

THE PIANOFORTE AND ITS MUSIC

IV.

Changes in the Stringing of Pianofortes—Precious Metals Used—Extension of Compass—Laws Regarding Tense Strings—The Overstrung Scale—Hammer Action and Pedals—The First Pianoforte and a Modern Grand Compared.

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The changes which have taken place in the stringing of pianofortes have been quite as radical and extensive as those in the construction of the frame which they were chiefly instrumental in bringing about. The makers of the pianoforte's precursors were diligent in the search for metals which might ennoble the wiry, tinkling tone of their instruments. As the old organ builders sometimes mixed precious metals in the composition of their pipes, so the makers of clavichord and harpsichord wire sometimes turned to silver and gold. In the catalogue of the court orchestra of Philip II, 1602, mention is made of a clavichord of ebony, with cover of cypress, keys of ivory and strings of gold. Experiments were made with gut, silk and latten.

"Gold and silver compounded," says Dr. Rimaault, "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 silkworm, 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."

The earliest pianofortes were strung with brass wire for the lower tones and steel for the upper. Seven or eight thicknesses of strings were used in the clavichords, spinets and harpsichords of the seventeenth century, but the Cristofori pianoforte discloses but three diameters. The evidence adduced by this instrument, however, is not unimpeachable in this respect, since Signor Ponsicchi may have found it necessary, or thought it wise, to alter the

honest maker, but commercial considerations have led to their preservation. Bösendorfer, in Vienna, however, has made an "Imperial Concert Grand" with a compass of eight octaves, from sub-contra F, in the eighth space below the bass staff, to E in *altississimo*, in the eleventh space above the treble.

Pianoforte strings increase in thickness as the tones proceed down the scale in obedience

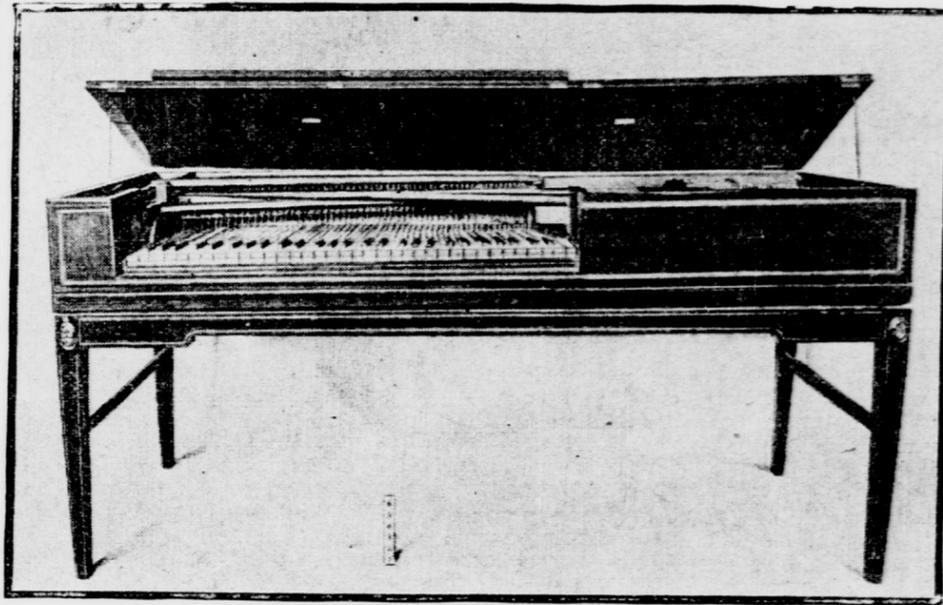
immediately adjoining. The disposition is thus fan-shaped and greater length is obtained for the strings of the lowest octave. This is the so-called overstrung scale, the combination of which with the solid steel or iron frame is the distinguishing feature of the American pianoforte, a feature that has been extensively adopted in all European countries.

The principle exemplified in the overstrung scale, like the other features of construction the invention of which has been discussed, had long been in the air before it was successfully applied. The device was employed in clavichords of the eighteenth century, and it seems likely that the idea was fermenting simultaneously in the minds of the American inventor of the solid iron frame for a square pianoforte, Alpheus Babcock, and Theobald Boehm, the German who revolutionized the flute by his new boring and system of keys. Cabinet and square pianofortes are now made in London after Boehm's design in 1835, but overstrung squares were exhibited in New York two years before, and the patent of Babcock for "cross-stringing

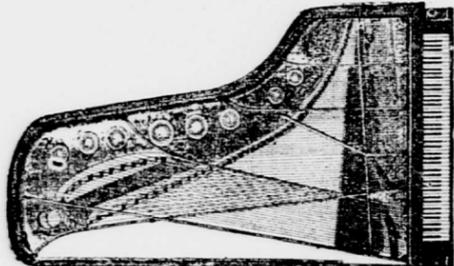
further end of the key. A slow pressure on the key lifted the hammer head to within a short distance of the string; a blow impelled the hammer away from the key with its metal spine and against the string, from which it fell by its own weight. This device was imperfect, in that the blow necessary to the production of a tone had to be so strong that very soft playing was impossible. Then came the device which in various forms and modifications has remained in use till now. The key raises a hopper which exerts a thrust against the hammer shank with an energy corresponding to that exerted by the finger of the player. The hammer is thrown against the string, and on its recoil is caught by a check which prevents its rebounding and holds it in readiness for a repetition.

The fact that the hammer does not need to travel over the entire distance from its resting place to the string makes extremely rapid repetitions of the blow possible. As the key acts upon the hopper it also raises a damper of wood lined with felt, which in its normal position lies against the string from above. The release of the key brings this damper back to its place of rest and checks the vibrations of the string, thus preventing the discordant confusion of tones which would be heard if they were permitted to die by the gradual cessation of the vibrations. When it is desired that the tones shall continue through a series of arpeggios or a repeated harmony all the dampers are raised simultaneously by means of a pedal, the one to the right—the damper pedal, commonly spoken of as the loud pedal, though its use for the purpose of increasing the volume of tone is the cheapest to which it can be put. The left pedal shifts the action sidewise so that the hammers strike only one of the double and two of the triple unisons, leaving the others untouched to vibrate sympathetically. This is the action of the left pedal in the grand pianoforte; in the upright it moves the hammer action nearer to the strings so that the hammer describes a smaller arc in reaching the strings and its force is lessened; in the obsolete square it interposed a strip of felt between the hammers and the strings and thus softened the tone.

The soft pedal movement of the grand does more than diminish the volume of tone; the tone emitted by the strings which have not felt the impact of the hammer but vibrate sympathetically—that is to say, in response to atmospheric waves sent forth by their unisons—is of an æolian sweetness and lends a color of



AN ENGLISH PIANOFORTE, LATE EIGHTEENTH CENTURY: GEORGE ASTOR, MAKER. Original at the Metropolitan Museum of Art.



INTERIOR TOP VIEW OF A CONCERT GRAND. Showing the iron frame and the cross stringing.

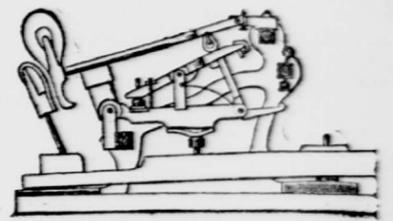
stringing so far as diameters were concerned, when he restored it in 1875. In the modern instrument all the strings are of steel, though those for the lowest twenty tones (taking the Steinway Grand as a model) consist of a steel core wrapped about closely (like the G-string of a violin) with wire of a compound metal to give them greater weight and compensate for their disproportionate vibrating length. Irrespective of this covering, eighteen different sizes of wire are used, the development during the last century having been not only along the lines of elasticity, tenacity and tension, but also diameter. The lowest eight bass tones are produced by single strings, covered; the next five, by double unisons, covered; the next seven by triple unisons, covered, and the remaining sixty-eight by triple unisons, of simple wire. In all 243 strings are employed to produce the eighty-eight tones of the concert grand. The average strain on each string may be set down in round numbers at 176 pounds. It was much higher before an agreement was reached some fifteen years ago among the principal pianoforte manufacturers of the United States to adopt a lower pitch than the old London Philharmonic, which had long been standard, and which many makers gave up grudgingly because of a belief that it was more brilliant than the French *diapason normal*. Before the change a Steinway Concert Grand endured a strain of nearly 60,000 pounds; now the pull is the equivalent of 43,000 pounds.

The Cristofori pianoforte has a compass of four and one-half octaves, from C on the second leger line below the bass staff to F in the fourth space above the treble. Very early the keys were extended downward to F, on the fourth leger line below the bass staff, so as to give the instrument five octaves. At the time of Haydn and Mozart five and five and a half octaves were in use, Clementi having added the half octave in 1793. The pianoforte which Broadwood, the English manufacturer, sent as a gift to Beethoven in 1817 had a compass of six octaves, but six and a half had already been reached in 1811, and the practical extreme of seven octaves in 1836. I say the "practical extreme" because the three notes which have been added since are of no artistic value. This, I venture to say, will not be disputed by any

to a law of acoustics which teaches that when strings have the same length and tension, but differ in weight (that is, thickness), their vibrations are in inverse proportion to their weight. Two other canons of the stretched string are also of validity, one of which teaches that as a string is lengthened it vibrates more slowly, as it is shortened more rapidly, the tension remaining the same; in the former case the tone produced is graver (lower is the popular definition); in the latter more acute (higher) than the fundamental. According to the second canon the tighter a string is drawn the higher the

pianofortes" (his meaning is vague and the original record is lost) was taken out in 1820. In 1859 Henry Engelhard Steinway, grandfather of the present president of the corporation of Steinway & Sons, combined an overstrung scale with a solid metal frame, thus taking the last really radical step in the development of the American pianoforte. What has been done since is in the way of development of the system in details.

The mechanism by means of which the hammer is made to strike the string and set it to vibrating is a marvel of ingenuity. Its simplest

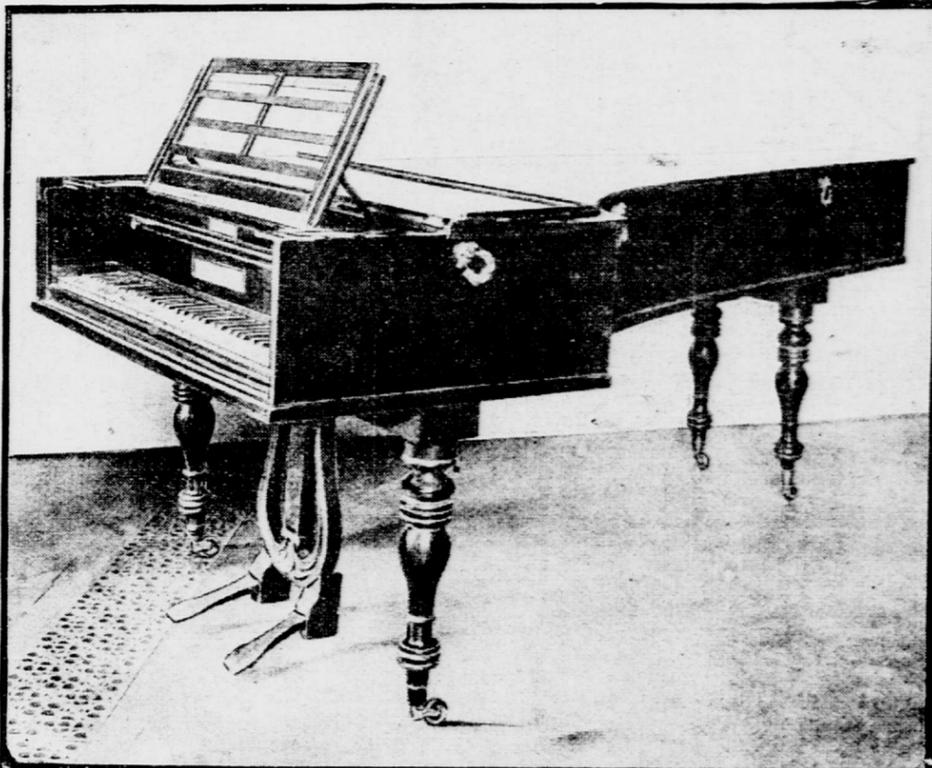


HAMMER ACTION OF A GRAND PIANOFORTE.

wonderful charm to the music. It is the desire to combine this tint with sonority that tempts pianists to the abuse of the instrument discussed in connection with the difficulty of keeping pianofortes in tune before the introduction of the metal frame. On some pianofortes there is a third pedal between the other two, called the Tone Sustaining Pedal, the action of which is to withhold the dampers from the string or strings struck just before the depression of the pedal.

The actions which have been in use for many decades are modifications of three models, the English perfected by Broadwood, the French repetition invented by Sebastian Erard and the Viennese invented and perfected in Vienna. These models have been modified in particulars but not in principles by different manufacturers to suit the requirements of their instruments. The action of Steinway & Sons, of which a diagram is presented here, is a modification of the Erard mechanism.

A comparison of some of the details of the Cristofori pianoforte in the Crosby-Brown collection at the Metropolitan Museum of Art, in New York, and a modern Concert Grand made by Steinway & Sons will help to illustrate the tremendous progress made in the art of pianoforte construction from the time of the invention of the instrument till now. The Steinway Concert Grand pianoforte is 8 feet and 10 inches long and 5 feet wide. The weight of its metal plate is 320 pounds, which probably is more than the weight of the Cristofori instrument in its entirety. The total weight of the Steinway is 1,040 pounds. It has a compass of seven and a quarter octaves, eighty-eight keys, against the Cristofori's four and a half octaves, fifty-four keys, its range extending nineteen keys above the top note of the Cristofori instrument and fifteen below the bottom note. The longest string of the Steinway is six feet seven and one-half inches in length, its shortest two inches; the longest string of the Cristofori



THE PIANOFORTE SENT BY BROADWOOD TO BEETHOVEN IN 1817.

tone; the looser the slower its vibrations and the lower the tone, the length remaining equal. All three canons find their application in the stringing of pianofortes. The old rule, still prevailing in some houses, like that of Erard, in Paris, and their imitators, is to dispose the strings parallel with each other. The majority of manufacturers the world over, however, have taken a leaf out of the book of American practice and carry the overspun bass strings of the lowest octave across a number of the strings

form was that shown in the tangent of the clavichord—by depressing the key a short tongue of metal was thrust against the string. The key was a simple lever, and the metal tongue, the tangent, had to be held against the string as long as it was desired that the tone should sound. The next step in the way of improvement was to hitch the handle of a small hammer to a rail with leather hinges and to replace the tangent with a bit of wire with a leather button at the end, placed upright on the

Continued on eighth page.

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