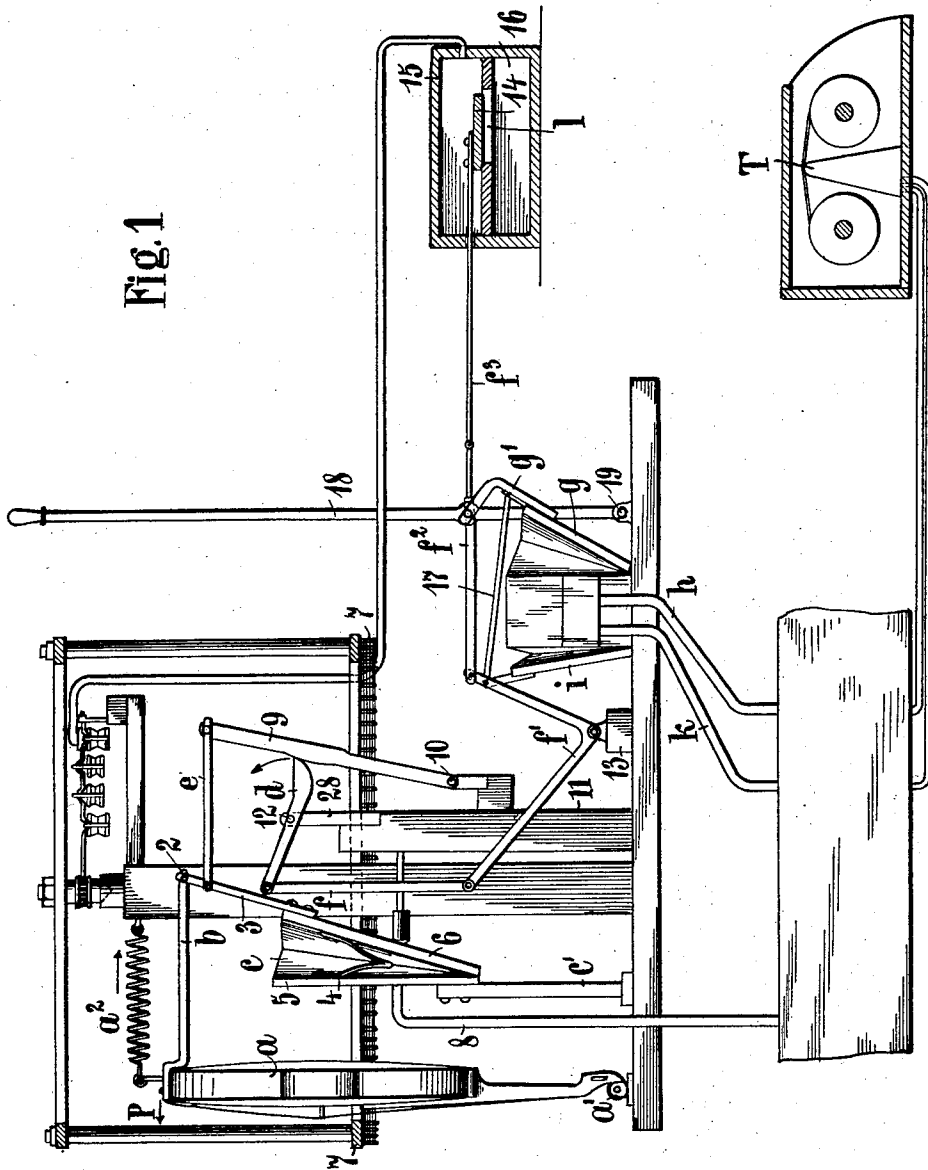


1,025,397.

Fig. 1



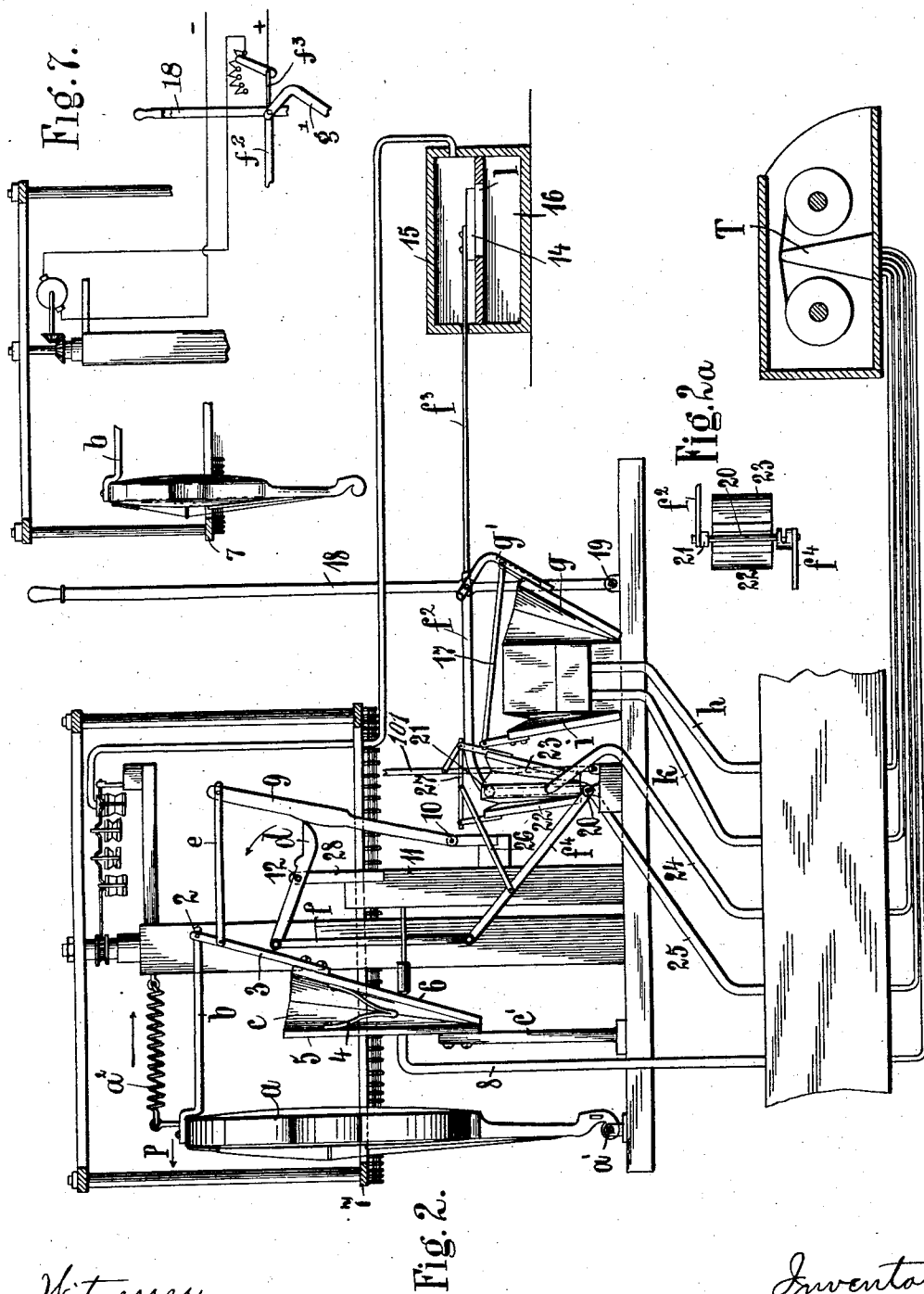
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 EXPRESSION DEVICE FOR MECHANICALLY OPERATED VIOLINS.
 APPLICATION FILED APR. 1, 1911.

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Patented May 7, 1912.
 3 SHEETS—SHEET 2.



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3 SHEETS-SHEET 3.

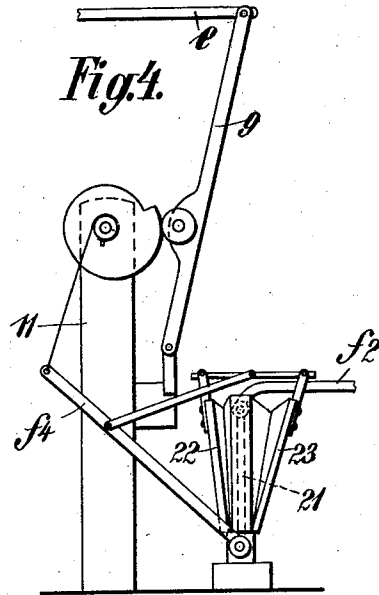
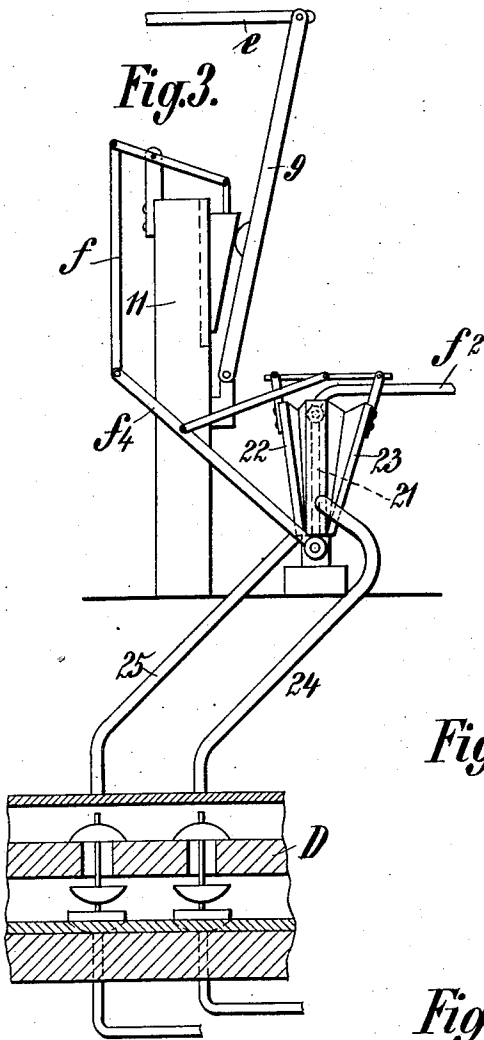


Fig.5.

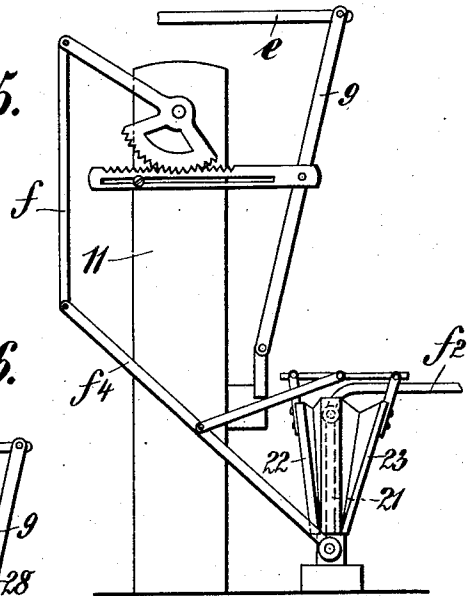
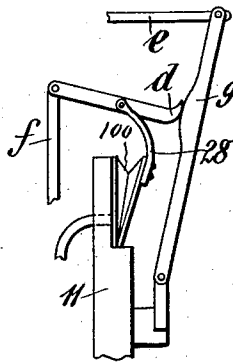


Fig.6.



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UNITED STATES PATENT OFFICE.

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EXPRESSION DEVICE FOR MECHANICALLY-OPERATED VIOLINS.

1,025,397.

Specification of Letters Patent.

Patented May 7, 1912.

Application filed April 1, 1911. Serial No. 618,412.

To all whom it may concern:

Be it known that I, GUSTAV KARL HENNIG, a subject of the King of Saxony, residing at Wahren, near Leipzig, Germany, have invented certain new and useful Improvements in Expression Devices for Mechanically-Operated 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 expression devices for mechanically operated violins and especially to that class of such instruments wherein bowed musical instruments are automatically operated pneumatically, and their tone modulated.

The invention consists in the provision of means to modulate the tone by varying the pressure between bow and strings, the speed of the bow and in addition thereto providing staccato mechanism or mechanisms for suddenly increasing the tone and operable at any intensity of tone, together with details of construction hereinafter more specifically described and claimed.

Referring to the drawings in which like parts are similarly designated, Figure 1 is an elevation partly in section of one form of my invention showing the tone modulating mechanism. Fig. 2 is a like view of the same mechanism including staccato mechanism. Fig. 2^a is a bottom view of the lower end of the double bellows 22—23. Figs. 3—6 show modifications of the means for varying the swing of lever 9. Fig. 7 illustrates diagrammatically electric mechanism for operating the bow.

Referring to Fig. 1 *a* represents a bowed string instrument, of which the violin is a type. The violin *a* as herein shown is held in an inverted position, the head being pivoted at the bottom at *a'* and is connected at the upper end or its tail to a link *b*, pivoted at 2 to a lever 3 connected to the pneumatic *c*. This pneumatic is of the ordinary type having an internal expanding spring 4. The primary pneumatic *c* is mounted on a supporting block *c'*, whereby only the stationary member 5 is supported on said mount leaving the movable member 6 free to move

the violin *c* to and from the moving ring bow 7, that is, into and out of operative position. This bellows is connected by pipe or tube 8 to the tracker bar *T* as shown. When the bellows *c*, as with all pneumatics of this type is operated from the tracker-bar or otherwise pneumatically it executes a complete movement, that is swings the violin against the pressure of the spring *a*² the whole extent of its movement either to the left or right into and out of playing position. Now it is advantageous for proper musical effect to move the violin *c* against the bow 7 either strongly or lightly for forte and pianissimo effects and to vary the pressure to give any desired modulation of tone between these two.

To this end I provide means for varying the extent of movement of the main pneumatic *c* as follows: The movement of the movable member 6 of the actuating pneumatic *c* is limited and this may be done by means of a cam *d* acting directly on the movable member but preferably as shown, by connecting the rod 3 by means of link *e* to a lever 9 pivoted at 10 on a supporting block 11 or otherwise and limiting the swing of lever 9 by a cam *d* pivoted at 12 on the support or block 11. The tail of the cam is connected by a link *f* to one arm of a bell crank lever *f'*, mounted in a block or other support 13. The other arm of this bell crank lever *f'* is connected by a link *f*² to the arm *g'* of the movable member of a double pneumatic comprising a springless pneumatic *g* connected by conduit *h* to the tracker bar *T*. The lever *g'* is connected to a rod *f*³ of a throttle valve 14 controlling the air admitted from the reservoir conduit 15 through an opening or port *l* to the motor conduit 16. The second springless pneumatic *i* is also connected by a conduit *k* to the tracker-bar *T*. The object of this pneumatic *i* is to move the pneumatic *g* into distended position by means of link 17. These two pneumatics *i* and *g* operate oppositely and simultaneously. The position of the parts shown in Fig. 1 is for pianissimo playing. The throttle valve 14 is nearly closed so that the motor for the bow has its lowest speed and the pneumatic *c* is under very low tension so that the string of the violin just touches the bow. Now should the pneumatic *i* be vented to the atmosphere and simultaneously the pneumatic

g be placed under tension, the cam d will be turned and valve 14 opened to move the violin in the direction of arrow P. The increased pressure of the string on the bow and increased speed of the bow increases the tone.

The pressure of the string on the bow and the speed of the bow can be controlled within the widest limits with great exactness. The mechanism can also be actuated either by means of a hand lever or by both a hand lever and automatically.

If it is desired to control the expression by hand only, the lever g' is disconnected from f^2 and f^3 and the lever 18, pivoted at 19 is used alone. If it is desired to use both automatic and hand controlled expression then the parts are connected as shown. Instead of using a cam d as shown I may use a wedge, Fig. 3, or snail, Fig. 4. If the bow is driven by an electric motor, the throttle valve 14 is replaced by a variable resistance in the motor circuit so that the current supply to the motor may be varied to vary its speed or otherwise, the main object being to control the speed of a motor of any kind that drives the bow.

In Fig. 2 I have shown a modification for sudden alterations in tone by means of which a soft tone can be suddenly increased for a short or a momentary period as in staccato playing without disturbing the adjustment of the pneumatic mechanism illustrated in Fig. 1. This simply consists in making the bell crank lever shown in Fig. 1 in two movable levers whose angularity to one another is changed by suitable pneumatic mechanism that is to say the right hand member is maintained in its adjusted position by the mechanism of Fig. 1 while the left hand member is movable by pneumatic mechanism. To this end the left hand member of the bell crank lever f' Fig. 1, is made a lever f^4 , in Fig. 2, pivoted at 20 and the right hand member of said bell crank lever f' Fig. 1, is made the medium member 21 of a double springless pneumatic 22, 23, similar to the pneumatic i , g . The two movable portions 22 and 23 are connected by a link 27 and this link is connected by a link 26 to the pivoted lever f^4 . The conduits 24 and 25 controlling the operation of the two pneumatics 22 and 23 lead to the tracker bar T. Thus it will be seen that the lever f^4 and double bellows member 21 act as a bell crank lever and may be adjusted as a unit by g , i , about the pivot 20 but when a sudden increase in tone is desired 25 is vented and 24 placed under tension thus extending 22 and collapsing 23. To this end the two conduits 24 and 25 are preferably controlled by reversing valves D that are controlled from the tracker-bar T. See Fig. 3. The cam d is suddenly moved in the direction of the arrow and

the instrument is moved against the bow. This occurs without disturbing the adjustment effected by g , i , so that as soon as the staccato action produced by 22, 23, is made the pianissimo effect is immediately resumed unless g i or 18 have, in the meantime, been moved.

The double bellows 22, 23, may be actuated by a lever 101 similar to lever 18 said lever being connected to 27 or otherwise. The same result can be attained by making the support 28 for the cam d pivoted and operating or swinging the cam by means of either a tracker-bar-controlled pneumatic 100, Fig. 6, or a lever mechanism f , f^4 , or both.

I claim:

1. A mechanically played musical instrument comprising a driven bow, a movable stringed instrument, a pneumatic and connections between the pneumatic and stringed instrument to move said instrument to and from the bow, in combination with auxiliary means to control the pressure of the string against the bow and thereby control the intensity of tone.

2. A mechanically played musical instrument comprising a driven bow, a movable stringed instrument, and a pneumatic connected to the stringed instrument to move it to and from the bow, in combination with auxiliary pneumatic means to control the movement of the instrument and thereby the pressure of the string against the bow to control the intensity of tone.

3. A mechanically played musical instrument comprising a driven bow, a movable stringed instrument and a pneumatic connected to the stringed instrument to move it to and from the bow, in combination with both hand-operated and pneumatically operated mechanism to vary the pressure of the string against the bow.

4. A mechanically played musical instrument comprising, a bow, a motor and its connections for operating the bow, a movable stringed instrument, a pneumatic connected to said stringed instrument, in combination with auxiliary means to simultaneously control the movement of the stringed instrument and thereby the pressure of the string against the bow and the speed of the motor, and thereby control the intensity of tone.

5. A mechanically played musical instrument comprising, a bow, a motor and its connections for operating the bow, a movable stringed instrument, a pneumatic connected to and to move said stringed instrument with relation to the bow and both hand and automatic means to simultaneously control the movement of the instrument and thereby the pressure of the string against the bow and the speed of the motor.

6. A mechanically played musical instru-

ment, comprising a driven bow, a movable stringed instrument, a tracker bar, a pneumatic controlled by the bar and connected to the stringed instrument to move it with relation to the bow; in combination with an auxiliary, tracker-bar-controlled, pneumatic-actuated mechanism to control the movement of the instrument and thereby the pressure of its string against the bow.

7. A mechanically played musical instrument comprising a bow, an air motor and connections to drive the bow, a movable stringed instrument, a tracker bar, a pneumatic controlled by the bar and connected to and to move the instrument with relation to the bow, an auxiliary pneumatically operated mechanism to control the pressure of the string against the bow and to simultaneously throttle the air to the motor.

8. A musical instrument comprising, a bow, an air motor and connections for driving the bow, a movable violin, a pneumatic to move the violin with relation to the bow, in combination with a pivoted lever connected to the pneumatic, a cam acting on the lever, a throttle valve controlling air to the motor, a pneumatic operatively connected to the cam and valve, to simultaneously move the violin string and valve, and thereby press the violin against the bow and throttle the air passage to the motor.

9. A mechanically played musical instrument, comprising a driven bow, a movable stringed instrument, a pneumatic connected to and to move the stringed instrument to and from the bow, auxiliary mechanism to move the instrument toward the bow, and additional means to temporarily vary the pressure of the string of the instrument against the bow without disturbing the position of the auxiliary mechanism.

10. A mechanically played musical instrument, comprising a driven bow, a movable stringed instrument, a pneumatic connected to and to move the stringed instrument to and from the bow, auxiliary pneumatic mechanism to vary the pressure of the string against the bow, and additional pneumatic mechanism to temporarily vary the pressure of the string against the bow without disturbing the position of the auxiliary mechanism.

11. A mechanically played musical instrument comprising a driven bow, a movable stringed instrument, a tracker-bar-controlled pneumatic connected to and for moving the stringed instrument to and from the bow, auxiliary mechanism to vary the pressure of the string on the bow including hand-operated means and pneumatic tracker-bar-controlled means, and additional devices to temporarily vary the pressure of the string without disturbing the hand or pneumatic adjusting means.

12. A mechanically played musical instru-

ment, comprising a driven bow, a movable stringed instrument, a tracker bar controlled pneumatic connected to and to move the stringed instrument to and from the bow, pianissimo mechanism to control the movement of the stringed instrument including mechanism movable with and also separately operable without affecting the pianissimo mechanism to suddenly alter the pressure of the string against the bow.

13. A mechanically played musical instrument comprising a motor, a bow driven thereby, a movable violin, a tracker bar controlled pneumatic connected to the violin to move it to and from the bow, a separate tracker bar controlled pneumatically operated mechanism to adjust the instrument to and from the bow and simultaneously control motive medium to the bow motor, and tracker-bar-controlled pneumatic means movable with and also independently operable from the said mechanism, to vary the pressure of the string against the bow.

14. A mechanically played musical instrument, comprising an air motor, a bow driven thereby, a movable violin, a pneumatic connected with and to move the violin into and out of normal playing position, a pivoted lever connected to the pneumatic, a cam to act on the lever, a bell crank lever comprising a pivoted arm, and a second pivoted tracker-bar-controlled pneumatic, said arm connected to said cam, a link between the arm and second pneumatic; a third tracker bar controlled pneumatic, connected with the last pneumatic, and a throttle valve also connected to the last mentioned pneumatic to throttle the air to the motor to decrease the speed of the bow.

15. A mechanically played musical instrument comprising an air motor, a bow driven thereby, a movable violin, a pneumatic and connections to move the violin into and out of normal playing position, a pivoted lever connected with the pneumatic, a cam to act on the lever, a bell crank lever the arms thereof being independently pivoted, one arm being connected with the cam and the other arm comprising a second tracker-bar-controlled pneumatic, and a link between the arms, a third tracker-bar-controlled pneumatic, a link connecting the last two pneumatics and a throttle valve also connected to the last mentioned pneumatic to throttle the air to the motor to decrease the speed of the bow, and a hand lever to actuate the second pneumatic and a second hand lever to actuate the third pneumatic and their connected parts.

16. A mechanically played musical instrument comprising a tracker bar, a driven bow, a stringed instrument a tracker-bar-controlled pneumatic connected to and to move said stringed instrument, in combination with mechanisms, both simultaneously and inde-

- pendently hand- and tracker-bar-controlled, to control the pressure of the strings of the instrument against the bow and auxiliary mechanism connected with the aforesaid mechanism and moved thereby including both simultaneously and independently hand operated and tracker bar controlled devices to vary the control of the first mentioned mechanism.
- 10 17. A mechanically played musical instrument comprising a tracker bar, a bow, a motor driving the same, a stringed instrument, a tracker-bar-controlled pneumatic and connections between it and said stringed instrument, in combination with mechanism controlled simultaneously and independently by hand and by the tracker bar to vary the pressure of the strings of the instrument against the bow including means to control the speed of the bow and means both hand and tracker-bar controlled to suddenly alter the operation of the aforesaid mechanism.
- 15 18. A mechanically played musical instrument comprising a bow, means to drive the bow, a stringed instrument and means to move the stringed instrument into and out of normal playing position with relation to the bow, in combination with hand-operated mechanism to vary the pressure produced by said means.
- 20 21. A mechanically played musical instrument comprising a bow, means to drive the bow, a stringed instrument and means to move the stringed instrument into and out of normal playing position, in combination with tracker bar mechanism to suddenly alter the pressure of said means.
- 25 22. A mechanically played musical instrument comprising a bow, means to drive the bow, a stringed instrument and means to move the stringed instrument into and out of normal playing position with relation to the bow, in combination with hand-operated mechanism to vary the pressure produced by said means.
- 30

19. A mechanically played musical instrument comprising a bow, means to drive the bow, a stringed instrument and means to move the stringed instrument into and out of normal playing position with relation to the bow, in combination with tracker-bar-controlled mechanism to vary the pressure produced by said means.

20. A mechanically played musical instrument comprising a bow, means to drive the bow, a stringed instrument and means to move the stringed instrument into and out of normal playing position, in combination with hand operated mechanism, to suddenly alter the pressure of said means.

21. A mechanically played musical instrument comprising a bow, means to drive the bow, a stringed instrument and means to move the stringed instrument into and out of normal playing position, in combination with tracker bar mechanism to suddenly alter the pressure of said means.

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

GUSTAV KARL HENNIG.

Witnesses:

EMILE GEUDTNER,
ALBERT R. MORAWETZ,
RUDOLPH FRICKE.

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."