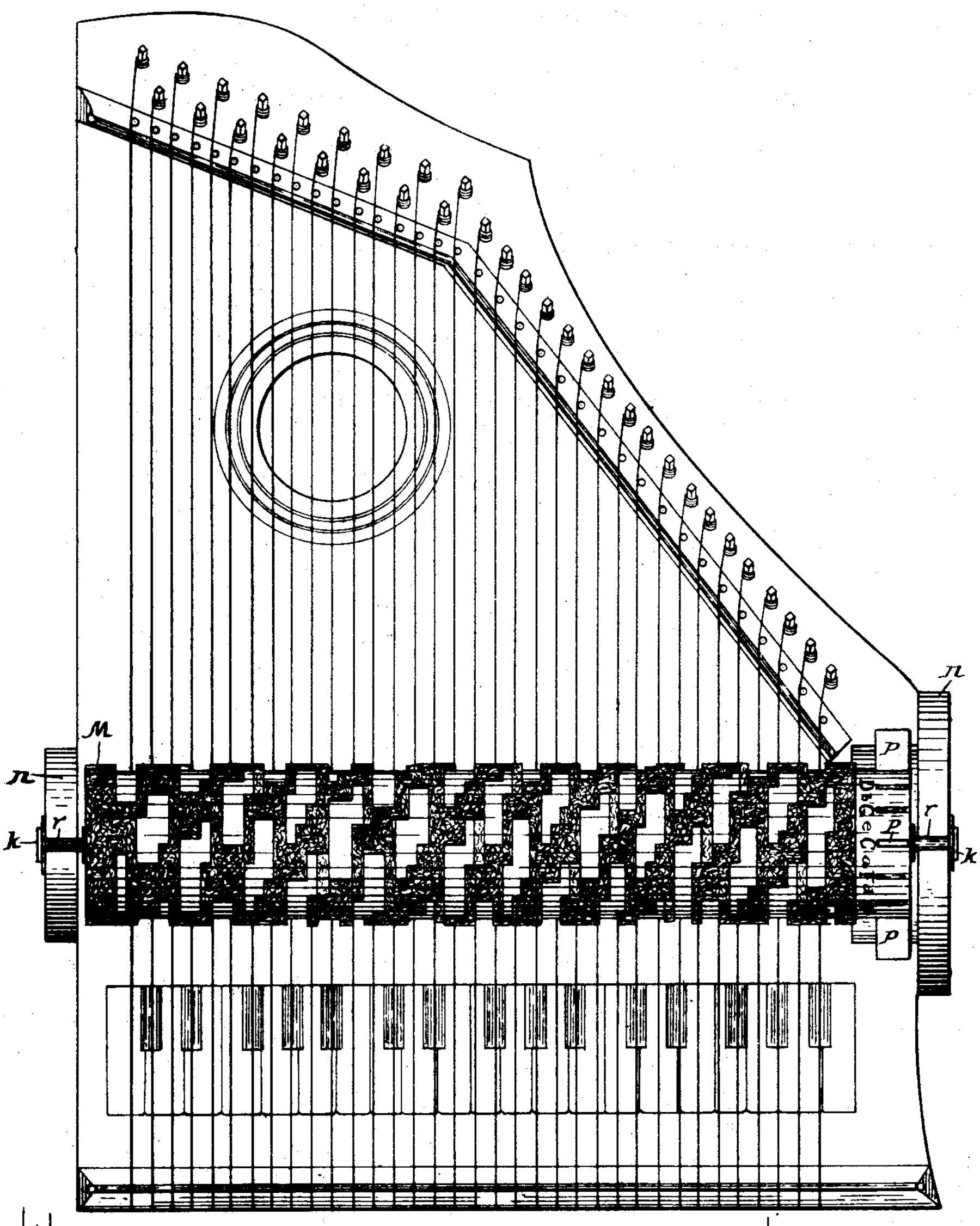
No. 682,303. Patented Sept. 10, 1901.

J. P. WHITE.

BOX HARP OR ZITHER.

(Application filed Dec. 1, 1900.)

(No Model.) 3 Sheets—Sheet 1.



Witnesses:
H. B. Davis.
J. L. Hutchinson.

Fig. 1.

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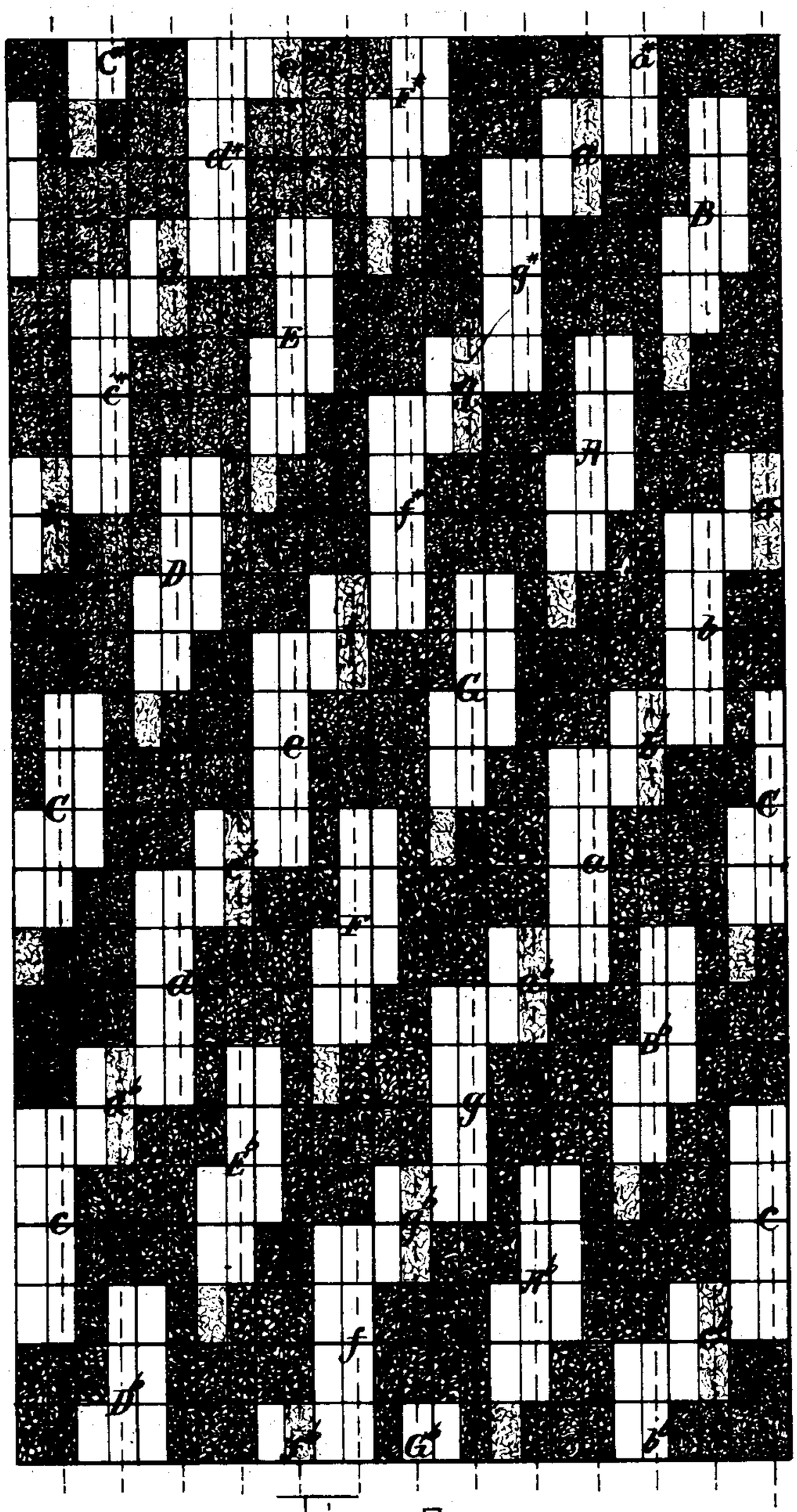

Fig. 2.

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(No Model.) 3 Sheets—Sheet 3.

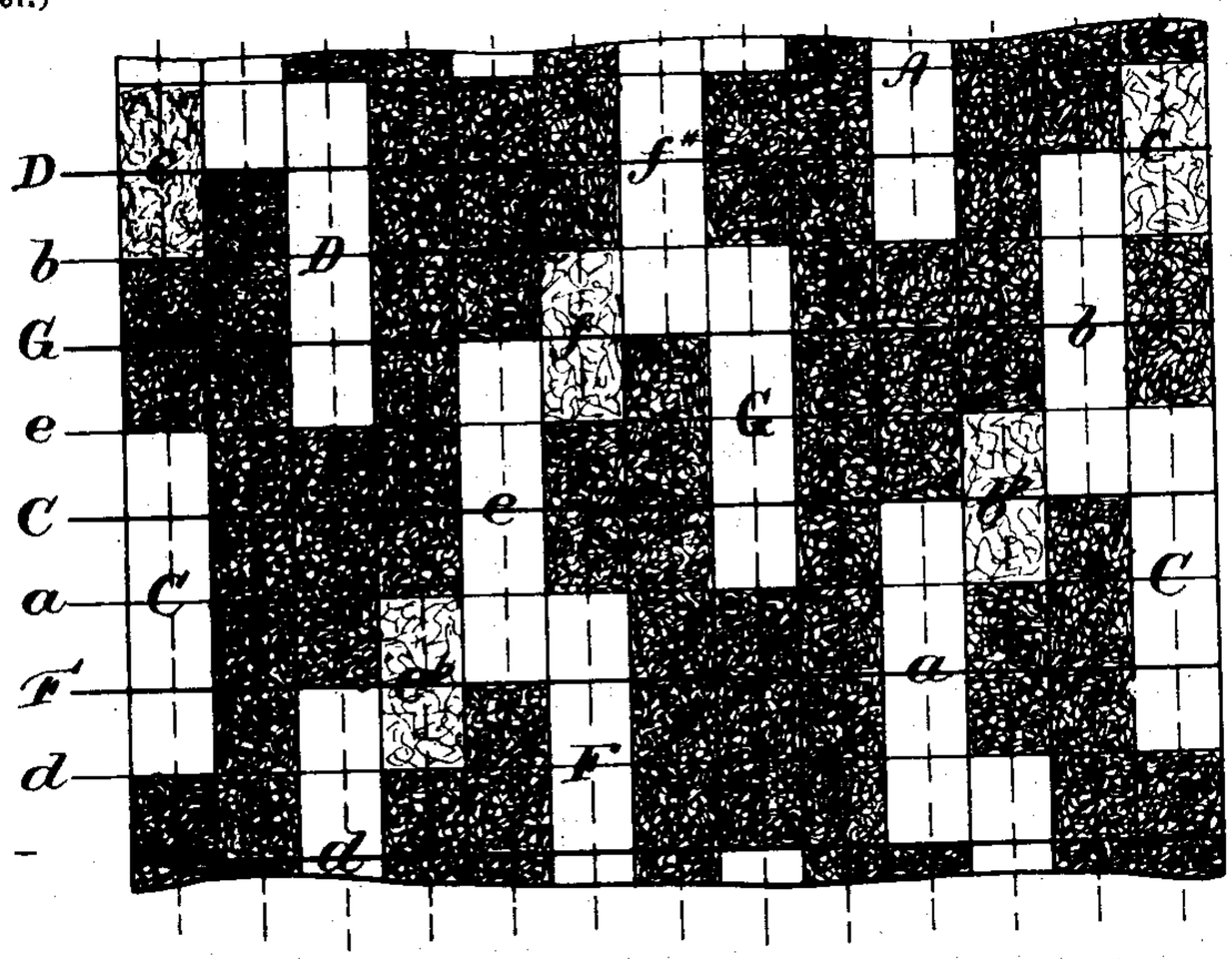

Fig-3-

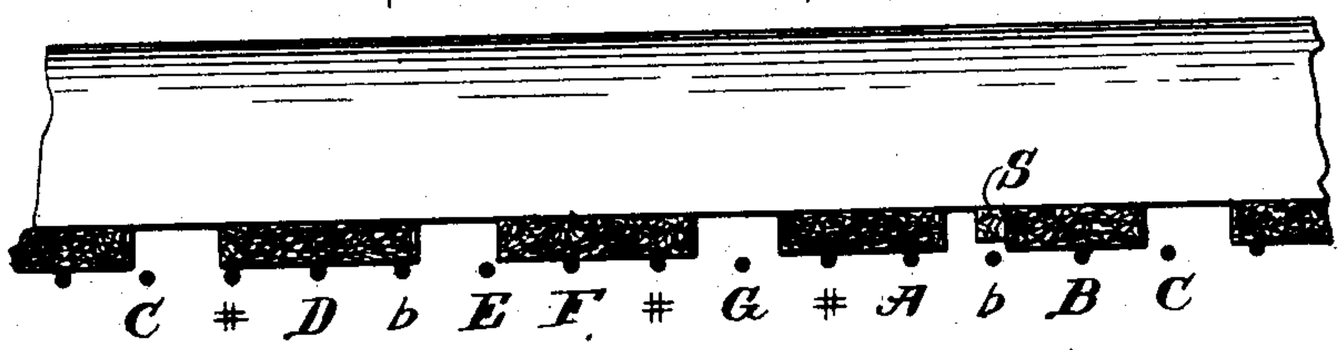

Fig-4-

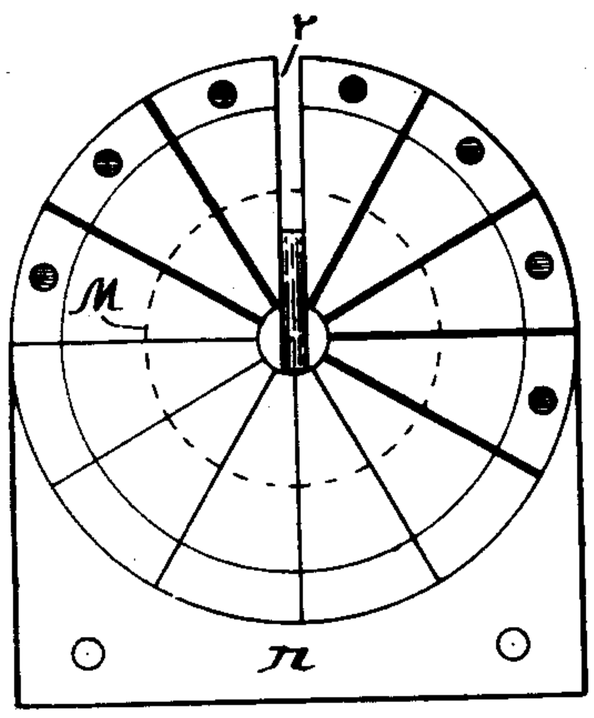

Fig-5-

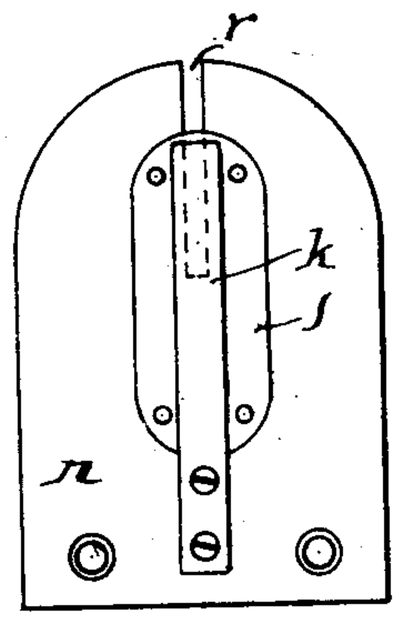

Fig-6-

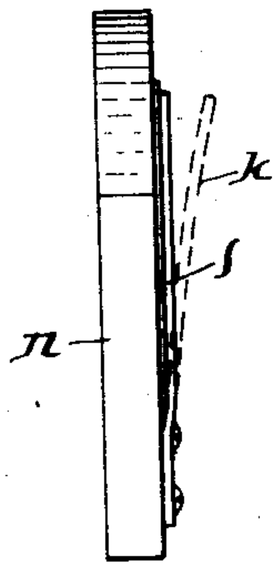

Fig-7-

Witnesses:
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Inventor:
James Paul White

UNITED STATES PATENT OFFICE.

JAMES PAUL WHITE, OF BOSTON, MASSACHUSETTS.

BOX-HARP OR ZITHER.

SPECIFICATION forming part of Letters Patent No. 682,303, dated September 10, 1901.

Application filed December 1, 1900. Serial No. 38,326. (No model.)

To all whom it may concern:

Be it known that I, JAMES PAUL WHITE, a citizen of the United States, residing at Boston, in the county of Suffolk and State of Massachusetts, have invented and developed new and useful Improvements in Box-Harps or Zithers, of which the following, with the accompanying drawings, is a specification.

The use of my invention is in that it greatly increases the scope and musical value of the autoharp principle of muting and does so by an economy of mechanism and with a regularity and facility in passing from chord to chord which are believed to have been hitherto wanting in muting instruments. Although this well-known principle of furnishing chords ready for the plectrum, by means of felted bars or other such mechanism, is intrinsically valuable to music, and although it has long been employed to produce either a few or a considerable number of chords, sometimes the identical quorum of my invention, yet there seems to have been a want of some method or embodiment for the extended application of this principle that would be sufficiently easy, economical, and regular. The muting instrument has either provided for only a few chords required for accompaniments, and in one key only, it being therefore but a toy, or else has employed various mechanical appliances which more or less prevent the required ease, despatch, and regularity of manipulation, and has even then often been wanting in the indispensable quorum of chords. As the chromatic musical scale contains cycles of twelve major triads, twelve minor triads, twelve of the ordinary chords of the seventh, and, apparently, twelve chords of the diminished seventh, (although nine of these are repetitions of three others,) and as at least all these thirty-nine chords of the four kinds are absolutely necessary for satisfactory musical accompaniments in all the keys, and in fact almost any one of them may be wanted in a single piece of music and must be easily and promptly brought out, the mere autoharp principle in any of its applications is inadequate.

My invention consists, essentially, in devising and applying an improved scheme of felting or other padding, whereby a single muting body, almost without other mechanism, is made to produce by easy manipulation all the said thirty-nine chords, and even many duplicates in all the various keys and relationships which music requires. By "duplicates" I here mean the formation of one and the same chord by more than one position of the muting-body or muter.

I am aware that the form of my muter, which in its now developed state is a cylinder, (and will here be called either the "muter" or the "cylinder,") has been before employed for damping purposes in this line, as well as have endwise-shifting bars and other devices for improvements on the autoharp-bars, yet none of these forms and constructions of the muting arrangement have, to my knowledge, embodied the essential principles of my invention. The longitudinal shifting of a muting-body seems not to have effected other than the obvious result of changing in an awkward manner a chord to another of the same kind, but higher or lower by one or more semitones, (a change very seldom required in music,) and the revolving muter also heretofore seems to have been capable of producing on but one plane of revolution only the chords represented by the few independent series of damping-pads, which can be arranged longitudinally upon its surface without interference in their work of chord-selecting from the scale. Now with the soft felt usually employed the practical limit of this number of series is about eight only, whatever the size of the cylinder or other revolving body. With harder felt the practical number might, perhaps, be increased to ten; but even this would gain none of the valuable results of my scheme, which is founded upon the natural and musical relationship of chords. Binding tones, or tones common to two or three related chords, do not require in my invention a separate space between mutes for their production, nor is any change ever made in the order of the mutes, which are all firmly glued to the wood. Thus it is made possible and easily practicable for a slight longitudinal shift of the muter of only one-half (or only one-third in other forms of my scheme) of the distance between consecutive strings to liberate a complete chord related to and also different in kind from the preceding one, and also by an arc motion whose minimum amount is only a

twenty-fourth part of a revolution, or possibly a thirty-sixth, to effect a similar result. This change in the chord-making power and facilities of a single muter resulting from my novel plan of constructing the mutework on its surface gains the two great advantages characterizing my instrument—namely, the necessary economy of space on the surface of the cylinder for providing cycles of twelve chords, progressing by fifths, in one revolution and the bringing into close proximity for manipulation the chords which are musically related, while no chord in the whole system, however distantly related, is far out of the performer's way in whatever key he is playing. The muting substance which I use at present is felt; but it is of a firmer texture than that generally employed for such muting, and the performer can therefore grasp without injuring the felted cylinder at its center with the left hand in order to make the required moves. A handle would be an impediment and of no use.

As my invention is primarily a musician's instrument and in no sense a toy, the muter especially will be handled and preserved with care, and thus it is found to be reasonably durable. There is no mysterious or hidden mechanism any more than about the violin and bow, and if any part be even injured it can usually be repaired without the aid of a regular expert or manufacturer.

My invention as embodied in the instrument, Figure 1, has an appearance so unpretentious that a casual observer might suppose that it might be substantially described in a few words. As to its general form and operation it is indeed an ordinary and simple device. As compared with numerous other inventions on the muting principle it nearly dispenses with mechanism except the novel feltwork in which the distinguishing value of the instrument consists.

In the drawings, Fig. 1 represents a top view of the instrument. Fig. 2 is a diagram showing the plan of felting the surface of the muting-cylinder. Fig. 3 is a diagram of a fragment of the surface of a simpler muting-cylinder better suited for a particular illustration. Fig. 4 is a side view of a muting-bar, which, although not now used as such in my instrument, shows concisely the working of certain principles. Fig. 5 is a face view of the dial or larger fixture, which serves the double purpose of an end bearing for the cylinder and a guide in turning it to the desired arc positions. Fig. 6 is the smaller fixture, which, with the larger, holds the cylinder-pivot in its slot. Fig. 7 is a view of the same, showing the spring as pushed open by the cylinder-pivot.

In Fig. 1, M is the cylindrical muting-body or muter, the shaded portions representing the felt or other muting substance, though it is not claimed that this is a perfectly correct plan of the feltwork, which, however, is correctly shown, with a slight modification to be hereinafter pointed out in Fig. 2. *n n* are the two fixtures by which the cylinder is secured in place and in which it performs its two kinds of motions. *k k* are flat metal springs, always pressing against ends of cylinder-pivots and normally pressing against outside of fixtures. *l l* are pieces of soft leather to prevent noise. *p p p* are three of the four pointers, being thin bits of ivory or other hard substance movably inserted in radiating sockets at the end of the cylinder and resembling the spokes of a wheel. The central one is not easily seen in the figure on account of its position at the top, and the fourth one underneath cannot be shown at all in the figure, the four pointers being preferably inserted in such of the twelve sockets as to divide the whole circle into quarters.

In the complete form of my invention described in this specification the harp must have the entire chromatic number of twelve strings per octave, and these must be consecutively equidistant, especially at the crossing line of the muting-cylinder. They must also be carefully adjusted to one level and substantially parallel with the top or soundboard. The muter, which rests normally upon the strings, crosses them at right angles. As the surface of the wood of which its body is now made is about half covered with the muting-felt, which is of firm texture, the felted cylinder can be freely turned or even slid in the required slight degree endwise without injury from the strings if a needless amount of pressure be not applied. The two vertical slots engaging the cylinder-pivots are cut low enough to leave merely side bearings and allow the weight of the muter to be wholly upon the strings. The pivots reach exactly through each fixture, being normally kept thus by the springs *k* on the outer side of the fixtures. The pivot ends are rounded and smooth. The distance from the hard-leather washer on the pivot to the fixture should be normally half the distance between strings, (by which I always mean "string centers," though such precision is not of consequence.) The revolving or arc motion is easily effected by the left hand, which controls the cylinder at will, even slightly raising it from the strings occasionally in certain chord changes where the arc motions combine with the longitudinal. Only small parts of a revolution, however, are usually made. A modulation from the key of C into A-flat, for example, would require one-third of a revolution; but even this is done without difficulty. There should be a small lock or other fastener at each end for keeping the muter at rest upon the strings when the instrument is to be carried or shipped.

There are three complete circles or planes of revolution for the muter, two of which, called here the "side" circles, are entered by the longitudinal motions. The most of the chords, the leading ones, are obtained in the middle circle and by easy and convenient

degrees of circular motion in whatever key the music is played.

The dial-fixture—whose face is white and whose twelve circular divisions represented by the vertical slot and by dark lines radiating from a center in line with the cylinder-axis correspond with those marking the hour divisions of a clock-dial, the large dots or buttons corresponding with the half-hour marks—is the guide in playing upon the instrument, although by practice it is found that the intermittent moves can be adjusted with little or no light or sight, for approximate positions will suffice. The main or key pointer, which points directly upward in line with the slot when the cylinder is so turned as to give the major tonic chord, keeps usually near that position in playing. The pointers can be inserted into any of the twelve sockets; but an experienced performer, by using the whole four pointers, inserted so as to quarter the circle, as aforesaid, can play in all the major and minor keys without ever changing the pointers at all, for any one of the positions indicated near the top of the dial can be employed as a tonic-chord mark, and not the vertical slot only. There is a hollow in the body of the instrument, under the cylinder, (shown in Fig. 1,) to give free passage to any pointer when it is turned underneath. The circle described by the end of a pointer is over a foot in circumference, and therefore it moves more than half an inch from any radiating mark to the next button. The approximate adjustments of the muter for the chords wanted are therefore quite easy to the player.

As there are twenty-four chord positions in each of the three circles, many duplicate chords are produced. There is also still another means of increasing the chord resources and facility in using them, to be particularly described with the rest, and this is a device by which merely a difference of pressure on the muter will change any major triad into a chord of the seventh having the same root. This, although the least of the three elements of my scheme, is a great aid thereto, and as it will be continually met with in the particular explanation of the two other elements I will describe this first, and it can best be done without any reference to the cylindrical form of muter, as the principle can be applied to an ordinary muting-bar if the muting substance be sufficiently hard. Fig. 4 therefore represents a fragment of a muting-bar, not belonging to the form of my invention now used, resting upon musical strings, which are represented by dots, and are designated underneath by the letters and other characters of musical notation. The strings C, E, G, and B-flat, being here free from contact with the pads, are free to sound, even though the B-flat string has a small pad S immediately over it, for that pad, being thinner by perhaps a twenty-fourth of an inch, leaves the whole chord of the seventh free, just as if no felt were over said string; but if there be a certain manual pressure upon the bar all the strings which already touch the felt will slightly bend downward, and thus allow the B-flat string also to be muted by its thinner felt, leaving nothing free but the triad C E G. If the bar be as heavy as the proper muting-cylinder, its weight alone is sufficient to make the lighter pressure for the chord of the seventh, and the weight of the hand and forearm will usually make the heavier pressure for the triad. In such an extremely easy way the performer can always make this distinction, which is so often required in music, especially as in my invention the muter rests normally upon the strings and is not kept normally out of contact with them, as is usual in other such muting instruments. This device, however, although an invaluable adjunct to my scheme, is not a main part thereof, and I will now explain the operation of the two principles which are more fundamental. One of these, which concerns the functions of the longitudinal motions of the muter, can also best be explained by reference to Fig. 4. The consecutive strings being considered three-eighths of an inch asunder, a little inspection will show that if the bar be slid one-third of this distance, or one-eighth inch to the right, the C-string, which is already near the edge of a mute, will be covered and muted, and also C-sharp, which is already near a space, will simultaneously become free to sound instead, while B-flat, for a like reason, will now be also free by either pressure. The result is the complete liberation of C-sharp, E, G, and B-flat, which constitute a chord of the diminished seventh. Again, if the bar be slid from the original position the same slight distance in the opposite direction, or downward in the scale, the E will be muted and E-flat will become free to take E's place in the triad. The resulting free strings will be the minor triad C, E-flat, G. Here then are furnished without going further a representative of each of the four kinds of chords aforesaid by merely two slight longitudinal moves of a muting-bar and by observing a difference of pressure in one of the positions. The next such move in either direction would only give a chord of the same kind, as one of the four already mentioned, although it would be a semitone higher or lower, since three such moves would amount to the distance between consecutive strings.

In the present form of the instrument the two shifts of the muter do not always perform precisely the same functions as those explained above; but thus I have concisely shown the working of the whole principle of the end motions—the order of chord-producing thus specified being really that which I formerly used; but that method required the distance between strings to be rather more than three-eighths—say half an inch—otherwise the feltwork would be too small in its

divisions to operate well. The muter being a cylinder, and, in its normal circle of revolution producing both major and minor chords without shifting at all, it has been subsequently found that the two longitudinal movements can be well utilized without requiring the distance between strings to be more than three-eighths of an inch.

As I have above, in Fig. 4, shown essentially the work of the two longitudinal motions independently of the circular, so I will now precisely explain those of the circular independently of the longitudinal. Instead therefore of referring directly to Fig. 2, in which both principles are embodied, I refer to Fig. 3, in which for the sake of perspicuity there is no provision in the felting for end motions.

Fig. 3 is a fragment of a plan for felting the convex surface of a non-shifting muting-cylinder, which produces merely the thirty-six chords of the middle or normal circle of the complete instrument, twelve of these resulting from the light pressure. The dark portions are the felt, which is firmly glued to the wood and should be of the uniform thickness of at least one-eighth of an inch. The small and less shaded oblongs are the thinner felt pertaining to the two kinds of pressure already explained, and the white portions are the spaces which leave strings free to sound. The fragment here given is one octave of the length of such a muter and little more than one-third of its circumference, the broken lines marking the breaks in the circle. The dotted lines represent the strings. If the cylinder be now so turned that the line C will lie undermost, it is evident that the strings C E G constituting a major triad will be free and even the B-flat if the pressure be light, the edges of felt on lines *e* and *a* being just out of contact with the strings on account of the curving surface of the muter, as shown in Fig. 1. Turning now the cylinder a twenty-fourth part of a revolution or about three-eighths of an inch, (the circumference being now considered nine inches,) so that the line *a* will be undermost, the G of the C-chord will be muted by contact with edge of felt at end of G-space. *a*, which was before muted by a similar edge, will now vibrate instead of G, and B-flat is also now securely mute by a similar means. By this economical change of one sounding-string the triad of C-major is changed into its relative minor triad, which is A-minor. If now another similar turn be made in the same direction, bringing the line F undermost, the E-string, which has heretofore remained free in both chords, and even another chord still further back, will now be mute, the F-string will be released, and E-flat optional. Hence the major triad of F or the chord of the seventh F A C E-flat. The change from the C-major to the F-major chord can just as well be made by one easy move, if desirable, as, in fact, music more usually requires; but musicians will readily see the great advantage of thus having the relative minor chord in such easy practical relation with both the said major chords and in the moves midway between them. but the same thing occurs throughout the whole muting system of twelve major and twelve minor chords, and we get the chord of D-minor relative of F-major by one more such turn onward, when C itself finally becomes mute. Further turns in this direction would lead out of the scale of C and into F, a few moves farther on into B-flat, and so on entirely around the circle, alternating with major chords and their respective relative minors. The C-chord would be found again at the twenty-fourth move, which completes the circle, or at the twelfth move had the minors been skipped and the major chords succeeded directly by fourths, (or downward fifths.) The explanation might be clearer on some accounts if, beginning again at C-major, the cycle of major chords and the cycle of minor chords be made by upward fifths, (or downward fourths,) which requires turning the cylinder in the opposite direction; but I wished to give prominence to the change into the relative minor, and therefore chose the "subdominant" direction of the cycle; but if the cylinder be now turned one degree in the "dominant" or opposite direction the first chord will be E-minor, which is the "relative" of the next chord, G-major, this last being the dominant triad of the scale of C, and the "dominant seventh," F, can be added by the light pressure when desired. Proceeding further in the revolution, the two other chords found on lines indicated in the figures, B-minor and D-major, are out of the scale of C and in that of G, and thus modulation begins here also, as it did beyond D-minor in the opposite direction. The whole cycle of twelve major chords or the double cycle of twelve majors and twelve minors, all in the order of their musical relationship, and even the cycle of the twelve chords of the seventh, are thus made by one revolution of the muter, which has been far from possible by other methods of felting a revolving muter. Although a cylinder completely felted on the plan of Fig. 3 would not produce diminished sevenths and would be inconvenient also for certain occasional chord changes, it would still be easily capable of providing major, minor, and the usual seventh chords with the usual modulations in all major keys, and it would doubtless make a valuable instrument, being afforded more cheaply than a complete one; but it would be only partially satisfactory to those well conversant with music. Such and other reductions of my scheme are of course within the scope of my invention.

Referring now to Fig. 2, the combined musical work of the three functions of the muter, already explained separately, will largely explain itself. The manufacturer of the muter has only to follow this plan of the felted sur-

face of one octave thereof. It should be said, however, that while the perpendicular lines, representing circular ones on the cylinder, should be strictly followed in the felting, still the felt should be varied a little—that is, cut away from all the cross-lines—thus making all the oblong or arc spaces longer by a full twentieth of an inch at each end, or one-tenth inch in all, in a nine-inch circumference. Otherwise the chords will not always be distinctly heard. The-straight line form here given, however, is easier to comprehend in the description. The same remarks apply also to Fig. 3. Fig. 2, then, represents one octave of the felted surface of the complete muting-cylinder, in which figure or diagram the top and bottom would meet if the vertical lines were the actual circumference in one continuous circle of the regular muting arrangement, and it would make no difference where the division is made for such representation on paper. As here shown, the cylinder is in its normal or central plane of revolution, the strings represented by dotted lines in alternate columns or ring-sections. The columns containing letters are identical with those of Fig. 3, and the alternate columns have for their primary use the producing of chord changes by the slight shifting of the cylinder to the right, which is here considered three-sixteenths of an inch, or half the distance between strings; but these same unlettered columns or ring-sections also produce chord changes by a similar shift to the left, and the amount of the two shifts being therefore equal to the distance between strings the chords will be respectively the same as by the right shift, though a semitone lower; but whether the shift is to the right or to the left a chord different in kind is always the result. The fact that the chords resulting from the left shift are respectively identical in kind with and a semitone lower than those made by the right shift on the same transverse line is only incidental in the scheme and is not in itself a factor originally counted upon. In actual practice the shifts are not made from one extreme position to the other, which would raise or lower the whole chord a semitone, but they are made from the middle circle to either side circle and back again, the leading chords in any music being in said middle circle. The two shifts now cover the distance between strings, each being half that distance, while in Fig. 4, by which was explained the principle of the shifting motions, it would have required three shifts to equal said string distance; but the two chord changes made by the right and left shifts (illustrated in that figure) are represented in the present cylinder-muter by only shifts to the right, for the middle circle furnishes either major or minor chords, according to its circular position upon the strings, and while the right shift from a normal major-chord position produces a diminished seventh, as in Fig. 4, the right shifts from minor-chord positions in the circle give major or seventh chords. The left shift of Fig. 4 is here simply reversed, shifting upward instead of downward and changing minor to major instead of major to minor, the chords being always of the same letter-name in each instance—C-major and C-minor, for example. Thus both principles (shown by opposite moves in Fig. 4) are here utilized by two moves in the same direction, but from different arc positions. The circle of twenty-four chord positions thus resulting from right-hand shifts is made possible in the felting on principles similar to those explained in Fig. 3. The diminished sevenths being in both side circles, which would otherwise have only major chords or sevenths, the chord positions are twenty-four in each of the three circles. The twelve major and twelve minor chords occupy the middle circle, and the major chords or sevenths of the side circles are of course the same as those of the middle circle; but the identical major chords or sevenths in the three circles are on such different transverse lines of the cylinder that it greatly serves the convenience of the player, who occasionally, were it not for the side circles or shifts, would have to make one-third or more of a revolution of the muter to obtain the desired major or seventh or augmented-sixth chord, and although this is done without difficulty in occasional modulation it would be inconvenient in the numerous rapid chord changes. For example, Fig. 2, supposing the cylinder is now resting where it will give the major triad C E G, or by a slight turn its relative minor A C E, (according to explanation on Fig. 3,) the chord of E-major or seventh, this being often wanted in this connection, is on the transverse line with E G B, (E-minor,) which is reached by a small turn, and then the push to the right, which always changes any minor to its radical major or seventh produces the required chord E, G-sharp, B, (D.) It is really by one move only, as is found in practice, that this chord change is made. Furthermore, a small turn from this same right-hand circle position (bringing the transverse line G undermost) changes the E-string of this last chord to E-sharp, (or F, as here indicated;) hence the free strings E-sharp, G-sharp, B, D, which form a diminished seventh; but a similar turn in the opposite direction gives another diminished seventh, C-sharp, E, G, B-flat, this being on the transverse line C. In fact, diminished-seventh chords are very profuse and convenient everywhere in the instrument, (being much duplicated,) for a little shift in either direction from each of the normal major-chord positions always produces one, and likewise a small arc motion from each of the other twelve chord positions in each side circle gives one of the same results, and there is always a choice between two or more easy positions of each one wanted in every key. This great facility in the use of these curious and indis-

pensable chords, as well as of the relative minors and the augmented sixths—the latter still to be noticed—are among the striking features of the instrument. In the circle of chords formed by the left shift it is now necessary to notice only the twelve major chords or sevenths made on the transverse lines of the minors of the middle circle, which, as now explained, are also the lines of the majors or sevenths of the upper circle. Now since the minor chord A, C, E, for example, Fig. 2, becomes A, C-sharp, E by the shift upward, the shift downward will make it A-flat, C, E-flat. To this major triad the seventh G-flat can be added by the light pressure. Shifting upward and observing only the heavy pressure changes only the mediant tone of a minor triad and shifting downward changes all except that, (the provision for the light pressure to make the sevenths in these side-circle chords is shown in Fig. 2 by the smaller of the light shaded oblongs;) but the said A-flat major chord, with the added seventh, as musicians know, is identical in strings with a chord of the augmented sixth in relation to the scale of C now considered, and here it is conveniently at hand by the left shift from the A-minor position, though precisely the same chord is found in the middle circle by a considerable part of a revolution. All augmented sixths are everywhere thus convenient by entering the left-hand circle.

As the two kinds of motion and their functions have been detailed separately in Figs. 4 and 3 it is not necessary to particularize further as to their combined operations. Usually the motion is circular, sometimes longitudinal, or both together, (by one quick move,) but in every case it is decidedly more easy to effect with the left hand holding the cylinder than would be supposed by any mere description.

To play in a minor key, the pointer (for only one had better be used by the beginner) is inserted into the socket belonging to the desired key or tonic. The twelve sockets in the cylinder are designated by the usual seven capital letters and the sharp and flat characters. Midway between these slot divisions are small letters, &c., indicating minor chords. The chord ready to sound is always indicated by the character which is uppermost on the cylinder whatever the pointer indicates, for the latter points out on the dial the relative positions of chords in any key and not their special letter-names which are on the cylinder. If the pointer be now vertical in line with the dial-slot, the tonic major chord of the desired key is ready for the gliding motion of the pick, held in the right hand. Turning the cylinder with the other hand and resting the pointer at the first radiating dial-mark at the right, Fig. 5—skipping the button-mark—gives the dominant triad or seventh, and the same kind of move to the left gives the subdominant chord, while the three minor chords of the diatonic scale are beside those their relative majors, as the buttons indicate. Modulation is found by further turns. The chords of the side circles already described will be easily found by the player without further direction.

To play in minor keys—A-minor, for example—the pointer is inserted in the socket of its relative major C, and then instead of being made to rest before the slot, as for a major key, it is turned so as to rest at the first button at the left, like an hour-hand at half-past eleven. The dominant majors and sevenths in the minor scales are found by the upward shift from the dominant minor-chord positions, all diminished sevenths being everywhere at hand, as described. The subdominant minors are relatively the same as the subdominants in major keys. The chord resources of the minor scales are thus easily found.

The letters and other characters on the treble end of the cylinder now represent only the names of the chords of the normal circle. The side-circle chords, which are located the same for all keys, may be learned by acquaintance with the instrument, the said characters being used as points of departure, or the muter and fixture may be so constructed as to leave room on the cylinder for more lettering, if desirable. An instruction-book for both playing and tuning is to be prepared for general use, though a musician scarcely needs more than the instrument itself in order to learn its technique.

Although my invention is primarily for accompanying the melody of another instrument or voice, yet it is found by practice that the facilities for readily obtaining all its chords and the skilful use of the pick as well as the muter give it good possibilities as a solo instrument. Finally, my instrument does not play itself and does not appeal specially to "those who have had no previous knowledge of music whatever." Its reason for existence lies in the fact that it so largely does away with the mechanical and technical objections to the extended application of the muting principle in stringed instruments and then gives the performer a chance by the easily-operated system of ready-made chords to improve the real and peculiar advantages of said muting principle by all the art he can acquire by study and practice.

What I claim as my invention, and desire to secure by Letters Patent, is—

1. In a stringed instrument, or zither, a muting attachment resting normally upon and across the strings of said instrument, with means whereby the longitudinal shifting of the whole muting-body a fractional part of the distance between said strings liberates strings of different chords; said means consisting of muting-pads, or mutes, placed upon the surface of said body so as to leave, in some instances, but a small margin between a muted string and a space; in others, but a

small part of a space between a free string and a mute; in still others, more margin of mute or of space for the string; as described.

2. In a stringed instrument, or zither, a muting attachment resting normally upon and across the strings, having a curving muting-surface, with means whereby the turning, or partially revolving, of the muting-body but a part of the distance which would be required were the mutes in independent longitudinal series, liberates strings of different chords; said means consisting of mutes placed upon said curving surface so as to leave, in some instances, only the edge of a mute in contact with a string; in others, the edge of a mute just out of contact with a string; and in still others, a reserve of arc length of mute or of arc length of space for the string; as described.

3. In a stringed instrument, a muting-body crossing the strings of said instrument, having muting-pads of two thicknesses, the thinner pad permitting the vibration of a string when said body is but lightly pressed, and serving like the thicker padding to mute the string when more pressure is applied, as described and for the purpose set forth.

4. In a chromatically-strung musical instrument, having strings successively equidistant, the attachment of a muting-cylinder mounted in suitable bearings and resting normally upon and across said strings, and capable of either revolving or shifting longitudinally one-half or other fractional part of the distance between strings, with means whereby either the slight shiftings of said cylinder in either direction, or twelve, twenty-four or other number of slight arc motions of the same amounting to a complete revolution thereof, or a difference of manual pressure on the cylinder in certain positions, liberate strings of different and successively related chords; said means consisting of mutes placed upon the curving surface of the cylinder so as to leave in some instances, only the edge of a mute in contact with a string; in others the edge of a mute just out of contact with a string; and in still others, a reserve of mute or of space for the string; also mutes of two thicknesses, with the circle of muting-surfaces completed without breaking the order; as described.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

JAMES PAUL WHITE.

Witnesses:
CHARLES H. PATTEE,
ALICE C. BRADBURY.