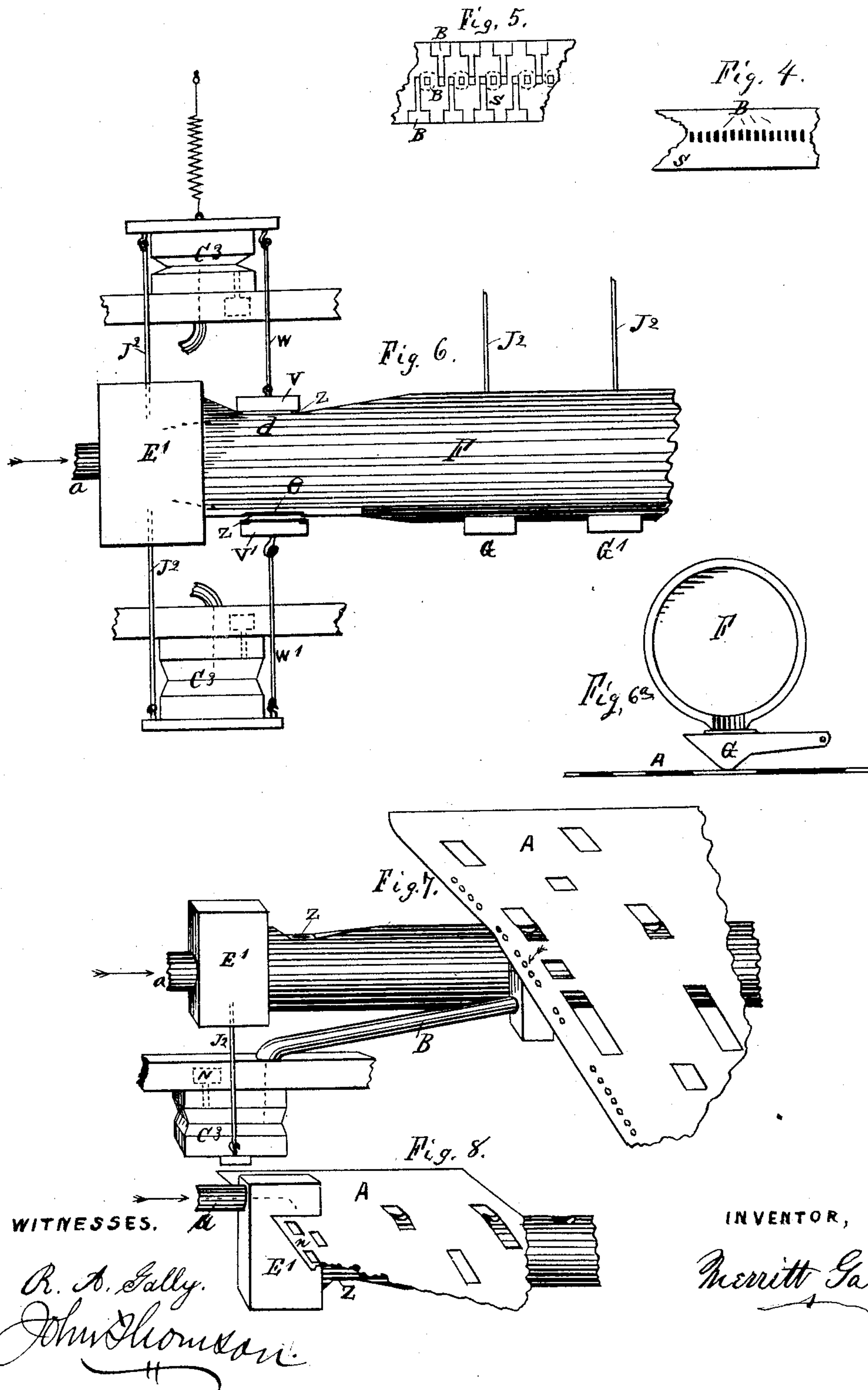


M. GALLY.
Mechanical Musical Instrument.

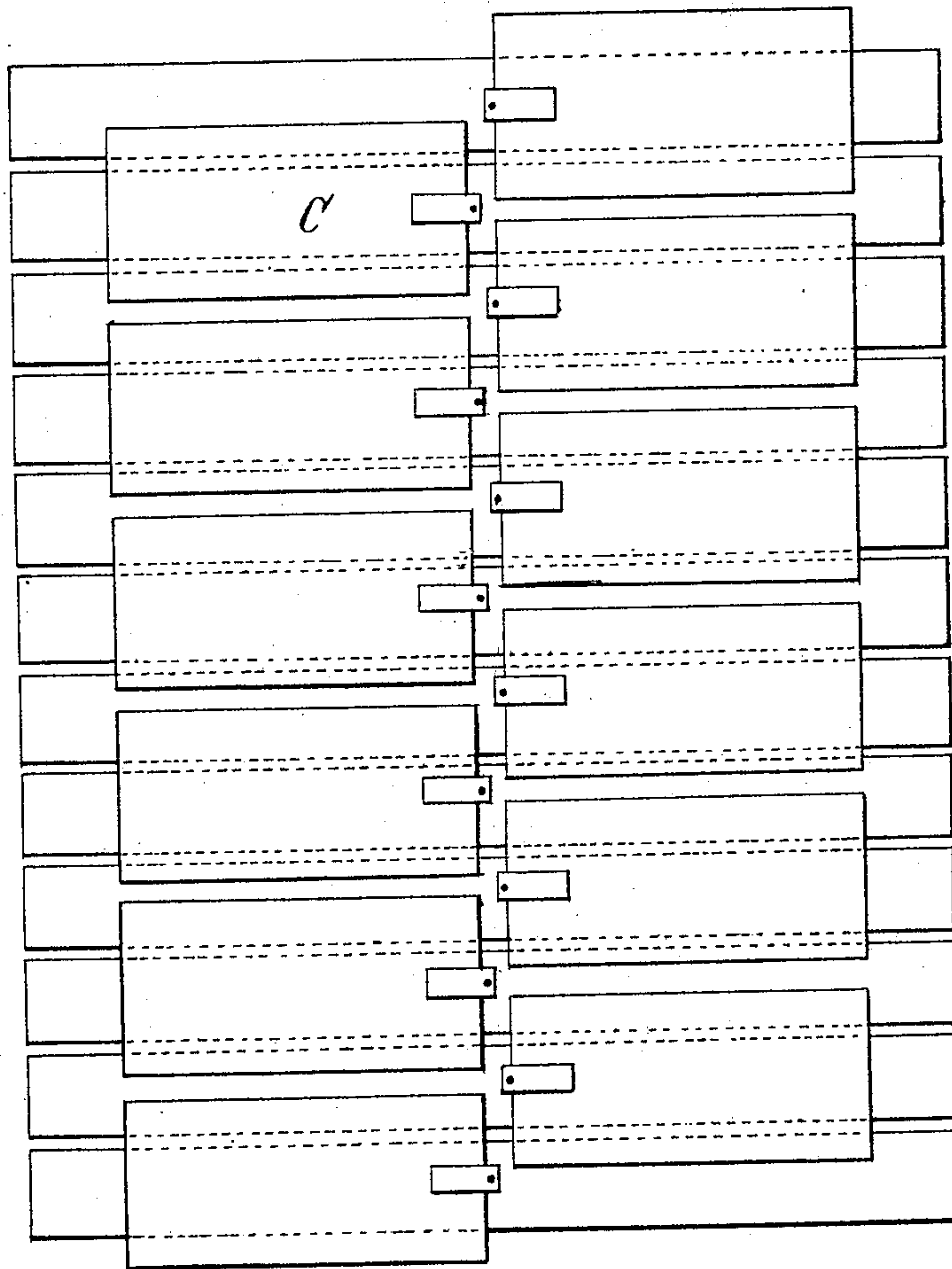
No. 220,369.

Patented Oct. 7, 1879.



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Fig. 1a



Witnesses:-
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UNITED STATES PATENT OFFICE.

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IMPROVEMENT IN MECHANICAL MUSICAL INSTRUMENTS.

Specification forming part of Letters Patent No. **220,369**, dated October 7, 1879; application filed April 24, 1879.

To all whom it may concern:

Be it known that I, MERRITT GALLY, of the city, county, and State of New York, have invented certain new and useful Improvements in Mechanical Musical Instruments, or attachments for performing upon musical instruments; and I do hereby declare that the following is a full and exact description thereof, reference being had to the accompanying drawings, and to the letters of reference marked thereon.

My invention relates to that class of musical instruments, or attachments for performing upon musical instruments, which are operated by means of a perforated music-sheet.

In the figures of the drawings, Figure 1 is a side elevation, partially sectional, of the principal features of the invention. Fig. 1^a is a plan showing the arrangement of the pneumatic keys in two lines, alternating in their connection with the valves of the instrument. Fig. 2 is a front view of an organ-pipe with operating pneumatic keys. Fig. 3 is a cross-section of the tracker-range and music-sheet over the vent-ducts. Fig. 4 is a face view of a section of the tracker-range. Fig. 5 is a plan of the arrangement of ducts of the tracker-range. Fig. 6 is a front view of organ-pipe with keys for finger-stops and mouth-valves. Fig. 6^a is a modification showing the finger-stops, &c., operated by means of lever-keys. Fig. 7 is a perspective of a modified arrangement of music-sheet and pipe, showing the sheet operating directly in connection with the finger-stops of the pipe, with a pneumatic key for operating the mouth-valve. Fig. 8 is a modification showing both the finger-stops and air-duct at mouth of pipe operated by direct connection with the music-sheet without intervening keys.

The first part of my invention consists in a very simple construction of a pneumatic key-action and the devices for operating the valves of reeds or pipes, or for producing the stroke upon strings, bells, or other sounding devices.

In Fig. 1 the music-sheet A is represented as passing directly over the vent-duct of the pneumatic key C. The duct for the operating current of air is shown at N, which current may be either an exhaust or a pressure current, whichever may be most desirable, re-

quiring only a slight difference of arrangement in the position of the key. As shown in the drawings, Fig. 1, it is arranged for exhaust. This duct may lead directly to the common air-chamber of the instrument, or to a separate air-chamber and bellows or pump, as desired.

As shown in the figure, the upper surface of the key C is attached to a support, and the base is allowed freedom of movement, and when the orifice of duct B is opened by a perforation in the music-sheet the base of the key drops of its own gravity. The base of the key is connected with the valve E by the cord or connecting-rod J.

The valve E requires no spring to hold it to its seat. When an unperforated portion of the music-sheet closes the orifice at B, the key is forcibly drawn up by the exhaust through duct N, and the valve E is held firmly closed to its seat. When a perforation in the music-sheet reaches the orifice at B, the key C immediately fills with air and valve E drops. When a hammer for striking a bell or string is attached to or operated by means of connection J, it has the advantage of its own gravity for the stroke, which may be aided by additional weight or spring, if necessary.

To arrange the key for pressure-current it is only necessary to place the key upon the upper surface of its support, and, by inflating the key, raise its upper part, to which the connection J would be attached.

It is desirable to make the range of pneumatic keys as short as possible, at least not to exceed in space occupied that necessarily required by the reeds when reeds are used as the sounding devices. In order, therefore, to be able to make the pneumatic keys wide enough to be sufficiently powerful and of convenient shape, I place them in two or more lines, as shown in Fig. 1, and in the plan, Fig. 1^a, Sheet 3, of the drawings, and alternate them so that they may be brought into relative positions with the valves of the reeds not exceeding their length of range.

A pneumatic key similar to C is shown, at C², connected with one of the valves of the finger-stops of a flute, organ-pipe, or the like.

In operating organ-pipes by means of a perforated music-sheet, it is customary to use a distinct pipe for each note, thus requiring a

large number of pipes for the range of notes. Any musical pipe may be operated for different notes in similar manner to a flute by openings in proper position along the side of the pipe, like the finger-stops and keys of the flute. Instead, therefore, of using a number of pipes to represent the several notes of the scale, I have conceived the idea of using a single pipe for a number of notes, and operating the same by means of a perforated or other music-sheet, as the fingers operate the stops and keys of a flute or other finger-keyed pipe-instrument of similar character.

To accomplish my object I adopt several methods, preferring that, however, shown in Figs. 2 and 6. Simple modifications are shown in Figs. 7 and 8; but both require a much wider music-sheet than the method of Figs. 2 and 6. The simplest form of construction is shown in modification, Fig. 8. A musical pipe is provided with openings at proper intervals along the line of the face to produce the different notes of the scale. A music-sheet perforated to correspond with the openings in the pipe is passed over these stops, and if the pipe is sounded only at such times as the perforations reach the stops the tune is produced.

It will be seen that the pipe must be allowed to sound only at such times as a perforation or perforations are in connection with the openings; and to secure the proper result I use the edge of the sheet with suitable corresponding perforations to open at proper times the air-duct which admits the air for sounding the pipe. As many notes in the music may follow each other in close order, a single line of perforations for opening the air-duct *a* into the pipe would cut the sheet away so much as to make it very weak and render it useless. I therefore use two lines of perforations, as shown, for this purpose. These alternate in position, so that the sheet is left strong and still a continuous current of air admitted of any desirable duration. The perforations *n* do not represent any particular note of the scale, but are used in addition to and with each and all of the perforations which represent the notes.

In Fig. 7 a modification is shown in which the perforations for producing the entry of air to the pipe from the air-chest *E'* are used in connection with a pneumatic action, *C*³, which operates an ordinary entry-valve in the chamber. The pneumatic duct or vent under the music-sheets at the arrow being out of the line of the note-openings in the pipe, it will be seen that the note-openings of the sheet are a corresponding distance out of line with the pneumatic perforations.

The preferable method of operating the note-openings of the pipe is shown in Fig. 2, although any of the described modifications may be used, according to the required cheapness or expense of the instrument.

In Fig. 2 all the openings of the pipe are operated by means of pneumatic keys, as in Fig. 1. The tracker-range *S*, over which the

music-sheet is drawn, is provided with orifices representing the notes of the scale, and also for the pneumatic, which operates the valve at *E'*. Two of the note-keys are shown in the figure, the note-stop *G* being open and *G'* being closed. The note valves or keys *G G'* produce a much better effect than when the music-sheet passes directly over the openings.

With a sufficient number of pneumatic keys it will be seen that a tune may be performed upon a single pipe, or one pipe may be used for the lower and another for the higher notes of the range. An entire organ, representing a large number of different kinds of instruments, may therefore be constructed with very few pipes.

One set of pneumatic keys may operate the note-valves of a number of pipes representing a number of different instruments—*e. g.*, the flute, flageolet, hautboy, &c.; or the pneumatic tubes from the orifices at *B* may each or any one of them have a number of branches, to operate, by means of one perforation in the sheet, a number of pneumatic keys in unison for the different instruments represented in the combination. I also produce changes in the character of the music by providing the pipe with more than one speaking device representing different kinds of instruments, as flute and clarionet, or clarionet and hautboy, or other combinations, as shown in Fig. 6.

The pipe is shown as having two speaking devices of different characters provided with shutters, so that they may be used alternately at will.

A greater number of speakers may be attached to one pipe, if desired. The shutters are represented at *V* and *V'*, one being open and the other closed. If either one of the speakers has no external opening, it requires no shutter, but is stopped off by means of its entry-valve only in *E'*. Each shutter is operated in unison with its entry-valve by a single pneumatic key, as shown.

Two or more speakers of proper construction may sometimes be operated in a single tube at the same time, blending their effects, producing a third effect, differing from either one when sounded alone.

The note-stops may be operated in any of the methods already described.

Fig. 6^a represents another modified arrangement of music-sheet and note-stops, the sheet operating directly upon note-keys of a single pipe.

One of the advantages arising from the use of a single or a very few pipes for producing an extended range of notes is in the fact that there is much less waste of air in passing from one note to another, and very much less air required for producing the music.

There are no bellows or pumps shown in connection with the main air-chamber in the drawings, as it will be readily seen that any of the ordinary forms of these devices may be used.

In case the instrument is small and requires

only such quantity of air as can be supplied by the lungs of the performers, it can be operated by the breath; but if the instrument is made to require more air than the lungs can supply, bellows or pumps must be used.

Figs. 3, 4, and 5 represent an improved tracker-range. As the ducts B of my pneumatic action are very small and the music-sheet very narrow, it is difficult to lead the ducts in a single plane to the several pneumatic keys, even with a diverging tracker-board. I therefore lead certain of the ducts to either side of the direct line of the tracker-range, thus securing sufficient space for easy attachment of tracker-tubes, as shown. These tubes may be of any suitable material. I, however, prefer to use rubber or other elastic tubing for two distinct reasons: first, the elasticity of the rubber causes the tube to make its own air-tight connection with the body of the tracker-range and pneumatic, and, second, the elastic tubes are easily detached at either end and changed to other portions of the instrument at will.

The next part of my invention consists in an improved construction of the tremolo. A small pneumatic key, I, is provided with a valve, P, to which is attached a weighted vibrator, H. When an exhaust-current of air is used to operate the pneumatic, the spring *b* is arranged to distend the chamber of the pneumatic. A spring of lighter tension is used to hold the valve closed when the pneumatic is in its normal position. The vibrating portion of the pneumatic is connected by a reciprocating attachment to a vibrating shutter, M, which is placed at the opening of the ordinary reed-shutter L or the swell; or the connection may be made directly with the swell or reed-shutter, to cause either of them to have a movement, as the case may be; or the pneumatic key, as constructed, may connect with any vibrating tremulant.

The object of the construction shown is to open and close to a greater and less degree, alternately, in rapid succession, the opening of the reed-shutter or swell, thus causing a pleasing tremolo. The superior quality of the motor as described is, that it can be started or stopped instantly by simply cutting off or letting on the current of air through Q. Thus even a very short note or a part of a note may be given with tremolo effect without affecting the remainder of the passage in the music.

The action of this tremolo is as follows: When the exhaust is allowed to operate through the tube Q, the pneumatic key is instantly closed against its spring. The ball H, moving with the vibrating portion of the key, acquires a momentum and does not stop with the key, but, moving on by its momentum, opens the valve P, and, the chamber of the key being filled from the external atmosphere, returns the follower to its normal position, when the exhaust begins again to compress the key.

A pressure-current may be used by reversing the action of the springs and valve. The

tremulant may be set to move more rapidly or slowly by changing the position of the ball up or down on the rod.

I use one of the pneumatic keys of the range B to open and close the duct Q of the tremulant, so as to secure its action in such portion of the music as require it.

The tones of some pipes, such as the flute and the like, can be changed from a lower to a higher octave by changing the tension of the air which produces the sound, which is also facilitated by diminishing the size of the entry-duct. In my patent of April 8, 1879, I explain the mechanical changing of air-tension or use of different tensions of air to produce different effects, such as loud and soft, on musical devices; and I here make the application to instruments to produce differences in pitch, as raising a flute from one octave to another, &c. In such cases I not only use the different air-tensions, but also similar devices to those of Fig. 6, for changing the air-entry ducts.

What I claim as my invention is—

1. In a mechanical musical instrument or, a mechanism for performing upon musical instruments, the combination, with a perforated music-sheet and a pneumatic key operated thereby, of a valve for opening and closing the air-passage to or from a sounding pipe or reed, which valve is held to its seat while closed by the power of the pneumatic key.

2. The combination, with the air-passage to or from a sounding pipe or reed, of a valve for opening and closing the same which drops from its seat by gravity, and is raised to its seat by means of a pneumatic key, consisting of an air-chamber and a follower adapted to be operated by means of air pressure or exhaust within the chamber, the outside of the follower being exposed to the external atmosphere.

3. In a pneumatic key-action, pneumatic keys arranged in two or more lines, alternately connecting with the valves or striking devices of the instrument.

4. The combination, with a perforated music-sheet, of a wind musical pipe having openings or keys for producing different notes of a scale.

5. The combination, with a perforated music-sheet and pneumatic keys operated thereby, of a wind musical pipe having openings or keys for producing different notes of a scale.

6. The combination, with a wind musical pipe having openings or keys for producing different notes of a scale, of a perforated music-sheet having perforations representing notes of music to be produced by such pipe, and also perforations for causing air to enter the mouth of the pipe for sounding the notes.

7. The combination, with a wind musical pipe having openings or keys for producing different notes of a scale, of a perforated music-sheet arranged to operate directly or indirectly upon said openings or keys.

8. A tracker-range for a perforated music-sheet, having a number of its ducts turned to either side of the main line of openings, to fa-

cilitate the continuation of the ducts or attachment of tubes.

9. The combination, with the tracker-range for a perforated music-sheet, of elastic or flexible leader-tubes, to facilitate the connection of the tracker-range with any part of the instrument, or to avoid abrupt turnings in their direction.

10. A pneumatic-tremulant motor consisting of a flexible chamber with a reacting spring and a valve operated by momentum.

11. A wind musical pipe with two or more distinct speaking devices for producing sounds of different quality or pitch, each complete and operative in itself, substantially as specified.

12. A wind musical pipe having openings or keys for producing different notes of a scale, in combination with two or more speaking devices, which speaking devices may be used alternately on the same notes of the scale in imitation of different kinds of instruments.

13. In a wind musical pipe, the combination, with two or more speaking devices, of pneumatic keys and shutters for stopping off either one of the speakers while the other is being used.

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Witnesses:

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