

*The*  
AMPHION  
ACCESSIBLE  
PLAYER ACTION



---

What it is—How it works—Why it excels  
How to care for it

---

# Foreword

FOR more than twenty years the Amphion Company has specialized in the production of strictly high grade piano player actions.

During this time the foremost engineers of the industry have contributed their undivided efforts to perfecting the company's product. The most modern equipment and methods have been employed. Materials of the highest possible quality have always been used. The company's product has always been sold only to manufacturers of fine pianos, and Amphion Actions are not to be found in pianos of inferior or questionable quality.

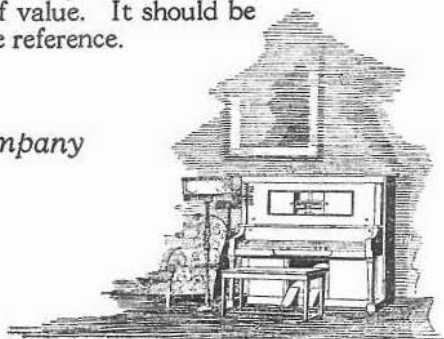
A distinctive feature of the Amphion action over all others is the accessibility of every working part and the ease with which any part of the player or piano action may be reached for adjusting, cleaning, or re-conditioning, as well as for tuning the piano.

The Amphion action is noted also for its ease of operation and for the perfect control of expression at the command of the operator.

This little booklet is intended to convey in clear and simple language the workings of an Amphion Action so that anyone may understand it. It shows how to care for the action so as to obtain the best results from the piano. A little care will add years of life to the instrument.

To prospective purchasers of a player piano or to the owner of a piano equipped with the Amphion Accessible Action, this book is sure to be of value. It should be read carefully and kept for future reference.

*Amphion Piano-Player Company*  
Syracuse, New York



# Contents

## 1

### *Making Music from a Paper Roll*

Unskilled Hands Produce Music—The Player Piano Roll—The Player Action—The Amphion Accessible Action—Its Distinctive Advantages

Pages..... 5 to 8

## 2

### *Interesting Features of the Amphion Accessible Player Action*

General Construction—Top Action Assembly—Decks and Valves—Valve Construction—Spool Box—Transmission—Air Motor—Air Motor Governor—Gate Box—Vent Block—The Bellows—Sustaining Pedal Pneumatic—Rail Lifting Pneumatics

Pages..... 9 to 24

## 3

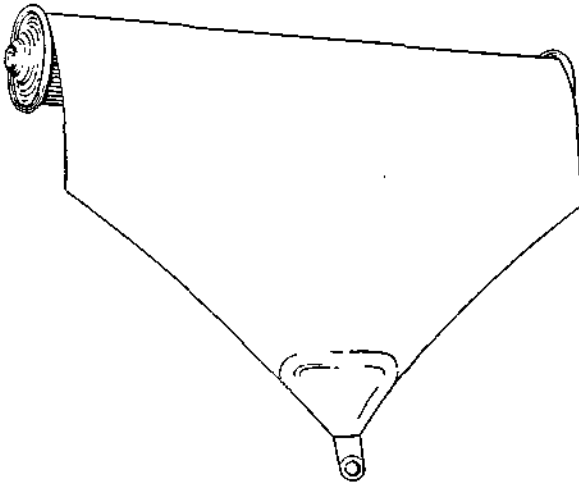
### *How to keep an Amphion Player Action in Perfect Working Order*

Use of Tracker Pump—Lubrication—Valve Functioning—Automatic Tracking—Brake Drum and Music Roll Brake—Care of Air Motor—Air Motor Governor—Tempo Regulation and Governor Adjustment—Bellows Care and Adjustments

Pages..... 25 to 32

1

# Making Music *from* a Paper Roll



A WOMAN who has never been musically trained sits at the piano and brings forth from the instrument masterly interpretations of great music. A man who does not know one note from another makes his piano produce old time melodies or lively popular music as capably as the accomplished musician.

What is the mystery behind this concord of harmony from hands unskilled in musical performance? Just a perforated paper roll, together with the mechanism of the player action installed within the piano.

So swiftly have science and invention progressed in the past quarter century, that we hardly stop to marvel over the wonders of the mechanism that produces music from the piano with the aid of the perforated roll. In the roll is music ready to be released. Within the piano is the mechanism, the player action, which enables the operator to release the music, and with but little practice or experience, to endow it with his own moods, feeling and expression, imparting to it in fact his own interpretation.

The character of the interpretation that it is possible to obtain depends upon the design and construction of the player action, and upon the tone and other intrinsic qualities of the piano. The finest piano equipped with an inferior and non-responsive player action cannot possibly yield good music any more than such a piano could yield good music at the hands of an inexperienced pianist. Neither can good music be produced with the aid of the finest player action from a piano of poor tone and inferior quality.

To produce good music and to provide lasting satisfaction the player piano must consist of a combination of a high grade piano with a nicely balanced, well constructed, and responsive player action. In this regard the Amphion Accessible Action leaves nothing to be desired. It stands apart from all other mechanisms of its kind in the perfect balance of its design, the material and workmanship employed in its fabrication, and its responsiveness and ease of operation. Moreover, this action is not to be found in pianos of questionable quality; therefore a piano equipped with it is sure to be a good piano.

Let us mention a few distinctive features of the Amphion Accessible Action.

## EASE OF OPERATION

In a foot pump player piano the pumping characteristics are of utmost importance. The pumping may be too heavy or too light, too rapid or too slow, according to the design of the bellows or pumping element.

The bellows of the Amphion Action has been perfected through years of painstaking development to the point where it operates with perfect smoothness and precision, providing for the instantaneous accenting of any selected note or group of notes without carrying over the accenting intensity to succeeding notes. Thus the most delicate shading and phrasing can be imparted to the music and the greatest degrees of contrast of which the piano is capable can be developed without conscious effort on the part of the operator.

The speed of pumping and pressure of the pedals under foot can be varied within wide limits by simple adjustments to suit the pleasure of the individual.

## ACCESSIBILITY

All mechanisms require occasional attention and reasonable mechanical care if they are to yield the best service.

The player action of a player piano is no exception to this rule; therefore accessibility or lack of it to the player action elements is an important feature in determining the ultimate satisfaction that the player will give to its possessor.

The Amphion Accessible Action is unique among mechanisms of its kind in providing the maximum degree of accessibility to every working part. Every part of this action is instantly accessible for examination, cleaning, and reconditioning. Every part is replaceable with a minimum of effort and expense, should replacement become necessary.

Adjustments to the player action may be made at all points without disconnecting tubing or otherwise disturbing the installation. The piano may be tuned and regulated without any interference from the player.

In general the Amphion Accessible Action provides every feature of interchangeability of parts and every convenience for maintenance to be desired, and in this respect differs radically from most other apparatus of its kind.

## MUSICAL QUALITIES

The quality of music obtainable from most player pianos must not be confused or associated with that which can be obtained from the piano equipped with an Amphion Player Action.

Music is a thing of mood and impulse, and in the design and construction of the Amphion Action this point is always held clearly in view. Elaborate and distracting control apparatus is avoided. Instead, there are employed principles of design that yield through the perfection of their well balanced character complete freedom of operation with spontaneous and natural reflection of each passing mood and fancy of the operator.

Thus with the Amphion Action the player pianist may express musically every impulse and feeling as readily as he could through highly trained fingers, were he an accomplished musician.

## QUALITY AND DISTINCTION

It is perhaps needless to state that a player action in which all of these most desirable features are combined is not the least expensive apparatus of its kind to manufacture.

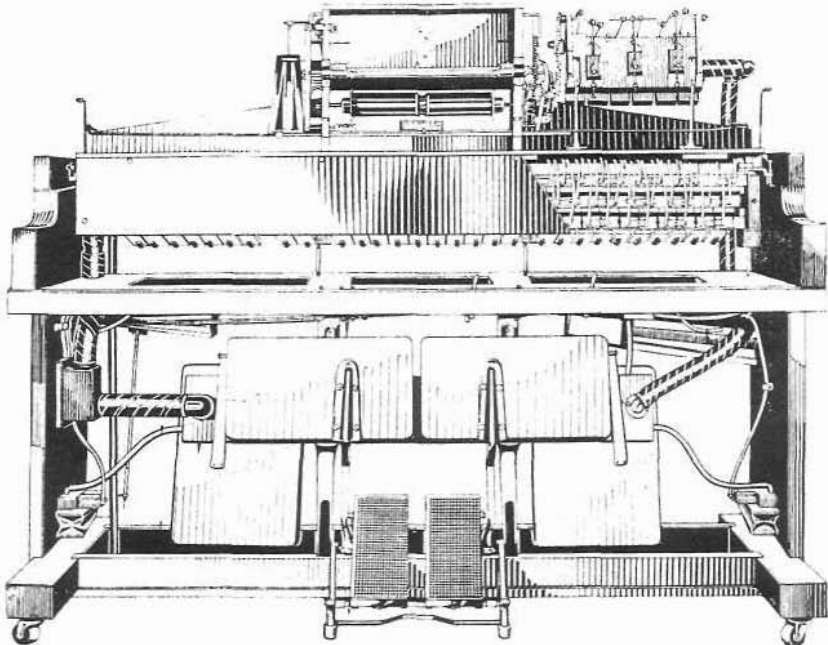
Yet a good piano equipped with the Amphion Accessible Action costs the purchaser little, if any, more than the same piano equipped with a commercial type of action; and in the end whatever slight extra cost may be involved is returned many times over in superior service and lasting satisfaction given to the owner.

From the fact that this action is not used in pianos of cheap manufacture or questionable reputation, it follows that the Amphion equipped player piano always represents a combination of quality, distinction, serviceability, and value that cannot be excelled.

The distinctive mechanical features of the Amphion Accessible Action are set forth on the following pages.

2

Interesting Features  
of the  
Amphion Accessible  
Player Action





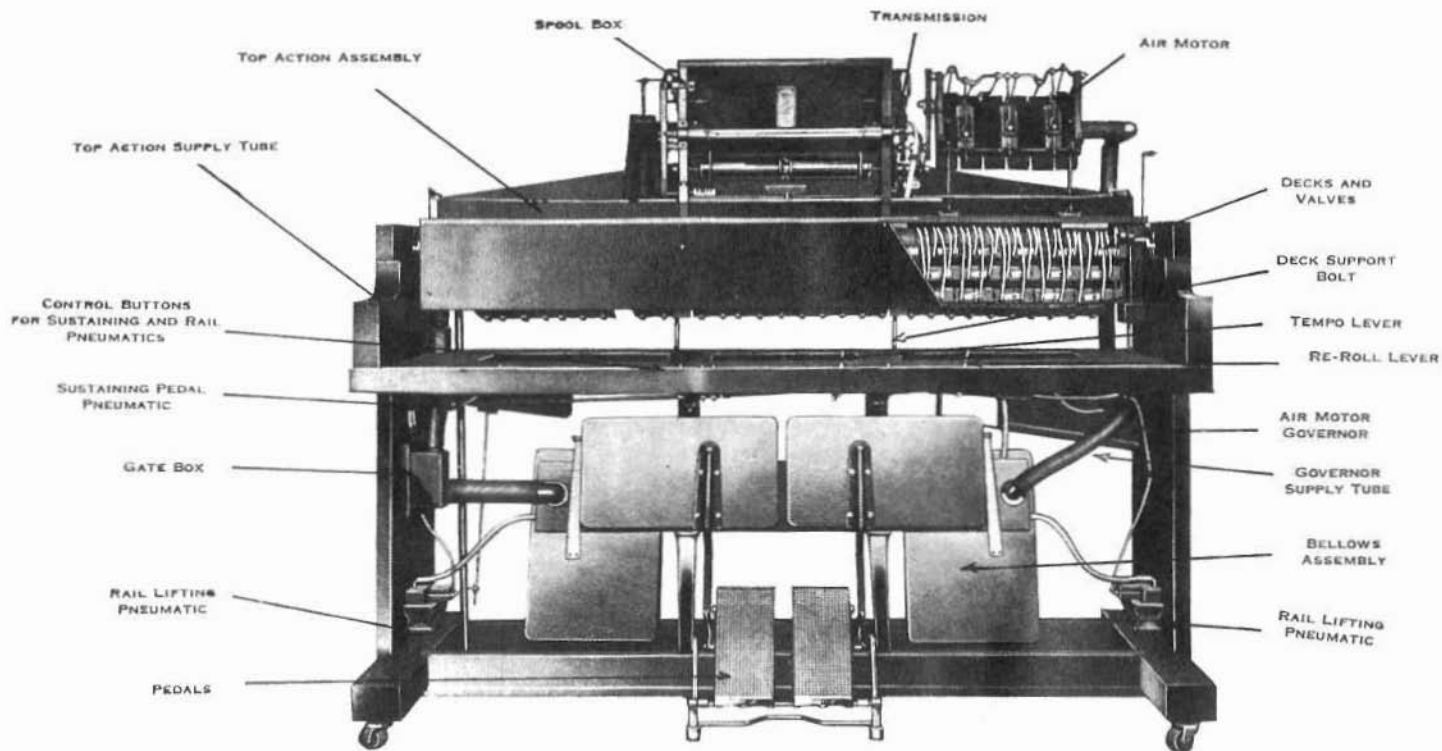
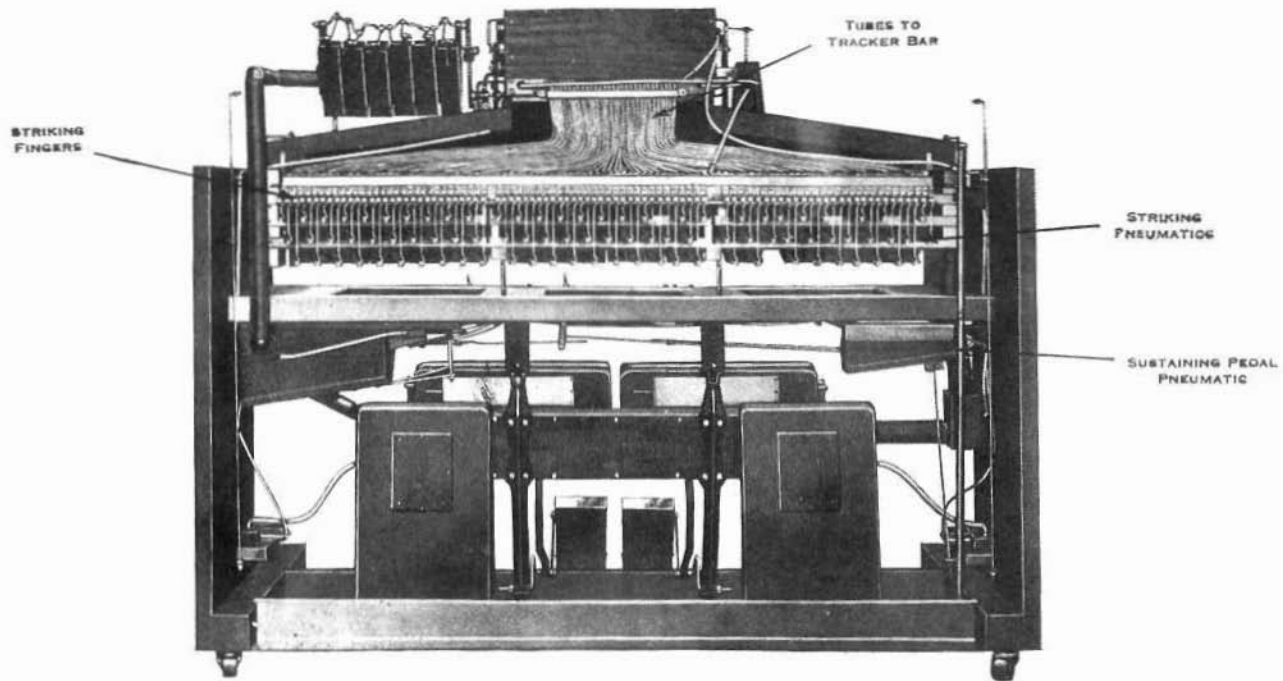


FIGURE 1

FRONT VIEW OF AMPHION ACCESSIBLE ACTION SHOWING LOCATION OF PRINCIPAL PARTS. THE ACTION IS SHOWN MOUNTED IN A SKELETON PIANO FRAME



**FIGURE 2**  
**REAR VIEW OF AMPHION ACTION IN SKELETON FRAME, SHOWING POSITION**  
**OF STRIKING PNEUMATICS AND STRIKING FINGERS**

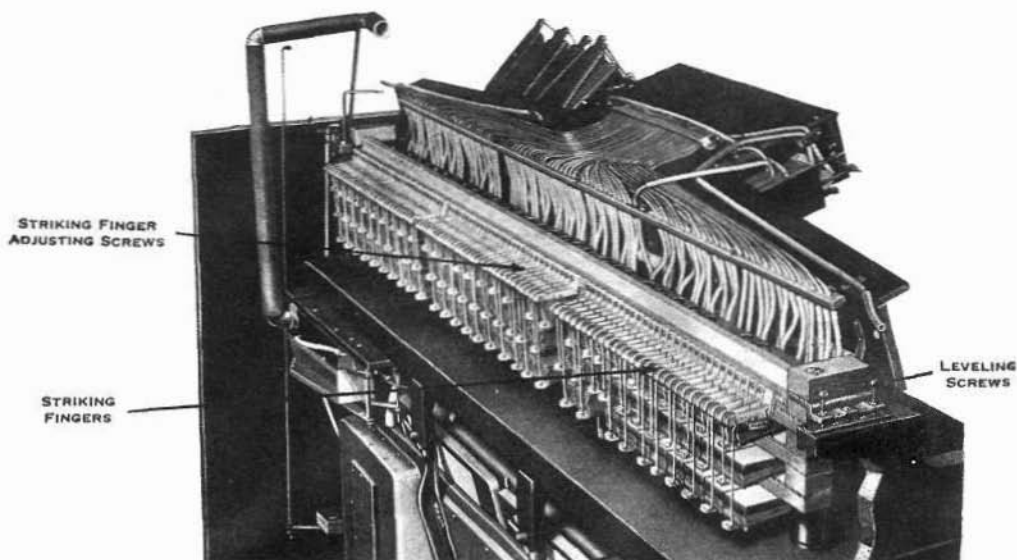


FIGURE 3  
TOP ACTION ASSEMBLY SHOWING SPOOL BOX TIPPED FORWARD

### THE TOP ACTION ASSEMBLY

FOR tuning the piano and regulating the piano action the spool box may be tipped forward as shown. To accomplish this, remove one screw at each end of the spool box board and disconnect the air motor supply tube; then rotate the spool box on the hinges at the end of the spool box board, supporting it from the piano keyed with a music roll box.

The top action is supported on the cheeks of the piano by leveling screws at the ends of the decks, providing quick and accurate means of adjusting its general position with reference to the piano action.

Deck support bolts at the scale breaks insure rigidity and stiffness of the deck structure. When changes are made in the top action position by means of the leveling screws at the ends of the decks, the deck support bolts should also be adjusted to maintain proper alignment of decks.

Individual adjustments of striking fingers to secure contact between these members and the piano action wippers are made by turning the adjusting button screw projecting through the top of each finger. These screws may be reached and the adjustments made without difficulty either with the spool box in its normal position or rotated forward as shown.

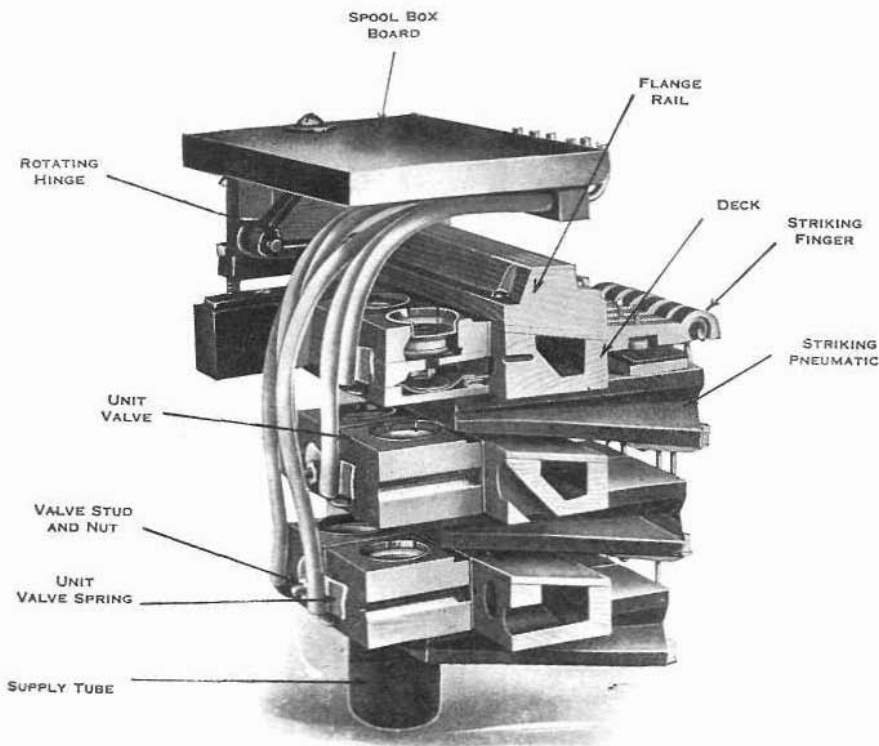


FIGURE 4  
SECTIONAL VIEW OF DECKS AND VALVES

## THE DECKS

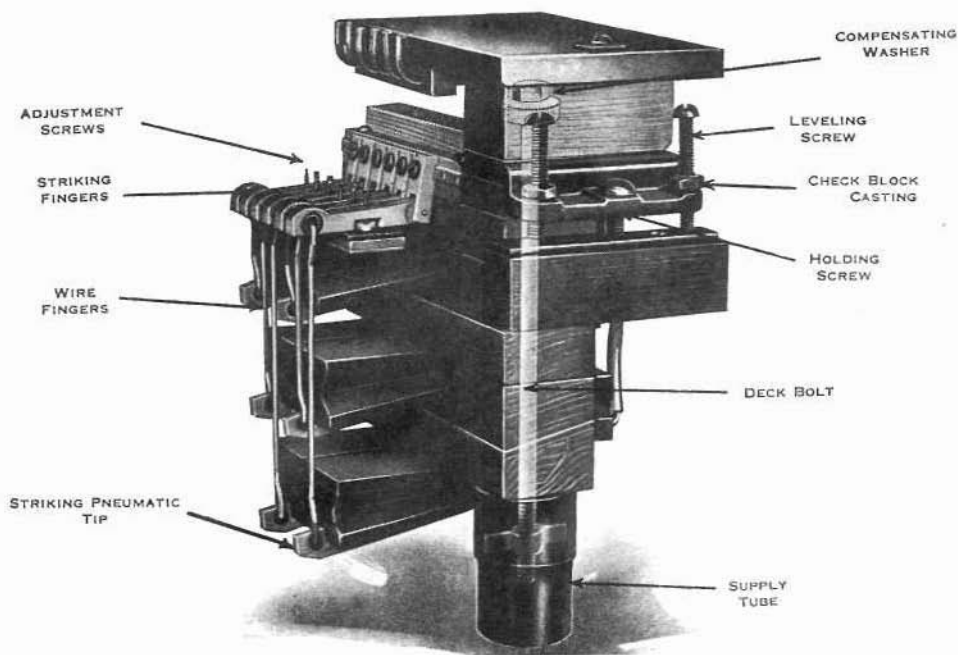
In this illustration the tubing at the rear of the action to the tracker bar has been removed.

Each deck carrying its striking pneumatics and valves to operate them is a separate member of the top action assembly.

Each valve is a separate, interchangeable unit, instantly removable from the deck by releasing the nut which holds its spring.

The joints between unit valves and decks are maintained tight by the heavy spring pressure applied to the valves.

These joints are not subjected to mechanical stresses resulting from the operation of the striking pneumatics.



**FIGURE 5**  
**REAR AND END VIEW OF DECKS, PNEUMATICS AND**  
**STRIKING FINGERS**

## THE DECKS

The three decks are assembled together at each end by means of a single bolt; thus they readily can be taken apart when necessary.

A heavy rubber washer is employed under the head of the deck assembly bolt to compensate for dimensional changes in the wood of the decks and to maintain tightness of the deck joints. No other joints are involved in the structure of the top action, therefore difficulties due to leakage are minimized.

If leakage does develop at these joints it may be eliminated simply by tightening the end bolts, the slotted heads of which are exposed when the spool box is tipped forward.

The lengths of the wire fingers between pneumatic tips and striking fingers are fixed. There are no adjustments to make and no nuts to strip from threaded wires.

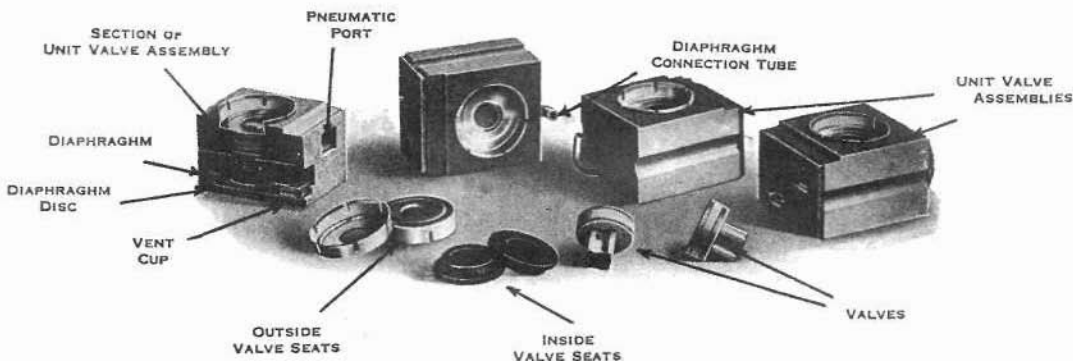


FIGURE 6  
 DETAILS OF UNIT VALVE CONSTRUCTION

## THE UNIT VALVE

Every valve assembly of the action is an interchangeable, demountable unit. Each unit represents a complete self contained valve assembly.

The valves or moving parts of the assembly are simple in structure having no metal stems to corrode and stick in their guides.

The inside valve seat, against which the valve rests at all times when not in actual operation, is a moulded part of special composition, unaffected by climatic conditions, and proof against corrosion.

The outside seat or valve cap is of nicked brass assembled as a press fit into the valve chamber of the unit and cemented in position.

The assembly of valve cap into valve body is mechanically accomplished in the factory by automatic machines, which simultaneously make the assembly and adjust the throw or motion of the valve. Thus the human element is eliminated from the operation of setting the valves, and all valves are adjusted with utmost precision and regularity.

The vent cup is in the contact face of the valve assembly, and is readily made accessible for cleaning by removing the valve from the deck.

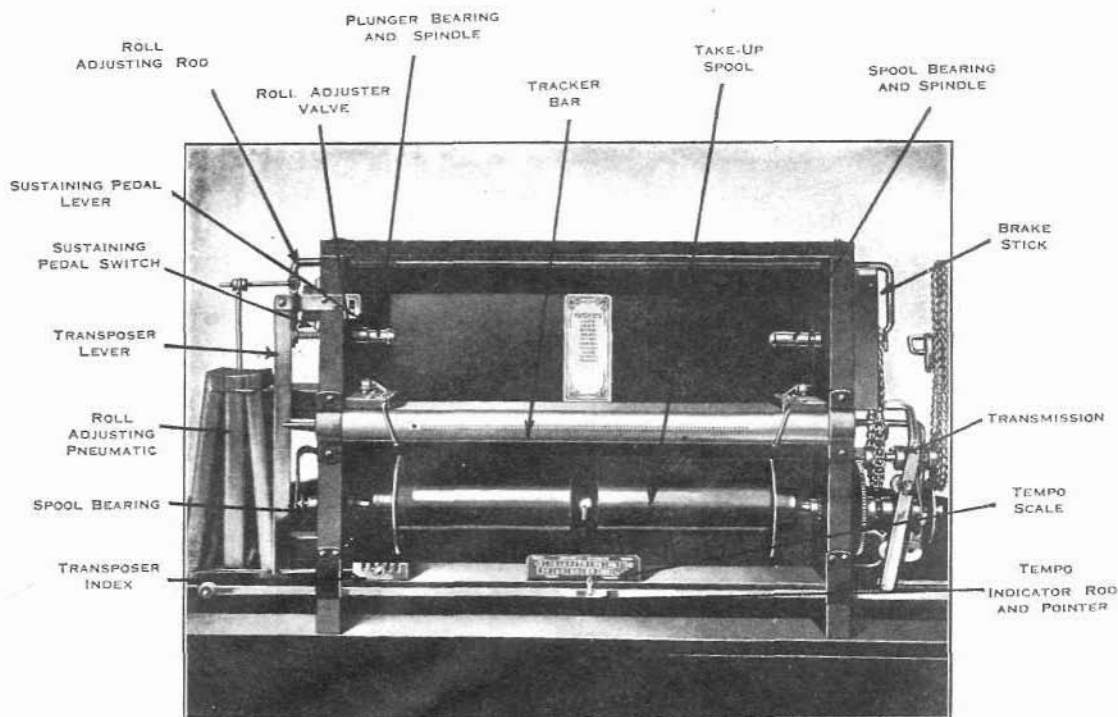


FIGURE 7  
SPOOL BOX AND RELATED PARTS

## THE SPOOL BOX

The tracker bar is of solid brass, not a shell, therefore free from any tendency to warp or get out of alignment. The ports or openings in the bar are accurately formed and perfectly spaced.

Automatic tracking of the music sheet is accomplished by moving the music roll bearings in their spindles by means of the roll adjusting pneumatic, which is the simplest apparatus of its kind in existence, containing no complicated mechanical parts to get out of adjustment, no valves to get out of order, and no screens or vents that require cleaning.

The transposing apparatus is extremely simple and positive in its action, transposition of the music being accomplished simply by moving the small knob from one position in its index plate to another, which action moves the transposer lever and shifts the tracker bar.

All spindle bearings are ample in size and readily lubricated. They are accurately positioned, so require no provision for adjustment.

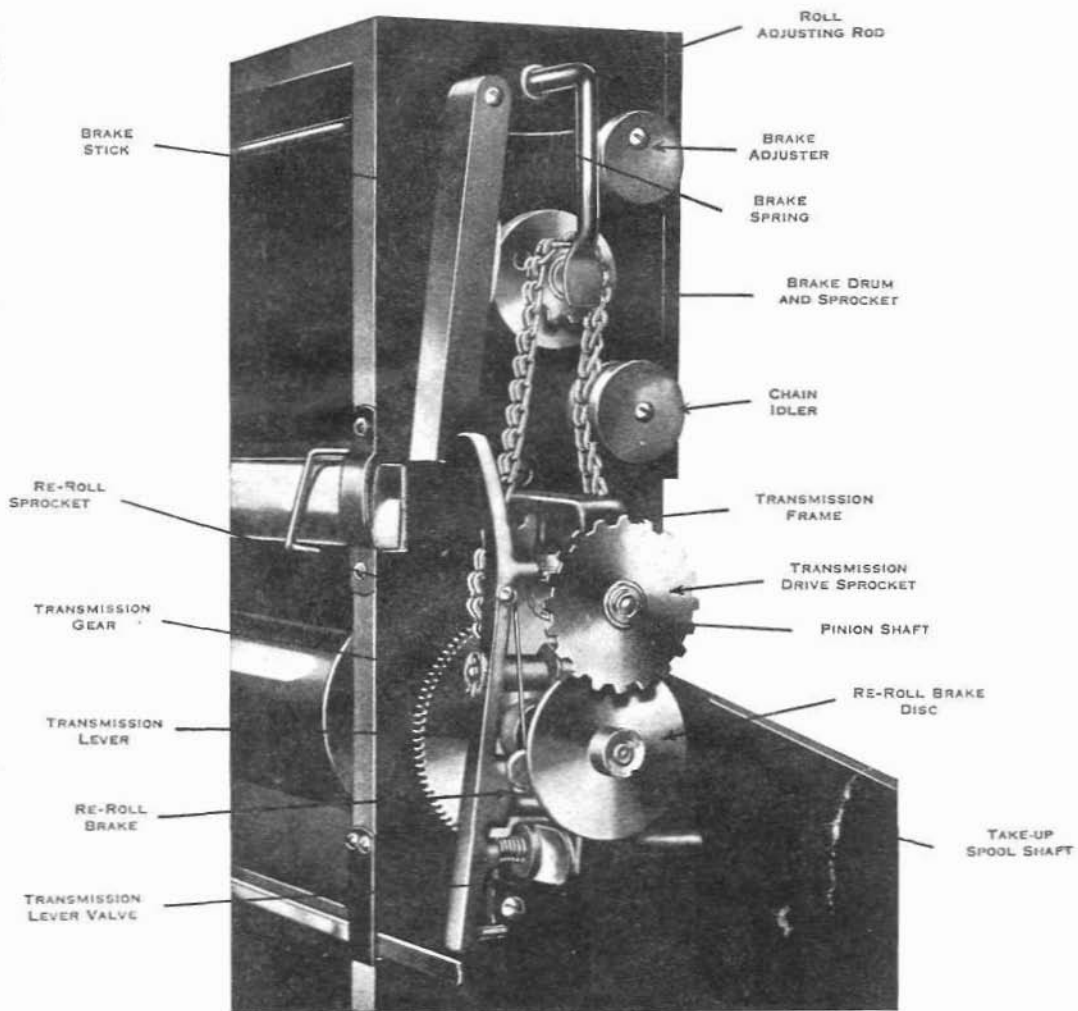


FIGURE 8  
TRANSMISSION AND RELATED PARTS

(See also Figure 9)



## TRANSMISSION AND RELATED PARTS

The transmission assembly is an interchangeable unit readily removed from the spool box by loosening two screws. Its die cast frame provides liberal bearing surfaces for its two shafts with convenient oil holes for the lubrication of bearings. It is extremely rugged in construction and not subject to disorder. At the same time it is constructed with watch-like precision and operates with a minimum of noise.

A most notable feature of this transmission is that its construction does not require the alternate engaging and disengaging of its gears. The large gear and pinion are always engaged and therefore there is no wear or burring of gear teeth incidental to any gear shifting operation.

Pin clutches of simple construction, with hardened steel pins accurately formed to facilitate shifting and to minimize wear relieve the gears of any stresses incidental to reversing the direction of travel of the music sheet.

The arrangement of transmission clutches is better shown by the next illustration, Figure 9. In it the transmission lever is shown in the "play" position with the lower or take up spool clutch engaged. Shifting the lower end of this lever to the left disengages the spool clutch and engages the reroll clutch. At the same time the upper end of the lever lifts the music spool brake stick from the drum and permits the music roll to turn freely.

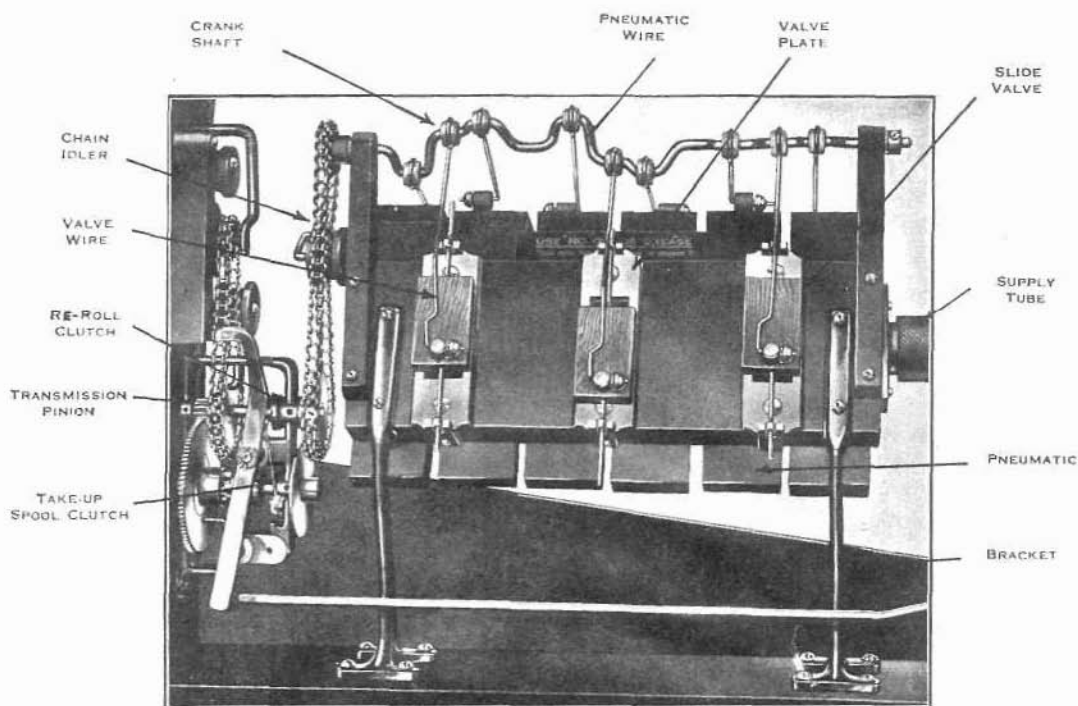


FIGURE 9  
AIR MOTOR

## THE AIR MOTOR

The Amphon Air Motor is constructed with six power pneumatics thus insuring perfect smoothness of operation.

For the operation of the six pneumatics only three slide valves are employed instead of six.

The valve plates are metal of a special composition ground to a true flat surface. This material is not subject to corrosion, will not warp, and is not scored by the slide valves.

The slide valves of the motor are made of mahogany specially treated to prevent warpage.

All other details of the motor represent the best practice known in the construction of this part of the player.

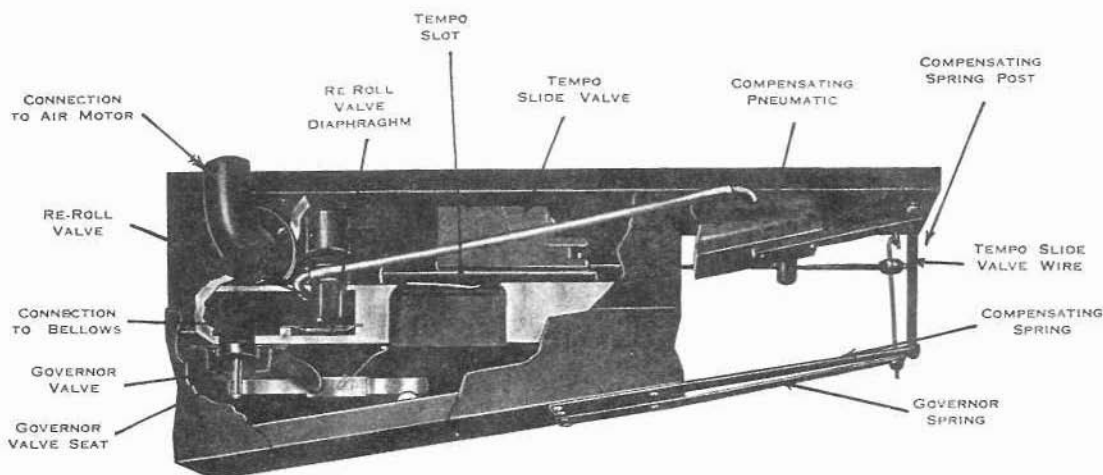


FIGURE 10  
AIR MOTOR GOVERNOR  
*Sectional view from rear as installed*

### AIR MOTOR GOVERNOR

The air motor governor is constructed as a single unit separately installed in the piano to insure maximum accessibility. It is instantly responsive to the slightest change in position of the tempo lever, and provides perfect tempo regulation for the note sheet at all speeds and under every condition of bellows tension.

The governing valve seat is made of cast iron, Parkerized to prevent corrosion, and the structure of the valve moving parts is such as to insure positively against their sticking.

A unique feature of this governor is the means employed for compensating the effects of variations in bellows pressure. A common failing of air motor governors is that they allow the music sheet to speed up under hard pumping conditions and slow down under soft pumping, or otherwise to react erratically to changes in bellows pressure, either sudden or gradual.

In this governor a special pneumatic and spring is provided to compensate exactly the widest ranges of bellows pressure encountered, and thus to maintain a uniform range of travel of the sheet over the tracker bar under all pressure conditions from lowest to highest.

The governor springs are thin leaves of tempered steel, not wire coils. They do not lose their strength or break.

Governor adjustments for regulating the tempo are extremely simple to make, and the points of adjustment are easy to reach.

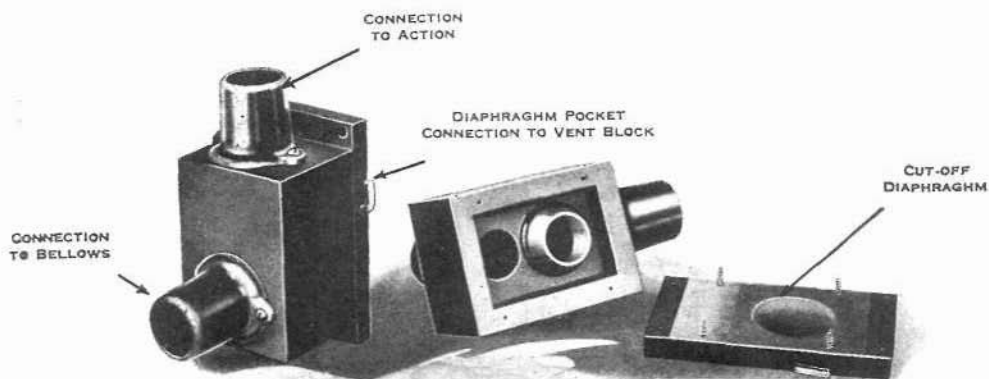


FIGURE 11  
GATE BOX

The gate box, which serves to interrupt the top action supply and prevent the playing of notes during reroll, is another independent unit. It is simple in structure, consisting only of the tube box and diaphragm board, which may be taken apart by removing four screws.

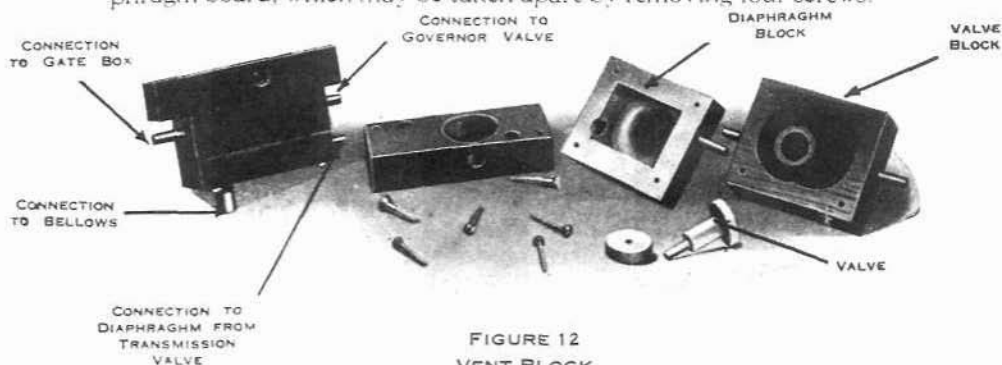


FIGURE 12  
VENT BLOCK

This part of the action is what is known as a primary or relay valve, serving to operate the cut-off diaphragm of the gate box and the reroll valve of the governor.

The diaphragm pocket of the vent block assembly is connected in the installation to a port in the transmission frame, which is closed when the transmission is set in the "play" position and open when the transmission is in the reroll position. During roll the vent block valve is lifted by its diaphragm and in turn this valve admits atmosphere to the gate box and governor reroll valve diaphragms. Thus the top action is cut off from its supply by the gate box, and the reroll valve of the governor provides a direct passage for air from the air motor to bellows, around the governing valve, thus increasing the speed of reroll.

The vent block is of simple and sturdy construction. Its valve is fully protected. The valve seats are of the same moulded composition as is used in the unit valves. It may be taken apart without difficulty if necessary.

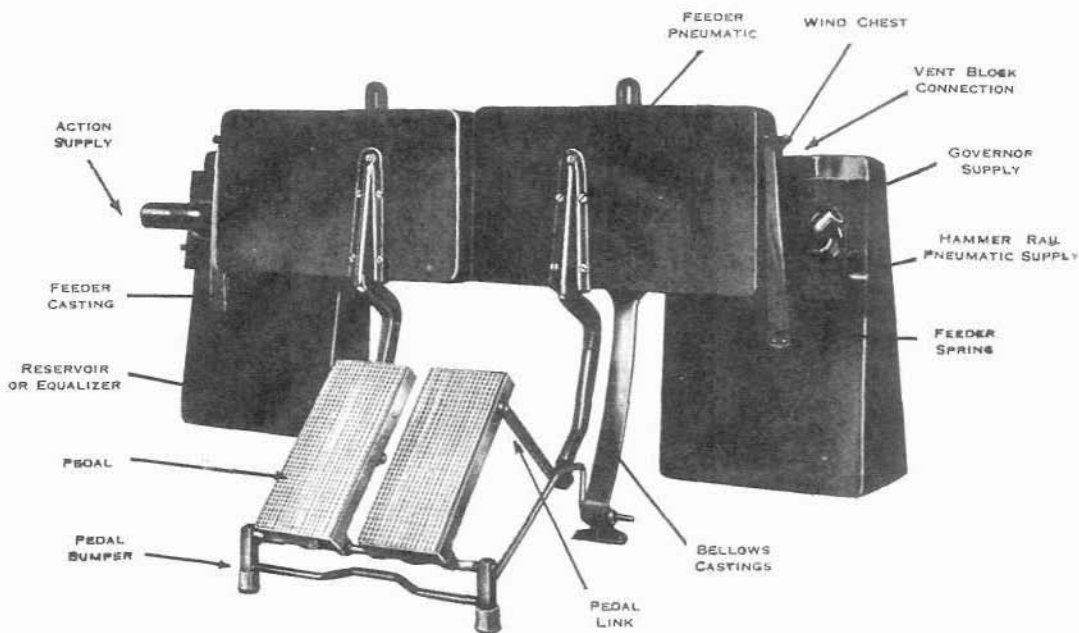


FIGURE 13  
BELLOWS

## THE BELLOWS

Next to the top action, the Bellows or power plant of the player is the most important element of the mechanism.

In this bellows we have a most perfectly balanced unit, exactly suited in capacity to the needs of the action, and easily adjustable as to pedal pressure and speed of pumping to the desires of the operator. The bellows castings or supports are of cast iron sufficiently heavy to withstand all stresses of operation. The same is true of the feeder castings. The design is such as to involve the least possible number of mechanical joints and moving parts between pedals and feeder pneumatics.

Ample reservoir or equalizer capacity is provided and distributed with respect to pressure to smooth out in a perfect manner the intermittent action of the feeders.

The accent valve equipment of the bellows reacts with utmost precision and speed to the slightest accenting foot stroke, making it unnecessary to anticipate the arrival at the tracker bar of notes to be accented, and after accents have been produced there is no carry-over or sustained high intensity effect.

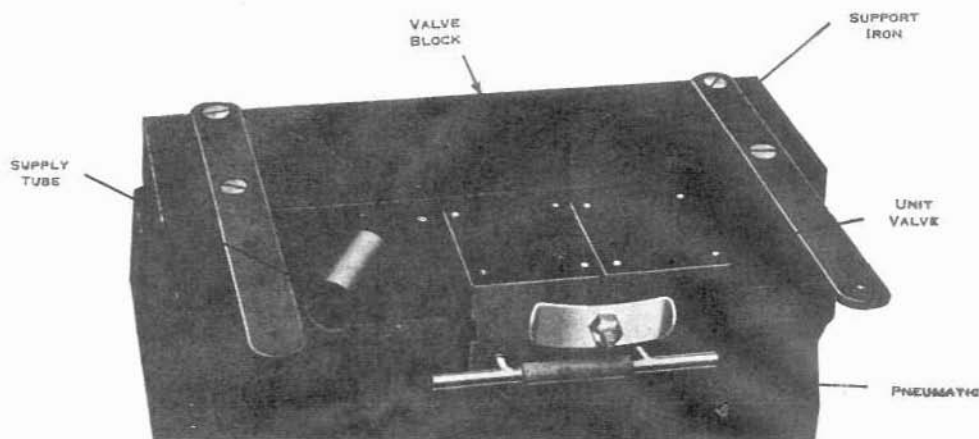


FIGURE 14  
SUSTAINING PEDAL PNEUMATIC

### THE SUSTAINING PEDAL PNEUMATIC

In the sustaining pedal pneumatic assembly the unit valve system is employed as well as elsewhere in the action.

Two valves are provided for the operation of this pneumatic on account of its size and the necessity of rapid operation. One of these valves is constructed with a vent and the other is not. As the diaphragms of both valves are connected together, the single vent serves both of them.

In the installation the valves are connected to the pedal switch and to a finger button in the keybed, so that the pneumatic is operated either from the note sheet or from the keybed, or both, at the will of the operator.

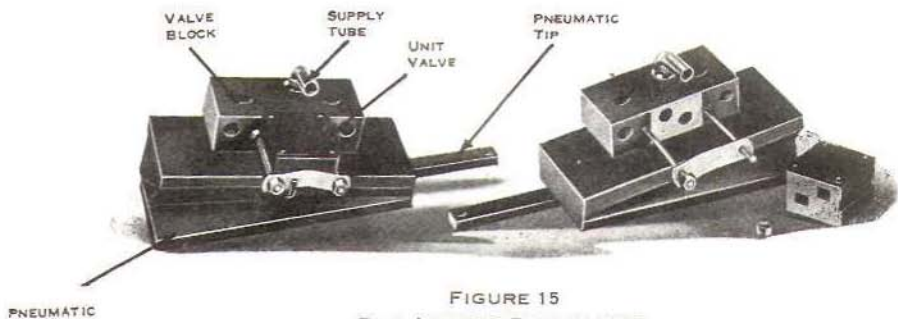


FIGURE 15  
RAIL LIFTING PNEUMATICS

### RAIL LIFTING PNEUMATICS

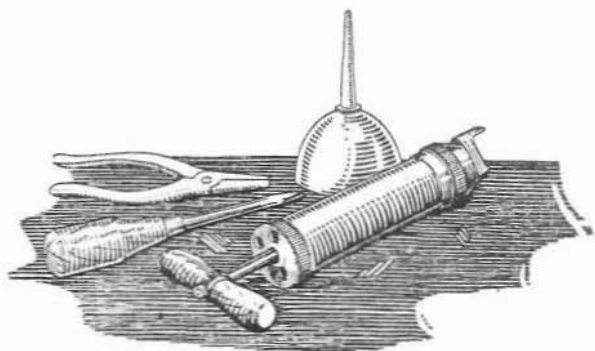
Here again the unit valve construction is seen.

In the case of rail lifting pneumatics, as contrasted with the sustaining pedal pneumatic, only one unit valve is used on account of the smaller size of the pneumatic.

This valve is held in place against the valve block by two studs and nuts, and a special spring

# 3

## How to keep an AMPHION PLAYER ACTION in perfect Working Order





EVERY mechanism, regardless of its kind or function, requires reasonable mechanical care and attention if it is to yield good mechanical service. The piano player action constitutes no exception to this rule. However, in the Amphion Accessible Action the difficulties of upkeep are minimized at all points by the features of accessibility and simplicity outlined in the preceding section.

There are only two details in the way of routine upkeep that are of such importance as to require periodical attention on the part of the owner, but these are really important and should be attended to regularly. These will be outlined first, followed by more technical information intended primarily for the tuner and repair man, but useful as well to the owner.

The two items referred to are pumping out the tracker bar and lubrication.

### THE TRACKER PUMP

Every owner of a player piano should have a good tracker bar pump and should use it regularly.

As the music roll is drawn across the tracker bar it is subjected to a considerable abrasive or scraping action, which loosens small particles of fibre from the paper. These particles are forced into the tracker ports by the air that enters the openings during the playing of the roll.

The small particles of paper, as well as atmospheric dust, collect in the tubes leading from the bar and obstruct the flow of air from tracker ports to valve diaphragms. Eventually, they may reach the diaphragm pockets and then may obstruct the small openings or vents that serve to discharge the air under the diaphragms at the conclusion of the valve's cycle of operation.

Sluggish valve operation and clogged vents may be prevented and more extensive cleaning operations may be avoided by the regular use of the tracker pump, which is a simple, hand operated suction pump or vacuum cleaner with a rubber tip shaped to fit the tracker bar, and a screen that serves to catch the material withdrawn from tracker bar openings.

Use the tracker pump regularly, and the most common difficulty with player pianos, that of impaired valve function, will be avoided.

No set rule can be laid down as to how frequently the tracker should be pumped out. This will depend upon how much the player is used, how much atmospheric dust is present, and the kind and age of the music rolls. Some music roll papers are more easily abraded than others. New rolls will always discharge more lint into the tracker than old ones.

The best guide in the use of the tracker pump is the amount of the material withdrawn from the bar. If a large amount of material is withdrawn, use the tracker pump quite frequently; otherwise, less frequently.

### LUBRICATION

Failure to lubricate moving parts causes premature and unnecessary wear, with its resultant development of looseness and noise.

Points that should receive periodical lubrication are the:

**TRANSMISSION:** Use light non-gumming oil on four shaft bearings, sliding clutches, and gears. Also oil sparingly the surface of the re-roll valve at the bottom of the frame. Use vaseline on the chains and sprockets.

**TAKE-UP SPOOL BEARING:** Apply a few drops of light oil to the spindle at the left hand end of the take up spool, then rotate and move this spindle lengthwise in its bearing to distribute the oil.

**MUSIC ROLL:** Use light oil on the right and left hand music roll spindles, applying and distributing the oil as described above.

**PLUNGER BEARING TIP:** Apply a few drops of oil to the rotating tip of the music spool plunger bearing at the left hand end of the music roll, turning the tip to work the oil into the joint.

**BELLOWS PEDALS:** Oil the bearing at the lower end of the pedal about which the pedal moves. At the upper end of the pedal oil the pedal link connection. Also oil the pin joint at the lower end of the pedal link where it is attached to the bellows feeder iron.

No other routine lubrication is required about the entire player. That outlined above is important and should be looked after with the same regularity as is the periodical lubrication of an automobile. Thus squeaks, rattles, and premature wear may be avoided.

Excess oil applied at the various points should be wiped off to avoid its spreading over adjacent surfaces.

### VALVE FUNCTIONING

Perfect valve functioning is the first essential of good operating conditions in the player action.

Practically every common valve trouble may be forestalled by frequent and proper applications of the tracker pump.

If tubes between tracker bar and unit valves should become obstructed they may be disconnected at the unit valves and cleared by blowing into them.

If vents become clogged, the valves are instantly removable, and the vents may be cleaned with a pin.

A clogged vent is indicated when a note speaks in response to opening its tracker port but the valve does not close and allow the hammer to drop back from the string promptly after the tracker port is closed.

When valves are removed from decks for any purpose it is well to blow them out to remove any accumulated dust. They should be assembled again to the same points from which they came. The packing between valves and decks is somewhat compressible and develops imprints of the deck ports, therefore greater tightness of joints between unit valves and decks is maintained by returning the valves to their original positions.

Each action as manufactured is equipped with a number of spare unit valves, attached to the decks in places where there are no striking pneumatics. Thus, trouble with any valve that is not readily corrected may be overcome by the substitution of one of the extra units.

### AUTOMATIC TRACKING

The correct registration of tracker ports with their corresponding perforations of the music roll is another detail essential to the perfect operation of the player.

The Amphion automatic tracking apparatus shifts the music roll and thus moves the sheet longitudinally across the tracker bar instead of shifting the bar itself as is frequently done.

Referring to Figure 7 the roll adjusting pneumatic is seen at the left of the spool box. This is a double pneumatic with a movable center board attached to the roll adjuster rod. Each side or section of this pneumatic is connected through small internal orifices to a single supply tube, which is connected to one of the decks of the action.

Also each side of the pneumatic is connected to one of the roll adjuster valves, which are mounted above the tracker bar near its ends with their

wires overhanging the bar on the right and left edges of the music sheet. These valves are normally closed when the sheet is in proper position. Under such conditions both sides of the double pneumatic are subjected to the same tension, which holds its center board in a fixed position and centralizes the sheet over the bar.

With the sheet in motion, a movement of it lengthwise of the bar causes the edge of the sheet to make contact with the valve wire toward which the motion occurs. This opens the valve and allows air to enter that side of the double pneumatic to which the valve is connected, rendering that side of the pneumatic inoperative. The opposite side of the pneumatic is thus allowed to collapse. This moves the music roll back into proper position over the bar. If the automatic tracking apparatus fails to function properly, the cause will usually be found to be a leak in the rubber cloth cover of the pneumatic or in its valve or supply connections.

Occasionally it may be necessary to adjust the roll adjuster valves, and this is readily done by simply bending the valve wires with the fingers. When the sheet is in proper registry with the bar the weights at the rear of these valve wires should seal the tubes with which they make contact and the wires should just clear the edges of the sheet.

#### BRAKE DRUM AND MUSIC ROLL BRAKE

These parts (illustrated in Fig. 8) and their adjustment, require special mention only because they constitute an important factor in connection with maintaining proper tempo, or speed of travel, of the music sheet.

The brake drum is integral with the sprocket that drives the upper right hand spindle of the music roll during the reroll of the sheet. During the reroll operation the brake stick is lifted away from the drum by the transmission lever and the brake has no function to perform. However, with the sheet traveling forward over the tracker bar, the brake stick is in contact with the drum, serving to check the rotation of the music roll and subjecting the paper to tension which maintains proper contact between paper and tracker bar.

The contact pressure between the brake stick and the brake drum is adjustable by means of a flat brake stick spring, the free end of which rests on the brake adjuster. This is an eccentric knob mounted on the spool box and supporting the free end of the spring. Rotation of this knob to create a greater spring pressure increases the tension on the music sheet. Rotation of it in the opposite direction decreases the tension of the sheet.

The music sheet tension should be just great enough to keep the paper from vibrating between the music spool and tracker bar, thus preventing the paper from rolling up on the take-up spool too loosely. Too great a tension on the sheet may cause tempo irregularities. Too little tension on the sheet allows slack to form in the paper as it is wound about the take-up spool. This slack may be taken up at intervals during the playing of a roll by the continued rotation of the take-up spool while the travel of the sheet over the bar decreases in speed or stops altogether. It is therefore important to check the music sheet tension and to adjust the music roll brake, if necessary, before proceeding with any other tempo adjustments as described hereafter.

#### CARE OF THE AIR MOTOR

The main point to be observed in connection with the care of the air motor is that of following the instruction card attached to it. Neither oil nor grease should ever be applied to the air motor slide valves. If these parts

require lubrication finely powdered dry graphite is the only proper lubricant to use.

The position of all three of the slide valves is carefully adjusted at the factory; but if adjustments in valve setting are necessary to smooth out the rotation of the motor crank shaft, such adjustments are readily made by slightly bending the valve connecting wires.

In case the slide valves and their plates become covered with sufficient atmospheric dust to interfere with their free operation, and require thorough cleaning and relubrication, the proper procedure is as follows:

First, remove the valves from the motor and clean the motor valve seats by wiping them off with gasoline. Next, surface the contact faces of the valves by rubbing them lengthwise on very fine sand paper held on a perfectly flat surface. Then rub the sanded surfaces of the valves thoroughly with finely powdered dry graphite working the material into the pores of the wood. Finally, replace the valves on the motor in their original positions so as to maintain the original adjustments and to avoid readjusting the valve setting.

There is no objection to the use of a little oil mixed with graphite on the bushings of the air motor wires where they are attached to the crankshaft, if lubrication at these points is necessary to avoid any squeaks that may develop. The end bearings of the crankshaft may be similarly lubricated, if necessary. However, these bushed bearings should preferably be lubricated, when they require it, with dry graphite only.

#### AIR MOTOR GOVERNOR

In detail the construction and functioning of this part illustrated by Figure 10 is as follows:

The governor is connected in the tubing line leading from the bellows to the air motor for the two-fold purpose of controlling the tempo or rate of travel of the music sheet over the tracker bar and of maintaining a constant rate of travel for a given tempo setting, irrespective of the bellows tension.

Air from the motor enters the upper chamber of the governor and flows through the open section of the tempo slot into the governing pneumatic. The extent to which the tempo slot is open in connection with the governor spring tension determines the rate of air influx, and thus the rate of rotation of the motor and the speed of the paper over the tracker bar. The tempo slot opening is determined by the position of the tempo slide valve, the wire of which is connected in the installation to the tempo lever in the key bed and the tempo indicator pointer in the spool box.

From the governing pneumatic the air flows through the governing valve and thence from the governor to the bellows through the connecting tube.

The governing valve operated through its lever by the movable board of the governing pneumatic serves to maintain constant tension within the pneumatic in the following manner:

Under operating conditions air pressure within the governor is less than the external atmospheric pressure and the excess external pressure tends to collapse the governor pneumatic, thus closing the governor valve. Against this action is the resistance of the governing pneumatic spring, the tension of which is adjustable by the nut at its end. Consequently, with a given adjustment of this spring, a balanced condition prevails between the pressure tending to collapse the pneumatic and close the valve and the spring tension opposing this action. This creates a constant tension in the governor applied to the tempo slot opening for any given bellows tension.

However, a constant bellows tension does not prevail in the Foot Pump action, and while other governors compensate imperfectly, or not at all, for variations in bellows tension, the Amphion governor provides perfect compensation for such changes, maintaining constant tempo under all conditions of pumping.

This compensation is accomplished by means of the small auxiliary pneumatic attached to the governor, connected by a supply tube to the bellows side of the governing valve. The interior of this pneumatic is therefore always subjected to bellows tension. Consequently a greater or less force, according to fluctuations in bellows tension, tends to collapse this compensating pneumatic. This force is transmitted to the movable board of the governing pneumatic by means of the post and compensating spring attached to the tip of the compensating pneumatic. Thus a compensating force is applied through the movable board to the governing valve according to the bellows tension that may prevail. This serves to regulate exactly the opening of this valve according to any bellows tension that may prevail, the valve being more nearly closed under high bellows tension conditions and opened further under low bellows tension condition.

To expedite reroll at any position of the tempo setting, a by-pass valve is present in the governor which is lifted during reroll by its diaphragm to provide a direct path of communication for the air from the motor to the bellows around the tempo slot and governor valve. The by-pass or reroll valve diaphragm of the governor is inflated by atmosphere admitted to it through the vent block valve when this valve is operated by the opening of the transmission port, when the transmission lever is in the reroll position.

The compensating pneumatic of the governor is carefully adjusted to perform its function properly at the factory and rarely if ever needs attention, but should occasion require, this element may be adjusted as follows:

If the rate of note sheet travel tends to increase under heavy pumping and to decrease under light pumping the effective length of the post between compensating pneumatic tip and compensating spring should be increased by adding one or more washers of felt or cardboard at the end of the post. If the reverse occurs decrease the effective length of the spring post by removing punchings.

#### TEMPO REGULATOR AND GOVERNOR ADJUSTMENT

Several conditions are involved in maintaining correct tempo regulation and since this is such an important factor in the quality of musical rendition these will be outlined at some length.

First of all, it is important to have all moving parts of the transmission, air motor, etc., in good mechanical condition. Therefore, before any governor adjustments or other tempo adjustments are made, these details should have attention.

See that the music roll bearings, the take up spool bearings, and the transmission are clean, properly lubricated, and in general, in good running order. For instructions concerning the lubrication of these parts see the previous section on Lubrication.

Next, see that the music spool brake is properly adjusted to apply the proper amount of tension to the music sheet. Make necessary adjustments according to instructions contained in the section on this subject.

Following this, see that the air motor is operating properly. If it is not, follow the instructions given on the care of the air motor.

Also see that the transmission and air motor chains are lubricated and are properly tensioned, adjusting the chain idlers, if necessary, to bring about proper conditions.

It will be found that many tempo irregularities, when encountered, may be traced to improper conditions among any or all of the above mentioned parts. Setting all of them in good order frequently obviates the necessity of making governor adjustments.

Proceeding now to the governor, the mechanical connections from the tempo slide valve wire to the tempo lever in the key bed and to the tempo indicator pointer should be checked and adjusted if necessary. With the tempo lever at its extreme left position the tempo indicator pointer should stand at "0" or a little below this point on the scale. With this condition prevailing the air motor should not run but should just start when the tempo pointer is shifted to the neighborhood of 10 on the scale.

The levers at the rear of the tempo lever rod should swing an equal distance to the right and left of a vertical position when tempo pointer is moved from 0 to 120 on the tempo scale.

Adjustment to bring about these conditions may be made, if necessary, by regulating the lengths of wires that connect the tempo indicator to its lever on the tempo rod under the key bed, and by adjusting the nuts on the tempo slide valve wire of the governor.

After all mechanical conditions are as they should be according to the above, set the tempo indicator at 70 and time the rate of music sheet travel over the tracker bar by using a roll with two marks on it  $3\frac{1}{2}$  ft. apart. At tempo 70 the roll should move from one mark to the next in half a minute, or at the rate of 7 ft. per minute. If the movement is too slow, increase the tension on the governing pneumatic spring by adjusting the nuts on the spring wire toward the top board of the governor. If the movement is too rapid adjust the spring tension in the reverse direction.

In case tempo irregularities prevail in connection with variable bellows tensions, adjust the length of the compensating pneumatic spring post of the governor according to instructions previously given.

## BELLOWS CARE AND ADJUSTMENTS

Lubrication of pedal bearings and pedal connecting links constitute the only routine care required by the bellows. For instructions concerning this see the previous section on "Lubrication."

The pumping characteristics of the bellows may be changed within wide limits to suit the pleasure of the individual operator as follows:

Two holes are provided in each pedal for the connection of the upper end of the pedal link. The pedal link is assembled to the pedal at one of these two points by means of a screw held in place by a set screw through the back surface of the pedal, which must be loosened or backed off, before the point of attachment of the pedal link to the pedal can be changed. Two holes are provided in the lower end of the pedal link for its attachment to the bellows feeder iron. Also two holes are provided in the bellows feeder iron for the attachment of the link.

The condition which yields the easiest pumping, as measured by the lightest pressure or resistance under foot, is that which provides the greatest leverage between the pedal and the movable board of the bellows feeder. This condition prevails when the pedal link is attached to the lower hole of the pedal

and attached to the lower hole of the bellows feeder casting, making use of the second hole in the end of the pedal link for the latter connection.

Although the above described connection between the pedal and the bellows feeder iron provides the least pedal resistance under foot, it also necessarily involves a greater rapidity of pedal strokes. Therefore, while one individual might consider this to be the easiest or lightest pumping condition, another might prefer heavier pedal pressure under foot with less speed of pedaling.

It is because of the different tastes of individuals in this respect that the Amphion Action bellows is made with the wide range of adjustments it possesses to vary the pumping characteristics. The mechanical condition for heaviest pressure under foot and lowest speed of pumping is the reverse of that outlined above, namely; the adjustment of the pedal link to the upper hole of the pedal and to the upper hole of the feeder casting, employing for the latter connection the end hole of the link.

Various combinations between these two extremes of mechanical connections are obviously possible, and the combination best suited to the needs of the individual owner may be selected.

Adjustment of the accent valve of the bellows is rarely, if ever, necessary; but this member of the apparatus is readily accessible if adjustments are required. The accent valve is situated in the bass or right hand reservoir pneumatic of the bellows. The removal of the small panel from the back of this pneumatic exposes the valve, which is a simple open-end pneumatic, normally held open by means of a spring in its hinge end to allow the free passage of air between the wind chest of the bellows and the reservoir pneumatic.

A sudden foot stroke, either heavy or light, applied to either pedal instantly closes the accent valve or pneumatic, thus interrupting the means of communication between the bellows wind chest and the bass reservoir pneumatic. Following such a foot stroke the accent valve springs open and opens the connection between the two parts. If accents are too sharp the tension of the spring at the hinge end of the valve or pneumatic should be increased. If accents are not sufficiently sharp this spring tension should be decreased.

The treble reservoir pneumatic of the bellows is not provided with an accent valve. Thus it is always in communication with the wind chest of the bellows. The capacity of this pneumatic and the arrangement of its internal springs is such as to cause it to function as an equalizer for the intermittent strokes of the pedal and to provide an ever present cushion for pedal strokes throughout all ranges of bellows tension.

## GENERAL

Since no manual of instructions on the care and upkeep of the player action can be so complete as to cover every situation in the way of improper functioning that may arise, it is the policy of the manufacturer of this action to invite correspondence on unusual difficulties and their treatment.

Any one who encounters difficulty with an Amphion Accessible Action and cannot correct it with the aid of the foregoing information should communicate at once with the manufacturer, sending a complete description of the difficulty with information as to what, if any, steps may have been taken to overcome it.

## THE RECORDO ROLL EXPRESSION ACTION

**I**N addition to being made as a straight foot pump player the Amphion Accessible Action is also constructed as an automatic expression player for the Recordo Music Roll.

In this form the action possesses every feature of distinction and accessibility of the regular Amphion Action, because in its principal parts it is identical with the action described on the preceding pages. In fact, the Recordo Roll Expression Action by the shifting of a small lever in the spool box may be made to operate exactly as the regular foot pump action, with any type of music roll.

The expression apparatus of the Recordo Action is simple in structure and possesses every feature of complete accessibility and ease of maintenance characteristic of the Amphion Action in general.

At the same time the expression apparatus is constructed in principle along lines that yield complete control of expression from the Recordo Music Roll, and insure the interpretation of the music exactly according to the cutting of the roll.

The details of construction of the Recordo Action expression apparatus are explained in a supplementary booklet.



*Printed in U. S. A.*