APPENDIX I.

HINTS TO THOSE WHO HAVE THE CARE OF PIANOFORTES.

General Directions.

When we take into consideration the great variety of woods, metals, leathers, &c. used in the construction of the pianoforte, it will be obvious that the instrument should be zealously preserved from dampness and currents of air. All sonorous musical instruments are extremely susceptible on these points, and we cannot be too particular in our care of them.

1. A pianoforte should always stand in a place perfectly dry, and of mean temperature. It must never be placed on a damp ground floor; or between two windows; or between a door and a window. An instrument will never stand in tune, if exposed to draughts or currents of air.

2. A pianoforte should never be left open when it is not being used; and when the room is being cleaned, it would be well to cover the entire instrument with a baize, or skin case, fitted to its shape.

3. A pianoforte should never be placed too near a stove, chimney, or fire-place. Extreme heat is particularly injurious, and often causes the warping of some of the delicate machinery.

4. The instrument should always be kept clean and free from dust. No light substance, as a needle, pin, a bead, a crumb of bread, &c. should be suffered (in a square or grand pianoforte) to lie on the sounding-board or the strings of the instrument, as they will in all probability produce a disagreeable jingling or whizzing sound, the cause of which it is not always easy to detect.

5. It is also important to remark that the lid or top of the instrument should not be loaded with books, music, and other objects. All weights placed in this manner are calculated to injure the tone of the pianoforte, and to produce an unpleasant jarring during performance.

6. Keep the instrument always in tune, and fully drawn up to concert pitch. A pianoforte ought to be tuned once every six weeks, if much played on; and oftener, if new. Metal strings are generally a little too sharp in dry frosty weather, because the cold condenses their material and increases their tension. In hot summer weather, they are somewhat too flat. New strings require to be drawn up several times before they will stand well in tune. When a string breaks, it must be replaced by another of exactly similar thickness.

How to place a Pianoforte for Effect.

The walls, floor, and ceiling, echo every sound which is produced in a room, and increase by *resonance* its volume and length. It is of the utmost importance that buildings designed for audiences, particularly music rooms, should be so constructed that there may be no *perceptible* echo from the walls, but a sufficient resonance to give tone and volume to the sounds. The best form for the interior of such rooms is that their length be about two thirds greater than their breadth, in order that the sounds reflected from the side walls may mingle with the direct sounds and strengthen them. The height should somewhat exceed the breadth; and the ceiling is better when *coved*—that is, made in the shape of a coach roof. If a room has too great an echo, drapery should be hung upon the walls. Venetian shutters are excellent preventives of echo, especially when they are drawn forward. Carpets, matting, or any soft covering on the floor, absorbs reverberation; because the echo, which would otherwise combine with the direct sound and swell it, is smothered amidst the fibres.

The pianoforte, when possible, should be placed away from the wall, and as much *in the room* as convenient. The floor then, if hollow, acts as a large sounding board, and greatly enhances the effect. The reason of this is, that the sonorous vibrations created by the pianoforte puts the wood of the flooring upon which it is placed into a similar state of vibration, and its simultaneous shocks against the superincumbent air adds to the original tone and renders it more audible.

In Italy, orchestras are constructed with especial reference to the advantage to be derived from a reciprocating floor; but in this country, such things are paid but little attention to; the practical part of acoustics being sadly neglected.

How to prevent the Sounds of the Pianoforte from being heard in the adjoining Chambers.

We have many of us experienced, and are still experiencing, the intolerable nuisance of our next-door neighbours, on each side, right and left, practising the pianoforte at all hours, seasonable and unseasonable. Now all this might easily be remedied by constructing the walls of our dwelling-houses with *hollow* bricks, which are known to be non-conductors of sound. The reason of this is, that the hollow portion being filled with rarefied air, every sound which finds its way into such a mass is effectually buried there, and cannot penetrate to the outer surface. If the space between the two surfaces of the partition walls, and that between the ceiling of one room and the flooring of another, were filled with brown paper, gummed over with flock or sawdust, it would aid materially to deaden the sound. Or if the space were filled with shavings, tow, or cut straw, it would probably have the

same effect. All these substances are bad conductors of sound; because they shut up a large quantity of air between their minute detached parts, so that they cannot readily transmit an impulse. The sound is thus *entangled,* as it were, and, being no longer able to preserve its regular outline, becomes deadened, if not altogether lost.

The Rev. Dr. Brown, from whose little volume on *Sound and its Phenomena* (Longmans, 1854) we gather much of our knowledge of these matters, says, "It is truly surprising that no ingenious mechanic has yet contrived a substance for partition-walls, where cheapness and lightness are especially considered. Nothing, for example, could be easier than to make panels with two sheets of common pasteboard or tarpauling, separated from each other by wooden blocks. Sawdust should be thickly strewed over the inner surfaces, and the intervening space be well filled with coarse tow or cut straw. A wooden "upright" of the thickness of the blocks would hold the panels in their place, especially if the edges were made to lie over the supporters. Such a partition wall would be a real boon in hotels, &c. where chambers are often separated by half-inch wood, or by simple canvass."

We have somewhere read, that if the walls of rooms were covered with a solution of *gutta percha* before papering, it would effectually deaden all sounds from the adjoining chambers. Or, we believe, a substitute for this is the *gutta percha* lining, extensively used of late years in covering damp walls.

APPENDIX II.

ON TUNING.

The system of tuning here explained is that of *Equal Temperament,* which is now universally adopted throughout Europe. Its inestimable advantage is, that it enables us to employ all the twelve major and minor scales with equal freedom, and without a fear of offending the ear in any of them more than in another; thus giving unlimited room of play to all the wonders of modern harmony.

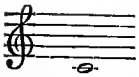
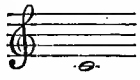
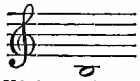
The chief difficulty in tuning consists in making what is termed the *partition;* that is, so to tune the twelve semitones of an octave, that they may become a basis for tuning the rest of the instrument. By a peculiarity in the musical scale, if thirteen notes were tuned perfectly true, advancing by fifths (beginning, for instance, from C), the thirteenth note, a *sharp* forming the twelfth fifth, would not be a true octave to the first C, but would be found to be a little higher. It follows, therefore, that a pianoforte tuned in this manner would be false at the end of the operation. Hence the necessity of diminishing a little the elevation of each fifth—an operation to which has been given the name of Temperament.

The intervals of most use in tuning are the *unison,* the *octave,* the *fifth,* and the *major* and *minor* thirds.

The Unison.

The *unison,* or identical sound, is the easiest interval for the student to commence with. In instruments which have only two strings to each note, as in square, cabinet, and cottage pianofortes, one half the strings are always tuned by means of unisons; and in grand pianos, of three strings to each note, whether horizontal or upright, two thirds of the strings are so tuned. Hence, the unison, or identical sound, is the interval, if it may be so called, which most frequently occurs in tuning, and which it is of the highest importance should be tuned with perfect accuracy.

We will suppose that the student has provided himself with a *tuning hammer,* and that he has seated himself at the instrument. Let him then strike any note in the middle of the key-board;

 for example; and we shall at first suppose this note to be accurately in tune. If he listen attentively to the vibration of the strings, he will hear a steady, pure, continuous sound, such as is produced from a single string when struck alone. Then let him place his tuning hammer on one of the *pins* or *pegs* round which one of the strings belonging to the note C is coiled or twisted, and turn the hammer a very little towards the left: this, by relaxing the tension of the string, will sensibly flatten or depress its pitch; so that, instead of sounding  , the pitch of the string thus depressed will approach nearly to that of  , the note next below it. If he now strikes the C, he will hear nothing but a confused collision of harsh and jarring sounds, such as we are sensible of when we touch a note that is much out of tune. After striking the note thus purposely put out of tune several times, let him then turn the hammer to the right, gently and by almost imperceptible degrees, and, if he listens attentively as the pitch of the two strings approaches more and more nearly towards coincidence, he will at first hear several strong and quick *beats*, which, as he proceeds, will gradually become slower and slower, and fainter and fainter, till they subside into mere gentle *wavings*, or undulations of sound; and these, as he proceeds, will at length disappear, and give place to one steady, pure, and apparently single sound, which constitutes the real unison.

The student will at first experience considerable difficulty in tracing this progression from confusing and jarring sounds to *beats*, at first quick and strong, and then gradually slower and fainter, till they insensibly degenerate into mere *waves*, or gentle undulations of sound, and ultimately disappear, and give place to one pure and uninterrupted sound.*

Considerable practice is required to gain flexibility of wrist, so as to turn the hammer by extremely minute degrees. These gradations supply the only *mechanical* helps of which the tuner can avail himself; and without a distinct perception of them through their various degrees, it is impossible, even with the finest musical ear, to tune a pianoforte tolerably.

The Octave.

After the student is able to tune a perfect unison, he may proceed to the octave, which is the next interval to the unison in point of importance and facility. Here the sounds, though no longer identical, have so strong a resemblance to each other, that, when struck together and perfectly in tune, they seem

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* The cause of this phenomenon is beautifully explained in *An Essay on the Theory and Practice of Tuning*, &c. published by Robert Cocks and Co. 1853, p. 34, *et seq.* See also Hamilton's *Art of Tuning*, to which valuable little work we have to acknowledge our obligations in drawing up the above rules.

to form but one single sound, the lower note, as it were, seeming to swallow up or absorb the upper one.

In tuning this interval, the student will discover the same progressive gradations of *beats, waves,* and final *coincidence* of tone, as in the unison.

For the purpose of tuning one note an octave to another, it becomes necessary to stop the vibrations of one of the strings belonging to the note to be tuned, in square, cottage, and cabinet pianos; and two of those strings in grand instruments. In square pianos, this is done by means of a little bit of leather, card, or even paper, which is called a *damper,* and which must be inserted between the string of which we wish to stop the vibration and the adjacent string, belonging to the next note to it. In cabinet and cottage pianos, the pedal, which is placed under the left side of the key-board, when pressed down by the foot, shifts the whole key-board a little to the right, so that the hammer strikes only one string belonging to each note throughout the instrument. In grand pianos of three strings, when the pedal is pressed down, the hammers will still strike two strings, unless the small vertical bolt which moves up and down in a groove on the right side of the key-board be first drawn up; and then, when the pedal is pressed down, the hammers will strike only one string belonging to each note.

When the student has tuned an octave, by striking the notes together, let him also try these in quick succession; thus:

at the same time holding the bottom note down: for the ear is apt to fancy them in tune, while they are in reality still too flat; and this striking them one after another will greatly assist him in detecting any mistake in this respect.

In tuning octaves in the bass, the student must be careful not to strike the notes too hard, particularly in the very low notes.

The Fifth.

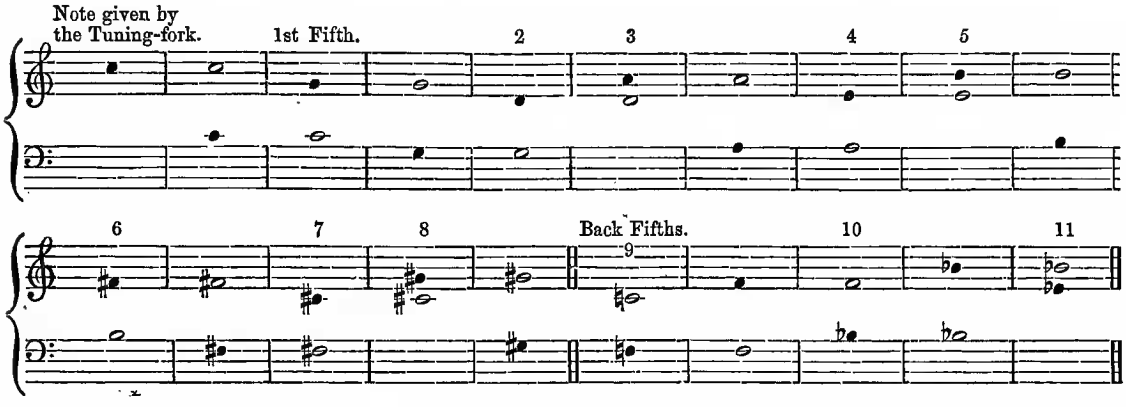
When this concord is perfectly in tune, the ear cannot detect either *waves* or *beats;* but both notes unite in one pure, agreeable, uninterrupted *complex* sound. It will be desirable at first to tune the fifth perfect, though we shall presently show that it is not so tuned in practice.

Major and Minor Thirds.

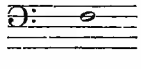
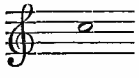
The major and minor thirds are the most agreeable concords in music. In tuning, however, they are only employed as tests of the accuracy with which the other intervals have been tuned. When perfectly in tune, they have neither *beat* nor *wave,* but coalesce in one pure, agreeable, uninterrupted *complex* sound.

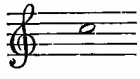
On Laying the Bearings by Means of Fifths.

In studying the following diagram, or scheme for tuning the pianoforte, it must be borne in mind that the white note in each bar is already tuned, the black one remains to be adjusted.



Explanation of the Scheme.

In the above scheme it will be observed that the only intervals employed are the *octave* and the *fifth*. As it is more easy to tune the notes situated in the middle of the key-board with accuracy, than those which are placed towards the extreme ends of the instrument, the scheme is so devised as to include all the notes between  and  .

The first note  is obtained by means of a C tuning fork*.

The octave, in our modern system of keyed-stringed-instruments, being divided into *twelve* semitones, and only one of these notes being given us by the tuning fork, the remaining eleven notes must be obtained by means of a circle or series of *eleven* fifths, as C, ^{1}G, ^{2}D, ^{3}A, ^{4}E, ^{5}B, ^{6}F♯, ^{7}C♯, ^{8}G♯ (tuned before); or ^{8}A♭, ^{9}E♭, ^{10}B♭, ^{11}F, C. The order in which the eleven fifths are tuned is indicated

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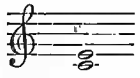
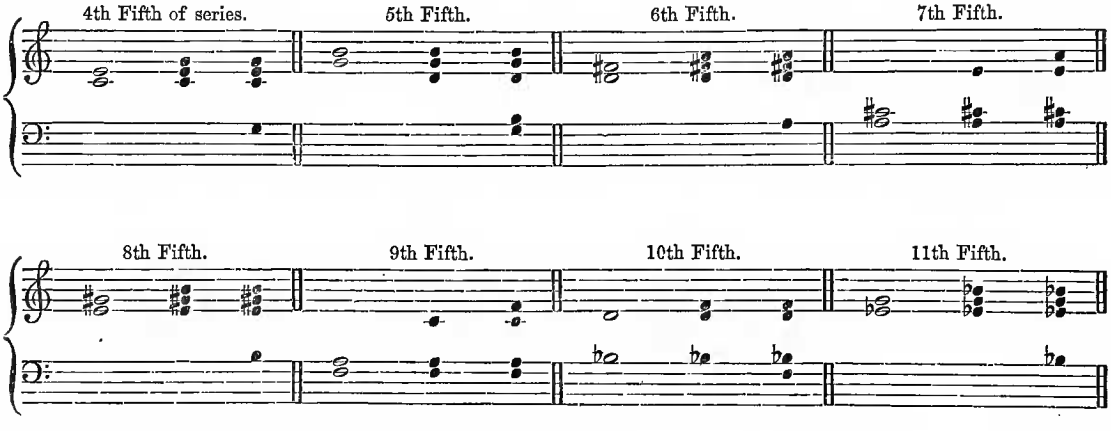
* James Broadwood (the son of the first Broadwood) was the author of a *Practical Method of Tuning*, called "Broadwood's Temperament of the Musical Scale." He says, after mentioning that most tuners begin their operations with the note C, "I prefer tuning from A, the second space in the treble clef, as being less remote from the finishing fifths, than any other point of departure: the A being tuned to the fork, tune A below, an octave; then E above that octave, a fifth; then B above a fifth; then B below, an octave; the F♯ a fifth above; then its octave F♯ below; then C♯, its fifth above; then G♯, its fifth above; and then G♯, its octave below. We then take a fresh departure from A, tuning D, its fifth below; then G, its fifth below; then G, its octave above; then C, its fifth below; then C, its octave above; then F, its fifth below; then B♭, its fifth below; then B♭, its octave above; then E♭, its fifth below. The five fifths tuned from notes below are to be tuned flatter than the perfect fifth; and the six fifths tuned from tones above must be made sharper than the perfect fifth." This is similar to the equal temperament.

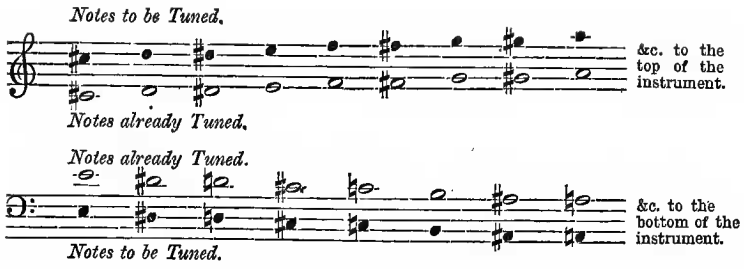
by the figures 1, 2, 3, &c. *All octaves are to be tuned absolutely perfect. All the fifths are to be tuned a very little flatter than perfect.* This, as we have already explained, is called *tempering* them. When we arrive at the eighth fifth of the series, instead of proceeding onwards in the circle to D♯ or E♭, it will be better to return to C, and tune the remaining fifths backwards, as shown in the scheme. In adjusting these latter fifths, marked 9, 10, 11, the student must first tune the bottom note so as to form a perfect fifth with the upper note, and then *sharpen* it by exactly the same quantity as he depressed the upper notes of the fifths which were tuned *forwards*. By this means the interval of the fifth is still *diminished* or *flattened*, as the lower extremity is brought nearer to the upper one.

The operation we have thus explained is called laying the *bearings;* it forms the most delicate and important step in tuning, as all the other notes on the instrument are tuned to these notes by means of octaves above or below.

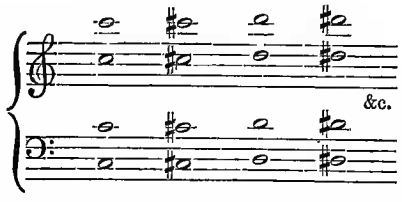
It is not, however, necessary to tune the whole circle of fifths before we have the means of trying the accuracy of what has already been done. As soon as we arrive at the fifth numbered 4 in the scheme, we may try the major third  . If this third is properly in tune—that is, if it is somewhat sharper than perfect, but still very harmonious and agreeable—we may be sure that so far all is correctly adjusted. A similar test must be applied to all the subsequent fifths. These triads may be represented in notes, as follows:



When the *bearings* are laid with sufficient accuracy, it only remains to tune the remaining notes on the instrument in the relation of octaves to those already adjusted. This must be done in the following manner:



After having tuned the bass notes, it is desirable to go over the octaves in the treble again, as they are apt to fall in pitch while the bass notes are being tuned. And, finally, before we consider the instrument as thoroughly in tune, each note should be compared with its octave and double octave below; thus:

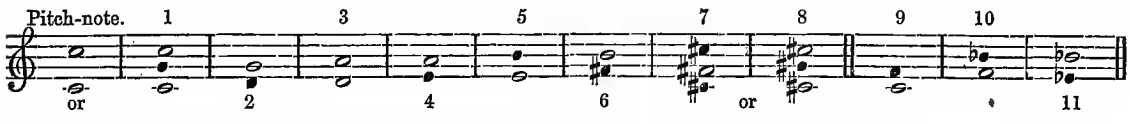


In tuning a cottage, or semi-cottage, or piccolo piano, it will be desirable to adjust first the whole series of notes upon *one* string, and then to tune all the *second* strings in unison to those of the first series.

In a grand piano, after the second set of strings is tuned, we must tune the third set in unison to the first and second. In square pianos, the second string to each note must necessarily be tuned before we proceed to another note.

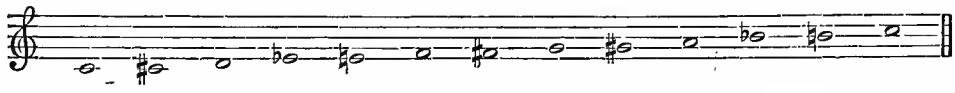
We do not intend to notice the various systems of *unequal temperament* that have been proposed, as they have long since been abandoned. The system of *equal temperament* is that which now prevails throughout Europe.

It is perhaps desirable to mention another method of laying the bearings, which has been adopted by some eminent tuners. The method is by fifths and fourths, omitting tuning the octaves until the groundwork is laid, as follows:

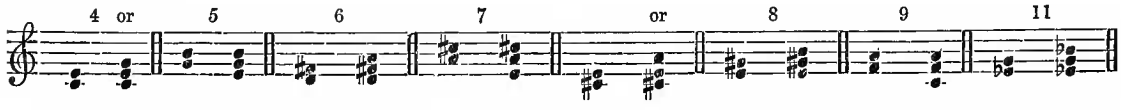


The fifths are tuned a little flat; and, by the same rule, the fourths a little sharp.

In the above scheme, we shall have tuned the following notes within the circle of the octave; thus:



and have avoided the possibility, when tuning the octaves between the fifths, as in other methods, of not getting the octaves true. Besides which, the grouud-work or bearings will be sooner laid down. The trials would be:



The great difficulty in tuning is the necessity of *tempering* the fifths. In this, professional tuners are guided by habit; but artists and amateurs who do not possess this practical skill are obliged to feel their way as they can, and by their repeated experiments, increasing and diminishing the tension of the strings, always injure their tone, and frequently end by breaking, without having the means of replacing them.

With a view to remove these objections, MM. Roller and Blanchet, of Paris, invented, in 1827, an instrument, to which they gave the name of *Chromamètre*, by the help of which a pianoforte can be tuned without the trouble of temperament. The instrument consists of a vertical monochord, which is sounded by means of a hammer placed internally, and which is put in motion by a key similar to that of a pianoforte. Its total length is thirty inches; its greatest breadth, four inches and a quarter; and its thickness, three quarters of an inch. The handle is furnished with a copper plate, divided into twelve degrees, which, like the heads of the jacks in a pianoforte, are inscribed with the initials C, C sharp, D, D sharp, E, F, F sharp, G, G sharp, A, A sharp, and B. The string is fastened to a pin at the upper end, and at the lower to a brass hook, mounted upon a screw, which works up or down with an easy action: by means of this, the pitch is gently raised or lowered at pleasure, steadily, and without effort. A bridge with a spring, which can be fixed at will upon either of the degrees, modifies the intonation, and according as it is placed on C, C sharp, or D, gives the C, C sharp, or D, and so on with the rest, continuing to B. After this, nothing remains but to tune each of these notes at the octave, to the two extremities of the piano.

The back of the *Chromamètre* is disposed in such a manner as to be adapted to all pianofortes at the height of the key-board; so that the note of this instrument, and that of the instrument intended to be tuned in unison, may be touched simultaneously.

The idea of such a regulator, however, was not entirely new. Francis Loulié, a French musician, had already proposed something of a similar kind, as far back as 1698, in a work entitled *Nouveau Système de Musique, avec la description du Sonomètre, instrument à cordes d'une nouvelle invention pour*

apprendre à accorder le clavecin. But this *Sonomètre* being mounted with several strings, was obliged to be tuned beforehand, by which means it rendered all the expected results illusory.

Ambrose Warren, "a lover of musick," in the next century, invented an instrument which he called a *Tonometer.* A full description of it was printed in a now rare tract, entitled *The Tonometer; Explaining and Demonstrating, by an easie Method, in Numbers and Proportion, all the 32 distinct and different Notes, Adjuncts or Supplements contained in each of Four Octaves inclusive, of the Gamut, or Common Scale of Musick. With their exact Difference and Distance. Whereby the Practitioner on any Key'd or Fretted Instrument, may easily know how to Tune the same, &c.* London, 1725.

Scheibler's apparatus for tuning pianofortes, consisting of a series of pulsatory tuning forks, answering exactly to the twelve semitones of the equalized scale, and the octave of the tonic, is the only satisfactory invention that has yet appeared. This ingenious artist has succeeded in providing for the musical world a measure of sound which, in regard to accuracy, surpasses the most rigorous demands that can be made upon it, whilst its application is as easy as it is free from the possibility of a mistake. We strongly recommend the perusal of *An Essay on the Theory and Practice of Tuning in General, and on Scheibler's Invention of Tuning Pianofortes and Organs by the Metronome*—a lucid and charmingly written little tract, published by Robert Cocks and Co. in 1853.

At the recent meeting of the British Association (Aberdeen, Sept. 1859), the Abbé Moigno made known a discovery which promises to be of the highest importance to musical science. He laid before the section of Physical Science a collection of sheets of paper in which were registered the sounds of the human voice, organ pipes, and the tuning fork, to the amount of 500 or 1,000 vibrations. So accurate a self-registration has never before been made, and was judged almost impossible by the great masters of science, and its success was greeted with enthusiastic admiration.

This continued enregistration forms an undulatory curve so perfectly and distinctly traced that the naked eye can easily reckon the innumerable vibrations, especially when it is divided in periods by the periodical intervention of a chronometer. It is very interesting to examine the variations which the curves undergo when the sounds are the results of the component parts of different harmony: for instance, a note with its octave, third, fourth, or fifth, or any other consonant relation, as the 17th or 19th. When the sounds are very nearly in harmony, but not in perfect accord, their simultaneous resonance produces beats, and these beats are perfectly indicated or made known to the naked eye.

APPENDIX III.

HOW TO REGULATE DEFECTS IN THE MECHANISM OF THE PIANOFORTE.

Most musical instruments are liable to defects, from various causes; but more especially the pianoforte, from the delicate and complicated nature of the machinery appertaining to the "action."

The following brief directions have been carefully gleaned from those whose experience entitles them to consideration. They are not put forth with a view to supersede the *professional* regulator. Far from it. They have been compiled solely for the purpose of aiding and assisting those who, from circumstance or situation, are unable to secure the services of the experienced in these matters; and as mere "hints," they may probably prove acceptable to many.

The Sticking of the Keys.

The causes of some of the accidents that take place in the key department of the pianoforte are as follows:—1. When either pin is too tight in the mortices. 2. When the hopper spring is too strong. 3. When the end of the hopper that touches the under hammer is rough. 4. When one key sticks against another. 5. When a key touches the front slip. 6. When a pin, needle, or any other detached substance, is between two keys. 7. When a key touches the cheeks of the key-frame. 8. When a key touches the pillar of the hammer-rail. 9. When any glutinous substance is under a key, or betwixt two keys. 10. When the leather on the under hammer is rough.

How remedied.

(1.) File the mortice carefully. (2.) Weaken the spring by straining it a little from the hopper. (3.) Black lead it, and rub the inner edge with a hard stick. (4.) First consider whether the pins are in a proper position; if so, plane a little off where the keys touch; or if a key is considerably warped, bend it back with a warm iron; press it very gently, in case the mortice is weak. (5.) Incline the slip outwards by putting a piece of paper or card between that and the frame. (6 and 7.) The defects here mentioned can be remedied without directions. (8.) Hollow out carefully a large space.

Great care must be used in all these operations, particularly in opening the mortices or pin-holes. For the latter, a very fine key-file must be used—a flat one for the square hole, and a round or rat-tail

file for the round hole under the key. In taking out a key, great caution must be used. Draw the front block or blade of the hopper forward with your finger, to prevent its touching the under hammer, while with your other hand you gently lift up the key and pull it out. The same care is requisite in replacing it.

The Clicking or Rattling of the Keys

Takes place from the following causes:—1. When the pin-holes are too large. 2. By friction of one key against another. 3. By friction of the key against the front slip. 4. By friction of the key against one of the pillars that support the hammer-rail. 5. When the key touches the balance-rail. 6. When the ivory or ebony is loose. 7. When the lead with which the key is loaded is loose. 8. When the key is unsound. 9. When the cloth or baize under the key is not sufficiently soft. 10. When some hard detached substance lies betweeu the key and the cloth or baize. 11. When the key-frame is not firmly attached to the bottom. 12. When a loose splinter is in the pin-hole. 13. When a pin is rough, at or near the head. 14. When the metal of a pin has communicated itself to the hole which has become too hard or corroded. 15. When the further end of the key touches two damper levers. 16. When a key touches a cheek of the hammer-rail. 17. When a key touches a cheek of the case. 18. When a key touches the name-board. 19. When the ivory or ebony touches that of the next key. 20. When the leather at the further end of the key is too hard, causing it to rattle against the damper lever. 21. When the further end of the ebony touches the front of the name-board. 22. When a key touches any hard substance at the further end near the damper lever. 23. When any hard detached substance is on a key. 24. When a hopper or hopper-guard is loose.

How remedied.

(1.) Wedge the key on one or both sides of the mortices; when this defect occurs in all the keys, it is better to introduce thicker pins. An extremely thin chisel, bevelled on both sides, is necessary for this purpose. (2.) Plane a little off where the keys touch. (3.) Incline the slip outwards, aud place a piece of paper or card between that and the frame. (4.) Hollow out carefully a large space. (5.) Hollow it underneath. (6.) Carefully remove it and clean away the glue, and reglue it with strong glue, aud a small quantity. (7.) Hammer it till firm. (8.) Glue it. (9.) Renew it. (10.) Remove it. (11.) First examine the screws; if they are tight, place some brown paper betwixt the rail and bottom, where the vacancy occurs. The screws may require to be replaced by larger ones. (12.) Remove it. (13.) Polish off the roughness. (14.) File the mortice and clean the pin. (15.) Reduce the key. (16 and 17.) Reduce the parts touching. (18.) Raise the latter and place some cloth under it. (19.) File it very smoothly, or perhaps the key may require wedging. (20.) Renew the leather.

(21.) Saw or file it off very carefully. (22 and 23.) Remove the causes; most likely accidental. (24.) The hopper may require a new hinge, or to be reglued.

An unpleasant Sound in the Hoppers.

The chief causes are as follows:—1. A looseness of the spring. 2. The friction of the spring against the groove. 3. A looseness of the hinge. 4. A looseness of the check. 5. A looseness of the tennant. 6. A roughness in that part which touches the under-hammer. 7. A sudden blow against a hard under-hammer. 8. By touching the next hammer. 9. By touching the next hopper. 10. When the regulating screw is loose. 11. When the cloth is too hard.

These defects can easily be remedied without any particular directions.

A Noise in the Upper Hammers.

Produced by—1. Looseness or unsoundness of the hinges. 2. Hardness of the leather under the block. 3. Looseness or unsoundness of the head. 4. Friction of the head against the damper socket. 5. Unsoundness of the shank. 6. Friction of loose glue against the hammer-rail near the hinge. 7. Looseness or unsoundness of the block. 8. Looseness of the leather under the block. 9. The upper coat of the hammer being too hard. 10. A hammer in the box action touching the wrest-plank at the back, or the sound-board.

In upright pianofortes, the upper hammer rattles occasionally at the centre. This occurs from various causes—when the hole is too large, or badly clothed—when the head or shank is unsound—when the shank is loose—when the bed of the centre wire is broken or gulled. The hammers occasionally stick when the centre wire is too tight in the hole, or when the butt is confined in the notches, or when the hammer is caught between two wires, or when it catches the damper in its return.

How remedied.

The only causes requiring directions are the following:—(9.) Prick the upper coat with a marking awl. If there is no substance in the leather to admit of this being done, it must be replaced by new leather. (10.) The part of the hammer touching should be marked, the action taken out, and the part reduced, to free it.

A Noise in the Dampers

Happens in various ways:—1. When a damper wire is too close to the string. 2. When the damper is loose in the head. 3. When the damper wire is loose in the button, or detached from it.

4. When the whole or chief part of the socket-holes are misplaced. 5. When the socket-hole is not well lined, or the cloth too hard. 6. When the socket-hole is broken. 7. When the damper head touches the top. 8. Or, in grands, when it touches the iron arches.

How remedied.

(1.) Bend the wire, or loosen the cloth from the socket-hole, on that side of the damper wire that touches the string. Perhaps the string may require to be removed from the damper wire, by bending the bridge pins. Both operations require the greatest care. (2.) Plug up the hole, and bore a fresh one. (3.) If the wire does not hold properly, plug up the button-hole, and bore a new one, or introduce another damper wire. (4.) The socket must be detached and placed in a better position, by planing or other means, as may seem best. (5.) Prick the cloth with a marking awl, or unscrew the damper, and line the socket-hole with new cloth, removing the old. Paste, or very thin glue, is best for this purpose. (6.) Glue some cloth or leather round it. (7 and 8.) Screw the damper further in.

A Noise in the Damper Levers

Frequently occurs from the following causes:—1. When the lever touches any hard substance. 2. When the last lever touches the frame-cheek. 3. When the hinge is loose or unsound. 4. When one lever touches another from being badly hinged. 5. When the leather, if any, is too hard. 6. When the wood touches the slip. 7. When the wood is unsound. 8. When there is glue betwixt the hinge and the edge of the slip.

These defects are easily remedied, and require no particular directions.

Defects in the Damping

Are likely to occur—1. When the damper is not sufficiently screwed down. 2. When the damper cloth is too hard. 3. When the damper cloth does not bear equally on two strings. 4. When the damper cloth touches the next string. 5. When two wires are not of the same height under the damper. 6. When two wires are of different thicknesses. 7. When the damper wire does not play in the socket-hole. 8. When the pedal-wire is too long, or other obstructions prevent the damper-action falling to its place.

The remedies suggest themselves.

The Sticking of a Damper

Occurs sometimes—1. In the socket-hole. 2. When the lever does not descend. 3. When the pedal-wire does not act properly. 4. When the pedal-foot sticks.

How remedied.

(1.) Open it, or unscrew the damper-wire, and rub the wire with leather. The other remedies require no directions.

The Sticking of a Hopper

Occurs sometimes—1. Against the under-hammer. 2. When the top of the hopper is rough. 3. When the hopper-spring does not operate in the groove. 4. When it is displaced to one side of the hammer. 5. When the spring is too strong. 6. When the regulator touches the hole of the front block. 7. When any part of the hopper is loose.

How remedied.

(1.) Examine the leather and hopper-spring. (2.) Black lead it, and rub with a hard stick. The other remedies suggest themselves.

The Sticking of a Damper Lever.

1. Against another. 2. Against the key frame. 3. Against any detached substance.

The Sticking of a Hammer.

1. Against the wrest-plank. 2. Against the damper-socket. 3. Against the next hammer head. 4. Against a damper-wire. 5. Against the sound-board. 6. From any glutinous substance adhering to it.

How remedied.

(1.) When this is the case, pare off as much leather from the hammer as it may seem to require; alter the position of the hammer, or press it with a warm iron. The other causes are easily remedied.

The Blocking of a Hammer.

1. When the hopper-spring is too weak. 2. When the hopper-cheek is too high. 3. When the top of the hopper is not smooth, particularly on the inner edge. 4. When any part of the hopper is loose. 5. When the hopper strikes but one side of the under-hammer. 6. When the hopper is too far under the hammer. 7. When the leather of the under hammer is not firm. 8. When the regulating-button is turned too far in.

How remedied.

All the directions required are:—(1.) Bend it, to give it strength. This is done by removing it from its place to the side of the hopper, and bending it downward in a curve; then replace it and

try its strength. (2.) Reduce it. (3.) Black lead it, and rub the inner edge with a hard stick. (5.) Place it in its right position. (6.) Unscrew it till the hammer falls from the string, about a quarter of an inch.

The Jarring of the Wires

Takes place from the following causes. 1. When two or more strings touch each other. 2. When a string is not firm on the bridges. 3. When the damper-wire is too close to the string. 4. When a string touches a wrest-pin. 5. When the centre bridge is loose. 6. When the sound-board is unglued. 7. When the barring is loose. 8. When the instrument is not firmly placed on the floor. 9. When any hard detached substance is on the sound-board. 10. When one string is thinner than the other. 11. When a string is confined by the pins on the sound-bridge. 12. When there is not sufficient side bearing. 13. When a bridge-pin is loose. 14. When a covered string is loose. 15. When the vibration of the strings is not sufficiently damped by the cloth betwixt the sound-bridge and right block. 16. When a damper-cloth is too hard. 17. When a wire is unsound. 18. When a wire touches the break of the treble string. 19. When a wire touches the name-board.

The remedies suggest themselves.

Hammers touching the wrong Strings.

When this occurs, it is from the following causes. From the hammer-head being too large. 2. From its not being properly hinged. 3. When, from the action not being properly adjusted, the majority of the hammers strike in a wrong place.

How remedied.

(1.) Cut it; this is done by removing the action, or holding up firmly the hammer with a loop of wire while cutting. (2.) Rehinge. (3.) The hammers will generally require to be wedged to the right from left-hand cheek of the hammer-rail.

Defects in the Wrest-pins.

1. When the wrest-pin starts or jumps. 2. When too close to another, thereby hindering the proper use of the tuning-hammer. (3.) When the wire is twisted too high or too low on the wrest-pin. 4. When a wrest-pin is too close to the next string. 5. When the wrest-pin is too small for the hole.

How remedied.

(1.) Probably caused by an unseasoned wrest-plank; or perhaps by the wire having been wound on the pin with a damp hand. A little chalk filled in the hole, will sometimes remedy this. The other defects are easily removed.

Defects in the Pedal.

1. When the pedal wire is too short to raise the dampers to their proper height. 2. When, by being too long, it raises them too high. 3. When the pedal foot is too light. 4. When the pedal foot-pin is too tight. 5. When the pedal foot is too close to the floor. 6. When a rattling is caused by the pedal foot being too loose.

The remedies suggest themselves.

How to alter the Touch.

1. When the touch is too shallow, place brown paper under the balance-rail, near the screws, till you obtain the requisite depth. If the hoppers are too near the under hammers, plane the bottom of the front rail. When the alteration in touch is accomplished, reduce the hopper cheeks if too high. 2. When the touch is too deep, place some paper under the front rail, near the screws. If the hopper cheeks should be found too low, glue some thicker leather on them. 3. When any part of a key is deeper or shallower in touch than the rest, you must operate as directed above, on that particular part of the key alone. 4. When one key is higher than the rest, reduce it on the balance-rail, with sand-paper. 5. When any key is shallower in touch than the rest, raise it on the balance-rail by placing a thin piece of paper on the balance-pin under the cloth. 6. When the hoppers are too short, raise them by putting another piece of cloth under the end rail. 7. When the hammer falls off too far from the strings, rectify it by turning the hopper-pin to the right. 9. When the hopper is high, and the front of the key too low, plane off a little under the further end of the key.

In grand pianofortes the touch is generally altered by moveable blocks or brackets under the balance-rail, screwed up and down, as required; or by placing pieces of paper, or card, under the blocks.

New Leathering the Hammers.

The result of this process is very uncertain. When the hammers have become hard merely by much use, new leathering will succeed. When they are hardened by imbibing damp, the instrument will be found to have suffered irremediable injury from the same cause, and any attempt to restore the tone by new leathering the hammers, will be unsuccessful. It is rather a difficult matter to ascertain which of these two causes may have affected a pianoforte; but by careful inspection we may discover small blue specks upon the sounding-board of the instrument, which are sure indications of damp. If the sounding-board be free from these marks, and the hammers be deeply sulcated with the wires, it is probable that new leathering will, in a considerable degree, restore the tone.

APPENDIX IV.

A GLOSSARY OF THE PRINCIPAL TERMS USED IN THE MANUFACTURE OF THE PIANOFORTE.

ACTION (The). The key-frame, with all its apparatus of hammers, hoppers, keys, &c. In other words, the machinery through which the impulse given by the finger of the performer is transmitted to the string. It is this part of the pianoforte that taxes the ingenuity of various makers.

ÆOLIAN ATTACHMENT. An addition to the pianoforte, the object of which is to sustain and graduate the tone, without the assistance of reeds, pipes, or any vibrating bodies, other than the string. The principle (an invention of M. Isoard, an engineer and mechanician) consists in causing a current of air to act on the string, which prolongs its vibration somewhat on the principle of an æolian harp. For this purpose there is an opening opposite to each string, through which a stream of air passes from a bellows, when a valve, corresponding to the given note, is opened by the key. The bellows are moved by pedals, in the same manner as those of the seraphine or harmonium.

ALBION GRAND PIANOFORTE. The peculiarity of this instrument is that it has a *down-striking* action. It has no metallic bracing, and affords a good example of how much the introduction of the down-striking principle would cheapen the instruments of this form. It was patented by Wornum in 1842.

BEARING (The). The direction the strings take from pin to pin; that from the bridge to the long block is called the *side* bearing.

BELLY—*i. e.* the sounding-board of the pianoforte. See SOUNDING-BOARD.

BELLY-BRIDGE. The bridge on the sounding-board.

BICHORD PIANOFORTE. Any instrument with two strings to each note.

Boudoir Cottage Pianoforte. A name given to those small instruments extending in width at the back, the bass strings of which run obliquely, thereby increasing the richness of the bass.

Boudoir Grand Pianoforte. A small horizontal grand piano, generally with two strings to each note.

Brass open covered Strings. First introduced for the bass notes of square and other pianofortes.

Brass Wire. Formerly used (and still by the French) for the higher portion of the bass notes: by some makers, throughout the instrument.

Bridges. There are two bridges: that on the sounding-board varies in form, according to the scale of the different makers. It is glued and screwed to the sounding-board, with wooden nuts underneath, before the latter is fixed on the case. That on the long block is glued and pinned, and sometimes screwed to it. Some pianofortes, not having the metallic plate, have a third bridge—that is, a slip of wood near the hitch-pin.

Button. A circular piece of leather or wood, moving upon a screw wire; for regulating purposes.

Cabinet Pianoforte. A form of upright instrument, invented and patented by William Southwell, in 1807. The name still remains; but the invention has long since been superseded and laid aside.

Check. Only used in grand and double-action instruments. It is a small projection fixed at the back end of the key, serving to prevent the reiteration of the hammer, by catching and firmly holding it when freed from the string.

Close-covered Strings. These strings, lately introduced in England, for the entire bass are of steel, covered with copper. The largest of them are now, for the extreme low notes, double lapped with thick copper wire. The wrapping too is close, like that of the fourth string of the violin; whereas, formerly, it was open, like the worm of a corkscrew. The best pianoforte wire is made, expressly for the purpose, by Mr. Webster, of Penn's Mills, near Birmingham.

Compact Square Pianoforte. An instrument six or eight inches shorter than the ordinary square; hence the name. The action is "down-striking," and exceedingly simple. Stodart introduced the inverted mechanism into square pianofortes some ten or twelve years ago. The present invention was by Greiner, who exhibited it in 1851.

COMPENSATION GRAND PIANOFORTE. This instrument has a frame-work of metal tubes, extending from end to end, to withstand the tension of the strings, which have always a tendency to depress the sounding-board and curve the frame-work upward. This invention, patented by Stodart in 1820, was an appliance to prevent the tendency referred to.

CONSOLE PIANOFORTE. A small upright instrument, a little more than three feet high; the top projecting only a few inches above the box enclosing the key-frame. It has the appearance of a cheffonier, and is very effective for its size. The sound-board is made to extend over the whole vertical area of the instrument; whereas, in ordinary uprights, it is of necessity limited to the area occupied by the strings alone. On this account, the tone of the console piano is remarkable for so small an instrument. It is the invention of M. Pape, of Paris.

COPPER WIRE. At one time used by Broadwood, and some other makers, for a few notes in the bass.

COTTAGE PIANOFORTE. The original name of the short upright pianoforte.

DAMPER. A silencing agent to stop the vibration of the strings when the fingers are lifted from the keys. It consists of several folds of soft cloth, which press against the strings when at rest, but are lifted off by the back end of the key when the front end is pressed down. The grand pianoforte damper originally consisted of a simple rod, headed with cloth, and rising vertically between the strings. But little alteration has been made in this, except that, as the strings were made heavier, and the vibration became stronger, the force with which the damper was held against the strings required to be increased, and the damping surface of cloth extended. The damper movement is variously disposed by different makers, sometimes *above* the strings, sometimes *beneath* them.

DAMPER-CRANK. A hinged or centred lever, raised by the key, and connected with the damper-head by a fine wire.

DAMPER-SLIP. The slip to which the damper is hinged.

DAMPER-STICK. A stick running through a rack-rail, simply raised by the end of the key; formerly made of wood, latterly of wire; also connected or unconnected with the damper-lever.

DOUBLE-GRAND PIANOFORTE. An instrument consisting of two grands, enclosed in one large oblong rectangular case—the players sitting at the two opposite ends, facing each other. One string-plate

serves for both instruments, the short strings of one coming in a line with the long strings of the other. Invented by Mr. Pirsson, of New York, and shown in the Great Industrial Exhibition of 1851.

ESCAPEMENT. That part of the hopper which, moving on a hinge or centre, is pressed to its raising power by a spring, and by means of the regulating screw (acting upon a bevelled point) is nicely adjusted to cause the hammer to leave the string at the instant of impact. It is in this particular part of the action that makers, who claim invention, so widely differ.

EUPHONICON PIANOFORTE. An upright pianoforte invented by J. Steward, Esq. in 1841. The compass is seven octaves, and its frame, wholly of iron, highly japanned, beautifully ornamented with pearl and gold pencilling on black, blue, or crimson grounds, and embellished with exquisitely chased ormoulu designs, produces an extremely light and elegant appearance. The left portion of the instrument is much higher than the right. To the upper part of the former are attached the three lower octaves of the strings, which are exposed to view ; thus combining the appearance of harp and piano. It has three sounding-boards—treble, tenor, and bass,—corresponding to the violin, tenor, and violoncello. It is not now under manufacture.

GRAND PIANOFORTE. The largest sized horizontal instrument, with *three* strings to each note.

GRAND SQUARE PIANOFORTE. Similar to the common square, but having the sounding-board the whole length of the instrument, and the action the same as the grand. Generally made a few inches wider, from back to front, than the common square.

HAMMER. The striking lever, moving upon a centre. The covering of the face of the hammer was formerly of buff leather; now it is made of a fine kind of felt, prepared expressly for the purpose, which gives a much superior quality of tone, and is much more regular in its structure.

HAMMER-BUTT. The part of the hammer-lever which is centred, and the point upon which the hopper acts.

HAMMER-RAIL. A rail extending from end to end of the action, into which the butts of the hammer-lever are centred or hinged.

HARMONIC BAR. A metallic bar firmly attached to the edge of the wrest-plank, through which the treble strings pass, in lieu of over the solid pin-bridge. By this means a bearing *upwards*, instead of *downwards* (as formerly), is attained, giving a more firm and clear tone to the grand pianoforte.

HITCH-PIN. The pin in which the eye or noose of the string is hitched.

HITCH-PIN BLOCK. The block in which the hitch-pin is inserted, at the opposite end or side to the wrest-plank, now generally covered with a metal plate.

HOPPER. A spring medium between the key and hammer, with an escapement to let the hammer fall from the string. It is well explained by Mr. Pole:—"It was a jointed upright piece, attached to the back end of the key, and used to lift the hammer, in place of the stiff wire and button of the former mechanism. When the key was pressed down, the hopper, engaging in a notch on the under side of the hammer, lifted it to within a very short distance of the string—so near, in fact, that almost the slightest pressure would cause it to strike; but at this moment, while the key was still pressed down, the jointed part of the hopper coming in contact with a fixed button as it rose, escaped from, or 'hopped' out of, the notch, and let the hammer fall clear away from the string. This mechanism, as applied with trifling variation to the square pianoforte, was called the 'double action,' and is extensively in use for this and the upright form at the present day."

HOPPER-LEVER. A delicately adjusted lever, with double centres, upon which the hopper action is centred; acting upon the damper action by reverse motion. It is used in Erard's action.

HOPPER-SPRING. A fine brass spring to keep the hopper to its bearing.

JEU CÉLESTE. A soft pedal, interposing cloth between the hammers and the strings. It is used in many of the French pianos, in addition to the ordinary soft and loud pedals.

KEY (CLAVIER). The lever upon which the finger acts, giving motion to all other parts of the action.

KEY-FRAME. The frame upon which the keys act (moveable in grands), made always of wainscot, formed of three rails; the front and centre to receive the key-pins, the back (lined with green baize) to receive the balanced end of the key. In grands, and usually in Broadwood's upright instruments, this frame is made to slide to the right by means of the left pedal. In many transposing pianos, the key-frame is made to move to the right or left by some simple mechanism. See TRANSPOSING PIANOFORTE.

KIT-GRAND PIANOFORTE. The smallest size of grand-shaped instruments.

Lyra Pianoforte. An instrument of the upright shape, the back of which is intended to be turned towards the centre of the room, and is formed like a lyre, with openings covered with silk; the object being to throw the sound outwards. The piano stands on a raised platform or sound-conductor, into which the bass strings descend, and which also elevates the stool for the player. It has three pedals, the additional one being a soft one on the French principle, viz. introducing a thickness of soft cloth between the hammer and the string. Invented by Messrs. Hund and Son, and exhibited in 1851.

Microchordon Pianoforte. An upright instrument, in size between the piccolo and cottage.

Oblique Cottage Pianoforte. A small upright instrument, having the strings placed obliquely, thereby obtaining greater length and power of vibration. These pianos are generally wider than ordinary piccolos, and usually with three strings through the upper part of the compass. A very superior and powerful description of small-class piano.

Pédalier (The). A kind of *armoire*, placed upright against the wall, and played by means of a pedal-board under the feet of the performer. The instrument has its own strings, hammer, and peculiar mechanism, and is totally independent of the pianoforte, which is placed before it. Its height allows its strings to be unusually long and thick; while the dimensions of the sounding-board, proportionably large for a pedal-board of two octaves and a half, imparts a peculiar richness and power to its tones. The gravity of the thick strings is modified by their being united with finer strings, which produce at the same time the octave next above. This valuable instrument, so desirable for playing a pedal obbligato, is the recent invention of M. Auguste Wolff, of the house of Pleyel and Co. Paris.

Pedals (The). The forte pedal, usually on the right side of the instrument, is used to lift off the dampers from the strings. By touching the pedal-foot, a wire or stick, is set in motion, which raises the damper frame. The piano pedal moves the entire action along the strings, causing the hammer to strike on one of two, or on two of three strings.

Piccolo Action. The double or 'piccolo action' was the invention of Mr. Wornum. It is now universally used on the Continent for upright pianofortes.

Piccolo Pianoforte. A very small upright instrument, generally 3 feet 9 inches high, 4 feet wide, and 2 feet 2 inches deep.

PINS. There are six sorts of pins:—the *wrest*-pins, or tuning-pins; the *bridge*-pins; the *hitch*-pins, on which the strings are hooked; the *key*-pins; the *hopper*-pins; and the *pedal*-pins.

PIN-BRIDGES. Either single or double: the latter, generally used in the grand pianoforte and harpsichord, has a reversed bearing. These bridges serve to give the *sounding* length of the string; one placed near where the string is struck, on the edge of the wrest-plank solid; the other on the most sonorous point of the sound-board.

PITCH. The acuteness or gravity of any particular sound, or of the tuning of any instrument. Any sound less acute than some other sound, is said to be of lower *pitch* than that other sound, and *vice versâ*.

POCKET GRAND PIANOFORTE. A small semi-grand instrument, generally with two strings to each note.

RAIL AND SOCKET. A rail of wood covered with cloth, extending from end to end of the action, under the hammers, midway, as a fixed point of rest to which the hopper is regulated.

REGULATING SCREW. Variously used to adjust the point of escapement of the hammer in the hopper movement.

REPETITION ACTION. "In the ordinary action," says Mr. Pole, "after the hammer has fallen, the key must rise to its position of rest before the hopper will engage again in the notch of the hammer, so as to be ready for another stroke; and hence a note cannot be repeated without not only requiring the finger to be lifted through the entire height of the key's motion, but also demanding a length of time between the repetitions, sufficient to allow of its full rise. The contrivances by which this inconvenience has been overcome, are of various kinds, according to the fancy or the ingenuity of the makers; but they all act on the same principle,—namely, by holding up the hammer at a certain height while the key returns; by which means the hammer is allowed to engage itself under the hopper earlier, and to reproduce the note in less time, and with less labour to the finger, than before."

ROYAL ALBERT TRANSPOSING PIANOFORTE. The invention of Messrs. Addison and Co. A "Piccolo upright," capable of transposing music upwards or downwards. For instance, if a song be played

on the keys as if in C, it can be made to sound either in the key of C sharp, D, E flat, B, B flat, or A; i. e. in any key within a range of three semitones above or below the original one.

Ruler. A rail lined with cloth, used in the old actions, as also in harpsichords, spinets, &c. to prevent the jacks and dampers from jerking out.

Scale (The). The distance between each wire; in fact, the general plan of the instrument. Each maker has his particular scale. Formerly the wires were much thinner than they are at present; consequently the distance from one bridge to the other was greater; for the longer the measure, the thinner the wire must be, and *vice versâ*.

Semi-cottage Pianoforte. A somewhat shorter instrument than the ordinary Cottage Piano.

Semi-grand Pianoforte. The next size smaller to the grand instrument, and with a somewhat different action.

Sostinente. The application of a cylinder and silk loops to an upright pianoforte. The loops were attached to the strings and the cylinder, which, being moved by the foot, bowed them: the tones came forth somewhat like the tones of a seraphine. It was the invention of Mr. Mott.

Sounding-board. Often called the "belly." It is that smooth thin board over which the strings are distended, and which, by its vibrations, greatly contributes to the tone of the instrument. It is analogous to the belly of the violin, and is composed of the best Swiss pine, perfectly free from knots orimperfections, cut in a particular direction of the grain, and thoroughly seasoned.

Square Pianoforte. The shape of the first pianoforte introduced into this country. Its inferiority, even in its present improved state, to the grand instrument, consists in the comparative weakness of its tones, consequent to its having only two, instead of three sets of strings, and the body of the instrument being so much smaller than that of the latter. Very few instruments of this shape are now made in this country.

Square Semi-grand Pianoforte. This instrument, invented by the Messrs. Collard, has precisely the same action as that used for semi-grands; whereas the ordinary grand-square has only an adaptation of the peculiarities of the grand action to that of the square.

STEEL ARCHES. Used in old grand pianos to counteract the tension.

STEEL SPUN-WIRE. Used for the lapped strings of the lower part of the pianoforte.

STEEL WIRE. Used, of various thicknesses, for the upper four and a half octaves of the pianoforte.

STICKER. A medium of communication between the *under*-hammer and the butt of the hammer; used in the action of the upright pianofortes.

STRING-PLATE. A metal plate, partially extending over the hitch-pin block, to obviate the fault of the hitch-pin's tendency to draw out. It was first introduced by the Messrs. Broadwood.

STRINGS. Of various metals, substance, and manufacture. See STEEL WIRE, BRASS WIRE, COPPER WIRE, BRASS OPEN COVERED STRINGS, CLOSE COVERED STRINGS.

STUD. A metallic application to grand and other superior pianofortes, screwed into the wrest-plank to obtain an upward bearing of the string, instead of a downward one over the pin-bridge, by which clearness of tone is attained.

TABLE PIANO. An instrument having the size and appearance of an ordinary drawing-room table; one end being lifted up, the keys slide out in a sort of drawer, and the table is converted at once into a pianoforte. The action is down-striking, and the hammers are directly under the front end of the keys; the strings are brought up to the front, and cross each other in two different planes, by which the necessary length for the lower notes is obtained. The sounding-board extends over the whole instrument. It was invented by M. Pape, of Paris.

TENNANT. A small groove in the middle of the key, into which the hopper is inserted.

TENSION. The force employed in stretching a string to the required degree.

TEMPERAMENT. A small, and to the ear almost imperceptible, deviation from the absolute purity of intervals. In its more limited sense, it denotes that arrangement of a system of musical sounds by which a minute quantity is abstracted from the original purity or magnitude of some or most of the intervals which may be formed by them.

TRANSPOSING PIANOFORTE. The object of this instrument is to transpose music to suit voices of different compasses. The key-board and action, or the strings and framing, are shifted laterally, so as to make one hammer strike different strings, according to its position. See ROYAL ALBERT TRANSPOSING PIANO.

TRANSVERSE BAR. Part of the bracing so called.

TUNING FORK. A steel utensil, about three inches long, consisting of two prongs and a handle, and which, being struck against a table or any other substance, produces the tone to which itself was originally set. There are various tones or pitches; but the A and C forks are most generally used.

TUNING HAMMER. A steel or iron utensil used by pianoforte tuners. It is about four inches long, and formed like a common hammer. With the head of the hammer the pegs round which the ends of the wires are twisted are driven into the sockets; and the bottom of the handle is furnished with a square or oblong hole, in a longitudinal direction, which, being of a size to fit the tops of the pegs, enables the hand to turn them, and thereby to relax or extend the wires.

UNACHORD. Any instrument with one string to each note.

UNDER-HAMMER. A hinged lever, similar to the damper lever, to which the hopper is adjusted; used in upright pianofortes.

UNDER-HAMMER SLIP. The slip to which the under-hammer is hinged.

UTILITARIAN BOUDOIR PIANO. A small piccolo upright instrument, with one string to each note. The keys are shorter and project less, by which the legs or scrolls usually put under the key-frame are saved. The action consists of a simple projection at the end of the key, which lifts the tail of the hammer directly, without the intervention of any hopper. It is, in short, a return to the old single action, with which the pianoforte was first made; the only difference being the variation in form necessary to adapt it to the upright instrument.

WREST-PIN. Iron pins upon which the strings are strained. They are not screws, but have sufficient

tendency to draw themselves in tightly, when turned to the right. They protrude about an inch from the wrest-plank, having an oblong or square upper end, by which they are turned.

WREST-PLANK. Usually formed of two or more kinds of wood, joined together in the flat, with the grains running in opposite directions; the upper one of wainscot oak endwise, to resist the great tension of the strings, usually veneered with holly or other white wood. It receives the wrest-pins, on which the wires are stretched to their necessary tension. Its situation differs according to the kind of pianoforte. In the *grand,* it is placed in the front of the instrument, immediately above the keys; in the *upright,* at the top of the instrument, above the action; in the *square,* (originally at the right end) latterly at the back, behind the keys.

ADDITIONAL NOTES AND ILLUSTRATIONS.

Page 15. In summing up our information upon the musical acquirements of those extraordinary people, the ancient Egyptians, we extract the following passage from Sir J. Gardner Wilkinson's recent volume on *The Egyptians in the time of the Pharoahs*, 8vo. 1857.—"Their bands were often composed of a harp, lyre, and *guitar*, a double pipe, and tambourine; of a fourteen-stringed harp, a double pipe, and a lyre of seventeen chords, with voices; of two harps, a flute, and voices; of a harp, a *guitar*, and a double pipe or of two flutes; of harp and two *guitars*, with a double pipe, and the clapping of hands; of two harps, and a jingling instrument which may correspond to the crescent-crowned bells of our military bands; besides many other combinations. * * To discover, rather than to invent, these simple instruments, required little skill; but, before they could devise the means of obtaining various notes from a small number of strings, by shortening them on a neck, as in our modern guitar and violin, considerable experience was required; and this could only have resulted from an attentive study of musical sounds. The three-stringed guitar, therefore, proves that the Egyptians had acquired a knowlege of music at a very remote time, for, though not represented in a band of music earlier than the eighteenth dynasty, it is found among the hieroglyphics upwards of 600 years before that period as the initial of the word *nofr*, 'good." The guitar had a long neck, about twice the length of its oval body, which last was a hollow case of wood with leather or parchment strained over it, having small holes to allow the sound to escape. It was played with the *plectrum;* and as the *cithara* of Greece was smaller than the other Greek lyres, the guitar of the Egyptians was of less power than their lyre. Women generally played it; men rarely. It was supported on the right arm, and even by a strap over the shoulder, like the Spanish guitar; while the strings were shortened by the left hand; and the performer occasionally danced to its sound."

Page 28, line 18. *Catgut* is the name applied to strings made from the peritoneal covering of the intestines of sheep. The greatest care is necessary in preparing these strings for musical instruments, to secure the strength necessary for the great tension required for the high notes. The best strings are made at Naples, because the sheep, from their leanness, afford the best raw material; it is a well-ascertained fact that the membranes of lean animals are much tougher than those of animals in high condition.

Page 33, line 1. Du Sommerard, in his *Album of Archæology*, engraves a Clavichorde with "*cordes de laiton*," which belonged to one of the *dames d' honneur* of Catherine de Medicis, and was preserved in the Hotel Richelieu till 1791. The "strings of brass" strongly favour our theory.

Page 34, line 15. We are not quite clear upon the point that the monochord of the middle ages was not used in the *performance* of music. Since writing the passage in the text, we have noticed in the second volume of Gerbert's *De Cantu et Musicâ Sacrâ*, plate 34, the figure of a man evidently playing upon an instrument of this description. See also plate 26, of the same work.

Page 48, line 22. Gold and silver compounded and rendered elastic would undoubtedly produce beautiful tones. A gold string or wire will sound stronger than a silver one; those of brass and steel give feebler sounds than those of gold and silver. Silk strings were made of the single threads of the silk worm, a sufficient number of them being taken to form a chord of the required thickness; these were smeared over with the white of eggs, which was rendered consistent by passing the threads through heated oil. The string was exceedingly uniform in its thickness, but produced a tone which the performer called tubby.

It seems probable that when Josephus speaks of the musical instruments belonging to the Temple as being "made of a composition between *gold and silver*," he alluded to the strings or wires.

Page 48, line 11.—The following advertisement appeared in *The Times* newspaper, July 8, 1858:—

"A MUSICAL CURIOSITY.—A magnificent and historical HARPSICHORD may be seen, for a few days, at No. 6, Arundel Street, Haymarket. It has belonged to the old and princely house of De Medicis, Dukes of Florence, and is the great work of Marco Sadre, who flourished in the sixteenth century. There are five octaves and a half, and the keys still have their original sweetness. In front of the keys are three authentic portraits chiselled in gold, surrounded with the following relative inscriptions:—"Francis Medices Florent Senaraum; the other "Carolus Galliorum Rex Cristianis, 1565" (who was the son of Henry IV and Catherine de Medicis); and the last, "Joanna Princ, Florent, Senar, Arcid" (who was the wife of Francis de Medicis). Besides, there is the name of the great manufacturer, and the year (1565) in which he made this work."

Upon inspecting this "musical curiosity," it proved to be a very small virginal, of sweet tone, and in the most perfect state of preservation; its compass, from E below the bass staff to F in alt, four octaves and one note. The maker's name is Marco *Jadrae* (not Sadre as printed in the *Times*), concerning whom nothing seems to be known. After making considerable research for some particulars of this early maker without success, we wrote to Count Pepoli upon the subject, and were favoured with the following answer:

"I believe that 'Opus Marci Jadræ,' id est, 'Opera di Marco Jadra,' or di Jadra, is the name of the artist Marco dai Cembali, or Marco dalle Spinette; and that Jadra or Jadera was the name (being the latter one) used very often instead of Zara. And it was the fashion to call the artistes after the names of their towns: Coreggio, Bassano, D'Arpino, &c. This is my opinion; but '*valeat quantum valere* potest."

This interesting instrument was purchased in Rome, by the present possessor, from an old monk of the Cornaro family. The price put upon it by the advertiser was £500!

A small virginal of German make, bearing date 1600 (called a spinet in the description), was lately exhibited in the Art Department of the South Kensington Museum; its compass was from G, the lowest note of the bass staff, to A above the treble staff, three octaves and one note.

Page 57, line 16—"A man whose facultie in profession is a maker of Virginalls, going to the brick kilns, at the upper end of Golding Lane, to seek *Ravens feathers*, which he putteth to some use in his handy craft," &c.—Anthony Munday's *View of Sundry Examples*, 1580, 4to. (*Shakespeare Society's* reprint, p. 93.)

Page 58, line 19. Queen Elizabeth's virginal was purchased at Lord Spencer Chichester's sale at Fisherwick, by Mr. Jonah Child, a painter, of Dudley in Worcestershire. Shaw, in his *History of Staffordshire*, article Fisherwick (vol i, p. 369), gives a minute description of the instrument.

Page 64, line 10. Among the Howard papers, Lady Arabella Stuart, writing to the Earl of Shrewsbury from Broad Street, June 17, 1609, says:—"But now from doctrine to miracles; I assure you within these few dayes I saw a paire of virginalles make good musick without help of any hand, but of *one* that did nothing but warme, not move, a glass some five or six foote from them. And if I thought these great folkes invisibly and farre off worke in matters to tune them as they please, I pray your Lordship forgive me; and I hope God will, to whose holy protection I humbly recommend your Lordship," &c. How was this virginal made to play without the "help of hand"? The passage affords an early example of scientific knowledge. We have in vain searched for a more minute account of this wonder.

Page 65, line 2. The following extracts from the *Obituary of Richard Smyth* (printed by the Camden Society in 1848), relate to a virginal-maker whose name had escaped our notice;

"1660. Janua. 5. Tho. White, virginal maker in Old Jury, buried."

"1665. Septem. 2. Mary White, ye relict of Thom. White, virginall maker, my late tennant in Old Jury, buried, *ex peste*."

Page 65, *note*. The interesting virginal mentioned in the note as being in the possession of T. Mackinlay, Esq. is now the property of the author of the present volume. It was made in the year 1666, by Adam Leversidge, and is in

an excellent state of preservation. The painting, embossing, and gilding, are all as fresh as if they had recently come from the hands of the manufacturer.

Page 69, line 8. Baker Harris was an eminent maker of spinets in the latter half of the eighteenth century. We saw one by this maker at a broker's shop in Great St. Andrew's Street, Seven Dials, in April 1858. It had white keys, and was dated 1776.

Page 77, line 29. A book very little known and imperfectly described by Forkel and Lichtenthal, in their Musical Bibliographies, contains some singular descriptions of musical instruments constructed in the seventeenth century, upon principles which, after having been lost and forgotten, were brought forward again as new at a later period. This book is entitled *Dichiaratone della Galeria Armonica eretta in Roma da Michele Todini, Piemontese di Saluzzo, nella sua habitatione, posta all arca della Ciambella*, printed at Rome by Francesco Tizzoni, 1676, ninety-two pages, 12mo. Forkel and Lichtenthal mention this book only by the abridged title of *La Galeria Armonica*, and do not appear to have been aware of its real contents; for they cite it merely as a description of an ingenious organ which had cost Todini eighteen years to complete; whereas it is not only a description of the organ, but of several other musical instruments and curious pieces of mechanism, which Todini had constructed and placed in those apartments of his dwelling-house to which he gave the designation of an *Harmonic Gallery*. In the first room were some curious and complicated specimens of clocks; in the second, a mechanical representation of the story of Polypheme and Galatea, in which tritons and sea gods played several tunes on a harpsichord, and Polypheme himself performed on a kind of bagpipe, the sounds of which were produced by a key-board under that of the harpsichord.

It was in the third chamber that the most curious of Todini's inventions in the construction of musical instruments were deposited; and these, considering the period at which they were manufactured, are really astonishing. Amongst them were two violins, the pitch of one of which could, by an ingenious mechanical contrivance, be at once heightened a whole tone, a third, or even a fifth; the other, under the usual strings, had a second set of strings, like those of a kit, tuned in the octave above, and was so contrived that the violin and kit might either be played separately or both together, at the pleasure of the performer.

In the twenty-third chapter of this tract is a description of a viol-di-gamba, so contrived that, without shifting the neck, all the four kinds of violins, namely, the treble violin, the contralto (or *viola bastarda*), the tenor, and bass viol, could be played upon it. Todini had originally given the bass of this instrument an unusual depth; but he abandoned that when he invented the double bass, which instrument he was the first to introduce and play upon in oratorios, concerts, and serenades.

Todini also invented and manufactured two harpsichords; on one of which, by an ingenious contrivance, the three genera of the ancients, the diatonic, chromatic, and enharmonic, could be played without any multiplied or inconvenient division of the keys.

In this third room of the gallery was also his grand organ, which had cost so many years' labour, and in the construction of which were many contrivances that have since been revived and called new inventions. This organ contained seven instruments of different kinds, any number of which might be played on separately or united, at the pleasure of the performer. The organ had numerous stops, which could be adjusted, combined, or separated, without the necessity of the player taking his hands off the keys. There were an harpsichord, an octave spinet, a small theorbo, a violin, and a kind of bass violin with fifteen strings, then in use, and called the lyra or accordo. Todini had invented a mechanism by which the effect of the bow on these instruments was perfectly produced. It is well known how many attempts were made to produce this effect, a detailed account of which has been given in our earlier pages; but what is worthy of notice in Todini's instrument is, that the same key-board served for the organ with all its stops, the harpsichord, spinet, theorbo, and violins; and that they might not only all be played, as above mentioned, either separately or united at pleasure, but without the performer being at any time obliged to lift his hands from the keys.

Todini wrote his book when all these inventions of his were completed, and invites all musicians to satisfy themselves, by ocular inspection and examination, of their advantages. There can be no doubt, therefore, of their reality, even if Lichtenthal had not expressly said that the organ was still in existence, at Rome, in his time.

Page 84, line 12. The earliest harpsichord made in England which we have seen was lately exhibited in the Art Department of the South Kensington Museum. It consisted of a mere shell, the inside being entirely gone, with the inscription on the name-board, "Johannes Asard, 1622."

Page 91. To the note on this page add the following:

"The Harpsichord, an instrument of power and compass, is now going out of use. The guitar, a trifling instrument in itself, and generally now taught in the most ignorant and trifling manner, is adopted in its place; while the theorbo and lute, the noblest because the most expressive and pathetic of all accompaniments, are altogether laid aside. What is the reason of this? Because the guitar is a plaything for a child, the harpsichord and lute require application." —Dr. Brown's *Estimate of the Manners and Principles of the Times*, vol. ii, p. 77, edit. 1758.

Page 93, line 32. In addition to the English makers of the middle of the eighteenth century which we have noticed, we may add the names of "Mr. Mahoon, Harpsichord-maker to His Majesty," and "Mr. Sells, Harpsichord-maker," both of which appear among the subscribers to *Travers's Canzonets*.

Page 147, line 17. In the *Quarterly Musical Register*, edited by A. F. C. Kollman (of which we believe only two numbers were published), No. 1, January 1, 1812, is an interesting article, giving a "Retrospect of the state of Music in Great Britain, since the year 1789," from which we extract what relates to the various inventions which have been introduced in the pianoforte:

"1. *Additional Keys*, above the former high F, three lines and a space over the treble stave; and below the former low F, four lines under the bass stave. In regard to these, it is certain that, though any rational extension of the compass of the scale is an improvement in an instrument, the modern rage for additional keys *without end* seems to carry the art of invention too far in that respect. For no great composer for keyed instruments, or great performer on them, has reason to complain of their limited compass, even when they contained but five octaves, from F to F; and to them a good tone, with a mechanism that admits of a highly finished, as well as an expressive performance, always will remain the first consideration. To this must be added, that too great an extension of the scale of keyed instruments renders their construction precarious in regard to an equality of tone throughout; as well as the instruments themselves too unwieldy for a removal, and too large for a room of moderate size. It might therefore be wished that the compass of pianofortes would not be enlarged beyond six octaves.

"2. Hammers with different sorts of *double actions*. These have been universally considered as real improvements of the pianoforte.

"3. Varieties of *dampers*. In regard to these, every good player knows how much there depends on dampers which take away the sound perfectly and promptly without occasioning a noise or jarring. Every *improvement* of this kind, therefore, ought also to be considered as very useful and desirable.

"4. Square pianofortes, with the sound-board extending over the whole instrument, have been made for some years by Messrs. Broadwood; and they seemed to depend on the principle of giving a firmness to the instrument *at the top*, where it is particularly wanted; but their unremitted attention to the improvements of those instruments seems to have made them discover a method by which that support at the top can be dispensed with, for which reason they have discontinued making them in the above manner.

"5. Other sorts of square pianofortes, apparently on a similar principle to the above, have also been made by other manufacturers; one of which were those with a slender wooden beam *at the top* along the lowest bass string, similar to that in front of the harp. This invention greatly improved the firmness of the instrument, without injuring its tone. But it has not been generally adopted.

"A variation of the same principle seemed to be Mr. Hawkins's pianoforte, with a *metal frame* all around the strings, as well as with a metal supporter along the midst of them; which, however, appeared as being too stiff for the necessary vibration, and as spoiling the tone.

"And, as another variation of the principle, we consider the square pianoforte by Mr. Scott, which were equally firm and closed up in front, as behind; and the keys to be pulled out, in a manner as at some organs. This construction

seemed to be very natural, and not disadvantageous to the sound of the instrument; but the required sliding of the keys apparently rendered the mechanism of the action less certain than otherwise. And we are not sure whether this kind of instrument is still manufactured.

"6. A few years ago, a Mr. Riley, of Hull, brought out a patent pianoforte, constructed so that the whole set of keys could be shifted towards the right or left, in order to transpose the same keys into a higher or lower scale. This was very useful for the accommodation of singers, though it could be of no advantage to good players; but we have also not heard of these instruments lately.

"7. Upright grand pianofortes have been brought to a great perfection by several of the first makers, and they are very useful for saving room; but, we must confess, that, though in regard to a fullness of tone, we think them highly preferable to square pianofortes, we cannot, for several reasons, consider them as equal to horizontal grand pianofortes.

"8. A smaller sort of upright pianoforte, with only two strings to each key, called *cabinet* pianofortes, have lately been brought forward by Messrs. Wilkinson and Wornum, but are also manufactured by the other makers. Whether they will be adopted as preferable to the square pianoforte, time must show."

Page 159, line 18. The New York Exhibition, of 1853, brought into notice a number of pianoforte makers, whose names deserve to be placed on record; viz. William Hall and Son; Hazelton and Brother; Bennett and Co.; Grovesteen and Co.; Lighte and Newton; Charles J. Holden; Jean Lankota; A. Bassford; Firth, Pond and Co.; John Ruck; and W. H. Bowden; all of New York. Hallet, Davies and Co.; George Hews, and Gilbert; all of Boston. Schomaker and Co. of Philadelphia; and Knare, and Gahele and Co. of Baltimore.—*Science and Mechanism; illustrated by Examples in the New York Exhibition*, 1853-4. *Edited by C. R. Goodrich, Esq.* 4to. Putnam, New York, 1854, p. 250.

Page 171, line 10. "Some philosophers have imagined that there are certain fibres in a sounding-board which vibrate to one tone, and others which vibrate to another, and that in no case the entire board can be made to sympathise with any particular sound. From M. Savart's experiments it is evident that the board in every instance becomes a part of a vibratory system, and acts in unison with every note, although much more perfectly with some than with others. To this philosopher much honour is due for the accurate and ingenious manner in which his experiments were made, as well as for the splendid results he obtained; but it ought in fairness to be stated that the fact here alluded to was first observed by M. Perrole."

In stringed instruments the sound is not produced by the vibration of the strings alone, but by the communication of these vibrations to the substances that surround them; and experiments have been made to prove the absolute vibration of the entire body of an instrument. See Mr. Higgins's charming volume on *The Philosophy of Sound*, 12mo. 1838.

Page 188, line 9. The old way of producing the soft tone was to shift the action so that the hammers would strike two strings instead of three, or one instead of two; the French method is now often adopted of interposing a piece of soft cloth between the hammer and the string, which deadens the blow, and produces a very pleasing effect, without the risk of putting the instrument out of tune by striking upon only one string.

"One of the recent American improvements is the "dolce campana" pedal, by which the sound is prolonged and the quality changed to that of sweet bells or harps. The mechanism is simple, being merely a number of weights arranged, by a lever pedal, to fall, when required, upon an equal number of screws fixed in the sounding-board; this, of course, alters the vibrations, and, in connexion with the other pedals, produces great brilliancy and delicacy of tone, like the chimes of distant bells, whence its name."—*Science and Mechanism*, 4to. Putnam, New York, 1854, p. 250.

Page 206, line 11. A more minute account of Hohlfeld's claims to having perfected an instrument for noting down music is given in Professor Beckmann's *History of Discoveries, Inventions, and Origins*, edit. 1846, vol. i, p. 12, from which we extract the following:

After noticing Creed's proposition, he goes on to say, "In the year 1745, John Frederic Unger, then land-bailiff and burgomaster of Einbec, and who is known by several learned works, fell upon the same invention without the

smallest knowledge of the idea published in England. This invention, however, owing to the variety of his occupations, he did not make known till the year 1752, when he transmitted a short account of it, accompanied with figures, to the Academy of Sciences at Berlin. The Academy highly approved of it, and it was soon celebrated in several gazettes; but a description of it was never printed.

"A few days after Euler had read this paper of Unger's before the Academy, M. Sulzer informed Hohlfeld of the invention, and advised him to exert his ingenuity in constructing such a machine. In two weeks this untaugh mechanic, without having read Unger's paper, and even without inspecting the figures, completed the machine, which Unger himself had not been able to execute, through want of an artist capable of following his ideas.

"Unger's own description of his invention was printed with copper-plates at Brunswick, in the year 1774, together with the correspondence between him and Euler, and other documents. A description of Hohlfeld's machine, illustrated with figures, was published after his death by Sulzer, in the New Memoirs of the Academy of Berlin, 1771, under the title of '*Description of a machine for noting down pieces of music as fast as they are played upon the harpsichord.*' Sulzer there remarks that Hohlfeld had not followed the plan sketched out by Unger, and that the two machines differed in this—that Unger's formed one piece with the harpsichord, while that of Hohlfeld could be applied to any harpsichord whatever.

"When Dr. Burney visited Berlin, he was made acquainted with Hohlfeld's machine by M. Marpurg, and has been so ungenerous, or rather unjust, as to say, in his 'Musical Travels,' that it is an English invention, and that it had been before fully described in the Philosophical Transactions. This falsehood M. Unger has fully refuted. Without repeating his proofs, I shall here content myself with quoting his own words in the following passage: 'How can Burney wish to deprive our ingenious Hohlfeld of the honour of being the sole author of that invention, and to make an Englishman share it with him, because our German happened to execute successfully what his countryman, Creed, only suggested? Such an attempt is as unjust in its consequences as it is dishonourable to the English nation and the English artists. When we reflect on the high estimation in which music is held in England, the liberality of the English nobility, and their readiness to spare no expenses in bringing forward any useful invention—a property peculiar to the English, it affords just matter of surprise that the English artists should have suffered themselves to be anticipated by a German journeyman lace-maker. To our Hohlfeld, therefore, will incontestibly remain the lasting honour of having executed a German invention; and the Germans may contentedly wait to see whether Burney will find an English mechanic capable of constructing this machine from the information given by his countryman Creed.'"

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See also the *Glossary of Terms used in the Manufacture of the Pianoforte* (p. 387), the references to which are not included in the present *Index*.

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The following Erratum has been kindly pointed out by Mr. Robert Stodart.

Page 140, line 9, instead of "John, William and Matthew Stodart," read "Matthew and William Stodart," omitting the name John.