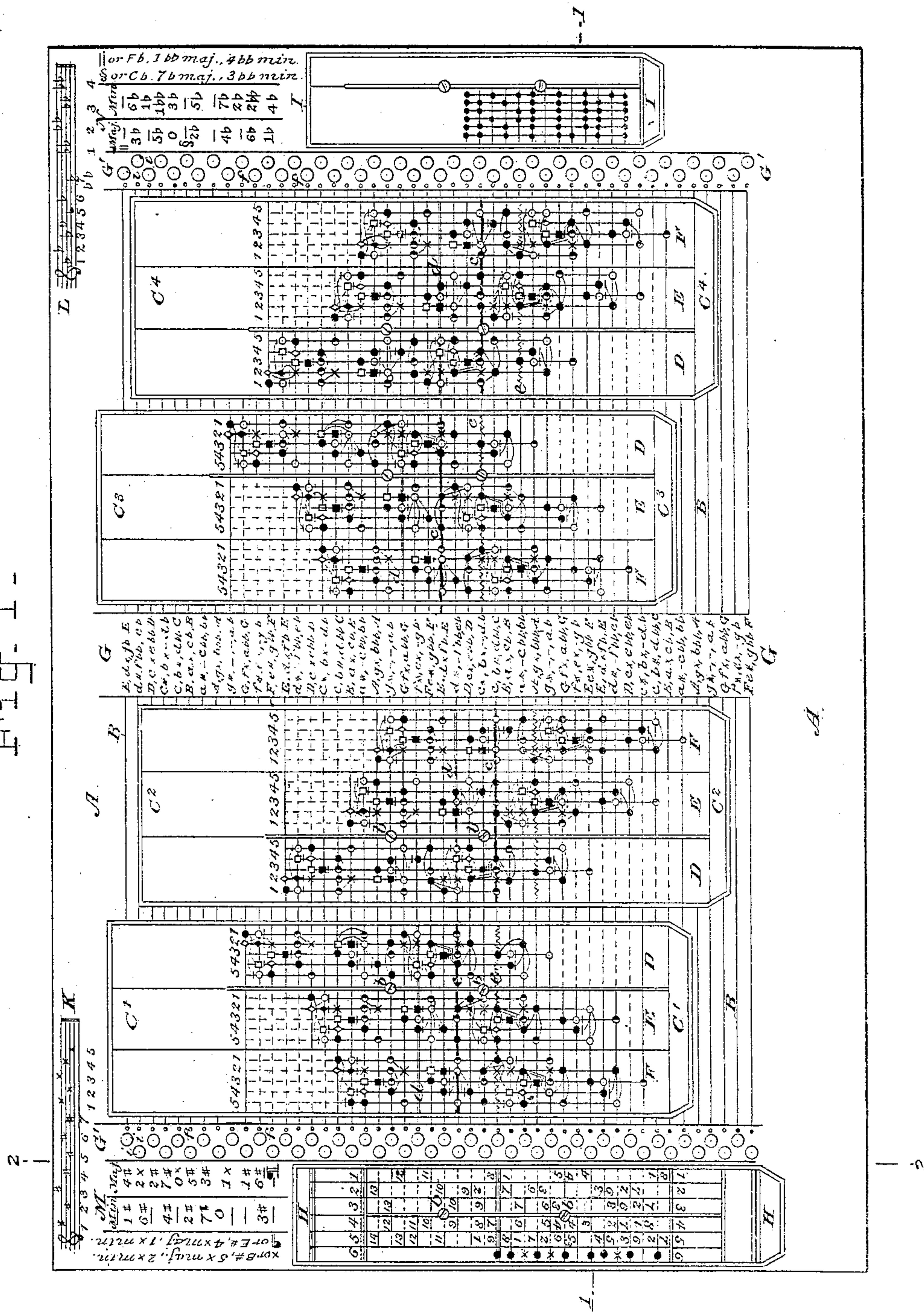
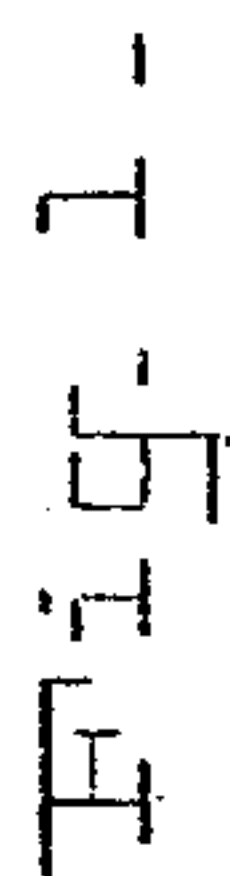


B. S. MAITLAND.

APPARATUS FOR USE IN STUDYING HARMONY.

No. 294,139.

Patented Feb. 26, 1884.



WITNESSES:

E. B. Bolton

Geo. Minton

INVENTOR:

INVENTOR:
Bligh Sedgwick Mathews

By his Attorneys,

Burke, Francis Connors

(No Model.)

2 Sheets—Sheet 2.

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Fig. 2.

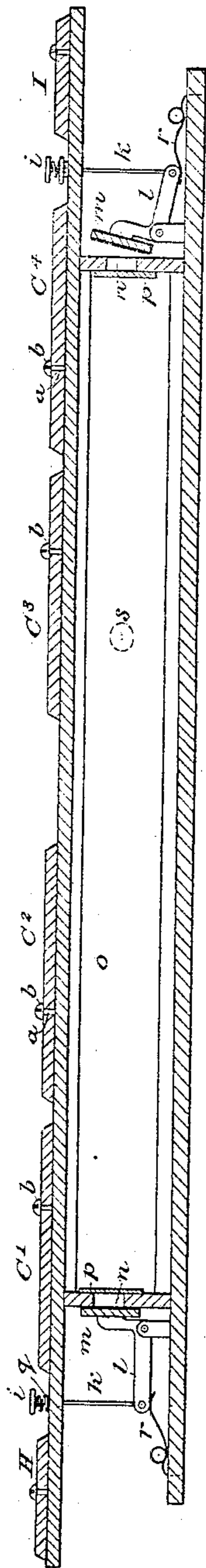


Fig. 3.

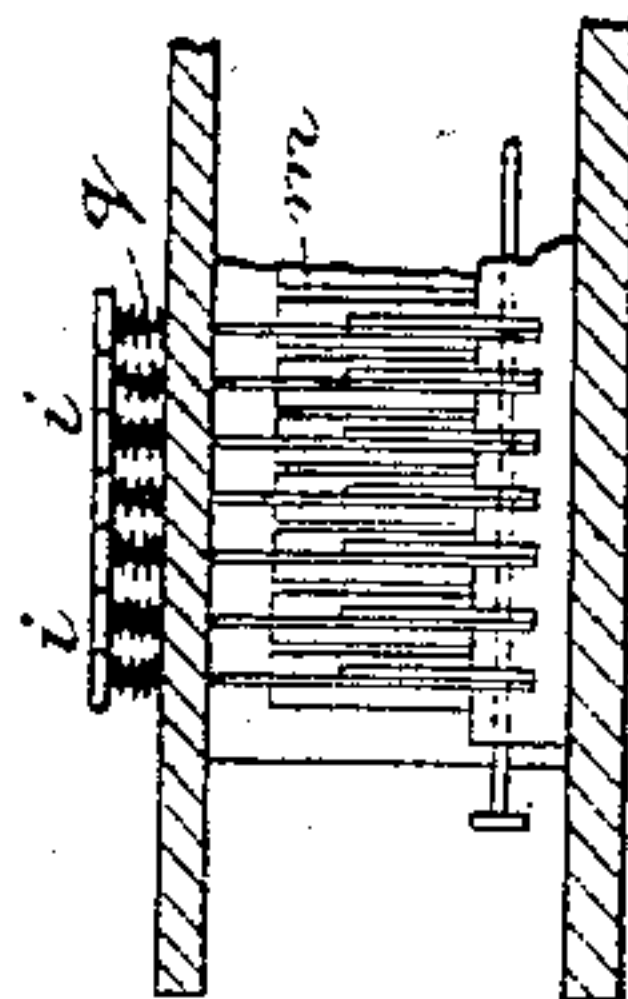


Fig. 4.



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UNITED STATES PATENT OFFICE.

BLIGH SIDENHAM MAITLAND, OF LONDON, ENGLAND.

APPARATUS FOR USE IN STUDYING HARMONY.

SPECIFICATION forming part of Letters Patent No. 294,189, dated February 26, 1884.

Application filed October 22, 1883. (No model.) Patented in England April 16, 1883, No. 1,918.

To all whom it may concern:

Be it known that I, BLIGH SIDENHAM MAITLAND, of London, England, have invented a certain new and useful apparatus to be employed in harmonizing melodies, modulating, analyzing, and effecting other operations in connection with the science of harmony, of which the following is a specification.

My invention consists of improved apparatus by means of which I can harmonize melodies, modulate, analyze, and effect other operations in connection with the science of harmony—such, for instance, as finding any given chord in any key, giving the attendant keys to any tonic, transposing music, or giving intervals. My apparatus for these purposes is composed of a frame or board having a series of guides on or in which a corresponding number of parallel slides, hereinafter described, are free to be moved independently up and down (or it might be across or in concentric circles within) the said frame or board, as required, according to the particular musical operation to be effected. Various means for moving the slides may be adopted—such, for example, as screws fitted in the frame and taking into female screws in the slides—so that the slides are moved up or down, according to the direction in which the screws are turned; but I prefer to arrange the slides, as hereinafter described, and shown in the annexed drawings, so that they can be slid up or down by hand. Four of the slides are chord-slides.

Each of them is divided vertically into three parts—for the tonic, dominant, and subdominant keys, respectively—and each of these three parts has five vertical chord-lines, representing, respectively, first, the tonic or common chord; second, the chords of the dominant seventh, ninth, eleventh, and thirteenth; third, the chords of the subdominant, added, substituted, and Neapolitan sixth; fourth, the three forms of the chord of the augmented sixth; and, fifth, the augmented and diminished triad. These five chord-lines bear certain arbitrary signs or marks (corresponding with signs or marks on a given guide or reference table, which is hereinafter given) representing the various chords according to the laws of harmony, as will be well understood by those conversant with the science of harmony. Each chord-slide is also formed with horizon-

tal note-lines, corresponding with a chromatic scale on the fixed frame or board, and in connection with this chromatic scale are columns of notes in regular musical succession. Upon each of the chord-slides, near the middle, is a suitable device—such as a thick black line—to represent the tonic root (or lowest note) of the tonic chord, (which always applies to the tonic key.) At the proper distance a little higher up is a device such as a double line, and when this line is placed on a major tonic key the relative minor to that key is indicated by the black line, and below the tonic root is a device such as a waved or zigzag line, and when this line is placed on a minor tonic key the relative major to that key is indicated by the black line. On the lines of the chromatic scale I make at each end a hole to receive a peg or pin, and I employ these pegs or pins in pairs connected together by wires, the pegs or pins consisting, by preference, simply of the ends of the wires turned down at right angles. Thus, when it is wished to harmonize on any given key, I insert pairs of pegs on the lines containing the notes or intervals of a chord accompanying a given note in the melody, so that by means of the connecting-wires which thus lie across the slides the “binding-notes” of this chord, in connection with the next chord accompanying another given note of the melody, can be seen. By “binding-notes” I mean notes which are common to the two chords.

In cases where it is desired to produce the chords, &c., in sound, I form holes in the note-lines of the chromatic scale, and I apply to these holes buttons or knobs, which can be pressed down by the finger. When so pressed down, they act upon the valves of apertures, which are fitted with correspondingly-tuned reeds, in a wind box or chamber forming part of the apparatus; or the wires may be made to act upon tuned strings; or, instead of having the buttons or knobs on the note-lines of the chromatic scale, the arbitrary marks before described on the chord-slides may be in the form of buttons or knobs which, when pressed down, act upon the reed-valves through the intermediation of blades so placed crosswise of the frame or board below the slides that all the buttons in one note-line of the same chord-slide or pair of chord-slides will act upon the same blade, and consequently

upon the same reed; but as this modification is complicated I do not recommend it.

Although I have described that I employ four chord-slides, this number may be varied.

- 5 For example, there may be only two chord-slides; but the results desired could not be obtained so readily. In addition to the chord-slides, I employ an interval-slide, which I divide vertically into five parts, for the perfect, major, minor, augmented, and diminished intervals, respectively, and sometimes I add a sixth part for the degrees of the scale used in transposing, &c. This interval-slide has note-lines, which are marked according to the laws of harmony with the numeral names of the various intervals used in harmony. By altering the position of this slide relatively to one of the note-columns on the frame, the interval or intervals built on any given note are ascertained, and by inverting the apparatus the "inversion" of the interval is shown. I also, in some cases, employ a scale-slide divided vertically into parts for, first, the major scale ascending and descending; second, the minor scale ascending; third, the minor scale descending, and three other forms of minor scales. By altering the position of this slide in conjunction with the interval-slide before described relatively to one of the note-columns on the frame, a transposition of any given scale or composition is obtained.

In the annexed drawings, Figure 1 is a plan or face view of my apparatus. Fig. 2 is a section on the line 1 1, and Fig. 3 a fragmentary section on the line 2 2.

35 A A is the frame or board bearing a chromatic scale, B B. C' C² C³ C⁴ are four chord-slides, free to be moved up and down upon the frame A. For this purpose each chord-slide is formed with a slot, *a*, to slide on two screws, *b b*, in the frame A; or other means of guiding the slides in their movement may be adopted. Each of the chord-slides is divided vertically into three parts, D E F, of which D in each slide represents the tonic key, E the dominant key, and F the subdominant key. Each of the three divisions D E F has five vertical chord-lines, numbered 1, 2, 3, 4, 5, which bear certain arbitrary signs or marks, as shown, representing the various chords according to the laws of harmony, these signs corresponding with the signs in the following guide or reference table, which in practice it will be well to affix to the face of the frame or board A itself.

GUIDE OR REFERENCE TABLE.

Chord-line 1.

- 60 Tonic or common chord.
 ●● Major common chord.
 ●○ Minor common chord.

Chord-line 2.

- 65 ●○ Dominant seventh.
 ●□ Dominant major ninth and seventh on leading note, major key (†).

- Dominant major ninth and diminished seventh, or seventh on leading note, minor key (†). 70
 ●□● Dominant eleventh of major key.
 ●■● Dominant eleventh of minor key.
 ●□●◇ Dominant thirteenth of major key.
 ●■●◆ Dominant thirteenth of minor key.
 † Omit the root of dominant for seventh on leading note in major key, and for diminished seventh, or seventh on leading note, minor key. 75

Chord-line 3.

- Major subdominant chord. 80
 ●○ Minor subdominant chord.
 ●●□ Chords of the added and substituted sixth (§).
 ●○■ Chord of the Neapolitan sixth (§). 85
 § Omit fifth of subdominant for substituted sixth and for Neapolitan sixth.

Chord-line 4.

- The three forms of the augmented sixth. 90
 ● Italian sixth.
 ●◇ French sixth.
 ●□ German sixth.

Chord-line 5.

- Augmented triad. 95
 ●● Diminished or imperfect triad.

Each chord-slide C' C² C³ C⁴ has horizontal note-lines, as seen in Fig. 1, corresponding with the chromatic scale B, and in connection 100 with this scale is a column, G, of notes in regular musical succession. Other columns of notes are by preference also placed at G' G'. Across each chord-slide are a black line, *c*, to represent the tonic root, a double line, *d*, to represent the relative minor tonic key to a major tonic key, and a waved or zigzag line, *e*, to represent the relative major key to the minor tonic key. In line with the lines of the chromatic scale B, I make at each side a series of 110 holes, *f f*, to receive pegs or pins on the ends of wires, as and for the purpose already herein explained. Fig. 4 represents a pair of these pins, *g g*, and their connecting-wire *h*, the whole consisting of a piece of wire turned down 115 at the ends. *i i* are a series of buttons or knobs applied to holes in the note-lines of the chromatic scale B. Each of these buttons *i* is connected by a rod, *k*, to a lever, *l*, carrying a valve, *m*. The valves *m* fit corresponding 120 apertures, *n*, in a wind-box, *o*, having a like number of toned reeds, *p*. When one of the buttons *i* is pressed down by the finger, its rod *k* acts on the lever *l* and opens the valve *m*, so that air from the box *o* is allowed to escape by 125 and sound the corresponding reed, *p*. Springs *q* and *r*, fitted, respectively, to the button *i* and lever *l*, return the parts to their normal positions when pressure is removed from the button. *s* is an air-inlet to the box *o*, and connected by a tube with a bellows or with a mouth-piece. 130

H is the interval-slide before described, capable of being moved up and down the frame A.

in a similar manner to the chord-slides C' C^2 C^3 C^4 . This slide H is divided vertically into six parts, respectively for the (first) perfect, (second,) major, (third,) minor, (fourth,) augmented and (fifth) diminished intervals, and (sixth) for the degrees of the scale used in transposing; or this last division may be omitted.

I is the scale-slide, likewise hereinbefore described, and capable of being moved up and down the frame A like the other slides. It is divided vertically into three parts, respectively for the major scale ascending and descending, the minor scale ascending, and the minor scale descending.

At K on the board or frame A is shown the order of sharps of the signature; at L, the order of flats of the signature; at M, the signature in sharps, and at N the signature in flats. All these are not necessarily applied to the board A; but they should be where they can be easily referred to, so as to enable the apparatus to be most readily applied to the various musical operations for which it is intended.

In the chord-slides C' C^2 C^3 C^4 a line above a note (thus, for instance, \odot) indicates that that note has been raised a semitone, and a line below a note (\ominus) indicates that that note has been lowered a semitone. Lines (full or dotted and not being note-lines) running from a note of one chord to a note of another chord show the progression and the resolution from the one chord to the other. The sign \times on the chord-slides indicates that the note which this sign represents is a repetition of a note-sign which is an octave above or below.

Such being the construction and arrangement of the apparatus, the harmonizing of melodies, modulations, analysis, and other like operations are effected by shifting the slides, or some of them, according to requirement, upon the frame or board A, the respective positions of the slides relatively to each other and to the note-columns G producing and showing the desired result in connection with the guide or reference table hereinbefore given, as will be well understood. I will give a few examples. If I wish to modulate from the key of $E\flat$ major to the key of E major, I place the tonic root—that is to say, the line c of chord-slide C' and the double line d of chord-slide C^2 —on the note-line $E\flat$, thereby obtaining the five attendant keys on $E\flat$. I next place the tonic root (the line c) of chord-slide C^3 and the double line d of chord-slide C^4 on the note-line E, thereby obtaining the five attendant keys on E major. I next look at N, Fig. 1, to see what is the signature of $E\flat$ major, when I find that three flats are required for the major key. I next look at L to find their order, which is $B\flat$, $E\flat$, and $A\flat$. I next look at M, Fig. 1, for the signature of E major, which I find to be four sharps, the order of which is shown at K to be $F\sharp$, $C\sharp$, $G\sharp$, and $D\sharp$. After having marked my signature of E major, I take down the major tonic or common chord belonging to the tonic key of slide C' , or $E\flat$, (presuming that I am modu-

lating from the tonic chord,) which is done by referring to chord-line 1 in the reference-table, and using only the signs \odot \bullet , which form the major tonic or common chord. I begin at the bottom of the chord-line 1 of the tonic key of chord-slide C' . I write down the sounds on which these signs fall—viz., $E\flat$, G, and $B\flat$, and the octave, if necessary, of $E\flat$. I next look to see if any of the sounds $E\flat$, G, $B\flat$ are contained in the dominant chord (not the dominant key) of $E\flat$, (chord-slide C^3),—namely, any note or notes on the same note-line. I find on the note-line $E\flat$ on the dominant chord (tonic key) of slide C^3 a small \times , (showing that the note is repeated an octave above or below the $D\sharp$ of the dominant chord of the tonic key of $E\flat$ in slide C^3), there being no $E\flat$ in the key of $E\flat$, which is changed according to the signature to $D\sharp$. (In strict theory, $E\flat$ and $D\sharp$ are two distinct sounds; but they are so nearly alike that since the introduction of tempered instruments—such as the piano—they have been regarded as the same sound.) I therefore take $D\sharp$ as the highest note, for contrapuntal reasons—i. e., if a tone or note occurs in both of two chords which are to be connected, it is to be retained in the same voice, a voice being equivalent to a part. (Richter's Manual of Harmony.) I then take down the lowest note of the dominant chord of E—the tonic key—and build the chord B, $F\sharp$, A, B, and $D\sharp$ —the highest note. (I omit the $D\sharp$ in the lower part of the chord, because the third of a chord, if major, must not be doubled, which it would be if placed in the lower part of the chord.) This being done, I follow the lines of resolution which lead from the dominant chord (line 2) to the tonic chord, (line 3,) both of the tonic key of $E\flat$ on chord-slide C^3 , which resolve as follows: The root $B\flat$ goes to the root $E\flat$. (All roots can resolve to roots.) The $D\sharp$ goes to $E\flat$. $F\sharp$, having no resolution-line, can go to either $E\flat$ or $G\sharp$. The A goes to $G\sharp$, and B—the octave of the root—goes to B.

Example.



There are many other ways of showing this, as well as other modulations; but they are all worked in the same way, and of course one could work through the attendant keys to obtain the same end. It sometimes occurs that no note exists connecting the two chords. In this case the assistance of another chord, or even of an attendant key, is called in, and one works in the same way as above through that key. In harmonizing, instead of modulating from one key to another, I modulate or pass from one chord to another. Say, for instance, I wish to harmonize "God Save the Queen," the melody being given in $E\flat$, I place the

tonic root—that is, the line *c* of slide *C'* and the double line *d* of slide *C²*—on *E_b*, (or on whatever key the melody is given,) which, as before, gives the five attendant keys. Seeing
 5 that the note *E_b* begins the melody, I harmonize with the tonic chord of that key, because if the first, third, or fifth begins a melody, the harmonizing should be done with the tonic chord. The next note of the melody being
 10 another *E_b*, I change the chord, because it is against the law in strict composition for the parts to succeed in parallel motion. Therefore I use that chord which has most notes in common with the chord of *E_b*, but containing
 15 the note *E_b* in it. I find that chord to be the tonic chord of the key of C minor, (slide *C²*,) the relative minor of the key of *E_b*, because it has *E_b* and *G_b* common to both chords; therefore I write down that chord. The third
 20 note of the melody being *F*, I again, as before, move to a chord having *F* contained in it and either of the notes *C*, *E_b*, *G* contained in it. This I find in the chord of the substituted sixth of the tonic key, (line 3, slide *C'*,) it having
 25 *F* for the melody and *C* of the preceding chord. I write down the chord of the substituted sixth. The first note of the next bar is *D*. Then, as before, I take the chord containing
 30 the note *D*, as well as *A_b*, *C*, or *F* of the last chord. I find that the dominant seventh (of the tonic key of *E_b*) has *D* of the melody and *F* and *A_b* of the last chord. I therefore write down that chord; but to avoid the false
 35 progression before mentioned, I omit the *F*, which, although it must exist in the chord, need not always be expressed. The second note of the second bar of the melody is *E_b*. Here I
 40 can either resolve to the tonic of *E_b*, or, as before, take another chord with the *E_b* of the melody and either of the notes *B_b*, *D*, *F*, or *A_b*. For a better progression in the bass, particularly as here the *E_b* does not end a theme, I
 45 use the subdominant chord, (of the key of *E_b*, line 3, slide *C'*,) it having *E_b* of the melody and *A_b* common to the last chord; therefore I write that chord. The third note of the second
 50 bar of the melody is *F*. Then, as before, I take a chord with *F* in it; also, either of the notes *A_b*, *C*, or *E_b*. I find that the dominant seventh of the tonic key (line 2, chord-slide *C'*) contains *F* of the melody and *A_b* of the last
 55 chord. I therefore use that chord in its first inversion to avoid consecutive octaves with alto part, and so on to the end, avoiding consecutive, &c., and ending the theme on the tonic chord uninverted.

Example.

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Should the major key of slide *C'* become a minor key, the zigzag line *e* of slide *C³* is

placed on its tonic root, giving, of course, the relative major keys of slide *C'* as a minor key. In the same way, if slide *C²* becomes major, 70 the double line *d* of slide *C²* is placed on the same note-line as the tonic root *c* of slide *C²*, giving in the same way the relative minors of slide *C²* as a major key. To analyze, (after
 75 having set the instrument as before,) I take the first chord of a composition and find the same on the chord-slide, and so on, marking their resolutions, &c. If I wish to transpose from *C* to *D*, for example, I place the perfect
 80 I of the interval-slide *H* on *C*, and the root of the scale-slide *I* on *D*. Wherever I see a note of the melody to be transposed on the slide *H*, I take the same interval on slide *I*, which will be the note to which the melody has to be
 85 transposed.

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

1. An apparatus to be employed in the study of the science of harmony, comprising a frame or board bearing a chromatic scale, 90 and four or other number of chord-slides to move on the said frame or board, these slides being each divided vertically into three parts, and each of these parts having vertical chord-lines, and each slide bearing arbitrary signs, 95 (to correspond with a guide or reference table,) and having also devices to represent, respectively, the tonic root, the relative minor key to a major tonic key, and the relative major key to the minor tonic key, all substantially 100 as and for the purposes herein set forth.

2. An apparatus to be employed in the study of the science of harmony, comprising the frame or board *A*, bearing a chromatic scale, *B*, and the chord-slides *C'* *C²* *C³* *C⁴*, hav- 105 ing the holes *f f* in line with the note-lines of the chromatic scale, in combination with pegs or pins *g g*, to fit in said holes, and wires *h*, to connect said pins *g g*, as and for the purpose set forth. 110

3. An apparatus to be employed in the study of the science of harmony, comprising a frame or board, *A*, bearing a chromatic scale, *B*, the chord-slides *C'* *C²* *C³* *C⁴*, and a wind-box containing a number of tuned reeds, 115 the valves connected with these reeds being operated by buttons or knobs on or in line with the note-lines of the chromatic scale, said parts being arranged and constructed substantially as and for the purpose set forth. 120

4. The combination, with the frame or board *A*, bearing the chromatic scale *B*, of the chord-slides *C'* *C²* *C³* *C⁴* and interval-slide *H*, as and for the purpose set forth.

5. The combination, with the frame or board 125 *A*, bearing the chromatic scale, of the chord-slides *C'* *C²* *C³* *C⁴*, interval-slide *H*, and scale-slide *I*, as and for the purpose set forth.

In witness whereof I have hereunto signed my name in the presence of two subscribing 130 witnesses.

Witnesses: BLIGH SIDENHAM MAITLAND.

JOHN C. NEWBURN,

GEORGE C. BACON.