

## CHAPTER I

### KEYBOARD TROUBLES

(AUTHORS' NOTE: This chapter on keyboard troubles is a long one, for four reasons: 1, the subject of assembly is the most complex of those dealing with a linecasting machine, for, as at present constituted, assembly depends to a large extent on gravity; 2, it accounts for probably 50 per cent of all the trouble on the average older machine (25 per cent — roughly speaking — being attributable to distribution, and the other 25 per cent to casting); 3, it is the immediate concern of the machinist-operator, for he knows that if he can get a slug, the pressman will manage to print from it, but until he can get the mats in a line, he can't get a usable slug at all; 4, keyboard troubles account for a very large percentage of the questions asked by country-shop operators of a traveling machinist.)

#### MAT FAILS TO RESPOND

QUESTION: When a mat fails to respond, where do you start looking? There must be some system for tracking down the trouble.

EDWIN B. HARDING (E. B. HARDING) in *The Publisher's Auxiliary*:

First, let us assume the mats and magazine are reasonably clean. Then, for the benefit of the beginner, we'll start with the most common cause:

A. A distributor stop. When the experienced operator misses a mat, he will invariably glance first at the distributor.

B. Be sure the keyrod is rising and falling. (These are sometimes called keyboard rods, but more often are spoken of as "reeds.")

C. See if a mat is in position to drop from the magazine. *If the channel is empty at the bottom of the magazine*, have somebody hold the light at the edge of the magazine while you look down from above. One or more of several things may be seen:

The channel may be empty, in which case take inventory of your mats. Have you got them all in the tray or in a long line, or have you dropped a lot of them on the tray under the distributor and failed to pick them up and put them back in the magazine? Don't allow your pi to accumulate more than 12 or 13 picas.

### Mats Stuck in the Magazine

You may see a mat in the magazine flatwise, in which case it is safer to use a long hook and pull out the mats from above; the wedge shape of the magazine often leads to trouble when you try to pull them out from below. You can, however, run out mats in the nearby channels, and sometimes a poke from below will loosen the flat and it will fall out. An operator should have two mat hooks — one 12 or 15 inches long to be used at the front, and another the length of the magazine, to be used from the back. These can be made from wire coat-hangers; the heavier wire is best. Straighten the wire, clamp it in a vise near one end, and hammer the end into a 90° angle, then file off the "hook" part until the hook is not over an eighth of an inch long. Break the sharp corners. Make a loop in the end you will hold, and make it so the open part points in the same direction as the hook. This may save getting the hook caught in the magazine.

You may find a mat with a bent toe or ear; most of these will be *i's*, *l's*, periods, and commas. Usually this mat will stick near the top of the magazine, but if it is bent just a little, it may stick near the bottom. If at the bottom, try your short hook on it — not too hard. If it is willing to come, pull it out as you work the key-button. If it resists, take it out from above, to avoid getting it stuck in the magazine.

You may find a mat in the wrong channel. Treat it the same as a bent mat.

If you are using old mats in a newer magazine, you may find burrs on the toes of the mats that make them stick. That's what mat files are for — but use them sparingly, to take off the burrs only. *Warning:* It is criminal to use a mat file indiscriminately. You soon thin out the toes and get in all kinds of trouble. Use a mat file to dress off burrs, and then lightly.

Of course there may be foreign matter in the magazine. I have seen mats come through upside down without assistance from practical jokers; I found a nail file in one magazine; and I'll never forget the day a penny rolled into the assembling elevator.

### Mat in Place but Won't Drop

On the other hand, you may find the right mat in place, undamaged but not dropping. Run the channels empty on each side. See if the pawl is going up and down. If not, the keyrod may have slipped off the verge. On a Model 5, the tops of the keyrods are adjustable by a screw bushing, usually set on the lower case *p*, but you will have to examine the lineup for its full length, and may have to shift it a little one way or another; also, even after this, it is usual to have to bend the tops of some of the keyrods a little to align with the verges. If not, they may bind and not pull the verge back down. Also, the springs occasionally slip off the verges.

Use your short hook and get the mat out as gently as possible. Turn the rubber roll by hand, holding the light with your other hand. Get your eye



down on the same plane as the floor of the magazine and observe if the pawl goes below the bottom of the channel. It should. If it does not, you have worn parts. (See Loomis' comments for a more extended treatment.)

On the Models 1 and 5 and similar escapements, see that the keyrod rises high enough to clear the verge by  $1/32$ " on each end of the verge frame. There is a screw adjustment on the magazine frame.

Sometimes an escapement spring will wear out and break at the point where it rubs against the verge, leaving a sharp end that will gouge and hamper the verge's motion. This applies also to other models. On the Model 15, a characteristic trouble is caused when a verge spring is not absolutely parallel with the slot in the verge. The best remedy is to flatten the spring from the sides — on the business end, of course. Use a small hammer.

#### **Verge Plates and Escapement Covers**

Rarely you may find, in putting a magazine on a machine where it has not been used before, the verge plate does not align with the magazine channels. Verge plates on the older machines are adjustable sidewise and usually are set on the lower case *p*.

It is possible also to find the plate (escapement cover) across the top of the magazine damaged — but Bill Gordon of Minneapolis called my attention to the fact that a slight bow does not indicate damage. I checked with Mergenthaler, and this is their answer: "This escapement cover has been designed with a slight bow [so the cover will] fit snugly down to the magazine. . . . This design applies to both old style or new style magazines."

#### **Damage to Magazines**

Sometimes you may find a burr in the magazine itself. If near the end, it can be reached with a nail file or magneto file. If in the middle — which is not likely unless you have been careless with the mat hook — there is a broach that will remove it. And yes, in extreme cases a magazine can be taken apart, but one should be certain of the necessity, because it is a difficult job to put it back together. (See *Taking a Magazine Apart*, page 51.)

#### **Escapement Pawls**

It is possible also to find two thin mats jammed together in one channel, or a mat with its ears reduced too much by filing, so that it slips alongside a worn pawl. This can happen on a badly worn pawl without the mat's having been filed, usually on thin letters like *i* and the period. In such a case, use a jeweler's file and widen the slot in the verge rack so you can install a thicker pawl.

#### **Goosenecks**

In a Model 8 or 14, the escapement lever (gooseneck) may be bent.

**Escopement Plungers**

Run the magazine up and push in the plunger by hand. It should work freely. If not, take off the verge rack, take out the plunger; rub it on emery paper and then on a graphite board. Rub graphite over the end when it meets the gooseneck. See that the plunger is not bent so much it binds, but **WARNING:** sometimes a plunger is bent a little to function properly; do not straighten unless the bend interferes with its movement.

**Mat Drops When Keyrod Worked by Hand**

D. If you have not found the trouble yet, try the keyrod up and down by hand with a pair of duckbill pliers.

*If the mat drops readily*, the trouble is usually below the keyrod. Check the following:

Deep grooves worn in the rubber roll, or rolls shrunken after long use.

Keyboard speeded up (see Loomis' comments on keyboard speed in *How Fast Should It Run?* page 16.)

On Linotypes of Model 8 and later, the plunger over the outer end of the cam yoke may rise too much and rob the inner end of its proper motion. You can make a small spanner wrench of an old liner to turn down the screw and tighten the spring, or you can work it down with the corner of a small screwdriver. (Mergenthaler makes a wrench for this — part No. H-1425.) **WARNING:** this plunger should not bear on the cam yoke at the rest. It should clear by .005" or more. You can file a little off the end of the plunger if necessary.

**If the Keyrod Does Not Function:**

E. On an Intertype, examine the spring between the two parts of the keyrod. Sometimes it breaks or slips off; sometimes the parts get shoved together and jammed.

On earlier Linotypes, the keyrod spring may be broken, allowing the keyrod to stay in its upper position.

On Linotypes, remove cam cover and see whether the cam drops to the rubber roll.

**If the Cam Does Not Drop:**

F. Either end of the cam yoke may be gummy; rub both sides with a mat eraser. There may be a kink in the cam wire or the trigger wire; move it one way a quarter of an inch. The wire may be rusty or extremely dirty. The trigger might be gummy. The keyboard locking bar may ride too low. The banking bar may have had the pins pulled out and may have worked too low, preventing a full upward stroke of the weights. There should be .005" space over the pivot end of the cam yoke (new style).

**If the Cam Drops But Refuses To Turn:**

G. The cam pivot may be dry. Oil with a toothpick; wipe off surplus. The rubber roll may have become glazed; roughen it with sandpaper. Washing in soap and water is excellent for the liveness of the rubber. The cam or the pivot may be worn, allowing the cam to run far out of alignment and rub against the yoke. The yoke itself may be filled with dirt—usually cut from the rolls by the cam. The stop pin on the “comb” may be bent.

**If There Is Still Trouble:**

H. Be sure the rubber rolls are fully one inch in diameter all the way across. Measure with micrometer.

You may weaken the verge springs a little on all machines whose keyrds return by gravity. Try one or two first.

Remove escapement cover and with a piece of emery cloth over a one-point rule, dress the channel a little.

It is possible that a magazine binding screw has been turned too tightly, swelling the channel.

**Thick Mats**

On thick mats, as 14-point, some mats may hit against a tooth on the matrix channel guard strip at upper end of magazine; twist off the tooth with duckbills. Also, an unusually thick mat to the right of a magazine partition (this happens in aligning gothic, with three sizes in a magazine, where the mats in center section are badly out of place) may occasionally rub against a magazine binding screw down toward the bottom. Mark the head of the screw on the right side and take it out; grind down the body of the screw on that side, then put it back—but carefully, for now this screw is pretty fragile. Be sure the flat side faces the thick mat.

**Clean The Magazine And Mats**

I. Finally—we said this first, but it will stand repeating—*be sure the magazine is clean*. Brush out all black spots. There may appear to be dents in the channels, but you are looking at them from an unusual angle, and the dents are not as large as they seem except on an excessively used Linograph magazine, where no particular trouble will occur if it is kept clean. When you are cleaning, watch the narrow channels and the channels next to magazine partitions. (See *Cleaning Magazines*, page 31.)

NOEL M. LOOMIS:

This subject has been covered systematically, but I would like to add a few suggestions. I agree that the first place to look is the distributor, then the keyrod (I usually observe whether the cam is turning over by listening); then into the

magazine for a flat if there is no mat down in place; if it is there but won't drop all the way out, and if there is nothing wrong with that particular mat, and especially if the trouble is repeated, and repeated by other letters also, then you may very likely find worn parts.

#### **Toes Sticking Out**

When the toes of mats stick out but the mat doesn't drop, worn parts usually are indicated. This happens more often on Models 8 and 14, because they have a longer series of parts involved. If there is a mat in place, I clear the channel and two channels on each side and get my eye down on a level with the floor of the magazine, with the light beside it, and turn the shaft by hand to observe if the pawl goes down even with the bottom of the channel; if it appears to do this, then try it under power; sometimes the result will be different (this would indicate a gummed-up verge that works too slowly).

#### **The Pawl Must Go to the Floor of the Channel**

If the pawl does not plainly clear, we'll start at the bottom and work up — but first, hold your finger on the overthrow spring at the end of the keyboard cam yoke and see if that makes the pawl go down; if it does, turn the screw down on the spring and put a drop of oil on the top end of the plunger.

Examine the rubber roll shaft bushings; on an old machine — i. e., around 30,000 serial number or under — or machines that have been pretty well pounded, you may find considerable vertical wear; the bushings should be replaced. Be sure the rubber rolls are good.

#### **The Goosenecks, or Escapement Levers**

Turn the magazines up to the top, to clear the goosenecks. Turn off the power. Hit the offending keybutton and about two on each side of it; turn the roll by hand and observe the tips of the goosenecks at the top of their stroke; sometimes you will see a lot of difference. The top of the stroke here should be nearly the same for all. Lay a piece of patent base on each side of the gooseneck that is short; pull out the hinge rod, all the way, for you will have to emery it and polish it before you put it back in. Peen the tip of the gooseneck; you can add a sixteenth of an inch if necessary. (You'd better order fifteen or twenty new ones; if this is your trouble, there will be more of it.)

#### **Plungers and Verges**

But maybe the goosenecks have already been replaced and look good; let's go higher. Occasionally you will find a deep gouge along with red rust, in the end of the plunger — not often, though. More often you will find a big dent in the verge where the plunger impinges on it. Examine all the verges, particularly the first eighteen or twenty-four, the em quads and leaders, the period and comma, and the dash. Also you may find a verge with a badly worn pivot-hole

which allows it to lose its motion; test for this by pushing down on the top of the verge with a small screwdriver. Push in the end of the plunger a few times to detect gumminess or resistance to free movement. Some m-o's have used clock oil on verges with success.

Remove the plunger; polish it on emery cloth and graphite on the space-band board or with the fingertips. Tap off surplus graphite. Sometimes they are bent — and sometimes they are supposed to be; don't be in a hurry to straighten them; find out first if that's the trouble. If it is, there will usually be a groove in the rubber roll.

### Replacing Verges, Pawls and Plungers

You can take out one verge without removing any others. First take out the plunger if an 8 or 14; then fasten the plunger bar (cover) back in place. Get a  $\frac{1}{4}$ " piece of drill rod, bessemer steel, or bronze or steel welding rod about the length of the hinge rod or a little longer; grind the leading edge at a bevel until there is no more flat on the end than the size of a pencil-lead. Push this end in against the hinge rod. Tap it gently. Stop at once if it hits something solid. You can tell when it reaches the right spot, for the verges move up a little as the smaller rod enters them. Take out the verge.

It may be merely gummy or dirty; if so, wash with carbon tetrachloride or rub on strawboard or emery cloth to take off dirt; then rub on chipboard with graphite, or replace without graphiting. Jiggle the verge to make the pawls drop in place. But before replacing, use a 2-point brass rule and a cloth wet with tetrachloride and clean out the slot.

But let's say there is a hole worn in the verge where the plunger hits it. If you have a new verge of the right size, you probably will have to ream out the hole a little or file it with a small rat-tail file; try it on the old rod until it works freely — but not sloppily! If the pawls have nicks in their upper edges, they also should be replaced. When you put them back, the steps go toward the front of the machine.

Note that there are seven or more thicknesses of verge. Lists of the correct size for each channel are given in parts catalogs. If you do get them mixed up, you can mike them and get them straightened out. Don't try fitting them by guess; some are within .005" of each other, and you might be able to get a thick one in between worn partitions, but pretty soon you won't be able to get anywhere. If you mike them, note that verges usually measure from .002" to .005" under the book-size. When ordering it is safe to specify what letter it is for.

Harding points out that the verges on the cap side are set at an angle, and you must be sure the verge is free on the rod at the exact angle at which it has to work. He also mentions graphiting the hinge rod. On principle I believe in this too, although I have come to question its value. At any rate, graphite it by rubbing with the fingers, and leave no surplus to cake up.

### To Remove Verge Rack from Model 5

**QUESTION:** The verge rack on our Model 5 needs cleaning, for I can see the verges sometimes return very slowly. The trouble is, I don't know how to go about it. What do you advise? — X. M., Buffalo, Wyo.

**LOOMIS:** The verge rack, or verge block (its technical name is "escapement, assembled") may be in one of many types. Some slide into place like wedges, others are hinged, while still others are held by screws and dowels.

To remove the Model 5 verge rack: Lock the mats in the magazine and remove the magazine. Low on the right side, next to the spaceband keyrod, is a short lever that swings upward in a very short arc. In the lever you will find a stud that seems to be there to lock the lever in place when you raise it—but you will not find a corresponding hole in the frame unless some traveling machinist has drilled one there.

It is a good project to drill that hole. Remove the pin and use a 1/4" drill. That should fit the hole (but check to be sure). If you can't manage drilling on the machine, mark the lever through the hole with a sharp needle around the periphery; then drive out the taper pin and remove the lever and drill the frame. If the hole turns out to be a little off center, drill it a fraction bigger—or, if drills are hard to get, grind off the pin on one side so it will go into the hole.)

If there is no hole, and you cannot drill one as suggested in the preceding paragraph, then get a 10 or 12-point linotype slug and cut it in a long bevel length-wise of the slug. Raise the lever and fit the slug under it to hold it up. The lever raises the keyrods off of the verges. Now, with the keyrods up, press down on the small lever under the verge plate at the right end. Push the keyrods back in their guide plate. Now remove the two screws that hold the verge rack—one on each end. Lift the rack off of its dowels.

Proceed with cleaning as above.

### Intertype Verges

An Intertype verge is in one piece that includes the pawls, and also comes in different thicknesses. On an Intertype magazine, take a piece of old brass column rule as long as the verge assembly; notch it in the middle of one side to go around the center bar of the magazine; now hold the straight side against the projections on the verges which receive the impact of the keyrods (just under the keeper wire); push down hard; get all the verges down and turn the column rule toward the top of the magazine; if the notch fits around the center bar, the column rule will stay there while you take out the wire. Then release the rule to remove a verge. You can also use a magazine brush handle to depress the verges.

Clean the verge the same as a Linotype verge. When you are ready to replace the wire, use the rule again the same way. Those keeper wires cause most of the trouble you will encounter with Intertype verges; they become bent or rusty or dirty, and so be sure to polish them, or, far better, have a few new

ones for replacement when one gets beaten up. Sometimes the Intertype escapement spring is weak or broken; test it with the others to be sure of its strength.

#### **How to Repair a Worn Verge**

If you have no new Linotype verge but must repair the trouble anyway, put the old verge in a vise. On a Model 8 verge, about  $\frac{1}{8}$ " behind the worn spot, cut into it with a hacksaw, straight down, about  $\frac{3}{16}$ " deep. Put the blade of a small screwdriver into the slot and cautiously pry out until you have enough; take a file and dress off the worn surface, restoring the original level. Oddly enough, I've never seen one of these break in use — but I don't guarantee it. Order a new one.

On Model 5 verges you will have to start about  $\frac{3}{8}$ " down from the tip and saw at an angle — not directly crosswise. About  $\frac{3}{16}$ " deep. Angle toward the center hole. Then put the verge in a vise with a small screwdriver through the pawl hole under the tip to keep the verge from moving, and tap the tip until the saw slot widens a very little. File or grind the worn spot smooth. You can check the amount of bend — which need be but little — by using  $\frac{5}{32}$ " rods through the pawl holes (old assembling elevator hinge rods are the right size) and lining the repaired verge up with a new one or an unworn one.

I don't think there is any satisfactory way to repair a worn center hole in a verge.

#### **Verge Springs**

Replace the verge; push the hinge rod all the way out; polish it and bevel both ends; put it back. Replace the plunger. Now with a small screwdriver (and when I say "small" I mean one of these ten-cent pocket screwdrivers, because you can feel better with them) try the verges against the springs; the tension should be somewhere near the same; too strong a spring will resist the stroke of the gooseneck and throw the motion back onto the rubber roll and into the cam yoke overmotion spring; too weak a verge spring (escapement spring, more properly) may fail to return the pawls to position and result in another miss. Verge springs as they come are pretty strong for an 8 or a 14; invariably I weaken them until the spring, in its hole and out from under the verge, will stand up about half an inch above the surface of the verge at the point where the spring goes under it. If you are putting in a new spring, it is often a good idea to flatten the sides of the curve a little with a small hammer so the wire won't bind in the slot.

#### **Rough Surgery**

Besides stretching the goosenecks, you can also stretch the keyrods (but it is not ordinarily convenient); you can split the free end of the cam yoke about an eighth of an inch from the top and about a quarter of an inch deep, and spread it the same as the verge (but this is a poor method which may lead to complications, and should be used only in extreme emergency).

### **Raising the Keyboard**

One of the best methods I have found to put new life into an old keyboard quickly is to raise it. Loosen the  $\frac{3}{8}$ " bolt at the side and the two big bolts beneath and put two-point leads at all four corners. A two-point lead is about the limit; I have raised them four but ran into trouble with the assembler entrance; however, two points will help a lot if it isn't too bad already. You may have to remove the bolt at the side.

### **Trigger Bite**

On old keyboards, the trigger bite sometimes is found excessive — due to wear in the series of parts below the trigger — and I have been able to make a quick repair by filing out the cam yoke to reduce the bite. This also is complicated, for you will be under the necessity of keeping that cam in that spot forever — or however long a linecasting machine lasts. (See *Cleaning the Keyboard* page 45, for details on replacing worn parts in the keyboard itself.)

### **Sidewise Adjustment of Intertype Keyrods**

It is well to note that later Intertypes have a lower sidewise adjustment for the keyrod bank, to center the rods over the cam yokes, and also a sidewise adjustment at the top, for centering on the verges.

### **Cam Frames**

On older machines the cam frame and its two end pieces were not always well fitted together. I remember a Model 5 in a brief shop in Oklahoma City that caused trouble for a year or more; the caps on the back side would not drop consistently. Eventually it occurred to me that whenever I put the cam frame back on I had to force the pins into their holes. First I tried grinding down the pins to fit loosely — which was not the right thing to do; besides, it didn't work. Eventually I removed the end pieces and filed them down by hand across their entire inner surfaces (first I filed small grooves to give a guide on the depth). When the keyboard was put back together the new pins went in easily and the keyboard ran like a watch. But don't try this sort of mayhem unless you are very sure it is called for. Otherwise it may be difficult to explain to the boss.

Somewhat the same trouble may occur if you tighten the long screws that hold the end pieces to the main part of the frame; they are not binding screws and not intended to be tight; their purpose is to keep the three pieces together. Sometimes also the set screw that holds the rubber roll shaft bushing, if tightened, will cant the bushing and slow down the roll. Often those set screws have to be run loose.

### **Assembler Entrance Partitions**

A mat may be slowed or blocked by hitting on an assembler entrance partition. Also on occasion, if you have been adjusting the plate that holds the partitions, you will find a curious condition: mats will start out of the magazine,



come about half-way, and stop. This is different from the trouble indicated by toes sticking out; it is caused by the plate being too low. The toe of the mat is not supported as it leaves the magazine; the mat makes too sharp a curve downward, and the upper ear binds against the magazine and holds it back. (See *Lining up the Assembler Entrance Partitions*, page 58.)

#### **Cam Teeth Worn**

On an older machine, the cam may drop to the rubber roll and just not turn over, even when the roll is good and there is nothing binding. This may be due to worn teeth. They sometimes become smooth and will not take hold unless the roll is fresh and live. In this case, take a small three-cornered file and cut new, sharp notches — but order new cams, for the diameter of the cam is now reduced and you may have trouble up above.

#### **Loosening Magazine Screws**

There are times when a mat seems to slow down in the magazine and go through the channel reluctantly; sometimes it will help to loosen a magazine binding screw in that region. And I can't forget the old beaten-up Model 5 out in northern Colorado; they had hauled it across-country and put it together, but the mats wouldn't come out of the magazine. The mats would wiggle when you worked the keyrod, but they wouldn't drop out. You could pull them out with slight pressure of the hook. We fought it until five o'clock in the morning but got nowhere; we stopped for coffee, and then, feeling a little relaxed and warmed up by the coffee, and watching the sun come up over Julesburg, I reviewed the situation. Presently I got up and announced: "It has to be that; it can't be anything else." I went back and looked — and it was that: very small burrs at the bottom of the channels at the very end of the magazine. Sometimes the mats would jump over, sometimes not. How the burrs got there I don't know; there were no bruise-marks; they appeared to be the result of long usage of some sort. But we filed them carefully, and the mats poured out like nobody's business.

#### **Exploratory Operation on Magazines**

When the mat comes down close to the pawls but just doesn't slide out, Harding and I agree that when the pawl seems to function properly, it may be desirable to look into the magazine. Harding points out that on older magazines with a hole on each side about three or four inches from the bottom, it is simple to put a round locking rod through (older machines came equipped with this rod), run two mats out of each channel, and take off the escapement cover. On newer magazines, however, the holes may be lacking. Run out all the mats in the two channels on each side of the offender. Carefully lift off the escapement cover. Get a good light and a pair of tweezers and examine the mat and the channels carefully. You may find a burr that you have not seen before or

a slight misalignment of the magazine channel and the verge plate channel that causes a mat to bind because the two channels are not parallel. Very, very careful filing will remedy this—but be sure first. When the mat stops, use the tweezers to move first one corner, then the other corner, sidewise and vertically. If the bottom toe persists in crowding one side, first try thinning the toe to prove the point. If that works, either thin them all or repair the magazine with great caution.

But first be sure the mat is not bent, by holding it between two thick pi mats, and be certain the retarding agent is not dirt and not some agent that has been used to clean the magazine. (See *Cleaning Magazines*, page 31.)

### **Spaceband Keyrod**

A word about the spaceband keyrod. Most machines require a spring on the keybar or weight to counteract the weight of the spaceband lever; this spring should be just strong enough to pull the weight back in place with sureness. Then there is a spring to pull the keyrod back into place; this should be just strong enough to perform its task. It often happens that the spaceband keyrod will become worn down an eighth of an inch at the point where it rests on the keyrod banking bar; in emergency this can be repaired by pinning or screwing a piece of an old keyrod over the worn spot (solder won't hold very long). The top end of the keyrod should not have much looseness about it; if the holes are elongated, you may drill them out to three thirty-seconds or more and use a cotter key to fasten them together.

### **Mysteries**

There are three more mysterious things that can happen to a keyboard. (There are a lot I don't know about, too.) This is the situation in which the rubber roll turns, and the cam is perfect, and it drops, but it doesn't turn. This can result from one of three causes: 1, if on the end, the roll may have crept out from under the cam; 2, gasoline or oil on the roll; 3, on older machines with two pulleys on a double belt, the roll may be running backward (I made a long trip in central Nebraska to fix this one). (And there was the keyboard in southeastern Louisiana that consistently doubled on about eight letters; eventually I discovered the operator had spilled Coca-Cola on that section of the keyboard. He'd tried to remove it with gasoline, but Coca-Cola is more soluble in water.)

### **Too Many Flats**

One thing more: if you get too many flats in a magazine, see if the stop trip is in at the top. Many older magazines have had the stop strips removed because the m-o's found them in the way when they did get a flat. But the strips stop most of the potential flats, and should be in place. Intertype magazines do not have them.

**Delayed-Action Response**

**QUESTION:** My lower case *r* periodically drops late. It seems to work fine when I am trying it, but after it has not been touched for a minute or two, it will drop late or refuse altogether. I don't think it's my fingering, because sometimes it is two or three letters behind. Can you suggest a remedy?

**LOOMIS:** Sometimes this is a hard one to catch. Often it shows up as a simple but persistent transposition, but sometimes a mat will drop several characters late.

Sometimes these are so tricky to catch that I have tied a white flag (small piece of cloth) to the keyrod to observe whether the fault is in the keyboard or in the assembler.

First, be sure the cam is oiled and be sure it is dropping to the rubber roll. Be sure the mat is not hitting on a partition. See that the belt from the main drive pulley to the intermediate shaft is pulling; see that the keyboard belt and the assembler drive belt are tight; see that the matrix delivery belt is reasonably tight and running freely. Sometimes when the upper idle pulley and stud become too worn, the pulley will cant and throw the belt against the assembler entrance plate; also sometimes a gummy substance accumulates on the matrix delivery belt supporting plate beneath the belt, where, unseen and unsuspected, it drags on the belt and slows it.

How about the assembler chute rails; are they sticking up so as to occasionally stop a mat? Is there a space at the top of the rails where a mat can catch? Back off and watch the assembler pulley; is it running steadily or does it slow down? See also that the assembler cover (the small one) is not pushed in under the larger plate so the mats can hit it. Sometimes the large plate will be sprung so far away from the matrix delivery belt supporting plate where the delivery belt runs, that mats will get half caught in the crack and be stopped until another mat breaks them loose.

When a cam works well as long as you continue to hit it, but refuses to operate willingly after it sits a few minutes, look for one of three things: a dry pivot, dirty cam yoke ends, or a kink in the hinge wire (or, as a corollary, the hook at the end of the cam yoke is tight on the wire; spread it just a little with a screwdriver).

**DOUBLES**

**QUESTION:** We are having lots of doubles on our Model 8. Do you think we need new keyboard cams? — R. C., Norwood, Minn.

**HARDING:** I doubt it. Your keyboard probably needs cleaning.

**Weights**

Until that can be done, here is a quick remedy: Fill a large oil can with clean, high-test gasoline, or at least white gasoline (no leaded gas, no benzene, no alcohol, and no type-cleaner or carbon tetrachloride). Get a light and look

under the rubber roll on the back side. Just below the roll you will see a squarish bar behind which you can just see the tops of the weights. This is the banking bar, and dirt around it accounts for a lot of doubles. Put the spout of the gas can in just above this bar, no higher than absolutely necessary, and flush the entire length of the bar liberally. If you get gas on the rubber roll, wipe it dry. This will last for a week, and sometimes much longer.

Have somebody hit the keybutton while you watch the weight. If, after the flushing, the weight still sticks up, double a piece of emery cloth and hold it between the weight and the bottom of the banking bar, having someone hold the key down firmly while you pull the cloth out several times. A banking bar becomes worn and even grooved and this will smooth it a little.

#### **Key Levers**

Dirt or rust or gummy substance on the keylever, where it enters the key-board, will cause doubles. Withdraw the fulcrum rod carefully and take out the key lever; emery it; use a slim warding file to clean out the slot *but do not enlarge it*. Then holding the key lever by the keybutton, you can maneuver the lever back through the slot at the back of the keyboard and into the notch in the weight. Be sure to polish the fulcrum rod with emery cloth.

Often a little dirt can be cleaned from the lever by taking hold of the keybutton firmly and working it vigorously up and down, first against one side, then the other. Squirt some gas on it to help.

If you have had the key lever out, you may have sprung it a little putting it back in. Push the keybutton from side to side and see if it is free in the slot. If it persists in rubbing against one side, it probably is bent. Take it out and straighten cautiously with your fingers, holding it up to your eye to see when it is straight.

#### **Stop Strip and Stop Pin**

With a light, take out the cam and look at the stop strip. If there is a bright spot at the end of the tooth, slightly beveled, the cam may be slipping under. Now examine the stop pin in the cam itself. You may find a groove in the pin that makes doubling easy.

#### **Banking Bar out of Position**

LOOMIS: Sometimes the pins have been taken out of the banking bar and the banking bar moved up too high. This reduces trigger bite and may make doubles. (See *Adjusting the Touch on a Keyboard*, page 47, for correct setting of the banking bar.)

Also, if you have previously filed off the trigger seat of a cam, and then gotten it back in the wrong place, or if perhaps filing off the seat was not the answer to your former trouble, you may now get doubles from it.

On an Intertype the locking rod may slip down a little so the weights occasionally stick on it long enough to produce doubles or continuous response.

### Double Spacebands

QUESTION in *The Graphic Arts Monthly*: We are getting two or three spacebands at a time on our Model X. Please suggest a remedy. — H. M., Genoa, Ohio.

HARDING: The answers to the previous question on doubles apply to the spaceband also. There is an additional cause, however: insufficient spring tension on the keybar or weight. There should be enough tension to pull the weight down surely against the weight of the spaceband key lever after each stroke.

LOOMIS: There is also another cause of trouble that shows up particularly with the spacebands; when the spring on the keyrod (the upper spring) is too tight — and many of them are — it will cut a groove in the rubber roll, and the cam will sometimes be able to go under the tooth on the stop strip for that reason.

### Continuous Response

HARDING: Continuous response is often a development of double response. The usual causes:

- A. A chip of metal in the slot below the keybutton.
- B. The cam stop strip tooth broken.
- C. Stop pin worn deeply on the keyboard cam.
- D. Too much filing on the trigger seat.
- E. A worn-out trigger or one damaged when putting the keyboard back together.
- F. Intertype keyboard cam inserted crooked and the screw tightened with cam out of position.

LOOMIS: If you have just had the cam frames off, you probably tightened them up with one trigger out of position. Try it again, and be sure you first lock all the triggers through the upper hole. But straighten your cam frame wire first.

Suggestion: If a stop strip tooth is broken and you do not have a new one, temporarily you may take another old one (broken in a different place), use longer screws and superimpose it over the one you are using. Or you can bend a paper clip or other small wire, fasten it under a screw, and make a temporary stop.

### Mats Drop When Not Hit

LOOMIS: There are three situations in which mats may fall without invitation: 1, when a key alongside or in the same row is struck; 2, when mats are dropping from the distributor bar; 3, without relationship to other movements.

In the first case, usually there is some physical connection between the two series of parts involved below the keyboard cam. The hole in the key levers may be rusted so that the fulcrum rod moves a little; there may be an unusual accumulation of dirt that causes one weight to raise another; there may be unusual burrs at the tops of both weights; the upper or lower keyrod guide may be badly worn, allowing one keyrod to rub against the other; the trigger seat of the second cam may be so short (we sure got into a lot of trouble by filing that thing, didn't we?) that a heavy touch on the keyboard will jar the cam into action. I have seen the far end of the key lever, that fits into the notch in the weight, so burred that the burr would rub against the other weight.

Second, note if this happens when mats of the unwanted channel are dropping from the bar. This is true of heavy mats, particularly the em quads, and is not uncommon on Intertype magazines. Strengthen the verge spring. Occasionally a medium-weight letter, such as lower case *h*, will drop from the impact of mats from above; same remedy.

In the third case, look for the same items that cause doubling: short trigger seat, worn stop tooth, worn stop pin, groove in the rubber roll, and so on.

### MISCELLANEOUS

#### How Fast Should the Keyboard Run?

QUESTION: Can I speed up the keyboard by putting string around the upper pulley? I am gaining speed, and the keyboard is getting too slow for me. — D. McG., Wausau, Wis.

LOOMIS: Don't do it without knowing the revolutions per minutes your keyboard is making already. I had a job once as an operator — I won't say where; it was a long time ago and a long way from Chicago — and I thought I was pretty fast. So I was. I built up the upper pulley. A few days later the heavier mats in the 12-point failed to drop. I could not find out why. My employer finally wired Chicago, and a factory man came out. He looked the situation over and said, "Got a sharp knife?" I gave him one. He cut off the string and tightened the belt. "Try it," he said. I did. The 12-point dropped perfectly. So I learned something — at somebody else's expense, as all of us learn many of the things we learn.

I am grateful for one thing: factory men did not then get the \$8.00 an hour they get now — although they got considerably more than \$1.00 for two hours, which was the rate in New York City in the late 1890's.

Newer Intertypes have rubber rolls turning at as much as 360 r.p.m. and seem to work very well, but older machines won't take it.

When the rubber rolls are turning over in the neighborhood of 300 r.p.m., a heavy mat does not have time to clear the magazine. Also, you will find yourself missing doubles because the cam does not turn over as fast as you hit the keybutton. I have been timed at eight letters a second on a 280 r.p.m. keyboard, and that's fast enough. Most keyboards run best at 280 r.p.m. Some of the fastest keyboards I have ever seen — down in Texas in piecework days — never went over 280. Many will not perform at all at 300. You can borrow a speed indicator from your friend in the garage and time your keyboard rolls. If you can't get an indicator, tie a small white flag on one spoke of one gear, or dab a spot of white paint on the pulley, and get somebody to hold a watch with a second hand while you count. With a few trials you'll do pretty well. Then keep your keyboard speed at 280 or below. If you speed up the machine itself, *cut down* the keyboard speed to 280. I've run machines as high as 10 lines a minute, but always the keyboard speed was held down.

### Keyboard Locking Rods

I personally do not like keyboard locking rods on a machine at all. Sooner or later they cause trouble — both Linotype and Intertype. The rod on the Linotype slips down a little — just enough to make you miss a few mats but not enough to show you what the trouble is. The Intertype locking rod also works down occasionally, and the flat plate gets in such a position that the weights get hung up against it and you get doubles. If you use any sort of locking rod that locks the weights behind the keyboard, be sure it stays up out of the way when it is supposed to. (More about these under *Cleaning the Keyboard*, page 27.)

### Repairing Keyboard Cams

When cams have the teeth worn down, it is best to replace them; also if the journal pin or the hole in the cam are worn excessively, they should be replaced. In putting in new cams and/or pins, use a light touch of the hammer to brad the pin, or you will squeeze the yoke unduly and the cam will bind. If the cam itself is worn, it is usually best to get a new cam and yoke assembled.

On occasion, however, the stop pin only in a cam will be unduly worn. You can replace it with care. The danger again is that you will squeeze the sides of the cam together. If so, they will bind on the tooth of the stop strip. Take a six-point liner and thin it down on a grindstone or with a file until it will just slide in between the two halves of the cam. In the middle of the thinned-out place, cut a notch with a hacksaw about  $\frac{1}{4}$ " deep. Make the notch wide enough to go around the stop pin. When you knock the old pin out, have your filler-piece in place to save distortion of the sides. Lay the cam itself flat on a metal surface — preferably a block with a small hole in it. Knock the pin

out with a small punch. Put the new pin in place, lay the cam down on the metal, with the filler-piece in place again, and brad the stop pin. Don't be rough; those cams are made of brass and not designed to stand up under much pounding.

### Replacing Stop Strips

If you apply a new stop strip or "comb," be sure the teeth are centered on the cams; leave the screws barely loose; hold a tooth with a pair of duck-bills and work back and forth to determine the best position. (If you let the stop strip slip down into the cam frame, you don't have to take off the frame. Take out two or three cams near the middle and fish it out with a hook.)

### Does Leveling Affect The Keyboard?

LOOMIS: This is a question that has been asked many times. The answer is yes. I worked on a Model 19 out in South Dakota; they were having trouble with the first ten or twelve letters; it was cold that day — about 20 below — and they had a fire roaring in the stove. I could see when I walked in that the machine, on an unsupported board floor and with an auxiliary unit on the side, was far from level — between one and two inches off. I got into the keyboard, finally took it off when my fingers thawed out, and found that the weights, thrown to the right side by gravity, had been contacting the key levers only by the corner of the notch, and there were big gouges in the weights almost a quarter of an inch deep. This had not bothered for many years, until finally the key levers began to wear, and then the levers would bind in the gouged-out places.

### How About Heat and Cold?

LOOMIS: Ordinary summer heat does not seem to affect a keyboard adversely; down in Tulsa it used to get up to 113° at night, and it was almost as bad in Omaha — but the keyboards ran well. Cold is another story. In a country shop it is often necessary to build a fire a couple of hours before you start on the machine; and on the old *Minneapolis Journal* even a mildly frosty morning in the early fall would make the keyboards sluggish.

### Why Does Most Trouble Occur on the Back Cam Frame?

LOOMIS: It is my theory that the heat radiated by the motor and often by the electric controls dries out the cams and the rubber roll to make trouble. I have long thought of making an asbestos shield for the machines in the shop, to test that theory, but I haven't gotten to it. If it is true, something could be done about it. (Note that this continuous radiation is different from a few hours of hot weather.)



## RUBBER ROLLS

### What is the Best Way to Install Rubber Rolls?

**QUESTION** in *The Graphic Arts Monthly*: By the time we have stripped the old rolls from the cores and have the new ones in place, everybody in the shop has blistered hands. Is there any easy way to perform this operation? — N. C., New Washington, Ohio.

**H. C. ROCKWELL**: Some start the roll on the shaft and fill it with water, then push it on, but a rusty core results. Compression of air is usually most satisfactory. One operator put on the end of the roll a clamp to which he attached a bicycle pump, and a few strokes would slip it in place. There are other compressed air devices.

The shaft must be well prepared. Polish with emery cloth; rub with graphite. One way is to start the roll on, holding the palm or the thumb over the end to compress the air, and push it down quickly.

**HARDING**: Many rubber roll shafts have oil rings which must be removed. The first Linotype ring is in three pieces. You insert a sharp instrument between the two rings and pry off the cap or outside ring. Drive out the taper pin or straight pin, and the second ring may be slipped off. Some look the same but are in one piece; pry or drive off. Intertypes have a steel wire ring that must be pried off. Some oil rings are eccentric; these are knurled, and you turn them anti-clockwise to remove.

If the rubber roll becomes stuck half-way on, insert a slender screwdriver between the roll and the shaft and dust in a little graphite. Always push the roll, either off or on. Pulling stretches it and makes it tighter.

When rolls only are removed for cleaning, leaving the cam frames on the machine, wipe out the hole in the bracket before inserting the rubber roll to avoid getting oil on the roll. Rolls should be cleaned with soap and water when they become hard or glazed.

The removal of some rubber rolls may appear very awkward because of the auxiliary keyboard which appears to stand in their way, but it will be noticed on these machines that the bolt in the cam frame bracket, through which an oil hole passes to lubricate the roll bearing, can be removed and the roll shaft can be moved about two inches to the right, tipped down, and withdrawn without the necessity of pulling out at the right of the keyboard.

LOOMIS: Mr. Rockwell's answer is a graphic demonstration of changing conditions. It was written in 1937, before the advent of synthetic or plastic rolls, so I can sympathize with him on the use of water, for I never liked it myself. Years ago I got a piece of metal tubing that would slip over a roll, and welded a length of  $1\frac{1}{4}$ " brass rod onto it, then bored out the brass to fit over the small end of the shaft. Onto the brass I welded an automobile valve. This gadget worked wonderfully for many years, with assistance from filling stations. But the war came, and presently we had a new kind of rubber roll. Whether it was plastic or just synthetic I don't know, but it was the stickiest material ever made for keyboard cam rolls. It worked wonderfully, but the rolls were next to impossible to get on. On a Saturday afternoon in River Falls, Wis., I attempted it first. Graphite didn't help at all. I tried the compressed air at the truck station next door — 200 pounds pressure. No good. The rolls stuck two thirds of the way down, and every man in the shop had blistered hands within a couple of hours. Those rolls were immovable.

If I had not ruined the old rolls taking them off (I always use a sharp knife and slit them to remove them) I would have put them back on. But the trout weren't biting that afternoon in the Kinnikinnick, and presently the floorman wandered in. He took two pieces of ten-em wood furniture, put one on each side against the end of the roll, and, holding the shaft against the floor, pushed slowly but steadily. In ten or fifteen minutes he had them on. This is worth remembering.

I had another call to make on Sunday, and I was worried. They had ordered the same kind of rolls, and I thought it would be best to forget changing them. But when I got there, the operator, an old-timer, said, "I put the rubber rolls on for you." I said, "*You what? And how?*" "I used water," he said, "same as I have done for forty years." So water is the answer. Yes, it rusts. I don't like that, but I can't help it. All rolls today are stickier than they used to be. The next time I'll try gasoline, maybe, to avoid rust — but gasoline burns, remember. Get out in the open, away from all fires, if you try this, for when the pressure gets built up, the stuff will squirt out from under your thumb.

The main thing to remember with rolls is: push and twist. I have used Harding's method of getting graphite into ordinary rolls that stick half-way, and in an extreme case I suggest you remember the stunt with furniture.

### **Corrugated Rolls**

Corrugated rolls have much to offer. They grab better, and the corrugations don't wear very fast. Also they measure a little bigger over all, and for that reason are good to take up the slack in worn parts on old machines. But don't try them on all Intertypes! A good many Intertypes, especially later ones, won't take them. There's not enough clearance for the cams to turn over.

**Creeping Rolls**

Occasionally a roll will creep away from the end of the shaft and leave an *e* or a *t* or a spaceband or dash high and dry. To some extent this depends on the roll itself — but I never glue them as some do. Graphite or talcum powder, of course, accelerates such creeping. However, I have often used graphite without trouble. My system is this: I push the roll down hard against the far end; then I turn the shaft over and push the other end of the roll about half an inch over the open end. Then I back up both ends by pushing. In other words, when you are through, the roll is stretched a little in the middle and bunched a little at the ends — but not, I hasten to say, enough to be seen with the eye. I imagine you'd have to measure it with a micrometer. As far as I know, a roll put on this way has never crept.

**WARNING:** If your roll shaft has a gear on the driving end, it is safer to remove the gear before installing a roll. There's only a set screw holding it, and the gear always fits easily. I have, in the heat of installation, broken those cast iron gears by slamming them against something.

**Rubber Rolls Can Be Patched**

In case a short section of roll is badly grooved, if you have no new roll you can cut away the bad section with a sharp knife. If on the end, cut a section of equal length from the good part of an old roll, and push into place. If in the middle, push one end to the middle and put the new piece on the end. If one particular letter is deeply grooved, loosen the keyrod spring or the over-throw spring on the cam yoke plunger.

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# LINECASTING OPERATOR-MACHINIST

*Compiled by*

EDWIN B. HARDING

Professor Emeritus of Journalism and Printing  
South Dakota State College

*Edited by*

NOEL M. LOOMIS

*Linecasting Machinist*  
Minneapolis, Minn.

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