

The Perforating of Music Rolls

With the

TEABARJAN

Perforator

BY

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P R E F A C E




HIS BOOK is issued to familiarize owners of mechanical pianos and organs with every detail of our simple method of music roll making. The music roll is ordinarily considered a mysterious product of complicated machinery, the operation of which requires a knowledge of musical composition as well as mechanical ability. As a matter of fact any child can readily understand the simple principles involved. Every player-piano or mechanical instrument that is operated by air has a wooden or metal strip called the tracker-bar, containing small holes, over which the perforated music roll travels, covering or exposing the holes as may be desired. As the music roll passes over the tracker-bar we notice that each perforation has a duty to perform. Each key on the key-board is controlled by one of the small holes in the tracker-bar, and when air is permitted to enter into any one of them, the respective key responds immediately. The most improved instruments have additional holes which provide expression or operate the pedals. The relative position of the holes in the tracker-bar corresponds to the keys of the piano, beginning with the lower or bass notes on the left and terminating with the high or treble notes on the right. Thus the perforation in the music roll determines the pitch of a note. The bass notes are on the left of the roll and the treble notes on the right.

The duration of a tone depends upon the length of time during which the corresponding hole in the tracker-bar remains uncovered. Hence, the length of the perforation on the roll determines the length of the note which is played. If the note which is to be played is short, the perforation will be short. If the note is a long one, the perforation is correspondingly long. A definite relation between length of perforation and length of tone is maintained throughout the music roll.

The making of music rolls therefore simply involves a process of accurately locating perforations in a strip of paper and also a method of determining the length of the perforations. These operations are easily understood and learned by means of the illustrations and descriptions given in the following pages.

With the aid of the Leabarjan Patent Music Roll Perforator anyone can readily accomplish the interpretation of music for reproduction on mechanical players. This book covers all the essential principles of music which must be understood in order to accurately reproduce any composition of music. Even those who do not have a knowledge of the fundamentals of music will find the principles presented in such a simple manner that they will quickly be able to master the subject. For not only does the Leabarjan Perforator produce the best of music rolls; it also teaches music by beginning with simple rules and progressing until the most difficult compositions can be interpreted and reproduced. The operator in making music rolls will thus unconsciously acquire a thorough understanding of the principles of music.

DEFINITIONS

USICAL ideas are expressed in writing by characters called NOTES. The notes are expressed by the first seven letters of the alphabet; A, B, C, D, E, F, G. Notes are written on five parallel lines and in their spaces; which, taken collectively, are termed the staff, or stave. To augment the scope of the staff, added or leger lines, above and below the staff are used. Names of the notes and their pitch are ascertained by means of a character called a clef, which is placed at the beginning of the staff. There are two principal clefs, viz., the treble and the bass clef. In musical notation the upper staff is usually the treble clef, and the lower staff the bass clef.

A sharp (♯) raises the pitch of a printed note a half step; literally the next key above. A half step or semitone is the smallest interval used in modern music and the divisions on the Note Scale represent half steps or semitones.

A flat (♭) lowers the pitch of a printed note a half step; literally the next key below.

A double sharp (♯♯ or ※) or a double flat (♭♭) indicates a whole step above, or below a printed note.

A natural (♮) contradicts the sharp or the flat and restores the note to its original state.

A double sharp is contradicted by a natural followed by a sharp, (♮) ♯.

A double flat is contradicted by a natural followed by a flat, (♮) (♭).

An accidental is a sharp, or flat, or natural that changes the pitch of a note to one foreign to the key of the composition or passage.



A succession of seven notes ascending or descending is called a scale. The word key is used synonymous with "scale" and implies a regular succession of sounds, regulated by a principal note called a key-note or tonic.

NOTE SCALE

Leabarjan Music Roll Perforator
 Patented October 11th, 1911
 Leabarjan Manufacturing Co.
 Hamilton, Ohio
 U. S. A.

Middle
C



THE above is a reproduction of the Note Scale as shown in the illustration of the perforator on page 12. The character  at the beginning of the upper staff indicates that it is the Treble Clef and the note called "middle C" is placed on the first ledger line below the staff. The character  at the beginning of the lower staff indicates that it is the Bass Clef and "middle C" is placed on the first ledger line above the staff. The "octave" of any note is the next note of the same name, above or below on the scale. From one "C" to the next "C" is called an octave; from "D" to "D" is an octave, etc.

The purpose of the Note Scale is to accurately locate the note which is to be perforated. The Λ shaped notches directly beneath the names of the notes will correspond with the holes in an 88-note tracker-bar. The standard 88-note scale is shown above to illustrate the principle, but music rolls can be made for any mechanical instrument by providing the correct Note Scale. For instance, if the player-piano is a 65-note, the scale must have 65 notches. The number of notches in the Note Scale and the exact spacing will depend upon the style of instrument for which music rolls are to be made.

The perforators are provided with a punch that may be moved widthwise across the paper and in this manner the desired note is located. A Λ shaped index corresponding to the notches in the Note Scale holds the punch in position at any note on the scale. The operator locates the notes on the Note Scale in the same position on the staff as they are found in the composition. The beginning of the perforation is located from the Time Scale.

In locating the notes of a composition on the Note Scale it is best to follow a definite plan in order to avoid omitting notes. As one note is perforated at a time it is advisable to cut all the notes of one measure in the Treble Clef and then proceed with the notes in the Bass Clef.

KEY OF COMPOSITION



At the beginning of every musical composition there is a Key Signature, denoting that certain notes throughout a part or entire selection must be sharpened, or flattened. The absence of a Key Signature indicates that the composition is written in the key of "C" and the notes must be located on the Note Scale according to their position on the staff. The sharps or flats necessary to the key of a composition are marked at the Key Signature and they affect all the notes during the composition, unless contradicted by a natural. In making music rolls the operator should remember the names of the notes that are to be sharpened or flattened.

Accidentals may appear before a note, changing it to a sharp or flat or natural. Such changes will be indicated by the proper sign appearing before the note—this will affect only the measure in which the sign appears unless otherwise cancelled.

The following is a list of the different Key Signatures used in musical composition, showing key of composition and notes that are to be sharpened or flattened.

No. of SHARPS KEY NOTES TO BE SHARPED UNLESS CONTRADICTED BY A NATURAL OR DOUBLE SHARP.

0.....	C.....	
1.....	G.....	F.
2.....	D.....	F, C
3.....	A.....	F, C, G
4.....	E.....	F, C, G, D
5.....	B.....	F, C, G, D, A
6.....	F#.....	F, C, G, D, A, E
7.....	C#.....	F, C, G, D, A, E, B

(See example of Key Signature on page 24.)

No. of FLATS KEY NOTES TO BE FLATTED UNLESS CONTRADICTED BY A NATURAL OR DOUBLE FLAT.

0.....	C.....	
1.....	F.....	B
2.....	Bb.....	B, E
3.....	Eb.....	B, E, A
4.....	Ab.....	B, E, A, D
5.....	Db.....	B, E, A, D, G
6.....	Gb.....	B, E, A, D, G, C
7.....	Cb.....	B, E, A, D, G, C, F

(See example of Key Signature on page 20.)

In order to avoid mistakes, the operator should memorize or have a memorandum of the names of the notes that are to be sharpened or flattened—the key of the composition. Keep this in sight at all times

DEFINITIONS



MUSICAL NOTATION is expressed by notes printed upon a staff consisting of five lines and four spaces with added, or leger, lines above and below to augment its scope. Every composition has upright lines drawn across the staff dividing it into equal proportions called MEASURES. The figures standing at the beginning of a composition are called the TIME SIGNATURE. The upper figure denotes the number of counts or beats in the measure, the lower figure the value of the note that fills each count, e. g. 2-4 means 2 counts, each count the value of a quarter note.

TIME is the subdivision of the measures into counts, or beats, of equal length.

RHYTHM is a regular recurrence of accents, thus establishing a sense of regular pulsation in the flow of the musical thought or expression.

ACCENT is special emphasis given to certain notes in playing.

A SLUR is a curved line extending over two or more different notes. It is primarily an indication that all the notes under it are played legato, though it has further significance in marking the phrasing of a composition.

LEGATO is imparting the full value to each note (or tone) thus producing a smooth, connected effect in playing a succession of tones. In other words each tone is to be sustained until the next tone begins, without the slightest break or detaching between them.

STACCATO is indicated by dots placed over, or under, the notes, or by the word "staccato". Staccato is shortening the value of the note by releasing the key before the full value has expired.

A TIE is a curved line connecting two consecutive notes, of the same name and pitch, into one continuous tone, the first note being played and the key held down through the full value of both notes.

A DOT always increases, by one-half, the value of whatever precedes it, whether it be a note, dot or rest.

A HOLD is a short curved line with a dot beneath it indicating that whatever stands under, or over it, is held longer than the original value. It should be held at least twice the value of the note.

All these different effects can be reproduced in a perforated music roll and will be illustrated as we go along

Comparative Value of Notes and Rests



The most important feature in any musical composition and therefore in a perforated music roll is the proper time value to be given each tone and rest.

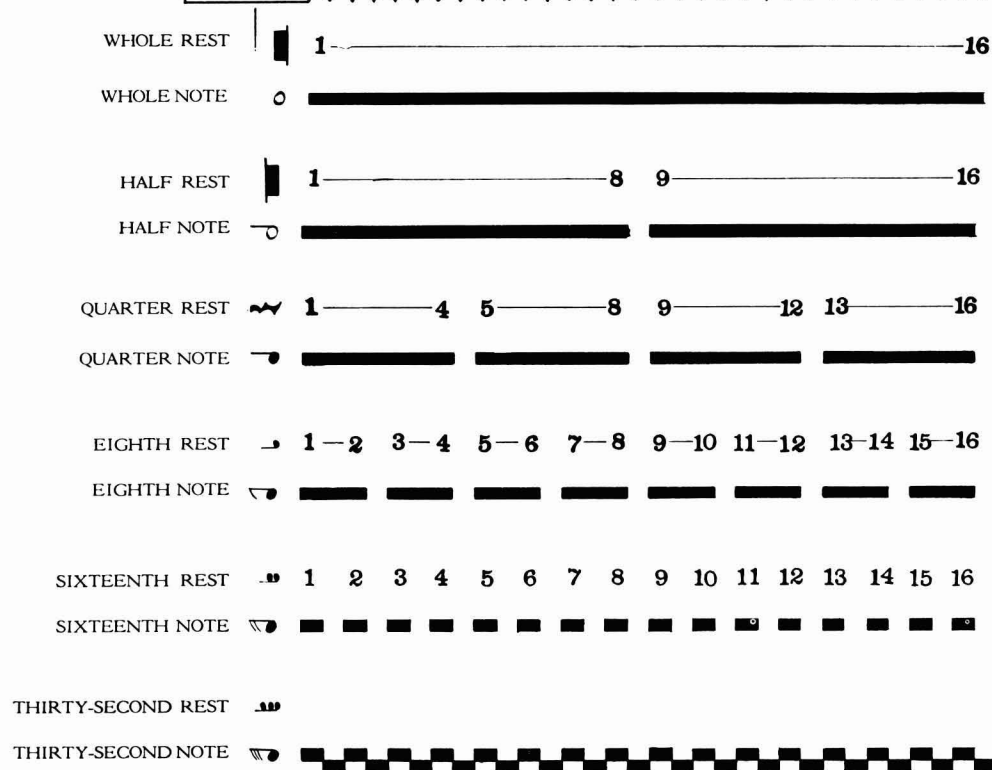
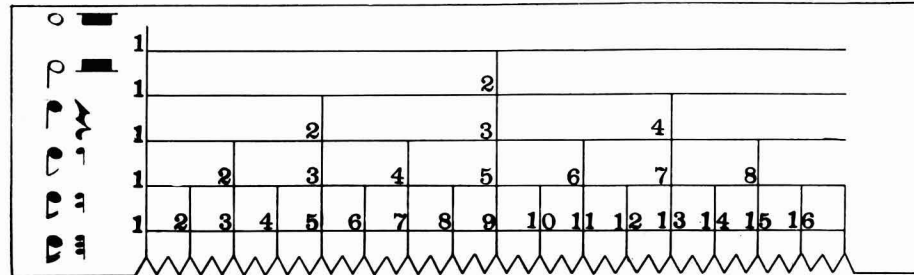
In musical notation the duration or time-value of tones and rests is denoted by various symbols called notes and rests, all of which are included in the above chart.

Before making a music roll the operator should be able to clearly distinguish between whole, half, quarter, eighth, sixteenth, thirty-second, and sixty-fourth notes and rests, as shown in the chart.

From the chart it can be seen that a whole note equals two half notes, four quarter notes, eight eighth notes, four triplets, sixteen sixteenth notes, thirty-two thirty-second notes, and sixty-four sixty-fourth notes. The comparative value of notes and rests is very important in determining the length of a perforation or distance between perforations.

Note—Sixty-fourth notes are seldom used in musical notation

LEABARJAN



Time Scale of Perforator



VERY Leabarjan Perforating Machine has what is known as a "time scale" designated by the figure "3" in the description and illustration of the machines. (See pages 12, 14, 16.)

The purpose of the time scale is to accurately locate the beginning, length, and end of each perforation. It is also used in determining the distance between perforations.

By comparing the time scale with the chart on page 7, the principle can easily be understood.

NOTE—As a music roll passes over the trackerboard the perforations appear in a vertical position, but throughout this book the examples of perforations are shown in a horizontal position which is their relative position to the paper and to the time scale when perforating a roll. Compare with illustrations on pages 12, 14, and 16.

Graphical Representation of Notes



IN the chart shown on the opposite page, notes and rests are illustrated graphically by heavy and light lines respectively, representing the division of time in a measure of music. The line representing the perforation corresponding to a whole note is equivalent to a full bar or measure, and as will be noticed by referring to the lines representing the perforations for notes of lesser duration, the bar or measure is subdivided into sixteen equal portions.

A WHOLE NOTE is equal to sixteen sixteenths, starting on No. 1 of the Time Scale and ending at No. 16.

A HALF NOTE is equal to eight sixteenths, and the perforation must begin on No. 1 and end at No. 8; the second half starting on No. 9 and continuing on to No. 16.

A QUARTER NOTE is equal to four sixteenths, and the perforation beginning at No. 1 extends to No. 4, leaving the space between No. 4 and No. 5. The second quarter note starts on No. 5.

EIGHTH NOTES are equal to two sixteenth notes, and the entire space between No. 1 and No. 2 must be perforated. Begin the second perforation of an eighth note on No. 3 and perforate a continuous opening to No. 4. This leaves the space between No. 2 and No. 3 for releasing the tone.

SIXTEENTH NOTES correspond to the sixteen numbers on the Time Scale—one perforation is required for each note.

THIRTY-SECOND NOTES are represented by each notch of the Time Scale.

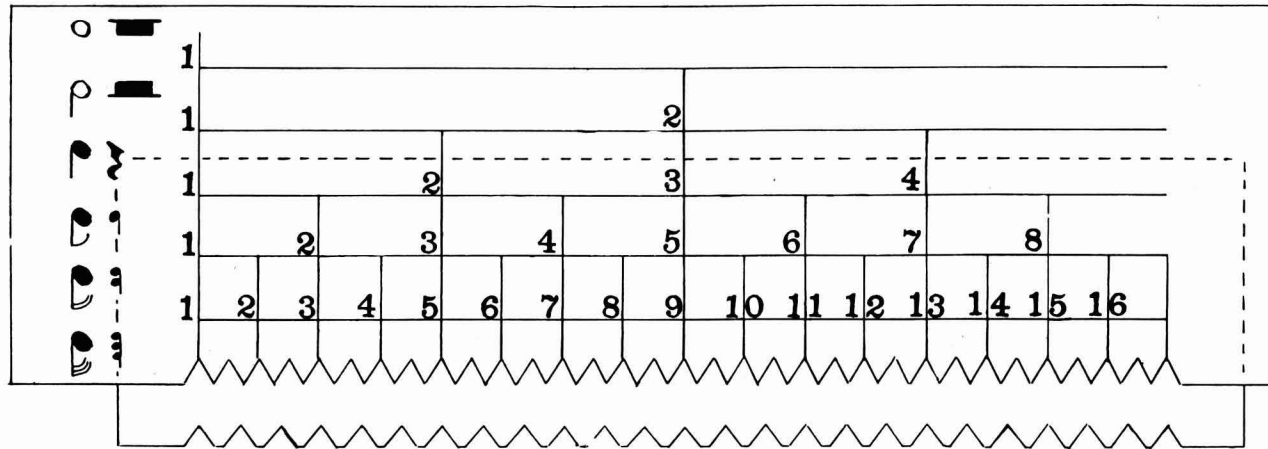
ALL NOTES should be measured according to the value of sixteenths.

Inasmuch as a measure of music usually consists of different kinds of notes, such as half notes, quarter notes, eighth notes, etc., the reader will understand that a note may begin at any point on the Time Scale. For instance, the first note in a measure may be a quarter note—the perforation would be started at No. 1 and ended at No. 4. The next note may be an eighth note—started at No. 5 and ended at No. 6. The following note may be a sixteenth note—perforated on No. 7. A sixteenth note following this one would be perforated on No. 8. The last note may be a half note—the perforation starting on No. 9 and continuing to No. 16.

A rest may also occur in a measure of music and its time value is counted by OMITTING the perforation. If there is an eighth rest at the beginning of a measure, the first perforation begins on No. 3 of the Time Scale, allowing the distance between No. 1 and No. 2 for the rest.

Note—See illustration on page 12, showing use of the Time Scale

Time Scale With Triplet Index Plate



Sometimes the time-value of tones is divided into what are designated as "Triplets". In musical notation a triplet is shown as a group of three notes with a figure 3 over or under it.

The above chart illustrates a quarter note with triplet formation, and the corresponding heavy lines illustrate the perforations. To make the corresponding perforation a special index plate (shown above) is arranged to drop below the regular Time Scale by turning a key on the reverse side. The reading of time is taken from the regular Time Scale, while the index divides evenly by three.

LEABARJAN

The Leabarjan Perforator in the Schools



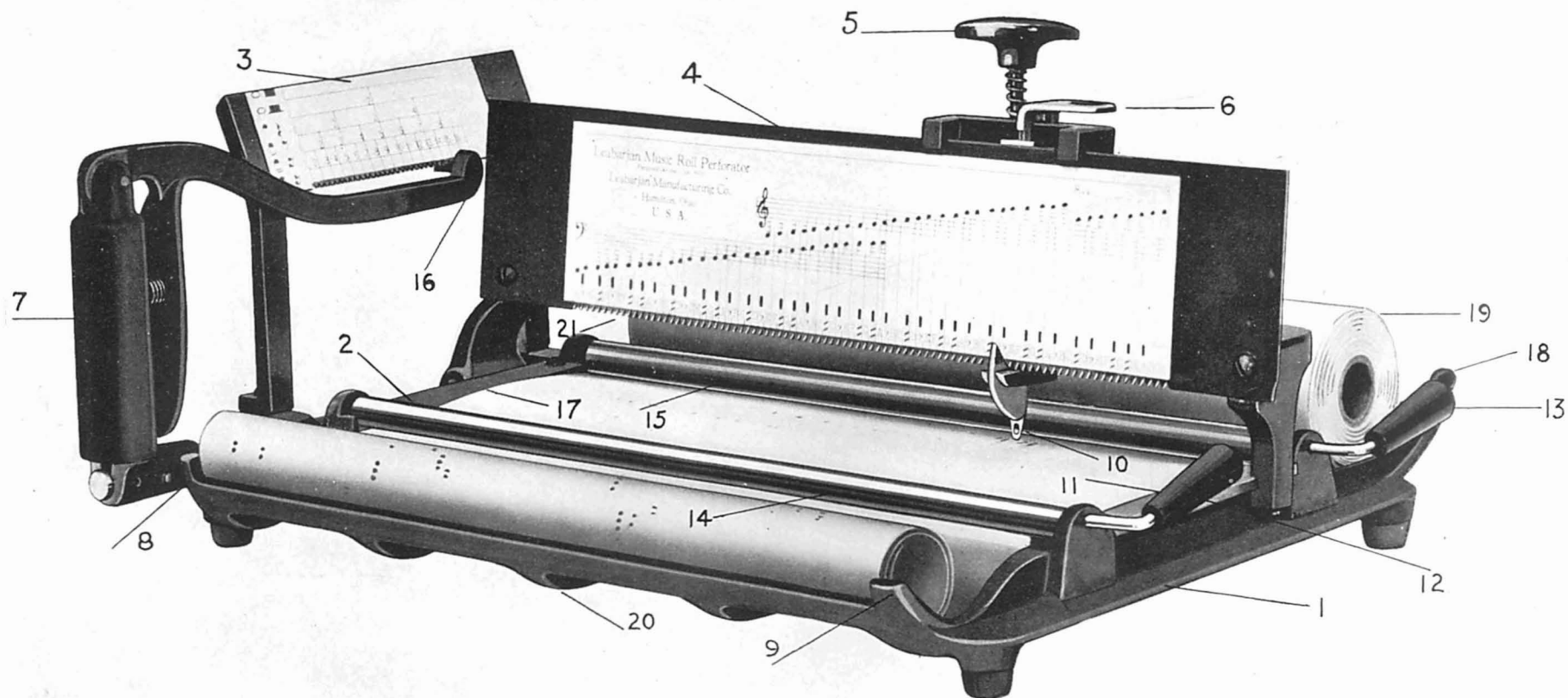
The above illustration shows one of the Leabarjan Perforators, Style 5, being used for educational purposes in a public school room. The music teacher is demonstrating the use of the machine to a group of students.

The Leabarjan Perforator affords a very interesting and successful method of teaching the time values of notes and rests, the position of notes on the staff, the piano key-board, different scales, and all the fundamental principles of music. The science of music is a separate and fundamental subject, the problems of which should be mastered, if possible, before the instrument of expression is chosen. This is possible where the student learns to make a perforated music roll—with the Leabarjan Perforator genuine music study will be a pleasure and the student will be anxious to accomplish a greater task each day.

The Leabarjan Perforator will give the music student a tangible record of his knowledge of music; a record that will not only be a book of notes that he has written or from which he has played or studied, but a roll of perforated music that will immediately reveal the accuracy of his musical understanding.

LEABARJAN

LEABARJAN MENTOR—"STYLE 3"



Names of Machine Parts

- | | | |
|-----------------------|----------------------------|-----------------------------|
| 1. Base | 8. Left Front Paper Guide | 15. Rear Paper Fastener |
| 2. Cross Slide | 9. Right Front Paper Guide | 16. Time Scale Index Pin |
| 3. Time Scale | 10. Punch | 17. Left Paper Guide |
| 4. Note Scale | 11. Right Paper Guide | 18. Right Paper Guide, Rear |
| 5. Punch Button | 12. Front Nipper | 19. Paper Supply |
| 6. Note Scale Index | 13. Rear Nipper | 20. Front Roll Holder |
| 7. Cross Slide Handle | 14. Front Paper Fastener | 21. Notches in Note Scale |

Note—Place a drop of oil on moving parts occasionally

Instructions for Operating the Leabarjan "Mentor" "Machine Style 3"



HAVING familiarized ourselves with the fundamentals of musical notation and the corresponding relationship of the perforations in a music roll, we are now prepared to proceed with the actual perforation of a music roll. The following explanations apply especially to the "Leabarjan Mentor", the machine shown on the opposite page, but the simple principles involved are exactly the same for all the other machines for which any additional instructions are given under their respective head.

The Leabarjan Perforator, Style 3, which we call the "Leabarjan Mentor" is especially designed to familiarize player-piano owners with the principles of music. The operator of the Leabarjan Mentor will find that the making of music rolls teaches music in a very satisfactory and interesting manner. Those beginning the study of music usually have difficulty in understanding the subjects of "Time" and "Rhythm", but the construction of the Leabarjan Mentor permits of simple explanations and illustrations, which by ordinary methods of music instruction are hardly possible. A miniature key-board is before the operator at all times, affording a very interesting study of the position of keys on the piano and the corresponding notes on the printed scale.

To facilitate a ready understanding of the different steps in the operation of the machine, the illustration and description on the opposite page should be referred to.

First, place the roll of paper in the rear paper supply holder and draw sheets beneath paper fasteners No. 15 and No. 14. Allow about 20 inches of paper before beginning perforations of roll. This is to allow sufficient paper to shape the end for the end-fastener on the roll, and to give the mechanism of the player a proper start.

Be sure to have edge of paper snug against the right paper guide No. 11. The left paper guide No. 17 must be adjusted to take care of any slight variation in the widths of different rolls of paper.

With the paper in this position, tighten the rear nipper No. 13 and give paper a tension before tightening the front nipper No. 12.

Having the adjustment of paper complete, with the right hand release the note scale index No. 6 (by pressing downward) and move on note scale No. 4 to the desired note, which can be located by those unfamiliar with reading notation, by merely finding the same note on the note scale No. 4 as is shown in the respective bass or treble clef of the composition to be perforated. The notches No. 21 on the note scale No. 4 serve to hold the index No. 6 at any note desired.

With the left hand grasp the cross slide handle No. 7 and with slight pressure release index pin No. 16 from the notches in the time scale No. 3. With the left hand the index pin No. 16 can be moved to any position on the time scale.

After locating the first note to be perforated and having the time scale index pin No. 16 at the first notch on the time scale (assuming a quarter note is to be perforated) with the right hand give punch button No. 5 LIGHT VIBRATING TAPS—do not strike the punch button with the full pressure of the hand. With the left hand move the time scale index pin No. 16 one notch forward and continue this operation to the figure 4 on the time scale No. 3.

For the following note advance to the figure 5 on the time scale, omitting perforation; this allows space between perforations for releasing tone.

After perforating every note in the bass and treble clefs of the first measure, set the time scale index pin No. 16 in the last notch of the time scale No. 3, and locate the first note of the next measure on note scale No. 4. Make only ONE perforation and move time scale index pin to the figure 1 on the time scale No. 3.

Release paper nippers No. 12 and No. 13 and draw paper forward until the last perforation made is directly beneath punch No. 10. In moving paper, allow it to pass between paper guides No. 8 and No. 9. This is necessary to keep the perforations in alignment.

The paper must track against the right paper guide No. 11 at all times.

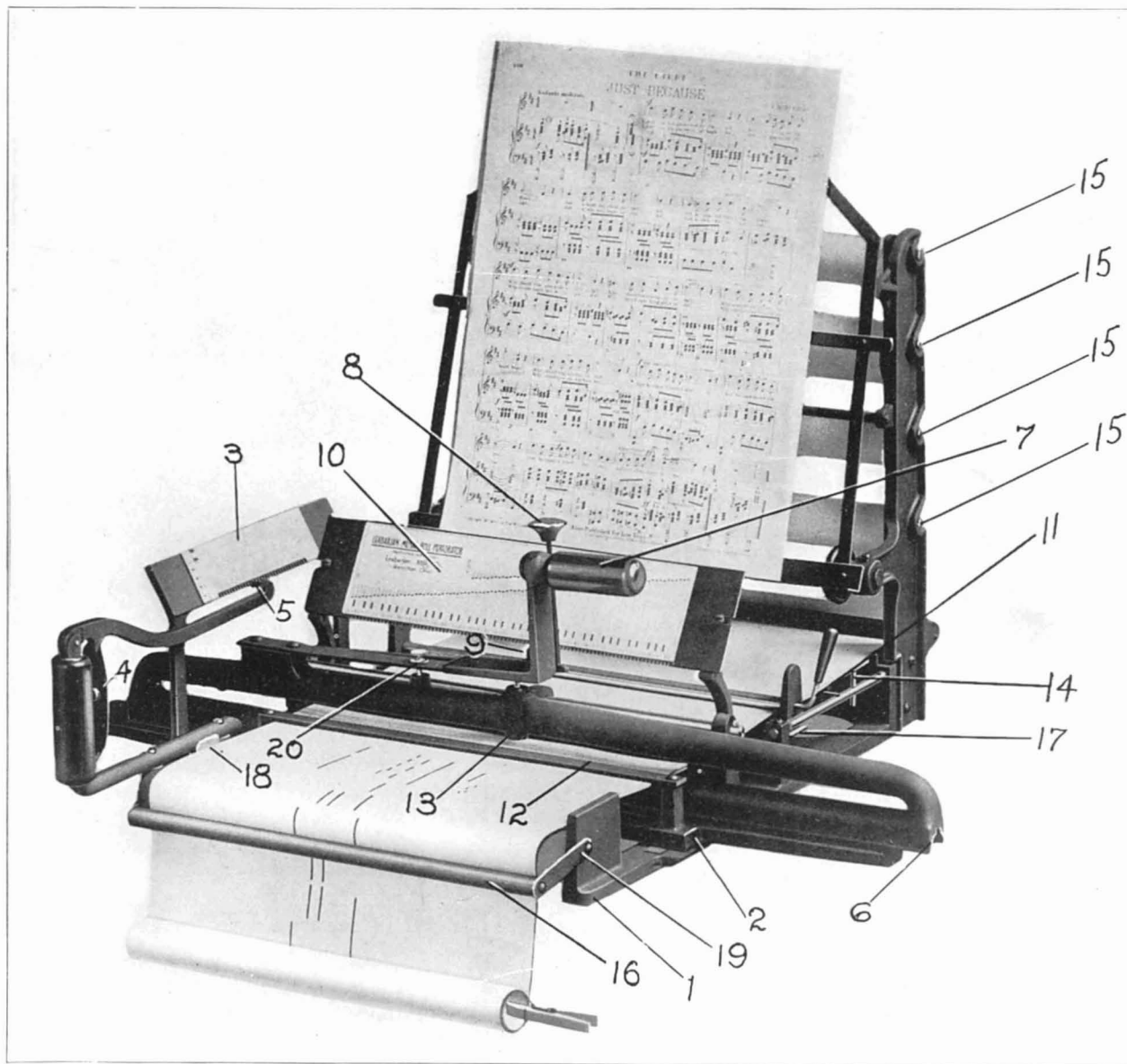
Now complete length of perforation started when the time scale index pin was in the last notch of the time scale No. 3. Proceed with remaining notes in the measure as before.

Note—The Leabarjan Mentor makes round perforations only. Other models make either round or square perforations as specified in ordering the machine, but the same principle of counting time applies to both. In other words, where one machine makes a square or oblong perforation the Leabarjan Mentor makes a round perforation and allows a "bridge" between each perforation instead of being continuous.

LEABARJAN

NAMES OF MACHINE PARTS

- No. 1—Base—Supporting the entire mechanism.
- No. 2—Ball-bearing cross slide operating lengthwise over paper.
- No. 3—Time scale used to locate perforations and to measure tone duration.
- No. 4—Handle for operating cross slide.
- No. 5—Time scale index pin controlled by cross-slide handle to accurately locate position of perforations.
- No. 6—Ball-bearing punch slide moving widthwise over paper for location of notes.
- No. 7—Punch operating handle for making perforations.
- No. 8—Index button to release index pin from note scale.
- No. 9—Index pin operating in index under each note on scale.
- No. 10—Note scale representing chromatic scale, bass and treble clefs, name of each note with key illustrating keyboard of piano.



NAMES OF MACHINE PARTS

- No. 11—Paper time-nipper gauge used to measure length of paper for each measure of music.
- No. 12—Paper guides, keeping paper in position between punch and die.
- No. 13—Punch and die for making perforations.
- No. 14—Paper time-gauge pins, gauging length of paper for different time arrangements.
- No. 15—Paper supply holder.
- No. 16—Front paper fastener, holding paper in position while perforating.
- No. 17—Permanent nipper stop. Nipper is pulled against this stop, holding paper while perforating.
- No. 18—Adjustable paper guides, front and rear, for tracking variations in width of paper perfectly.
- No. 19—Stationary paper guides. Paper must be adjusted to track close to this guide.
- No. 20—Screw for adjusting punch movement.
- Note: Place a drop of oil on moving parts occasionally*

LEABARJAN MUSIC ROLL PERFORATOR, STYLE 5

General Directions for Making Music Rolls Machine "Style 5"



ASSUMING that the reader is familiar with the fundamental principles explained under headings of Note Scale and Time Scale, the operations necessary in making a music roll will be explained by following the numbers of the different parts of the machine shown on page 21. Place supply of paper on any one of the holders No. 15, unwind and pull through below stationary steel roll. When more than one roll is to be made at the same time fill as many holders as are wanted, seeing to it that the upper sheet is drawn through first.

Continue pulling paper forward through nipper No. 11 under paper guides No. 12 and between punch and die No. 13.

After pulling paper over front plate below fastener No. 16, allow about twenty inches of paper before beginning perforations of roll. This is to allow sufficient paper to shape the end for the end-fastener on the roll, and to give the player mechanism a proper start.

SEE THAT PAPER IS SNUG AGAINST THE STATIONARY PAPER GUIDES NO. 19, one in the front of machine and one in rear. The flanges on the rear roller must be adjusted to permit the paper to track perfectly against the stationary guides—DO NOT ALLOW THE PAPER TO CREASE.

Next adjust front guide No. 18 so the paper is held in position against the corresponding guide on the right. Set nipper No. 11 against stop No. 17 and tighten. Stretch paper below fastener No. 16 and hold in position by pressing downwards on this fastener. The paper supply is now ready for perforating.

With the right hand and thumb resting on index button No. 8 and forefingers grasping handle No. 7, release index pin No. 9 from note scale No. 10. This allows a free movement widthwise over paper to locate any desired note. Those unfamiliar with reading notation can locate the note by finding the same note on the note scale No. 10 as is shown in the respective bass or treble clef of the composition to be perforated. The musician will locate either from the music or the miniature key-board with the names of notes above every notch indexed on the note scale.

With the left hand grasp handle No. 4 and with a slight pressure release index pin No. 5 and move to starting point—the first notch under time scale No. 3.

After locating the first note to be perforated and having the time scale index pin in position at the first notch (assuming a quarter note is to be perforated) with the right hand give handle No. 7 a light vibrating tap, making the first perforation. With the left hand move forward one notch, repeat operation and continue to the figure 4 on the time scale No. 3. This equals the first quarter note or four sixteenths. For the following note advance to the figure 5 on the time scale No. 3 omitting perforation; this allows space between perforations for releasing the tone.

A complete measure of music is perforated before the paper must be moved. Time gauge pins No. 14 (one on right side of machine and one on left) must be placed in position according to the time in which the composition is written. The figures standing at the beginning of a composition, after the clefs and key-signature, are called the Time Signature. If the composition is written in $2/4$ time, the time gauge pins are placed in the first holes from the nipper No. 11; in the second holes for $3/4$ time; third holes for $4/4$ time; $3/8$ time must be set to $3/4$ time and two measures of music must be perforated before moving the paper. $2/4$ time can be set to $4/4$ time and two measures of music can be perforated before moving the paper. By this method the exact amount of paper is measured automatically.

Having completed the first measure and with the time gauge pins No. 14 in their correct position, the paper time-nipper gauge No. 11 is released and moved back against the time gauge pins No. 14. The nipper is again fastened and the paper is drawn forward as far as it is permitted to go, thus automatically measuring the amount of paper necessary for the next measure. The paper is fastened with front paper fastener No. 16 and the operator proceeds with the notes in the following measure.



Machine Details "Style 8"

- No. 1. Base-supporting the entire mechanism.
- No. 2. Ball-bearing cross slide operating lengthwise over the paper.
- No. 3. Time scale used to locate perforations and to measure tone duration.
- No. 4. Handle for operating cross slide.
- No. 5. Time scale index pin controlled by cross-slide handle to accurately locate position of perforations.
- No. 6. Ball-bearing punch slide moving widthwise over paper for location of notes.
- No. 7. Punch head for operating punch to make perforations.
- No. 8. Regulator for fixing motion of punch.
- No. 9. Index button for releasing index pin from note scale.
- No. 10. Note scale representing chromatic scale, bass and treble clefs, name of each note with key illustrating key-board of piano.
- No. 11. Punch and die for making perforations. Insert to right of machine shows large view of punch and die.
- No. 12. Paper guide, keeping paper in position between punch and die.
- No. 13. Gauge for determining start of next measure of music.
- No. 14. Permanent nipper stop. Paper is held here in a firm position while perforating.
- No. 15. Nipper for holding the sheets when moving after each measure. This prevents independent moving of any one sheet.
- No. 16. Stationary paper guides; paper must be adjusted to track close to these guides.
- No. 17. Spring adjuster for regulating strength of spring.
- No. 18. Front paper fastener for holding paper in position while perforating.
- No. 19. Music rack for holding music.

Note: Place a drop of oil on all moving parts occasionally

Instructions for Operating the "Style 8" Perforator



THE same underlying principles of music roll making apply to the Style 8 Perforator as were discussed in connection with the Style 5. The Style 8 is designed for producing music rolls in large quantities and also for duplicating purposes. A special copying device makes it possible to duplicate the standard perforated music roll. Although hand operated, this machine perforates as many as 16 records at the same operation.

On page 16 the Style 8 Perforator is shown with parts numbered. The machine is provided with a paper supply holder consisting of 16 rollers, or one for each sheet to be perforated. The paper is cut to the desired length before perforating. The exact amount of paper required for a given composition can be determined by counting the number of measures and multiplying by the number of inches required for each measure. Each measure of music written in $\frac{3}{4}$ time requires two inches of paper; each measure in $\frac{3}{8}$ time requires three inches of paper, etc. About twenty inches of paper must be allowed for beginning and end of roll.

If preferred, the paper may be drawn directly from the rolls, but in either case the sheets must always hang loose from the rollers in order to permit perfect tracking against the stationary paper guides No. 16.

Allow sheets to pass beneath paper nipper No. 14, between punch and die No. 11, and under gauge No. 13. Allow margin for beginning of roll and fasten the permanent nipper stop No. 14, and Front paper fastener No. 18. The sheets must track snug against the stationary guides No. 16 to assure perfect alignment of perforations. After completing one measure, move the paper until the last perforation is covered by the gauge No. 13. In moving the paper, nipper No. 15 must be used to prevent sheets from creeping.

Instructions for Replacing Punch and Die

The punch can be inserted in the die one way only, that is, the front of the punch must be inserted in the front of the die. The front of the die is indicated by a small notch which has been ground away for this purpose. The front of the punch is indicated by the insert showing punch and die No. 11.

The punch is held in the machine with a small draw pin which is held firmly with a nut. Always place the punch in position first, having front of punch toward front of machine.

Place the die directly beneath the punch, as in its usual position, observing that punch enters die one way only.

Depress punch into die (the punch must just enter die).

Holding punch in this position, start to tighten the screws from the bottom of the punch head. The screws pass through a washer first.

Tighten each screw a little at a time, giving each of the four screws a turn or two until they are all tight.

Do not tighten any one screw at a time as this will tend to draw the die out of proper alignment with the punch.

Release the punch which is now depressed into the die and see if it enters easily; try to perforate a piece of paper.

If the punch does not make a clean perforation, loosen the die and repeat the above operations.

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Counting for Perforating Music Written in $\frac{4}{4}$ Time

The small figures written below and above the staff show how to count the time value of each note and rest when perforating. Thus the first note in the treble clef will extend from the figure 1 to the figure 12 on the time scale. The next three notes are triplets and will extend from the figure 13 to 16 on the time scale with the triplet index plate in position as explained on page 10. The illustrations below show actual length of each note as determined by the time scale.

CAUTION: Remember that in counting time value or length of perforation you do not count the notches in the time scale; instead the counting refers to the numbers from 1 to 16 as shown on the time scale.

The above examples of perforations illustrating time relations or values are shown in their relative position to the time scale when perforating a music roll. Compare with illustrations on pages 12, 14, and 16.

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Counting for Perforating Music Written in $\frac{3}{4}$ Time

The example illustrates the method of counting for perforating music written in $\frac{3}{4}$ time. The counting refers to the numbers from 1 to 12 on the time scale, and not to the number of notches.

The examples of perforations are actual size and each measure is shown as it would look on the music roll. See illustrations on pages 12, 14 and 16 for relative position of perforations and time scale.

Musical score for piano in $\frac{3}{4}$ time. The score consists of two staves: Treble and Bass. The tempo is marked *mf*. Above the treble staff, fingerings are indicated: 1-2-3-6, 7-8-9-10-11-12, 1-4-5-10, 11-12, 1-2-3-4-5-7-8-9-10-11-12, 1-4-5-10, 11-12. Above the bass staff, fingerings are indicated: 1-2-3-4-5-6-7-8-9-12, 1-2-3-4-5-6-7-8-9-12, 1-2-3-4-5-6-7-8-9-12, 1-2-3-4-5-6-7-8-9-12. The music features a melody in the treble and a bass line in the bass.

FIRST NOTE
IN BASS

FIRST NOTE
IN TREBLE

Diagram illustrating the first notes in bass and treble for the first three measures of the music. The diagram is divided into three vertical sections, each representing a measure. The top section is labeled "FIRST NOTE IN BASS" and the bottom section is labeled "FIRST NOTE IN TREBLE". Each section shows a series of horizontal bars representing the notes. The first measure is labeled "FIRST MEASURE" with a time scale from 1 to 12. The second measure is labeled "SECOND MEASURE" with a time scale from 1 to 12. The third measure is labeled "THIRD MEASURE" with a time scale from 1 to 12.

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Counting for
Performing
Music
Written in
 $\frac{2}{4}$ Time

This example illustrates the method of counting for performing music written in $\frac{2}{4}$ time. The counting refers to the numbers from 1 to 8 on time scale and not to the number of notches.

FIRST NOTE
IN BASS

FIRST NOTE
IN TREBLE

FIRST MEASURE

SECOND MEASURE

THIRD MEASURE

FOURTH MEASURE

The example of perforations is actual size and each measure is shown as it would look on the music roll. See illustrations on pages 12, 14 and 16 for relative position of perforations and time scale.

Counting for Perforating Music Written in $\frac{2}{4}$ Time



HE example shown here illustrates the method of counting for perforating music written in $\frac{2}{4}$ time, having sixteen thirty-second notes in the bass part. By referring to the chart on page 8 it will be noted that each notch of the Time Scale represents a thirty-second note. Therefore, there is no distance between perforations as one follows immediately after the one preceding it.

The examples of perforations are actual size and each measure is shown as it would look on a music roll.

The example of perforations illustrates notes occurring in rapid succession. Each successive note is different (different location on the Note Scale) and perforated on each notch of the Time Scale.

If the thirty-second notes should be the same (same position on the Note Scale) it would be necessary to double the scale. In other words, instead of perforating one note on each notch of the Time Scale it would be necessary to use the scale from 1 to 16, perforating on the numbers 1, 2, 3, etc.

In doubling the scale the length of the first chord in the treble clef would be from 1 to 8, instead of from 1 to 4. This method is necessary when a thirty-second note is repeated rapidly, otherwise there would be one continuous perforation.

FIRST NOTE IN BASS

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Counting for Perforating Music Written in $\frac{6}{8}$ Time

Musical score in 6/8 time. The top staff is in treble clef and the bottom staff is in bass clef. The music is marked with *mf* and *sf*. Above the staves are counting notations for perforating, such as "11-12", "1-2 3-4 5-6 7-8 9-10 11-12", "1-2 3-4 5-6 7-8 9-10 11-12", "1-2 3-4 5-6 7-8 9-10 11-12", "1-2 3-4 5-6 7-8 9-10 11-12", "1-2 3-4 5-6 7-8 9-10 11-12".

Diagram showing the perforations for the first five measures of the music. The diagram consists of vertical lines representing measure boundaries and horizontal bars representing the perforations for each note. The measures are labeled: FIRST MEASURE, SECOND MEASURE, THIRD MEASURE, FOURTH MEASURE, and PART OF FIFTH MEASURE.

The above example illustrates the method of counting for perforating music written in $\frac{6}{8}$ time. The counting refers to the numbers from 1 to 12 on the time scale, and not to the number of notches. The example of perforations is actual size and each measure is shown as it would look on the music roll.

NOTE—The first note shown must be considered as the last note in a measure. Therefore it does not begin on number 1 of the time scale, but on number 11 extending to number 12. In the bass clef the first notes are preceded by a treble clef sign, indicating that they must be read in the treble clef. The effect of the treble clef sign is cancelled when the bass clef sign appears.

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Counting for Perforating Music Written in $\frac{12}{8}$ Time

This example illustrates the method of counting for perforating music written in $\frac{12}{8}$ time. The counting refers to the numbers from 1 to 12 on the Time Scale, and not to the number of notches.

The example of perforations is actual size and each measure is shown as it would look on the music roll. See illustrations on pages 12, 14, and 16 for relative position of perforations and Time Scale.

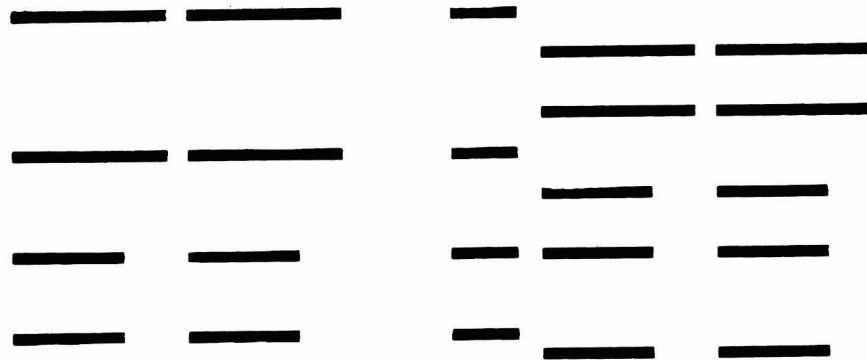
FIRST NOTE
IN BASS

FIRST MEASURE

SECOND MEASURE

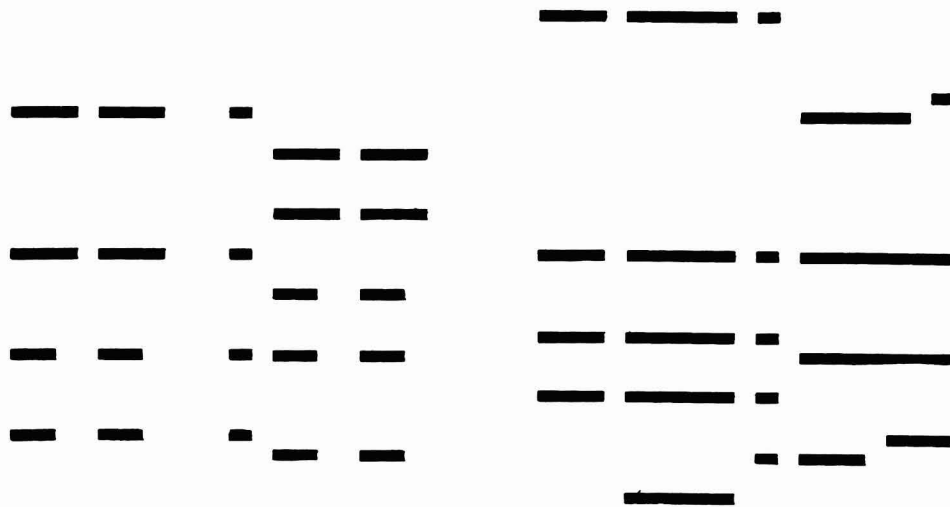
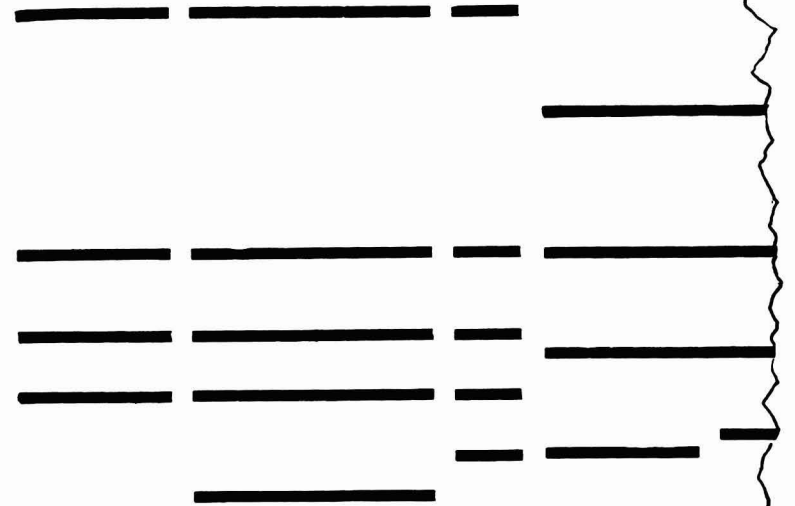
THIRD MEASURE

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EXAMPLE 1

Method of Reducing Length of Roll One-Half



EXAMPLE 2

The above example shows four measures of music written in 3/4 time, from which the examples of perforations were made.

Example No. 1 represents full size perforations made according to the time scale, each measure extending from the number 1 to 12. (Compare with examples on page 19.)

Example No. 2 shows the same music perforated one-half size. When eighth notes are the shortest notes to appear in a composition, the sixteenth scale can be used as one eighth, thus reducing the length of the music roll by one-half—two measures of music are perforated in the distance allowed for one measure in example No. 1.

In perforating a roll in this manner it is necessary to read a whole note as if it were a half note; and half note as a quarter; a quarter note as an eighth; an eighth note as a sixteenth; and a sixteenth as a thirty-second. The same rule applies to value of rests.

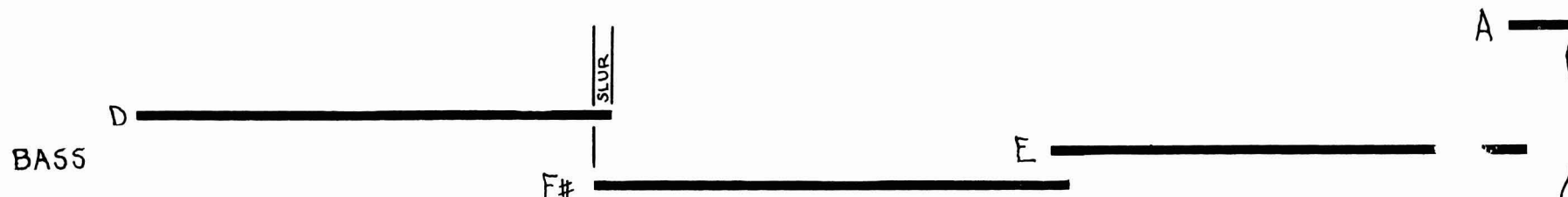
Note—This method is possible only where an eighth note is the shortest note in the composition, and very desirable when the selection is written in a slow tempo

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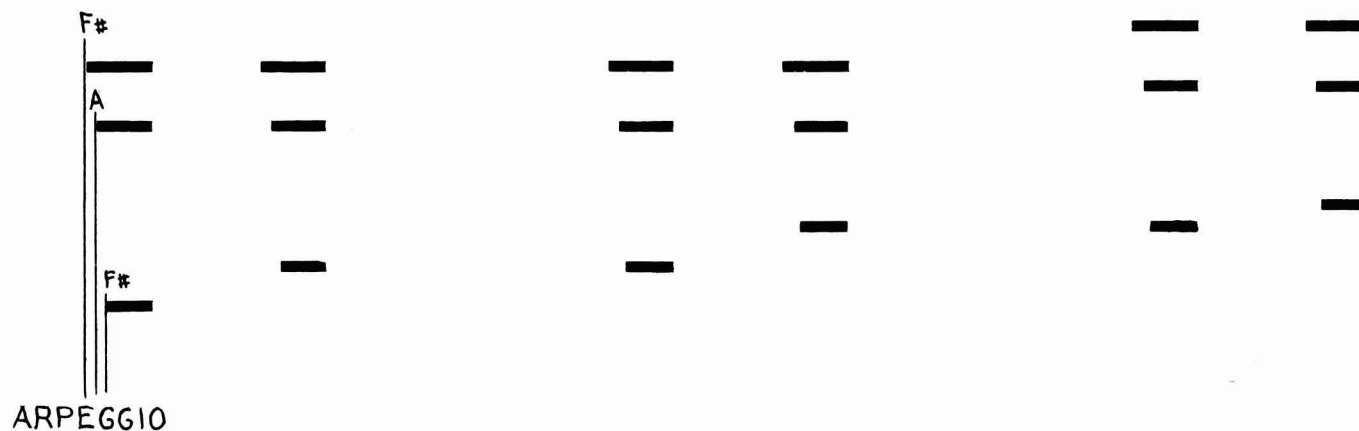
The Slur and the Arpeggio

A "slur" is a curved line extending over two or more notes. It is primarily an indication that all the notes under it are to be played legato. In other words each tone is to be sustained until the next tone begins, without the slightest break or detaching between them.

In the example of musical notation shown the slur is used in the bass part. The method of perforating a slur to produce the "legato" effect is shown in the example of perforations. One perforation extends just beyond the beginning of the next perforation, thus producing a smooth, connected effect.



TREBLE

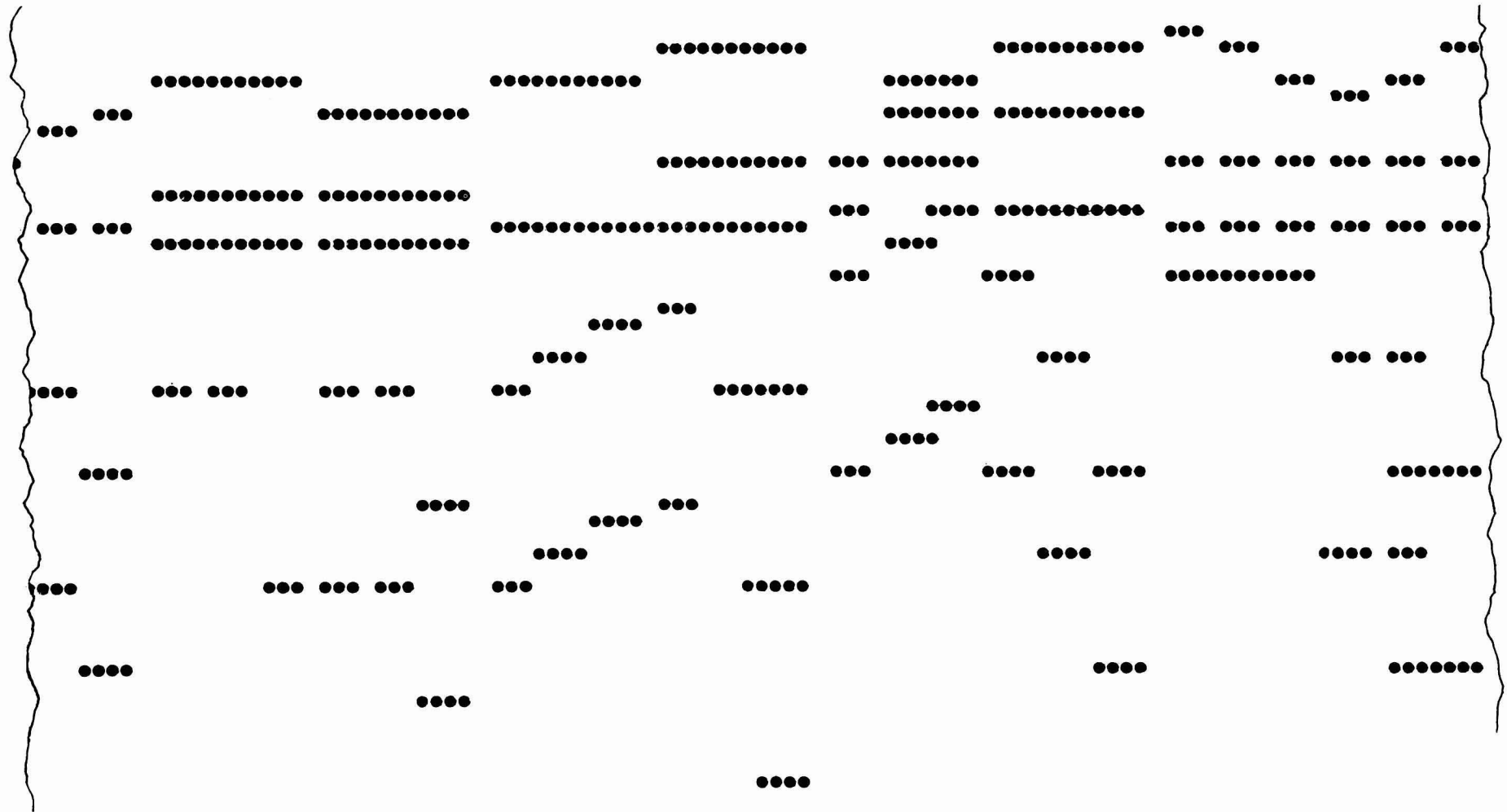


The "arpeggio" is represented by a perpendicular wavy line preceding a chord, and should be perforated beginning with the bottom note advancing one notch for each note in the chord, thus spreading each note in rapid succession.

The above example of musical notation illustrates the "arpeggio" throughout the treble part. The example of perforations above illustrate the relative position of the notes in an "arpeggio".

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Example of Round Perforations



The above is an illustration of perforations made on the Leabarjan Mentor. As explained on page 13, the Style 3 machine makes only round perforations, but the same principle of operation applies to all three machines.

Either the Style 5 or the Style 8 machines can be equipped with round punches and dies if preferred.

As far as the quality of playing is concerned, the round perforation is as satisfactory as the square. However, in making long perforations the round punch is more satisfactory as it leaves a small "bridge" of paper between each perforation, thus strengthening the music roll.

Producing the “Hand Played” Effect in Music Rolls

After a pianist has mastered his technique or his ability to read and play the notes correctly, he proceeds to develop the expression. If he were to disregard all expression marks, his interpretation of the composition would not be complete—his playing would sound elementary and monotonous. In musical composition the expression is always carefully marked, indicating that certain notes or passages are to be played soft, loud, fast or slow. Other musical terms and characters are used to express certain appropriate effects as desired by the composer. The advanced musician will observe expression marks and at the same time play according to his individual interpretation.

In making music rolls it is therefore essential to reproduce every detail expressed by the composer. In addition to applying the principles discussed in the preceding pages there are many ways of improving the music roll, although there are no definite rules which may be said to govern this feature.

On page 28 of this book a list of musical terms and their definitions are given. Very often it is possible to provide expression by marking the term upon the music roll to be observed when playing the roll. If a certain passage is to be played softly, it is indicated on the margin of the roll and the expression devices on the instrument are operated accordingly. A change in tempo may also be indicated on the music roll and effected by regulating the metronome on the instrument.

A second method of providing expression is to incorporate desired effects in the music roll itself by means of perforations. One term used frequently in music is the expression “legato” Legato is imparting the full value of each note or tone, thus producing a smooth, connected effect in playing a succession of tones. In other words, each tone is to be sustained until the next tone begins, without the slightest break or detaching between them. In musical notation legato is expressed by curved lines (or slurs) over the notes meaning that the notes are to be blended. The legato effect is always desirable unless the term “staccato” is used, which is indicated by dots placed over, or under, the notes. Staccato is shortening the value of the notes.

To produce the legato effect, perforations should be extended wherever possible. Especially in the bass notes very good results are obtained by lengthening the perforations and thus extending the time value of the tone. Also in the melody parts and between measures it is usually necessary to lengthen the perforations to produce a smooth rhythm or hand played effect, instead of the short, abrupt, elementary style of playing.

Another method of improving the music roll is by incorporating additional notes, octaves, embellishments, or orchestral arrangements. In rearranging a composition the transcriber must realize that all changes should clearly grow out of the ideas which exist in the original composition.

It will become evident to the reader that while even very simple or elementary rhythms are quite well adapted to the player-piano, by working into the musical scheme certain counter-melodies or developments of the principal melody it is possible to add much to the music roll.

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Definitions of Musical Terms



ACCELERANDO, accelerating the movement.

ADAGIO, very slow and expressive.

AD LIBITUM, at will or discretion. This expression implies that the time of some particular passage is left to the pleasure of the performer; or, that he is at liberty to introduce whatever embellishments his fancy may suggest.

ALLEGRETTO, somewhat cheerful, but not so quick as "allegro".

ALLEGRO, quick, lively. A term implying a rapid and vivacious movement, but which is modified by the additional other words; as "allegro agitato", quick with anxiety and agitation;" "allegro assai", very quick.

AL SEGNO, AL SEG., or the character , signifies that the performer must return to a similar character in the course of the movement, and play from that place to the word "fine", or the mark  over a double bar.

ANDANTE, somewhat slow and sedate. This term is often modified, both as to time and style, by the addition of other words.

ANIMATO, CON ANIMA, ANIMOSO, with animation, in a spirited manner.

A PIACERE, A PIANIMENTO, at the pleasure of the performer.

A TEMPO, in time; return to the original degree of movement.

BRILLANT, sparkling, brilliant.

CANTABILE, in a melodious and singing style.

CAPRICCIO, a fanciful and irregular species of composition.

CODA, a few bars added at the close of a composition, beyond its natural termination.

CON, with; as, "con espressione", with expression.

CON SPIRITO, with quickness and spirit.

DA CAPO, from the beginning; an expression which is often written at the end of a movement, to indicate that the performer must return to and finish with the first strain.

DIMINUENDO, implies that the quality of tone must be gradually diminished.

DOLCE, implies a soft and sweet style.

ESPRESSIVO, or CON ESPRESSIONE, with expression.

FINE, the end.

FORTE, or f, loud.

FORTISSIMO, or ff, very loud.

FORZANDO, or FORZ., or fz, implies that the note is to be marked with particular emphasis or force.

GRANDIOSO, in a noble and elevated style.

GRAVAMENTE, dignified and solemn.

GRAVE, slow and solemn; also deep, low pitch in the scale of sounds.

LARGHETTO, indicates a time slow and measured in its movement, but less so than "largo".

LARGO, a very slow and solemn degree of movement.

LEGATO, in a smooth and connected manner.

LENTO, in slow time.

MAESTOSO, with majestic and dignified expression.

MARCATO, in a marked and emphatic style.

MARCIA, a march.

MEZZO, in a moderate degree; as "mezzo forte", rather loud.

MODERATO, with a moderate degree of quickness.

MORENDO, gradually diminishing the tone and time; dying away.

MOSSO, movement; as "piu mosso" with more movement, quicker.

OCTAVA, or 8va., an octave. This word is generally joined with "alta" or "bassa"; the first signifies that the passage to which it is applied must be played an octave higher than it is written; the second that it must be played an octave lower.

PEDALE, a pedal or stationary base. In piano music, this term implies that the performer must press down the pedal which takes off the dampers.

PIANO, or p, soft.

PIANISSIMO, or pp, extremely soft.

POCO, a little, somewhat; as, "poco presto", rather quick; "poco piano", somewhat soft.

POCO A POCO, by degrees, gradually; as, "poco a poco crescendo", louder and louder by degrees.

PRESCIPITATO, in a hurried manner.

PRIMO, first.

RITENNENTE, RITENUTO, a keeping back, a decrease in the speed of the movement.

SCHERZANDO, SCHERZANTE, SCHERZOSO, or SCHERZ., in a light, playful and sportive manner.

SERIOSO, in a serious style.

SOLI, plural of SOLO, implies that two or more principal parts play or sing together.

STACCATO, implies that the notes are to be played distinct, and detached from each other.

SYNCPATION, connecting the last note of one bar to the first note of the next, so as to form but one note of a duration equal to both; this displaces the accent, and produces a peculiar effect.

TENUTO, or TEN., implies a note, or notes, must be sustained or kept down the full time.

TREMENDO, with tremendous expression, horribly.

TREMANDO, implies the reiteration of a note or chord with great rapidity, so as to produce a tremulous kind of motion.

TRIPLET, a group of three notes arising from the division of a note into three equal parts of the next inferior duration.

VIGOROSO, VIGOROSAMENTE, boldly, vigorously.

VIVACE, VIVAMENTE, or CON VIVACITA, with briskness and animation.

The above list includes all the terms frequently used in musical composition. The reader may consult a dictionary for such terms as are not defined above.

Special Terms and Definitions

APPOGGIATURA, a note or embellishment, generally written in a small character. The Appoggiatura (sometimes called GRACE note) is expressed by a small note placed before the large one which it is intended to ornament. There are two kinds of grace notes; the upper and the lower. The upper grace note may be a tone or semitone above the principal note; the lower one is always a semitone below.

Grace notes have no time value in music and should be perforated one notch in advance of the note they precede.

CADENCE, a close in melody and harmony; an ornamental and extemporaneous passage introduced at the close of a song or piece of music.

CADENZA, a cadence, or close, at the termination of a song or other movement, introducing some fanciful and extemporaneous embellishments. A cadenza has no particular time value; its place is signified by a hold and should be perforated by using the time value of the notes represented and extended in regular time to any length required. The paper is adjusted for the start of next measure at end of cadenza.

METRONOME, an ingenious instrument for indicating the exact time of a musical piece by means of a pendulum, which may be shortened or lengthened at pleasure.

TRILLO, marked (tr), is a quick and alternate repetition of two notes, the principal note and the note above. For instance, the term (tr) placed over the note "C" indicates that "C" and "D" are to be repeated alternately.

TURN, a union of the upper and lower appoggiatura (grace notes).

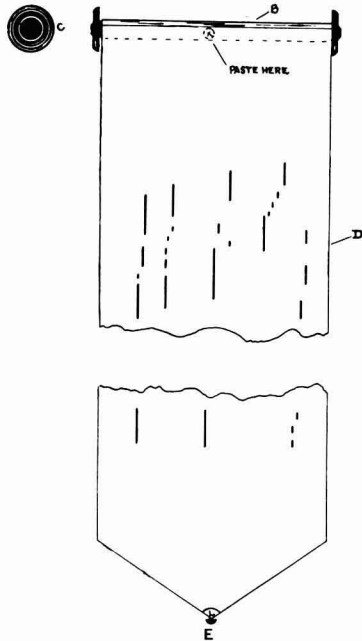
Suggestions

After becoming familiar with the fundamental principles of music roll making, the reader should proceed to perforate a simple piece of music. By referring to the directions for operating machine, the operator will very readily understand the purpose and use of the different parts.

A good plan to start with is to perforate the short examples of music on pages 18 to 25 inclusive. In each case several measures are given, showing how the notes are to be counted in perforating. The examples are intended to be representative of music written in different keys, different time, and grades.

After perforating an example it should be compared with the corresponding example of perforating in order to discover possible errors. Corrections can be made by covering the perforation over with transparent tape.

Assembling the Music Roll



^A The accompanying illustration shows the different parts of a music roll. The names of the parts are as follows:

A—chuck or drive end of spool. This end is always on the right hand side of the player-piano.

B—tube on which the perforated strip is wound.

C—loose end of spool. This end is always on the left hand side of the player-piano.

D—perforated strip.

E—end-fastener at beginning of roll.

After having completed the perforating of a music roll, the sheets must be removed from the machine. In order to avoid pasting the wrong end or wrong side of the strip on the tube first, always mark the end of the strip on the **TOP SIDE**.

Allow about ten inches of paper from the last perforation and cut squarely.

Assemble one of the spools—the chuck end of the spool must be inserted in the tube as far as it will go; a little paste or glue will prevent it from turning in the tube.

The loose end of the spool is adjustable and must not be inserted in the tube all the way, and should not be glued at all.

At about the center of the end of the perforated strip, place a little glue on the lower side. Hold the strip squarely against the tube with the right hand side against the chuck end. After the glue is set, wind the entire strip on the tube—the right hand edge of the roll will be snug against the chuck end.

Allow about twelve inches of paper from the beginning of the first perforation to the end-fastener. Cut the paper squarely and then shape the point. The end-fastener is glued to the extreme end of the point, which is exactly in the center of the roll.

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IN writing this book the authors have endeavored to describe and illustrate the fundamental principles involved in the making of music rolls. The purpose of the charts and examples of perforations is to enable the reader to visualize these principles—to appreciate the meaning of perforations in a strip of paper and their relation to the mechanical instrument. To further illustrate the principle of music roll making a special instruction roll has been prepared and should be used in conjunction with this book. This roll, known as the “Leabarjan Instruction Roll” illustrates the principles of music notation and perforation by means of actual perforations and printed explanations. The roll is played on the mechanical instrument like an ordinary music roll and it begins by playing a certain note to illustrate time-values. It progresses step by step until every principle discussed in this book is illustrated both visually and audibly. Every owner of a Leabarjan Perforator should possess one of these rolls.

Owners of Leabarjan Perforators may feel at liberty to communicate with us at all times for any additional information.

The Leabarjan Mfg. Co.

Sole Manufacturers

of

The Leabarjan Patent Music Roll Perforator

Hamilton, Ohio, U. S. A.

