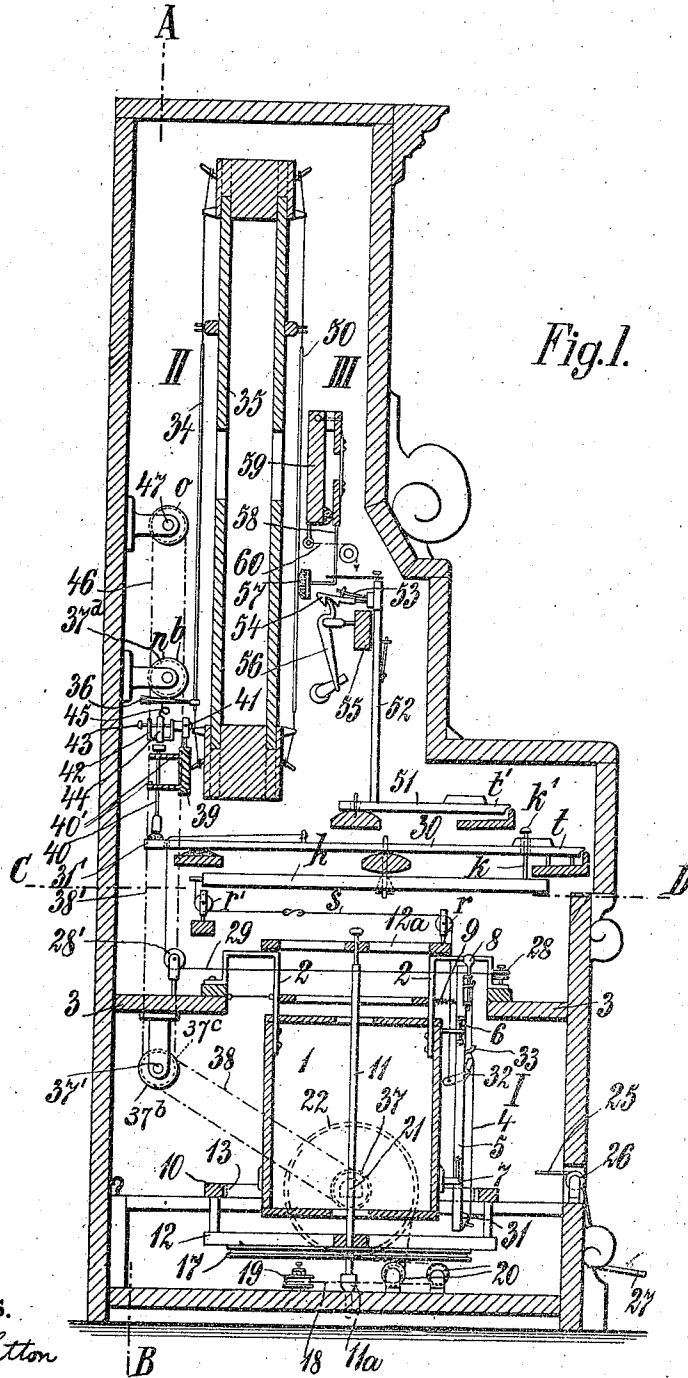


939,786.

J. BAJDE.
PIANO VIOLIN.
APPLICATION FILED JAN. 16, 1908.

Patented Nov. 9, 1909.
6 SHEETS—SHEET 1.



Witnesses.

Jesse N. Lutton
C. Rommers

Inventor.

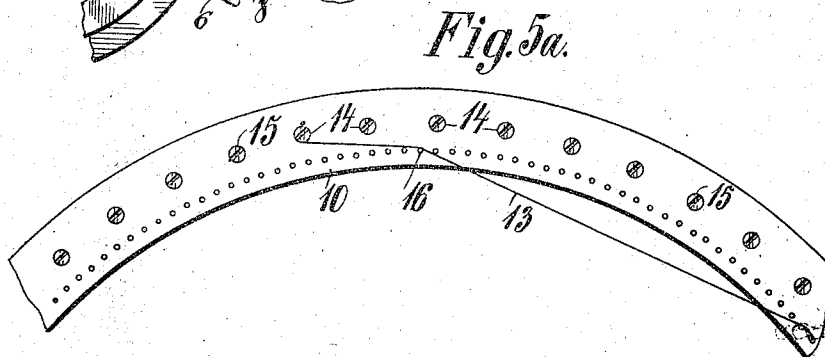
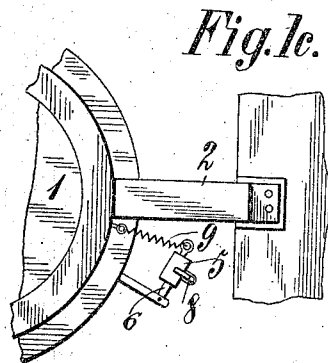
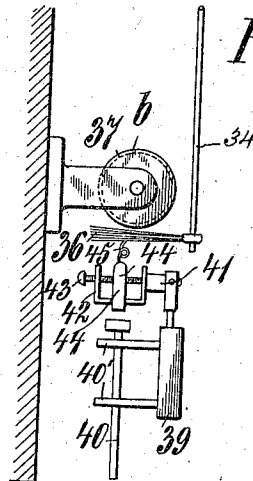
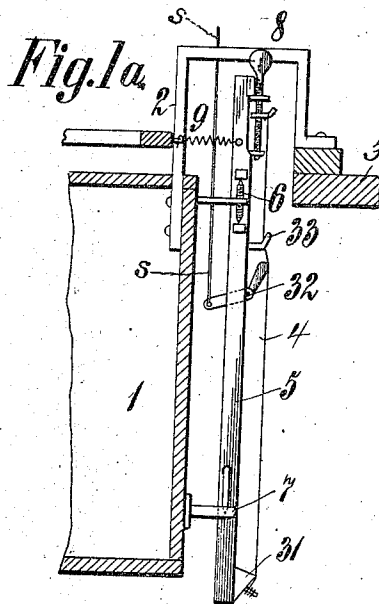
Johann Bajde
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939,786.

J. BAJDE
PIANO VIOLIN.

APPLICATION FILED JAN. 16, 1908.

Patented Nov. 9, 1909.
5 SHEETS—SHEET 2.



Witnesses

Jesse K. Lutton

P. Kommer

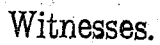
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PIANO VIOLIN.

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939.786.

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PIANO VIOLIN.
APPLICATION FILED JAN. 16, 1908.

Patented Nov. 9, 1909.
5 SHEETS—SHEET 4.

Fig. 3.

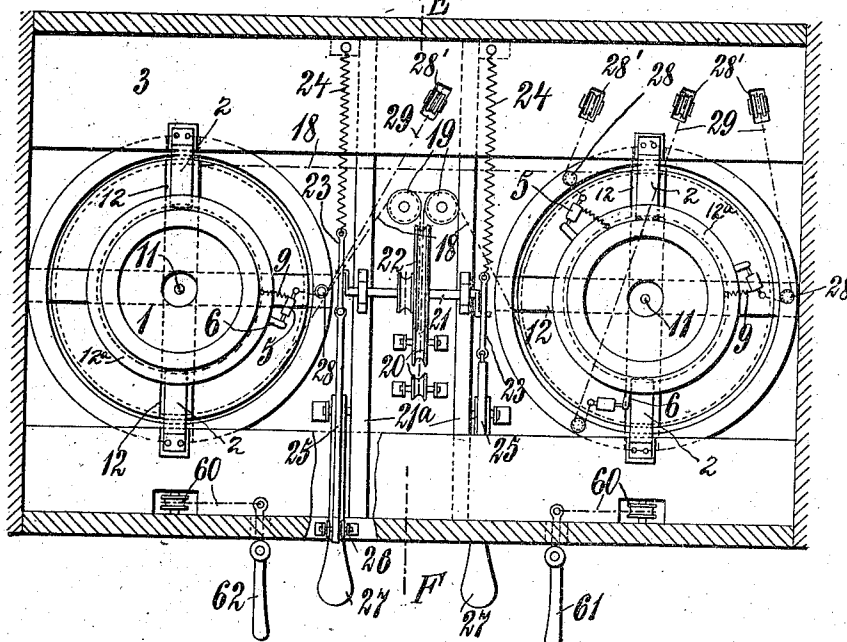
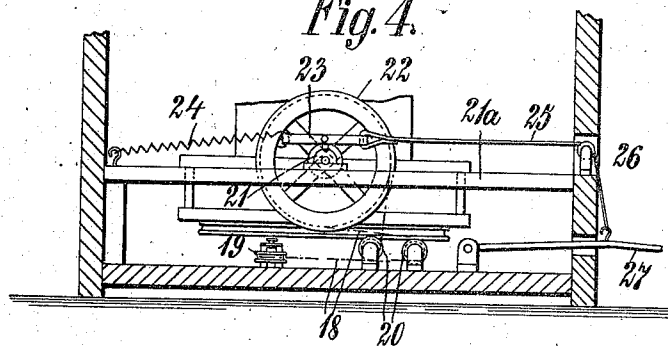


Fig. 4.



Witnesses.

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939,786.

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APPLICATION FILED JAN. 16, 1908.

Patented Nov. 9, 1909.
5 SHEETS—SHEET 5.

Fig. 5.

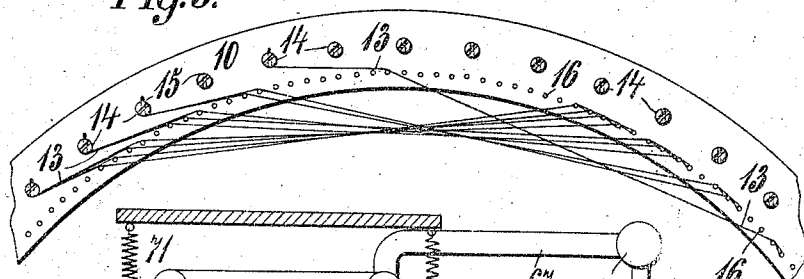


Fig. 7.

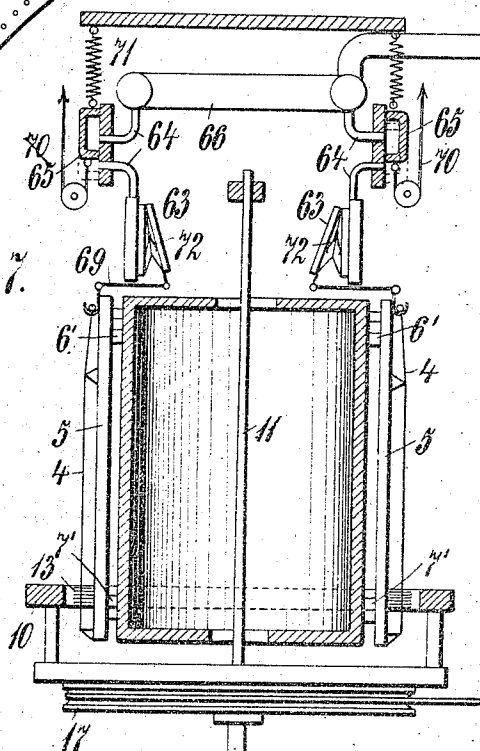


Fig. 5^c.

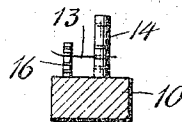


Fig. 6a.



Fig. 5^b.

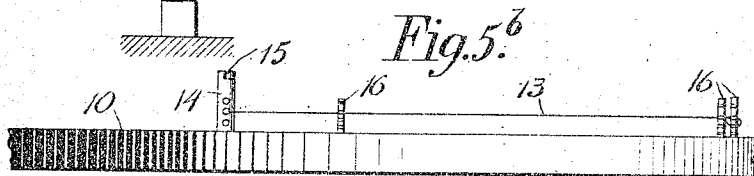
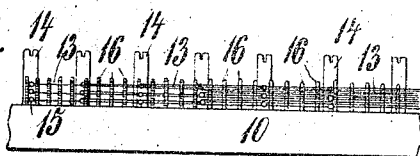


Fig. 6.



Witnesses.

Jesse H. Sutton.
O. Rommels

Inventor.

Johann Bajde
by *[Signature]*
Att.

UNITED STATES PATENT OFFICE.

JOHANN BAJDE, OF NEAR LAIBACH, AUSTRIA-HUNGARY, ASSIGNOR TO THE FIRM OF
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PIANO-VIOLIN.

939,786.

Specification of Letters Patent.

Patented Nov. 9, 1909.

Application filed January 16, 1908. Serial No. 411,131.

To all whom it may concern:

Be it known that I, JOHANN BAJDE, a subject of the Austro-Hungarian Emperor, residing at No. 62. Unterzischka, near Laibach, Austria-Hungary, have invented certain new and useful Improvements in Piano-Violins; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, and to letters or figures of reference marked thereon, which form a part of this specification.

My invention relates to improvements in piano violins and has for its object to provide means for setting the strings in vibration as with a violin bow and includes a ring-shaped violin bow set in rotation by a suitable mechanism, means for supporting the strings within the bow and key operated devices to present the strings to the bow, said devices being of mechanical pneumatic or electrical construction together with other details hereinafter described.

The instrument comprises a group of strings I for the higher notes distributed in two similar sets arranged in a circle about two drums 1, the arrangement and structure of both of which are identical, one set being for the highest or violin notes and the other set being for the next lower tones of the viola. There is a second group of strings II for the lower tones of the cello and base and a third group of strings III operated in a manner of a piano for the lowest notes.

For the higher tones the group of strings I is divided preferably into two sets one for violin strings, and the other for the viola strings, each set being identical I will describe but one of them.

Referring to the drawings in which like parts are similarly designated, Figure 1 is a vertical transverse section of the instrument on line 1—1, Fig. 2. Figs. 1^a, 1^b, 1^c are detail views of Fig. 1. Fig. 2 is a section on the line A—B of Fig. 1. Fig. 3 is a section on the line C—D of Figs. 1 and 2, showing the lower part of the instrument in plan view. Fig. 4 is a section on the line E—F, of Fig. 3. Fig. 5 is a plan and Fig. 6 an elevation of a portion of the ring-bow. Figs. 5^a and 6^a are detail views of Fig. 5. Fig. 5^b is a side view of Fig. 5^a. Fig. 5^c is a

cross section of the box showing a screw and pin in elevation. Fig. 7 is a modification, showing pneumatic operating devices.

I am aware that mechanically operated string instruments provided with bows have been used, but the difficulty arising in these structures has been that the bow when setting in vibration a particular string or strings at the same time had to glide over the remaining or other, silent strings, the result being that there was an extraordinary amount of friction and wear consuming considerable power. I have constructed a bow operating in relation to the strings in which only that power is consumed requisite for setting the particular string or strings to be sounded in vibration in addition of course to a small amount of friction of the moving parts.

One feature of my invention consists in providing a ring bow comprising hairs or strands of hair of equal length each hair or strand separately strung whereby the hairs or strands are maintained displaced relatively to one another but to a very small extent, so that as a whole they inclose a polygon approaching as closely as possible to a circle. In such a bow the hairs at one point overlap a cross hair and if a hair breaks the bow maintains a circular form.

My invention also comprises means for mounting the strings, said strings being moved into contact with the bow independently of one another by suitable mechanism and further comprises the provision of a single sounding board or sounding box for the lower tones, one group of strings being on one side thereof and the other group being on the other side thereof.

The sounding board or box 1 is preferably cylindrical and is suspended by means of brackets 2 supported on horizontal fixed rails 3 one of the latter being at the front and the other at the back of the instrument and secured to and forming part of the case. Each string 4 is mounted on a bar or support 5, supported on the sounding board 1 by means of pivots 6 near its top and 7 near its bottom so that the support can be swung outward. Each string is held toward the sounding box by means of a spring 9, see Figs. 1 and 3.

The vibration of the strings is set up by a ring bow 10, said ring bow being supported from cross arms 12 secured to the vertical

shaft 11 passing centrally through the sounding box 1. The lower end of this shaft has bearing in a suitable step 11^a while the upper end of this shaft has bearings in cross arms 12^a mounted on the brackets 2. In order to prevent the hairs of the bow from crossing one another at the angles of the many sided polygon forming this substantially circular bow, I prefer to stretch each hair separately and in parallel planes separated from one another at least by the thickness of a hair so that each hair will be free to vibrate as well as the strings. I thereby produce a bow having a very wide vertical contact face well adapted for producing a clear full tone. The formation of this bow will be more clearly seen from Figs. 5 to 6^a. Each hair 13 passes through a hole 15 in the tension screw 14, each screw, preferably but not necessarily, containing three superposed holes, thence to a pin 16 provided with shallow grooves 16^a or threads adjacent the inner edge of the bow frame 10, thence to a second pin 16; this hair or one knotted to it is then passed over the next pin and again over the first two back to the same hole 15 in the screw 14 so that the hairs or parts of hairs will lie in substantially parallel planes over one another. In a similar manner, other hairs are laid around pins 16 and stretched in parallel planes forming chords of a circle in the manner shown in Fig. 5, and form a circular bow of somewhat less diameter than the ring 10. Since all the hairs of this bow are arranged in parallel planes combining to form a circular bow and the hairs are in superposed vertical planes uniformly distributed, the necessary width of bow is obtained to give a full clear tone. In Fig. 5^a is shown the arrangement of a single hair.

The two ring bows 10 are simultaneously driven from a treadle mechanism in the same direction. For this purpose there is provided beneath the cross arm support 12 of each bow, a grooved wheel 17 in which is an endless cord 18 passing at the rear directly from one wheel 17 to the other thence over grooved guide wheels 19, 20 to a vertical driving wheel 22 and making a complete turn around this wheel. The wheel 22 is mounted on a shaft 21 having suitable bearings supported by rods 21^a. The shaft 21 is provided on its ends with oppositely directed cranks whose crank pins take into rods 23; one end of each rod is connected at the rear to a spring 24 and the other end thereof is connected by belt or cord 25 passing over a pulley 26, to pedal 27. By alternately depressing the pedals the wheel 22 is set in rotation thereby causing the continuous cord 18 to rotate both bows in the same direction.

Each bar 5 carrying a string 4 is connected to a key lever 30 having a key in the bank of keys *t*, by means of a cord 29

passing over rollers 28 and 28' to the rear end of the key lever 30 so that when the key *t* is depressed the rear end of the key lever 30 is raised to pull cord 29, thereby swinging the string support 5 outward against the bow and against the stress of its retracting spring 9.

By increasing or decreasing the pressure on the key *t*, the string can be brought with greater or less pressure against the bow and thereby the intensity of the tone for the piano and forte playing may be varied. The intensity of the tone can also be varied by varying the speed of rotation of the ring bows which can readily be done by increasing or decreasing the speed of pedaling. Each string 4 is secured at its lower end to a pin or other securing device 31 mounted on the lower end of the string support 5, then passes over a lever 32, forming the upper bridge, under a fixed hook 33 to the tension screw 8. The bent tremolo lever 32 is connected to a cord *s* passing over the rollers *r*, *r'* to the rear end of the lever *h*. This lever is provided with a pin *h'* passing through its appertaining key lever 30 and ending in knob *h'*. The pin *h'* passes freely through the key *t* and is not actuated when the key *t* is depressed, but when a tremolo effect is to be produced the knob *h'* is rapidly depressed and released whereby the lever *h* is vibrated producing a vibratory pull on cord *s* and vibrating lever 32 whereby that portion of the string 4 lying between its lower support 31 and the hook 33 is rapidly bent outward and released giving a tremolo tone when the bow is drawn over it. It is of course unnecessary to state that suitable means may be provided whereby the tremolo levers *h* may be locked to their respective key levers 30 so that an entire movement may be played in tremolo if desired from the keys *t*.

The lower tones cello and base, are arranged in group II at the rear of the sounding board 35 and at the rear in the upper part of the instrument. Since these heavier strings cannot be properly set in vibration by a mechanically operated bow, I have provided special means for actuating them. Each string 34 stretched over the sounding board 35 between suitable bridges and in a manner now in vogue in pianos, is provided at its lower end with a tuft of bristles or other suitable material 36; the tufts 36 are all arranged in a line across the instrument and above the line of tufts is a resined roller *b* driven by means of a cord from the main driving device. On the shaft 21 is a small pulley 37 driving a shaft 37' by means of the cord 38 passing over the pulley 37^b. The shaft 37' carries a second roller 37^c which is connected by cord 38' with a pulley 37^a on the roller *b*. In order to set a string in vibration means are provided to bring the

tuft on the string into contact with the roller *b* and the friction between the two will set up vibration in the string.

On the rear end of each lever 30 is a knob or pad 31' which supports a vertical slidable pin 40 passing through holes in plates 40' secured to the fixed rail 39. Above each pin 40 is a stirrup or yoke 42 rotatable about a horizontal pin 41 and in which an adjusting screw 43 is held. On this screw is mounted a carrier piece or block 44 prevented from rotating in any suitable manner. This block carries a loop spring 45 whose upper portion forms an abutment for the tuft 36. As soon as the key lever 31 is depressed, pin 40 is raised to lift the fork 42 and the spring 45 presses the tuft against the roll *b*, and causes the string to be vibrated. By turning the adjusting screw 43 the spring 45 can be moved nearer to or farther from the string so that the tuft will engage the roll at the proper point. The roll *b* is provided at one end with a pulley *n* which is belted by means of the cord 46 to the pulley *o* mounted on the shaft 47. The shaft 47 carries a worm 48 which drives a worm wheel *p*. Secured to the worm wheel *p* is a gear wheel *q* driving a gear wheel *r* provided with a crank *r*². This crank is connected at one end to a connecting rod 100 and the opposite end of said rod is connected to one end of the two armed lever 49 having at its lower end a fork 101 taking over a spool 102 fixed on the shaft 103 of the roll *b*. The rotation of the roll *b* imparts movement to the worm 48 which in turn operates a crank *r*² which through the connecting rod 100, lever 49 and spool 102 moves the roll *b* axially so that during the rotating of the roll *b* it is moved backward and forward longitudinally in order that the tuft may not always engage the same place on the resined surface.

At the front of the instrument is the group III of strings 50 operated by a suitable piano action, the sounding box 35 of which is common to both groups II and III. These strings are actuated by the bank of keys *t*' comprising key levers 51 each of which is provided with an upwardly directed arm 52 under spring pressure on which is pivoted to a hook lever 54 under pressure of the spring 53. In the hook of lever 54 engages the curved and notched upper end of the hammer shank 56 mounted on a rail 55. When a key in bank *t*' is depressed its arm 52 is moved against the stress of its spring causing the hook lever 54 to leave the notch in the end of the hammer shank 56 causing the hammer to operate against its respective string. The dampers 57 pertaining to each string 50 are mounted on spring arms 58 in such a manner that when a key 51 of the bank *t*' is depressed its respective damper is moved from

the strings. All the damper arms 58 are secured to a transverse rail 59 which by means of the cords 60 is connected to the right and left hand knee levers 61 and 62 guided of course over suitable rollers, see Fig. 3, by means of which all the dampers can be removed from the string simultaneously. The levers 61 and 62 for the altering of the strength of tone are readily operated by the knees of the player.

In this instrument where the strings are pressed against ring bows it is sometimes desirable to use pneumatic pressure produced by means of bellows operated by treadle or other suitable mechanical devices. By rapidly actuating the bellows there is necessarily produced an over pressure or by operating the suction bellows if the instrument be provided with suction mechanism, an over pressure of the outer atmosphere in the suction conduits, whereby the strings are pressed with greater force against the bow, independent of the pressure on the keys. The same result can be obtained by maintaining a constant vacuum in a suitable container or a constant pressure by means of pedal operated bellows or of suitable mechanical operated bellows and providing in the main conduit a suitable throttling device which can be adjusted in accordance with the strength of tone.

Referring more particularly to Fig. 7 there is shown mechanism for moving the strings against the bows by means of suitable pneumatic or suction apparatus. The string supports 5 are each connected by suitable rods 69 to the suction bellows 63 arranged above the cylindrical sounding box 1. These bellows are each connected by a pair of pipes 64 through a valve 65, to a pipe 66 common to all of the bellows 63. The pipe 66 is connected by pipe 67 to the main suction conduit 68. Each valve 65 is held normally closed by a spring 71 and is urged against the stress of its spring to connect the pair of pipes 64 by means of the cord 70 passing over a suitable pulley, said cord being connected to the end of that key lever pertaining to the string. When a pull is exerted on cord 70, pipes 64 belonging to a particular bellows are connected by valve 65 and place the bellows 63 in connection with the suction conduit 68 thereby causing the bellows to collapse, operate the rod 69 and move the string support outward to cause the string to press against the bow, the support being hinged by any suitable hinges 6' and 7'. As soon as the key is released the spring 71 moves the valve 65, thereby freeing the lower pipe 64 and permitting the outside air to enter the same whereby the bellows is permitted to expand under the action of its spring 72 to move the string support 5 in an opposite direction away from the bow.

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

1. A ring bow comprising a ring frame, hairs stretched across the same in chords of equal length and at varying angles to one another and means to change the tension of the hairs.
2. A ring bow comprising a ring frame, a plurality of independent supports mounted thereon, hairs stretched across the frame on the supports in chords of equal length and at varying angles to one another, and adjustable tensioning members connecting the hairs in groups.
3. A ring bow comprising a ring frame, grooved pins and tightening screws mounted therein, hairs stretched between the screws and a pair of pins in equal chords, said hairs being spaced apart by the grooves in said pins.
4. In a piano violin, the combination with a ring bow, means to rotate the same and a stationary cylindrical sounding board mounted within the bow, of a plurality of bars pivotally connected with the board, each separately movable parallel to itself, a string stretched on each bar, means to normally hold the strings out of contact with the bow and means to swing the bars on their pivots to bring the strings into contact with the bow.
5. In a piano violin, the combination with a ring bow, means to rotate the same, and a stationary cylindrical sounding board mounted within the bow, of a plurality of bars connected with the board and movable parallel to the axis thereof, string supports mounted on the bars, a string on each bar stretched on the supports, and means to move the bars independently of each other to bring the strings into contact with the bow.
6. In a piano violin, the combination with a ring bow, means to rotate the same, and a stationary cylindrical sounding board mounted within the bow, of a plurality of bars connected with the board and movable parallel to the axis thereof, string supports mounted on the bars, a string on each bar stretched on the supports, a bellows connected with each bar, a main air conduit normally disconnected from the bellows, and means to connect each bellows with the conduit.
7. In a piano violin, the combination with a ring bow, means to rotate the same, and a stationary cylindrical sounding board mounted within the bow, of a plurality of independent bars connected with the board and movable parallel to the axis thereof, strings stretched on the bars, a bellows mounted

above each bar, a rod connecting each bar with a bellows, a conduit common to all the bellows, a pipe leading from each bellows, pipes leading from the conduit, and valves normally closing the conduit pipes adapted to connect the latter with the bellows pipes.

8. A piano violin having in combination keys for operating the violin strings, a series of low tone strings, a brush tuft secured to each of the latter, a sounding board for said low tone strings, a resined roller in proximity to the tufts, means to rotate the roller, means to move the latter axially, means operated by the keys to present the tufts to the roller, a set of piano strings mounted on the opposite side of the sounding board and a piano action in front of the piano strings for operating the latter.

9. A piano violin having in combination keys for operating the violin strings, a series of low tone strings mounted above the keys, a sounding board for said low tone strings, a brush tuft secured to each of the latter, a resined roller in proximity to the tufts, means to rotate the roller, means to move the latter axially, a vertically movable pin supported on each of said keys and a spring interposed between the tuft and pin adapted to be moved by the latter into engagement with the tuft.

10. A piano violin having in combination keys for operating the violin strings, a series of low tone strings mounted above the keys, a sounding board for said low tone strings, a brush tuft secured to each of the latter, a resined roller in proximity to the tufts, means to rotate the roller, means to move the latter axially, a vertically movable pin supported on each of said keys, a spring interposed between the tuft and pin adapted to be moved by the latter into engagement with the tuft, and means to shift the spring to and from the low tone strings.

11. The combination with a ring bow, and means to rotate the same, of a plurality of string supports each having a string stretched thereon, means to move the supports to present the strings to the bow, keys for operating said moving means, a tremolo lever pivoted on each string support, adapted to engage the string, and means independent of the keys for operating said tremolo levers.

In testimony that I claim the foregoing as my invention, I have signed my name in presence of two subscribing witnesses.

JOHANN BAJDE.

Witnesses:

HEINRICH SCHWINGSCHAKL,
EUGEN STELTZER.