw between jaw and separating block, straightening back jaw (not easy), or replacement to correct.

C. Faulty Vise Automatic—machine should stop if there is any obstruction under the center or banking screw. Adjustment is made by screw in 1st elevator (center) that hits vise automatic stop rod. Check also for worn lip in stop rod, or on stop dog, improper clutch settings, dry drive wheel, gummed up driving leathers. Set center screw to stop machine on a six-point thin space, or less.

D. Mold Turning Shaft Brake—starts machine manually and push in the clutch before 1st elevator gets to the vise cap. If elevator coasts on down, there isn't enough grab to brake (located on rear of shaft that spins the mold disk.) Tighten nuts on casting, but don't overdo it or machine will hesitate at casting and ejection. Replace, or scrape leather in the brake with a knife, if necessary.

2. *Lug Rounded off by Hitting Edge of Lower Assembler Cover:*
To Test: Examination. This is a fault of the older machines as the upper and lower covers interlock in the newer models.
To Correct: Bend about the upper inch of the lower cover only.
3. *Lug Flattened by Short Duplex Rail and Fibre Buffer in Assembling Elevator:*
To Correct: Check star wheel tension (should be able to stop it with a forefinger pressure. Check for wear on the fibre buffer in the assembling elevator front plate.
To Correct: Set star tension on the new machines by removing front chute rail and the star wheel, then adjusting stud on the front of star wheel shaft. On old machines re-adjust star wheel spring tension. On Intertypes loosen locking nut on the rear of the star shaft and adjust knurled knob, then tighten nut. Replace fibre buffer in the assembling elevator front plate if it is worn.
4. *Bent, Burred, or Flattened by Lower Front Distributor Screw:*
 (See Test and Corrections under Damage to Front Uppr Lug).

Damage to Lower Rear Lug of Matrix

1. *Damaged by Forward Movement of the Mold:*
To Test: Open vise jaws to 30 picas. Place a new matrix at either end of the 1st elevator. Lower 1st elevator to the vise cap. Disconnect ejector, disconnect the mold slide, and pull the mold disk forward over the matrix ears. Should be able to move matrices along 1st elevator jaws without binding on the mold lip.
To Correct: With the mold disk forward and lip of mold over the

ears of matrices, turn down on the 1st elevator banking screw until the matrix ears are pulled up tight against mold. Then back off banking screw 1/8 turn. This allows the required .010" clearance between matrix ears and the lip of the mold. On display machines this distance is decreased to about .005".

To correct with a feeler gauge, send in a thirty pica line, push in the clutch when elevator head rises slightly, then set center screw to allow proper clearance from vise cap.

Note: Be sure to test vise automatic after resetting banking screw.

2. *Bent to the Right by the Back Rail of Line Delivery Channel:* The matrix is generally the first in the line and is slightly elevated.
3. *Thin Matrix Lugs Damaged by Escapement Verges:* Matrix does not escape fast enough and is caught by the return stroke of verge. Dirt, gum, matrix previously injured, or keyboard rollers running too fast will cause this trouble.
4. *Lug Smashed by Mold:* (See Damage to Lower Front Lug of Mat.)
5. *Lug Rounded by Partition Plate in Distributing:* This generally happens to large lower-case letters, frequently used.

Damage to Sidewalls

1. *Metal too hot:*
Keep at 525 to 550 degrees.
2. *Spacebands Dirty:*
Clean every eight hours on a pine board with a little graphite. Rub the long way of the bands, not around and around.
3. *Spaceband Edges Rounded, or Bands Run Backward in Machine:*
Bands should "mike" a plus .0005" on the casting edge. If they don't, take them out of the machine.
4. *Oil on Matrices or Bands:* Hot metal will follow oil, forcing its way between matrices and crushing sidewalls of the matrices.
5. *Matrix With Crushed Sidewall in Machine:* One hairline matrix will injure all its contacts. Remove it immediately.
6. *Metal Adhering to Face of Mold:*
This damages the casting edges of matrices as mold locks up against them. Clean face of molds with a soft cloth.

Note: Faulty forward movement of mold slide will cause excessive adherence of metal on mold face. First movement should be .009" from matrix line, second should be .003". Test with feeler gauge after removing 1st elevator back jaw and closing vise jaws (vise jaws will correspond to the matrix line).

7. *Loose Lines*: This permits metal to force between matrices, if pump stop is not accurately set.

Damage to Upper Lug of Matrix

1. *Burred, Bent, Flattened, by Rear Distributor Screw*:
(See Damage to Upper Front Lug.)

Operator Damage to Matrices

1. Picking matrices out of the assembling elevator and tossing them onto copyboard. This damages sidewalls. Matrices should be stood on the lugs, never laid flat.
2. Opening up assembler partition and running out a channel of matrices, catching them as they come. This damages sidewalls. Run them into the assembling elevator.
3. Handling matrices with dirt, grease, or excessive moisture on hands.
4. Dropping and carelessly retrieving matrices.
5. Slamming up the assembling elevator.
6. Forcing tight lines to cast.
7. Sending in lines too tight or too loose.
8. Attempting to force sorts onto the 2nd elevator bar.
9. Putting matrices in distributor box backward.
10. Turning distributor clutch too far backward when starting it.
11. Raising back screw when there are matrices on the combination bar.
12. Forgetting to completely lock magazine when taking it off the machine.
13. Forcing a change of magazine when a matrix is jammed at front or rear of machine, or in the mechanism.
14. Seating magazine on escapement when a matrix lug is stuck through escapement slot in the magazine.
15. Careless clearing of front squirts.
16. Neglecting to clean spacebands.
17. Neglecting to remove matrices with injured sidewalls.
18. Fishing out matrices from magazine with heavy hooked wire.
19. Throwing matrices on the floor by carelessly opening the channel entrance gate.

PART XIX

Basic Machine Settings

PART XIX SECTION A

An alphabetical listing of the basic machine settings.

1. *Assembler*: Adjust (don't bend) assembler spring to width of cap W of the font in use.
Star wheel shaft spring must slip in tight lines.
Catch spring must prevent matrices from falling backwards.
2. *Assembler Slide Brake*: Must release just before line delivery starts. Adjust by screw in operating lever.
3. *Assembling Elevator*: Starting pin must release delivery slide as latch catches. Adjust screw under starting pin.
4. *Automatic Pawls*: 15/16" from edge of cam. Set by screws that go through pawls striking on cam lugs.
5. *Automatic Stopping Pawls*: 1/4" on upper stopping lever.
6. *Back Knife*: Must set square on back of mold trimming slugs to .918".
7. *Back Mold Wiper*: 1/8" between the cotter pin and the mold wiper bracket.
8. *Delivery Slide*: Slide on return should clear second notch in delivery pawl by 1/64". Adjust by split lever at shaft in rear of machine, or lever at front of shaft in newer models.
Must start the machine when the slide stops against the stop screw on face plate. Adjust plate on automatic pawl.
9. *Distributor Beam*: Mat must clear top of channel entrance partitions by about .043".
10. *Distributor Box*: Matrices must pass freely from rails to bar. Adjust the screws in top of distributor bar.
11. *Distributor Box Lift*: Mats should lift 1/32" above distributor box rails. Adjust by screw in cam lever.
12. *Elevator Transfer Lever*: 5 5/8" from intermediate channel to slide finger. Adjust by split lever on shaft at rear of machine.
13. *Ejector Blade*: Adjust forward movement by screw in ejector lever pawl.
14. *First Elevator*: Must just clear transfer and delivery channels. Adjust by gibs on first elevator slide.
15. *First Elevator Connecting Link*: 3/4" at top and 13/16" at bottom from shoulder to eyebolt holes. Then adjust first elevator jaws a hair lower than grooves in line delivery by screw in auxiliary delivery pawl by 1/64". Adjust by split lever at shaft in rear of machine. There should be .010" between adjusting screws and vise cap when first elevator is lifted for alignment. Jaws should be a hair higher than transfer channel. Adjust by screw

- at bottom right of first elevator slide.
16. *First Elevator Slide Guide*: Releasing lever should clear transfer slide 1/32". Adjust by screw in second elevator.
 17. *Gibs on Vise Frame*: First elevator must stand square with mold.
 18. *Keyboard Upper Guide*: Leave first section of upper guide blank if machine is not equipped with double *e* attachment.
 19. *Lower Stopping Lever*: 1/32" between lower stopping lever and forked lever. Set by adjusting screw in upper stopping lever.
 20. *Main Clutch*: 15/32" between the collar and the machine bearing. (Turn off the machine, break back machine, and pull clutch fully out before testing.)
 21. *Matrix Delivery Belt*: Adjust by idler pulley.
 22. *Metal Pot*: Must have a square lockup with mold. Mouthpiece holes must align with smooth side of slug.
 23. *Mold Disk Locking Stud Blocks*: Disconnect mold slide and pull mold disk forward on locking studs. Check mold slide support screw and mold disk turning cam shoe segments.
 24. *Mold Driving Shaft Friction Clamp*: Adjust screw in clamp to prevent disk from running past locking stud blocks.
 25. *Mold Slide*: At first advance, mold should advance to within .009" from matrix line. Must not strike mats. Adjust by means of pin in eccentric screw in mold disk cam lever roller.
 26. *Mold Support Blocks*: Should support right-hand mold at ejection, but not at casting. Test with a spt of red lead on the blocks, opening vise frame to check after casting and after ejection.
 27. *Mold Turning Bevel Pinion*: Set screw on top when cams are in normal position.
 28. *Mold Turning Cam*: Adjust by screw bushings in cam. Should have .002" clearance.
 29. *Pot Lever Eye Bolt*: 3/16" between nut and pot lever when spring is compressed at casting.
 30. *Pump Stop*: 1/32" clearance between stop lever and stop. Adjust screw in pump stop operating lever.
 31. *Spaceband Box*: Pawls should go 1/32" below rails on down stroke.
 32. *Spaceband Box Center Bar*: Adjust by screw in center of bar, allowing only one band to lift at a time.
 33. *Spaceband Lever*: Should pass point of spaceband box rails by 1/8" between slide finger and end of slot in spaceband lever pawl. Adjust screw in transfer slide.
Cut in slide finger to be flush with right-hand end of first elevator back jaw. Adjust screw in automatic safety pawl.
 34. *Second Elevator*: Should be free of cam at transfer point. Adjust by connecting bolt in second elevator lever. When elevator is at upper position connecting bolt should be loose. At transfer,

- it should be flush with collar.
35. *Starting Lever*: $1/32$ " between eccentric screw and vertical lever lower lug.
 36. *Tie Rod*: Head of bolt should fit firmly against the cam shaft bracket cap.
 37. *Trimming Knives*: Adjust left hand knife to trim overhang from smooth side of slug. Adjust right-hand knife to trim slug ribs to point size required.
 38. *Vertical Lever*: Must push pawls $1/6$ " clear of upper lever. Use adjusting screw in outside of vertical lever. Use adjusting screw in outside of vertical lever to tighten spring. $1/64$ " between the upper lugs and automatic stopping pawl. Set by adjusting screw inside of column.
 39. *Vise Automatic Disk Dog*: Must just clear automatic stop rod. Adjust by screw at right on top of elevator slide.
 40. *Vise Frame*: Must align squarely with face of mold. Remove first elevator back jaw and shut vise jaws. Run machine around until mold slide moves forward. Test for equal clearance the length of the vise jaws. Correct by removing female vise frame locking studs from machine and shimming between them and machine bearing.
 41. *Vise Jaws*: Adjust by screw in knife block for right-hand overhang. Knurled knob on left of vise frame positions left jaw. Both jaws should be set to allow a slight shoulder on ends of slugs

PART XX

Linotype Quiz Questions

PART XX SECTION A

A self check of machine questions designed to cover the fundamental care and maintenance of all Linotypes.

1. To remove keyboard cams (singly and as a unit.)
2. Remove keyboard rollers.
3. Change rollers.
4. Sharpen keyboard cam teeth.
5. Clean cams and rollers.
6. Repair and tighten assembler belt.
7. Adjust chute spring.
8. Remove assembler slide.
9. Remove assembler block.
10. Replace star wheel.
11. Set and adjust assembler slide.
12. Remove assembling elevator.
13. Take up play in assembling elevator.
14. Remove delivery channel.
15. Change pawls in 1st elevator head.
16. Set first elevator slide by adjusting gibs.
17. Remove first elevator head.
18. Align first elevator with delivery channel.
19. Remove line delivery.
20. Set line delivery.
21. Setting of line delivery inside 1st elevator.
22. Setting of connecting link.
23. To remove connecting link.
24. Set vise automatic.
25. Remove vise automatic.
26. Correct overhang on either end of slug or indentation.
27. Remove vise closing mechanism.
28. Time mold.
29. Adjust mold support screw.
30. Remove mold and mold slide.
31. Remove and properly replace liners.
32. Set mold in relation to mat line.
33. Clean molds properly.
34. Set transfer finger and spaceband grabber.
35. Center grabber in intermediate channel.
36. Remove transfer finger.
37. Align 1st and 2nd elevator so that mats transfer smoothly.
(Important)

38. Maintenance of pot.
39. Clean plunger and spacebands.
40. Proper level of metal in pot.
41. Consistency of metal.
42. 45 point alignment.
43. Set pot correctly to back of mold (red lead test.)
44. Adjust mold turning cam segments to align male and female locking studs.
45. Use of recasting block.
46. To recast border.
47. Setting of second elevator adjusting screw.
48. Changing second elevator bar.
49. Removal of intermediate channel.
50. Use of banking blocks at transfer.
51. Adjusting intermediate bar.
52. Replacing intermediate bar pawl.
53. Removal and adjusting of spaceband box.
54. Removal of eccentric and pot lever.
55. Setting of pot lever adjusting nut.
56. Setting mold turning pinion shaft brake.
57. Movement of 1st elevator cam and actions of machine in various positions of cam.
58. Removal and adjustment of distributor box.
59. Timing back distributor screw.
60. Removal and actions and adjustment of distributor clutch.
61. Adjustment of distributor beam.
62. Adjustment of speed of line delivery.
63. Change magazines.
64. Remove magazines.
65. Clear second elevator hangup.
66. Remove stuck slug from mold.
67. Five things to check before operation.
68. Adjusting of driving clutch.
69. Removal of driving clutch.
70. Changing driving leathers.
71. What returns ejector and pot.
72. How to change angle of clutch toggles.
73. Stroke of plunger,
74. Setting pump stop.
75. Temperature of metal.
76. Square vise frame with mold.
77. Adjust starting and stopping and safety pawl.
78. Know why machine stops if 2nd elevator doesn't fall.
79. Cleaning mats and lines.
80. Daily, weekly, monthly, six months and year maintenance.

81. Setting of automatic stopping pawl on upper stopping lever.
82. Setting of vertical lever.
83. Setting of tie rod.
84. Setting back and side knives.
85. Action and mechanism of knife wipers.
86. Remove and clean keyboard weights and key rods.
87. Recognize 2 or 3 justification lines.
88. Types of molds.
89. Types of mats.
90. "Back Milling".
91. When do you use double flipper.
92. Clear a tight line (correctly).
93. Clearing a mat stuck in magazine (correctly).
94. Start a distributor.
95. All performances of each cam.
96. Increase force of plunger stroke.
97. Increase forward stroke of ejector blade.
98. Remove geneva lock.
99. Purpose of 2nd elevator starting spring.
100. Align 2nd elevator horizontally at normal position.
101. Five positions of machine stops.

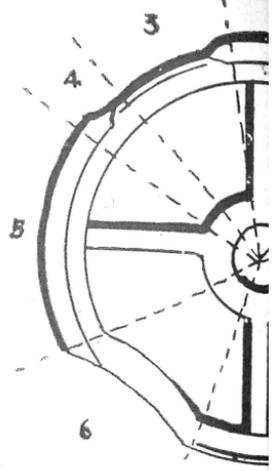
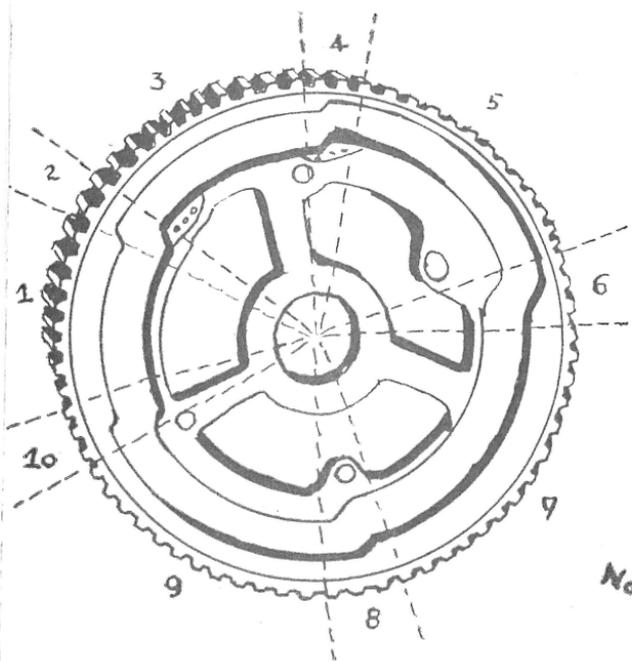
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No. 3 Cam

