The Ampico Model B— an Important New Development in 1929

By Craig Brougher

There are so many vague and misleading ideas out there today about the Ampico Model B's inabilities to play the earlier rolls in the Ampico library authentically that I felt it was necessary to clarify some simple mechanical details which would obviate these misconceptions and be constructive to putting rebuilders on the right path **to understanding the system correctly**. If we're going to do a credible job and restore these instruments properly, we first have to understand intimately how they work, and the Ampico 1929 Service Manual may not be the best way to learn about it. So first, let's contrast the Model A system to the B and go from there.

I have previously written a shorter article entitled "Why the Ampico Model B May Not Play Ampico A Rolls Well" which is centered mainly around the pump. The article here is a much more thorough explanation of the B expression system with each expression component detailed and includes rebuilding notes about each one.

Ampico A Expression System in Comparison

The Ampico model A expressions operate from primary valves which, when actuated, relieve the down pressure of a long hinged lever, which is normally closing the stack valve. Lever pressure would be proportional to the position of one of three square pneumatics along its length, the weakest being closest to its hinge end. This allowed the designer to use equal-sized pneumatics rather than three different sizes in a vertical stack. The end of the lever operates a large circular disk valve covered with leather which closed off the stack supply tube from the pump. For instance, The #2 expression position was closest to the lever's hinge at the rear so its influence was minimal at the operating end. Then the #4 expression pneumatic was midway, while the #6 was closest to the operating end of that lever. But its pressure on the stack valve has to be countered and precisely adjusted automatically with an opposing pneumatic so that the air resistance imposed by the series stack valve would always be proportional to striker pneumatic requirements, both how many notes playing at one time and how hard they were to play, plus normal valve losses throughout the operation.

When all three expression valves are closed (off), the lever exerts maximum pressure on the stack valve to close it. That balances against the opposing pressure of the "spring pneumatic" pushing back the other way to open it and the difference in pressure determines the stack pressure for that side of the stack (bass or treble). Each spring pneumatic in turn is driven by a "crescendo pneumatic;" a set-point regulator having a spring adjustment used to set the minimum intensity at which all notes could play reliably. These expression stack valves requires both power and a measureable (visible) movement to make meaningful expression changes for both bass and treble. With measureable bellows movements then come mass-inertia losses, volume/pressure equalization losses, delay times, and even overshoots. Naturally, the delay and other abnormalities are compensated for in the roll coding and no one was any the wiser that it existed because of remedial coding compensation.

The earliest Amphion stack system also had sensitivity issues. All valves and piano notes in any pneumatic system vary a little and of course some notes are more responsive than others at the lowest intensities. Naturally that would be the case, but the early stacks could not be adjusted note for note, so until the stack design changed with later models called "finger stacks," the system didn't have any capability of individual note adjustment designed in. The only solution was to raise its first intensity overall to accommodate the least-sensitive playing note—until the finger stack was introduced. In most cases with a well-regulated piano action, fully restored and regulated valves, and lost motion adjusted out, this alone isn't a serious compromise.

However, the noticeable compromise is the limitation of the hammer rail soft pedal effect, which considerably increases lost motion between stack and keys. The early stacks don't have a soft pedal compensator. That lost motion has to be compensated for yet again by increasing the first intensity overall, which reduces soft pedal dynamics. So the soft pedal is compromised on the early model since it cannot allow the hammers to raise effectively. But yet, that's only half the problem. The earlier Ampico's key weight or damper weight was not (*to my knowledge*) ever modified for use in an Ampico system with the hammer rail lift in mind, so when the hammer rail rose to lift all hammers and soften the playing, the key tails rose accordingly, lightening the dampers and allowing those notes to sing through on soft playing, which is totally unacceptable, musically. Thus the technician is required to make some further compromises in first intensity, the degree to which varies between pianos. That shortcoming can also appear in any reproducer in which the key and damper weighting have not been modified accordingly, however. That probably has to do more with the date and brand name of player than the player action itself. Grands normally use a key shifter to soften and so were not regulated for hammer lift. Unless the piano company specifically weighted keys accordingly then, it was ignored.

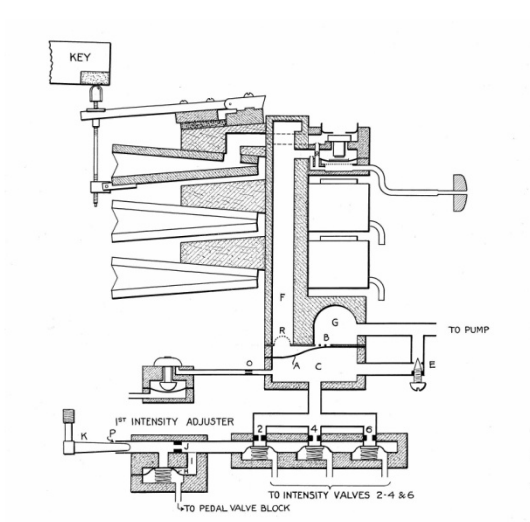
Fast repetition on a roll at lowest intensity with soft pedal partly determines sensitivity capability of course, but other variations include both the hole size and cleanness of the player roll perforations and/or the roll tracking precision of the spoolbox. And then there's the delay time between the double-valve setup of the old Ampico. It all counts. When you operate a player from a pneumatic drawer under a grand (in particular) it requires tubing averaging 6 ft. long or so in effect, because of all the angles and zig-zags the tubing makes to connect to the primary valves. Indirectness increases "flow resistance," and flow resistance especially at the lowest levels equates to greater delay times, thus also compensated for on the roll. But that still isn't all.

An ordinary note valve with a fixed bleed requires several times longer to return than to actuate, depending on its mechanical configuration. This principle is not well-understood in the field of rebuilding anyway. We all understand that at very low stack pressures the delay increases quite a bit. But even though the valve can close a pneumatic striker with much less delay when vacuum pressure is higher, it still returns to its seat again much less quickly than it actuates because the pouch has to get out of the way of the poppet stem, and the poppet has nothing directly propelling its return except residual suction from the stack supply, some of which is getting wasted during the transit. Not only that, but the pneumatic itself must relax by filling back with air again, and that has to happen through its outside valve seat from the pneumatic's valve supply hole. This slows the poppet down considerably from atmospheric blow-by and resultant reduction of stack vacuum inside the valve chamber, which was needed to return the poppet. So you can see how the overall return time can be 1/4th the actuation time. These are normal delays in all pneumatic systems, or "travel losses" which are also anticipated by necessary coding corrections in the music on a paper roll. Luckily, repetition speed of the music is still much lower than valve travel times are, except during extremely soft and rapid repetition. In that case, they can almost converge at times.

Add to this the delays in the model A expression system due to its system of larger pneumatic movement (*compared to the Model B*) required to bring about the intensity changes, and you have a bit more insight into the problems encountered when coding realistically played rolls for either one. There was much more to it than simply adding the appropriate intensities, crescendos, and pedaling, in the older models. Everything you change as you code a roll has timing requirements. It has to be anticipated beforehand, and in some cases lengthened or stretched out ahead of time, or either you won't hear it, or it won't be a cleanly accented or well-timed drop of an intensity. All compromises on the paper roll therefore make for a slightly less realistic performance. Still fully acceptable, imperceptible in most cases, but yet not ideal.

The Model B Response Timing in Contrast

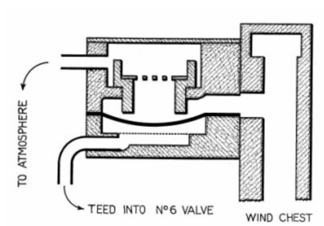
When the model B came about, many of these shortcomings were eliminated. The piano's expression system was greatly modified, from ***individually adjustable pneumatic strikers*** that played each note through ***a single valve directly to the trackerbar***, along with ***a vastly superior tracking system*** that keeps the roll smack in line with the trackerbar holes, and every other detail in-between as well. As a matter of fact, it doesn't even resemble the early Ampico they started out with, with all its lead-lag timing requirements, having been made much quicker-acting by comparison, and greatly simplifying roll coding having much less compensation.



EXPRESSION REGULATOR and ATMOSPHERE CONSTRICTIONS—*Fig. 4*

One of the vast improvements in the system was a ***completely new, direct stack expression system***. It operates almost instantly from primary valves connected to small spring-loaded pouches which determines the pressure of an almost mass-less expression curtain sealing long rows of small supply holes supplying vacuum to the stack valves. Now the only requirement for expression curtain rapidity is a very small but continual air spill above the curtain. This maintains a small flow of air through the expression regulator at all times, but that in turn eliminates any need (theoretical or otherwise) for the so-called "equalizer pneumatics" of the Model A.

This is accomplished through a small #52 fixed bleed to atmosphere on each half of the stack, and then there are two wind-chest spill valve units which are also continually leaking atmosphere proportionally to the chest vacuum as well, ***with this exception***: As long as only the two lower intensities are being used alone, #2 and #4, these spill valves change proportionally with stack vacuum, **since they don't have their own bleeds**. Instead, they are each cleverly operated through a #60 series bleed through their pouch signal tube from the #6 expression primary output, so the degree they are allowed to open the stack to atmosphere depends inversely upon the vacuum pressure called for on the roll.



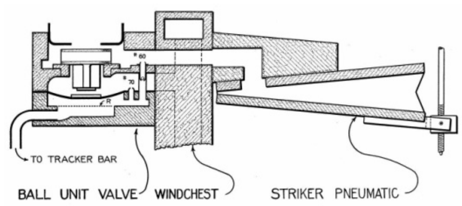
WIND-CHEST SPILL UNIT—*Fig. 18*

But when the #6 intensity is called for, those spill valves' pouches close off tightly to allow the pressure to accommodate the louder intensities and accents and otherwise, they are always leaking to atmosphere proportionally. This permits the stack to respond almost instantly to rapid intensity changes, whereas the Model 'A' must rely on exhaust air through valve losses. If that isn't happening as quickly as necessary for quick change-ups, then further roll compensation might be required, or the music critic in charge of the final product would take over roll performance in a few specific passages and do it esthetically.

The thing to remember about the Model B is that tightness of these pouches against their spill hole (*which is stack vacuum*) is relative to the percent of stack vac under their pouches—as valve losses incur—until the #6 intensity. That percent is achieved by the spill valve's restricted pouch supply tube to vacuum and the fact that it doesn't also have a bleed of its own. When #6 int. operates though, it puts straight atmosphere pressure under its spill pouch, which closes off the spill. These are operated by the #6 primary valves—the same primary that operates the spring-loaded #6 expression pouch under the expression curtain. So when this #6 primary operates, its output is atmosphere and its series bleed is irrelevant. When #6 is not called for, the output vacuum of the expression primary is relative to continuing changes of stack vacuum. This quickly varying ratio "floats" these spill pouches proportionally to the differential of vacuum on each side of each spill pouch. That's exactly the same principle which operates the precision pressure, hence percentage of closure of the expression curtains against their own grid.

This same principle makes the expression curtains practically instantaneous in their changes. Those curtains respond to valve losses the same way and compensate for it almost instantly! It's a very quick response system. It's just that in order to be fully compatible with the Model A roll coding, the full capability of the Model B could not be utilized on 'A' rolls. But no matter. You can always slow down a fast system to suit, since you cannot speed up a slower one. That's one reason the Model B remains compatible to the 'A.' It has no problem with response speed in managing an Ampico A roll, dynamic-wise. But there's a lot more than just that to consider.

The slowest part of any player system including the Ampico is the striker pneumatic/note-valve combination. Also in Ampicos you must add the tubing run resistance delay from the drawer. However this is more or less equal in all Models A and B and therefore a given. So how does the Model B improve on Model A valve performance when slowed by long trackerbar signal tubes?



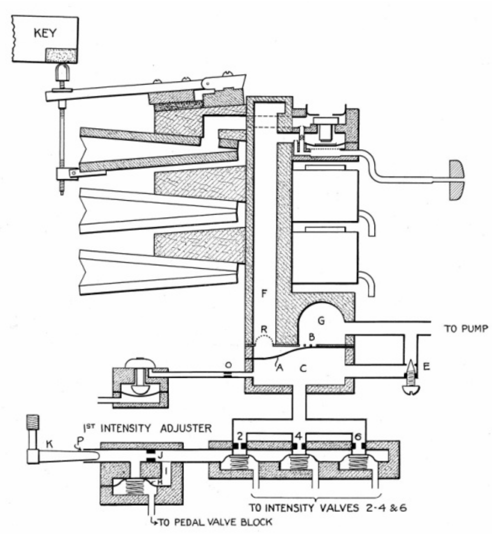
BALL UNIT VALVE—*Fig. 17*

<u>The reason an ordinary valve is slower to return is because it takes longer for its pouch to get out of the way of the returning poppet stem</u>. If it could return almost as quickly as it actuates, then the interacting striker pneumatic reopening wouldn't account for as much delay either. But as you enlarge a <u>fixed bleed</u> to drop the pouch faster and speed up return, you desensitize the valve to quick, low intensity staccato and softly played notes especially. It's the same problem as a failure to seal valve pouches well (or at all). Since the Ampico requires long tubing runs from the trackerbar to its valves, this adds to the sensitivity problem. The long tubing runs require the Ampico to have a very sensitive, quickly responding valve system. Sensitivity and valve return speed are the inverse of each other.

The ball bleed valve solves this by allowing the pouch to inflate on a #70 bleed, and deflate on a larger hole through the ball bleed as the ball is returning to reseal it. The initial impulse to its pouch to actuate is several times greater than a normal valve. So much so that it's more sensitive to a faint, quick trackerbar signal than even a small primary valve can be. Why? Because the fixed bleed of a primary still has to be a compromise between sensitivity and return speed. ***If a primary uses a #63 bleed, and since between the #70 and the #63 bleed sizes there's a difference in sensitivity of 175% on actuation speed, that makes the secondary faster. The ball bleed opens on return, making a faster return by 400-500% for the Hickman valve***. That's called a huge difference. Add all that up with the beautiful consistency of the Model B intensity changes, and regardless of how many valves are playing down at one time, you have a very large theoretical difference, there. Dr. Hickman commented that his valve was so quick that the roll department changed to using his single ball bleed valve system to sense the master rolls to make copies, removing all the old double valve systems altogether.

A Counter-Intuitive expression System

We are used to thinking in terms of **<u>opening</u>** a certain sized expression hole—which equates to a certain-power level result. That leads us to imagine that the 3 intensity combinations equate to 3 different-sized holes *normally closed* when playing softly. To most minds, "off" means intensity holes are closed, and "on" means intensity holes are open. **Just the opposite is the case, however**. In the Model B, when all three expression pouches have closed off their respective-sized holes (.070, .093, and .110) responsible for the 3 major steps of "***changes in stack vacuum***" (*which we'll refer to from now on as 'pressure'*), the piano plays at its loudest intensity! That's because their primary valves when off normally have a vacuum output.



EXPRESSION REGULATOR and ATMOSPHERE CONSTRICTIONS—*Fig. 4*

Why is that, you ask? "***That just doesn't sound right, somehow. No expression holes open equate to the loudest intensity?***" Yes, that's right. That's because those holes are located *underneath* the expression curtains and so, since that small chamber is still supplied with vacuum from the first intensity setting, which in turn comes from the pump, they work exactly backward from what you perhaps thought. When they're open they OPPOSE the amount of supply vacuum to the stack through the curtains by dropping the vacuum (*raising the atmosphere*) under those curtains.

This should be easily seen, however, because the spring-loaded expression pouches are operated by primary valves. When a primary valve is not actuated it is seated, so its output is vacuum. That means, when you set the "*first intensity*" needle valve adjustment, you are doing so against the atmosphere created in that same small chamber by all those sucked-down expression pouches. **So normally, the spring-loaded expression pouches in the Ampico B are all sucked down flat when no intensity is called for**. That's one reason why the 1929 Service Manual can appear to be misleading. It never shows them normally sucked down flat and doesn't mention it. Yes, I know that really sucks, but that's just the way things are in the 'B,' so we must just suck it up and agree it's normally sucked down. Now the entire expression system in general works the same way—and mostly with primaries.

Now while this may for some be counter-intuitive for those familiar with other reproducing systems and even primary valve expressions which are indirect into pneumatics first, this makes for a much faster-responding instrument. The expression curtain changes as quickly as a small primary valve can pop because it's practically inertia-less and reacts to small changes *with tension variations against a grill*, rather than a discrete number millimeters of measureable travel against a wire spring. No longer do we have relatively large pneumatics operating a large valve indirectly, with the requisite play and wobble, or a knife valve sliding up and down over a hole, with variable friction and play in its bushing combinations. The first intensity adjust becomes the ratio of pressure above and below an expression curtain, making it almost instantaneous.

Compared to the Model A mechanical stack valve disk in which .002 inches of vertical travel makes a very small but measureable difference in its expression pressure (*yes, I've also measured that, too*), the 'B' curtain is a decided improvement in sensitivity and precision. When the curtain makes an equivalent small change of expression at the low intensity as the 'A,' you couldn't see it doing it, even if it were visible. But thank goodness you don't have to take my word for that either. Just make a plexiglas model and watch it yourself—or, don't.

As you can see, there's one other primary valve also connected to that little chamber under the expression curtain. It's effect is minor and can only be sensed at the very lowest pressures of all.

It's called the "**sub-primary**," or sub-intensity. Remember that when the piano is playing ***at its softest***, then all the spring-loaded expression pouches are sucked down? Well, that's *almost* right. There's one other item under the curtains and that's the sub-intensity which actuates for an extra soft "accent" but only on 'B' rolls. It adds just a tad more air under the curtain than the three collapsed spring-loaded pouches alone, and so it drops the first intensity offset by the vacuum through the needle valve yet a little more, thanks to a #58 bleed (*desig. 'O' in fig. 4 above*) in series with the sub-intensity valve atmosphere output located in the treble expression valve block.

The First Intensity Adjuster

With that all explained, I failed to mention where the atmosphere comes from, uncorked by those 3 expression pouches. There is a handle called "The First Intensity Adjuster" that's connected into the stack under the expression curtains. When the expression pouches are open, atmosphere flows through this adjuster. This is the same air that our first intensity stack screw adjustment counteracts with vacuum through its needle. When the handle is pulled out fully, it is admitting the most air. That makes the instrument play the softest (*excluding sub-intensity, of course*). **So when you adjust your first intensity set point with the needle screw, be sure to have this handle pulled out as far as it will go**. Now if your piano also has the "subdue switch" in the left panel of the drawer, it adds atmosphere by collapsing a pair of cutout pouches added to the 1st Intensity Adjuster circuit. That adds more air under the curtains, the amount of which will be relative to the expressions which are in use at the time.

The Ampico B Crescendo System and Amplifier

Shown in normal position while playing 'A' roll.

This too works differently than the Model A crescendo, but achieves the same thing at the same time. It is a much simpler design, all contained within the pump and is part of the spill system. While the Model A also has a spill spring pneumatic too, it's different in that it is not a crescendo but operates with a separate pneumatic amplifier to tighten the spill. The Model B is different, in that its so-called "amplifier" refers to two fixed crescendo positions. These become a steady-state pressure platform above nominal pump pressure. It locks the crescendo into its half-way position or its full power position, ***but only on 'B' rolls***. They do not operate with 'A' rolls. Those are called 1st and 2nd amplifier positions. ***When playing 'A' rolls, the crescendo is unimpeded. It is not blocked or interfered with and the 'A' roll has full control of crescendo, just as it does on the Model A***.

The model B does not have the 'amplifier' equivalent of a Model A, being physically separate from its crescendo, **<u>but on the other hand, it isn't intended to be operated without crescendo</u>**. **In Brilliant mode, the amplifier effects in the 'A' without a corresponding crescendo don't exist, either.** The mistake some technicians make is to believe that the amplifier effects in the 'A' are separate and perceptible in addition to crescendo, while in the Model B it isn't. That is wrong, and it is also measurable in simple static vacuum gauge tests. Try it and see. But really, all you need to do is watch the amplifier pneumatic in the Model A pump with tape over the trackerbar, the Modify switch to Brilliant, and then actuate the #6 intensity. The pneumatic cloth tightens but it doesn't stretch the spill spring (*assuming the amplifier spring itself is correctly set*).

The only time Amplifier operates in the 'A' is when that system is switched to Brilliant mode. But the crescendos operate in all modes so what's the difference between 'Normal' mode and 'Brilliant' mode? The amplifier. And how does the amplifier change the performance to Brilliant? It tightens the spill in the pump proportionally to the number of intensities on at one time—as long as the #6 intensity or above is used. Does that mean accents cannot be heard in Normal mode? Of course not. Everything is dynamically proportional to itself, but in Normal mode the pump pressure is not supposed to rise above nominal "rewind" pressure, and if "amplifier" were a mode of expression by itself, the Model A pump would rise above nominal.

In the Model A System, the Amplifier Alone Doesn't Accent Notes

Without the amplifier the accents are still there in the music by intensities. They just aren't as loud. Yet if the amplifier system were designed to act independently of crescendo as some wrongly believe, then it's obliged to operate in Normal mode too and of course it can't because the amplifier valve is turned off. **So the physical fact that there is both a Normal and a Brilliant mode of operation in the Model A requires that the amplifier alone cannot be a separate dynamic and can never act independently on its own without crescendo!**

To back up that statement, **t**here must be also the same mechanical limitation in Brilliant mode, too, and there is. Brilliant mode then merely allows the escalation of pump pressure above nominal when the combination of **BOTH** the #6 intensity **plus crescendo** is on! Therefore whether the amplifier is on or not <u>**still doesn't change pump pressure to brilliant**</u>, unless one of the 4 higher intensity ***combinations*** are utilized as well. This means then that Brilliant applies only to the last 4 intensity combinations anyway and the "amplifier" <u>**merely enables that to happen**</u> for loudest playing of the accents. There is absolutely no such thing as "*the amplifier expression*" in the 'A' without crescendo. (*That is not true in the Model B which has 2 fixed levels*.)

While the 'A' pump's amplifier pneumatic alone wasn't intended to raise nominal 20" pump pressure, the musical intention is the breakover point at the #6 intensity and above—with crescendo—for both machines. The #6 intensity and above is used in both 'B' and 'A' rolls, the crescendo almost always employed for a smooth rise of pump pressure (if 'A' is on Brilliant). "*It was intended for touch-up*." So except for individual single intensity accents, crescendo alone signals a swell in the music (***The Ampico Reproducing Piano, Valerio Interview, pps 187-188***). For weak Model B's on A rolls, a device that holds the 'B' piano in 1st amplification mode will aide their weak accenting of 'A' rolls, but that is unnecessary for fully restored Model B's.

All that said, it is still confusing to some that if you have two separate crescendos, bass and treble, then why wouldn't you have separate crescendo-ing, bass and treble? The answer proves this entire chapter. The reason they don't do it and NEVER did it is because ***if they were to do it that way they would negate the purpose of their own modify switch and amplifier***! If the rolls were ever coded that way, then once you turned the player to Brilliant you would no longer have your distinctly separate crescendos. Woops! The amplifier integrates both bass and treble crescendos anyway, so at the end, all you have left which are still separate are the intensities.

Crescendo Excursions in Model B's Limited on 'A' Rolls

1T and 5T are the only crescendo holes in the Model B. It doesn't use 1B and 5B for musical expression as the 'A' does. Therefore, any lone crescendos occurring in the bass of an 'A' roll are ignored. But it was usually bass crescendo which operated vacuum compensation for the 'A' which the 'B' doesn't require. Another convention was to operate both at the same time while adding in compensation to the bass crescendo. That's no different than 1T, 5T alone to the 'B.'

When the 'B' plays a 'B' roll, 0B operates in conjunction with the fast 5T crescendo/decrescendo valve, too. When 0B operates alone, it actuates both the additional "trigger" pneumatic and the (5T) fast crescendo/decrescendo. That interposes a stop pin in the way of the decrescendo return if timed accordingly. We'll read about that later. As one might guess, there would be no reason to operate 0B except to platform the pump pressure (meaning to hold it steady) or to remove it again. So 0B operates a primary valve momentarily and very quickly for the trigger pneumatic (*vacuumed down normally but opens on its spring when operated*) to jump out by its spring and then clamp the crescendo rod with its vacuum closing again. 0B's output is both as pallet valve to the 5T fast crescendo and as a primary valve to the trigger (***pg. 6,7 of 1929 Service Manual***).

Fast crescendos (1T + 5T) were used to ramp the intensities while a series of slow crescendos sometimes provided the intensity "platform" from which the intensities would all be raised and maintained, since the old Ampico wasn't equipped with amplifier "positions." So by raising the overall power and then bumping it back and forth, a "pressure platform" was maintained for an occasional rise of overall intensities in the Model A. You can also see how an interplay between bass and treble crescendo might accomplish this pressure platform as well, but these early coding procedures later bit the dust as new standards were set. That first happened in 1922.

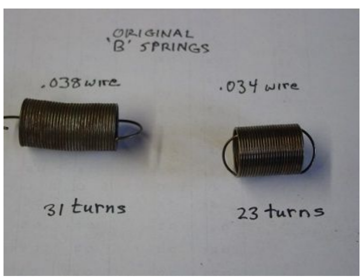
On the other hand, short slow bass crescendos alone were also used by the 'A' for pneumatic compensation while treble crescendo was used mainly for expression. When the 'B' plays the 'A' rolls it would react to treble crescendo compensation too, even though they are not needed musically for the 'B.'


First Amplifier position. Trigger holds crescendo at half-way position.


Second Amplifier position, full pump power. Vacuum on trig. here is 20."

Luckily in most cases the reason this early coding technique does not affect the performance is because they are still too minor to hear. But when they are noticed on paper by an untrained eye, unfamiliar with original crescendo procedure it might cause skepticism. That's not the criteria, however. Later on, minor pressure loss compensation for 'A' rolls was moved to the bass on 'A' roll recuts. They were maintained for equalization, according to a procedural compensatory coding requirement only, unrecognized by the 'B.'

I've mentioned the extra hole in the 'B' trackerbar called 0B, also called "0 amplifier," except it doesn't close the trigger pneumatic in the pump as most envision it. It allows it to open instead, while quickly bumping the 5T. When that happens, the opening of the trigger pneumatic interrupts a stop lug on the crescendo rod which prevents it from returning, as long as it's only momentary. So when the pin flies out into the path of the lug and then the trigger pneumatic recloses, it pinches and holds the crescendo rod. The trick is, it's momentary. The first lug on that rod is the half-crescendo or 1st amplifier position. At that point, the piano's pump pressure rises from 20-22" nominal to 32-35." (*And by the way, pressures do vary among different Ampico B's*). The next step (*called the second amplifier position*) is able to crescendo fully to 45." Bump 0B again and everything returns to normal, no platform, then trigger closes out of the way. See photos above.



Regarding Model B pump pressures, the company utilized at least 4 different sizes of spill springs in these instruments depending on the size piano they went into, and possibly the new owner's preferences as well. Here are two such examples. It doesn't take a lot of pump pressure difference though to make a big difference in dynamics. For example, the velocity of piano hammers determine the playing loudness in db (spl), the increase in inches of vacuum *being proportional to the square of hammer velocity*, db loudness itself being a log function (*a power of ten that gives…*). Dr. Hickman was instrumental in measuring these pianos very precisely. His insight was strictly technical and not musical, however.

Regarding the 0B hole, one very often encountered problem with old Ampico rolls is that both feathered and torn edges of the paper, still capable of tracking but will definitely actuate the 0B amplifier valve in the Model B. Those will put your piano into either a continual 1st amplifier position, or conversely, turn it on and off indiscriminately, depending on feathered edge coincidence between treble crescendos and false trigger actuations, so it's no wonder that some people think Model B's can't play 'A' rolls well—in addition to additional weaknesses created by "selective rebuilding syndrome." I don't blame an unfamiliar rebuilder who simply isn't aware of other possible age problems. Just eyeballing stuff and passing on it however isn't good practice for 90 year old instruments. If you test everything first you'd see, but there's a lot you can't bench test. Just assume it's all gone or won't last much longer anyway, and <u>replace all sealing, soft materials</u>. That's called a "restoration." Anything less is called "selective repairs."

The Model B sometimes has stiff tracking fingers which easily feather the old, brittle paper all by themselves. So even when old rolls look perfectly fine right out of the box, sometimes certain tracking finger sets I have run into are easily able to feather brittle paper edges all by themselves, due to heavier flat spring material on some. I have previously offered a fix for that problem too, however. It should be mentioned here in the same section as the crescendo, since this is what most often disrupts the normal and expected excursions of crescendo. That said, I have also rebuilt Model B's whose tracking fingers had acceptable gentle pressure. They varied.

It was not the oversight or incompetence of the musicians or engineers at the Ampico factory that causes poor performance on some of our old rolls today, but the vagaries of time and aging alone, some of which affect other player components which were not fully restored, and some of which can be brittle roll paper, and more often a combination of both at the same time.

At this point it might be good to mention that when a modern Ampico A roll recut with new paper is played on the Model B, you should get the original coding safely. **There is nothing (*except torn roll paper edges*) preventing the crescendo in the 'B' from going its full distance because the trigger pneumatic is normally closed out of the way by stack vacuum and will stay in that position during the entire 'A' roll.** So the mistaken belief that somehow the crescendo system in the Model B is compromised on 'A' rolls by the trigger system and needs some help through the Amplifier because it cannot accent well enough to be acceptable is totally wrong. (***See my short article, Why the Ampico Model B May not Play A Rolls Well***).

It should also be remembered that on 'A' rolls you have crescendo in both bass and treble while on the 'B' there is only one crescendo and that's taken care of by 1T and 5T in the treble. That's why it's possible to halve the crescendo times in the 'B' and still have about the same overall expression dynamic, once a coding standard friendly to both systems is established, since either system crescendos both bass and treble through the pump, common to both sides, anyway.

The purpose of coding standardization was not to make all earlier rolls 'B' rolls, but merely to make the later recuts of 'A' rolls in a few details more compatible with 'B' and equally authentic on either one, but without changing the dynamics of the original performance. And summarily, it was primarily to give them all an equivalent dynamic syllabus with each other.

Let's not forget that music critics the world over had their sights set on the Ampico and its revolutionary new piano. Ampico would not get away with an inability to play their own roll library authentically from their new Ampico. That means, at least as well as the Model A did it, and preferably even better. Can we imagine for a moment the consternation of a dealer whose customer wishes to trade up to the new Ampico? He plays a roll the customer is familiar with and is told, "***I think my old one plays it better. Notice all the lack of accents in these crucial places?***" And then you have the problem of the dealer selling both models at the same time: "***Now here folks is the new Ampico. It has a completely new expression system and critics all agree, superior. Would you like to hear it play now and compare it to the older model right there?***" OOPS! Seems like our old one is playing it noticeably better than our new one is. Darn.

So to insist that there was always something wrong with the Model B two generations later is to tacitly admit to having problems with those so-called "rebuilt" Model B's. It's just an impossibility, financially speaking. Dealers would have all gone broke overnight! These are NOT design problems. ***These are age problems of both the pianos and the rolls, well-known to myself in detail, certainly not the basic design. That could simply never be allowed to happen when they were first introduced to such a critical market and in the depth of the depression.*** Their only customers and fans were professionals, wealthy and discerning, well-educated clientele that you are not going to fool on quality performance for a second! Who today would think otherwise, when in those days a small Aeolian reproducing grand alone cost the same as a three-bedroom house with a basement for cash, in the Midwest, while the Ampico Model B cost at least half again more than that one did, if not twice as much? Who's kidding whom?

It should also be understood however that a few of those early original first cuts could still have been recut modernly and yet sitting on collector's shelves today, so it's entirely possible that a few of them have noticeable coding incongruities musically that are incompatible with the 'B' system. This is particularly true with a few Welte transcriptions poorly recoded for Ampico by Milton Suskind. Luckily they are quite rare.

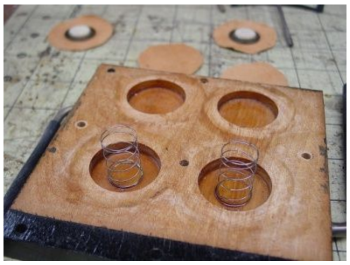
As I also understand, Suskind was eventually fired as a result of his big-shot attitude and for standing up Rachmaninoff, who had an appointment at 9 AM, but Suskind seemed to think that he was indispensible anyway, so it all kinda fits together. It makes sense since Valerio felt he obviously ignored the roll-coding standards developed by DelCamp (***The Ampico Reproducing Piano, pg. 199***). Ironically, it was also DelCamp who fired him on the spot that same moment he came in an hour and a half late. The Rachmaninoff appointment thing was clearly the last straw. Valerio obviously didn't appreciate the Suskind pomposity (*also known as Cookie Fairchild*).

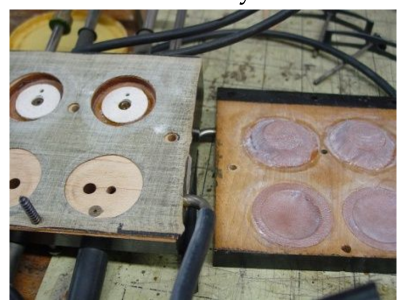
V: "That was it, yes. You see he did that for years. He felt he was so important that he could come in any time he wanted. I don't know how they put up with it that long but they did."

Rebuilding Notes for the Expression System

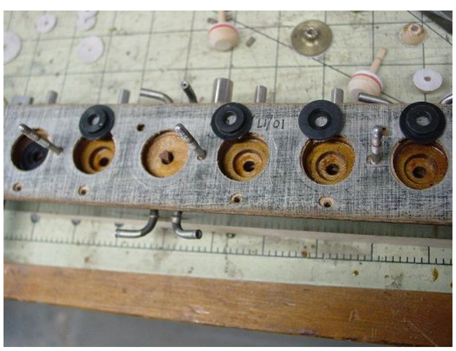
The expression curtains must be replaced, ideally with poly-coated nylon, since some rubber-coated pneumatic cloth today is even stiffer (and thicker) than the original. However, limp and smooth rubber cloth will still work. I prefer nylon though because of its longevity and low mass.

The biggest problem I find with replaced curtains is that they are too tight. It's also possible to get them too loose and floppy, but here's a picture which should give you the general idea. If you will take a piece of Plexiglas, scribe on it the exact position of the grid holes in relation to the curtain and then drill a 5/32" hole and insert a brass nipple to suction out the space between, you will see whether or not the curtain covers the row of grid holes you have outlined on the Plexiglas. One way to ascertain this is by pressing the new curtain down lightly onto its chamber floor with a few fingers. You can also overdo that and get them too sloppy, too, so be careful. Make sure when tested with the Plexiglas that the curtain will cover the ends of the grid hole area.





The spring-loaded expression pouches all must be replaced with new leather, as the old leather doesn't have much time left in it. Only when you take these pouches off their board will you notice how tired and half-rotten that leather has become, but not nearly as bad as it's about to get with a third generation of hard use. It simply won't last that long. The easiest way to do it is to make a shallow cup-like tool that accommodates the disk in the top and is the same depth as its rise, then the open end is designed to press the pouch ring into the glue. A vacuum tube holds your pouch and disk assembly in the cup after it has been placed on the spring. Hide glue is put around the pouch hole and it's pressed into it and held momentarily, then the glued leather ring is smoothed out evenly and a section of plastic pipe used to press it down solidly before the hide glue starts to set. These are pictures of the spring-loaded pouches, only on the First Intensity Adjuster spring pouches.



In the expression valves under the stack bakelite valve seats are used, and not just here but throughout the system. The picture you are looking at is a recent Ampico B that had been "totally restored" for a customer by a well-known, respected rebuilder in the trade. Do NOT repeat his mistake. It's very important to remove all of these and reglue them in using plastic glue—NOT hide glue or shellac.

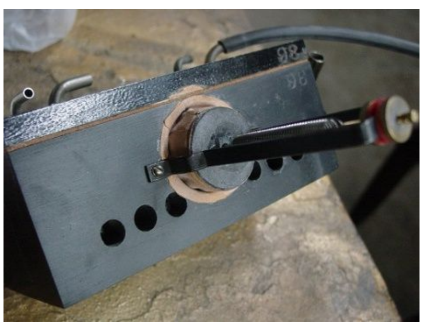
It may seem as though they are just fine, "tight as a drum," but they aren't. That's why very few rebuilders do it, and it's one more reason the Model B gets a bad rap. "***They were perfect so I let them go***." They aren't. They never are. And you will also find this black bakelite throughout all the valves in the system. ***Black bakelite breaks loose, unlike the fibrous phenolic seats of the Model A***. Do not omit ANY of these because it only takes a few in certain select places to put your Ampico B system 'dead in the water.' Even tight ones start seeping around their joints, or even literally falling out. These pictured above had to all be somewhat pressed out, but none were airtight any longer, and a few of these were still loose in their holes and ready to drop.

Don't trust anything that's black bakelite, shellacked into a wooden hole. They're tight, the first week that you pop it open, and then loose for the next 100 years. Every one of the photos in this article come from a "*formerly fully restored*" Ampico B, finished only weeks prior to my receiving it. It never played well after its original rebuild and I had to do EVERYTHING all over again, without exception. This was just a "PRETEND RESTORATION."

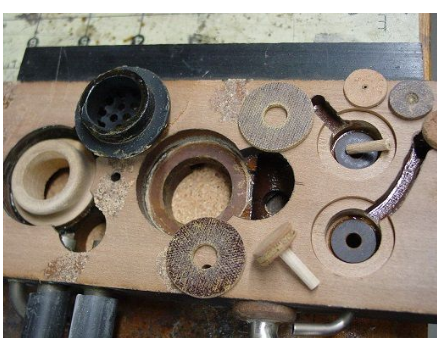
Now to his credit, all the parts including the note valves were nicely refinished, screws all buffed up, and had a shiny new coat of shellac. On the outside it looked great. But there hadn't been even one new playing pouch replaced in the entire player, much less anything else of real importance. But let's be honest—that does take a lot more time and work, and as I've been told, "***after all, these are all just old players***." Hmmm. Except, that's why we restore them so they'll play like they did when they were new players. But we can't leave even one thing out.

The Ampico Model B Pedal System

The Model B pedal system is the most powerful and quick-acting system in any reproducer that was ever built. Now that said, we should remember that the pedal response of all reproducers is taken into full consideration within the coding on its rolls, but that still required special compensation or extended note perforations no longer needed once Ampico B rolls went into production. And when the Model A plays the late Model B rolls, its sustain pedal is a little late in some cases and we have musically blurred phrases. So it was never an Ampico Co. criteria that the Model A must play 'B' rolls well, and it didn't.



The pedal system uses its own separate regulator, apart from pump pressure which assures a very consistent performance, independent of pump amplification. In addition, the pedal regulator also keeps the crescendo bellows in the pump primed with its regulated vacuum through a #70 fixed series bleed into the crescendo output line, and another 7/32" tube goes to the drawer for regulated pressure for reroll and tracking. Replace both the regulator curtain and the sleeve pneumatic, shown here, and always seal all your pouch leather with thinned silicone grease and coat with talcum powder when dry. While internal pouch leather outlasts external pouch leather, it all needs a total replacement. One tip to replace the sleeve pneumatic is to make (or buy) a template (***from Player-Care.com***) to cut them out accurately. It makes it much easier.

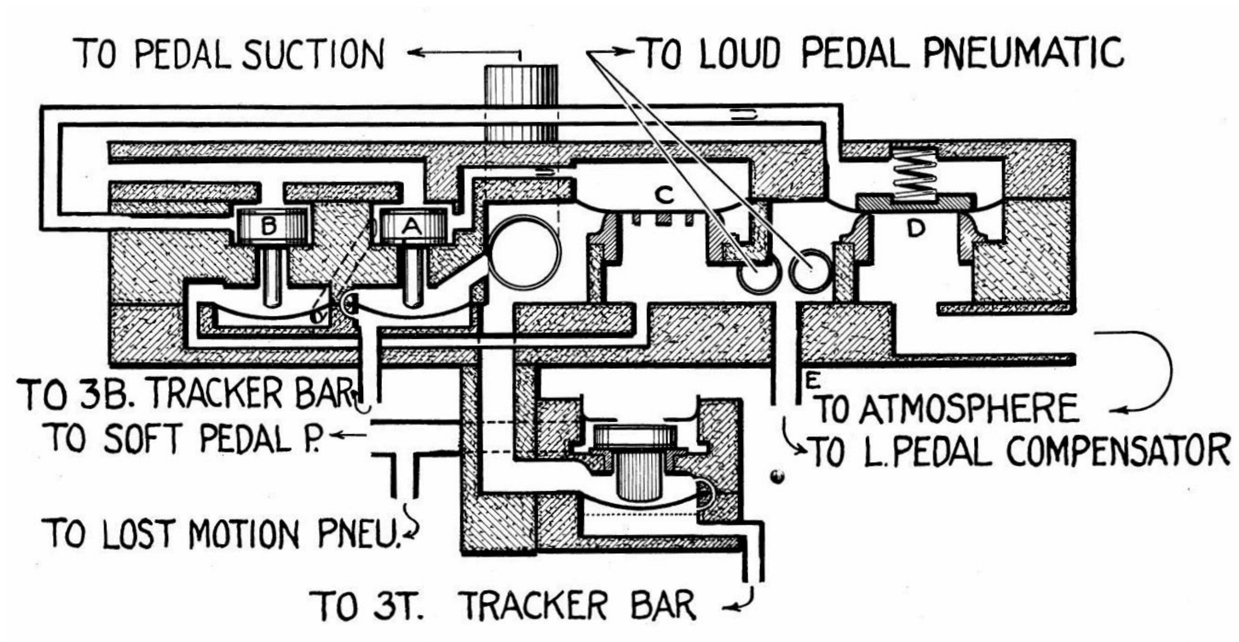


Left to right; pedal dump hole, pedal actuate hole, and a pair of secondary valves which toggle to operate them.

The pedal valve system for the Model B is unique among all the reproducers of the day, in that it used two small inside valves (*inverting valves, or secondary valves*) which toggled. As soon as the pump started up the "pedal off" valve actuates and stays on until the sustain pedal is called for. That operates the "pedal on" valve which turns off the "pedal off" valve. These valves in turn operate their own large dump pouches which also toggle along with their respective secondary valve. Note: The recessed valve seats to the right are fiber and usually do not need to be removed and reglued, although you should check them to be sure.

This pedal valve system is truly high quality and a design for the ages. Here you can see some new pouches to be installed, the large supply and dump pouches are already in place now, the dump valve being spring loaded, and the bottom board is being readied to restore, while the two valves and bakelite pedal supply grid have all been replaced on the other side of the gasketed section, shown top right. The soft pedal valve is not shown but is just a single block valve and mounts below this bottom board carrying the two secondary valve's pouches.

One special note is to make sure secondary valves A&B have sufficient valve travel. I have run into marginally adjusted (original) pedal valve assemblies whose A&B valves barely had visible movement at all. While this might still work, it is not correct. Don't always duplicate what you find. You have to know what's correct and always rebuild to that, not to something which was done wrong, if even straight from the factory as these were.



LOUD AND SOFT PEDAL VALVES—*Fig.* 14

Note Valve Restoration

Fully restoring the note valves has always been a big secret to assuring Model B performance, but this may not often be done and it is becoming a rare thing today because there are no more ball bleed valve replacements to be had presently, anyway. Even if the rebuilder doesn't have a new set somewhere, he might still have a set of good original ball bleeds. There's still a way to test.

I explained the principle of the ball bleed earlier in this article and now I will explain why so many of the old ball bleeds no longer work as well today, but how to test them. So in case the rebuilder has kept his old ones he can still find some that work well to replace others which don't.

The ball bleed is the key to the valve's sensitivity and speed. Normally, the two characteristics are the inverse of the other and bleed hole area is directly proportional to valve return speed while inversely proportional to valve actuation. When the steel ball is at rest the valve is at rest as well. Air from the trackerbar inflates the pouch quickly because of the tiny #70 fixed bleed it has to overcome, but while that first impulse of atmosphere pops the pouch up quickly and actuates the valve almost instantly, it also pops up the ball off its own bleed seat, which usually measures about a #63 drill size. This added to the #70 creates an oversized bleed and the ball stays aloft over this hole until the pressure is removed, at which time it drops back to seal its hole again.

In the same moment the poppet is returned quickly by stack vacuum since it no longer has to compete with a partly inflated pouch, still deflating through the tiny fixed bleed. The ball drop is relative to the pressure difference in the valve chamber. This variable bleed system works on impulse speed. The ball may seat before the pouch is fully relaxed but it doesn't matter since the pouch is out of the way of the valve stem by then. The poppet's initial impulse returning to its seat is the important moment. The ball's return speed is, to a degree, relative to the poppet return speed through the pressure differential created, it makes for a very fast valve return.

The reason old ball bleed valves quite often require replacement is because of the internal pitting of the brass seat. This causes the ball to leak and unable to seal its hole effectively. The pitting is caused by acid erosion, possibly sulfur and soot particles from coal-burning furnaces in the early 20th century with the moisture in the air, begins the dissimilar metal reaction in the seat. Two generations or more can cause considerable corrosion, and the only variables are the exposure to humidity and hours the instrument had been played in those conditions. This can be seen when testing ball bleeds not used much at each end of the note scale, versus the ones which have been used the most in the center of the scale. One can certainly see the blackening residue at the tops of the original ball bleeds and suspect that this oxidation will be worse in the ones more air was pulled through them. It lays in where it can chemically react between two dissimilar metals. This is not just guesswork. Bill Konigsberg who had access to a laboratory has parted ball bleeds and examined them under a microscope. This was his finding. You cannot "clean off" brass erosion. He contributed to my article on the subject in a ***1984 issue of the Amica Bulletin entitled "Now You Can Lose Those Ball Bleed Blues."***

That said, the rebuilder can test them for tightness by inserting each one into a 5/32" rubber tube and sucking down by mouth, for cartridge tightness. Or, (the fancy way) use a bubble jar and a pump vacuum source. The important thing is that each must be tested. Merely checking 5 or 10 out of the lot tells you absolutely nothing! They can also be cleaned in a solvent bath and then heated to reduce the residue to fine ash, I suppose, but internally pitted ball bleed valves will conceivably only be made even less tight that way.

Now in case you have a supply of new ball bleeds yet to install, I recommend first dumping them out on a screen wire and taking a torch to them. That will get rid of a thin ball bearing coating that all bearings come with. It is this coating in turn that causes a few new ball bleeds to intermittently stick after awhile. When a ball bleed sticks down, its poppet valve often tends to "float" and the note plays down all the time. When it is sticking to the side of the tube, the note is seen to either repeat audibly or wiggle visibly (*but not play down*) at the keyboard. That will sometimes only happen momentarily and then it's gone again. So these are performance aberrations that can be possibly prevented with the "torch trick."

My own Model B was restored in 1981 and '82. I bought all the parts and hardware from a collector to install into a Chickering Grand I owned, with the exception of the large wooden portion of the stack, which I had to build from maple, myself. I did however get the dimensions from someone, somewhere, so it is an exact copy to my recollection, and fits the original iron end pieces which I had. It had new ball bleeds, built by Bob Streicher. In 35 years of operation, I have had probably 5 momentary malfunctions and those were all on the earliest ball bleed design. He later improved them, and I'm also told that he took my advice and torched his new ball bleeds and also advised a few customers to do it with their own new ball bleeds. *That's just hearsay, however.* I can stand only by the things that I've personally proven, but the torch trick definitely works.

The following information is in added detail, considering that many who would like to rebuild this player correctly and all the way through (*for a change*) may have never done it before. Hey, don't feel like the Lone Ranger! Most "professional" rebuilders are actually in the same boat—or should that be, "on the same horse?" Oh wait… I don't really mean it that way, either.

Splitting the Valve Blocks Apart

Tearing down the note valve blocks involve parting them at their glue joint between the pouch board and the poppet valve chamber. There is another glue joint between the cloth filter screen and the pouch board on the bottom. Do not split it there. The first step is to remove the outside valve seat and poppet, then the cork gasket, and sand all 3 sides plus the top clean, using a belt sander with an 80 grit belt.

Next, the block is gently parted with a solid backed, sharp bladed knife having a sharp 90 degree corner edge, by finding a visible joint line the knife can start into and then gently tapping the knife with a small hammer while gradually laying the blade into the crack you are making. Most valve blocks come apart this way very easily. And if you need to repair a few later, just use some Bondo Body Filler and sand it flat first. It glues perfectly and permanently. However, you won't have very many to fix after you get the hang of splitting the blocks apart. There's no need to keep these parts "in order" on your bench. They are all the same and if they aren't, that's your fault. So be very gentle with your touch on a belt sander and visibly check each side several times that you aren't angling it out of square. That happens in an instant and it can't be corrected.

The first thing to do is to remove all the black bakelite inside valve seats that will come out and reglue. For the ones that won't, be sure to seal around their perimeters with the same PVC-e (plastic) glue. This is absolutely necessary and do not miss any of them. Next is to remove the ball bleeds by simply pushing them out of their holes from the bleed end.

The pouches have to come off and new pouches installed, so remove the lifter disks, as these are reusable, and use a knife to scrape, then sand off the residue and repair any pouch board that has even the smallest tear at the spot where the ball bleed hole seals down. That has to be perfect.

Re-leathering

Naturally, both sides of the poppet disk leather is replaced. It's very important to buy beautifully smooth suede that's soft, and today, one excellent leather for that can be sometimes heavy cabretta (goat) or garment calf leather. Hot hide glue is always used and cleaning off the valve disk well before gluing on the new leather is important. There is a brad connecting the inside leather to its fluted valve stem. Centering the brad is simple. Drill a very shallow flat-bottom hole the same OD as your new disks, into a board. Make a "jig." Where the center of the spot-face is, drill that out deeper, with a very small drill, and then drop your leather disks one at a time onto that recess, feel out the center hole through the leather disk with a small awl, *mine is made from a tiny screwdriver remnant*, and stab through the leather. Another way is to place an original leather you've removed over your new disk, both centered in your jig spot-face, and use it as a guide to stab your new hole. That's the idea (*at least*) to get them perfect.

Never start punching pouches from a skin until you have taped it up to a lighted window and marked all the pin holes. The thinnest leather and the best leather also has the most pinholes! Also use a precision vernier caliper to "mike" pouch leather thickness and reject any areas measuring over .010 inches thick. And if your leather measures .015 in places, DO NOT USE IT! Don't waste your time with thick pouch leather or mediocre leather of any kind. Stress to your supplier the necessity of getting the very thinnest leather he sells, and that if what you buy is too thick you will return it. Make it clear to them. That's being fair and honest.

To measure pouch leather thickness, fold, put the fold in the recess at the back of the jaw and halve your reading. You will need a 1-3/8" dia. punch. A couple of solid concrete blocks standing end for end, supporting a maple end-grain punch block is perfect for the job. Use hot-hide glue to make it. When it gets rough, put it on your belt sander and smooth it off again.

To dip all the pouches equally, make a dipping tool. Phenolic washers like the kind sold by OSI (Organ Supply Industries) make the best ones, by far. For Ampico I use a larger 1-1/2" Fiber washer mounted on a wood dowel section about 2" long. A couple of thin fiber washers glue to that one in the center to dip the pouches evenly. The thickness of the pair of 1/2" washers is about .1" or so. Test it to see if it works. Glue down all pouches with hot hide glue and keep the tool clean and dry. A shallow lid of talcum powder for the pouch dipping tool helps, here.

Once the pouches are planted, punch out a 3/8" thin leather punching to mount the lifter disk on. This is important as you will find out in a minute. If the lifter spreads the glue on a few pouches under it, it will stiffen the pouch and with our modern leather we can't afford that to happen. Keep the dot of glue small so it won't spread. Also, with a thin punching premounted first, we are able to SEAL only the moveable part of the pouch with thinned silicone grease (*thin with lacquer thinner/xylol combination or just xylol*) and then talcum when dry before adding the fiber lifter. But test the pouch tightness before you talc them. Too much sealant (of any kind) makes leather less supple. Too little sealant leaves them too leaky. ***Never use natural oils or petroleum grease***. These all create a vapor pressure in a vacuum environment and partially vaporize away. That vapor in turn causes the metal parts (read, ball bleeds) to get coated with residue. It also causes lots of brass corrosion within the player system and draws bugs. Silicone, on the other hand, has zero vapor pressure and in addition, never gets drawn into wood fibers by surface attraction. It is perfectly stable, and used exclusively in labs, food processing, as well as even outer space and doesn't contaminate. *Captain Kirk gives it two thumbs up, I am told. That was good enough for me*. But there's another even better reason to use it on valve pouches.

Silicone grease as a sealant is a natural preservative for leather, as opposed to rubber cement sealant. Rubber cement is slowly attacked by certain bacteria because it comes from gum rubber which are polymers of isoprene, a natural substance. But it is also slowly oxidized. When that happens with age it gets brittle. To then add yet another coat of that on top of an old pouch already coated and imagine that you're going to play it again at sub-pressure Model B levels, a requirement no other reproducer could ever meet, is simply impossible. It will no longer do it. That said, there is a balance between a perfectly airtight pouch, versus a well-sealed and yet very flexible pouch. I have tested hundreds of pouches over many years' time, but never just on a bubble jar alone. That's called "a waste of time."

The ideal pouch is bench tested, operating a valve playing a weighted pneumatic at sub-intensities using an overly long trackerbar tube in rapid repeatability tests. The best valves will NEVER HAVE the most 'airtight' leather pouches. It will always be with a pouch that's an ideal combination of tight, flexible, proper dip, and stem clearance, and that's the only test that counts. I have purposely over-sealed those pouches too, to see what they will do and they are **never as good**. 'Tightest' is NOT the primary factor. We repeat the same principle by asking why heavier pouch leather will also not work in the Model B. Heavier pouch leather is much tighter, but then it's a little less supple and responsive than thinner leather at the same time. That's hard to tell just by feeling it. So if "tight" is what you prefer, start with heavy pouch leather and seal that. After all, it "feels" almost as flexible, right? And you won't have to use nearly as much sealant. Now test it. You will prove how ridiculous this idea would be.

Every sealant stiffens pouch leather, but a stable, inert silicone grease seals with less "structure." ***It will not evaporate, nor soak in, or thin itself out throughout the leather fibers by migration like all other greases do***. As with anything however, the closer to airtight you make it, the more mass and resistance you also add so the less responsive you are making it at the same time. It's a trade-off. For other instruments which don't have the extreme requirements of reproducers and particularly the Model B, you may get away with over-sealing pouches and recoating old ones. It's only when you take the time to build jigs and test equipment, and test them by the hundreds, that you learn what really works the best, and it becomes indisputable. Year ago I built a tester that toggled a sliding pallet back and forth, switching the valve under test on and off through as long a piece of trackerbar tubing as I chose, at as low a supply vacuum as desired. Its toggle speed was adjustable, and it tested 'B' valve response at any pressure level with a weighted pneumatic "load," also adjustable.

Reassembly of the Block valves

Gluing the two halves of the block valve back together again can be a problem if it isn't done exactly right, because of the airtight connection the ball bleed connect hole on the pouch board has to make with its matching hole in the valve chamber top section. At this point it is difficult to specify proper glue viscosity because I do it by eye and experience. So I'll explain it this way: The glued pouch also tends to support the valve chamber half of the valve block, preventing a perfect wood-to wood seal around the perimeter. That's normal and it will still work but you can know if you got it tight or not as you go along. Here is how you do it.

Buy a box of heavy rubber bands. Make a fresh batch of hot hide glue and make it twice as heavy as you'd want it for simple gluing of valve leathers and pouches. Now just start with a couple of test blocks first and don't do the entire set until you're sure of it, yourself.

First, reinsert your tested and checked ball bleeds. Then spread a coat of glue around the perimeter of the valve chamber block. Next, spread a coat of glue around the perimeter of the pouch block, making sure the ball bleed connect hole also has adequate glue around it too but not overly heavy or the glue could squeeze into that hole and close it off.

Press the two halves together on a flat solid surface which perfectly aligns the gasket side of the block and holding it tight there, wrap the rubber band around the block 3 times. Lay it aside to set up for perhaps 5-10 minutes, but not to set solid. Now put a piece of masking tape over the fixed bleed supply hole and the ball bleed's horizontal connection hole that goes through the face of the block (*eventually covered by the cork*), and then take a 5/32" test tube with a nipple into the pouch supply hole. First blow into its pouch well, then suck. Do that a number of times to get the feel of it. When you blow in, it should blow easier. When you then suck you will be able to tell if the ball bleed hole is tight to the pouch board or not. It will feel like the unbled pouches you tested earlier. If it doesn't, you can take the block apart while it's still tender and reglue it.

At that time you will be able to tell if your glue is the right consistency, if you're using too much or too little, or if the glue is squeezing into the ball bleed hole. But when you blow into the pouch supply, you are also cleaning out a possible clog before you test. The ball bleed hole is long enough to give a little excess glue some space to go. Test a few like this until you get the hang of it, and then do the rest of them. But test them all in the same time frame and the same way. You don't want even one of them to malfunction. Leave the rubber bands around all the blocks for 24 hours. Now remove the bands and touch up the glue joints as need be.

Finishing the Block Valves

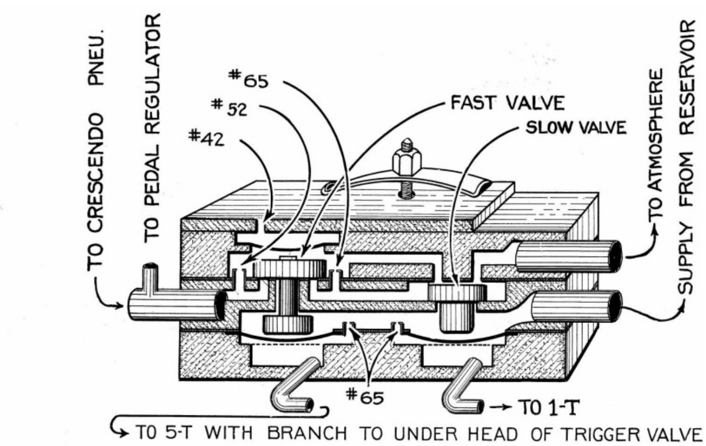
Once the blocks are reassembled, I personally coat the three sides with a heavy coat of Phenoseal, but you can also use shellac or both, for the correct color—Phenoseal first. Then glue on the cork gaskets with the same hot-hide glue that you used for the blocks. Just make sure not to get sealer on the face of the block you glue to cork onto. Also a good practice is to weight the block with the glued cork gasket side face down on a flat surface until they are fully set, especially if there's a slight curl to the cork. Don't take a chance that they will all be airtight, solid glue joints. The weight of the block itself is not sufficient to do this.

Next will be setting its poppet valves and re-gluing the outside valve seats. To set the restored valve travel, I frankly "blow the valve" by mouth and adjust for exhaust pressure. This is a "touch" and not fully explainable except to tell you this way—the mouth is the most sensitive little touchy-feely thing that you own. Once you get the gap right you don't forget the correct "back pressure" felt when blowing down through the outside seat with the poppet seated on its inside seat. You cannot tell the parallel-ness to its inside seat that way, so it takes an eyeball, too. If you have a trustworthy ORIGINAL valve to compare them to, haul it out first and blow through that one, feel the resistance, then through your rebuilt one. Back and forth, readjusting and straightening the outside seat until you're happy with it. This goes pretty fast, after awhile. You just have to learn to trust it, after checking back and forth. You can also build a simple valve tester with a pneumatic load yourself and see if you like it—if you still can't be sure. Use plastic glue around the outside seat after its adjusted. Just seal around it with a thin glue bead and then very lightly in each of the slots. Don't put glue inside the hole before you press it in or you'll be sorry. You want to be able to open a few of them back up to reset or fix again.

Finally, coat the tops of all the finished valve blocks with shellac or Phenoseal. Use a thin coating of hot hide glue on the pouch supply elbow and reinsert pointing down, and you're finished. Hot hide won't permanently glue brass to its wood hole but it strengthens the hole and won't fill the elbow with glue as long as you don't put the glue into its supply hole, first! It then allows you to later aim the elbow in the direction your tubing is coming from and usually stays firm. If a few seem a little too lose yet, repeat the procedure on those, in place.

When mounting the new valves on the stack, along with the restored spill valves, soft pedal compensation supply blocks, and blanks, be sure they are all regasketed with new cork gaskets as well. Because of the Model B's new design spring clamps, the blocks will never get loose, as they did under the old Model A spring clamps. That is not the rebuilder's fault but the company's fault. The old clamps weren't springs, at all. They were, in effect, just solid iron with no spring action. The cork compressed under the pressure of the clamp and the blocks loosened. To prevent that from happening on a Model A, grease the cork gaskets first, using plenty of silicone grease and then install them. Works forever after, that way. But you don't need to do this on the Model B.

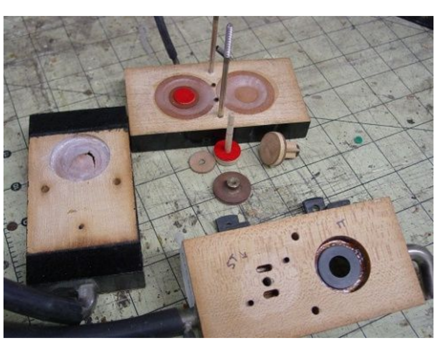
The Crescendo Valves



CRESCENDO VALVE BLOCK—*Fig. 11*

While there is nothing major about the crescendo valves, it should be noted that the 5T fast crescendo valve is a secondary type valve, except closed (just like a pallet valve) when off and a vacuum output when on. But it's output is supplemented when off with a #70 bled supply from the pedal regulator. This tends to keep the crescendo bellows somewhat ready at all times.

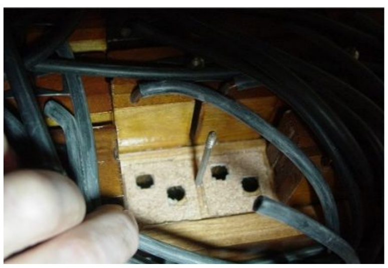
Now you are asking perhaps, that if the crescendo bellows are perfectly airtight themselves, then why wouldn't a vacuum, even from a #70 bleed, still pull them in slowly? And the answer is because that #70 bleed has to compete with the #52 bleed in the crescendo valve block. The "T" output shown in the drawing supplies the crescendo bellows with atmosphere from the crescendo block plus a little percentage of vacuum from the pedal regulator box.



As you can also see here, when only the slow crescendo (1T) is on alone, vacuum is supplied through the #65 bleed, over the top of the closed fast crescendo valve, down through the #52 bleed, and out to the crescendo bellows. Therefore, slow crescendo is through a #65 bleed. The area difference between these two bleed holes is about 1.9 to 1, meaning that when the pump is putting out 22" nominal, the crescendo bellows has about 11.5" vacuum. That isn't enough to notice but it keeps tension at all times and the bellows at the ready so there is no delay. The torn pouch in the photo is the fast crescendo poppet return pouch and the two pass-through bleeds can be seen on either side of its poppet seat. The actual valve disk here is the brass one. That's different than the original illustration but does the same thing as a wooden one.

Summary

While this is not intended to be an exhaustive rebuilding manual for the Model B, it does explain the basic principles on which it is designed and why it differs so much from the Model A Ampico. There are so many misconceptions today about these players that it was worth it to me, in the interest of helping those who really intend to do a thorough and very professional job. There's no joy in rebuilding something for the most part, and in the interest of saving time, put it all back together again and then be partly disappointed in what you have. Do it right, once, and you will never be disappointed.



The particular instrument used for these pictures was obviously a disappointment to its first rebuilder. He apparently wasn't even sure where his "huge leak happened to be," so here was his first solution—he glued all the block valves down to the stack, supposing that his leaks were all small and imperceptible and that's why he was only getting 15" H_2O vacuum, max. Then when he retested it and still could not bring the pressures up any more, he charged his customer anyway.

There are many extenuating circumstances for failure so I do not judge the individuals, but this happens all too many times. The only reason I mention all this here is to give the conscientious reader a contrasting and all too common example today to compare to. As you can see, rebuilding these instruments is a LOT of tireless work and testing, correcting natural mistakes, and continuing on to completion. Regardless how experienced you may become, you will still make errors. The difference is in those who accept it, and then go back and take care of them, versus those who can't see their way to make it right, so an excuse is their final recourse. Now granted, some simply don't know they did anything wrong. I fully accept that, too. So go by these basic principles and I think they will help clarify the mysteries of the Model B Ampico.

For those who are interested in improving the "touch" of the tracking fingers on the Ampico B, I have also written a short article which will show you the principle behind this highly successful method of doing it. It does, however, add a simple component to each tracking finger called a compass spring, which you can make from either spring brass wire or fine music wire. The Model B tracking fingers are generally too stiff to play old rolls safely. These make the system a breeze, once adjusted correctly, first. See, ***Improving the Ampico Model B Tracking System***.