

CHAPTER II

CLEANING THE KEYBOARD, KEYBOARD CAMS, MAGAZINE, MATS, KEYRODS, AND VERGE RACK

Cleaning Keyboards

QUESTION: How often should a keyboard be thoroughly cleaned, and how do you go about it? — A. P. S., Rifle, Colo.

HARDING: My friend, you really have asked a question. It's a question asked by a lot of operators, and so I am going to try to set down a complete answer. Every keyboard should be taken apart and cleaned thoroughly every two or three years, according to how much dirt sifts in on it. The first thing to do is take the keyboard off of the machine. There are quite a number of different ways to do that, but we'll take them one at a time.

First, in removing any keyboard, throw off the keyboard belt, take off the copy hooks, remove the copy board, copy tray, sorts tray, and cam frame covers; disconnect the assembling elevator and take off the counter-balance spring. Remove the hex-head bolt between and above the rubber roll shafts at the right side of the keyboard.

Make a copy of the keyboard layout if you do not have one. Those keys have a way of looking very unfamiliar when you start putting them back.

Also, mark the cam frames on the outer ends, front and back, before you remove them. It is a good idea to take a three-cornered file and make one nick on the edge of the right end-piece of the front frame, two nicks on the back. This will save much time later.

I will outline specific directions for some representative types. An m-o will recognize the variations in his own keyboard (and there are many) and will be able to take it from there.

WARNING: It is important on all models and on all guides such as key-rod guides upper and lower, keybar guides upper and lower, and all other guides, to note if there are any extra unused slots at either end. If there are, it is well to mark these with a small cut on the outer edge from a three-cornered file. Do this before removing. It will save a lot of time, and sometimes two or three assembling jobs.

The number of slots varies; some machines have ninety, some ninety-one, some of the swinging keyboards ninety-two. About 1 a. m., when you're trying to put the thing back together, it's confusing.

REMOVING KEYBOARDS

To Remove Keyboard from Models 1, 3, and 5

1. See that all keyrods and other parts are at rest or not in the course of a movement.

2. Lock the verges by inserting a locking wire above the shoulders of the verge pawls. The best wire is a flat one, made for the purpose. If a round wire is used, it should be a little larger than the regular keyboard cam-wire. The wire has been properly inserted if matrices are not released when the keyrods are raised by hand. The Models 3 and 5 verges are locked by turning the crank of the verge locking bar, located between the magazine and the verges, right side. In case of the Model 5, lock the matrices in the magazine or remove the magazine entirely.

3. Remove the cam frames. A screw at either end of each cam-frame. Nothing to lock.

4. Remove the screws from the two bars that carry the keyrod spring-hooks. The keyrods will now dangle, supported only by their notches where they engage the verges. The lower keyrod guide and the spring-hook plate will be supported by the keyrod springs.

5. Now be careful. We are about to separate the keyboard posts from between those two spring-hook bars. If the keyrods are jostled unduly, some of them may twist and slip off the verges. Use a socket-wrench to loosen the two large bolts that hold the keyboard from underneath. Sit with the knees under the keyboard, remove the bolts, and withdraw the keyboard very carefully by tilting the front up to allow the guide-posts to move down and out from between the keyrod spring-hook bars. Take the keyboard to the work bench.

To Remove the First Style 8 and 14 Keyboards

Here the keybars do not yet come off in a frame, and it is advisable to dismantle the keyboard without removing the cast iron frame of the keyboard from the machine.

1. Loosen the screws that hold the keyboard pulley gear-guard. Remove the large screws at either end of the cam frames, and remove both cam frames.

2. Cut a stick about $\frac{1}{2}$ x $\frac{1}{2}$ x exactly $15\frac{1}{4}$ inches. Tie a tough cord to each end, and tie it securely to the back of the keybars by bringing the cord through the slots in the back of the keyboard and around the keylevers at the front. Twist the cord around the lugs on the keyboard frame; bring one over on top, the other below. Be sure to do a good job. This is to hold the keybars or weights in place when you remove the banking bar. Raise the keybars by inserting 6-point shims under the keybar guard, T-254, or H-532, that rests under them. The late Linotypes do not have the guard.

3. Remove the banking-bar and keyboard lock.

4. The keyboard can now be removed by taking out the four screws at the front, under the assembling elevator lever shaft, and the two screws directly

under the rubber roll bearings. Pry the keyboard off the dowels at the back, and remove the keyboard and key-bars from the cast-iron base.

Clean the parts.

Reverse operations when assembling.

To Remove "Old Style" (Second Model) 8 and 14 Keyboards

This keyboard is locked at the front and the machine is equipped with keybars that are removed in a fixture.

1. Loosen the gear guard and remove the back cam frame.
2. Lock the keyboard in front, under the assembling elevator shaft.
3. Holding the keybar bracket at the rear of the keyboard, remove the flat head screws that go through the keyboard posts one inch under the rubber roll bearing — one screw at either end. If the keybar bracket does not come off by removing the two keybar bracket screws at the front, look for two screws that hold the bracket at the back.
4. Remove the front cam frame.
5. Leave the keyboard on the machine, but remove the assembling elevator lever shaft, the fulcrum rods, and the keylevers.
6. The skeleton of the keyboard can now be removed by removing the four screws at the front, under the assembling elevator lever shaft, the keyboard lock screw, and the two screws directly under the front rubber roll bearings.

The slotted plate that slides to lock the keyboard may be taken off by removing the two screws on which the plate slides. There are lock nuts on these shoulder screws.

To Remove the Linotype Swinging Keyboard

1. See that all the keyboard cams are in place and that no keyrods are elevated.
2. Lock the keyboard.
3. Raise the spring latch at the back of the assembling elevator lever and disconnect the lever from the assembling elevator link. Raise the assembling elevator handle. This will latch the assembling elevator down in normal position. (But watch it; they don't always hold.)
4. Turn the magazine shift lever to the highest point. This lever has a clutch that will allow it to disengage and move to the upper position without moving the magazines from operating position.
5. Unscrew the long, knurled-head screw under the left side of the keyboard and swing the keyboard out to the right.
6. Loosen the set screw that holds the large bolt under the right side of the keyboard — the bolt on which the keyboard pivots. Sit with the knees under the keyboard, remove the large pivot bolt and lift off the keyboard. (Most swinging keyboard work can be done without this last step.)

To Remove Intertype Keyboard, Model A, B, C

1. Lower the magazines to the lowest position and open the channel entrance, trip the dog from under the magazine cradle, and tilt back the magazines.

2. On the old style Intertypes, remove the upper keyrod guide strip from behind the keyrods. Remove the keyrods, one at a time, and lay them on edge in a galley, in their respective order. Do not get them mixed because they may not work properly if transposed.

If the machine is new style, mark the position of the keyrod frame, remove the screw on either end of the keyrod upper guide, lift out the keyrods in one unit, and lay them aside. The position of the keyrod frame should be marked before it is removed to insure returning it to exact position. Failure to do so may allow some of the keyrods to miss the verges.

3. Remove both the front and back cam frames.

CAUTION: On old style Intertypes, when you clean and oil the cams only, remove only one cam frame at a time, and replace it before removing the other. There is no keyrod frame here, and the lower keyrod guide fits into the cam frames. When both frames are removed at the same time, this guide will sag and prevent replacing the cam frames until all keyrods have been removed.

4. Drive out the taper pin from the assembling elevator lever handle and remove the shaft.

5. Use socket-wrench to loosen the two keyboard base screws, underneath the keyboard, rear left-hand corner. After loosening the screws, sit with the knees under the keyboard and remove the screws. Lift off the keyboard and take it to the work bench.

Dismantling the Keyboard

Now, with the keyboard off and fairly intact, and with your copy of the keyboard layout made, you are ready to take the thing apart. Fun, isn't it?

If there is a spring attached to the spaceband key lever, disconnect it and save it. Take out the spaceband key lever.

Remove the fulcrum rods and withdraw the key lever from the entire keyboard.

Now turn the back of the keyboard toward you and prop it up with a pig of metal under either end. Remove the banking bar and the keyboard lock, or the stick that you tied on in place of the banking bar. Remove the spring from the spaceband keybar (or weight) and tie a string to that keybar for identification. Lift out all the keybars. It saves a little time to keep them in order, especially on older machines where there are six different kinds, but it isn't essential.

If not already done, remove the skeleton of the keyboard by taking out the four screws at the front edge under the assembling elevator lever shaft, also the keyboard lock if it is in front, and the two larger screws directly under the front rubber roll bearings.

Cleaning the Keyboard

First we shall clean the keyboard itself. Later we'll tackle the keyboard cams.

1. Wash all parts in high-test gasoline (never leaded), and be careful of solvents. Wash the key levers (metal part only), weights, the banking bar, the keyboard plate — anything that has oil or dirt on it. Wash the keybuttons, using soap and water or an ammonia solution.

2. Watch for burrs and worn spots. File off burrs and rub graphite into the parts. Ream out the holes in the key levers with a pointed stick.

You can safely rub all parts with dry graphite where they rub against something else.

LOOMIS: You're doing fine so far. The only addition I have to make is the use of that much-worn thin warding file to clean the sides of the slots in the top plate and the back plate of the keyboard, where the key levers go through. This should be done with a light touch, for the idea is not to file out the slot but to clean out the dirt. A 1 or 2-point brass rule with a piece of emery cloth around it will do if you haven't the thin file (those thin files are sometimes hard to find).

On machines where the keybuttons have never been washed — or at least not for many years — I have been unable to get the buttons clean with anything but a strong solution of yellow lye soap that is used by janitors in mopping floors in public hallways. I have been unable to get a generic technical description of this soap, but it is a grease solvent, and can be bought from the National Soap and Chemical Co., 110 Fifth Ave., S. E., Minneapolis, as Nasco D. N. Cleaner. I use hot water and a small brush, dipping the button frequently. You can count on losing ten or twelve letters in the process, for the letters are formed by celluloid inserts that will come loose. Milton Anderson does very well with Bab-O and a pad of steel wool.

Assembling the Keyboard

HARDING: 1. If the keyboard locks from the front, put the slotted plate in place; two screws and a spring. Put in the lower row of key levers (the levers having the keybuttons — not the keybars).

2. Insert the fulcrum rod. If one end is notched insert from right to left, notch to the right. (Late Intertypes require the notch to the left.) After you get the rod through the second partition, it will be easier.

3. Insert the next row of key levers and so on, until all key levers are in place. The keybar guard, T-254, or H-332, that rests under the keybars, should be put in place before the keybars are put in (but may be put in afterward by cutting into short lengths.)

4. Insert the small bar in the fulcrum notches at the right or left of the keyboard and replace the screws that hold the bar.

5. Turn the back of the keyboard toward you and prop it up about two inches off the bench.

6. Set the spaceband keybar aside. Assemble the keybars in sets of six as indicated by the notches on their front sides and set the keybars in place, starting with the lower-case *e*. The lower keybars will bind just a little as they go into the lower keybar slots. Pressing down on the lower keylevers will help. The spaceband keybar goes on last and usually requires a spring. If there is no hole in the keybar for the spring, look for a screw or stud on the key lever. In this case the spring is fastened at the right side of the keyboard.

7. Put on the spaceband keybar spring referred to in the preceding paragraph.

8. With the thumbs, hold the banking bar in place, under the notches on the keybars. Have the banking bar screws handy. Place the fingers under the keybar guard which is under the keybars, and push up as you push the banking bar onto its dowels. This will raise all keybars. If the keybars are not raised, the banking bar will not slip into place. This applies to Intertypes and old Linotypes. Linotypes with keyboards that lock at the front do not have the keybar guard, H-332.

8. In case of the old style keyboard lock, put on the locking bar. Notice that the thick washers are put on with the flat side up. The thick washers go in place first, then the locking bar, and finally the thin washers and screws. Do not let the shoulder screws catch on the washers.

10. Try out the keyboard thoroughly before putting on the cam frames. This is the time to determine if all keylevers and keyrods work properly. As you press the keys, push them to the left and to the right, and straight down to detect any tendency for double response. All weights should drop promptly.

When replacing the two bolts that hold the keyboard at the bottom and the one at the right side, do not tighten one bolt until all three have been started in place. This direction applies in many cases where bolts and screws are to be inserted.

If the assembling elevator lever counterbalance spring is replaced with the solid loop to the front, the hook cannot tear the operator's clothes.

LOOMIS: I find it easier to insert the fulcrum rod from the left, handling the key levers with my right. If the keyboard is on the machine, you may have to lower the vise. But some keyboards have the keepers on the right, and in such a case you have to work from the right to avoid using the notched end as a leading end — which won't work very well.

The Book says this cleaning should be done once a year, but unless your shop is a bad dirt-trap, once every two or three years will do pretty well if you flush out the keybars and keyrod guide occasionally when the cam frames are off.

THE KEYBOARD CAMS

Cleaning the Keyboard Cams

HARDING: You can remove any cam frame one at a time for cleaning, but in this case we have them off already.

1. Remove the cams separately and place in a pan of naphtha or high-test gasoline. Use a shallow tin cake pan. Personally, I mix the cams to distribute the wear, but the novice may get along a lot better if he keeps them in order. Tie a string on the spaceband cam.

2. Use a brush to wash the cams; clean the free end of the yoke, the other end also, and the teeth. If there is a hard gum on the periphery, scrape it off.

3. Spread the cams out to dry. A fan or open window will help.

4. Loosen the small headless screw that holds the rubber roll bushing and remove the roll. Sandpaper the roll with medium sandpaper. Work until all marks have been removed from the roll. Then wash it with soap and water. The roll should have a "tacky" feel, like live rubber.

Wind a cloth tightly around the bushing to keep water out of the bearing.

5. Hold the cam frame over the gasoline pan and wash it thoroughly, paying particular attention to the ends of the cam frames, the triggers, the slots in the cam frames, and the stop pins; if any triggers appear to bind, remove the trigger wire and look for kinks in the wire. Polish the wire. If any cam stop strip pins have depressions where the cams have been striking, file away these depressions or put on a new stop strip. See that the cams do not rub on the stop strip pins.

Insert a probe in the oil holes in cam roll shaft bushings and cam frame.

6. Oil the bearings of the rubber roll shaft and replace it.

Be sure that the oil hole in the bushing is lined up with the oil hole in the bracket.

Do not set the small, headless screws tightly against the bushings. To do so may throw the roll shaft out of line and cause it to bind.

The cam pivot wire should always be removed, straightened, and polished with graphite.

If a cam is worn so that it tips and rubs on the yoke, replace the journal, the cam and journal, or the whole cam, assembled.

File all burrs from the free ends of cam yokes.

7. When certain that all gasoline has dried from the cam pivots, oil them very sparingly, using clock oil and a broom straw or piece of wire. Wipe off

any surplus oil after spinning the cam. Replace the cams, being careful not to place them wrong side up.

8. Lock the triggers through the upper holes, using an extra cam wire. If you cannot push cam and trigger wires with your fingers, there is something wrong. Be sure to push the wire out to the right as far as it will go without releasing the lefthand trigger. This will facilitate pulling out the wire after the cam frame has been replaced.

9. Replace the cam frames. Careful now; simple as this operation is to the experienced man, it presents many problems to the beginner. Observe the following:

- a. See that all triggers are locked.
- b. See that all cams are turned to normal position (turn the rubber rolls) and that they stay in position.
- c. See that no keybars are elevated. Keep your arms and sleeves off the keyboard keys.
- d. Do not tighten the screws in the ends of the brackets. Leave the brackets as you find them.
- e. Be sure the cam frame is all the way on the dowels before tightening the large cam frame screws. If it feels "springy," do not force the screws in. It should click into place. If it does not, the following may be out of place:

1, a trigger; 2, a cam; 3, a keybar. Back the screws out. Take off the frame and have a look. Any one of the above parts out of place will cause a kink in a cam or trigger wire when the cam frame screws are tightened. (Also see page 251.)

Tighten the cam frame screws. Pull out the trigger locking wire. Test every key twice, including the spaceband.

LOOMIS: Mr. Harding has given an outline of cam-cleaning in the traditional manner, and it belongs in here because most people clean cams that way, and The Book advises it. However, in the course of several years of maintenance work on the old *Minneapolis Journal*, where Bob Ritten (now Intertype representative in Minnesota) and I cleaned keyboards for piecework operators as often as every four weeks, we did some experimenting and came up with some different conclusions.

In the first place, we determined by taking cams apart that even the very highest test gasoline could not be removed or dried from the pivots by any ordinary means of heat or compressed air. We found that even after two or three hours of varied treatment, we could take a cam apart and still find oily liquid on the pivot. So I do not wash them in anything. Carbon tetrachloride

might dry in the pivots, but it has a curious viscous effect on steel. So I use a small brush and clean out the dirt all the way around, clean out the teeth of the cam, scrape the gum off the edge. Use an eraser and polish both sides of both ends of the yoke.

On principle I usually spread the hook at the fixed end just a little unless they have been spread before. I always use new cam frame wires. On machines with overmotion springs, I put a drop of oil on the springs.

Take that same thin warding file (by now it's getting worn about right) and clean out the slots where the free ends of the cam yoke work up and down in the cam frames. Again, don't file — just clean and take off burrs.

I remove the triggers, and these I do wash in gasoline. Spread them out and let them dry. These holes are open, and besides, they will not be oiled.

When it comes to oiling the cams, again I am unconventional. I have had good luck using what is commonly called separator oil; I have even used No. 10 oil with fine success. The only reason I can see for clock oil is for machines that will have to start up cold. Maybe oil has improved in the last twenty years. You might try No. 10 on some cams. If it works, it will last a lot longer than clock oil.

We always bent the end of the trigger-locking wire in a right angle so we wouldn't make a mistake and pull the wrong one. It has been done! If you get the hook on the wrong side, never mind. Get hold of it with a pair of pliers and pull it out in a curve.

If you find you've misplaced the weight with a hole in it for the spaceband spring, drill a new hole in the one on the end. Next time, remember.

You can tell the cam frames apart by the number of cams they will hold: the front one 45, the back 46. Most back frames will have a place cut out on the stop strip for the spaceband cam, also. On frames with gears, the one with the pulley is the back one. One good way to tell: the large bearing on the front frame is on the right, on the back frame is on the left. But I have seen some frames that were a little hard to tell apart even with all this.

With this type of dry cleaning of the cams, ordinarily once in six months will suffice. It is not necessary to do the job on the triggers more often than every two or three years.

It is an interesting sidelight to know that I once, many years ago before I dropped the gasoline wash, washed a set of cams in kerosene by mistake. I had a heck of a time getting off the surplus, but those cams ran for a year and a half without additional oil. At that time the machine was moved and I lost track of it. I have, as an experiment, tried this again — purposely. It had a different conclusion. The kerosene dried out thoroughly in two weeks; must have been different stuff. I oiled the cams then with No. 10 and they worked fine and lasted over a year.

THE MAGAZINE**Cleaning the Magazine**

HARDING: When you clean the keyboard, naturally you will clean the magazines and mats. As a matter of fact, these latter will need cleaning every six months or a year.

First, run out the mats as soon as you get the keyboard in order, and stack them on galleys. Use the light and see that no mats are sticking in the magazine. Then remove the magazine and place it on the bench.

Remove the escapement cover.

Remove the short pi-tube in some magazines.

Loosen screws, swing back the clamps, and pry out the matrix stop strip rod at the top of the magazine.

If it is an Intertype magazine, prop the shutter open with wood furniture.

If Intertype or Model 15 or any magazine that has self-contained verges, turn it on its back to keep the dirt from running into the verges.

Turn the magazine up and let any remaining mats run out.

Now use a magazine brush in good shape to expel the loose dirt. Push the brush through, pull it out, and turn it occasionally. Watch the channels next to partitions. After brushing, fold a sheet of paper to reflect light into the magazine and look for black spots left in the channels. If spots are found, clean the brush and sprinkle on some high test gas, alcohol or carbon tetrachloride. Low test gas is not to be used; it will leave a film of oil in the magazine. Brush until all spots disappear.

LOOMIS: Here again I've gone astray from the classical methods. Let me tell you a story. Less than a year ago I was called to make a Model 5 work. The owner had moved it and erected it but he could not get mats to drop properly. I asked him if he had cleaned the magazine. "Yes." "What with?" "Type Cleaner." "Who recommended it?" "The salesman; he guaranteed it would not leave anything in the magazine whatever."

We gave her the works for five hours but got nowhere. Finally took off the escapement cover and played with the mats, and discovered there was absolutely nothing holding them. They just didn't slide fast enough. I said, "Go down to the drug store and get a pint of carbon tetrachloride, commercially pure. Don't take anything else - no cleaner, no solvent, no nothing but carbon tetrachloride."

We emptied the magazine, laid it out on a table and stripped it as Harding tells you to. Then we applied my cleaning formula that has not varied for ten years; get a big squirt can and fill it with carbon tet. Squirt it liberally into the magazine. Let it soak a few minutes. Squirt in some more. Use that new brush now for the first time. Work from the wide part at the top. Take one section at a time. Keep the brush wet.

When you get through, let the magazine dry for fifteen minutes. Your brush will dry too. Now go through it with the brush and polish thoroughly. You will discover that carbon tetrachloride not only is practically the only solvent available that will not leave anything, but it also will polish brass until you can hardly bear to look at it in the light. And the polish will stay for a long time.

In the case above, we put the magazine back on, ran the mats in, and held our breath while we tried it. The mats almost tumbled over each other to come down!

WARNING: Do not wash steel or iron parts with this stuff. It does something to ferrous metals — intensifies their frictional qualities, so they don't slide well. On Intertype, Model 15, or any magazine with self-contained verges, turn the magazine upside down before cleaning.

CAUTION: In taking off a Linotype magazine with an automatic lock, push in the lock, then look at the locking strip studs to see that they are down level with the surface of the escapement cover. Automatic locks have been known to release the magazine frame without locking the mats in place.

If there has been trouble with sticky verges, sometimes it helps to dust graphite over the verges and then wash it into them with high test gasoline, or squirt the mixture from an oil can. If on a magazine with self-contained verges, do this before cleaning, and be sure the verges are on top when you clean the magazine.

HARDING: Look down all channels with the light. When all channels are polished, look for bristles. Look from both ends, for a bristle can hide until the mats try to go through. The wire hook that is used to pull out flat mats, is a good device for removing them. You can also use the handle of the magazine brush; some twist a rubber band around it to help. Loomis uses a sharpened piece of hacksaw blade fastened to the end of a steel rod, and cuts them out. Those near the end can be reached with tweezers or fingers.

Brush the escapement cover the same way. If your verge rack is easily removed, take it off, turn it upside down and bump it a few times to shake out the loose dirt. Graphite and gasoline will provide a quick but not very thorough cleaning. (See page 7, *Replacing Verges*, etc., for cleaning instructions.)

Put the magazine back together.

Graphite in Magazines

In 1900 John S. Thompson advised use of graphite on all new mats and magazines, but apparently the composition of the metal has changed since then, for now it is only necessary to clean and polish a new magazine with carbon tetrachloride (no, I do not own any stock in any chemical companies), and clean the bottom ears and toes of mats likewise, or, in case of heavy tarnish, rub the toes and ears with an eraser.

It is not necessary and not desirable to put graphite into a clean magazine, except occasionally an aluminum magazine. In such a case, brush it in thoroughly and do not leave any surplus. Use it for its polishing effect only. If you do use graphite, you will have to clean the magazine more frequently. Under most circumstances, clean mats will run well in a clean magazine without lubrication.

While you are at it, wipe off the distributor screws, the elevator jaws and distributor shifter buffer with gasoline and a rag. Go over the path of the mats through the machine and see that there is no gum or dirt to foul up the mats immediately.

Aluminum Magazines

LOOMIS: Aluminum bottom plates are not all the same. The companies have used several methods of making them, but all I have seen would not handle small type without a first brushing of graphite. One thing about an aluminum bottom plate: once in use, it does not seem to muck up and slow down the mats as soon as a brass plate. I have run them for two years without cleaning, and at the end of that time, though there was plenty of dust on the lands (which hurts nobody), the grooves themselves seemed as clean as they were at first. I don't guarantee it will be this way on yours. The ones I had might have been a special batch.

Graphite in Magazine on Models 25 and 26

LOOMIS: The Models 25 and 26 have a peculiar situation. The two magazines are hinged at the top, and the bottom lifts up and down to match the assembler entrance guides or partitions. This means that when the lower magazine is being used, it has less slant than a normal magazine. This small difference sometimes makes a lot of trouble in getting mats through, and sometimes graphite is the only thing that helps. It is better to run a large size in the bottom magazine, but if you must use a small size and have to graphite, do it this way: clean the magazine thoroughly with tetrachloride, then with a separate brush *polish* the magazine with graphite and blow out all loose or surplus graphite.

To Put a Linotype Magazine on a Machine

LOOMIS: In putting a Linotype magazine full of mats on the machine, follow this unvarying procedure: after the magazine is in place and before you drop it to the verge rack, run your fingertips along the two open places just underneath the magazine. Occasionally you will find the toe of the mat sticking down, especially in the far one. Push it back in. A magazine will lock in place with a mat out of place, and when you unlock the mats you will get considerably more than you expect to get. Now for a final check, drop the magazine in place, take the light — this will take only a few seconds and it is a habit that will save many pied magazines over a period of years — look at the magazine on each side and see that the verge rack fits up into the open places. This will get to be automatic, and is the best insurance there is.

THE MATS

Cleaning Solutions

QUESTION: Will you please give the proper method of cleaning mats? Would you advise the use of mat-cleaning solutions? — D. A., Lodi, Calif.

LOOMIS: Cleaning of mats on the sides is seldom necessary unless, from lack of care in keeping oil away from mats, gum accumulates on the side and impedes assembly and justification. This will be noticed when mats fail to sit down properly in the assembling elevator.

When this occurs, cleaning becomes a real question. Cleaning compounds (usually with a chromic acid base) will remove all dirt, but *it is not desirable to remove all dirt*. What is called the sidewall of a mat is very thin; this is the wall alongside the female die of the letter itself. This sidewall inevitably becomes pressed in a little in use, but the resulting small depression is filled with dirt, and you have no hairlines as yet. (I am not speaking of mats used with spacebands that have noticeable accumulations of metal at the casting-point; use a font of mats for a few hours with bands like that, and you may as well accustom yourself to hairlines until you get new mats.)

Now the chromic acid compounds, or *any* substance strong enough to remove dirt from the sides, will also remove it from the sidewalls. For the same reason, a wire brush is questionable. A rubber eraser on toes and ears, front and back, will take off the dirt that impedes motion through the magazine.

New solutions, methods and equipment are constantly being offered. A conservative and even reactionary attitude toward them is desirable. Many fonts of otherwise satisfactory mats have been ruined for practical use by new and easy methods of cleaning.

I do not advise use of any solution or fancy equipment except elbow grease. I use an eraser on toes and ears; recently I have had good success with a rag dampened with carbon tetrachloride with final polishing with an eraser.

I use nothing on the casting side unless there is an accumulation of metal (indicating a loose lockup) which must be removed to prevent uneven height on the press. In that case I line them up in a galley and use the eraser. You will note, if the eraser is held flat on one edge, it will not injure the sidewalls. The index side can be cleaned with an eraser, and this greatly aids visibility.

But solutions I do not like. They roughen the surface of the brass (you can see this with a magnifying glass), and you will never again get them to slide as well as they did before.

What Makes Gum Accumulate on Sides of Mats?

LOOMIS: Some fonts are much worse at this than others. Certain fonts of mats produced during the war were bad—why, I don't know. I suppose it comes from graphite on the bands. It can be removed by rubbing on a piece of strawboard or chipboard on a stone. Use no acids, and preferably no liquid of any sort, except perhaps, if the stuff sticks hard, you can dampen the card-board with gasoline or carbon tetrachloride.

Cleaning the Mats

HARDING: It is easiest to clean the toes and ears of the mats if you will push a couple of long six-point slugs under a row of mats in a galley. Bevel one end of one slug so it will slide under. These slugs will provide a rest for the main body of the mat, and the toes will not be so uneven.

To remove the dirt, some use an eraser, which is good, but many use a cloth dampened with tetrachloride. It's easier and perhaps works better. If you use an eraser, by all means blow the eraser dust from the mats on both sides; use a fine brush if necessary to get rid of it.

Clean the toes and ears on both sides, and clean the index side. If there is an accumulation of metal below the casting-point on the casting-side, line the mats up together and use an eraser, but not directly in the letters or you will break the sidewalls. If the mats are so dirty on the sides that they must be cleaned (see page 34) rub them on a piece of strawboard or chipboard on a stone. Do not wash them, and use no cleaning solution.

As each galleyful is lined up, look for broken or shaved toes, bent ears.

To turn a galleyful of mats over, place a second galley bottom side up over them, with the open end of the top galley over the closed end of the bottom galley. Holding the galleys together, turn them over neatly.

Now put your magazine on the machine. You can run the mats in through the assembling elevator, set at about 21 picas, or on the second elevator. Either way you will be able to feed them in faster than the machine can handle them.

As for frequency, some m-o's need to clean the mats every three months. Others get by for sometimes a year. It depends on how much dirt gathers, and

how much time you have. If you find mats dropping erratically, try cleaning a few channels. If it helps, clean them all. The last three rows need it oftenest.

HARRY G. POTTLE in *Who's Who in the Composing Room*: Benzine or low test gas should not be used, because they leave a residue. Chromic acid should never be used. A safe solution can be made with oakite, a commercial washing powder that contains no substance injurious to mats or hands. Boil the solution, with mats in it, for fifteen minutes. It is easier to make a tray of 1/4" galvanized screen, which holds the mats, and which is placed inside the pan. Then the mats can be rinsed with clean hot water. Very old fonts, of course, may develop an unsuspected set of hairlines when cleansed this way. Carbon tetrachloride is a good solution to use in cleaning mats or magazines.

Keep oil and graphite out of the path of the mats, from assembler entrance partitions to distributor entrance channels. If you polish the mold with oil and graphite, cast several blank slugs, then wipe off mold and vise jaws.

Carbon tetrachloride is the best agent for cleaning magazines also.

Hairlines on Mats

QUESTION: What causes hairlines on mats? We got a new font of 8-point a few months ago, and now it is already full of hairlines, as the enclosed clipping shows. The boss is raising particular cain, and I can't say I blame him. — O. T., Belle Fourche, S. D.

HARDING: Hairlines are those annoying fins of metal that appear between characters on a slug and show in print. The causes of hairlines are: accumulation of metal on spacebands, careless handling of matrices, pump stop misadjusted, loose lines, swollen lower front matrix lug which may bind in the elevator front jaw, forward thrust of mold disk pushing against the mats on first justification, face of mold dirty, grooves in mold or elevator head obstructed, nicks in grooves of mold or elevator jaws, screw protruding from mold or elevator head interfering with rise of a band, elevator jaws too close together, back jaw or duplex rail sprung, bent spacebands or mats, a kink in the vise closing lever link, spots of metal on ends of vise jaws, edges of vise jaws rounded, lug on pump lever that stands directly above the pump stop lever may be loose, duplex rail cap loose, wrongly adjusted downstroke of first elevator, so the mats are not free to spread out. The three screws at the left end of the vise, that hold the vise closing lever bracket, may come loose. Cases have been known where the measurement of the spaceband sleeves from the index to the casting side was greater than that of the matrices, thereby holding the mats away from the mold.

Hairlines may appear on bold-face slugs but not on roman, even though the roman is used more than the bold-face. Dirt is transferred from spacebands to the side-walls of the roman characters, building up false walls that make

the matrices actually thicker at the place where the roman characters press against one another in justification. This, of course, separates the bold-face characters and allows metal to flow between them when casting bold-face. The only remedy is to rub the sides of each mat on a tough cloth, spread over a board, or on a piece of chipboard.

Some operators persist in sending in lines without spacebands, especially lines of border matrices. If the vise jaws are not set absolutely right or if matrices are just a little dirty or bent, a line without spacebands cannot justify. If it is necessary to cast a line without spacebands showing, the vise jaws may be opened two or three picas and quads and bands put in on the left end. The jaws may be opened to $30\frac{1}{2}$ on 30-pica measure to allow for a thin space and spaceband.

Besides the above, which will break down the walls of the matrices, the following should be considered: Running the metal too hot over a long period, stepping on matrices, holding your hand under the mouth of the magazine to catch mats as you empty a channel. The cause of hairlines may be determined by the process of elimination, using the above list as a guide.

A false wall is gradually built up on mats. If the matrices are cleaned in a solution—even in high-test gasoline—this false wall will be destroyed and hairlines may result.

Lines must be "air-tight" when the cast takes place. To determine if the justification springs are stiff enough, first see that there is no obstruction to the free spread of the line in justification. Run down a reasonably loose 30-pica line having 20 spacebands. Send in the line and stop the cams on second justification. Slip a button hook through the opening in a band and note how much it can be pulled up. It should not come up over 1 to $1\frac{1}{2}$ picas.

If the side-walls of the matrices are broken down, the font probably is ruined so far as high class work is concerned, but for the country publisher, this is pretty hard to take, because mats are expensive.

If the hairlines are there beyond mistake, use a stiff scrubbing brush or a fine wire brush on the forms after they have been justified, brushing up and down the length of the column and keeping away from halftones. Some have tried planing the form with a rubber heel with good results, but this, of course, will tend to round the serifs on foundry type.

Experiments have been run by rubbing a very slight amount of laundry soap on the sleeves of the bands at the casting point after graphiting. This done over a long period tends to build up false walls on the matrices more rapidly.

We are admonished to clean the spacebands once for each eight-hour shift. It is assumed that there is a full set of twenty-five or more bands in use. If the

machine has only 15 bands or if the walls of the matrices are not good, it stands to reason that the bands should be cleaned more often.

LOOMIS: Back in the nineties hairlines were called "burrs" or "whiskers." In 1900, John S. Thompson in *The Inland Printer* said "hot metal causes whiskers." He mentioned that blue ointment was used on hairlines, but said he had "no faith in soap or other preparations," and in November he went humorous by saying that "when a set begins to show a few whiskers it is only a question of a short time when they will develop a full beard."

The problems of hairlines are still with us. Most of them are caused by one or both of two things: 1, sloppy justification on the part of the operator; 2, improper care of bands.

In the first instance, the operator may have fallen into the habit of sending in lines on the borderline of justification — i.e., loose lines. He should not fudge on this. If there is any doubt, drop some thin spaces alongside the bands. Also, check carefully your pot pump lever stop lever (don't be envious; I'm sitting here with a parts book at my elbow, looking up the names). This is covered fully in *The Pump Stop*, page 117.

On an old font, use of a cleaning solution may have caused hairlines to appear.

In rare cases, difficulty in vise-closing will assist hairlines. This is covered in Chapter XII, *Justification*, page 122. Here too I have seen a dry main camshaft bearing cause the same trouble.

Watch your bands; if they show an actual accumulation of metal at casting-point (anything more than a dark spot), see *Cleaning the Bands*, page 95.

Finally: Quit sending in those loose lines.

I note what Harding says about soap — others say it too — but my impression is that it can be only temporary. You may as well make up your mind eventually to buying new mats — and this time get a new set of spacebands along with the mats. It's cheaper. Take care of the bands, check over the pump stop — and remember, mats today are worth almost a third of a dollar.

Many authorities, however, suggest the use of soap, bees wax, or resin-containing soap. It creates other complications, but it will partially salvage a hairlined font.

I have been asked, "What is a hairline?" The answer is not too complicated. On each side of the female die in each matrix is a sidewall to hold in the metal. It is made very thin to obviate unsightly space between letters. If at any time the mats are not locked up tightly, metal will be forced between letters and will slightly bend in the sidewall. The next time this mat is presented to the casting mechanism, the metal has a slight opening, which presently is enlarged. Eventually the metal, casting always against the same point on the

spaceband sleeve, accumulates on the spaceband. This in turn crushes the sidewall of every mat against which it locks up.

When mats are not too bad, a little careful weeding will clean up a font. Run out all of one letter. Hold them with the casting side toward you and riffle them so all the right-hand sides show up, and examine the light-face positions. An old mat will show discoloration around the casting-point, but a hairline mat will show a fresher discoloration as a rule—a small quarter-moon of fresh lead color. If there is only one, you can often see a nick in the sidewall. If you cannot pick them out, cast them all together several times, then take them off the bar and keep them in order. Lock up the slugs and take a press proof on enameled paper; then pick out every pair between which a hairline shows and examine them. Sometimes you won't catch them even this way, but if you keep your eyes open, you will catch them sooner or later. When you get one, twist off the toe, and it will be gone for keeps.

HARDING: When bold-face or italic hairlines show up but not roman, it may be found that oil and graphite have been used too freely around the path of the matrices.

On old fonts, hairlines may appear on bold-face or italic but not on roman, because the roman is used more and has built up false sidewalls, which project a little and hold the bold-face letters apart.

H. R. FREUND, chief engineer of the Intertype Corporation, in *Who's Who in the Composing Room*: Primarily, hairlines are caused by improper justification. Be sure that:

1. Vise jaws are ground accurately, with a slight opening at the bottom and back;
2. Spacebands are thicker at the casting edge, and are parallel from top to bottom;
3. Spacebands and vise jaws are kept free from metal accumulations;
4. Matrices are free from distortions and foreign substances.

Type metal sometimes deteriorates and becomes prone to adhere to every surface.

Hairlines Suddenly Appear on an Intertype

HARDING: Earlier Intertypes were equipped with a large cotter pin hanging from the vise by a chain. When recasting with a Linotype border block, this pin was inserted in a hole in the right-hand justification rod. Often it has been forgotten, and lines that are only a little short will hairline badly because the spacebands cannot spread the line.

Rebuilding Mats

QUESTION: I have received some advertising from people who say they can rebuild old mats. Do you think this will be satisfactory? After all, there's a lot of difference between three cents and thirty-one cents. — H. B., Hanska, Minn.

LOOMIS: I know how you feel. It wasn't so bad in 1900, when mats were \$40 a "set," but nowadays that three cents a mat is tempting. I'll give you the same answer I've been giving owners for a good many years: I have not yet seen a satisfactory job of "rebuilding" mats, but there may be one. Send in fifty or a hundred and try them out. Include a bunch of lower case *o*'s to check alignment. As far as I have seen, no rebuilder of mats promises anything for hairlined mats, though some do say they can rebuild the chewed off toes, etc. But in all cases that have come under my knowledge, the rebuilders have returned as unsuitable all mats with toes broken off, combinations chewed up, etc. They seem to have taken mostly those mats with toes worn short and to have swaged them out, dressed them off, and sent them back. The toes are a little thinner, but it wouldn't be so bad if they would restore the original alignment. So it adds up to the fact that you have to have pretty fair mats to begin with, and, if you do, they will make them run through the machine — but don't be fussy about the printing you do from them.

Mats With Worn Toes

A new matrix measures .750" across the toes; when it is worn or damaged to less than .730", discard it. In distribution the short toe will frequently climb upon the land between the channels and cause a stop; in the bottom of the magazine it may do the same thing when it comes up against the escapement pawls.

Mats Out of Alignment

A very few mats out of alignment can make an entire font look bad; they show up more in the bold face or italic than in the roman. But they are easy to pick out of the font. Those that show high on the line will have the bottom edge of the toe shaved off on the casting-side; those that show low have the top edge shaved off of the same toe. The first one is the result of tight lines. The second one may be from tight lines or from misadjustment of the first elevator's down stroke. Run in a line of mats without bands; let the first elevator come to rest on the vise cap; let the mold disk come forward until the toes of the mats are in the groove on the mold; you should be able to raise the first elevator now and show a definite play of .005" to .010" between the first elevator banking screw (next to the jaw) and the vise cap. If this screw is too far down, the mats will be too high, and the mold may shave the tops of the toes. Then you will have a lot of mats out of alignment.

THE KEYRODS

Removing Keyrods

QUESTION: I can see that our keyrods are very dirty, and I would like to clean them while I am cleaning the keyboard. Can you tell me how to go about it? — W. W., Harrisburg, Tex.

HARDING: Usually there is dirt in the keyrod guide at the bottom, and this can be pretty well flushed out with gasoline if you are careful, but if you want to do a real job, and especially if the upper ends have accumulated that peculiar gummy grease that hampers movement, this is the answer.

This operation is very easily done on some machines, while on others it presents quite a problem. First, compose yourself. Don't be in a hurry. It is a job that requires care and patience. It is worth the effort, however, in your personal satisfaction in a job well done, and also in the improved performance of your keyboard.

To Remove Models 1 and 3 Keyrods

Remove the magazine. Then remove all of the keyrod springs, disconnect the spaceband keyrod, hold down on the upper guide plate and swing it forward slightly. Now lift out the keyrods one or two at a time, starting at the right, and lay them edge-wise on galleys, keeping the spring hooks up and joggling them a bit to economize space. Notice that the keyrods are numbered. They are all different lengths, because the keyboard is wider than the magazine. The lower-case *p* keyrod, No. 18, is the shortest because it stands perpendicular. Notice that there are 91 slots in the upper keyrod guide and 91 slots in the lower, yet the spaceband keyrod does not use the upper guide. The extra opening in the upper guide is for the extra lower-case *e* channel. If there is but one lower-case *e* keyrod, notice which verge it operates, and return it to its proper place, which is usually the second slot.

To Remove Model 5 Keyrods

Directions for the removal of Model 5 keyrods are the same as for Model 3, except some machinists prefer to remove the verge plate and face plate.

To Remove Models 8 and 14 Keyrods

Here too the actual removal of keyrods is easier with the face plate removed, although the professional generally does it the hard way.

To Remove Keyrods from Old Style Intertype

Shift the magazines to bring the top magazine into typesetting position, open the channel entrance, trip the dog under the cradle, and swing back the magazines. Remove the screw from each end of the bar behind the keyrods at the top. Lift off the bar and remove any or all keyrods. They are all the same length, but it will be wise to keep them in order. Do not lose the over-motion springs.

To Remove Keyrods from New Style Intertype

Mark the position of the keyrod frame, because all the keyrods will be lifted out in a unit and, when replaced, must be left in the original position laterally. If shifted a little to one side, some of the keyrods may miss the verges.

Disconnect and remove the spaceband keyrod.

When the screw at either end of the keyrod frame is removed, the whole set of rods may be lifted out in a unit. The screws are at the left and right of the upper ends of the lower-case *e* and the em dash keyrods. If the machine is equipped with the twin *e* attachment, that must be watched.

Cleaning the Keyrods

LOOMS: Both upper and lower keyrod guide plates should be examined. If some of the slots are badly worn, make a note to order a new guide plate.

The keyrods may be washed in gasoline, and the parts that rub against the guide may be graphited, or the keyrods may be buffed with a fine-wire power brush. On some keyrods, however, this will peel off a thin plating, so use caution. A third way is to wash them with the same soap that you may have used on the key-buttons. Use an old boiler or any vessel long enough to hold the keyrods. It doesn't have to be over three inches deep. Use hot water; dissolve the soap thoroughly. Drop the keyrods in a few at a time. Better not dip your hands in. Let the keyrods stay for ten or fifteen minutes. (If you leave them longer they will start to rust.) Then fish one end of a rod out and finish the job with a brush that you can use without dipping your hands in the water. This stuff will do a real job if you have the right soap.

If you do not remove the keyrods, use a squirt can and white gasoline and thoroughly flush out the guides — lower one especially. The cam frames, of course, must be off.

Replacing the Keyrods

HARDING: It is always best to start inserting the keyrods at the left.

If a lower slot is missed, it is an easy matter to raise each keyrod and move it over one slot, but if an upper slot is missed, all keyrods must be removed again.

After the keyrods have been connected to the verges, check to see that the keyrods at the left are engaged with the verges, as well as those on the right. Now pull out the verge and keyboard locks. If some of the keyrods remain elevated a little, bring all keyboard cams to place by hand. Push up on the mats in the magazine. Some of them may be part-way over the verges. Raise the offending keyrods by hand, and let the mats drop. If these measures fail, the keyrod spring is weak or the verge spring is too strong.

LOOMIS: Many persons do not remove the face plate from Models 5, 8, or 14. In this case it requires a little extra patience, ability to twist the hands and arms and neck in coordination, and a touch that allows you to bend the keyrods for insertion without putting a permanent wave in them. Some work from the front, some from the back. Cut a 1" square stick $1\frac{1}{4}$ " long. Drill a hole through each end and wire it to the keyboard posts. (The keyboard is on, of course, but the cam frames are not.) Loosen the keyrod lower guide plate just enough to allow you to work the keyrods in past the keyrod lifting bar by a very little bending and twisting. Do not bend or twist enough to put a permanent set in the keyrod. Most persons find it works best to come up from below, get the top end of the keyrod in the upper guide, and then (with the magazine out of the way) raise the keyrod still farther until they can get the bottom end in the guide. The bottom end comes to rest on the wood. When all are in place — the last few are the hardest — see that all are supported by the keyrod lifting bar or its equivalent; tighten the lower guide. If all keyrods are in place and move freely, you can remove the wooden block.

The Goosenecks

LOOMIS: Try as we may, we can no longer avoid the escapement levers, or goosenecks. Some prefer to take out the four screws and remove the entire assembly; if you do, be sure to mark the first slot in the guide if it is empty, and in returning the goosenecks, start the lower case *e* in first; put a screw in the bracket loosely on that side, and, using that screw as a fulcrum, insert the gooseneck tips one at a time in the guide, and keep swinging the assembly in closer to its proper position.

For my part, I have decided it is easier to take out the goosenecks one at a time by removing the hinge rod. This is particularly true if you have reversible joints in your wrists and elbows — which I have not.

Many words can be given on replacing the goosenecks. Many words *have* been given — some profane. First, by all means keep them in order. Second.

polish the hinge rod. Third, polish the lower and upper ends of the gooseneck. Fourth, it won't hurt to give the channels at the bottom end a touch of a thin warding file (an old one that doesn't cut much) to remove burrs. Fifth, you may have to bend the teeth of the escapement lever guide slightly to make them clear. Sixth, the goosenecks themselves mysteriously or otherwise turn up bent to one side; observe if the tip rubs against one tooth or the other of the guide; if it's clear on one side but rubs on the opposite side, remove the lever and bend it slightly to center it in the guide. Replacing goosenecks can be tedious, and requires patience and fortitude. See that every one falls back into place by its own weight. Also see that each gooseneck tip lines up pretty well with its neighbors; then turn the cam rolls by hand and see that they rise to the same height — half a dozen at a time.

This sort of job need not be done too often — perhaps five to ten years. In the meantime, I have had good luck by squirting gasoline and graphite along the pivot rod. Be sure the gasoline is white and high-test — no benzene or alcohol or other solvent.

Removing and Cleaning the Verge Rack

See *To Remove Verge Rack from Model 5*, page 8. See *Replacing Verges*, etc., page 7, for cleaning directions. It is highly important, if you clean the entire rack, to keep the verges in order. I usually lay them out by sections (18 in a row) to provide a check. On a Model 5 it is easy to turn all the verges backward in replacing, and not discover it until you try to put on the springs, so watch.

Why so Much Trouble After Cleaning the Keyboard?

LOOMIS: It is a universal experience to have all kinds of little troubles after thoroughly cleaning a keyboard and putting it back together. In many cases this is due to lack of experience, but there is a large class of trouble that is not covered by this reason.

Here, I think, is the answer: A certain part wears or gets dirty, and other parts compensate, or the operator himself, over the years, does things to compensate. Then when that dirt is removed or those worn parts replaced, a new factor has been introduced. It takes a little patience and a little care to iron these out; don't be in a hurry. Allow a half hour or an hour for this final "unbugging."

Naturally it will help to keep everything in order, including keyboard cams, but even then trouble will develop. My usual trouble is that cams fail to turn over; my favorite remedy is to switch cams a few times; this generally clears it up. But on old machines, you may have to check through the list of keyboard troubles. This itself is not very involved, for you have one big advantage on your side: you know the thing is clean.

LINECASTING OPERATOR-MACHINIST

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