

(No Model.)

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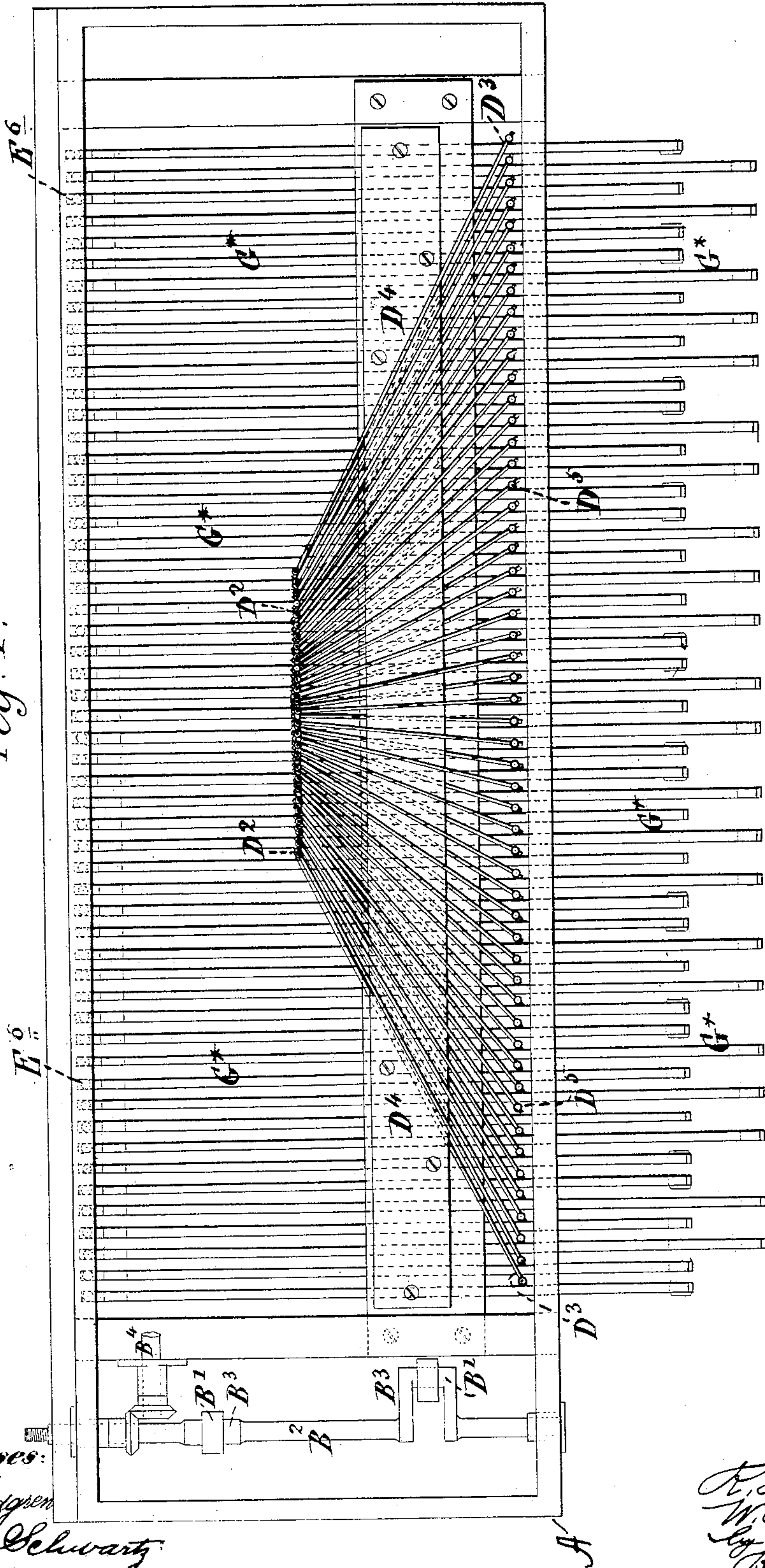
R. H. BISHOP & W. DOWN.

KEY BOARD ATTACHMENT FOR MUSICAL INSTRUMENTS.

No. 311,947.

Patented Feb. 10, 1885.

Fig. 1.



Witnesses:

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(No Model.)

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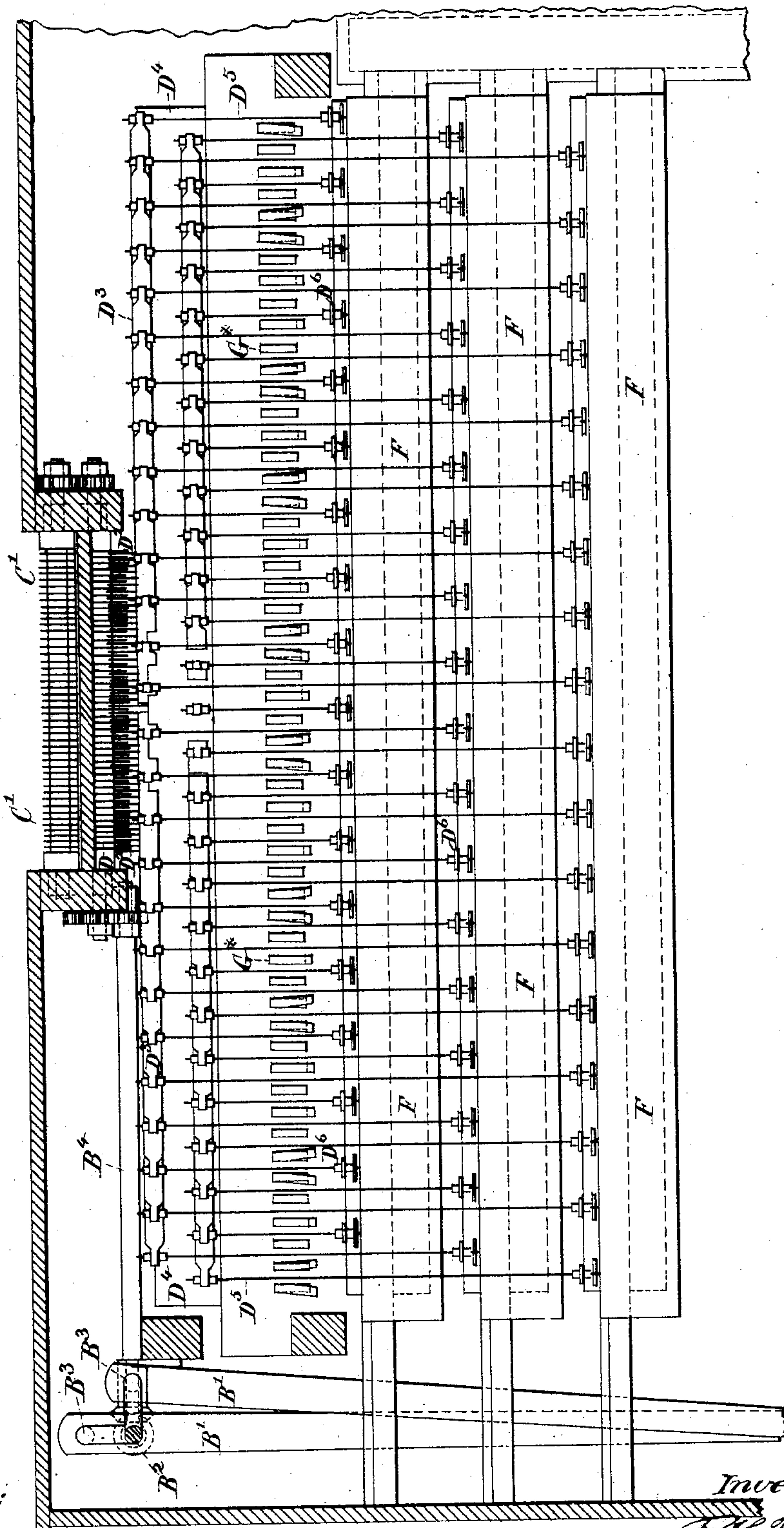
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Fig. 2



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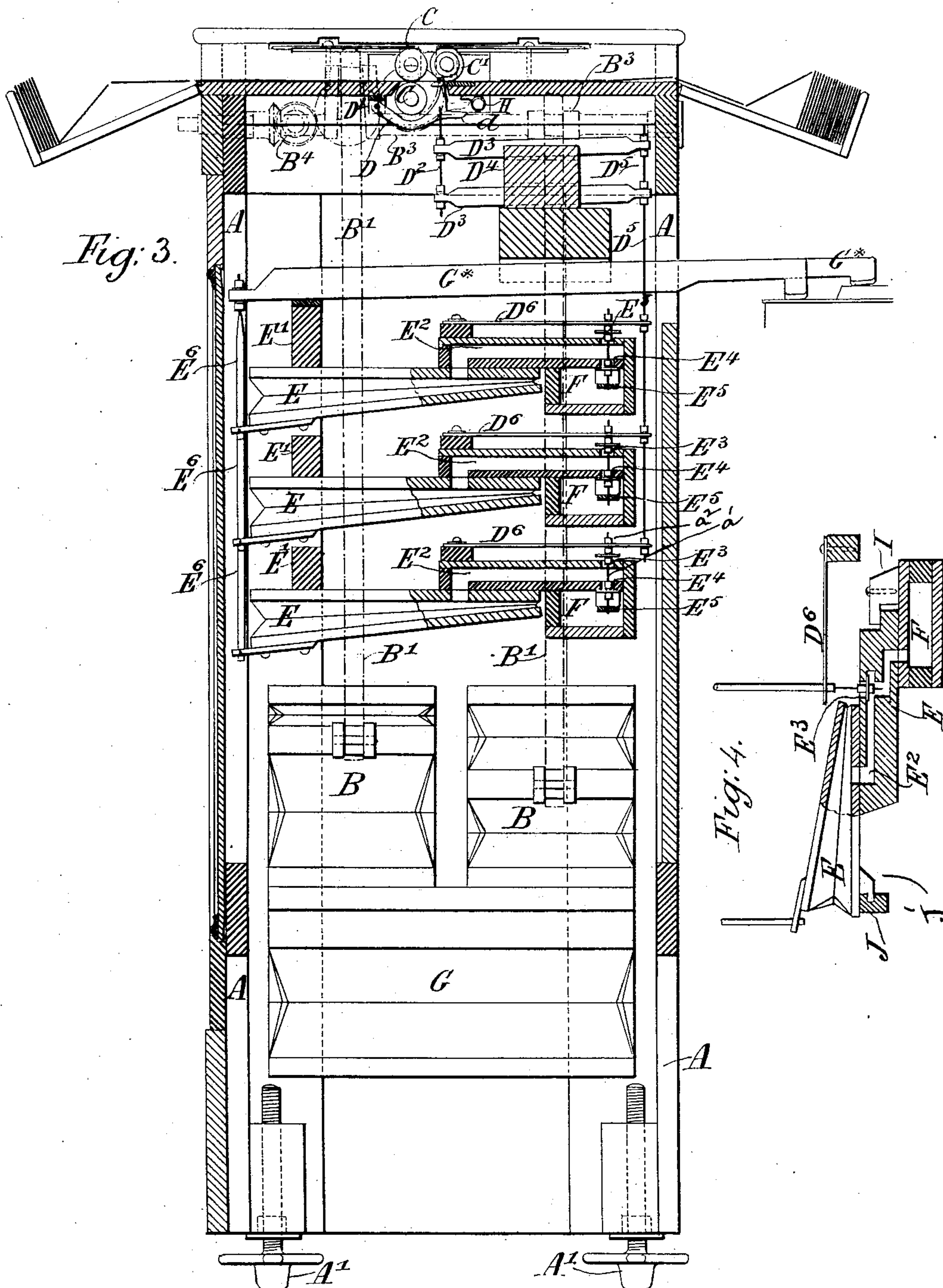
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4 Sheets—Sheet 4.

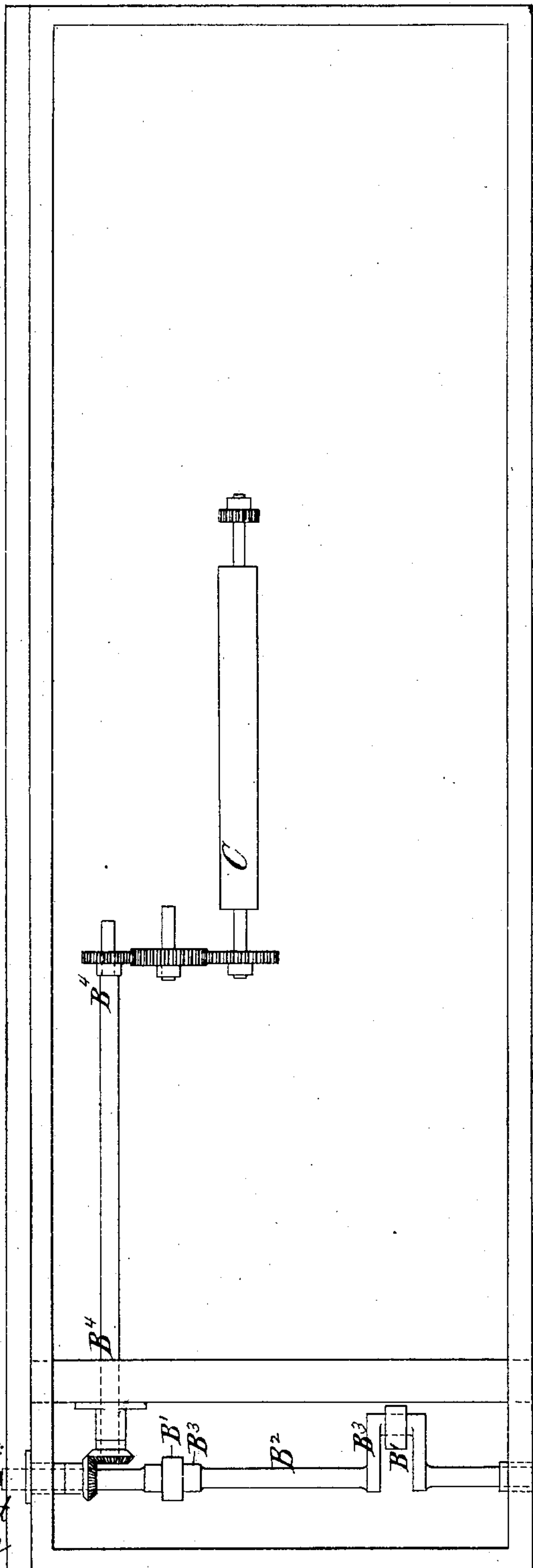
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Patented Feb. 10, 1885.

Fig. 5.



Witnesses:

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Fig. 6.



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UNITED STATES PATENT OFFICE.

ROBERT H. BISHOP, OF ISLINGTON, AND WILLIAM DOWN, OF VICARS ROAD, COUNTY OF MIDDLESEX, ENGLAND.

KEY-BOARD ATTACHMENT FOR MUSICAL INSTRUMENTS.

SPECIFICATION forming part of Letters Patent No. 311,947, dated February 10, 1885.

Application filed July 17, 1884. (No model.) Patented in England November 5, 1883, No. 5,248; in France May 2, 1884, No. 161,858; in Belgium May 7, 1884, No. 65,086, and in Germany May 10, 1884, No. 30,100.

To all whom it may concern:

Be it known that we, ROBERT HODGES BISHOP, of College Street, Islington, in the county of Middlesex, and WILLIAM DOWN, of Vicars Road, in the same county, England, have invented certain new and useful Improvements in Apparatus for the Mechanical Playing of Key-Board Instruments, such as Pianos and Organs, of which the following is a specification.

This invention has already been patented to us in Great Britain by Letters Patent No. 5,248, dated November 5, 1883; in Belgium by Brevet d'Invention No. 65,086, dated May 7, 1884; in France by Brevet d'Invention No. 161,858, dated May 2, 1884, and in Germany by Letters Patent No. 30,100, dated May 10, 1884.

This invention relates to apparatus for mechanically playing on pianos or other key-board instruments the moving parts of which are worked by pneumatic power; and the invention consists in a novel arrangement and construction of such parts, whereby the manufacture of the apparatus is greatly simplified. In apparatus of this kind a pair of bellows worked by cranks or eccentrics on a shaft driven by hand is employed to compress the air or produce a vacuum or partial vacuum in a wind trunk or chest or series of wind trunks or chests with which pneumatic levers to work the hammers or strikers are connected, the air being admitted to or drawn from the pneumatic levers through valves actuated by the rising and falling of levers caused by the forward motion of a sheet of stiff paper or card pierced with suitable holes to represent the notes of the music to be played, and against the under side of which paper or card these levers bear.

In carrying out our invention we employ similar parts and a similar description of music, and we prefer to work the apparatus by producing a vacuum.

In the accompanying drawings, Figure 1 is a plan view of an apparatus constructed according to our invention with the top and the music-forwarding rollers removed. Fig. 2 is a partial elevation, partly in section, of the back of the apparatus. Fig. 3 is a sectional

elevation of the same. Fig. 4 is a sectional view, hereinafter described, of a pneumatic lever to be operated by compressed air. Fig. 5 is a plan of the lower feed-roller and the shafts and gearing for operating it; and Fig. 6 is a detail sectional view, hereinafter described.

The same letters of reference refer to corresponding parts in all the figures.

A is the framing of the apparatus, which we mount on screw-feet A', Fig. 3, by means of which the height of the apparatus may be regulated, so that the hammers or strikers may be readily adjusted to the key-board of any instrument it is desired to play upon.

Bare the bellows, which are placed breadthwise of the apparatus, and are connected by the rods or bars B' to cranks B³ on an axle, B², placed across the apparatus from front to back, and carried in bearings in the upper part thereof, and actuated by a cranked handle, as usual in this class of apparatus.

C C are two rubber-clothed adjustable forwarding or feed rollers, which are placed breadthwise of or parallel with the length of the apparatus, and are carried in suitable adjustable bearings. These rollers are geared together, and are driven by gearing from the shaft B⁴, as shown in Fig. 5. The shaft B⁴ is actuated by the cranked axle B² through bevel-gearing, as clearly shown in Figs. 2, 3, and 5, and the rollers are intended to grip and forward the music-card.

C' is an adjustably-mounted grooved metal roller, in the grooves of which the music-levers enter as they pass through the holes in the music-card. The number of grooves on this roller will of course correspond with the number of the music-levers, and the roller rotates by friction of contact, or it may be driven from the forwarding-rollers. The parts of the apparatus thus far described are of the usual form, although the position of some is different.

D are the note or music levers, which are arranged transversely to the rollers C C, and are provided with the usual horns or projections to enter the holes in the music-card, and are pivoted at their rear ends in any convenient manner to a rod carried by the framing,

a notched bar, D', being employed to space them. These note-levers lie parallel to one another in the direction of the traverse of the music, and they are connected by pendent rods D² with intermediate levers or trackers, D³, as seen at Fig. 3. Each of these rods D² passes through one end of a lever or tracker, D³, and is threaded at its lower end to receive two nuts of leather or other suitable material, between which the lever D³ is held, so that by adjusting the nuts the amount of movement to be given to these levers can be regulated. The levers D³ have their fulcrum on a bar, D⁴, fixed breadthwise of the apparatus, and are placed radially or splayed out (see Fig. 1) alternately in two rows, one above and one below the bar, by which means sufficient space is allowed between each lever for proper working. The outer ends of the levers D³ are connected by pendent rods D⁵ to the ends of springs D⁶, of wood, which carry the valves, as will be hereinafter explained. These springs are secured to any convenient part of the apparatus; but in the drawings they are shown as secured to the air-passages, to be referred to hereinafter. The connections between the rods D⁵ and the levers D³ and springs D⁶ are formed by leather or other suitable nuts, which are screwed onto the threaded ends of the rods, as clearly shown in the drawings, such connections being thereby adjustable.

E are the pneumatic levers, which, for the purpose of economizing space and for convenience of removal, we prefer to arrange in three rows. The levers are secured in any convenient manner to the under side of the bars E', carried by the frame-work of the apparatus.

F are wind-trunks, one to each row of levers E, which are also arranged breadthwise of the apparatus, and are connected with the pneumatic levers E by the air-passages E², as clearly seen in Fig. 3. At the wind-trunk end of the air-passages E² openings E³ E⁴ are formed, one of which, E³, is open to the external air, and the other, E⁴, to the wind-trunk, the two openings being exactly opposite one another. These openings are closed by disk-valves, one for each opening, both being mounted on the same valve rod or stem, one outside the opening E³ and the other outside the opening E⁴, but inside the wind-trunk. The valves consist of rigid disks *a*—say of copper—cemented to flexible disks—say of leather—and are mounted loosely on the valve rods or stems *a'* between two semicircular faced leather or other nuts, *a''*, which are screwed onto the valve rod or stem. Each valve-rod is secured to one of the wood springs D⁶ in like manner. This mode of securing the valves to the rod and the rod to the spring permits not only of accurate adjustment as to position, but also allows the valve to accommodate itself to its seat with facility.

In order to prevent the valve-rod getting out of the center, we provide a guide, E⁵, in the wind-trunk. (See Fig. 3.)

The wind-trunks are connected in any con-

venient manner with the usual flexible reservoir, G, in connection with the bellows.

In using the apparatus, and when the music-card is in place, the note-levers will be depressed by the card into the drawn position, Fig. 3, which will have the effect of depressing the inner ends of the intermediate levers or trackers, D³, and raising the outer ends. This will bend the springs D⁶ and raise the valves into the position shown in the figure, the pneumatic levers E and air-passages being thereby open to the external air through the openings E³, the openings E⁴ to the wind-trunk being closed.

When a hole in the music-card comes opposite a note-lever, this lever assumes, under the influence of its wood springs D⁶, the dotted position shown in Fig. 3, which causes the valves, also under the action of the spring, to change position, thereby closing the opening E³ to the external air and opening E⁴ to the air-trunk. As a vacuum is being constantly maintained in the air-trunk by the operation of the bellows, the air contained in the air-passage and the pneumatic lever will be rapidly drawn into the air-trunk, and the pneumatic lever will consequently collapse or close up with considerable rapidity.

Each pneumatic lever E is connected by means of an adjustable connecting-rod, E⁶, with the inner end of a hammer or striker lever, G*, so that the rapid closing or collapsing of the pneumatic lever will cause this lever to rock on its fulcrum and give a rapid and forcible blow to the key of the piano or other key-board instrument to which the apparatus is adapted.

To permit of the facile insertion of the music-card, we provide a cam or equivalent arrangement, H, which, on being turned by a suitably-placed handle, will bear against the projecting ends *d* of the note-levers D and force them down into the drawn position, Fig. 3, in the manner common to this class of apparatus.

In Fig. 6 we have shown in detail view the cam H and a music-lever or note-lever, D. When the card is inserted, the cam will be turned into the position shown in the drawings, and the note-levers will be free to rise through the holes in the music-card as they are presented to them.

When the apparatus is worked by compressed air, the air is supplied by the bellows or feeders to the flexible reservoir G, whence it passes by the trunk and the air-passages in which the valves are placed to the pneumatic levers. This arrangement is shown at Fig. 4. The inlet for the compressed air is exactly opposite to the outlet for the exhaust, as in the previous arrangement; but in this case only one disk-valve will be necessary, and it will be placed within the air-passage E², and thus be made to close both openings, as required.

The pneumatic levers will be permanently attached to the air-passages, which will be

supported by the air-trunks, being secured thereto by wooden buttons I, as shown in the figure. The rear ends of the pneumatic levers will rest on a grooved bar, J, suitably fixed breadthwise of the apparatus, and each lever is held by a tongue, J', attached to the under side of the lever, and which enters the groove in the bar. By turning the buttons and disconnecting the valve-rod and hammer-rod or sticker, any one of the pneumatic levers may be readily removed should any reparation become necessary.

It will be observed that the hammer or striker levers G* and the pneumatic levers E are arranged with their length transverse to the length of the apparatus, or extending in a direction from front to back thereof, and the feed-rollers C C are arranged transversely to the said striker-levers G* and pneumatic levers E. The note-levers D are arranged parallel with the striker-levers G* and pneumatic levers E, and are of course transverse to the length of the feed-rollers C C. The intermediate levers, D³, have the same general direction as the striker-levers G*, pneumatic levers E, and note-levers D, but are splayed or spread, as shown in Fig. 1.

In apparatus of this class the striker-levers must necessarily be arranged and extend transversely across the apparatus from front to back thereof, and the pneumatic levers are also so arranged. By arranging the feed-rollers transversely to the striker-levers and pneumatic levers, so that they feed the music-cards directly across the apparatus from front to back thereof, and by arranging the music or note levers D transversely to said rollers and approximately parallel with the pneumatic levers, we are enabled to employ single rods or wires, each connecting the valve of a pneumatic lever with an intermediate lever, and we are also enabled to make direct connections between the music-levers and the intermediate levers.

The above-described arrangement of parts allows us to greatly reduce the number of connections in the apparatus, and thereby render its construction more simple and inexpensive and its operation more certain and effective.

The valve-rods a' are here shown as connected with the intermediate levers, D³, through the rods D⁵ and springs D⁶; but the valve-rods might be connected directly with the intermediate levers and springs otherwise applied to close the valves.

Having now described the nature of our invention of improvements in apparatus for the mechanical playing of key-board instruments—such as pianos and organs—and explained the manner of carrying the same into effect, we claim—

1. In an apparatus for mechanically playing key-board instruments, the combination of feed-rollers C C, for moving the music-cards across the center of the apparatus from front to back thereof, note-levers D, pneumatic levers E, and striker-levers G*, all arranged approximately parallel with each other and transversely to the feed-rollers, rods connecting the pneumatic levers E with the striker-levers G*, intermediate levers, D³, rods connecting the note-levers with the intermediate levers at one end and connections between the other ends of the intermediate levers, and the valves of the pneumatic levers, all substantially as and for the purpose herein described.

2. In an apparatus for mechanically playing key-board instruments, the combination of the feed-rollers C C, for moving the music-card across the apparatus from front to back thereof, music-levers D, pneumatic levers E, and striker-levers G*, all arranged transversely to the feed-rollers, intermediate levers, D³, splayed as described, and arranged in horizontal rows, and rods D² D⁵ E⁶, all arranged for operation substantially as and for the purpose herein described.

3. In an apparatus for mechanically playing key-board instruments, the combination of feed-rollers C C, for feeding the music-card across the apparatus from front to back thereof, music-levers D, two or more rows of pneumatic levers, E, and a single row of striker-levers, G*, all arranged transversely to the feed-rollers, intermediate levers, D³, and rods D² D⁵ E⁶, all arranged for operation substantially as herein described.

4. In an apparatus for mechanically playing key-board instruments, the combination of feed-rollers C C, for moving the music-card across the apparatus from front to back thereof, music-levers D, pneumatic levers E, and striker-levers G*, all arranged transversely to the feed-rollers, intermediate levers, D³, springs D⁶, with which the valves of the pneumatic levers are connected, and rods D² D⁵ E⁶, all organized for operation substantially as herein described.

5. In apparatus for mechanically playing key-board instruments by means of the exhaustion of air, the combination of two disk-valves, as a, on the same valve-stem, a', with the openings E³ E⁴ in the air-passage E², the said valves being placed outside the said openings, and operating substantially as herein described.

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