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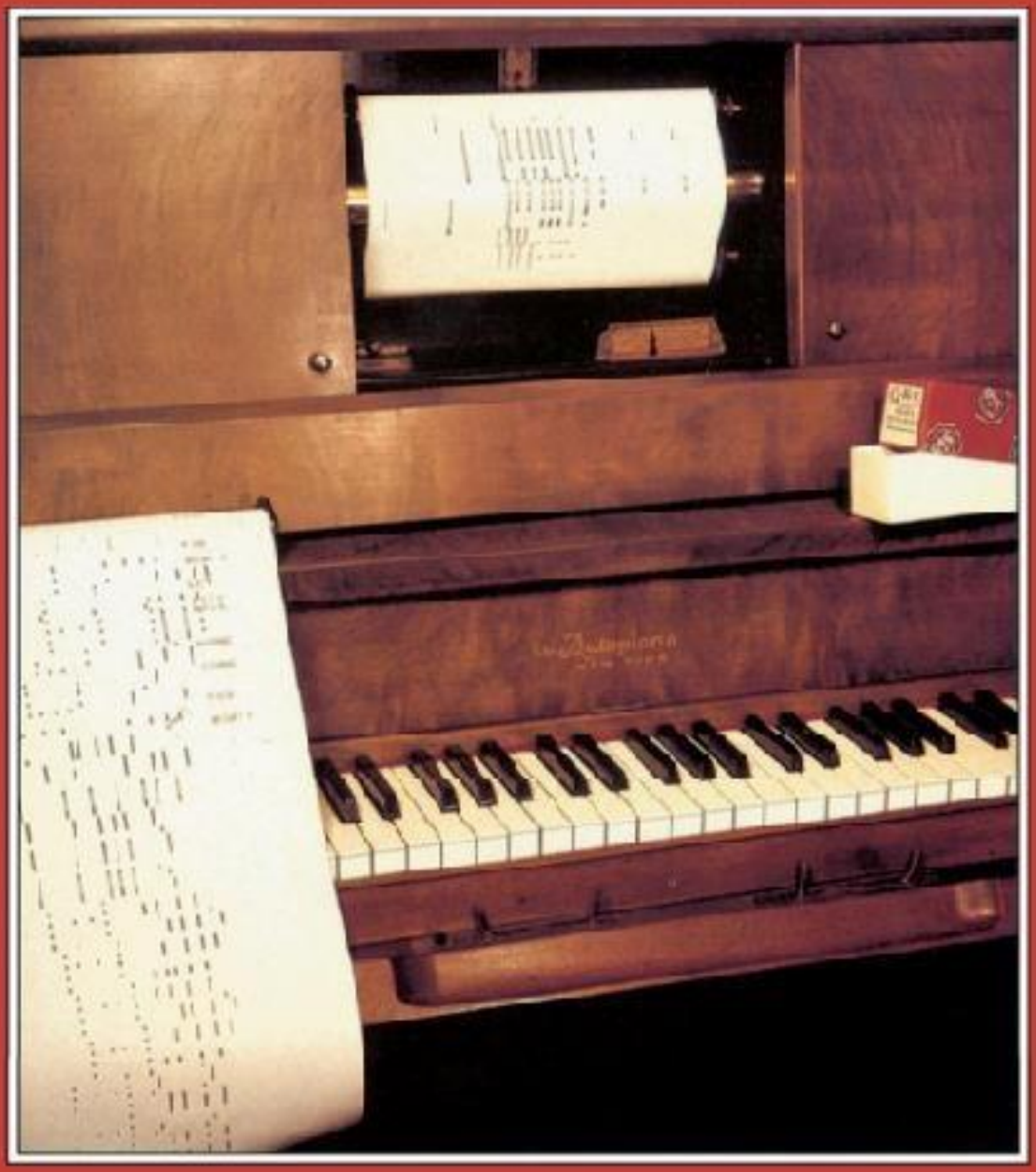
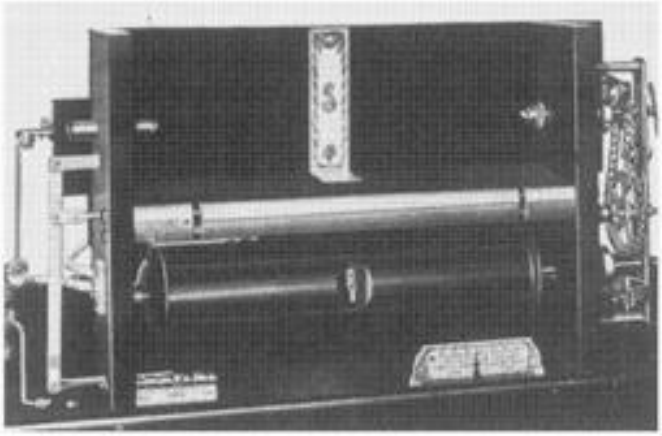
PLAYER PIANO

Servicing and Rebuilding



Arthur Reblitz



Illus. 2-13. Closeup of a Standard spoolbox with a transposing tracker bar. The lever in the lower left hand corner of the spoolbox latches into one of five slots, locking the bar into five different positions.

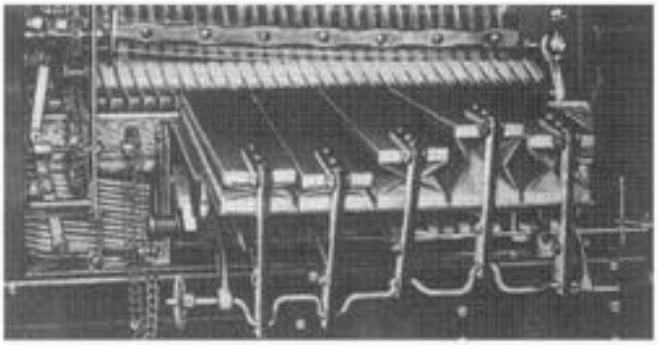
players, the brakes are turned on and off mechanically by the rewind/play lever, but in some instruments they are controlled by pneumatics.

88-Note vs. 65-Note Music Rolls

Prior to 1908, various types of piano rolls were made with various hole spacing across the width of the paper, with the 65-note format being the most common. At a conference of manufacturers held in Buffalo NY in 1908, common agreement was reached that everyone should produce rolls compatible with the full 88-note scale of the piano—and this standard has prevailed to the present day, all over the world. One very compelling reason for abandoning the 65-note scale was the recognition that the player piano could never be taken seriously for reproduction of classical compositions with such a limited capability; only with the full piano scale being used would the player piano be competitive in the world of serious music.

Both 65-note and 88-note rolls have a paper width of 11¼"; 65-note rolls have the 65 holes spread across the paper width at a spacing of 6 holes per inch, while 88-note rolls have all 88 holes in the same paper width, spaced at 9 holes per inch. 65-note rolls are also known as "pin end" rolls, because each flange has a small metal pin at its axis. The left pin is round, and the right pin is shaped to fit into a slotted drive socket in the spoolbox. The flanges of 88-note rolls have round sockets for the spoolbox roll support spindles. The left flange socket is round, and the right one is slotted. 65-note rolls are quite rare today, but they do pop up in an antique store or piano roll auction now and then. Prior to 1905, other non-standard rolls were also used on home player pianos, but these are extremely rare today. During the transitional era, a few players were made which accepted both types of rolls; these are known today as 65/88 note players. They are equipped with a tracker bar with two rows of holes and a switching device to turn one row on and the other off, (or more rarely, interchangeable tracker bars) and interchangeable roll drive spindles for the two types of spool ends.

Unless a 65-note player action is mentioned specifically in this book, all text is directed toward standardized 88-note players, although most information is also applicable to 65-note instruments with a little translation.



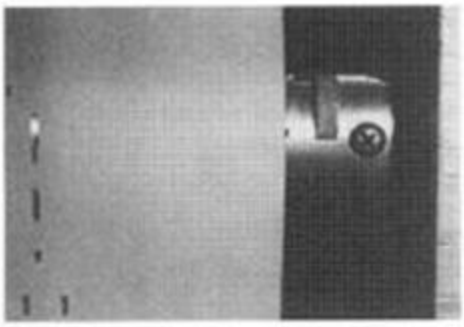
Illus. 2-14. A Standard wind motor tilted forward to provide room for tuning the piano, showing the pneumatics, connecting arms and crankshaft. By April 1917, Standard had produced over 120,000 of these wind motors!

THE WIND MOTOR

The *wind motor*, which turns the music roll, is an assembly of pneumatics and slide valves connected to a crankshaft. Each pneumatic turns the crankshaft part of one rotation, the crankshaft moves the slide valves, and the slide valves feed suction to the pneumatics in sequence, causing the crankshaft to turn. Most wind motors have either four, five or six pneumatics. In a five point (five pneumatic) wind motor, for example, each pneumatic turns the crankshaft a little more than one fifth of one rotation, with enough overlap between the pneumatics for perfectly smooth operation. Early pushup piano players have three point wind motors; these have a belt running to a cast iron flywheel which smooths out the steps between the three pneumatics. Four point wind motors work fairly smoothly without a flywheel, but the standard adopted by the late 'teens was the five or six point motor. Most six point wind motors are arranged with three pairs of double pneumatics, each pair of pneumatics sharing a double-acting slide valve; Gulbransen wind motors use two triple-acting rotary valves. All wind motors turn in one direction only; the direction of the music roll is reversed for rewind by the transmission.

THE TRACKING DEVICE

Every 88-note home player piano has some means of adjusting the alignment of the roll with the tracker bar, either manually or automatically.



Illus. 2-15. The simplest form of roll tracking adjustment, the manual tracking knob. In this piano, it serves the purpose of adjusting for rolls which are out of line, as well as shifting the bar several steps to the left or right for transposing.

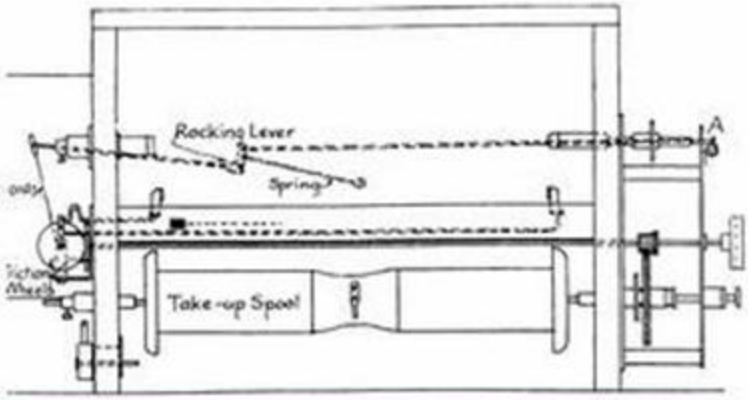
Manual Tracking Devices

The simplest form of tracking device is the manual *roll adjuster*. This is either a thumb wheel or lever which moves the tracker bar or music roll to the left or right. The thumb wheel shown in illus. 2-15 moves the tracker bar, the Kimball keyslip lever moves the *top* roll spool, and the early Aeolian push-up piano player spoolbox lever moves *both* spools. If a music roll is in perfect condition, with both edges trimmed straight, perfectly straight flanges, the holes punched correctly and the end tab centered at the beginning of the leader, the manual roll adjuster may be set once at the beginning, and the roll will play through in perfect alignment with the tracker bar from beginning to end.

Automatic Tracking Devices

Unfortunately, many rolls—both old and new—are less than perfect, requiring adjustment now and then while they play, so most player pianos contain an automatic tracking device (or *automatic tracker*) instead of a manual roll adjuster. Usually mounted directly on the left side of the spoolbox, or on the shelf to its left, the automatic tracker aligns the roll with the tracker bar by sensing continuously where the edges of the paper are, and by moving either the top spool or the tracker bar as necessary. Most automatic trackers move the top spool by means of a cam which adjusts the right hand roll spindle; very few move the tracker bar, by means of large pneumatics. The latter method was seldom used because it involves moving the whole bundle of tubing as well, making the tracking device sluggish.

Automatic trackers are either *mechanical* or *pneumatic*. All mechanical trackers sense the position of the roll with one or two sensing fingers; some pneumatic trackers use sensing fingers and others use sensing holes in the tracker bar.



Illus. 2-16. The "fishing pole" type of mechanical automatic tracking device of a Story & Clark player. This senses mistracking by feeling the paper edges with two fingers, and adjusts the music roll spindles to the left or right as necessary by means of the fish pole and friction wheels. Its adjustment is covered in the Gulbransen section on p. 125.

Mechanical Automatic Trackers

In a mechanical tracking device, the spring in the left hand music roll spindle constantly tries to push the roll to the right, pressing the right hand spindle shaft against the adjusting cam. As the cam moves up and down (or left and right, or whatever), the roll moves to the left or right. In most examples, (Simplex, Story and Clark, and Gulbransen), the cam is rotated by a "fishing pole" and string wound around a shaft. This shaft is turned by a friction wheel clutch which is propelled by the transmission. The sensing finger or fingers are mechanically linked to the clutch and cause the two friction wheels to engage or disengage. If the roll wanders to the *left*, the sensing finger(s) disengage the clutch, allowing the spring in the left hand music roll support spindle to push the roll to the *right*; if the roll wanders to the *right*, the sensing fingers engage the clutch, winding up the string, pulling the fishing pole down, and moving the roll to the *left*. The roll does not lurch abruptly to the left or right; rather, the clutch floats in the ideal position, making minor adjustments constantly.

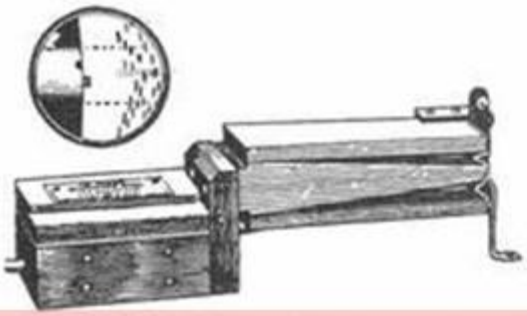
Another form of mechanical tracking device, used in some Fayette Cable players and possibly other brands, incorporates a gear train in place of the fishing pole. As in the fishing pole tracking device, sensing fingers manipulate a friction wheel clutch.

Many mechanical automatic tracking devices were made for player piano manufacturers by the Brand Player Accessories Co. of New York, N.Y.

An unusual mechanical automatic tracker is the one used in many modern WurliTzer player pianos. A sensing finger is connected to a microswitch, and a small reversible electric motor drives the roll adjusting mechanism. The motor pushes the roll to the right until the sensing finger trips the switch. This reverses the motor, pushing the roll to the left, until the finger trips the switch in the

other direction, reversing the motor again. The top spool constantly moves left and right, wearing the edges of music rolls faster than most other tracking devices.

Illus. 2-17. Another type of mechanical automatic tracker. In this version made by the Brand Player Accessories Co.and found in a Fayette Cable piano, the fish pole is replaced by a pulley and tracking cam. Numerous other varieties also exist.

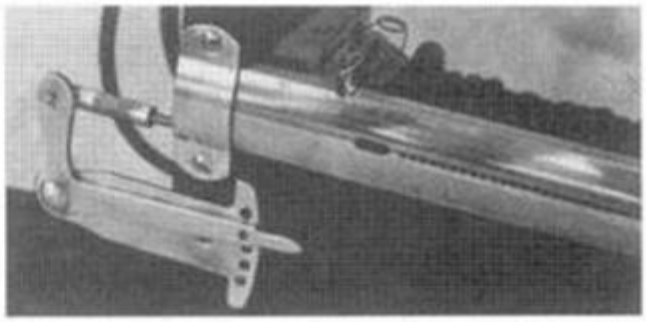


Illus. 2-18. The common Standard pneumatic tracking device, which takes care of paper alignment with four tracking holes which control a pair of pneumatics. Its sophisticated operation is described in detail on pp. 143–145.

Pneumatic Automatic Trackers

Pneumatic tracking devices have one or two pneumatics which push the roll to the left or right in response to sensing fingers or holes in the tracker bar.

The simplest form of pneumatic device was used in early Aeolian, some Hardman and some Price and Teeple players, with one hole or sensing finger on the left side of the tracker bar connected to a single pneumatic. During play, the pneumatic is connected to suction through a bleed. When the sensing hole or finger is completely closed, the pneumatic collapses slowly; when the hole or finger is completely open, the pneumatic opens because the sensing hole is larger than the suction supply bleed. During play, the pneumatic pushes the roll sideways until the edge of the paper nearly covers the sensing hole or almost closes the finger. At that point, atmosphere entering the pneumatic balances the suction supply, and the pneumatic floats in that position, holding the roll in alignment. To accomodate rolls of slightly different sizes, the sensing finger or the portion of the tracker bar containing the sensing hole is adjustable in relation to the note holes. This system works satisfactorily in play but tends to damage rolls during rewind (see below).



Illus. 2-19. This Fayette Cable transposing mechanism has a lever which shifts the entire tracker bar left or right; the tracker bar has an extra wide hole for the sustaining pedal, and the paper edge sensing fingers for the automatic tracking device remain stationary.

A much better type of sensing finger arrangement, used in most old Aeolian and Amphion players, has a double pneumatic connected to a constant source of suction, with each finger opening a tube connected to one of the pneumatics. When the edge of the paper pushes on one finger, air bleeds into that pneumatic, pushing the roll in the opposite direction. Usually there are constrictions (bleeds) between the pneumatics and suction supply, slowing the movement of the pneumatics to make the tracking device work smoothly. This type of tracker works well with rolls of one specific width. Wider rolls hold both finger valves open, and narrower rolls open neither one; both conditions render the tracker less sensitive, as the roll must wander over a wider range before correction can take place.

Somewhat more complex is the device used in players manufactured by Baldwin, using floating sensing fingers which are linked to little pallet valves with a balanced T lever. This device works regardless of paper width. (See the Baldwin information later in this book for further information).

Another slightly more elaborate system is found in some Jacob Doll and Pratt Read players, in which a double pneumatic responds to a pair of edge sensing holes, with one hole on each side of the roll. The sensing holes are drilled in little brass blocks which can be adjusted sideways in slots in the tracker bar to accomodate rolls of different widths. In some pianos, a manual control is provided for adjusting the sensing holes at the beginning of each roll; in others, a complicated mechanism automatically floats the holes in to the edges of the paper and then keeps the roll centered on the note holes while it plays.

The most common form of pneumatic automatic track-

ing device is found in Standard, Autopiano and modern Aeolian players. This device has two staggered sensing holes on each side of the roll, as shown in illus. 2-18, connected to a mechanism containing six pouches and four valves which control a large double pneumatic and tracking cam. When slightly wider rolls are played, the tracking device responds to the outer tracking holes, and when slightly narrower rolls are used, it ignores the outer pair of holes and responds to the inner ones. Details of its operation are included in the section on Standard player pianos in Ch. 6.

Combination Manual & Automatic Trackers

An automatic tracking device keeps the roll aligned properly as long as both edges of the roll are in good condition, or are worn equally. When one edge of a roll is torn and folded over, the automatic tracker doesn't know what to do, so it pushes the roll grossly out of alignment. Some rolls play better without an automatic tracker; others play better with one. An interesting tracking mechanism was used in early Balwin players. This gadget incorporates the usual Baldwin automatic tracking device plus a manual roll adjusting knob, with provision for turning the automatic mechanism off and locking the roll in a centered position. Details are included in the Baldwin section of this book.

Automatic Tracking Devices and Rewind

Note that most automatic tracking devices work *during play only*, and not during rewind. During play, when the roll is too far to the left, the tracker responds by pushing the upper spool a little to the right. Because the paper is unwinding slowly off the spool, the tracker moves the spool *and* the paper, correcting misalignment with the tracker bar. If the automatic tracker worked during rewind, however, it would tear the edges of the paper. For example, if fingers or edge holes sensed that the paper was too far to the left, the tracker would push the spool to the right, tearing the left edge of the paper on the upper left flange as it rewound rapidly. For this reason, all automatic tracking devices are disengaged during rewind. In a mechanical device, the friction wheel clutch is disengaged; in a pneumatic device, the suction is cut off. Simultaneously, the upper spool is locked into a centered position.

Unfortunately, some automatic trackers with one pneumatic and one edge sensing finger (early Aeolian, Price and Teeple, Hardman) shred music rolls during rewind if suction is disconnected. Instead, suction is connected all the time, and the tracker works backward during rewind, which also damages rolls. There is no simple remedy for this problem short of changing the tracking device to a more reliable style.

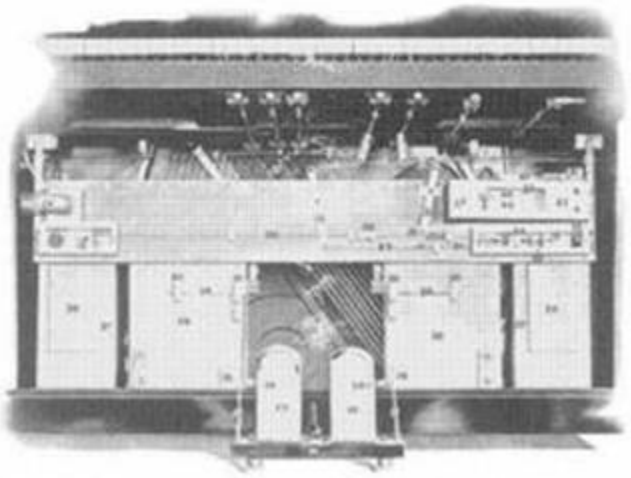
Transposing Tracker Bars

In players with a transposing tracker bar, the center section of the bar which contains the note-playing holes is mounted so it can be moved to the left or right in steps, allowing the music to be transposed to suit the vocal range of someone who wishes to sing along. This is done in a way which does not interfere with the automatic tracking device. If the device uses edge sensing fingers, the whole bar moves to the left and right for transposition, while the fingers remain stationary. If the tracker uses edge sensing holes in the tracker bar, the bar is cut into three segments as in illus. 2-13; the outer segments containing the sensing holes (and sometimes the sustaining pedal hole) remain stationary, and the center segment containing the note playing holes is adjustable. In rare examples, the edge sensing holes are mounted in separate brass blocks which fit in horizontal slots cut into the tracker bar; the whole bar moves from side to side around the stationary sensing holes.

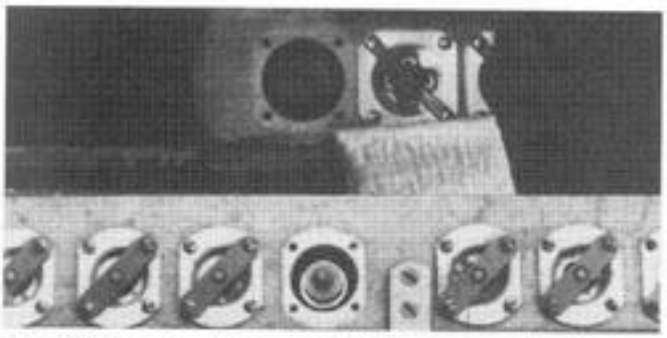
THE PUMP

The pump includes the two *pumping bellows* connected to the pumping pedals, and one or more *reservoirs* which serve to smooth the suction output between pumping strokes. The pumping bellows and reservoirs are usually all fastened to a common suction chamber called the *trunk*. Each pumping bellows has one or more external springs which hold it *closed* and hold the pumping pedal *up*. Each reservoir has one or more internal springs which hold it *open*.

The pumping bellows have internal and external *flap valves* which control the flow of air as the bellows are



Illus. 2-20. The complete pump of a Standard player action, including the two pumping bellows connected to the pedals, two large reservoirs, action cutoff and wind motor controls.



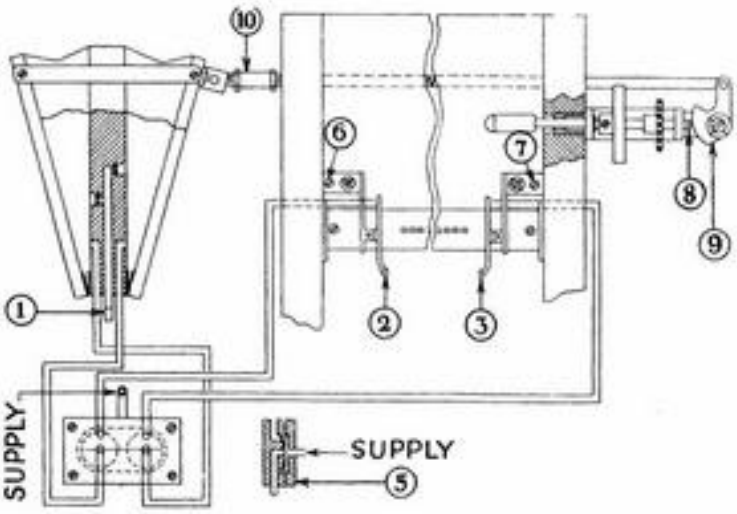
Illus. 6-2. Top: early Aeolian nickel plated brass cross valve plates, brass valve guides with fibre inserts, and valves with wire stems. Bottom: late Aeolian aluminum valve plates, fibre valve guides, and valves with wooden stems. *Photo by Robert Taylor.*

holes in the pneumatics will also line up with the screw holes in the rest or stop rails. Dab a little burnt shellac on each pneumatic before screwing the rest or stop rail in place to help secure the pneumatic to the rail; the screws have almost no strength.

Connect suction to each deck individually to test each note before assembling the stack. Then, after reassembling the lower portion of the stack, remove the spoolbox and other parts from the shelf, attach the shelf to the stack, and install it in the piano, to regulate the pushrods to the piano action. (The piano action should already be regulated). If you wait to regulate the pushrods until after the entire head is assembled and tubed, it will be too late because they will be inaccessable.

After regulating the pushrods to the piano, remove the stack from the piano, remove the shelf, reattach the spoolbox and assemble the whole works. The tracker bar tubing neatly passes downward between the pushrods, and connects to the pouch input nipples located on the back of the stack. Each nipple is contained inside a little countersunk hole in the tubing guide rails. In some stacks, the tracker bar tubing for one deck attaches directly to the pouch input nipples, but each tube for the other deck(s) has an elbow installed at the sharp bend at the guide rail. The original tracker bar tubing was small enough to pass through the holes in the pushrod rail but elastic enough to stretch over the pouch input nipples, two attributes which can be hard to find simultaneously in modern neoprene tubing. The easiest and most durable way to retube one of these stacks is to use small tracker bar tubing from the tracker bar through the pushrod guide rail. Install tracker bar tubing elbows for the deck or decks which did not originally have them, and use short connecting links of slightly larger tracker bar tubing from the elbows to the pouch nipples. The smaller tubing will fit through the tubing guide rail without enlarging the holes and without rubbing on the pushrods, and the slightly larger connecting links between the elbows and pouch nipples will slip over the nipples with ease.

The Aeolian wind motor is large and powerful. The three double pneumatics are held together with large round head wood screws hidden under seal cloth punchings. Large rubber washers serve as gaskets and spacers between the pneumatics; in many instances, the rubber is still flexible enough to be reused, providing that irregularities are sanded off prior to reassembly. If they are hard and brittle or cracked, replace them with several punchings of thick gasket leather or rubber inner tube glued together. Check the pneumatic hinges for strength and airtightness, and check each port and chamber for airtightness, sealing the wood with lacquer if necessary. Cover the pneumatics with the cloth stopping about ¼" from the hinge. Then cover the hinge area with a large punching of pouch leather as originally covered. Aeolian wind motors are prone to knocking if the cloth bushings for the crankshaft and connecting rods are badly worn; be sure to replace these if necessary with the correct thickness of woven action cloth, not felt. Regulating the slide valves is easy. Simply adjust each one so it uncovers each of its two ports by exactly the same amount. Early wind motors also have three double pneumatics with three slide valves, but the shape is different, with the moveable board of each pair of pneumatics between the two stationary boards and with the open ends facing upward, something like an upside down Gulbransen wind motor. They are no more difficult to rebuild than the later type.



Illus. 6-3. The Aeolian tracking device.

The earliest Aeolian transmissions used in pushup players and early inner players had no automatic tracking device. A manual tracking lever usually moved both spools in unison, providing accurate alignment with no paper edge wear during rewind. To align this system, simply install a roll, loosen the lock nuts and adjust the machine screws at the right side of the transmission frame until the upper and lower spools are in perfect alignment. Tighten the lock nuts.

A few actions built in the early teens have a single tracking pneumatic with one tracking ear; its regulation is obvious.

The most common Aeolian tracking system is the one shown in illus. 6-3. It works very well for rolls of one width— the width to which the tracking ears are set—but if a roll is played which is significantly wider than the distance between the tracker ears, holding them both open, the tracker will stay in the middle position and will not provide correction. In some players, the automatic tracker cutoff mechanism for rewind is redundant, both closing off the tubes which connect the ears to the pneumatics with cutout pouches (#4 in the illustration) *and* cutting off the suction supply from the pump. In players with a constant supply of suction from the pump during play *and* rewind, the cutout pouch block does the job.

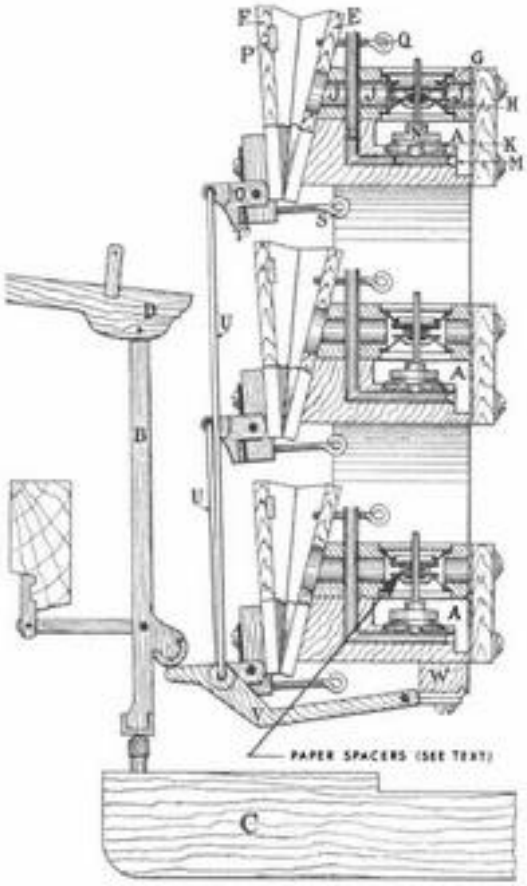
Always replace the little leather pads on the ends of the tracker ears. Remove each brass retainer by springing the tabs just enough to slip it off of the arm. If you are doing a fancy cosmetic restoration, polish and lacquer the individual parts, being very careful not to damage the hairlike springs. Then attach new pouch leather on the arms with PVC-E or shellac, and carefully slip the retainers back on.

To regulate the automatic tracking device, insert a roll of average width. Loosen screws #6 and #7 in the illustration and push the ears (or "triggers", in Aeolian parlance) away from the roll. Hold the tracker pneumatic in its centered position, and adjust turnbuckle #10 so cam #9 is centered on shaft #8, as shown in the illustration. Tighten the turnbuckle lock nuts. Then adjust the tracker ears so they are about 1/32" away from each side of the roll while it plays, and tighten screws #6 and #7. Try new and old rolls of various brands to find the best average. If the ears are adjusted to touch the edges of the paper, the tracker will be too sensitive, constantly shifting a little from side to side. 1/32" space will provide a compromise for rolls of slightly different widths.

The original 1925 Duo-Art service manual recommends "By keeping a very loose brake on the takeup spool and a rather slow speed on reroll, the music roll edges will not be torn." Today, this should be modified to read "By removing all brake tension from the takeup spool...". Some rebuilders also disconnect the wind motor accelerator slide valve from the manual rewind lever under the keybed, permanently turning the accelerator valve off. This gives the tempo lever complete control over rewind speed, from reasonably fast down to a dead stop.

AMERICAN PLAYER ACTION

Rare. Not to be confused with Amphion or Ampico actions used in American Piano Company instruments. The American Player Action Co. mechanisms were evidently manufactured for sale to small piano companies who did not build their own player actions. The valves have wire stems, metal seats, and wooden pouch lifter buttons somewhat like Standard/Autopiano valves. Illus. 6-4 shows the unusual design with small pneumatics mounted vertically



Illus. 6-4. Cross section of the rare American player action, not to be confused with the American Piano Company (Amphion) or Aeolian-American.

on the back of the three valve/pouch tiers, providing easy regulation of pneumatic travel and lost motion between stack and piano action. To regulate valve travel, insert or remove spacing washers made from various thicknesses of paper front or balance rail punchings.

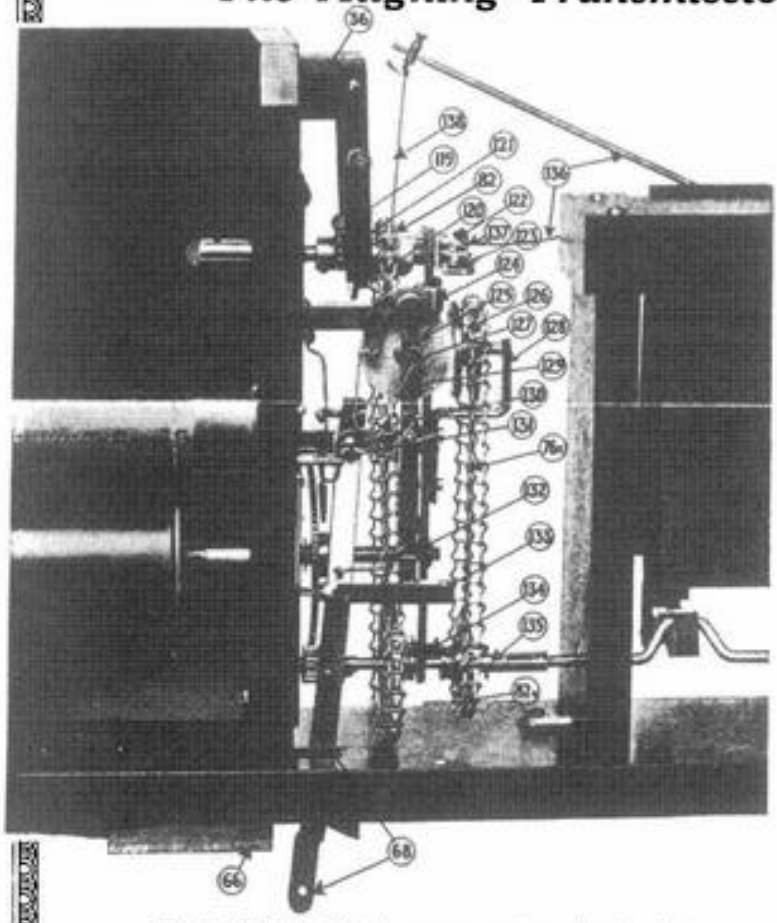
AMPHION

Very common. The "Amphion Accessible Player Action", as it was called in original factory literature, was manufactured in Syracuse, New York by the Amphion Piano-Player Company and was used in many brands of pianos. Amphion manufactured the player actions for most Ampico reproducing pianos sold by the American Piano Company prior to the Ampico B (see Ch. 7). They also built other reproducing and expression systems, including the Apollo Artecho reproducing mechanism using Artecho rolls, the Dynachord Art Expression Player using the Art Apollo family of expression rolls (Apollo X, QRS Autograph Automatic, QRS red X, and Automatic Music Roll Co. XP rolls - see pp. 188), and a Recordo expression player action, all of which are extremely rare today.

Amphion liked to use cast iron brackets, and you will find them everywhere - supporting the wind motor, con-

Supplement to Gulbransen Shop Chart

The Aligning Transmission (Tracking Device)



119. Feed Spool Brake (New arrangement to replace No. 81.)
120. Feed Spool Brake Wheel (To replace brake pinion No. 84.)
121. Ratchet Pinion, Dog and Dog Arm.
122. Shifting Arm.
123. Shifting Arm Spring and Bracket (Spring No. 18 wire.)
124. Transmission Frame Arm.
125. Front Friction Roller (Aluminum.)
126. Side Friction Roller (Brass) and Sprocket.
127. Friction Roller Shaft.
128. Side Friction Roller Bracket.
129. Friction Roller Arm.
130. Friction Roller Arm Spring (No. 13 wire.)
131. Paper Guide Connecting Rod with Adjustment loop.
132. Friction Roller Arm Lever & Spring (Spring No. 13 wire.)
133. Guide Lever Bracket.
134. Double Sprocket Bracket.
135. Forward Drive Shaft.
136. Jigger.
137. Leather Nut on Jigger.
138. Cord.

Purpose The purpose of this new device is to keep the music sheet in perfect alignment at all times with the air ducts in the tracker bar. It is not designed with a view to taking care of defective rolls although it will do so to the same extent as any good automatic tracking device.

Operation A music roll is placed in the Spool Box and starts to play. As the Forward Drive Shaft (135) turns, the motion is transmitted by the Sprocket (82A) and Chain (76A) to the side Friction Roller (126) which turns continuously as the music sheet moves forward. By means of the Friction Roller Arm Spring (130) the Front Friction Roller (125) is held against it and on account of the friction it turns. As this front Friction Roller (125) turns, it transmits the motion to its Shaft (127) winding up the Cord (138) and through the Jigger (136) and Shifting Arm (122) moves the Music Roll to the left until it reaches the center, at which time the left edge of the paper comes into contact with a paper guide at the left end of the Tracker Bar. This Paper Guide is attached by a connecting Rod (131) to the upper end of the Front Friction Roller Arm Lever (132). Therefore, when the Paper Guide is moved to the left the Arm Lever (132) is drawn against the tension of the Lever Spring, so that the whole Friction Roller Arm (129) is moved slightly to the left. As this compresses the Roller Arm Spring (130) the Rollers are separated and the Front Roller (125) slips backward as fast as it is turned forward, so that the upper bar of the Jigger plays about half way down. Now, if the paper should move to the left, the Cord would unwind and the music sheet would move to the right. If the paper should move to the right, the cord would wind up still more until the paper reached center, regardless of the position of the paper on the spool.

Proper Condition of Each Part

1. Cord No. 138 should be about 9½ inches long.
2. When Jigger No. 136 is pulled down all of the way there should be fully ⅛ inch play in the right music roll chuck. Leather nut No. 137 determines this.
3. Friction Roller Arm Spring No. 130 should be strong enough to cause friction enough between the Friction Rollers so the Jigger No. 136 will operate, but weak enough so the paper guide at the left end of the Tracker Bar will not curl up the Music Sheet Paper. Strength of Spring is changed by bending.
4. The Paper Guide Connecting Rod with adjustment Loop No. 131, should be adjusted so that the Paper Guide will line up with the left flange of the Take-up Spool so that when the sheet is running forward the paper will not crowd at either end of the Take-up Spool. Bend the loop to lengthen or shorten the Connecting Rod.

SUGGESTIONS

If the paper of the music sheet crowds on the left flange of the take-up spool, shorten the Paper Guide Connecting Rod No. 131 by means of the loop.

If the paper of the music sheet crowds against the right flange of the take-up spool, lengthen the Connecting Rod No. 131 by spreading the loop.

If the Jigger No. 136 comes down over half-way when the music sheet is running true, turn the little Leather Nut No. 137 to the left.

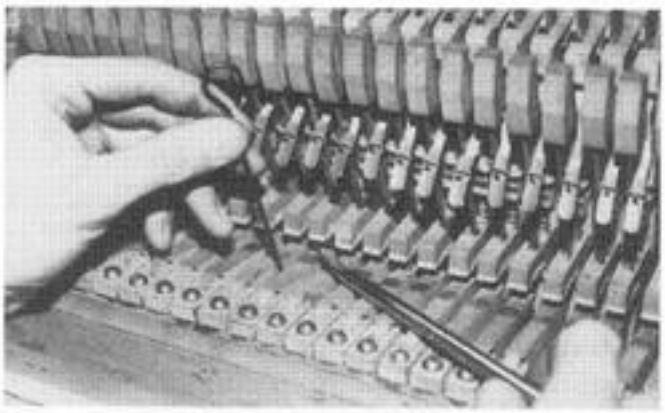
If the Jigger No. 136 does not move down when you start a roll that is true, turn the little Leather Nut No. 137 to the right.

If the Paper Guide does not move fully ¼ of an inch to the left when the re-roll lever is thrown to the right, bend the little elbow projection on the front of the Shift Lever No. 68, to the right so that it will push the Lower end of the Friction Roller Arm Lever No. 132 to the right thus throwing the upper end to the left and with it the Paper Guide. Use standard Q R S rolls for testing.

GULBRANSEN-DICKINSON CO. **October 1, 1921**

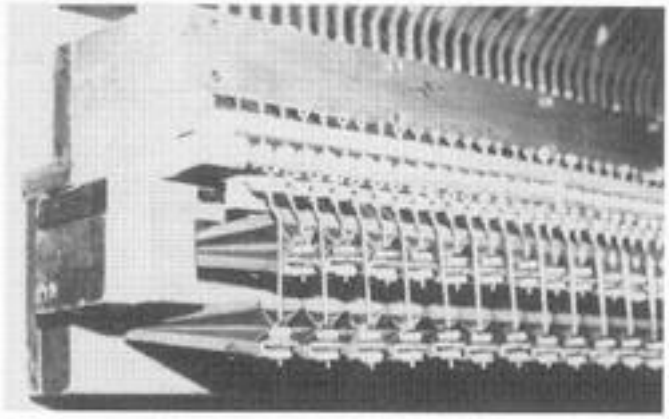
Illus. 6-84. The Gulbransen automatic tracking device

under the right end of the stack and under the suction supply manifold at the left, raising or tilting the stack to roughly regulate it. Then test each finger as shown in illus. 6-134, regulating the capstan until just a tiny amount of lost motion exists. After the capstans are regulated, install the stop rail, connect your test pump to the stack, and play each note by opening the pouch input hole. Adjust the stop so the backcheck catches the hammer at the same place as it does when you play the key by hand.



Illus. 6-134. Top: A homemade hook used for regulating stack flanged fingers to piano action. Bottom: Using the hook and a capstan wrench to regulate the flanged finger capstans. Install and regulate the stop rail after regulating the capstans.

Apply a thin coat of shellac to the secondary pouch board where the gasket touches it, let it dry until it is tacky, and install the head (and primary chest) in the piano.

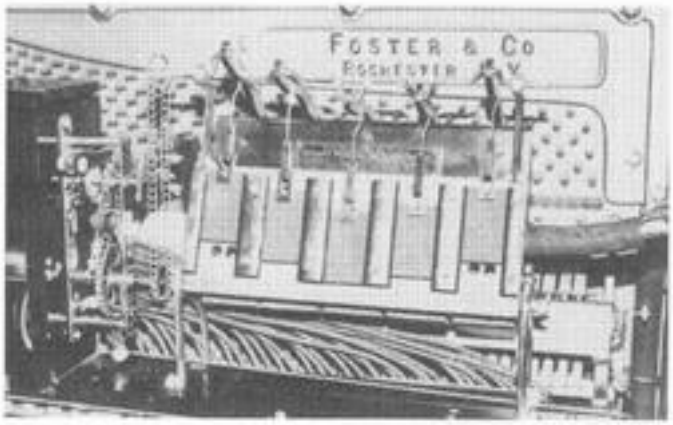


Illus. 6-135. A late two tier double valve Standard stack ready to be installed in its mission oak Foster piano. (Most Standard and Autopiano stacks have three tiers with larger pneumatics.) All leather nuts and cloth punchings have been replaced. The fingers and stop buttons have been regulated to the piano, and the primary valve chest and head are installed. This same stack is shown in illus. 4-8.

The Wind Motor

The Standard/Autopiano wind motor has five pneumatics glued to a mahogany-faced trunk, and it is common for the mahogany to split when the pneumatics are removed. Remove the broken pieces of mahogany from the pneumatic boards, reglue them to the trunk and sand it smooth, or sand the mahogany completely off and replace it.

Some Standard/Autopiano transmission frames are made of stamped metal and others are made of die cast pot metal, with thick cloth bushings holding some of the shafts to eliminate the need for precision machining. Be careful not to break a pot metal transmission while cleaning it.

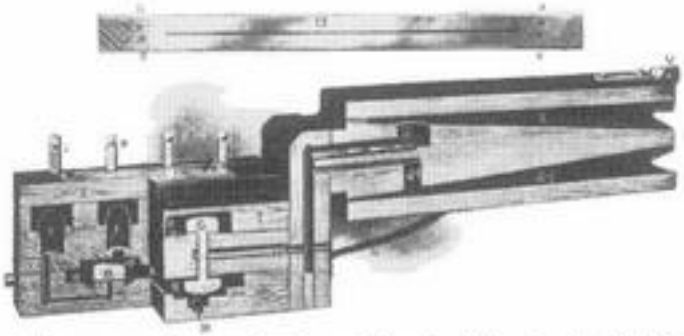


Illus. 6-136. Five-point wind motor of a double valve Standard player action, installed in the Foster piano. This spoolbox has a stamped metal transmission frame.

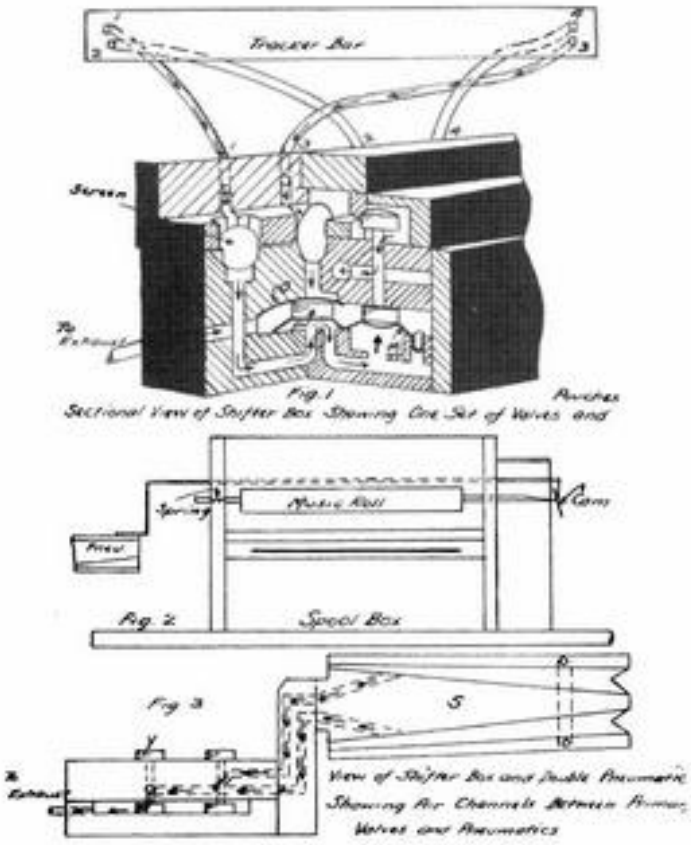
The Tracking Device

The Standard tracking device is one of the most sophisticated pneumatic mechanisms in any player piano. Its operation at first might seem difficult to understand, but it is just an assembly of interconnected pouches and valves, and unless you know how it works your chances will be slim of getting one to work right.

The tracker bar has two staggered paper edge sensing holes on each side of the roll, as shown in illus. 6-137.



Illus. 6-137. Cutaway drawing of the Standard automatic tracking device.



Illus. 6-138. Schematic representation of the Standard tracker.

The valve box contains two primary valves, two inside valves and six pouches - two primary pouches, two overhead pouches and two cutout pouches. Each primary valve admits atmosphere or suction to half of the tracking pneumatic; each primary valve is controlled by a primary pouch with a bleed. Each inside valve is glued to a cutout pouch which opens and closes the channel from one outer tracking hole to one primary pouch. Above each inside valve is an overhead pouch, with a bleed, which is connected to one of the inner tracker holes. The inner and outer tracking holes are cross connected to the primary valves, so the outer left and inner right holes control one valve, while the outer right and inner left holes control the other. The following paragraphs describe all possible states of the valves, pouches and pneumatics.

1. If all four tracking holes are *closed*, the overhead pouches are *up*, the cutout pouches are *open*, the primary pouches and valves are *down*, and both halves of tracking pneumatic have suction. (Although the cutout pouches open the passageway from the outer tracker hole to the primary pouch, the outer tracker hole is covered with paper, so the primary pouch remains down).

2. If all four tracking holes are *open*, the overhead pouches are *down*, the cutout pouches are *closed*, the primary pouches and valves are *down*, and both halves of the tracking pneumatic have suction. (Now although the outer tracker holes are open, no atmosphere reaches the primary pouches because the cutout pouches are blocking the passageways).

3. If the two inner tracking holes are *closed* and the two outer holes are *open*, the overhead pouches are *up*, atmosphere travels from the two outer holes to the primary pouches, lifting them and the primary valves, so both halves of the pneumatic have atmospheric pressure.

In the first three conditions described above, the system is balanced because the tracking holes on both sides are balanced. In the following conditions, the tracking holes are imbalanced, causing a response from the tracking pneumatic.

4. If one inner tracking hole is covered and the other three holes are open, one overhead pouch will permit its valve and cutout pouch to lift, admitting atmosphere to one primary pouch, lifting the primary valve and admitting atmosphere to one half of the tracking pneumatic. The other half of the pneumatic still has suction, creating an imbalance and recentering the roll.

5. If both inner tracking holes are covered and only one outer hole is opened, that outer hole will feed atmosphere to one primary pouch, lifting the valve and admitting atmosphere to one half of the pneumatic. The other half of the pneumatic still has suction, creating an imbalance and recentering the roll.

In other words, as long as both inner tracking holes are covered by the roll, the outer holes are connected to the primary valves and they control the pneumatic. As long as both inner holes are open, both outer holes are shut off by the cutout pouches. If one inner hole is covered by the roll, by definition the opposing outer hole must be open, causing one cutout pouch to open *and* to feed atmosphere to its primary pouch.

To get a better feel for how this complex unit operates, remove a properly working one from a piano, remove the primary valve dust cover and apply suction. With all four nipples open, both primary valves will go down, and the pneumatic will remain centered. With all four nipples closed with your fingers, the primaries will stay down and the pneumatic will also remain centered.

With only the two nipples for the inner tracking holes covered, the primaries will go up and the pneumatic will remain centered. You can now manipulate the pneumatic by alternately opening and closing the nipple for each outer hole.

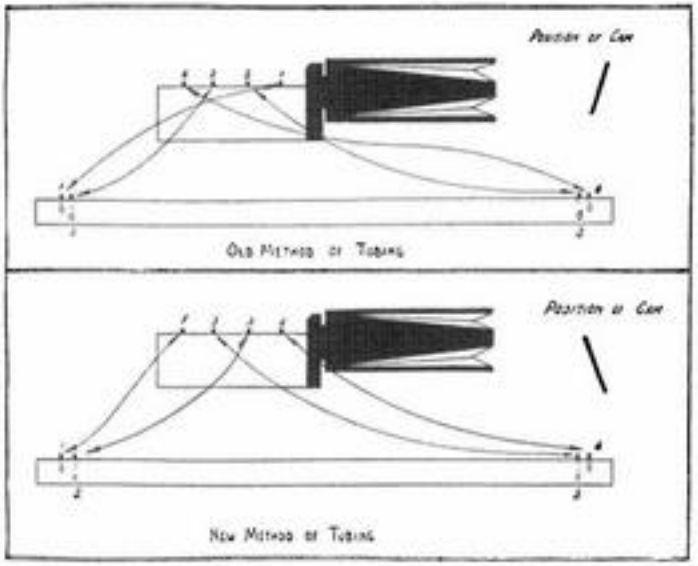
With all four nipples open, opening and closing the outer hole nipples will have no effect on the pneumatic, but if you alternately open and close the nipples for the inner tracking holes, the pneumatic will respond.

If you have a properly working tracking device and you

don't remember how to connect the tubes after you put the unit together, apply suction, and open and shut each nipple one at a time with your finger, *leaving the other three open*. Opening and closing two of the nipples will have no effect on the pneumatic; the other two will cause it to move. The two which cause it to move are for the inner tracking holes. Find the nipple which causes the pneumatic to pull the roll to the left when you close it, and tube it to the right inner tracking hole. Tube the other one to the left inner tracking hole. Tape over the two inner tracking holes, and find the remaining nipple which causes the pneumatic to push the roll to the left when you close it. Tube this one to the right outer tracking hole, and by the process of elimination—you guessed it—tube the last nipple to the left outer hole.

If a Standard tracking device refuses to work properly after you carefully seal the channels, repair stripped screw holes, and replace all of the gaskets, valve leather and pouches with new leather ones, you either have a leak somewhere or the pouches are not dished properly. Double check to make sure none of the holes for mounting screws are causing the problem. If it still doesn't work, check the pouches, particularly the cutout pouches. Are the valve buttons perfectly centered? Is there just enough dish for each cutout pouch to open the channel, but little enough so the cutout pouch has no wrinkles? Are the working areas of the cutout pouches perfectly free of glue so the valves can seat properly? Are the overhead pouches dished properly, or do they have a little glue on the working surface, causing them to cock the valves at an angle? If the valves and pouches work as they should but the pneumatic refuses to remain centered, are both halves of the pneumatic and the pneumatic gasket perfectly airtight? A leak in one half of the pneumatic or into one channel in the gasket will cause the pneumatic to pull off in one direction. If everything seems airtight but you can't seem to find the problem, replace the cutout pouches again, using a little more or a little less dish. At the moment the job might be frustrating, but once you get an old Standard tracker to work properly, it will last for a long time providing that you clean the paper dust out of the screens and tracker bar tubes regularly.

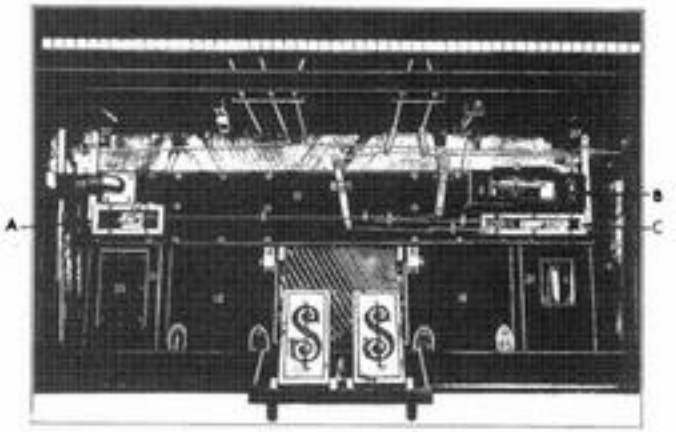
The Standard tracking device underwent several subtle but important changes. In earlier actions, the weight of the pneumatic pulls the tracking cam down during rewind, permitting the spring in the left hand spool chuck to push the roll to the right, causing paper wear. In later examples, a spring helps to hold the tracking pneumatic up, counteracting the spring in the chuck. In still later examples, the orientation of the cam is reversed, so the weight of the pneumatic counteracts the chuck spring. The tracking holes in the tracker bar are tubed differently, depending on the position of the cam, as shown in illus. 6-139.



Illus. 6-139. Old and new orientations of tracking cam and tubing.

The Pump

The left reservoir of a Standard pump contains an accent pneumatic, labelled the "expression pneumatic" or "crash valve" in the original service manual. During ordinary pumping, this pneumatic has no effect, but when a pumping pedal is given a quick push, the momentary higher suction in the trunk pulls the large valve in the pneumatic shut, closing the reservoir off from the rest of the player action. The pneumatic opens immediately after the accented note plays, reconnecting the large reservoir to the system. The author has seen many orphaned Standard crash valve pneumatics which were removed by previous technicians who thought they would take more work to restore than they were worth. The crash valve is an important part of the Standard system, however, because it provides the only means of obtaining a quick accent. Restore it and put it back in the pump where it belongs!



Illus. 6-140. The Standard pump. A: action cutoff. B: wind motor governor. C: tempo control and motor accelerator.