

Aug. 3, 1926.

1,594,477

K. K. SMITH

MUSICAL APPARATUS

Filed Sept. 28, 1922

10 Sheets-Sheet 1

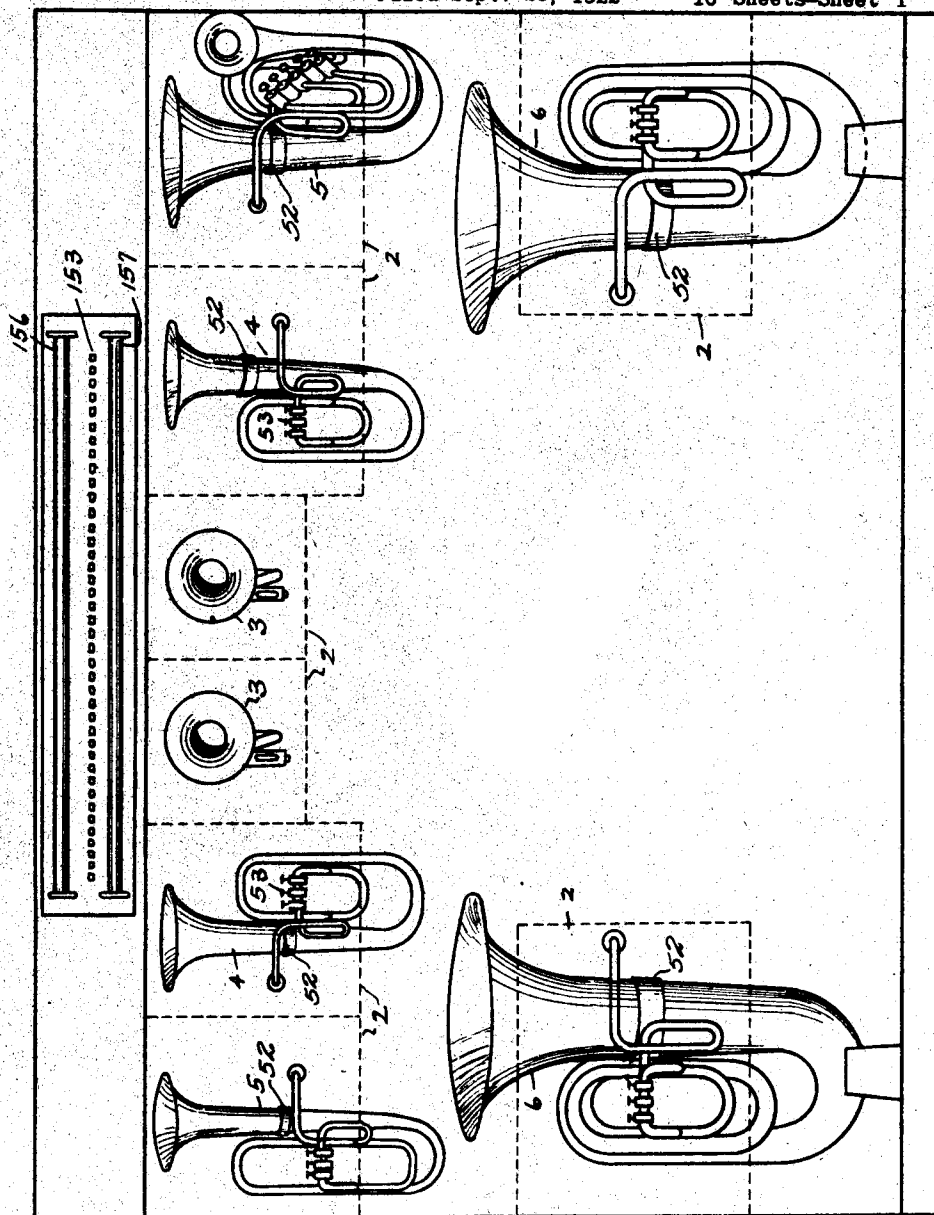


Fig. 1.

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10 Sheets-Sheet 2

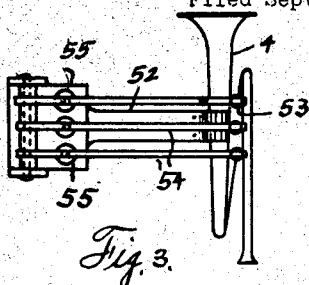


Fig. 3.

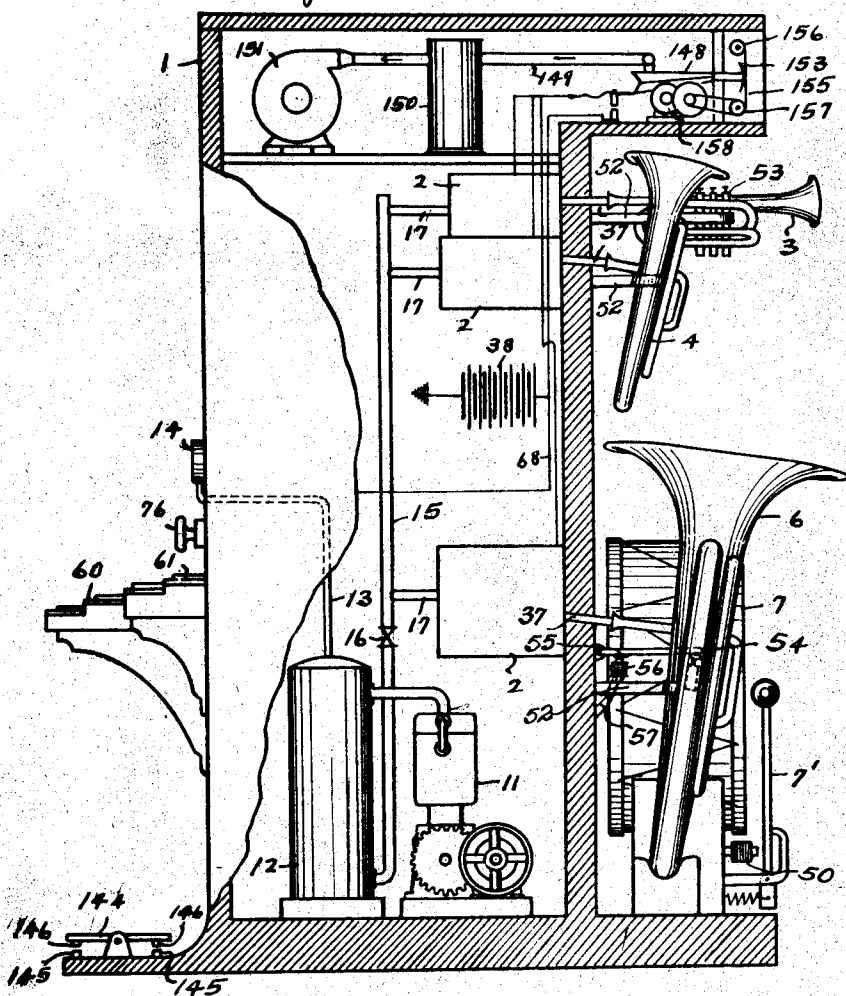


Fig. 2.

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10 Sheets-Sheet 3

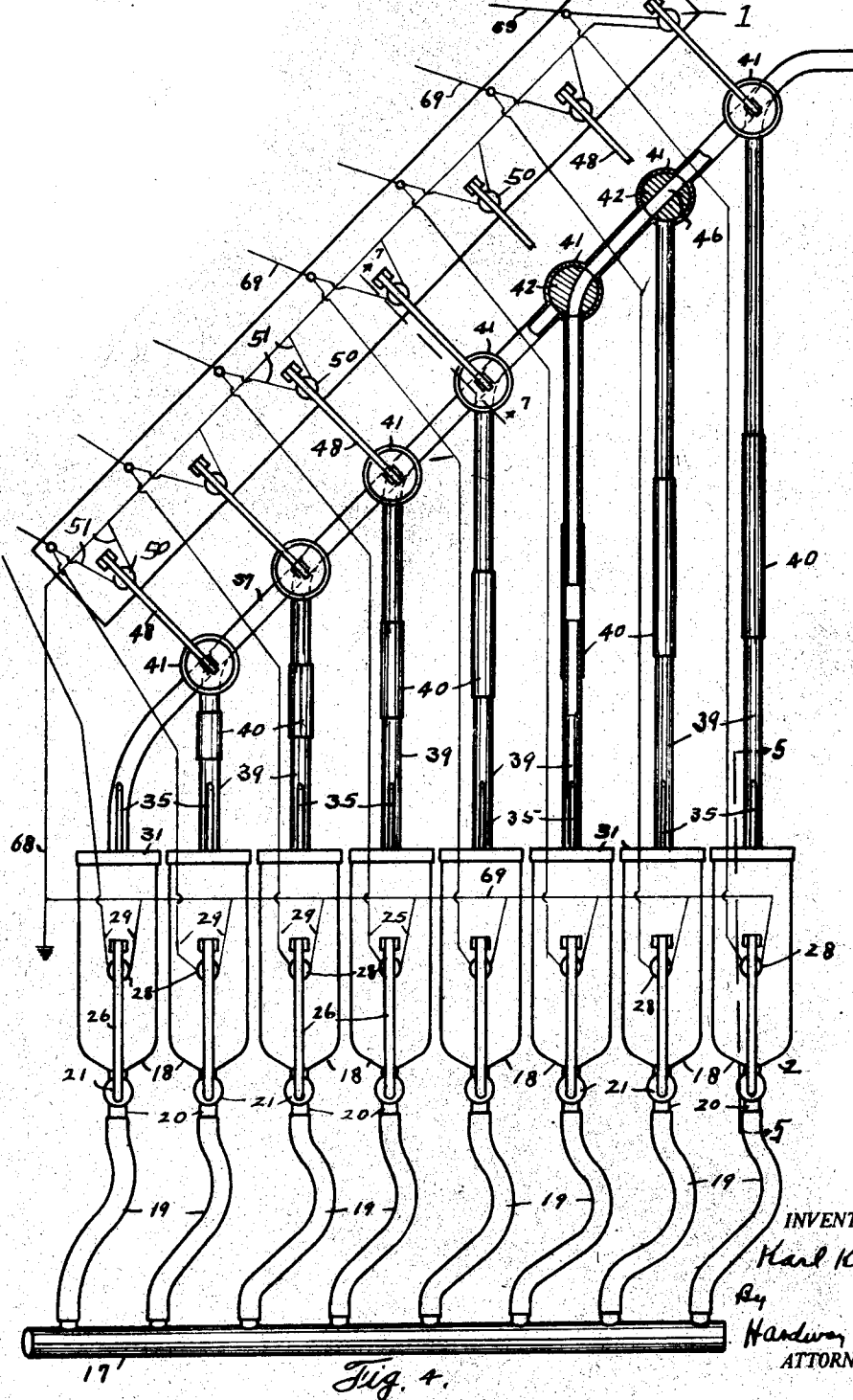


Fig. 4.

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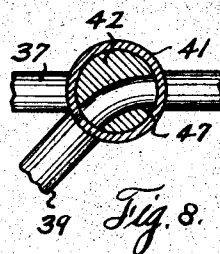
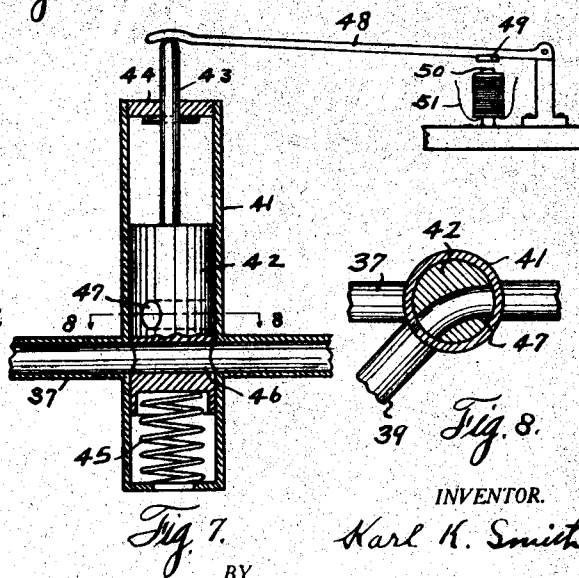
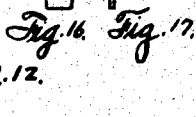
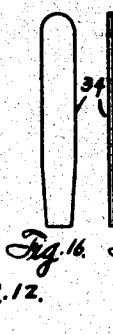
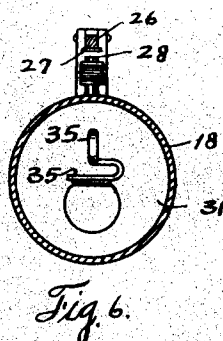
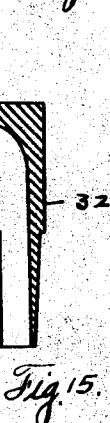
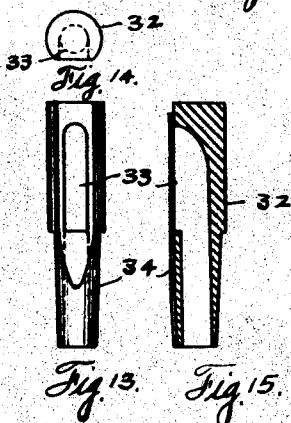
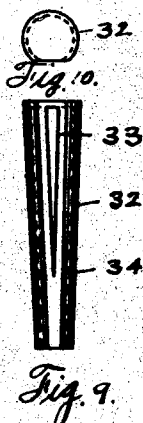
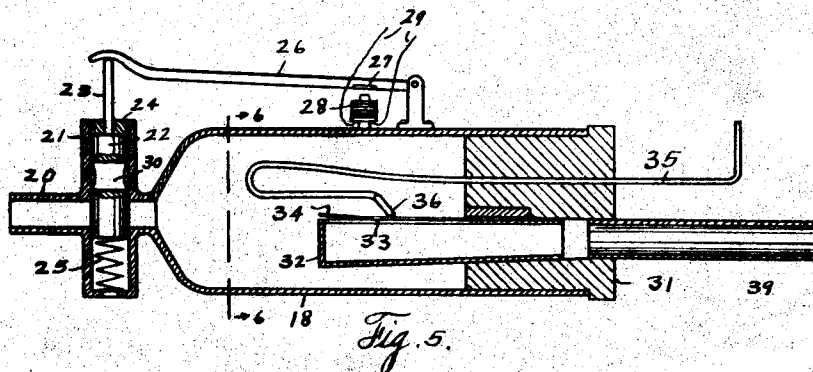
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Filed Sept. 28, 1922

10 Sheets-Sheet 4



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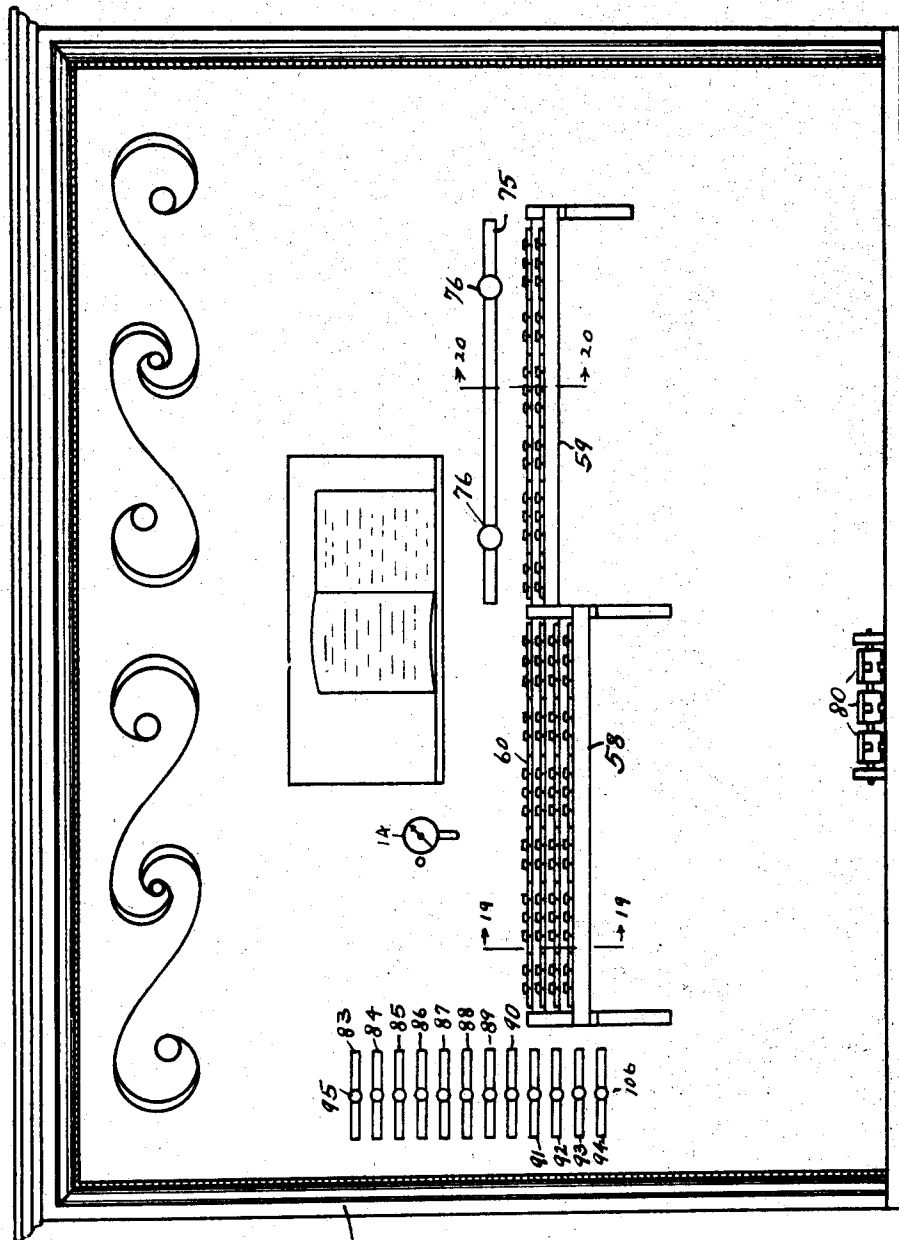
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10 Sheets-Sheet 5



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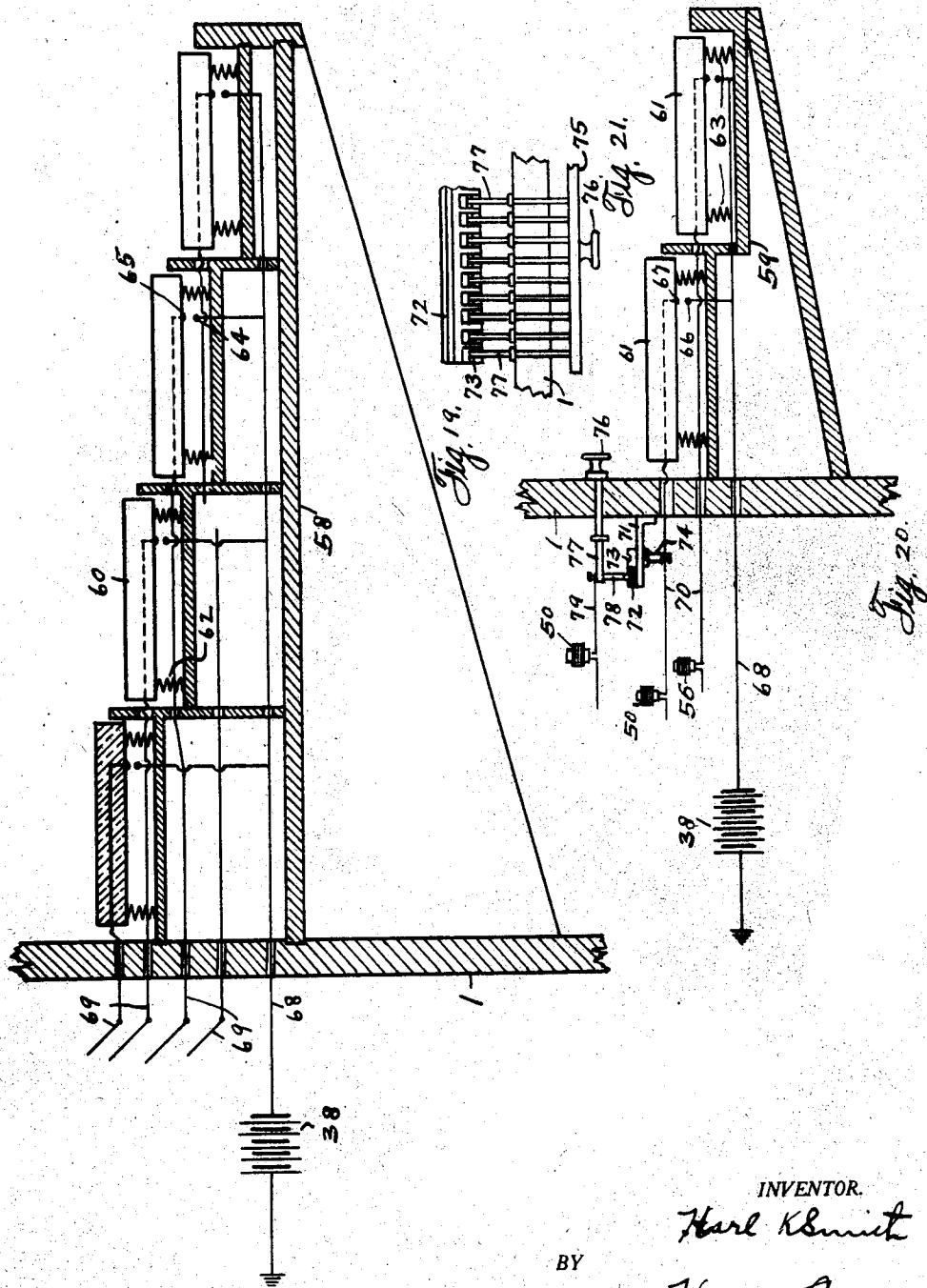
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Filed Sept. 28, 1922

10 Sheets-Sheet 6



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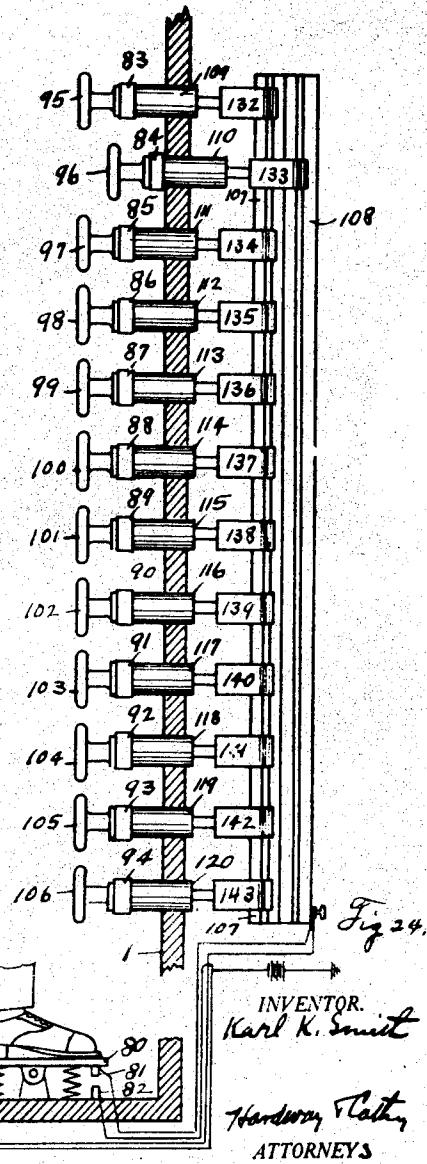
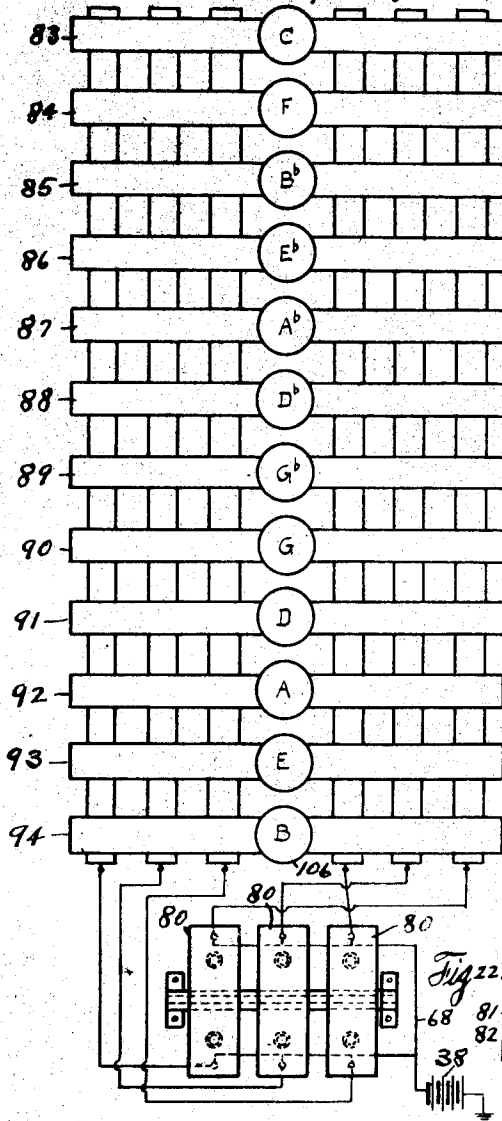
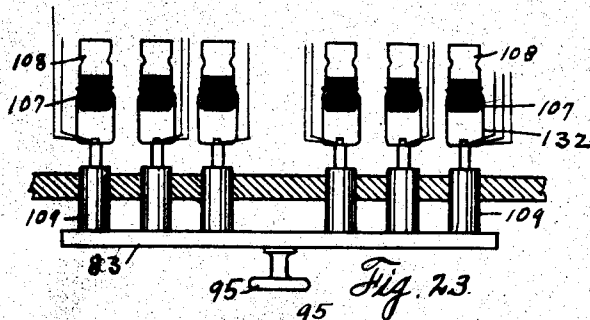
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K. K. SMITH

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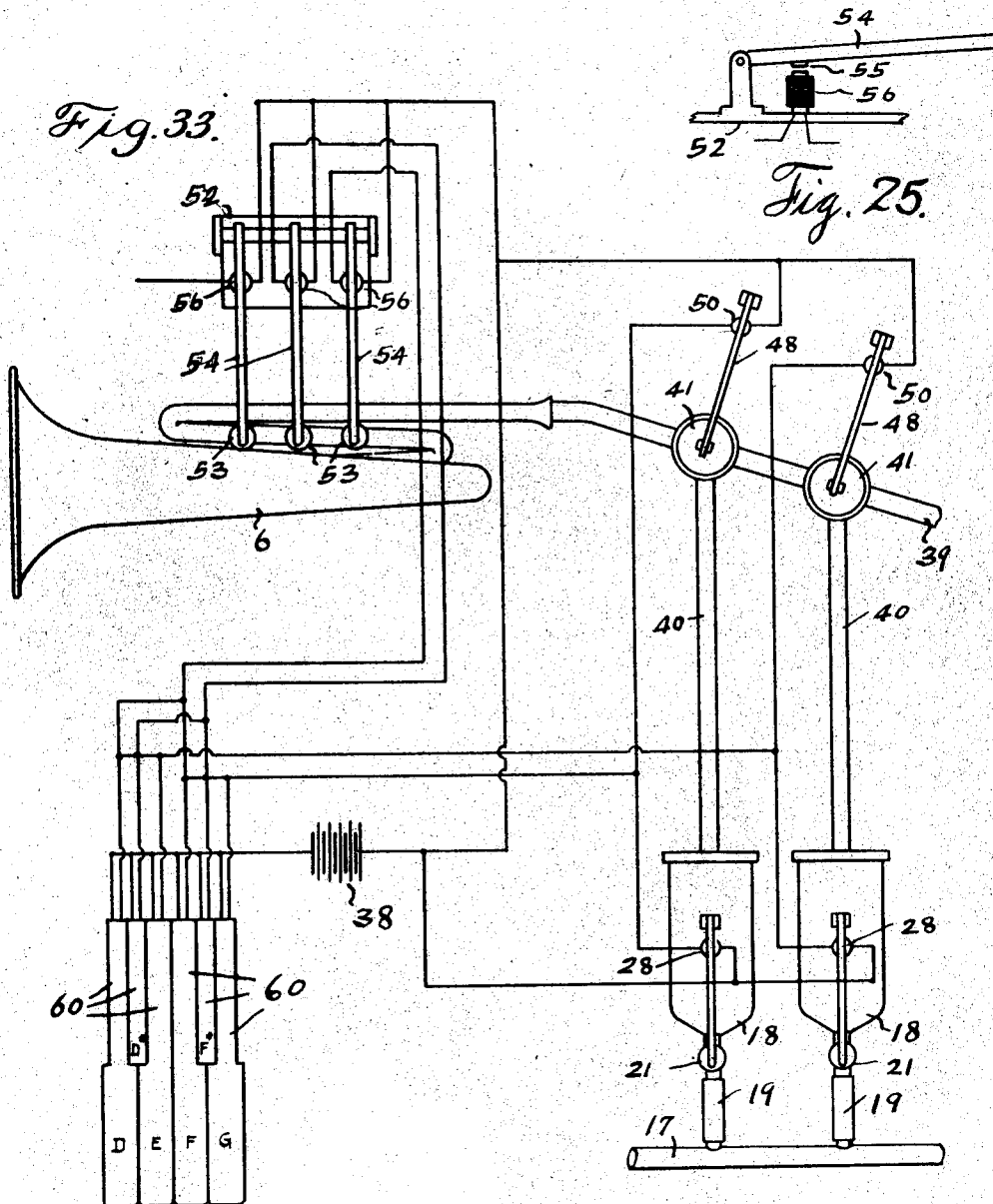
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MUSICAL APPARATUS

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10 Sheets-Sheet 8



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Aug. 3, 1926.

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MUSICAL APPARATUS

Filed Sept. 28, 1922

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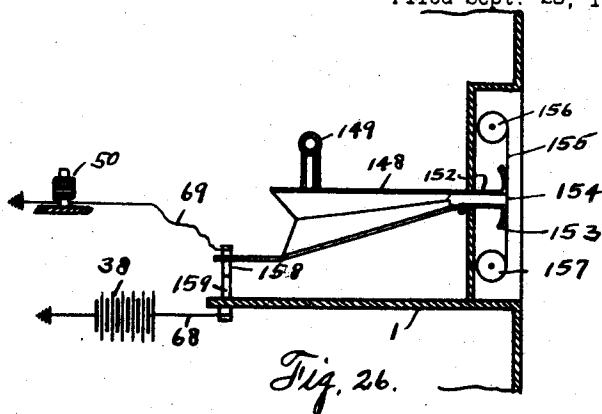


Fig. 26.

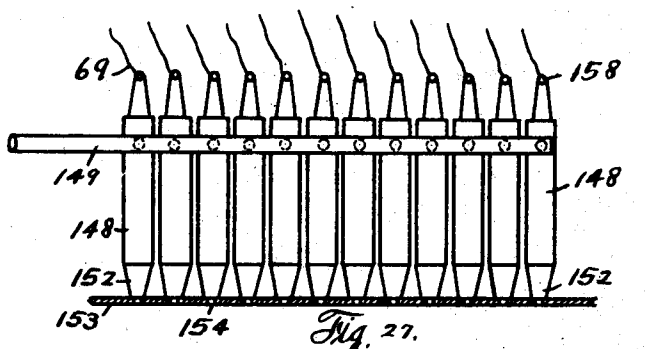


Fig. 27.



Fig. 28.

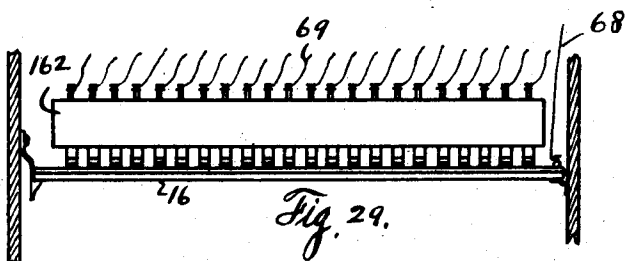


Fig. 29.

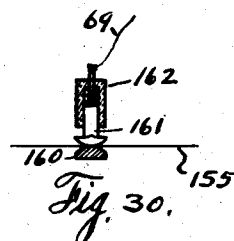


Fig. 30.

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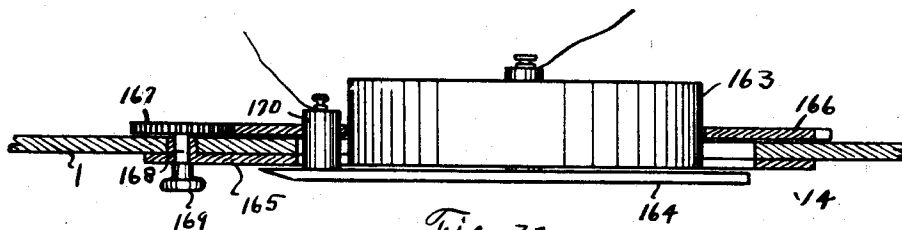


Fig. 32.

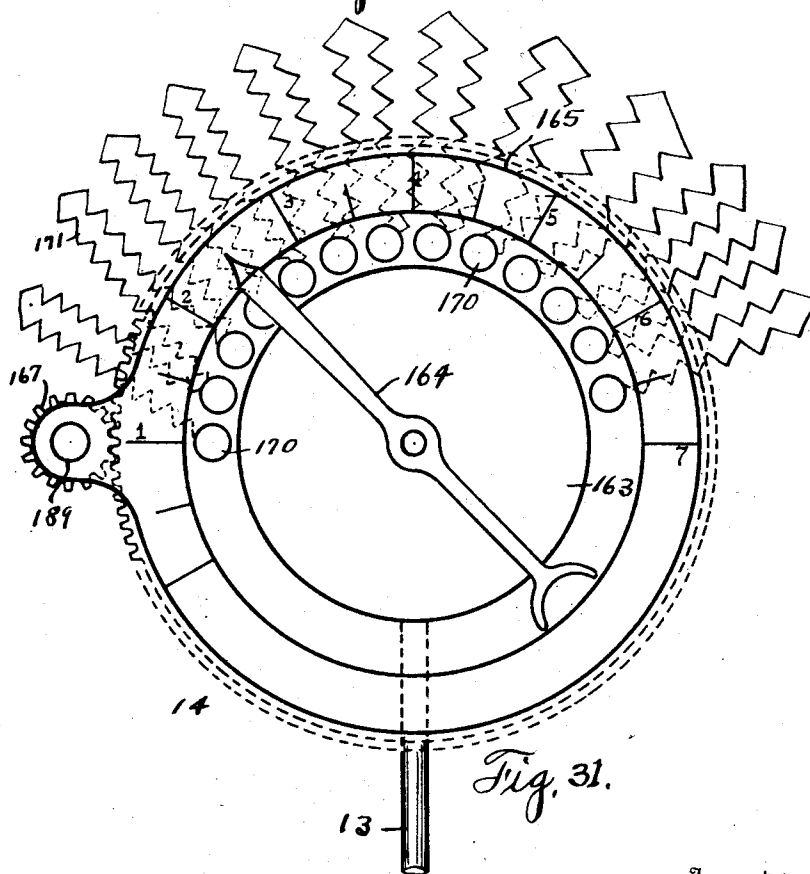


Fig. 31.

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## UNITED STATES PATENT OFFICE.

KARL K. SMITH, OF HOUSTON, TEXAS.

## MUSICAL APPARATUS.

Application filed September 28, 1922. Serial No. 591,043.

This invention relates to new and useful improvements in a musical apparatus.

One object of the invention is to provide an apparatus of the character described whereby different musical instruments, such as are commonly used in a band may be played by a single operator.

Another object of the invention is to provide an apparatus of the character described through which a number of wind musical instruments, as well as drums, cymbals, and the like may be simultaneously played, by a single operator, or mechanically to produce a musical effect similar to that produced when said instruments are played by individual musicians, thus producing ordinary band music.

With the above and other objects in view, which will be more specifically set forth hereinafter, this invention has particular relation to certain novel features of construction, operation and arrangement of parts, an example of which is given in this specification and illustrated in the accompanying drawings, wherein:—

Figure 1 is an elevational view of a complete apparatus, and which may be simultaneously played by the employment of said apparatus in combination with said instruments.

Figure 2 shows a vertical sectional view thereof.

Figure 3 shows a plan view of a musical wind instrument in combination with an apparatus for mechanically operating the valves of the instrument.

Figure 4 shows a plan view, partly in section of the tone producing unit used in connection with each of the wind instruments employed.

Figure 5 shows an enlarged fragmentary sectional view thereof taken on the line 5—5 of Figure 4.

Figure 6 shows a transverse sectional view taken on the line 6—6 of Figure 5.

Figure 7 shows an enlarged fragmentary sectional view taken on the line 7—7 of Figure 4.

Figure 8 shows an enlarged fragmentary sectional view taken on the line 8—8 of Figure 7.

Figures 9 and 10 show plan and end

views, respectively of one form of the tone producing horn employed.

Figures 11 and 12 show plan and edge views of the tone producing reed or tongue employed with this type of horn.

Figures 13, 14 and 15 show, respectively, plan, end and longitudinal sectional views of another form of tone producing horn.

Figures 16 and 17 show, respectively, plan and edge views of the tone producing tongue employed with this last mentioned type of horn.

Figure 18 shows a front view of a complete apparatus, showing the key boards.

Figure 19 shows an enlarged fragmentary vertical sectional view taken on the line 19—19 of Figure 18.

Figure 20 shows an enlarged fragmentary vertical sectional view taken on the line 20—20 of Figure 18.

Figure 21 shows an enlarged plan view of the coupling device disclosed in Figure 20.

Figures 22, 23 and 24 show plan, transverse, sectional and vertical sectional views, respectively of a pedal operated mechanism, in combination with a key regulator.

Figure 25 shows a fragmentary side view of a valve controlling finger and its support.

Figure 26 shows an enlarged fragmentary vertical sectional view of the apparatus disclosed in Figure 2, showing bellows associated with the perforated music roll, for mechanically producing the music.

Figure 27 shows an enlarged fragmentary plan view thereof, partially in section.

Figure 28 shows a section of the nozzle board forming part thereof.

Figures 29 and 30 show plan and cross sectional views of a mechanical appliance through which the apparatus may be electrically operated to produce the music.

Figures 31 and 32 disclose plan and side views, respectively of a pressure gauge employed, the latter view being shown partly in section, and

Figure 33 shows a wiring diagram.

In the drawings the numeral 1 designates a suitable casing enclosing and supporting the apparatus described. This casing may be of any desired construction and contour and is designed to support and enclose the tone producing units 2, associated with the

various wind instruments and hereinafter described. These units are shown assembled in the casing for convenience but their arrangement and location, as well as the particular form of their embodiment may be varied to suit the individual taste.

As shown they are assembled together in the casing and are associated with the cornets 3, 3, the altos 4, 4, the tenor and baritone 5, 5, and the basses 6, 6. Assembled with these wind instruments are the drums 7 and 8, the cymbal 9, the triangle 10. Within the casing 1 there is shown a suitable air compressor 11 which is connected into the compression tank 12, said tank being connected through the pressure line 13 with a gauge 14, to be more specifically described hereinafter. Leading from the pressure tank 12 there is a main line 15 controlled by the shut off valve 16 and provided with the branch lines 17 leading to, and supplying compressed air to the various units 2.

The unit associated with each of the wind instruments will now be described:—Each unit embodies a plurality, preferably eight, tone chambers 18 into which the corresponding branch pipe 17 is connected through flexible hose 19, said hose being connected at one end to said branch line and at their other ends into corresponding nipples 20, formed integrally with the respective tone chambers and each nipple 20 is formed with a transversely extending tubular valve casing 21 in each of which is the cylindrical valve 22. One end of this valve has a stem 23 which works through a central bearing in the stuffing box 24 which is screwed into the adjacent end of the valve casing. A coil spring 25 is interposed between said valve and the opposite end of said casing. A controlling arm 26 is pivoted at one end to the tone chamber 18 and its free end rests upon said stem. This arm is provided with a metallic plate 27, forming an armature which is arranged opposite the electro-magnet 28 which is also carried by the tone chamber 18, and this electro-magnet is in a circuit with the electrical wiring 29. Each valve 22 has a transverse opening 30 therethrough normally held out of alignment with the passageway through the nipple 20 by the spring 25. When the electro-magnet 28 is energized it will operate through the controlling arm 26 to overcome the resistance of the spring 25 and move the valve 22 to register the opening 30 with the nipple 20 and air under pressure will be admitted into the tone chamber. The other end of the tone chamber is closed by means of a plug 31 and enclosed within said chamber is the tubular horn 32 which is anchored to said plug and whose outer end is closed, said horn being provided with a side slot 33 and a tongue like reed 34 is anchored at one end to the plug 31 and hav-

ing its other end free and in overlapping the slot 33. The reeds 34 may be made of metal, fibre, or other suitable materials and are of the type commonly known as beater reeds, and they may be tuned by means of adjustable rods 35 which are slidable through the respective blocks 31 and whose ends within the tone chambers 18 are retracted and turned laterally forming the bearing fingers 36 which press against the respective reeds and these rods 35 may be adjusted, to, in effect, lengthen or shorten the reeds and thus vary the pitch of the tones produced thereby. Leading out from one of the tone chambers 18 is the tube 37, and leading out from the other tone chambers 18 are the respective tubes 39, said tubes 39 each being formed of two sections connected by the sleeves 40 into which they telescope thus providing for the proper adjustment of them. While the tubes 39 are of a variety of lengths they are so arranged and adjusted that the length of the air passage from the various tone chambers 18 to the end of the tubing 37, to which the brass band instrument is attached, is the same, or is as near the same length as is necessary for the proper production of tones of the various pitches desired. The tubes 37 and 39 are connected into the corresponding blocks 31 of the tone chambers 18 and are in alignment with the corresponding horns 32. The tube 37 is provided with a plurality of valve casings 41 in which the cylindrical valves 42 are mounted to slide, and the respective tubes 39 are connected into the corresponding valve casings. Each valve 42 has a stem 43 slidable through the stuffing box 44 which is screwed into one end of said casing and located between said valve and the other end of said casing there is a coil spring 45. Each valve 42 has a straight passageway 46 therethrough normally held in alignment with the conduit through the tube 37 by means of the pressure spring 45, as illustrated in Figures 4 and 7. Above the passageway 46 there is a curved passageway 47 through each valve 42 adapted to connect the conduit through the corresponding tube 39 with the conduit through the tube 37 when the valve is depressed by the corresponding controlling lever 48. These levers are pivoted at one end to the casing and their other ends rest upon the corresponding valve stem 43. Each lever is provided with a metallic plate forming an armature 49 arranged opposite the electro-magnets 50 which are fixed to said casing 1 and which are wired in multiple with the electro-magnets 28 through the electrical wiring 51. When any solenoid 50 is energized the corresponding controlling arm 48 will operate against the valve stem 43 to bring the valve passageway 47 into registration with the conduits through the

corresponding tube 39 and the tube 37. The free end of the tube 37 is connected into the mouth piece of a wind instrument through which the tune is produced. The air current passing from the tone chamber in through the horn 32 will vibrate the reed 34 originating a tone and the volume and quality of this tone will depend largely on the force of the air pressure as modified by the particular instrument through which it is delivered. The pitch of the tone will depend on the length of the reed and column of air vibrated thereby and different tones required to produce the music described are obtained by a proper selection of the tone chambers in which the tone is originally produced and the proper manipulation of the valves of the corresponding wind instrument. It is to be here noted that the corresponding valves 22 and 42 are manipulated in unison through a series of electrical contacts so that the branch pressure line 17 may be connected through any selected tone chamber into the tubing 37 and the tones of the instrument connected therewith thus varied.

Each instrument is held in position by a suitable bracket 52, and has the usual valves 53, the number of valves varying in accordance with the range and design of the instrument. The valves are of the usual construction and for the usual purpose, being provided to vary the tone produced. The valves 53 may be depressed by means of the controlling fingers 54 which are pivoted at one end to the casing and whose other ends are aligned over the valves 53. These fingers carry metallic plates as 55 which are aligned over suitable electromagnets 56 each of which are wired separately in the electrical circuits 57, and when the electro-magnets 56 are energized the corresponding fingers will be depressed thus operating the valves 53. Various tones may be obtained by operating the valves 53 in suitable combinations with any one of the tone chambers 18 and these various combinations of the valves 53 with each of the various tone chambers 18 in turn will produce a sufficient range of tones for executing music, and of course this range may be enlarged in scope by providing additional tone chambers 18 and connecting them with the tube 37 in the manner hereinbefore described and as illustrated in Figure 4.

In Figures 18 to 20, inclusive, I have shown the key boards arranged in right and left hand banks similar to the key board of the ordinary pipe organ. The numerals 58 and 59, respectively designate the left and right hand key boards proper whereon are mounted the keys 60 and 61 which are supported on yieldable seats as 62 and 63. These keys embody electrical switches formed with the fixed and the opposing movable contact points 64, 65 and 66, 67, re-

spectively, the fixed contact points being connected to the common return 68 which is connected through the battery or other source of power 38, to a common return or ground, and movable contact points being connected with the electrical wiring 69 and 70, respectively. The corresponding electromagnets 28, 50, and 55 are connected into the respective circuits through the electrical wiring 29, 51 and 57 so that by manipulating the keys 60 circuits may be established to operate the valves 22, 42 and 53 at the will of the operator.

The full understanding of the manner in which tones can be produced of the proper pitch to make a musical scale can best be shown by explaining in detail the production of part of a scale. The valves which are embodied in the construction of the brass instruments of a brass band are commonly designated as the first valve, referring to the valve closest to the mouthpiece of the instrument and farthest from the bell of the instrument which is usually manipulated by the first or index finger of the musician when playing the instrument; the second valve referring to the middle valve of the instrument, which is usually manipulated by the second or middle finger of the musician when playing the instrument; and the third valve referring to the valve farthest from the mouthpiece of the instrument, and closest to the bell of the instrument. Any tone produced in playing the instrument without manipulating the valves embodied in said instrument is known as an "open tone." The valves of said instrument are so connected with the tubing composing said instrument that when the second valve of said instrument is depressed it adds a certain amount of tubing through which the air must pass in going through the instrument and thereby lengthening the column of air which is caused to vibrate within the instrument, thereby producing the tone. The first valve of the instrument when depressed accomplishes the same result as the second valve, with the exception that the first valve when depressed adds twice the amount of tubing that the second valve adds; and the third valve, when depressed, adds an amount of tubing equal to the amount added by the first and second valves combined. Each instrument will produce several open tones of different pitches, the difference in pitch of the different tones being caused by the different frequency at which the column of air within the instrument is made to vibrate. The different pitches of the various open tones of any brass instrument of the brass band are always tones of a pitch which are known as "harmonics" of the fundamental tone or pitch of the instrument. The fundamental tone or pitch of the instrument

is the open tone of the lowest pitch which the instrument will produce. In an instrument so built or constructed that its fundamental tone is the musical pitch "C," the other open tones, in an ascending scale, will be pitched "G," "C," "E," "G," and "C," respectively, all of which are known as harmonics of the lower pitched of fundamental "C" of the instrument.

In producing tones of the pitches necessary to complete a musical scale, one of the tone chambers 18 is so pitched; that is, its reed or tongue 34 is so adjusted by use of the adjustable rod 35, that when the valves 22 and 42 are depressed and air is forced to flow through tone chamber and on out through the tubing 37, and through the instrument attached to said tubing 37, and when none of the valves of said instrument are depressed the pitch of the tone so produced will be the same as the "E" of the "E" string of a violin, or the second "E" above, or of higher pitch than the tone which is known as "middle C" on a piano; and another of the tone chambers will have the reed which it contains so adjusted that when its valves 22 and 42 are depressed and the air is forced through this tone chamber and on out through the tubing 37, and through the instrument attached to said tubing 37, and none of the valves of said instrument are depressed, the tone produced will be the pitch known as "G," being the "G" first above mentioned, or higher in pitch than the "E" of the tone chamber first described. The tone chamber first described will be called "tone chamber E," and the latter one described will be called "tone chamber G." It will be noted that these tones are "harmonics" of a fundamental "C." The method of producing the tones pitched from "G" to "D" in a descending scale, will be as follows:—

"G"—The "tone chamber G" will be used and none of the valves on the band instrument will be depressed.

"F#"—The "tone chamber G" will be used and the second valve of the band instrument will be depressed.

"F"—The "tone chamber G" will be used and the first valve of the band instrument will be depressed.

"E"—The "tone chamber E" will be used and none of the valves of the band instrument will be depressed.

"D#"—The "tone chamber E" will be used and the second valve of the instrument will be depressed.

"D"—The "tone chamber E" will be used and the first valve of the instrument will be depressed.

By the use of the various other tone chambers, with and without the depression of the valves of the instrument connected with the tubing 37, tones of the various

pitches necessary to complete a musical scale and the entire compass of the instrument may be produced. The valves of the instrument may be depressed separately or in various combinations with each other as is necessary to produce tones of the pitch required.

To explain the manner in which the valves 22 and 42 are operated either independently of the valves 53 of the instrument or with these said valves of the instrument the electrical wiring or connections necessary with the keys 61, in the keyboard 59, will be explained in detail for the production of tones pitched from "G" to "D" in a descending scale being the same pitched tones as hereinbefore described, together with the action necessary for their production.

Appropriate keys 61 on the keyboard 59 are designated as the "G", "F#", "F", "E", "D#" and "D" keys in the order named.

The electrical wire 70 running from the "G" key is connected with the wire 69, shown in Figure 4, controlling through the electro-magneto 28 and 50, the operation of the valves 22 and 42 necessary for the operation of that tone chamber 18, as has previously been designated as "tone chamber G". With these connections made, when the "G" key is depressed the contact points 66 and 67 will be brought together and the electrical circuit completed causing the electro-magnets 28 and 50 to become energized, thereby opening the valves 22 and 42 allowing the air which is being held under pressure in pressure tank 12, shown in Figure 2, to pass through "tone chamber G", and through tube 37; and through the instrument attached to said tube 37, thereby producing the musical tone of the pitch "G" as desired.

The electrical wire 70, running from the "F#" key is connected with the wire 69, shown in Figure 4, controlling through the electro-magnets 28 and 50, the operation of the valves 22 and 42 necessary for the operation of that tone chamber 18, as has previously been designated as "tone chamber G", and also is connected with wire, or circuit 57, controlling through the operation of the electro-magnet 56, the operation of the second valve of the instrument which is connected with the tubing 37. With these connections made when the "F#" key is depressed, the contact points 66 and 67 will be brought together and the electrical circuit completed, causing the electro-magnets 28 and 50 to become energized, thereby allowing the air which is being held under pressure in pressure tank 12, shown in Figure 2, to pass through "tone chamber G" and through tubing 37, and through the instrument attached to said tubing 37, and the depression of the "F#" key bringing together contact points 66 and 67, also causes the

electro-magnet 56, controlling the operation of the second valve of the instrument connected with the tubing 37, to become energized, thereby causing the depression of the second valve of said instrument, thereby lengthening the column of air within the instrument, and thereby producing the musical tone of the pitch "F#" as desired.

The electrical wire 70 running from the "F" key is connected with the wire 69 shown in Figure 4, controlling through the electro-magnets 28 and 50, the operation of the valves 22 and 42 necessary for the operation of that tone chamber 18 as has previously been designated as "tone chamber G", and is also connected with the wire, or circuit 57, controlling through the operation of the electro-magnet 56, the operation of the first valve of the instrument which is connected with the tubing 37. With these connections made when the "F" key is depressed, the contact points 66 and 67 will be brought together, and the electrical circuit completed causing the electro-magnets 28 and 50 to become energized, thereby allowing the air which is being held under pressure in pressure tank 12, shown in Figure 2, to pass through "tone chamber G", and through tubing 37, and through the instrument attached to said tubing 37, and the depression of the "F" key bringing together contact points 66 and 67 also causes the electro-magnet 56 controlling the operation of the first valve of the instrument connected with the tubing 37 to become energized thereby causing the depression of the first valve of said instrument, thereby lengthening the column of air within the instrument, and thereby producing the musical tone of the pitch "F" as desired.

The electrical wire 70 running from the "E" key is connected with the wire 69, shown in Figure 4, controlling through the electro-magnets 28 and 50, the operation of the valves 22 and 42 necessary for the operation of that tone chamber 18, as has previously been designated as "tone chamber E." With these connections made when the "E" key is depressed the contact points 66 and 67 will be brought together and the electro-magnets 28 and 50 to become energized thereby opening the valves 22 and 42, and allowing the air which is being held under pressure in the pressure tank 12, shown in Figure 2, to pass through the "tone chamber E," and through tubing 37, and through the instrument attached to said tubing 37 thereby producing the musical tone of the pitch "E" as desired.

The electrical wire 70 running from the "D#" key is connected with the wire 69, shown in Figure 4, controlling through the electro-magnets 28 and 50, the operation of the valves 22 and 42 necessary for the operation of the tone chamber 18 as has previously

been designated as "tone chamber E", and is also connected with wire or circuit 57, controlling through the electro-magnet 56 the operation of the second valve of the instrument which is connected with the tubing 37. With their connections made when the "D#" key is depressed the contact points 66 and 67 will be brought together and the electrical circuit completed causing the electro-magnets 28 and 50 to become energized, thereby allowing the air which is being held under pressure in pressure tank 12, shown in Figure 2, to pass through "tone chamber E", and through tubing 37, and through the instrument attached to said tubing 37, and the depression of the "D#" key bringing together contact points 66 and 67 also causes the electro-magnet 56, controlling the operation of the second valve of the instrument attached to said tubing 37 to become energized thereby causing the depression of the second valve of said instrument, thereby lengthening the column of air within the instrument, and thereby producing the musical tone of the pitch "D#", as desired.

The electrical wire 70 running from the "D" key is connected with the wire 69, shown in Figure 4, controlling through the electro-magnets 28 and 50, the operation of that tone chamber 18 as has previously been designated as "tone chamber E", and is also connected with wire, or circuit 57, controlling through the electro-magnet 56 the operation of the first valve of the instrument, which is connected with the tubing 37. With these connections made, when the "D" key is depressed the contact points 66 and 67 will be brought together and the electrical circuit completed causing the electro-magnets 28 and 50 to become energized thereby opening the valves 22 and 42, and allowing the air which is being held under pressure in pressure tank 12, shown in Figure 2, to pass through "tone chamber E" and through tubing 37, and through the instrument attached to said tubing 37, and the depression of the "D" key, bringing together contact points 66 and 67, also causes the electro-magnet 56 controlling the operation of the first valve of the instrument attached to said tubing 37, to become energized thereby, causing the depression of the first valve, of said instrument, thereby lengthening the column of air within the instrument, and thereby producing the musical tone of the pitch "D" as desired.

In like manner by the use of additional tone chambers 18, and the use of the valves embodied in the brass band instruments tones of other pitches are produced and sufficient varied pitches are produced to include the complete range of pitch or compass of the said band instrument. The length of the column of air which is caused to vibrate is varied by the use of the valves embodied

in the band instrument through which it passes. The different frequencies at which this said column of air vibrates is varied by the use of the different tone chambers 18.

5 It may often be found desirable, where certain parts are to be played in unison, to provide a coupling device for coupling the instruments together so that said parts can be played from the same keys. This is illustrated in Figures 20 and 21 wherein the  
10 numeral 71 designates a long bracket anchored to the framework behind the right hand key board and this bracket has a transverse bar 72 of insulating material fixed thereon, and adjacent this bar lies a row of  
15 contact points 73 of metal, forming a good conductor and each insulated from the other and connected to which are the binding posts 74 to which the wiring 70 is also connected.  
20 A long bar 75 is located above the key board and provided with hand knobs as 76. Attached at their outer ends to the bar 75 and extending through the bearings in the casing are the coupling bars 77 whose inner  
25 ends have the binding posts 78 which are connected with the wiring 79. The wiring 79 is connected into the circuit of the solenoids controlling the instruments to be coupled in. When it is desired to couple  
30 instruments together the coupling bars may be pulled outwardly, in the position shown in Figure 21, in which case the binding posts 78 will be brought into contact with the conductors 73, thus forming the coupling.  
35 When forced inwardly into the position shown in Figure 20 the binding post 78 will be carried into contact with the insulator 72 breaking the circuit.

40 In controlling two of the band instruments from the same key board the coupling device is used. The knob 76 is pulled out or forward, bringing with it the bar 75 and the coupling bars 77, and the electrical connection or binding posts 78, bring each of  
45 their binding posts into connection with the contact point 73 which in turn is connected with the wire 70, running from the key 61 directly in front of said contact point 73. These various binding posts are each so connected with wires of electrical circuits that  
50 they control the flow of electrical current through the proper electro-magnets to produce on another band instrument, other than the one with which the keys of the keyboard is regularly connected, a tone of the same  
55 pitch or a tone pitched one octave, or if desired, a fractional part thereof, lower or higher in the musical scale than the tone which is produced by the instrument with which said key is so electrically connected  
60 in circuit as to permanently control the production of.

65 The basses and altos are also controlled through the foot pedals 80 which are pivotally mounted and provided with the mov-

able contact points 81, 81 which oppose the fixed contact points 82, 82, said contact points being connected with the electro-magnets of the controlling valves 28, 50 and 53 which control the bass and alto instruments  
70 through a key regulator shown in detail in Figures 23, 24 and 25. This regulator includes a bank of key bars indicated by the numerals 83 to 94, inclusive, respectively, having the hand knobs numbered 95 to 106  
75 inclusive, respectively, each labeled to indicate the corresponding key. Within the casing there are arranged the vertical insulating bars 107 and adjacent them the vertical conducting bars 108, with the latter of  
80 which wired to the point 81. The regulator bars 83 to 94 respectively, each have the binding post anchors 109 to 120 inclusive, respectively carried thereby which work through suitable bearings in the casing and their inner ends carry binding  
85 posts which carry the flexible tongues designated respectively by the numerals 132 to 143 inclusive. These tongues are preferably U-shaped in form to embrace said bars 107 to 108, and connected to these  
90 respective binding posts there is electric wiring forming a part of the circuit into which the electro-magnets controlling the bass and alto instruments are connected.  
95 The key desired may be selected and the corresponding key bar forced inwardly to complete an electrical circuit through the bars 108 and the manipulation of the foot pedals will then operate to produce the  
100 chords on the bass chords instruments in the key selected.

The manner in which this chord operating device operates the electrical circuits necessary to control and operate the "C" chord will be described. The common "C" chord, as do the chords in all other musical keys, consists of what are commonly called  
105 three changes. These changes are given below, the letters indicating the musical pitch of the tone.

First change: "C"—"E"—"G".

Second change: "F"—"A"—"C".

Third change: "G"—"B"—"D".

115 These changes as shown above are listed on an ascending scale, that is, the "C" is the lowest pitched tone in the first change, whereas the "C" in the second change is the highest pitched tone in that change, and is pitched one octave higher than the "C" in the first change. In ordinary band music it is customary to have the bass horn produce the lowest pitched tone, and to produce the two higher pitched tones produced on the alto horns.  
120  
125

The foot pedals 80 will be considered as first foot pedal, second foot pedal and third foot pedal, numbered from right to left, and will control the first, second and third changes of the musical chords. The three  
130



vertical conducting bars 108 on the left will be known as the bass conducting bars, and the three vertical conducting bars 108 on the right will be known as the alto conducting bars. The bass conducting bars 108 will be known as first bass bar, second bass bar, and third bass bar, designated from right to left; and the flexible U-shaped tongues 132, used to embrace and engage said bars will be known as first bass engaging tongue, second bass engaging tongue, and third bass engaging tongue, being opposed to the first bass bar, second bass bar, and third bass bar, respectively. The three vertical conducting bars on the right known as the alto conducting bars, will be known as the first alto bar, second alto bar, and third alto bar, respectively, from left to right; and the flexible U-shaped tongues 132, used to embrace and engage said bars will be known as first alto engaging tongue, second alto engaging tongue and third alto engaging tongue, being opposed to the first alto bar, second alto bar, and third alto bar, respectively. That portion of the pedal 80 that lies under the heel of the individual operating the apparatus will be designated as the heel end of the pedal, and that portion of the pedal 80 that lies under the toe of the individual operating the apparatus will be designated as the toe end of the pedal. The contact points 81 and 82 are so wired or connected into circuits that when the heel end of the first foot pedal is depressed the first bass bar will be thrown into circuit, when the heel end of the second foot pedal is depressed the second bass bar will be thrown into circuit, and when the heel end of the third foot pedal is depressed the third bass bar will be thrown into circuit, and when the toe end of the first foot pedal is depressed the first alto bar will be thrown into circuit, when the toe end of the second foot pedal is depressed the second alto bar will be thrown into circuit, and when the toe end of the third foot pedal is depressed the third alto bar will be thrown into circuit. The circuits of which these various bass and alto bars become a part upon the depression of the foot pedals will be completed through the flexible U-shaped tongues and their respective binding posts and from these said binding posts through various wires connected with the proper electro-magnets 28 and 50, belonging to and connected with the proper units 2 to produce the tones of the pitch desired upon the instruments desired, and when necessary to produce the tones of the pitch desired the wires connected with these said binding posts will be connected also with electro-magnets 56 associated with the same, said instruments thereby operating, as is necessary, the valves contained and carried by these said instruments. The manner in which the

U-shaped tongues 132 are connected into electrical wiring is as follows:

The first bass engaging tongue 132 is connected through the binding foot to which it is attached with electrical wiring running to and connected with the proper electro-magnets, the energizing of which will cause a tone of the musical pitch "C" to be produced through and by a bass brass band instrument, attached to tubing 37 leading from one of the units 2.

The second bass engaging tongue 132 is connected through the binding post to which it is attached with electrical wiring running to and connected with the proper electro-magnets, the energizing of which will cause a tone of the musical pitch "F" to be produced through and by a brass band instrument attached to tubing 37 leading from one of the units 2.

The third bass engaging tongue 132 is connected through the binding post to which it is attached with electrical wiring running to and connected with the proper electro-magnets, the energizing of which will cause a tone of the musical pitch "G" to be produced through and by a brass band instrument attached to tubing 37, leading from one of the units 2.

The first alto engaging tongue 132 is connected through the binding post to which it is attached with electrical wiring running to and connected with the proper electro-magnets, the energizing of which will cause a tone of the musical pitch "E" to be produced through and by an alto brass band instrument attached to tubing 37, leading from one of the units 2; and the first alto engaging tongue 132 is also connected through the binding post to which it is attached with electrical wiring running to and connected with the proper electro-magnets, the energizing of which will cause a tone of the musical pitch "G" to be produced through and by another alto brass band instrument attached to tubing 37, leading from another one of the units 2.

The second alto engaging tongue 132 is connected through the binding post to which it is attached with electrical wiring running to and connected with the proper electro-magnets, the energizing of which will cause a tone of the musical pitch "A" to be produced through and by an alto brass band instrument attached to tubing 37, leading from one of the units 2; and the second alto engaging tongue 132 is also connected through the binding post to which it is attached with electrical wiring running to and connected with the proper electro-magnets, the energizing of which will cause a tone of the musical pitch "C" to be produced through and by another alto brass band instrument attached to tubing 37 leading from another one of the units 2.

The third alto engaging tongue 132 is connected through the binding post to which it is attached with electrical wiring running to and connected with the proper electro-magnets, the energizing of which will cause a tone of the musical pitch "B" to be produced through and by an alto brass band instrument attached to tubing 37, leading from one of the units 2; and the third alto engaging tongue 132 is also connected through the binding post to which it is attached with electrical wiring running to and connected with the proper electro-magnets, the energizing of which will cause a tone of the musical pitch "D" to be produced through and by another alto brass band instrument attached to tubing 37, leading from another one of the units 2.

Thus, when the hand knob 95 is pushed in forcing the bass and alto engaging tongues 132 to become engaged and connected with their respective vertical bass and alto bars 103, and the heel end of the first foot pedal 80 is depressed, bringing together contact points 81 and 82, a tone of the musical pitch "C" will be produced through and by a bass brass band instrument, and when the toe end of the first foot pedal 80 is depressed bringing together contact points 81 and 82, a tone of the musical pitch "E" will be produced through and by an alto brass band instrument, and also a tone of the musical pitch "G" will be produced by another alto brass band instrument, and when the heel end of the second foot pedal 80 is depressed bringing together contact points 81 and 82, a tone of the musical pitch "F" will be produced through and by a bass brass band instrument, and when the toe end of the second foot pedal 80 is depressed bringing together contact points 81 and 82, a tone of the musical pitch "A" will be produced through and by an alto brass band instrument, and also a tone of the musical pitch "C" will be produced through and by another alto brass band instrument, and when the heel end of the third foot pedal 80 is depressed, bringing together contact points 81 and 82 a tone of the musical pitch "G" will be produced through and by a bass brass band instrument, and when the toe end of the third foot pedal is depressed bringing together contact points 81 and 82, a tone of the musical pitch "B" will be produced through and by an alto brass band instrument, and also a tone of the musical pitch "D" will be produced through and by another alto brass band instrument.

The other engaging tongues 133 to 143, inclusive, will be so connected through their respective binding posts with electric wiring connected with the proper electro-magnets, as to permit the production of the chords of the various other musical keys in

a manner like that above described for the producing of the chords of the musical key "C".

In Figures 26 to 30 inclusive, I have shown means whereby the music may be mechanically produced by the use of a perforated sheet similar to the music roll now commonly used in operating player pianos. A plurality of bellows 148 have been provided. They are preferably arranged along-side and connected at the top into a common suction pipe 149 which leads to a vacuum tank 150 in which a vacuum is created by the usual suction fan 151. The bellows are provided with nozzles 152 which are anchored to a common nozzle board 153 provided with perforations 154 which are in alignment with the corresponding nozzles of the respective bellows. A perforated sheet 155 is provided and is wound on the roll 156 and as the music progresses unwinds from said roll and is wound onto the roll 157 passing closely over the nozzle board 153. These music rolls are driven from a suitable electric motor 158. The suction fan 151 will ordinarily maintain a partial vacuum in the bellows 148, this lifting the bottom of each bellows, but when a perforation of the sheet 145 registers with one of the nozzle openings 154 the vacuum in the corresponding bellows will be destroyed and the bottom will fall. The bottom of each bellows carries an electric contact point 158 wired with the corresponding electro-magnets 28, 50, 50' and 56 which controls the valves controlling the respective musical instruments and said contact points 158 are aligned above the corresponding points 159 carried by the casing and connected with the wiring 68. When the vacuum is destroyed in the bellows its bottom will fall causing a contact of the points 158, 159 and a completion of the circuit therethrough and as the music sheet 155 advances the music will thus be mechanically produced.

In Figures 29 and 30 the main wiring 68 is shown connected to a transverse metallic bar 160 against the rear side of which the sheet 155 passes and behind said sheet are yieldably mounted contact points 161 which are mounted in the transverse bar 162 and these contact points are wired to the various electro-magnets controlling the musical instruments. As the sheet of music travels along the perforations through it permit contacts between the points 161, and the bar 160, thus completing the circuits through the respective electro-magnets associated with the respective instruments and producing the music.

In Figures 31 and 32 I have shown an improved form of pressure controlling gauge hereinbefore referred to and designated by the numeral 14. This gauge is

connected with the pressure tank 122, through the line 13 and its purpose is to maintain a predetermined pressure by controlling the motor which operates the air compressor. This gauge embodies the conventional casing 163 enclosing any well known type of pressure gauge mechanism with which the hand 154 is connected. Surrounding the casing there is a stationary ring 165 whose outer side is formed with a gauge dial and on the inside of the casing there is a rotatable ring 166 formed with spur gear teeth which are in mesh with the spur gear wheel 167 which is fixed to the stem 168. This stem works in a bearing in the margin of the ring 165 and carries the hand knob 169 by which it may be rotated. The ring 166 carries an arcuately arranged row of contact points 167 with which the free end of the hand 164 contacts successively as it moves around the dial and said hand thereby cuts resistance coils into the circuit with which the motor is connected. As the pressure increases the hand 164 moves around the dial and cuts in additional resistance coils 171 thus operating to retard the motor and decrease the pressure. This gauge thereby serves as a pressure regulator. The dial may be adjusted, by turning the gear wheel 167 through the hand knob 169 and the contact points 170 being connected to said dial will be correspondingly adjusted with it so that in maintaining the predetermined pressure the dial may be adjusted to the proper position so as to cut into the circuit resistance in order to maintain the desired pressure.

What I claim is:—

1. A music producing apparatus including the combination with such a musical instrument as is known as a brass instrument of a brass band, of a mechanism with which said instrument is associated, said mechanism including a plurality of tubes through selected ones of which columns of air vibrating at different frequencies may be in a selected sequence forced through said instrument.

2. A music producing apparatus including the combination with such a musical instrument as is known as a brass instrument of a brass band, of a mechanism with which said instrument is associated, said mechanism including a plurality of tubes through selected ones of which columns of air vibrating at different frequencies may be in a selected sequence forced through said instrument, and selective means through which the desired tubes may be selected.

3. A music producing apparatus including the combination with such a musical instrument as is known as a brass instrument of a brass band, of a mechanism with which said instrument is associated, said mechanism including a plurality of tubes through

selected ones of which columns of air vibrating at different frequencies may be in a selected sequence forced through said instrument, electrical selective means, and switches operated manually, controlling said electrical selective means through which the desired tubes may be selected through said selective means.

4. A music producing apparatus including the combination with such a musical instrument as is known as a brass instrument of a brass band, of a mechanism with which said instrument is associated, said mechanism including a plurality of tubes through selected ones of which columns of air vibrating at different frequencies may be in a selected sequence forced through said instrument, electrical selective means, and mechanically operated electrical switches through which the desired tubes may be selected through said selective means.

5. A music producing apparatus including the combination with such a musical instrument as is known as a brass instrument of a brass band, of a mechanism with which said instrument is associated, said mechanism including a plurality of tubes through selected ones of which columns of air vibrating at different frequencies may be in a selected sequence forced through said instrument, a vibratory element within each tube which is vibrated by and in turn imparts vibration to said column.

6. A music producing apparatus including the combination with such a musical instrument as is known as a brass instrument of a brass band, of a mechanism with which said instrument is associated, said mechanism including a plurality of tubes through selected ones of which columns of air vibrating at different frequencies may be in a selected sequence forced through said instrument, and selective means through which the desired tubes may be selected, a vibratory element within each tube which is vibrated by and in turn imparts vibration to said column of air.

7. A music producing apparatus including the combination with such a musical instrument as is known as a brass instrument of a brass band, of a mechanism with which said instrument is associated, said mechanism including a plurality of tubes through selected ones of which columns of air vibrating at different frequencies may be in a selected sequence forced through said instrument, electrical selective means, and electrical switches operated manually thereby controlling said electrical selective means through which the desired tubes may be selected through said selective means, a vibratory element within each tube which is vibrated by and in turn imparts vibration to said column of air,

8. A music producing apparatus including the combination with such a musical instrument as is known as a brass instrument of a brass band, of a mechanism with  
5 which said instrument is associated, said mechanism including a plurality of tubes through selected ones of which columns of air vibrating at different frequencies may be in a selected sequence forced through  
10 said instrument, electrical selective means, and mechanically operated electrical switches through which the desired tubes may be selected through said selective means, a vibratory element within each tube  
15 which is vibrated by and in turn imparts vibration to said column of air.

9. A music producing apparatus including the combination with such a musical instrument as is known as a brass instrument  
20 of a brass band, of a mechanism with which said instrument is associated, said mechanism including a plurality of tubes through selected ones of which columns of air vibrating at different frequencies may be in a  
25 selected sequence forced through said instrument, a vibratory element within each tube which is vibrated by and in turn imparts vibration to said column of air, and means for manipulating the valves carried  
30 by said instrument for the purpose of varying the length of said column of air.

10. A music producing apparatus including the combination with such a musical instrument as is known as a brass instrument  
35 of a brass band, of a mechanism with which said instrument is associated, said mechanism including a plurality of tubes through selected ones of which columns of air vibrating at different frequencies may be in a selected sequence forced through  
40 said instrument, a vibratory element within each tube which is vibrated by and in turn imparts vibration to said column of air, and means for manipulating the valves embodied in said instrument for the pur-  
45

pose of varying the length of said column of air, and electrically operated means for controlling said valves.

11. A music producing apparatus including the combination with such a musical instrument as is known as a brass instrument  
50 of a brass band, of a mechanism with which said instrument is associated, said mechanism including a plurality of tubes through selected ones of which columns of air vibrating at different frequencies may be in a  
55 selected sequence forced through said instrument, a vibratory element within each tube which is vibrated by and in turn imparts vibration to said column of air, and  
60 means for manipulating the valves embodied in said instrument for the purpose of varying the length of said column of air, electrically operated means for controlling  
65 said valves, and switches operated manually for controlling said electrically operated means.

12. A music producing apparatus including the combination with such a musical instrument as is known as a brass instrument  
70 of a brass band, of a mechanism with which said instrument is associated, said mechanism including a plurality of tubes through selected ones of which columns of air vibrating at different frequencies may be in a  
75 selected sequence forced through said instrument, a vibratory element within each tube which is vibrated by and in turn imparts vibration to said column of air, and  
80 means for manipulating the valves embodied in said instrument for the purpose of varying the length of said column of air, electrically operated means for controlling  
85 said valves, and mechanically operated switches for controlling said electrically operated means.

In testimony whereof I have signed my name to this specification.

KARL K. SMITH.