CHAPTER XVI

METAL POT AND PLUNGER

General Action of the Pot

QUESTION: I was visiting in another plant and noticed the pot went up into position and stayed there until after the cast. The pot on our own machine drops back for a second and then locks up again. The other operator assured me our pot is not locking up right and I should change it. What do you say? – L.R.M., La Jara, Colo.

LOOMIS: For goodness' sake don't touch it. For a fuller description of the action of the pot, see Pottle's article below. It is well to be familiar with the exact action, for often casting trouble can be run down this way.

H. G. POTTLE in *Who's Who in the Composing Room:* Let's take the first look at the pot cam in the back. It has two shoes; a short one which moves the pot forward for the first alignment. Then the pot drops back for an instant before it is brought forward by the second and longer shoe, which holds it there during the cast.

This long shoe locks up against the roll on the pot lever and exerts pressure against the pot lever spring at the bottom. This spring transmits pressure to the pot itself.

The old-style eyebolts have a nut at both ends. The nut at the rear does not have anything to do with the pressure exerted by the pot lever spring, but rather it brings the pot back for that momentary relaxation between lockups. If this nut is backed off too far the pot will not drop back properly. On an Intertype this nut is set so there will be 11/64″ space between the nut and the lever when the pot is locked up; this is just under 3/16″. On a Linotype the space is 1/16″ to 1/8″. This nut should have a lock nut to hold the adjustment.

The front nut is the one that determines the pressure during lockup. It also should have a lock nut. On late Intertypes it has been replaced with washers, of which there usually are eight on a new machine. The new style springs are larger and are under pressure during lockup only; therefore they should last longer.

LOOMIS: It is distressing that in the past both manufacturers have not required more accuracy in the manufacture of the pot cam lever, pot lever eyebolt, the sleeve, the washers, and the nuts. A man out in the country, taking his eye-

bolt apart to replace a broken spring, often has been dismayed to find that the pins holding the sleeve have been sheared off or removed, and on occasion I have seen sleeves on eyebolts without any holes for pins, not to mention eyebolts without sleeves *or* pins. These conditions are, shall we say, confusing. See the heading, *Lockup Pressure of the Pot,* page 147, for suggestions on what to do next. (I understand that recently the manufacturers have introduced some uniformity into the dimensions of this assembly.)

Proper Filling of the Metal Pot

QUESTION: Is it all right to let the metal level run down near the top of the well? We get a cold face if we run it any higher. — H.C.H., Frederick, Wis.

HARDING: This should not be done as a custom. You need a machinist if you are having that trouble, for probably you already have a clogged throat. We give a fuller treatment of this subject under the heading, *Cold Face Caused by Throat Clogged,* etc., on page 183, but don't get in a hurry to clean out the throat until you have read all the material in these chapters on the pot.

In the meantime, as to your question: different pots do vary a little, especially if you demand a great deal of them, as in casting big slugs, big faces, and many slugs. But in general, metal should be kept in the neighborhood of ¾" below the place where the crucible meets the pot — or 1¾" to 2½" above the top of the well. On an Intertype, the metal level should be below the bevel at the top edge of the pot.

A pot holds about 38 pounds of metal when full, but this is by no means workable. If you are hand-feeding, drop in a pig whenever you are up. Don't let it vary more than you have to.

When the pot is too full, you may get a back squirt, for metal will run out of the mouthpiece holes as the pot moves forward. When a pot runs over, metal runs down through the asbestos packing. On old style Linotype pots with their throat heater terminals at the bottom, short circuits resulted. One pot that I took apart had fifeen pounds of metal that formed a regular jacket around the throat element.

Fuses have been blown by metal splashed from the surface through the opening through which the old style mercury tube passes, and out over the electric connections. A "hot spot" in an element has been known to splash metal onto heater terminals (it has even blown metal to the ceiling). When this spraying persists, throw a handful of slugs over the "hot spot" when you turn on the current.

A cut in *Printing Equipment Engineer* for August, 1939, shows an accumulation of slag or dross in a crucible throat, caused by allowing the metal level to remain constantly too low. This sort of accumulation becomes almost as hard as the iron itself, and, if it gets too solidly established, is hard to loosen.

LOOMIS: I ran into one of these crucibles once that had a solid accumulation of dross in the throat. We could not remove it even by heating the crucible red hot with an acetylene torch, and so we sawed it open and found the same thing William Reid & Company found. In my opinion this accumulation was caused by two things: 1, allowing the metal level to remain constantly low, and 2, allowing a heavy accumulation of dross to remain on top of the metal. These two factors over a period of years, plugged up the throat, I think. Questions asked of the owner seemed to support this theory. I do not believe that deteriorated metal had much to do with it, for if that were so there would be many more of them. I have cleaned out — well, hundreds — of throats in the last thirty years, and that is the only really bad one I have seen. It is something of a freak — but it could happen to you. And when it does happen, it's bad.

I hurry to point out that it requires only a very little dross in the throat to give a cold face on your slug — and this dross yields to the throat saw, of course.

Temperature of the Metal

QUESTION: We changed over to bottled gas, and after the orifices were installed we discovered our thermometer was broken. What would you suggest in a spot like this? — Q.R., Crawford, Neb.

LOOMIS: In a situation like this it is possible to get a pretty close adjustment of the heat without a thermometer. If it is a gas pot, be sure the throat burners are burning; if an electric pot, be sure the throat and mouthpiece elements are heating (if you can get metal through the mouthpiece, they are).

First set it this way: fold a piece of newsprint and hold it in the metal while you count slowly to three. The paper should be light to medium brown. The trouble is, newsprint varies, counting varies, and each man's idea of light brown varies. An old hand at this, who has checked it often against a thermometer, can come within ten degrees, but it isn't so easy for the inexperienced. Cut down your mouthpiece flame pretty low, or, if electric, to about the halfway point. Start setting type.

Pay first attention to the pot. Keep cutting down the main burner until a ball begins to form on the plunger. Then turn it back up a little until the ball disappears.

The throat flame should be from 1″ to 2″ high.

Now the main pot heat is pretty close to where it should be. Cut down on your mouthpiece heat until it starts to give a cold face; then raise it again.

With a little experience, this can be as good a setting as you can get with a thermometer — always allowing for exceptions caused by unusual conditions (under which circumstances a thermometer can be pretty helpless too).

For the record, it is now considered best to run the pot as cool as you can and still get good results. This will be around 510° to 530°. It must be hot enough to keep the ball off of the plunger — though sometimes you have to use an aluminum shield as assistance here. The temperature prescribed for the mouthpiece is 490°, but this is hard to measure. A 6-point slug held with one edge against the mouthpiece should start to melt in less than a minute.

In a Monomelt, it is now considered best to keep the temperature around 625°. At higher temperatures the metal will be oxidized with excess rapidity. At lower temperatures you may have trouble melting down fresh metal.

Metal Temperatures and Mold Cooling

HARRY G. POTTLE in *Who's Who in the Composing Room:* 530° is a safe low temperature with a cold-metal feeder; with a hot-metal feeder the temperature can go down sometimes to 510°. I have always favored a low heat in the pot, with plenty under the throat and mouth-piece. I have had excellent results by feeding gas to the throat burners independent of the main burner.

Mouthpiece temperature is supposed to be 475°, plus or minus 3°. So far this is difficult to measure and difficult to hold.

A mold is overheated beyond 150°, so when large slugs or continuous slugs or fast-running machines are involved, cooling is needed. Water cooling offers little cooling to the cap of the mold. (LOOMIS: The upkeep of a water cooling system is demanding too.) Air cooling helps both cap and body, and in general seems to have turned out to be more efficient in cooling.

Hollow slugs can be caused by lack of ventage. These usually have a bottom, but are like a shell and are hollow inside.

I have better luck with a mouthpiece that has holes a nonpareil apart instead of a pica apart.

Lockup Pressure of the Pot

QUESTION in *Printing Industry* for November, 1931: I removed the pot lever to grease it, and then decided to take the spring assembly apart for cleaning. To my consternation, I discovered there was nothing to reset the spring by. There was a sleeve, but there were no holes in the shaft. I got it running but it doesn't sound right. How can I get it set properly? — C.J.V., Mason City, Ia.

HARRY G. POTTLE: Unfortunately not too much has been done to provide a standard lockup pressure. We measured levers, eyebolts, washers, and springs in a plant of eleven machines, and on no two machines were the measurements the same. The springs vary. A Linotype spring has 7½ coils of ¼″ wire wound to 1 5/16″ diameter, and should be 2⅜″ long, but sometimes a new spring will be 1/16″ short. Also, the springs will become set in use and turn out ⅛″ short.

The Intertype spring has 4½ coils of 5/16″ wire wound to 1¾″ diameter, and is only 2¼″ long; this larger spring is not supposed to suffer from spring set.

The Mergenthaler Company uses a compound lever gauge to set their pot springs, but this is not available to the m-o, and it would require considerable experience to use it properly. The pot spring is set for 550-650 pounds pressure on the mouthpiece while the pot is cold; this automatically increases to 900 pounds when the pot is hot. Many machines have been tested where the spring had been tightened up to 1200 pounds cold. This can be done easily, for each turn of the front nut increases the mouthpiece pressure 200 pounds. It is well to note, however, that excessive pressure does not help back squirts, but often makes them worse by springing the pot legs.

The pot spring of course should not be solid. It is put there as a safety cushion, and when you screw it too tight, undue pressure such as a double black lockup will break off the vise locking screws or the pot lever itself.

Since the prescribed measurements are not dependable, what then can we do? As good a rough test as any is the space between the coils of the spring at lockup. This should be not less than 3/64″ and not more than 1/16″. When it is set and found to work, the lock nut should be checked to be sure it is tight.

LOOMIS: I made a small gauge that could be used without so much trouble, using another pot spring as a sort of counterbalance, and used it for a few years to check on Pottle's distance between the coils. That seems to be about right, and I don't use the gauge much any more.

Earlier I had tried to establish some sort of basic measurement. I chose the distance from the front edge of the pot spring to the nearest edge of the hole in the pot lever eyebolt. Like Pottle, I found no two alike. They measure anywhere from 1½″ to 1 13/16″ at this point. A Model 14 in the plant where I am now working measures 1-11/16″, while a brand new Intertype measures 1½″. My own choice on an older machine is to guess at about 1¾″, then set it according to Pottle's test. Get a piece of 1/16″ rod – the size of the mouthpiece holes. If that goes between the coils during the lockup, the spring is too loose. Grind a flat on one side until it measures .047″ with a micrometer. If this end *won't* go between the coils at lockup, the spring is too tight. Save the rod; one end is the go-gauge; the other is the no-go.

Greasing the Pot Lever Roll

QUESTION in *The Graphic Arts Monthly:* Our machine stalled recently, and the machinist we got on the job found a broken roller bearing in the pot lever roller. I have been careful to oil it every week and am at a loss to understand why it ran dry.

LOOMIS: The pot lever roll must be packed with grease. Because of the heat from the pot, oiling will not keep it lubricated. The old style bearing has

nine separate roller bearings and two washers. The new style has the bearing assembled.

Some m-o's put shims under the pot cam shoes to compensate for wear, but I believe this should be done only on the advice of an experienced machinist, for each shim has the effect of tightening up the pot spring three times its thickness; therefore a sheet of tympan paper adds from 40 to 50 pounds pressure at the mouthpiece. Moreover, those shoes are case-hardened and do not wear very fast.

To remove the pot lever: Drop the first elevator to the vise cap. Turn off the motor. Note the exact position of the pot balance spring base, under the pot lever, and pull the vertical balancing spring out from under the pot lever. Open the vise and pull the mold slide out a few inches. Block or tie the metal pot forward. (Blocking is easier, for you can saw a wedge-shaped block of cut-base, 4″ long, 8 picas wide at one end and 15 picas wide at the other; then push the pot forward and slide the wedge in between the pot and the pot pump roll. But this will be in your way until you acquire experience, so it is perhaps better to tie a piece of baling-wire around one of the brackets that hold the pot cam lever and then run it through the face plate.)

If a Linotype, note the number and position of the spacing washers on either side of the pot lever where the shaft goes through. Look closely. Some of the washers are very thin. (If Intertype, remove the screw in the slot at the top of the pot lever.) Now loosen the set screw that holds the pot lever shaft, stick a screwdriver through the hole in the end of the shaft; twist and pull. You may need penetrating oil. Be careful to catch the washers. Lay them out as they were in the machine.

Remove the wingpin from the eyebolt under the pot. If it has rusted in, squirt it with penetrating oil. Do not pry under the wing. Grasp it with pliers, and twist and pull. Catch the pot lever with the left hand while you remove the wing pin. Let the pot lever come down and out. Note that by leaving the wingpin in until the last, you were able to handle the washers much more easily. This is also true when replacing the washers; put the wingpin in first, and you won't need three arms as much as you might at first think. Take the pot lever to the bench. Tighten the two screws that hold the pot return cam. Make them good and tight. Loosen the set screw that holds the pot cam roll pin; some fit into a detent; others are very long and go all the way through the pin. Push out the pin; the anti-friction rolls, washers, and cam roll will fall out.

See that the two oil holes in the top of the pot lever are open. If they are plugged up with metal, drill it out with a No. 28 or 29 drill, or a ⅛″ drill.

Wash the parts in kerosene or gasoline. Use a good cup grease or hard oil (not axle grease) and pack it around the inside of the roll. If the anti-friction rolls are separate, stick them one at a time in the grease. Then fill in the cracks. (With an assembled roller bearing, put it in the cam roll and then, with grease on your finger, go around and around until all the spaces are filled. Stick the

washers in place. Slip the roll in place. Get it centered on the hole. Then shove in the pin, with its hole in place for the set screw. It may be necessary for you to plug the hole with a piece of paper to keep the rolls in place, but you should be able to do it with grease alone.

Tighten the set screw just snugly; it is hardened, and if you break it, it can be quite a problem to remove. Put the pot lever back in place from beneath the pot and slip in the wingpin to secure it. Now coat the upper washers with grease and put them in place and push the shaft through. On an Intertype, insert the set screw in the slot and then adjust the pot lever sidewise to prevent rubbing against the cams. On a Linotype, if it rubs, you will have to shift washers. (On an Intertype, of course, there are no spacing washers.)

Let the hole in the pot lever shaft protrude from the bearing, in preparation for next time.

If you should break the wing off of the wingpin before you read this, you can loosen the pin with penetrating oil and drive it *from the inside* with a very short punch and considerable patience.

We assume, of course, that if any of the rolls are out of round or cracked they will be replaced. If the cam roll pin itself shows a worn ridge, it should be replaced.

After a few greasings, one should be able to remove the roll without removing the pot lever, and grease it and return it — all of which won't take more than a few minutes, and makes the job easier. In this case, take a long, thin screwdriver and push the cam roll pin toward the pot side of the machine. Get hold of it with a pair of pliers.

As to frequency, I know The Book says this roll should be packed twice a year, but I never have seen one that was, and I don't believe they need it that often in the country. I don't think oiling should be demanded any oftener than necessary, because the m-o has his hands full anyway. He passes it up for a few months and then forgets it completely to get it off his mind. Therefore let's say once a year, for it does need it that often — and let's do it that often.

Incidentally, make it a practice to oil the wingpin and eyebolt when you oil the machine; then you won't have any trouble getting the pin out.

For grease, do not use any form of pressure-gun lubricant. I have recently heard bad reports from graphite grease also.

THE PLUNGER

General Action of the Plunger

HARDING: Normally the bottom of the plunger is just above the holes in the well. Then as the pot moves forward, the well moves up and the plunger

cuts off the holes. You should be able to push the pot well hook through the holes with the plunger in place in normal position. If the plunger rides too low because of a worn pot pump cam and cam roll, the holes will never be fully open, and continuous casting will produce hollow slugs.

To remove the plunger, twist a little as you pull it out — and don't pull it out too fast. If you are careless, some machines will allow metal to splash from the mouthpiece, which will cause a squirt.

LOOMIS: For the best possible face and body, the plunger should start down with a quick, free stroke, then "dwell" and follow on through its stroke until the lug on the pump lever is within about ¼" of the top of the pot jacket. This stroke is regulated by drilling a hole in the bottom of the plunger. Clamp the plunger rod in a vise, with the plunger itself tight against the side of the vise. Start in the concave curve near the middle of the plunger at the bottom. Drill into the center at an angle. Start with a No. 52 or mouthpiece drill. Try the plunger with a 30-pica 10-point slug. Drill larger if necessary. If you get the hole too big — sometimes they take up to ⅛" — you can plug it up with a cotter key inserted from the inside. Cast slugs for several hours after each drilling.

It is important on some machines to get this full stroke of the plunger, for if the plunger goes down "soft" and doesn't go all the way, pressure on the pump after the cast may cause an "after squirt." This will lead to a back squirt.

Note also that on an old machine that is running all right, it is wise not to monkey with the plunger. It is usually when the shop gets a new font of bigger or heavier type that this becomes necessary.

On an old crucible and plunger, you may run into trouble trying to give the plunger a full stroke, because the plunger may have worn a groove around the well or there may be a dross ring at the bottom of its down stroke.

Proper Method of Cleaning the Pot and Plunger

QUESTION: I have heard many different and conflicting ideas on cleaning the pot and plunger. Will you give me the straight dope? — D.G., Slaton, Tex.

LOOMIS: Glad to. First, use no goo of any kind on the plunger. I have never been convinced that it is helpful in any situation. For a well-cleaner, use either the two-bladed cleaner or the spiral cleaner where the ends of the wires do not stick out. If you use the blades, keep the fork sprung apart, and replace blades when they get worn. The old-type wire bristle cleaners are treacherous; they sometimes leave short wires in the well that later get caught between plunger and side-wall.

Use the pot hook to clean the two holes in the sides of the well.

The best place I have found for the plunger pin is in the end of the face plate just under the screw that limits the travel of the line delivery.

I favor the spiral wire brushes where there are no loose ends sticking out. The solid scrapers are good but m-o's in the country are inclined to use them when they have lost their spring or when the blades have big grooves in them so they could not possibly clean the well.

Brush the plunger with a wire brush, in the open to avoid breathing the dust. Do not immerse in water or oil and do not use any sort of dressing on the plunger. It is totally unnecessary. Skim the pot and put the skimmings in the Monomelt or remelting furnace.

In replacing the plunger, immerse it in the pot for a couple of minutes to warm it up, then work it in, twisting a little if necessary. Put the plunger in gently, or you may force a little metal from the mouthpiece which will cause a back squirt.

LOOMIS: It is good policy, as George Curle showed me on the old *Tribune*, not to clean loose and worn plungers and wells any oftener than necessary. Let them gather dross to eliminate slop, and clean them only when they have to have it.

Adjustable Vent in Plunger

LOOMIS: For a few years plungers were made with an adjustable vent in the bottom to secure the same result as had been secured by men in the field who drilled holes in the plungers. If you have an adjustable plunger, and if you can adjust it, it will save drilling. But ordinarily it is more trouble to loosen the screw than it is to drill the plunger.

Metal Collects on Plunger Rod

QUESTION: Metal constantly collects on the plunger rod. Can you tell me how to get rid of it? — E.O.W., Excelsior, Minn.

LOOMIS: The accumulation of metal on the plunger rod varies a great deal with different machines — possibly from variation in the metal formula. First, check the temperature. Often if you set the metal at 530° it will stop this. Sometimes a plunger with a good long stroke will be a constant offender. If it doesn't help to raise the heat, then get an aluminum sleeve from the company. You will need also a new plunger pin keeper spring. Take out the old spring, slip the sleeve over, put in the new spring. Usually the sleeve fits snugly enough to stay where you put it. Otherwise you can drill a couple of very shallow holes in the rod and pound the soft metal into the holes.

To get a metal ball off of a plunger rod, either dunk the ball beneath the surface of the metal, or take a large screwdriver and pound it gently alongside the rod, between the rod and the metal, until the ball drops down the rod below the metal. This can be done so it does not smack of strong-arm methods. The word is *gentle*. A still gentler way is to take out the plunger pin and twist the

plunger down into the well until the ball is submerged — taking care not to force metal out through the mouthpiece.

HARDING: This is apt to appear on plungers that have the long stroke about which we have talked, because the cooler part of the rod dips into the metal. You may have to increase the temperature. Some pots are worse than others at it — probably because of a difference in the composition of the metal. Have the metal analyzed.

Plunger Becomes Disconnected

There are several things that will make a plunger become disconnected:

1. Cold metal.

2. Dirty plunger and well.

3. Metal slugs or pigs dropped behind the plunger rod, or a ball formed on the plunger rod.

4. Weak plunger pin keeper spring. This should be made of spring steel. Coat-hangers are more handy but not as efficient in this spot. Get half a dozen springs at a time. They are not expensive.

What to Do With a Stuck Plunger

HARDING: When the plunger sticks tightly in the well it usually can be dislodged by putting a monkey wrench on the rod and twisting and pulling. When this method fails, dip the metal until the well is exposed, put a little beef tallow around the plunger, and repeat with the monkey wrench. If the slug on which the plunger sticks is not the first one cast, tap the plunger rod lightly with a pig of metal and again use the monkey wrench. But if the plunger sticks on the first stroke after cleaning (which would indicate it is binding on some foreign substance), tapping the rod will make it worse.

Put a rod through the upper hole in the plunger rod, cover the opening in the pot cover with a cloth, and tap the plunger up. Cases have been known where the end of a side-stick was forked and used as a pry in the lower hole. Be patient.

LOOMIS: Be careful in twisting on the part of the rod above the plunger pin. I have seen the rod twisted off there. The very best and most consistent results I have obtained in this fashion: Loop several turns of baling wire through the upper hole so that you can put a three-foot crowbar through the loop and get a hold with the end of the crowbar inside the column. Now pry up hard while somebody else uses a monkey wrench or large crescent wrench to twist the rod (below the plunger pin hole if possible). I have seen some very stubborn plungers come unstuck through the persuasive power of these combined pressures.

There is one more way to withdraw a stuck plunger, but it can be very dangerous. The back of my right thumb is a solid burn-scar to prove it. Do this only if other methods fail.

Get somebody reliable to handle the clutch. Close the pot-top. Pad your right hand thoroughly with rags. Let the machine turn over until the plunger is down. Then grasp the plunger rod just above the plunger lever with a BIG pair of pliers; you'll need the leverage. If your machine has a Monomelt, be sure your hand is padded on that side. Have your partner pull out the plunger. If you maintain your grip, the machine most likely will pull the plunger out. I haven't seen this fail — but remember, it is dangerous. It is not a thing to do habitually.

To Remove the Plunger Spring

HARDING: To remove the old style Linotype spring, remove the plunger pin, insert a heavy nail through the rod above the bracket, run the machine and hold out the pump stop until the lever descends, and lift out the spring and rod.

To remove the new style Linotype spring, loop a rope through the upper ring of the spring. Hold out the pump stop and run the machine until the lever descends. Climb up onto the machine and pull the rope straight up through the center column. An assistant can then push the spring off the hook on the lever. Do not leave the metal pot locked up more than three minutes.

To disconnect the Intertype pump spring, close the vise jaws, run the machine until the pump lever descends, insert a screwdriver in the hole in the top of the spring rod and unscrew the rod. The lower end of the spring may be screwed off the bracket, but this is not an easy operation.

To Put Back a Linotype Plunger Spring

LOOMIS: I have what I think is the world's best system for replacing a Linotype plunger spring. First turn off the mouthpiece heat. Then get some No. 14 insulated wire and make it into a double loop about 16″ from end to end. This will, of course, require a piece of wire about 6 feet long, to allow some for fastening together. Get a bar or rod about two feet long. Have your assistant stand on top of the machine where he can pull up from the top of the spring. Have him put the rod through the wire loop; hang the spring on the bottom end of the loop. Provide yourself with a big screwdriver — about a 12″ (that is, a screwdriver with a blade 12″ long and proportionately wide and thick). Hook the bottom end of the spring and have your assistant tighten up to hold it in place. Pull the plunger pin. Turn the machine over; hold the pump stop open until the plunger lever goes down. Stop the machine; shut off the motor. Go around behind the machine. Have your assistant pull up on the spring. When the loop is high enough, you can push the screwdriver blade between

about the third and fourth coils from the top of the spring, push it first away from you, then to one side, and finally bring it back over the lever. Get it into the notch you want. Then let your assistant get down, and untwist the wire if necessary to get it loose from the spring. Get the machine off of the cast. This should not take more than three minutes. If it does, you'd better turn the machine over and let the mold cool off — or do this when the pot is cold.

To change the spring from one notch on the lever to another, grease the notches, then use a big screwdriver if it has steel all the way through, or a small sidestick, and drive the plunger spring from one notch to another, using the drift pointed a little upward to make it easier.

How to Set the Plunger Spring

LOOMIS: The setting of a plunger spring is always a compromise between a solid body and a good face. The average machine works about right with the spring in the second notch from the front, if a Linotype. On an Intertype you can guess at a setting by using a ¾" or 1" rod, with one end through the column of the machine, to pry up the plunger lever and feel the pressure of the spring as compared to other machines. Other things being equal, too much spring will give a better face but a body inclined to hollowness; too little will give a fuller body but an indifferent face; and far too little will give a shell cast, or a slug that looks good but has nothing inside.

If you have a heavy fourteen-point, use the spring strong enough to get a good face on the bold and no more.

Many older Linotypes (Model 18, anyway) have a hook at the bottom end of the plunger spring that can be regulated (when the plunger is off the lever, of course) to give more or less pressure.

The oversize plunger springs sometimes help when your well and plunger are badly worn, but they have disadvantages too. They will often start leaks in a mouthpiece that hasn't leaked in twenty years — so I generally stick to the conventional type. These certainly will function if the pot is in proper shape.

To get a better face on 18-point and bigger, see *Quick Drop,* etc., on page 184.

Will the Quick Drop Cause a Cracked Crucible?

QUESTION in *The Graphic Arts Monthly:* About a year ago we put quick drop equipment on our machines to give us better faces. Two of the machines have had cracked crucibles lately within a month of each other. Did the quick drop have anything to do with this? — L.R.M., Berea, Ohio.

HARDING: A loose plunger acts as a cushion, and a snug plunger conceivably might cause a pot already partly cracked to leak on a quick drop, especially if you are using a heavy plunger spring.

Most crucibles crack on gas-heated machines. Did you ever hear of a cracked electric crucible? The gas pot heats from the bottom, and there is terrific expansion there until the top is melted through. On gas pots it is quite common for some metal to leak through at every melting; this probably is forced through the cast iron by the pressure. It is best to leave gas pots burning as much as possible. It helps also to let the metal run low before turning off the pot at night.

Cracked crucibles will allow metal to drop on the burner, especially each time the pot is heated, and some become so bad they plug up the burner.

Pot Relief Plug Will Help Prevent Cracking

HARDING: The old-fashioned pot relief plug used on gasoline pots is a good item to prevent cracking. A local mechanic can make one on a lathe. It is a cone-shaped piece of steel 12" long, 1¾" in diameter at one end and ½" in diameter at the other, with the taper running for about 6". Crosswise through the large end drill a ⅝" hole for handling. The plug should be smoothly polished from top to bottom.

Put the plug in the well after dipping the metal down to the well. Small end of the plug goes down. With such a plug in place, a crucible will seldom crack when heating up.

Can A Cracked Crucible Be Repaired?

QUESTION in *The Graphic Arts Monthly:* Kindly inform me if a leaky Linotype pot may be successfully repaired. If so, what is the procedure? — S.E.M., Canandaigua, N. Y.

HARDING: Repairing is not too successful. It may last for a time, but eventually it gives way in most cases. Use it in an emergency, but don't depend on it. Constant expansion and contraction will break it again.

Sometimes the throat will be cracked inside the crucible, in front of the well. This may cause loss of compression and poor slugs.

There are a number of compositions to stop small leaks, but do not be disappointed if they do not work:

Liquid glass and asbestos cement mixed to the consistency of putty; chloride of lime mixed with water; a saturated solution of hydrochloric acid and pure zinc; lye and salt, mixed with water; epsom salts and table salt, mixed with water.

These should be applied from the inside of the crucible and left to stand overnight. The crucible of course must be emptied and removed in most cases.

Sometimes copper has been pounded into the crack from either or both sides. But the solution of HCl and zinc probably is the best bet. Clean and scrape out the crucible and pour in the solution. Let it stand. If it will seep through the crack, so much better. Try several applications.

LOOMIS: Cracked crucibles are tricky. On the *Minneapolis Star* I saw one develop in a machine that had been moved only a hundred feet along the floor on one of those very low trucks furnished by the company. Nemo Wraggett was very unhappy over that, for he already had his hands full with thirty machines on the move. We never could fix that, and finally put in a new crucible. On the other hand, I saw a pot on a Model 15 in an inland town near Mobridge, S. D., where the well was cracked three fourths of the way around at the base until you could stick a paper clip into the crack. I couldn't figure out how it stayed on at all. But there was nothing else to do, and a paper to get out, so we went to the local welder. He used electricity to avoid heating the entire piece so much, and welded it all around. It worked for a long time, but I doubt that it is working now. I have even had the end of the crucible welded up and have filed out a new seating for the mouthpiece, and have seen it work. But most cracks are almost infinitestimal. You have to examine the iron closely to see them. My policy is: yes, weld it if you are in a hurry, but order a crucible and be sure. Electric welding seems best if you have to weld.

Dross Ring in Well

QUESTION: Our plunger will not descend past a certain point, even though I have drilled a hole in the bottom. Do you know what causes this? — R.A.B., Lyman, Neb.

HARDING: I think so. Your well cleaner has become too worn to do a good job of cleaning, and a dross ring has formed at the bottom of the plunger's former stroke. Make a scraper by welding a segment from a 2″ washer onto the end of an iron rod, and scrape the ring out of the well.

Should We Leave the Pots on Overnight?

QUESTION: Is it cheaper to leave the pots on at night or to turn them off?

LOOMIS: I am informed that in average cases, where the machine is used about eight hours a day, and then is heating for ten or eleven hours during the day, that there is no saving in turning them off at night. Bear in mind that the heat required to keep a pot up to temperature without new metal being added is not as great as that required when the machine is in operation; remember also that the heat required to melt down a cold pot is considerable. Where a pot is turned off for three or four days over the week-end, it is a different story.

Two years after writing the above, I got my model 15, and kept careful records. It is heated with 110-volt A.C. current, and has an electric Monomelt. I discovered the following startling facts:

1. It requires 4 kilowatt-hours to melt the metal, ready for casting. The main pot melts in 45 minutes, will cast in one hour with the mouthpiece set a little below half-way, where it runs, and the Monomelt, if the metal level is

allowed to run down a little, takes 15 minutes longer. If the Monomelt is full, it takes 1½ hours.

2. During fairly steady operation of the machine, comparable to the average shop, this machine consumes 1.7 kilowatt-hours of electricity per hour.

3. Overnight, when the machine is idle, the electricity consumption is about 1.6 kilowatt-hours per hour! This difference is roughly the difference of the motor and light.

Therefore the cost of melting down from scratch is only 2 kilowatt hours — the amount required to heat normally for one hour!

Perhaps during the melting-down process most of the heat is retained in the metal, while in the fluid state there is great radiation and loss of heat. This whole thing is a little hard to believe, but the figures are accurate according to my meter.

I have no actual figures on gas consumption, but I would not be astonished to find them similar.

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