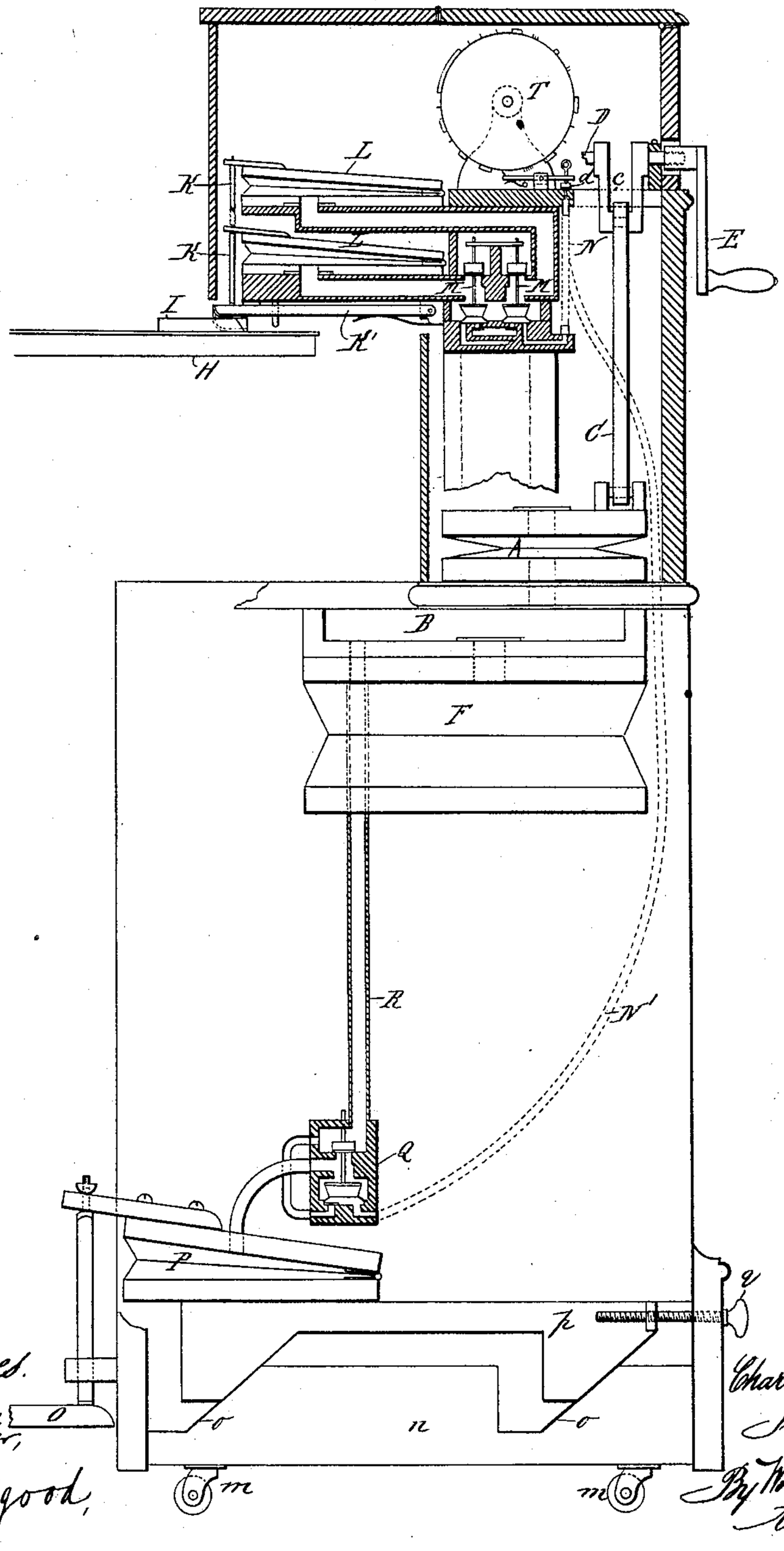
(No Model.) 2 Sheets—Sheet 1.

C. A. KUSTER.

MECHANICAL MUSICAL INSTRUMENT.

No. 361,300. Patented Apr. 19, 1887.

FIG. 1.



Witnesses.
John Butler,
L. H. Osgood,

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Inventor:
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Attorneys.

(No Model.) 2 Sheets—Sheet 2.

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MECHANICAL MUSICAL INSTRUMENT.

No. 361,300. Patented Apr. 19, 1887.

FIG. 2.

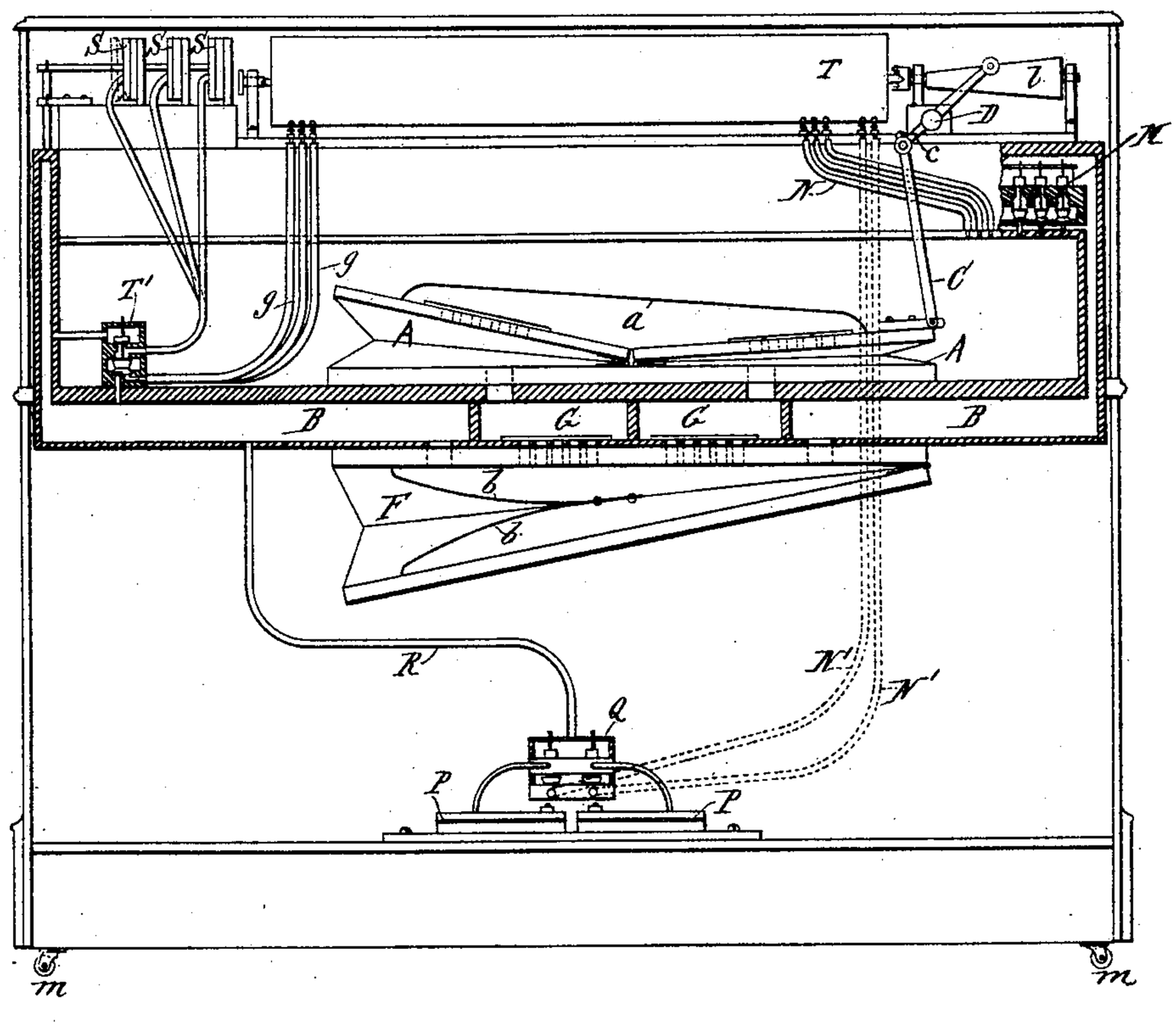


FIG. 3.

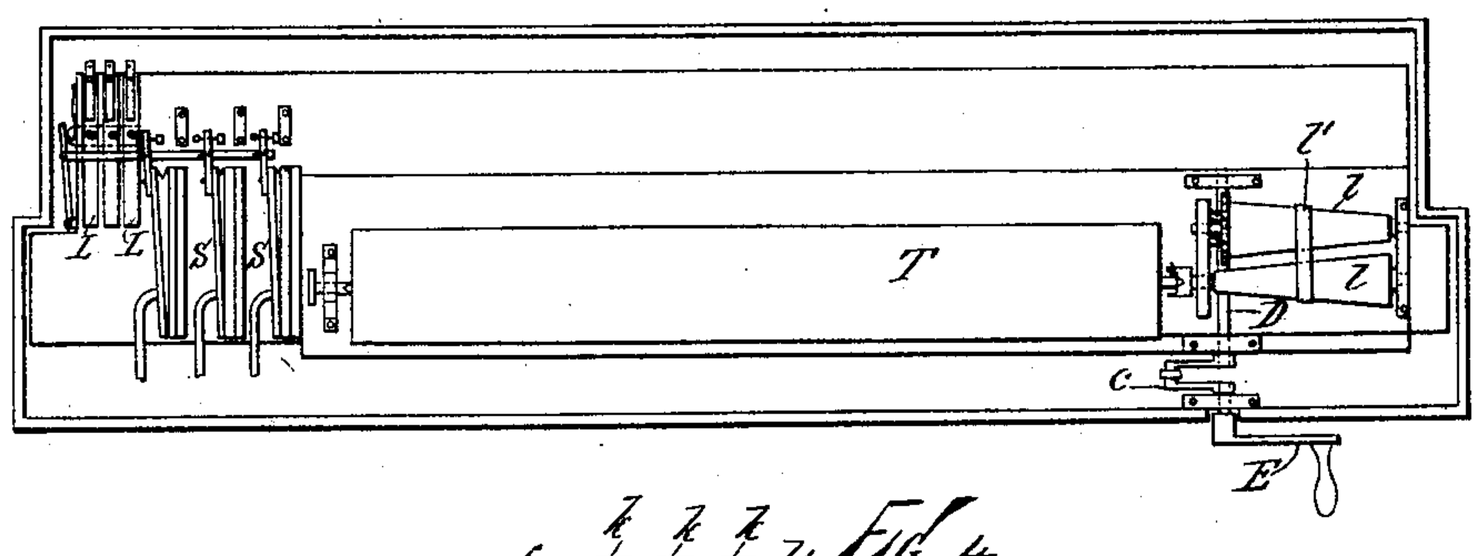
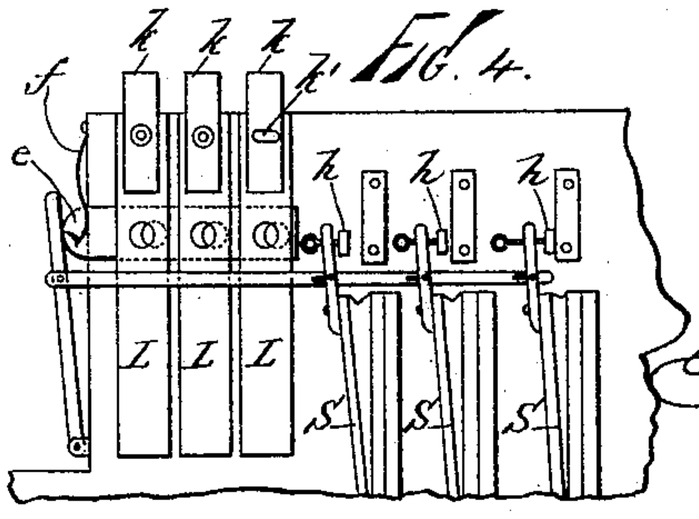


FIG. 4.



Witnesses:
John Buckler,
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Charles A. Kuster,
Inventor:
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UNITED STATES PATENT OFFICE.

CHARLES A. KUSTER, OF BROOKLYN, NEW YORK, ASSIGNOR, BY MESNE ASSIGNMENTS, TO THE PIANOPHONE COMPANY.

MECHANICAL MUSICAL INSTRUMENT.

SPECIFICATION forming part of Letters Patent No. 361,300, dated April 19, 1887.

Application filed June 9, 1886. Serial No. 204,571. (No model.)

To all whom it may concern:

Be it known that I, CHARLES A. KUSTER, of Brooklyn, county of Kings, and State of New York, have invented certain new and useful Improvements in Mechanical Musical Instruments, of which the following is a full, clear and exact description, reference being had to the accompanying drawings, and to the letters of reference marked thereon.

My invention has relation to that class of mechanical devices employed for striking the keys of an ordinary piano or organ or other such musical instrument having keys arranged in the usual way and primarily intended to be touched by the fingers of the player, and also for pressing the pedals or moving other accessories of the instrument through the medium of air-currents, which are governed or regulated in their flow by mechanical appliances.

The objects of my invention are to simplify and improve the construction and arrangement of various parts of the instrument, so as to insure the requisite duration, rapidity, and intensity of the stroke or touch; to perfectly regulate the tone or pitch; to simplify the means employed for regulating the height of the instrument, so as to make it easily and quickly adjustable in position to operate upon any piano or other instrument; to operate the valves by a roller or drum having pins or projections thereon, and to operate the pump and roller or drum by the same mechanical appliance. To accomplish these objects my improvements involve certain new and useful arrangements or combinations of parts, peculiarities of construction, and principles of operation, as will be herein first fully described, and then pointed out in the claims.

In the accompanying drawings, forming part of this specification, Figure 1 is a cross-section and partial elevation of an instrument constructed and arranged for operation in accordance with my invention and embodying my improvements. Fig. 2 is a longitudinal section and partial elevation of the same upon a scale about half that of Fig. 1. Fig. 3 is a top or plan view, the cover being removed. Fig. 4 is a plan view on a scale enlarged beyond that of previous figures, showing the means for operating the improved slide which governs the exit of air from the pneumatics and regulates the intensity of the stroke.

In all the figures like letters of reference, wherever they occur, indicate corresponding parts.

The main bellows or pump is represented at A A, being of the class known as "double-acting"—that is, it has two movable lids, which are connected one with the other by any suitable means, as by brace *a*, in such manner that when one lid is up the other will be down, causing a continuous and uniform exhaustion of air when the pump is moved. The pump is located above the main air trunk or chamber B B, and is operated by an arm, C, connected with crank *c* of shaft D, which shaft also operates the toothed barrel, as will be explained hereinafter.

E is a crank or handle applied to shaft D, and this stands in place of any form of motor which may be used for the purpose of driving the shaft.

F is a reservoir in the form of a bellows, the same being supplied with a spring, as *b b*, for keeping the reservoir normally distended. Upon exhaustion of air from the reservoir it closes more or less against the action of the spring, according to the degree of exhaustion. The reservoir thus made operates to regulate the exhaustion throughout all parts of the instrument with which it is connected. The pump communicates with the reservoir through channels G G, separated from B B.

H represents one of the white keys of a piano or organ, and I one of the black keys. These keys are struck or depressed by strikers K K, operating upon hinged bars or levers, as K', there being a striker for each key. The strikers are moved by small bellows, one for each, as at L L, these being usually called "pneumatics." The movable tops of these are connected with their respective strikers and depressed as soon as air is exhausted from them. In connection with each of these pneumatics there is a valve arrangement, (represented at M M,) governing ports leading from the reservoir to the pneumatics. These valves are unseated when air is admitted to their under sides through small tubes, as N N.

Each of the tubes N N is supplied with a valve, as *d*, the latter being arranged to be opened when the arm connected therewith is depressed by one of the pins or stops upon the barrel or roller. The pump and barrel being

moved, air will be exhausted from any pneumatic when the corresponding pin on the barrel raises valve *d*, and thus the proper key will be struck and the desired note sounded.

O represents one of the pedals of the piano or organ. This is depressed by a pneumatic, as P, when air is exhausted therefrom. A valve arrangement, as Q, is located in a conduit, R, leading from chamber B down to P. The valve is unseated as soon as air is admitted through tube N′, the upper mouth of which is supplied with a valve operated by pins on the barrel or cylinder. A pneumatic is supplied for each pedal, and thus the tone is regulated automatically by the cylinder.

The intensity of the stroke upon the keys or the touch depends upon the rapidity with which air may be exhausted from the pneumatics L L. To govern the degree of rapidity of exhaustion, I employ perforated slides, as *e*, Fig. 4, extending through the pneumatics L L, (one for each set of pheumatics corresponding with the black keys and white keys,) and these slides cover the openings leading from the pneumatics, the perforations in the slides corresponding or registering with the openings leading out of the pneumatics when the slides are moved to a proper position. When the slides are moved in the direction of their lengths, the air-openings are contracted, as will be readily understood.

The slides are moved against the action of suitable springs, as *f*, by any one of three bellows or pneumatics. (Represented at S S S.) These are connected with valve arrangements, as at T′, Fig. 2, to which tubes *g* lead from the position of the barrel or cylinder.

Pins upon the barrel or cylinder open valves at the mouths of tubes *g*, and the pneumatics S are automatically operated the same as the other pneumatics. The pneumatics S are supplied with adjustable stops or regulators, as *h h h*, set so that one bellows may move a certain distance, another another distance, and so on. The extent of movement of the slide *e* (and thus the intensity of stroke) depends upon which of the pneumatics S is operated, and this is controlled by the position of the pins or stops upon the cylinder. Thus by moving the cylinder and pump together the volume or tone, intensity of touch, and all the expressions are produced the same as by employing the fingers.

The perforated slides of the pneumatics can be employed in machines wherein the ordinary perforated paper is used to operate the valves. The arms *k*, which connect the strikers K with the tops of pneumatics L, are slotted, as at *k′*, Fig. 4, so that they may be adjusted laterally, in order to bring the strikers to proper place over the keys of the piano or organ. Provision for this adjustment enables me to make the improved device applicable in connection with various styles of pianos or organs the keys upon which vary in width in different styles.

T is the barrel or cylinder, provided with pins or stops to open the valves at the mouths of the air-tubes. Pins may be set for one or more tunes, as may be desired. The barrel T is turned by shaft D, through the medium of cone-pulleys, as *l l*, one of said pulleys having a gear meshing into a worm upon shaft D, the two pulleys being connected by a belt, as *l′*, and the axis of the barrel being secured to one pulley, substantially as indicated in Fig. 3. By moving the belt along the rapidity of motion communicated to the barrel may be regulated at pleasure.

To raise or lower the improved instrument, so that it may be adjusted to any piano or organ, I mount the casters *m m* in a vertically-adjustable block or strip, as *n*, (one on each side.) This block has inclined faces, as at *o o*. The instrument rests upon horizontally adjustable strips, as *p*, also having inclined faces to correspond with those at *o o*. The strips *p* are moved by bolts, as *q*, which extend out to the front of the instrument, where they are within convenient reach. By turning bolts *q* the instrument will be raised or lowered, as will be readily understood.

The improved device, when constructed and arranged for operation substantially as above set forth, is simple in all its parts, not liable to get out of order, and well calculated to answer the purposes or objects of the invention as previously stated.

Having now fully described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. In a mechanical musical instrument, the combination, with the pneumatics for operating the strikers, of the slides arranged to govern the flow of air from the pneumatics, substantially as shown and described.

2. In combination with the perforated slides, the pneumatics or bellows for operating the same, said pneumatics being provided with adjustable stops, substantially as shown and described.

3. The combination, with the strikers, of the slotted adjustable arms mounted upon the pneumatics, substantially as and for the purposes set forth.

4. In a mechanical musical instrument, the combination, with the revolving barrel or cylinder, of the cone-pulleys, the shifting belt, and the worm-shaft and gear, substantially as shown and described.

5. In a mechanical musical instrument provided with strikers arranged to operate the keys of a piano or organ, the sliding strips having inclined faces, the vertically-adjustable strip carrying the casters, and the adjusting-bolt, combined and arranged substantially as and for the purposes set forth.

In testimony that I claim the foregoing I have hereunto set my hand in the presence of two witnesses.

CHARLES A. KUSTER.

Witnesses;
JOHN BUCKLER,
WORTH OSGOOD.