

BEST AVAILABLE COP

BEST AVAILABLE COP  
W. A. WATSON AND W. EUSTIS

PLAYER MECHANISM FOR MUSICAL INSTRUMENTS.

APPLICATION FILED AUG. 19, 1919.

Patented Sept. 26, 1922.

7 SHEETS—SHEET I.

1,430,517.

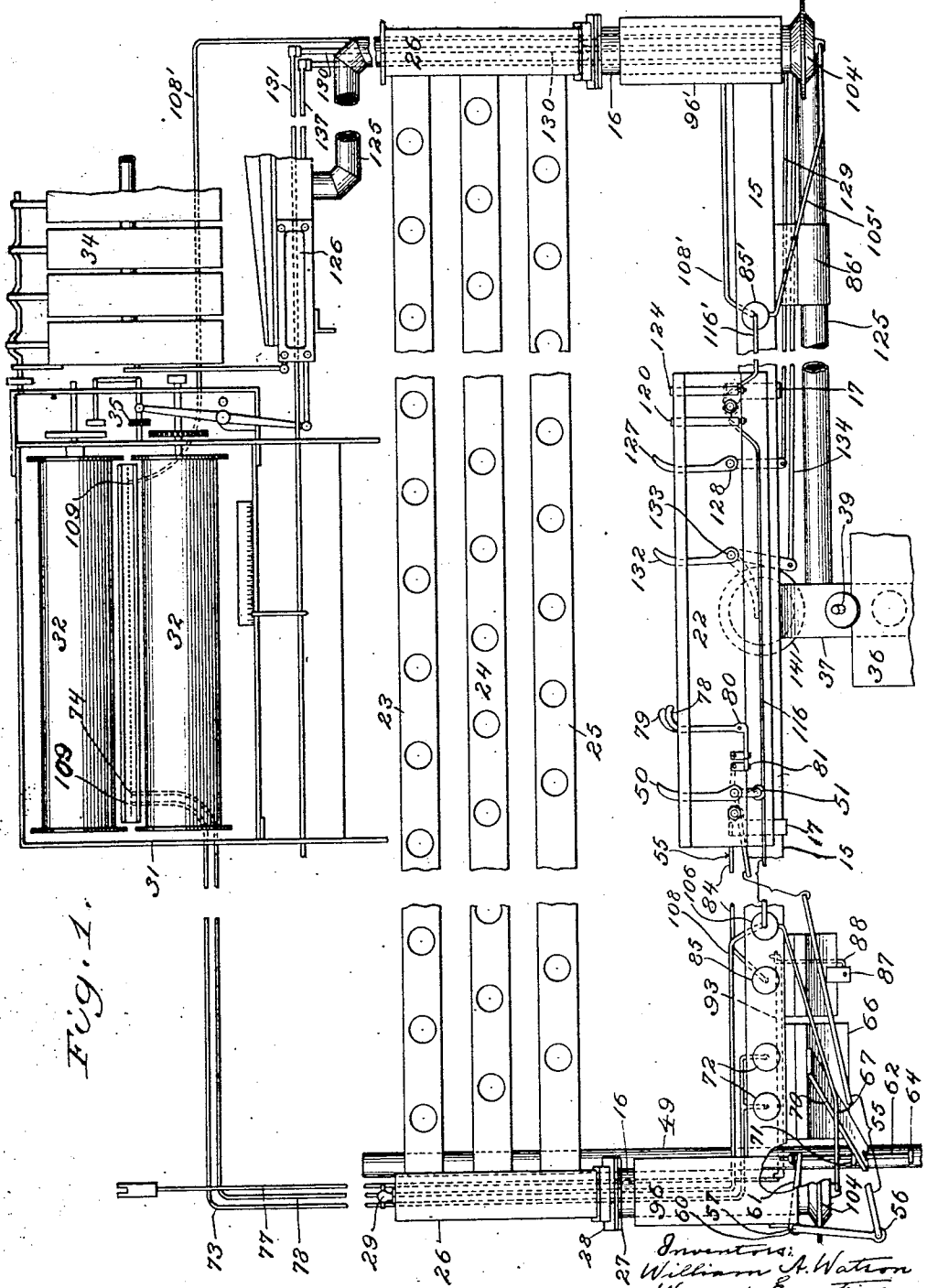


Fig. 1.

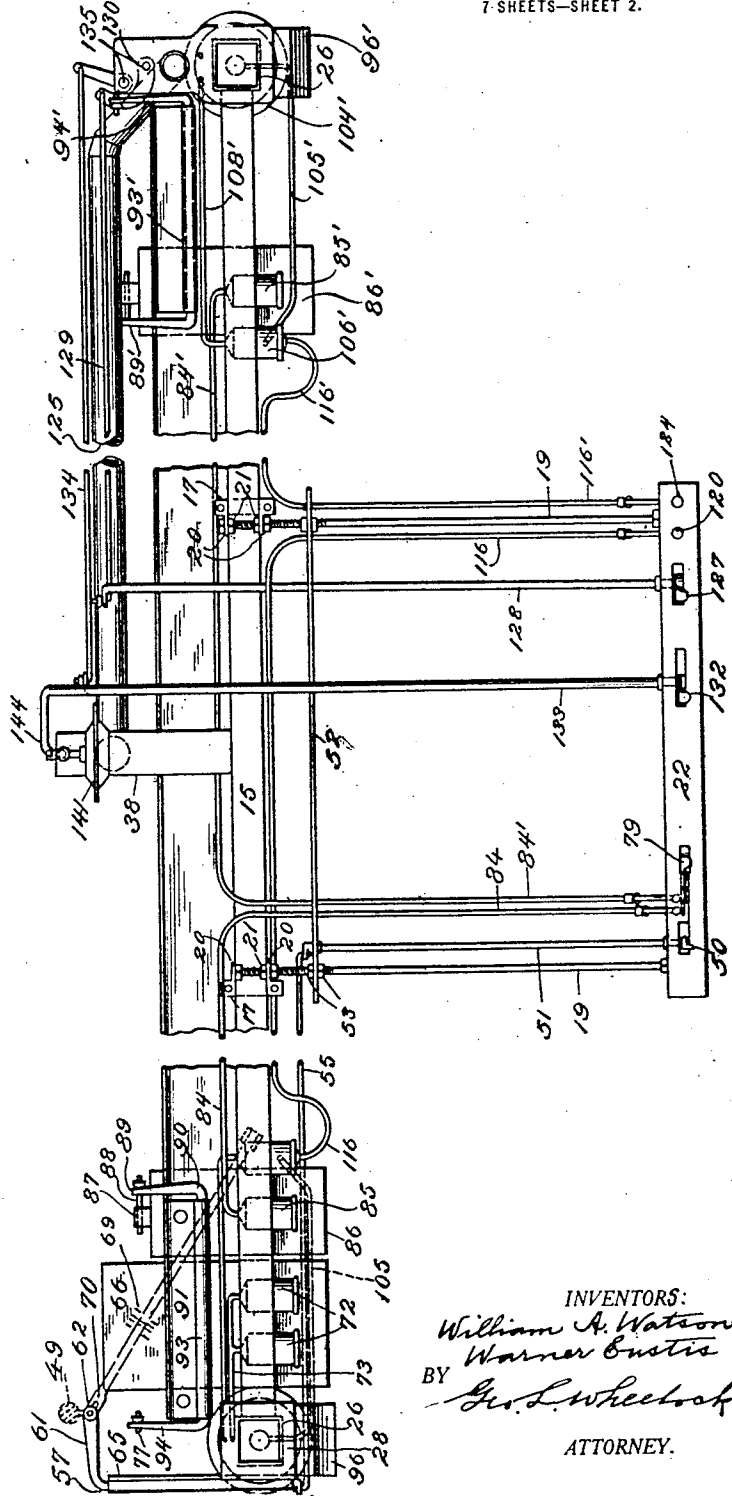
Inventors:  
William A. Watson  
Warner Eustis  
By Geo. L. Wheeler, ATTORNEY.

BEST AVAILABLE COPY  
 W. A. WATSON AND W. EUSTIS.  
 PLAYER MECHANISM FOR MUSICAL INSTRUMENTS.  
 APPLICATION FILED AUG. 19, 1919.

1,430,517.

Patented Sept. 26, 1922.  
 7 SHEETS—SHEET 2.

Fig. 2.



INVENTORS:  
 William A. Watson  
 Warner Eustis  
 BY  
 Geo. L. Wheelock  
 ATTORNEY.

BEST AVAILABLE COPY

W. A. WATSON AND W. EUSTIS.  
PLAYER MECHANISM FOR MUSICAL INSTRUMENTS.  
APPLICATION FILED AUG. 19, 1919.

1,430,517.

Patented Sept. 26, 1922.  
7 SHEETS—SHEET 3.

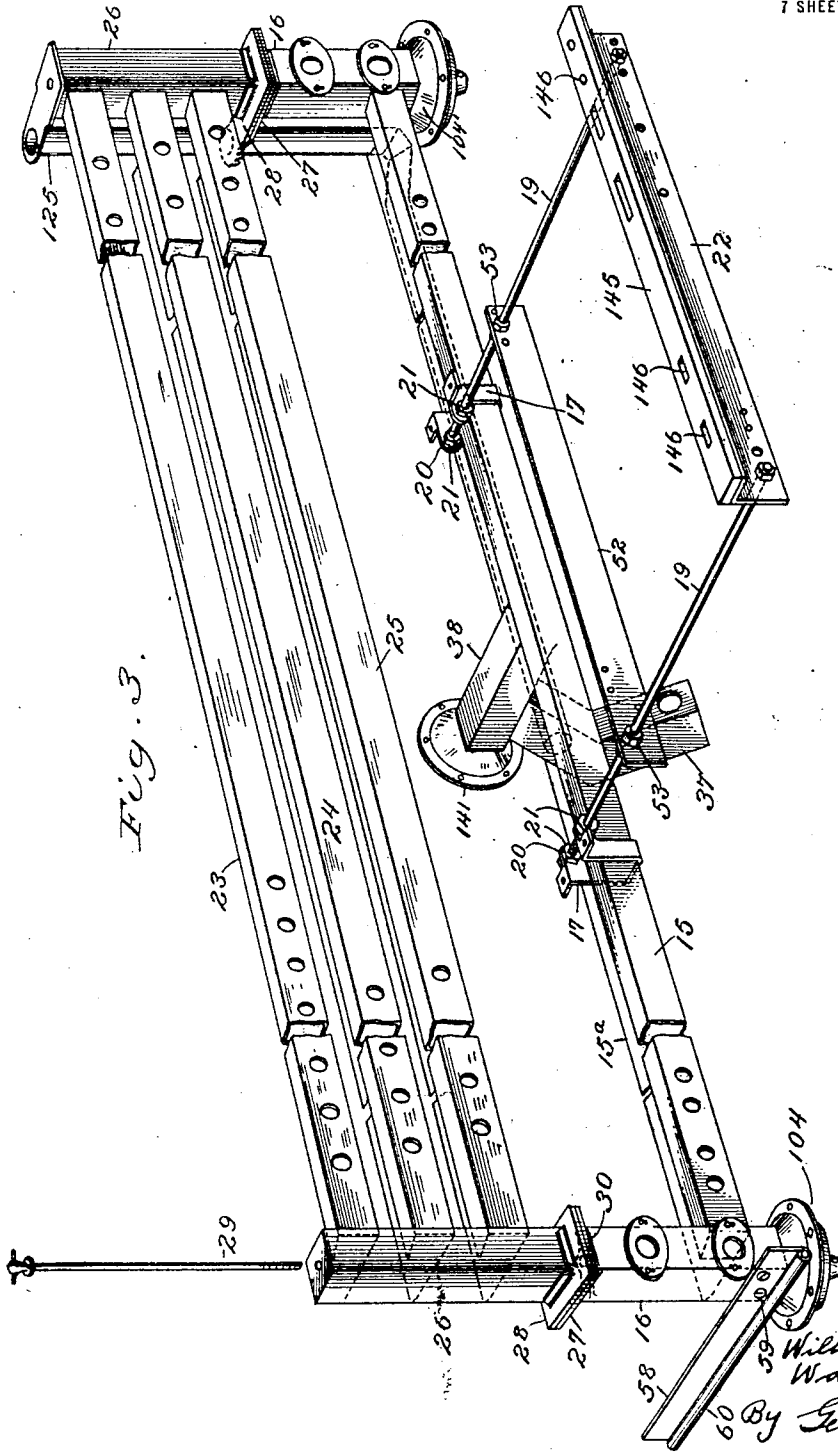


Fig. 3.

INVENTORS:  
*William A. Watson*  
*Warner Eustis*  
By *Lea Wheelock*  
ATTORNEY.

BEST AVAILABLE COPY  
W. A. WATSON AND W. CUSTIS.

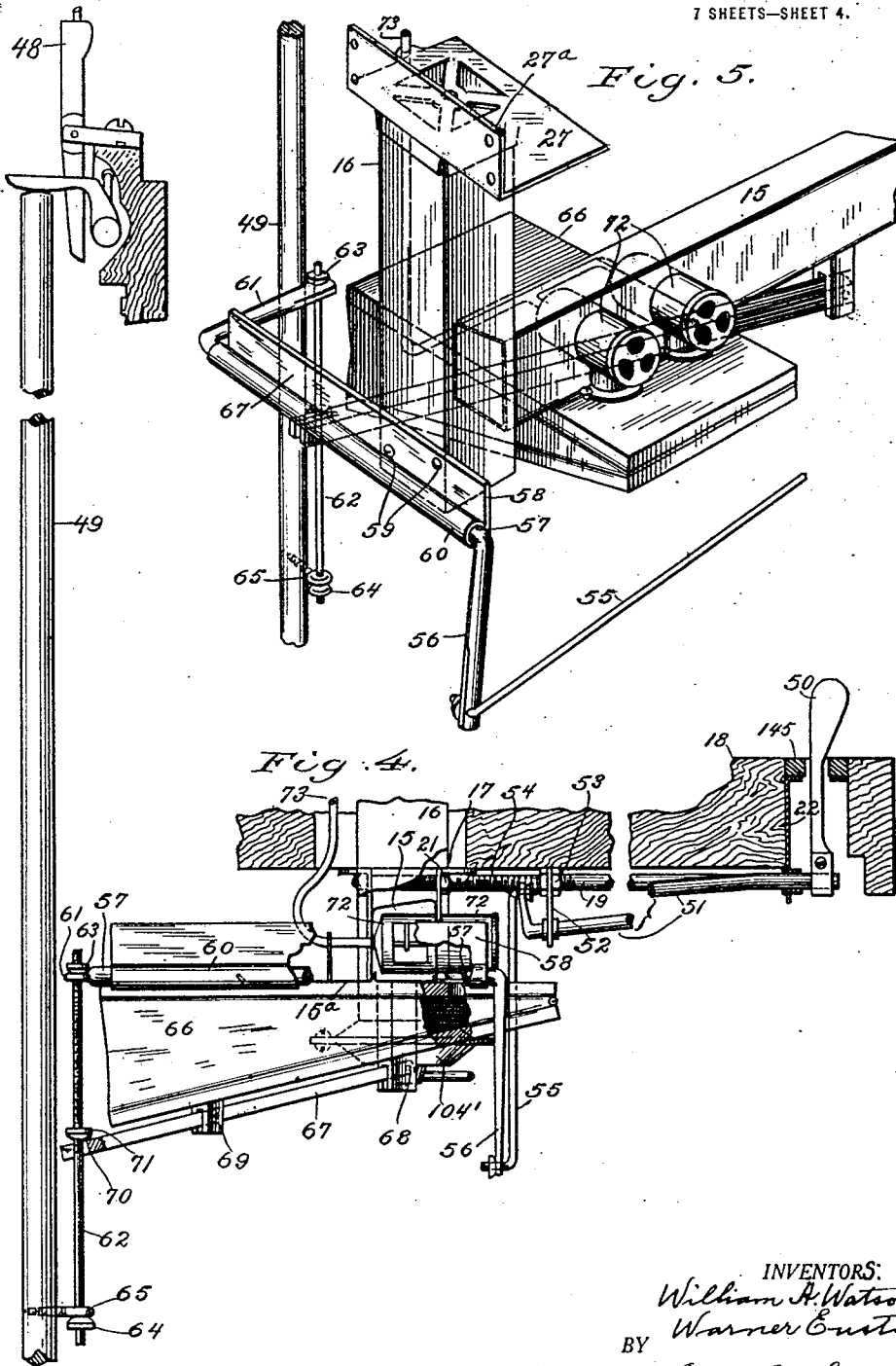
PLAYER MECHANISM FOR MUSICAL INSTRUMENTS.

APPLICATION FILED AUG. 19, 1919.

Patented Sept. 26, 1922.

7 SHEETS—SHEET 4.

1,430,517.



INVENTORS:  
*William A. Watson*  
*Warner Custis*  
 BY  
*Geo. L. Wheelock*  
 ATTORNEY.

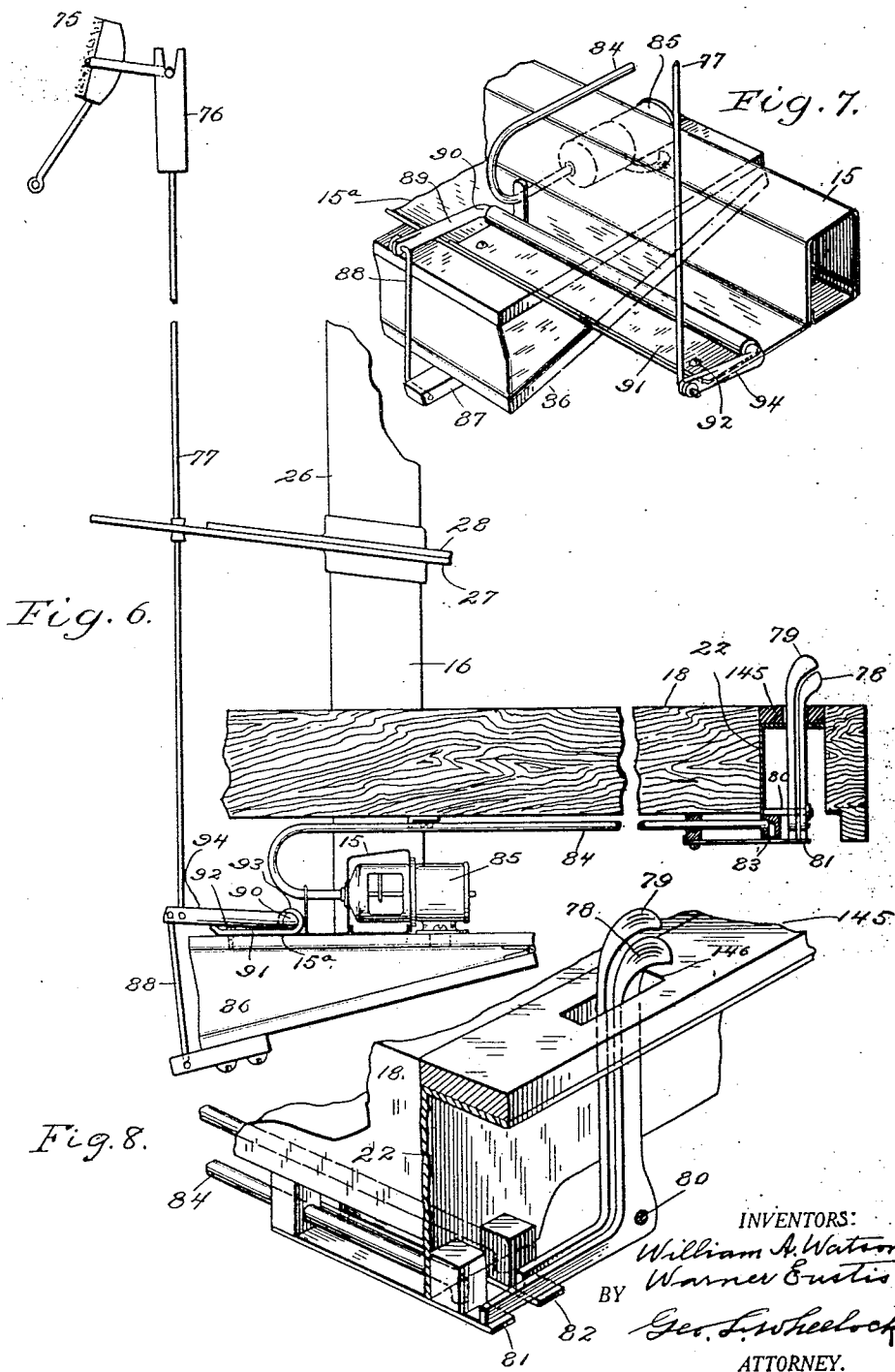
BEST AVAILABLE COPY

W. A. WATSON AND W. EUSTIS.  
PLAYER MECHANISM FOR MUSICAL INSTRUMENTS.  
APPLICATION FILED AUG. 19, 1919.

1,430,517.

Patented Sept. 26, 1922.

7 SHEETS—SHEET 5.



INVENTORS:

William A. Watson  
Warner Eustis

BY

Geo. L. Wheelock  
ATTORNEY.

BEST AVAILABLE COPY

W. A. WATSON AND W. EUSTIS.  
PLAYER MECHANISM FOR MUSICAL INSTRUMENTS.  
APPLICATION FILED AUG. 19, 1919.

1,430,517.

Patented Sept. 26, 1922.  
7 SHEETS—SHEET 6.

Fig. 9.

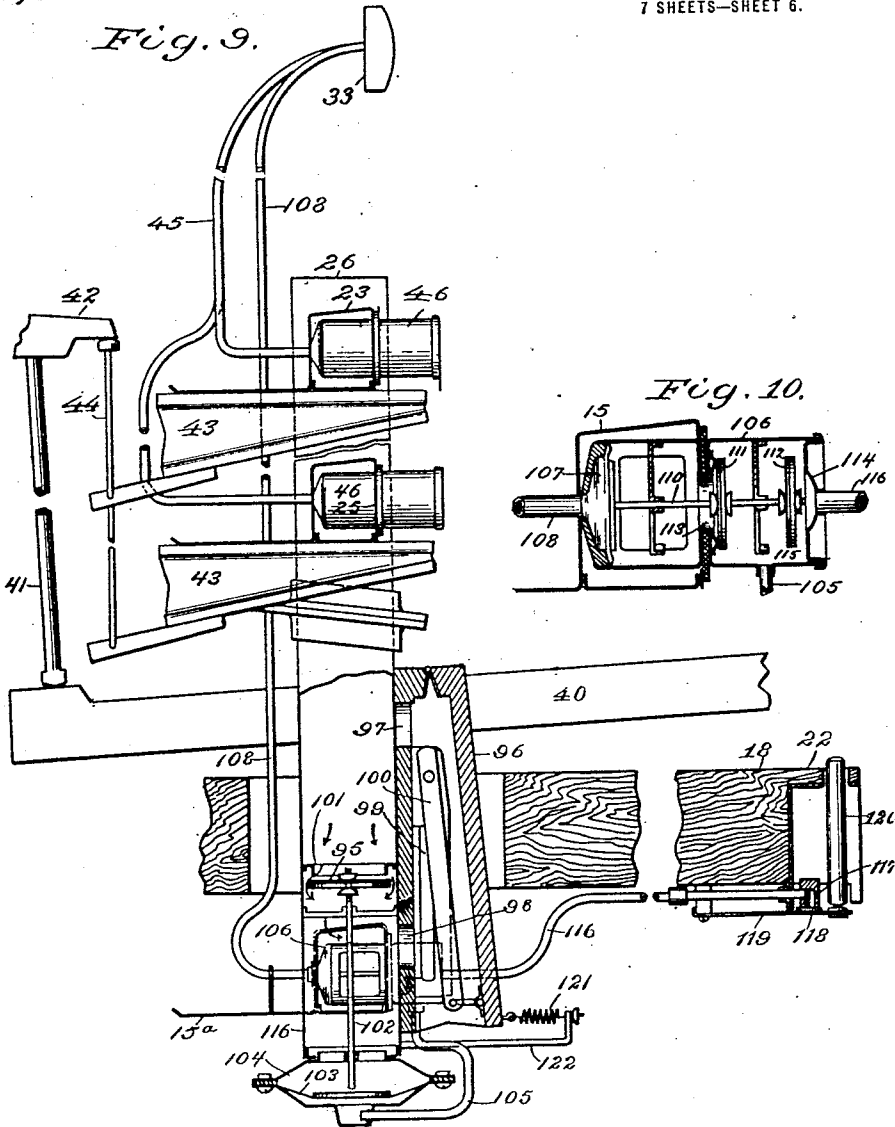


Fig. 10.

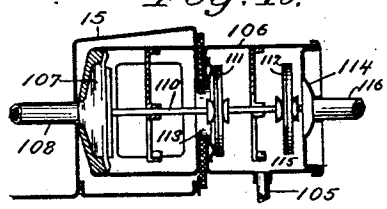
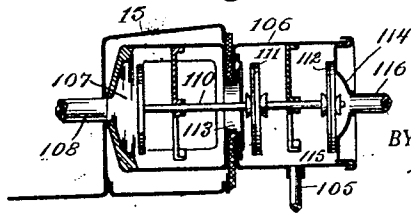


Fig. 11.



INVENTORS:

William A. Watson  
Warner Eustis

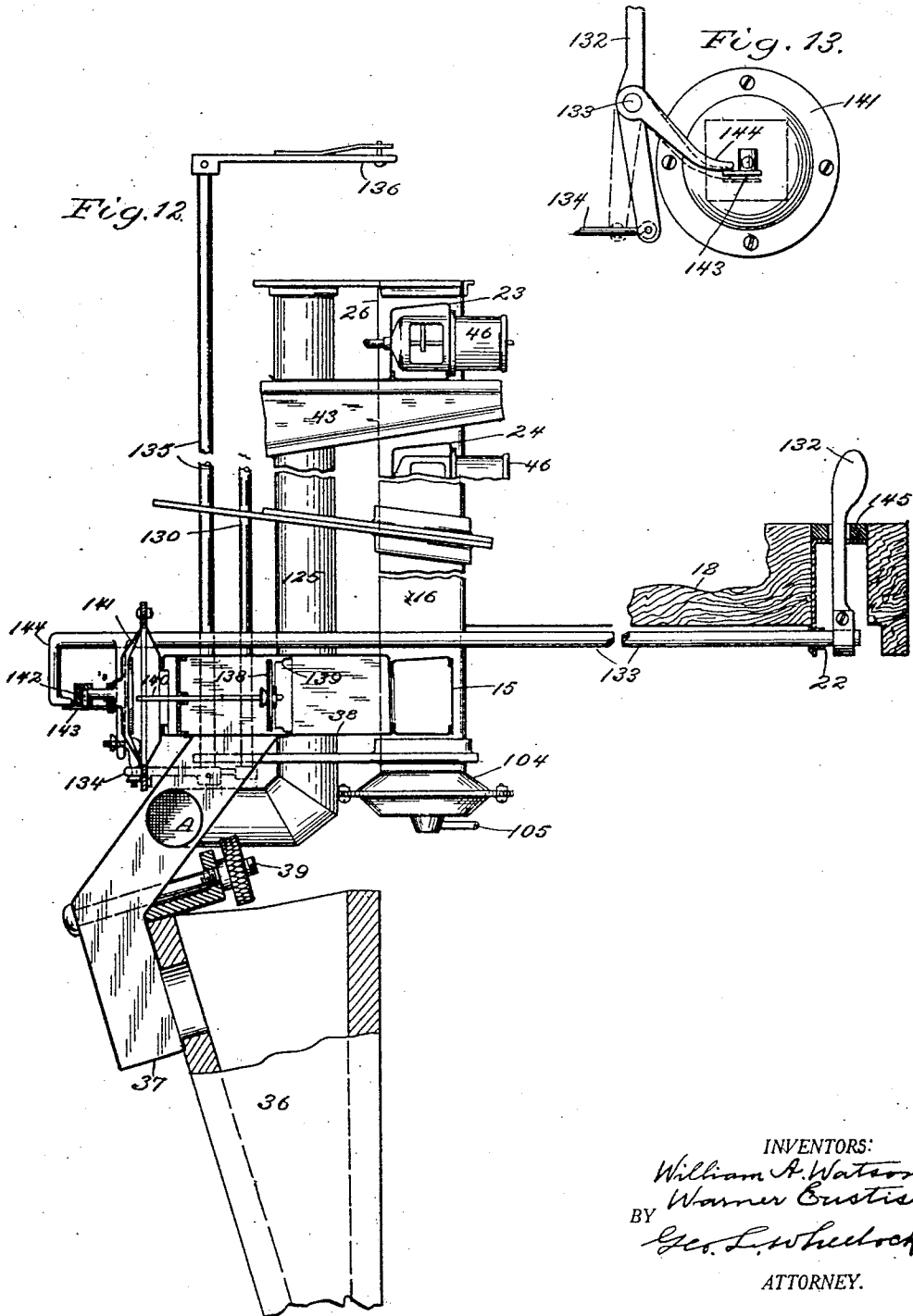
BY

Geo. S. Wheelock  
ATTORNEY.

BEST AVAILABLE COPY  
 W. A. WATSON AND W. EUSTIS.  
 PLAYER MECHANISM FOR MUSICAL INSTRUMENTS.  
 APPLICATION FILED AUG. 19, 1919.

1,430,517.

Patented Sept. 26, 1922.  
 7 SHEETS—SHEET 7.



INVENTORS:  
*William A. Watson*  
*Warner Eustis*  
 BY *Geo. L. Wheelock*  
 ATTORNEY.

# UNITED STATES PATENT OFFICE.

WILLIAM A. WATSON, OF MALDEN, AND WARNER EUSTIS, OF NEWTON, MASSACHUSETTS, ASSIGNORS TO J. P. EUSTIS MANUFACTURING COMPANY, OF CAMBRIDGE, MASSACHUSETTS, A CORPORATION OF MASSACHUSETTS.

## PLAYER MECHANISM FOR MUSICAL INSTRUMENTS.

Application filed August 19, 1919. Serial No. 318,521.

*To all whom it may concern:*

Be it known that we, WILLIAM A. WATSON and WARNER EUSTIS, citizens of the United States, and residents of Malden and Newton, respectively, in the county of Middlesex and State of Massachusetts, have invented certain new and useful Improvements in Player Mechanism for Musical Instruments, of which the following is a specification:

This invention relates to player mechanism for musical instruments, which may be adapted to upright pianos, and the invention may at least in part be adapted to grand pianos and organs.

One of the objects of the invention is to provide a player mechanism which embodies the manumotive parts; that is to say, it embodies or it is preferred that it does embody all manually controlled parts, such as are used in connection with player mechanism for controlling the style of playing. In other words, in the best form of the invention it is desirable that the player mechanism carry separately from the case of the musical instrument itself all parts that functionate from the manually controlled members, so that if the player mechanism is removable, all the parts embodied therewith, such as referred to, will be removable as a unit, or in a word, it is preferred that the player mechanism, with its controlled and controlling parts be self-contained as it were, although it will be obvious from the illustrated embodiment of the invention and the description that this is not necessarily the case.

Another object of the invention is to provide a player mechanism for musical instruments in which the power bellows constitute one unit and the player mechanism another unit in two sections, each of which may be detached from the other.

Still another object of the invention is to provide player mechanism with a wind-way which preferably is located below the key-bed and with which is associated suitable supporting means upon which the manually controlled levers or other controlling members are located so that the said parts may be removed as a unit from beneath the key-bed.

While as inferred it may be desired that all these objects be accomplished in one single or unitary self-contained player mech-

anism, it is to be understood that all these objects need not be inherent in any single player mechanism and it will also be obvious from the description that other objects as well as these may be attained and will be within the spirit of the invention.

General objects of the invention are to provide a player mechanism having parts and control elements which are rendered readily accessible for inspection, repair, &c., and to improve player mechanisms generally.

These being or preferably being among the objects of the invention the same consist of certain features of construction and combinations of parts to be hereinafter described and then claimed with reference to the accompanying drawings illustrating one embodiment of the invention in which—

Figure 1 is a front elevation, parts being broken away and omitted, of a player mechanism according to the present invention.

Figure 2 is a plan view of those portions of the player mechanism, embodying particularly the manual controls which are located below the upper player action wind-chests:

Figure 3 is a perspective view showing wind-chest sections and the supporting frame for the manually controlled parts; the movable parts carried by the illustrated parts being omitted.

Figure 4 is a fragmentary side elevation, partly in section, illustrating the manually controlled "sustaining" mechanism of the piano or other musical instrument.

Figure 5 is a perspective view of some of the members of the sustaining mechanism.

Figure 6 is a sectional side elevation, showing means for obtaining soft or loud playing, to be exact, connected with the hammer rail.

Figure 7 is a perspective view of the power pneumatic portion of the said means.

Figure 8 is a perspective view, parts being broken away, showing means for initiating the pneumatic control of the hammer rail.

Fig. 9 is a sectional side elevation, parts being broken away, of the means for obtaining the desired expression,—in playing a melody, or solo, or in accenting, said means being shown as associated with parts which attack the piano action.

Figure 10 is a longitudinal sectional view of the preferred valve device, associated



with the appropriate wind-way or wind-chest section, the valves being in one position.

Figure 11 is a similar view illustrating the valves in another position.

Figure 12 is a sectional side elevation, parts being broken away, showing the rewind and short-stop mechanism associated with the pumping-bellows, and

Figure 13 is a detail view illustrating more clearly the functioning of one of the parts of the rewind mechanism.

*Player action proper.*

Under this heading will be described those parts of the player action which do not include the actual control means affecting the style of playing.

Referring to Figures 1, 2 and 3, the wind-way or wind-chest section 15 is provided with a rearward shelf or bracket plate 15<sup>a</sup>, and it is preferred to carry on this the pneumatic functioning parts which are initially controlled from the manually controlled levers or members, buttons or the like. Supported on the ends of the wind-way or wind-chest section 15 are hollow headers or end cheeks 16, which, as shown more clearly in Figure 3, project mainly above the said wind-way. In the form of the invention shown, the wind-way 15 is supported underneath the keys by means of clips or saddles 17, which embrace the said wind-way and the upper ends of which are suitably secured as by means of screws to the key-bed or bottom 18, the latter being usually of wood and forms a part of the piano itself. Forwardly extending rods 19 pass through lugs 20 on the clips 17 in parallelism, and the said rods are screw threaded to receive adjusting nuts 21, whereby the said rods may be secured upon and adjusted relatively to the clips 17 and hence to the wind-way 15. An angular front rail or cross-bar 22 is suitably confined upon the forward ends of the parallel rods 19. As will appear later the rods 19 and front rail 22, together with the concomitant parts constitute a supporting frame upon which the manumotive or hand control parts are arranged, the parts of said frame being so disposed and proportioned as that when the wind-way 15 is secured underneath the key-bed the front rail or cross-bar 22 will constitute a "head," which may be located in a slot cut into the key-bed, the manumotive parts preferably protruding from the said front rail or head in advance of the keys.

Three upper wind-chest sections 23, 24 and 25 are illustrated, although this number may be altered as desired, and these are the wind-chest sections of the player action which carry the power pneumatics that actuate the hammers of the piano action whenever the pumping bellows are op-

erated. The said sections are shown as parallel with each other and as connected at both ends by means of hollow headers or end cheeks 26, which are provided at their lower ends with coupling or contact flanges 28, which are matched and brought in contact with similar flanges 27 on the upper ends of the headers 16 of the lowermost wind-chest section or wind-way 15. Obviously the joints between the flanges 27, 28 will be felted or otherwise packed inasmuch as it is intended in the preferred form of the invention to render removable or detachable the headers 16 and the parts carried thereby and the headers 26 and the parts carried thereby.

To connect the headers 16 and 26 at the respective ends of the wind-chest sections in alinement with each other fastening devices are preferably employed which will allow of the desired detachability of the parts. To this end headed tie rods 29 are passed downwardly through holes in the upper ends of the headers or end cheeks 26, so that when the said tie rods are pushed downwardly as far as possible, the heads thereof will rest upon the upper ends of said headers when their screw threaded lower ends have been screwed into suitable spiders 30 which are located in the upper ends of the lower headers or end cheeks 16. The spiders 30 are, of course, preferably rigidly secured in the headers 16.

It will be clearly evident from Figure 6, for example, that the flanged ends 27, 28 of the headers are disposed at a rearward and upward inclination, which is preferred because this inclination will assist in the assembly of the parts mentioned, inasmuch as when and if the wind-way 15 with its headers, &c., are secured in position, the wind-chest section 23, 24 and 25 and the headers 26 may be readily slid away from the lowermost parts mentioned or be slid onto said parts, so that all of them may be ultimately secured together by the tie rods 29 when the headers 16 and 26 are in alinement. With the wind-chest sections and concomitant parts disposed as illustrated, it is obvious that the wind-chest sections 23, 24 and 25 for actuating the power pneumatics for moving the hammers will be located above the key-bed 18, so as to be in convenient position for attacking the piano action.

It is preferred that all of the above enumerated parts of the player action be composed of metal so as to provide a practically rigid assemblage of parts, and the wind-chest sections or wind-ways, as well as the headers or end cheeks are preferably composed of sheet metal, such as brass or iron, the surfaces of which, as well as the surfaces of all of the metal parts which are preferred herein being provided with protective coatings, as of nickel, enamel, &c., which

not only protect the metal surfaces against oxidization, but presents a structure which is exceedingly handsome and attractive, not to mention durable. It is preferred that the frame, comprising parts 19, 22, &c., be an open or skeleton one.

The tracker box or frame 31 supports in any well known or approved manner the music sheet rolls 32 and the tracker bar 33, as well as the motor 34 and the transmission mechanism 35 between the motor and the music rolls.

Referring to Figure 12 in particular, the reservoir 36 forming part of the pumping bellows attachment or mechanism is provided or connected with a wind-trunk 37 having an extension 38 leading from the wind-way 15 so that when suction is created by the pumping bellows or other atmospheric tension created, the desired degree of air tension will be established in the wind-way 15 and the wind-chest sections associated with the player action. A detachable fastening device 39 is preferably employed for securing the reservoir and pumping bellows (the latter not shown) removably in position. It should be stated, that the trunk 57, extended downwardly from the wind-way or wind-chest-section 15, is preferably in the form of a stationary goose-neck, and that when said parts are made of sheet metal and rigidly attached together, as shown, it constitutes a rigid pendent neck on said wind-way. As the bend of the neck 57 is presented rearwardly, as clearly shown in Fig. 12, so that its lower end is inclined forwardly, it will be seen that the removable pumping bellows and the air-reservoir 36, which is a part of the bellows, may be readily placed into position in the lower part of the instrument, and that the upper part of the reservoir 36 may be brought to rest against the front wall of the forwardly-inclined lower end of said neck. Thereupon, the fastening device 39 may be placed in securing position and the nut thereof tightened up to hold the pumping bellows and its reservoir 36 rigidly in position. In the exemplification shown in Figure 9, the keys 40 of the manual of the musical instrument operate on stickers 41, which move the wippens 42, so that a manual performance on the instrument may be accomplished independently of the player action, while power pneumatics 43 in the form of little bellows are rigidly secured to the under sides of the wind-chest sections 23, 24 and 25, and the movable leaves of the said pneumatics operate on abstracts or sticker rods 44, which directly attack the wippens 42 so that the player action may be operated independently of the manual of the instrument. This method of securing independency of action between the keys of the instrument and the player action is illustrated merely to indicate one way in which this independency of ac-

tion could be secured, for, as is obvious to those skilled in the art, other means for securing this independency of action may be resorted to. Conduits or tracker tubes 45 lead from the tracker bar 33 to the valve carriers 46 for admitting atmospheric air to the same and these valve carriers are preferably inserted into suitable apertures of the wind-chest sections 23, 24 and 25. Any suitable or well known valve construction within the valve carriers may be resorted to and such construction does not require specific illustration. For instance, the construction shown and described in the patent to W. A. Watson, #1,142,863 dated June 15, 1915 may be employed.

#### *Sustaining or damper mechanism.*

The preferred construction and operation of these parts of the player are sufficiently illustrated in Figures 1, 2, 4 and 5. In these figures the dampers 48 are operated by the dowel or actuator 49, as is well known in the piano art, with a view to damping the strings whenever the hammers strike them or to enable the dampers to be removed from the strings when a sostenuto or sustained passage is to be played. The dowel or actuator 49 may, of course, be actuated, if desired, by an appropriate foot pedal when playing manually on the keys of the instrument. The possibility for such independent performance is illustrated herein.

The sustaining lever or control member 50 is operable by hand for the purpose of operating the dampers 48, and is projects from and is arranged for operation in the head or front rail 22, it being mounted for that purpose on the forward end of a rock shaft 51, which is mounted in suitable bearings on said head 22 and a rear rail or cross-bar 52, which is strung or secured on the forwardly extending rods 19, on which said rail is positioned and held by means of nuts 53, which work on screw threaded portions of said rods 19. At its rear end the rock shaft 51 is provided with a crank arm 54 which is loosely or movably connected by means of a lateral link 55 with a forward crank arm 56 on a rock shaft 57, said rock shaft 57 being carried by a plate 58, which may be secured to the lower end of the left hand header 16 in horizontal position, said plate being preferably formed of sheet metal and having formed integrally therewith a tubular sleeve 60 extending longitudinally thereof and forming an elongated bearing in which the rock shaft 57 may turn. A crank arm 61 is located on the rear end of the rock shaft 57, and preferably this rock shaft and its two crank arms 56 and 61 are formed integrally from a properly bent up and formed piece of metal rod. Loosely guided in the outer end of the crank arm 61 is a coupling pin 62 which is

provided at its upper end with a button or nut 63 for securing the said pin to said arm and to permit the same to depend from the said arm. Another button or nut 64 is secured to the lower end of the coupling pin 62, it being located under a screw-eye or other guide member 65 through which the said coupling pin extends so that a relative movement of the said coupling pin and the dowel or actuator 49 may be obtained, the said screw-eye being screwed into the said dowel. It will be clear that when the sustaining pedal is operated the dowel 49 may move without communicating its movement to the coupling pin 62, and it is also clear that the coupling pin may be lifted and simultaneously lift the dowel. Preferably the buttons or nuts 63, 64 are secured removably on the coupling pin. A bellows-like power pneumatic 66 has its upper leaf fixed firmly in position directly under the left hand end of the wind-way 15, preferably directly adjacent the header 16, so as to be directly to the right of the lower end of said header. This power pneumatic 66 may be operated pneumatically with a view to operating on the dowel 49, to which end there extends, on the bias, across and underneath the movable leaf of the pneumatic 66, a lever 67, one end of which is pivoted at 68 to a part which is rigidly secured to the under side of the wind-way 15, as indicated in Figures 1 and 2. Intermediate of its ends the lever 67 is pivoted at 69 to a piece on the under side of the movable leaf of the pneumatic 66, while the rear end of said lever is provided with an open fork or yoke 70 for loosely connecting the said lever with the coupling pin 62, which latter carries an adjustable button or nut 71, which is located above the forked end of said lever, so that the said coupling pin may be operated by said lever.

Inasmuch as considerable power is necessary to operate the dowel 49, it is preferred to make the power pneumatic 66 of a size relatively large as compared with the other pneumatics, and for the same reason it is preferred to employ a pair of valve carriers 72 which are located in the wind-way 15 above and connected with the said power pneumatic and the valves and puff mechanism may be of any well known or approved construction. The pair of valve carriers 72 are connected by means of a conduit or tube 73 with a tracker hole 74 located at one end of the tracker bar, as indicated in Figure 1, so that said hole is to one side of the apertures in the tracker bar, which are used for normal performance, and this tracker hole 74 will admit atmospheric air whenever any registering side perforations in the perforated music sheet are in register therewith. It will be seen that when atmospheric air is admitted that the air tension in the

wind-way 15 will be caused to act upon the power pneumatic 66, thereby operating the dampers 48 for a sustained passage. It is also obvious that a sustained note or passage may be obtained ad libitum by the operation of the sustaining control member 50 by the performer. When the manual sustaining member 50 is operated the coupling pin 62 will be lifted without operating the lever 67, inasmuch as the said pin will slide freely through the fork 70. Also when the lever 67 is operated by the power pneumatic 66, the coupling pin 62 will be shifted longitudinally and will slide freely through the crank arm 61 without interference thereby. In consequence of these slip movements of the coupling pin 62 there will be practically no friction caused by any of the other parts when the sustaining pedal, the sustaining member 50 and the power pneumatic 66 are respectively operated.

#### *Divided hammer rail action.*

It is preferred that the present described player action be embodied in a piano, when it is embodied in a piano, having a divided hammer rail, as most pianos constructed today are so equipped, for the purpose of obtaining loud and soft playing in either the bass or treble. Mechanism for operating either a single hammer rail or a divided hammer rail is illustrated in Figures 1, 2, 6, 7 and 8 and in these figures the hammer rest rail 75 is operated by a fork 76 on the upper end of an actuating rod 77, which in turn is moved initially through the operation of manually controlled levers or members 78, 79. These manually controlled members 78, 79 are for the bass and treble, respectively, and are preferably in close or paired arrangement, and in the form of angle levers, the angle portions of which are mounted on a fixed pivot 80.

The lower arms of these control members operate on leaf or plate springs 81, 82 when either or both of the control members are moved to the left, although it is obvious that the said springs may be operated by a modified construction of control members 78, 79, in which the latter are movable to the right. The leaf springs 81, 82 are fixed at their inner ends and extend forwardly in pairs so that their free ends will project underneath the lower arms of the control members 78, 79, the said leaf springs being provided with padded valve forming faces 83.

A specific description of the parts associated with and operable from the base control member 78 will suffice for a description of the parts associated with the treble control member 79, inasmuch as the construction is the same or substantially the same in both cases.

A conduit or tube 84 is mounted upon the

rails or cross-bars 22 and 52 and at its front end is formed with a port, which is controlled by the valve forming face 83. The leaf spring 81 is so set that it normally closes the outer end of the conduit or tube 84, and the inner end of said leaf spring may be anchored or secured to a part on the said frame or support for the said conduit is removed or detached from the case of the instrument.

A valve carrier 85 is inserted and fixed in the wind-way 15 and is provided with a puff and valves of approved construction, its preferred location on the wind-way being preferably next adjacent the valve carriers 72, so that when the power pneumatic 86 connected with the valve carrier 85 is mounted on the said wind-way, said power pneumatic will have a position next to the right of the power pneumatic 66, it being also preferably smaller than the latter. The movable leaf of the power pneumatic 86 is provided with a lug or extension 87, which by means of a link 88 is connected movably or loosely with a crank arm 89 on one end of a rock shaft 90. A plate 91 provided with a tubular bearing 93 is attached by means of screws or other fastenings 92 to the upper side of the bracket or shelf 15 on the wind-way 15, and the rock shaft 90 turns in the said bearing and is provided at its other end with a crank arm 94. It is preferred that the rock shaft 90 with its cranks and the plate 91 with its bearing 93 be constructed of the same material, size and dimensions as the similar parts used in connection with the sustaining mechanism. In this case also the corresponding mechanism for the treble will have similarly dimensioned and proportioned hinge parts for simplifying and cheapening the cost of manufacture and assemblage.

It will be seen from the above description of the hammer rail operating mechanism that the same may be operated pneumatically from a pneumatic mechanism supported entirely from the player action or from a wind-way such as 15 and the frame associated therewith, and that if the hammer rail be a divided one that provision is made for playing soft or loud on either the bass or the treble. The other parts illustrated in connection with the treble mechanism are the same or substantially the same as for the bass and the reference numerals applied thereto are the same with the exception that each has an exponent such as 84', etc.

#### *Thematic, solo and accent mechanism.*

This mechanism comprises preferably means for carrying a theme through a performance by the player action, or for carrying a solo or for accenting any given notes or

phrases, dependent upon particular side perforations which are cut into a perforated music sheet. This mechanism is amply disclosed by Figures 1, 2, 9, 10 and 11 and comprises a main or cut-out valve 95, shown in Figure 9, which is arranged in one or both headers or end cheeks, depending upon whether it is desired to produce such expression only in the bass or in the treble or in both of them. The cut-out valve 95 may be said to be a sort of switching valve for switching, as desired, either to loud or to soft playing for expression such as stated. A regulator pneumatic 96 preferably of the bellows type is shown as mounted in vertical position upon the header 16 at the left and it communicates at its opposite ends with the interior of said header by means of apertures 97 and 98, respectively. A port 99 leading to the aperture 98 is controlled from the bellows pneumatic 96 when a lever or scissors valve 100 is operated by the pneumatic to throttle the said port. Such a bellows pneumatic is of itself old in the art.

A valve seat 101 is fixed transversely of the header 16 and is provided with a large opening or port which may be opened or closed by means of the cut-out valve 95. Said valve 95 is provided with a valve stem 102 and the valve may gravitate away from the valve seat 101 due to the fact that the lower end of the valve stem is in contact with a flexible diaphragm 103 within a puff head 104. In Figure 9 the valve 95 is shown as open. The puff proper or that part of the puff head 104 which is at the opposite side of the diaphragm 103 is by means of a conduit or tube 105 connected with a valve carrier or casing 106, which is inserted into the wind-way 15, and the valve mechanism within the same may be of any desirable construction. One construction is illustrated.

The valve carrier is provided with large side apertures located in the wind-way, and, subject to the control of the air tension, within the wind-way there is a puff 107 which is connected by means of a conduit or tracker tube 108 with a tracker hole 109, shown at one end of the tracker bar in Figure 1. Atmospheric air admitted by the perforated music sheet through the tracker conduit 108 will oppose the air tension in the wind-way 15. Valve carrier 106 contains a valve stem 110 which carries outside of the wind-way 15 two valves 111, 112, respectively, and has control ports 113 and 114. Said valves are arranged in the valve chamber 115 of the valve carrier and the port 113 establishes communication between the valve chamber and the wind-way 15, while port 114 establishes communication with a conduit or tube 116 leading from the orifice controlled by a valve forming port

118 on a leaf or plate spring 119. Said conduit or tube 116 is led through and is supported by the rear supporting bar or rail 52 and by the front rail or head 22. A button or control member 120 is adapted to act upon the free forwardly projecting end of the plate spring 119, and is guided in the upper part or member of the head or front rail 22 so as to be located in advance of the keys. A downward pressure on the button or control member 120 will open the valve 118 and hence admit atmospheric air into the conduit 116.

The preferred spring means for maintaining bellows 96 distended is illustrated in Figure 9. A helical tension spring 121 is attached at one end to the movable leaf of the bellows pneumatic 96 and at the other end to the forward end of a bracket 122, which is rigidly fixed to the header 16. The power pneumatic wind-chest sections 23, 24 and 25 are preferably provided with transverse divisions or walls located preferably near the midlength of said sections so as to divide said sections into bass and treble portions, respectively, if it be desired to produce the expression incident to the present described mechanism in both the bass and the treble. Such divisions or walls are well known for such a purpose. Associated with and alongside of the bass control button or member 120 is another member 124 for controlling the expression in the treble.

It is not necessary to describe in detail the parts associated in this connection with the treble as they are the same or substantially the same as the parts associated with the bass for accomplishing similar functions. However, the corresponding parts in the treble bear the same reference numbers as those in the bass except that they bear exponents, such as 96<sup>a</sup>, etc.

The manner in which either the bass or the treble expression mechanism acts will be clear from a general description of the action of the expression mechanism of the bass. See Figure 9. If the operator desires to soften the bass, and opens the manually-controlled valve 118, atmospheric air will rush into the tube 116 in which there existed suction previously to opening said valve, provided the player mechanism is being operated for playing. The pressure of the admitted air will then act upon the face of the valve 112, and overbalance the action of the suction on diaphragm 107 that tends to keep said valve closed, and will open the valve to admit pressure air into the chamber of valve-carrier 106. The pressure air now enters the tube 105, and acts against the diaphragm 103, which closes the cut-out valve 95, so that the suction is exerted only through the restricted by-pass provided by the regulator-pneumatic 96.

The bass will then be played softly. To restore the normal conditions the operator closes the valve 118, whereupon suction will act upon the diaphragm 107 to open valve 111 and close valve 112, thereby establishing a suction action on the diaphragm 103, which acts to open the cut-out valve 95.

Now, if the perforated music sheet is cut with side perforations for accenting certain bass notes or for carrying a theme in the bass, and the operator is holding open the valve 118, any side perforations in the music sheet registering with the corresponding bass tracker-hole will admit atmospheric air into the tube 108, so that the pressure air will then act upon the diaphragm 103 and suddenly throw open the valve 95, thus emphasizing the note corresponding to the perforation brought in registry with said tracker-hole. This emphasis is due to the suction, inasmuch as the same is free to open valve 111 enough to permit it to influence the diaphragm 103, the atmospheric pressures on the diaphragm 107 and the valve 112 balancing each other and permitting suction to act with full freedom on the diaphragm 107.

#### *Tempo-governor and rewind.*

This mechanism is illustrated in its preferred form in Figures 1, 2, 12 and 13. It is connected with and influences the motor for the forward movement of the perforated music sheet in playing a piece of music and for an accelerated movement of the motor for rewinding the sheet or for stopping the sheet where desired, and also influences the tempo-governor which may be of any approved construction. The motor wind-trunk 125 leads from the motor 34 and the tempo-governor 126 to one side of the wind-trunk 37 which leads to the air tensioning bellows. In passing it may be remarked that the construction of the tempo-governor may, if desired, be as shown in prior Letters Patent to Eustis & Brown, No. 1,165,081, dated Dec. 21, 1913.

A manual control member or lever 127 is mounted in the head or front rail 122, it being preferably in the form of a lever which is pivoted at 128 and is connected by means of a link 129 to a vertical rock shaft 130 which is mounted at the right hand side of the player action and which is connected at its upper end with the tempo-valve slide rods 131, so that the time for playing the piece of music may be changed, the change of time being indicated, in any well known or preferred manner, just below the music rolls if desired.

A manual control member or lever 132 is shown in Figure 1 as arranged upon the front rail or head 22 between the control members 78 and 127. This member is pref-

erably in the form of a lever pivoted at 133 and constitutes the rewind or short-stop member which is manually controlled and initiates the adjustment and movements of the parts which are controlled by it. The pivot 133 takes the form of a rock shaft, which is mounted in suitable bearings in the head or front rail 22 and in the back rail 52 and its rear end is extended and connected by link 134 with a crank arm on a vertical shaft 135, which is adapted to shift the gears between the motor and the music rolls when rewinding the sheet of music. A coupling arm or gear shifting crank 136 is arranged at the upper end of the rock shaft 135 and is adapted for detachable connection with the gear shaft rod 137.

There is arranged in the upper part or horizontal extension of the trunk 37 from the wind-way 15 a cut-out or rewind valve 138 which is adapted to open and close an ample aperture surrounded by a valve seat 139 fixed transversely in the upper part of said trunk 37. Extending rearwardly from the valve 138 is a stem 140 which is arranged in contact with the flexible diaphragm of the puff head 141 which is located at the rear end of horizontal portion of the wind-trunk 37. At the other side of the diaphragm of said puff head there is arranged a port 142 which is normally closed by a spring valve 143, which valve is adapted to be opened and closed by means of a cam member 144 (see Figure 13) which extends from the rock shaft 133, this being the shaft which is rocked by means of the manually controlled member 132.

It will be seen that when it is desired to rewind the perforated sheet of music it is only necessary to operate the manually controlled member 132 so as to cause the cam member 144 to open the valve 143 thereby admitting atmospheric air in back of the diaphragm of the puff 141, thereby moving the valve to closed position. This will cut off the wind-way 15 and hence the wind-chest sections which operate the hammer power pneumatics from the atmospheric tension created by the power bellows and will enable full tension to be exerted through the motor wind-trunk 125. When the valve 143 is closed normal conditions will be established for running the motor, so as to move the perforated music sheet for playing the piece of music perforated therein.

It is preferred that the forwardly extending horizontal portion of the head or front rail 122 be covered as by a strip of hard rubber 145 fixed thereto, and which constitutes the finishing covering for the said expression head or rail, said strip being provided with suitable holes or slots 146 through which portions of the manually controlled members may protrude and be exposed for manipulation by the one who is playing the

musical instrument, by means of the player action, as opposed to the manual or keys of the instrument.

From the above description it will now be obvious how the parts of the player action proper, the sustaining or damper mechanism, the divided hammer-rail action, the thematic solo and accent mechanism and the tempo governor and rewind mechanism which are illustrated by the drawings, or the equivalent of such described parts, may all perform their separate functions in co-ordination with each other for obtaining the desired performance of a piece of music in simulation of manual playing.

As has already been stated, all parts of the mechanism herein described, with the exception of such parts as must have flexibility, are desirably made of metal, preferably sheet metal wherever that can be used. Where sheet metal is used it is desirable and practical as a manufacturing proposition that as many parts as possible of the construction be of similar shape and proportions. Obviously all parts which are detachable from each other, should be properly packed or felted, and all such parts as the valves should have soft faces as by felting them. It will also be obvious to those familiar with this art, that the diaphragms of the puffs be provided with bleed-holes.

For the best form of the invention it is preferred that the parts of the player action be self-contained, but it is obvious that the manually-operated control devices, or those operated from the note sheet, as well as the parts which are influenced thereby, may be differently supported.

When the stationary parts of the player action are composed of sheet metal, or the like, the metal parts of the player action will impart firmness to the structure, and it is believed that they will improve the tone qualities, as well as the responsiveness of the action of the musical instrument to the player action, whether the player action is newly manufactured or has been long in use, so as to simulate the musical tones produced by manual playing as closely as possible. This result is in part accomplished by the possibility of reducing the total linear dimensions of all air passages, thereby producing less friction of the air in said passages.

One way in which the player action may be attached to the case of an instrument is shown.

The flanged ends 27 of the lower headers may be formed with upturned portions or webs 27<sup>a</sup>, which are provided with screw-holes to receive screws which, if the musical instrument is an upright piano, may be screwed into the wooden end-cheeks of the

piano-case. By such means the player action may be readily attached to or detached from the case of the instrument.

From the standpoint of installation into, and the adaptability to, the case of an upright piano, it will be seen that the preferred construction of player action may be readily applied to the case and that the various members or parts thereof will be located, when assembled and so applied, in proper position for carrying out their respective functions, and that the adjustable and detachable connections will be so placed as to be conveniently accessible for adjustment, removal or repair, thereby constituting a comparatively cheap and easily installed mechanism, considering the many advantages which are gained by its construction and functional characteristics.

It will be obvious to those skilled in the art that the modifications indicated, as well as other modifications of the invention, may be resorted to, without departing from the scope of the claims.

What we claim as new is:

1. In a player mechanism for musical instruments, separate, manually-operated, control means for varying the style of playing, and the control-manuals thereof, all grouped together upon the instrument as a removable unit, and a wind-chest section included in said unit.

2. In a player mechanism for musical instruments, separate, manually-operated, control means for varying the style of playing, and the control-manuals thereof, all grouped together below the keys of the instrument as a removable unit, and a wind-chest section included in said unit.

3. In a player mechanism for musical instruments, separate, manually-operated, control means for varying the style of playing, and grouped together below the keys of the instrument as a removable unit, and a wind-chest section included in said unit, in combination with the player-mechanism proper above the keys, comprising a wind-chest structure detachably connected with said wind-chest section.

4. In a player mechanism for keyed musical instruments, a wind-chest section, and manually-operated expression control means and the control-manuals thereof supported from said section.

5. In a player mechanism for keyed musical instruments, a wind-chest section, and manually-operated expression control means and the control-manuals thereof supported from said section, all underneath the keys.

6. In a player mechanism for keyed musical instruments, a wind-chest section towards the rear ends of the keys, a manually-operated expression control means, and the control-manuals thereof supported on said section, said section being connected with

the key-bed and said manuals being free of mechanical connection with the key-bed.

7. In a player mechanism for keyed musical instruments, a wind-chest section, supporting means detachably connected therewith, manually-operated control means and the control-manuals thereof mounted wholly on said supporting means.

8. In a player mechanism for keyed musical instruments, a wind-chest section, supporting means detachably connected therewith, manually-operated control means, and the control-manuals thereof mounted wholly on said supporting means, all underneath the keys.

9. In a player mechanism for musical instruments, a wind-chest section, an open supporting frame mounted thereon and comprising front and rear bars and rods connecting said bars, and manually-operated control means and the control-manuals thereof mounted on said frame.

10. In a player mechanism for musical instruments, a wind-chest section, an open supporting frame mounted thereon and comprising front and rear bars and rods connecting said bars, and manually-operated control means and the control-manuals thereof mounted on said frame, all underneath the keys.

11. In a player mechanism for musical instruments, a wind-chest section toward the rear ends of the keys, an open supporting frame mounted thereon and comprising front and rear bars and rods connecting said bars, said front bar being in advance of said keys and manually-operated control means mounted on said frame and having the initial moving parts thereof associated with said front bar.

12. In a player mechanism for musical instruments, a wind-chest section, an open supporting frame mounted thereon and comprising front and rear bars and rods connecting said bars, means for detachably securing said frame to said wind-chest section, and manually-operated control means mounted on said frame.

13. In a player mechanism for musical instruments, an open supporting frame, comprising detachably connected lengths of material arranged in rectangular form, and manually-operated control means mounted on said frame.

14. In a player mechanism for keyed musical instruments, a stationary supporting frame, and manually-operated control means mounted on said frame, all underneath the key-bed, and control-manuals for the control means which project away from the front portion of the frame in advance of the keys.

15. In a player mechanism for keyed musical instruments, a supporting frame below the key-bed, a stationary member separate from the key-bed, and with which said frame

is removably but rigidly connected, said frame extending in a plane substantially parallel with the said key-bed to a position in advance of the keys, and manually-operated control means mounted on said frame.

16. In a player mechanism for musical instruments, a supporting frame, comprising front and rear parallel bars, the front bar being located in the front edge of the key-bed and the rear bar towards the rear edge thereof, said frame being underneath the keys, transverse rods connecting said bars and manually-operated control means mounted on said bars.

17. In a player mechanism for musical instruments, a wind-chest section, supporting means relatively narrow with respect to the length of said section, and located on and extending forwardly from approximately the mid-length of said section to beyond the keys, and separate, manually-operated, control means, grouped together on said supporting means.

18. In a player mechanism for musical instruments, a wind-chest section, relatively narrow supporting means on and extending forwardly from approximately the mid-length of said section to beyond the keys, and separate, manually-operated, control means, grouped together on said supporting means, said elements being assembled as a unit, which is removable from the instrument.

19. In a player mechanism for musical instruments, a wind-chest section, relatively narrow supporting means on and extending forwardly from approximately the mid-length of said section to beyond the keys, and separate, manually-operated, control means, grouped together on said supporting means, said elements being assembled as a unit, which is removable from the instrument, and being located beneath the keys, said control means having control-manuals in front of said keys.

20. In a player mechanism for musical instruments, a wind-chest section, supporting means relatively narrow with respect to the length of said section, and located on and extending forwardly from approximately the mid-length of said section, and separate, manually-operated, control means, grouped together on said supporting means, the wind-chest section and supporting means being detachably connected.

21. In a player mechanism for musical instruments, a wind-chest section, and separate, control-manuals supported from said section.

22. In a player mechanism for musical instruments, a wind-chest section, and separate, control-manuals supported from approximately the middle-portion of said section.

23. In a player mechanism for musical

instruments, a tubular, metallic, wind-chest section, and separate, control-manuals supported from said section.

24. In a player mechanism for musical instruments, a wind-chest section, and separate, manually-operated, expression control means and control-manuals therefor supported from said section, said section and control means being assembled in the instrument as a removable unit.

25. In a player mechanism for musical instruments, a tubular, metallic, wind-chest section, a metallic supporting frame mounted on said section, and control means and control-manuals therefor mounted on said frame.

26. In a player mechanism for musical instruments, a tubular, metallic, wind-chest section, a relatively narrow metallic supporting frame mounted on said section, at approximately the mid-length thereof, and control means and control-manuals therefor mounted on said frame.

27. In a player mechanism for musical instruments, a wind-chest structure comprising a series of wind-chest sections of approximately the same length and an upright header extending transversely of and below the key-bed, the lower of said sections being below said bed.

28. In a player mechanism for musical instruments, a wind-chest structure comprising a series of wind-chest sections and an upright header extending transversely of the key-bed to a point below it, the lower of said sections being below said bed, said sections being separable from each other at a joint which is located in said header above said lower section.

29. In a player mechanism for musical instruments, a wind-chest structure comprising a series of wind-chest sections of approximately the same length and an upright header extending transversely of the key-bed, the lower of said sections being below said bed, said sections being separable from each other at a joint which is located in said header directly above said lower section.

30. In a player mechanism for musical instruments, a wind-chest structure comprising a series of metallic wind-chest sections of approximately the same length and metallic upright headers extending transversely of the key-bed, the lower of said sections being below said bed, said sections being separable from each other at joints which are located in said headers directly above said lower section.

31. In a player mechanism for musical instruments, an assembly of elements constituting a unit extending from the rear forwardly to the front of the keys, fixed removably as such in the instrument, and comprising supporting means, and members for controlling the expression mounted thereon, and



having manually-operated parts for effecting the functioning thereof.

32. In a player mechanism for musical instruments, an assembly of elements constituting a unit fixed removably as such in the instrument, and comprising supporting means, including a head-rail, and members for controlling the expression mounted on said supporting means and having manually-operated parts, protruding from said rail, for effecting the functioning thereof, the key-bed of the instrument having a longitudinal recess which receives said rail.

33. In a player mechanism for musical instruments, an assembly of elements constituting a unit, fixed removably as such in the instrument, and comprising supporting means, including a head-rail, and members for controlling the expression mounted on said supporting means, and having manually-operated parts, protruding through said rail, for effecting the functioning thereof.

34. In a player mechanism for musical instruments, the pumpers, an assembly of elements constituting a unit, fixed removably as such in the instrument and located above the pumpers, and comprising supporting means, and members for controlling the expression and the expression pneumatics mounted on said supporting means, said members having manually-operated parts for effecting the functioning thereof.

35. In a player mechanism for musical instruments, a pneumatic player action, the pumpers, an assembly of elements constituting a unit, fixed removably as such in the instrument, and comprising supporting means, members for controlling the expression mounted on said supporting means, and having manually-operated parts for effecting the functioning thereof, and a wind-chest or air-main section leading from the pneumatic action to the pumping bellows and from which said supporting means extend forwardly.

36. In a player mechanism for musical instruments, an assembly of elements constituting a unit, fixed removably as such in the instrument and extending forwardly therein, and comprising supporting means, members for controlling the expression, including means for operating the hammer-rail and means for operating the damper-rail, mounted on said supporting means, and having manually-operated parts for effecting the functioning thereof.

37. In a player mechanism for musical instruments, an assembly of elements constituting a unit, fixed removably as such directly beneath the keys, and comprising a wind-chest section, supporting means thereon, and members for controlling the expression and tempo, and for controlling the damper-rail and hammer-rail, mounted on said supporting means, and having manu-

ally-operated parts for effecting the functioning of said expression members, said wind-chest section and supporting means being in a substantially horizontal plane.

38. In a player mechanism for musical instruments, an assembly of elements constituting a unit, fixed removably as such beneath the keys, and comprising a wind-chest section, supporting means thereon, members for controlling the expression and tempo, and for controlling the damper-rail and hammer-rail, mounted on said supporting means, and having manually-operated parts for effecting the functioning of said expression members, and primary conduits for the pneumatics of such expression members whether leading to the tracker-bar or to said manually-operated parts, in combination with the pneumatic striking action, connected with said wind-chest section and located above the keys, said wind-chest section and supporting means lying in a substantially horizontal plane, and said pneumatic action extending in a plane substantially at right angles to said wind-chest section and supporting means.

39. In a player mechanism for musical instruments, a wind-chest section and hollow uprights or cheeks at the ends of said section, all of said parts of metal and constituting a metallic structure, and, supported thereby, pneumatics and valves, such as those for expression and the like, but other than the action striker-pneumatics and valves.

40. In a player mechanism for musical instruments, a wind-chest section and hollow uprights or cheeks at the ends of said section, and constituting a hollow structure, and, supported thereby, pneumatics and valves, such as those for expression and the like, but other than the action striker-pneumatics and valves, and bearings for the moving parts, also incorporated in said structure.

41. In a player mechanism for musical instruments, a wind-chest section having hollow uprights or cheeks at its ends, an open frame extending approximately at right angles to said cheeks, said parts being of metal and rigidly connected as a unit constituting a metallic structure, in combination with pneumatics and valves, such as those for expression and the like, but other than the action striker-pneumatics and valves, mounted on said structure, and pneumatically-operated control parts for said first pneumatics and valves, mounted on said frame.

42. In a player mechanism for musical instruments, a wind-chest section having hollow uprights or cheeks at its ends, an open frame extending approximately at right angles to said cheeks, said parts being of metal and rigidly connected as a unit constituting a metallic structure, in combina-

- tion with pneumatics and valves, such as those for expression and the like, but other than the action striker-pneumatics and valves, mounted on and in said structure, and pneumatically-operated control parts for said first pneumatics and valves, mounted on said frame, said wind-chest section being located below the key-bed, and said metallic structure with its said supported parts being fixed removably in the instrument.
43. In a player mechanism for musical instruments, the combination of a damper-rod, a wind-chest section, a bearing at one end thereof, control and operating members, one of which latter is journaled in said bearing, and a connecting-stem between said operating member and said damper-rod.
44. In a player mechanism for musical instruments, the combination of a damper-rod, a wind-chest section, a bearing at one end thereof, control and operating members, one of which latter is journaled in said bearing, and a connecting-stem between said operating member and said damper-rod, and means for operating said damper-rod pneumatically through the tracker, comprising a power-pneumatic having its movable leaf connected with said stem, the connections with the said stem permitting an independent movement of the said pneumatic means and said operating member without moving the other of the last two when one of them is operated.
45. In a player mechanism for musical instruments, the combination of a damper-rod, a wind-chest section, a valve-casing having primary and secondary valves and inserted into said section, a power-pneumatic supported on said section and connected with said valve-casing, a tracker-tube leading to said valve-casing, and means for connecting the movable leaf of said pneumatic with said damper-rod for a direct pull on a line substantially parallel with the said rod.
46. In a player mechanism for musical instruments, the combination of a hammer-rail operating-rod, and means for pneumatically operating said rod, comprising a conduit provided with a manually-controlled valve at one end, a wind-chest section, a valve-casing having primary and secondary valves and inserted in said section, and protruding at its outer end beyond said section, the other end of said conduit connected with said casing, and a power-pneumatic mounted on said section and communicating with said valve casing, the movable leaf of which pneumatic is connected with said hammer-rail operating-rod.
47. In a player mechanism for musical instruments, the combination of a hammer-rail operating-rod at each end of the instrument for bass and treble, and means for pneumatically operating said rods, comprising a conduit provided with a manually-controlled valve at one end, a horizontal wind-chest section extending from side to side of the instrument, one such conduit being associated with each end of said section, a valve-casing at each end of said section having primary and secondary valves and inserted in said section transversely thereof, the other end of each of said conduits connected with one of said casings, and a power-pneumatic mounted on each end of said section and communicating with said valve-casings, the movable leaves of which pneumatics are connected with said hammer-rail operating-rods.
48. In a player mechanism for musical instruments, the combination of a wind-chest section, a header or hollow end-cheek thereon, having an internal valve-seat, a cut-out valve in the lower part of said cheek to control its seat opening, a pneumatic, mounted on and opening to said cheek by by-pass ports at opposite sides of said valve-seat, and having a valve controlling the said ports, a puff at the lower end of said cheek, and manually-controlled pneumatic expression means for acting on said puff to operate said cut-out valve for obtaining soft tone effects.
49. In a player mechanism for musical instruments, the combination of a wind-chest section, a header or hollow end-cheek thereon, having an internal valve-seat, a cut-out valve in the lower part of said cheek to control its seat opening, a pneumatic, mounted on and opening to said cheek by by-pass ports at opposite sides of said valve-seat, and having a valve controlling the said ports, a puff at the lower end of said cheek, and manually-controlled pneumatic expression means for acting on said puff to operate said cut-out valve for obtaining soft tone effects, said wind-chest section and pneumatic expression means being located under the key-bed.
50. In a player mechanism for musical instruments, the combination of a wind-chest section, pneumatically-operated means, having a cut-out valve, associated with said section for obtaining a normal or a restricted flow of air through said section, and a valve-casing inserted into and communicating with said section and provided with a puff and valved-openings, one of which openings connects said section and said pneumatic means, and the other is adapted to admit atmospheric air to said pneumatic means, whereby the restricted flow of air and consequent soft tones may be produced through the operation of said cut-out valve.
51. In a player mechanism for musical instruments, the combination of a wind-chest section, pneumatically-operated means, having a cut-out valve, associated with said section for obtaining a normal or a restricted

flow of air through said section; and a valve-casing inserted into and communicating with said section and provided with a puff and valved-openings, one of which openings connects said section and said pneumatic means, and the other is adapted to admit atmospheric air to said pneumatic means, and manually-controlled means for admitting atmospheric air, whereby the restricted flow of air and consequent soft tones may be produced through the operation of said cut-out valve.

52. In a player mechanism for musical instruments, the combination of a wind-chest section, pneumatically-operated means, having a cut-out valve, associated with said section for obtaining a normal or a restricted flow of air through said section; and a valve-casing inserted into and communicating with said section and provided with a puff and valved-openings, one of which openings connects said section and said pneumatic means, and the other is adapted to admit atmospheric air to said pneumatic means, and manually-controlled means for admitting atmospheric air, whereby the restricted flow of air and consequent soft tones may be produced through the operation of said cut-out valve, said wind-chest section, valve-casing and manually-controlled means being located below the keys.

53. In a player mechanism for musical instruments, the combination of a wind-chest section, pneumatically-operated means, having a cut-out valve, associated with said section for obtaining a normal or a restricted flow of air through said section; and a valve-casing inserted into and communicating with said section and provided with a puff and valved-openings, one of which openings connects said section and said pneumatic means, and the other is adapted to admit atmospheric air to said pneumatic means, whereby the restricted flow of air and consequent soft tones may be produced through the operation of said cut-out valve; and a tracker conduit leading to said puff for obtaining accents during such soft effects or for obtaining a solo-effect.

54. In a player mechanism, for keyed musical instruments, manually operated, control actions, separate from each other and for varying the style of playing, and their control-manuals all grouped together below the key-bed and upon the player mechanism as distinguished from the case and key-bed of the instrument.

55. In a player mechanism for musical instruments, a windchest section and supporting means mounted thereon, said means comprising front and rear bearings and connections mounted in said bearings, and manually operated control means on said connections.

56. In a player mechanism for musical instruments,

a windchest section and supporting means mounted thereon, said means comprising front and rear bearings and connections mounted in said bearings and manually operated control means on said connections, said front bearings and control means being in advance of the keys.

57. In a player mechanism for musical instruments, a windchest section and supporting means mounted thereon under and separate from the key-bed, said means comprising front and rear bearings and connections mounted in said bearings and manually operated control means rigidly supported on said connections under the key bed.

58. In a player mechanism for keyed musical instruments, supporting means under the key-bed, control action connections on said means, said connections extending approximately to the front of the instrument; and control-manuals for the front ends of said connections said manuals being supported from said supporting means.

59. In a player mechanism for keyed musical instruments, supporting means under, and supported for movement without movement of, the key-bed, control action connections on said supporting means and control-manuals for the front ends of said connections and which are supported by and removable with the removal of said supporting means.

60. In a player mechanism for musical instruments, the combination of a wind-chest section, pneumatics and valves, such as those for expression and for varying the style of playing, but other than the action-striker-pneumatics and valves, mounted on the wind-chest section, control parts for said first mentioned pneumatics and valves and carried by the wind-chest section a depending neck attached to said wind-chest section, and a bellows attached to said neck.

61. In a player mechanism for keyed musical instruments, a sheet metal wind-way beneath the key-bed and a depending sheet metal neck permanently attached to said wind-way and being of sufficient length for the attachment of a bellows, in combination with a bellows supported by said neck.

62. In a player mechanism for musical instruments, a wind-way, and a depending neck attached to said wind-way, in combination with means for creating air tension, and a fastening bolt and nut, said bolt passing across said neck and providing, with said nut, means for detachably connecting said tension means to said neck.

63. In a player mechanism for keyed musical instruments, a player structure comprising player parts, above and below the key-bed, said structure having a supporting member below the key-bed, and control means for said player parts and the control-manuals thereof, below the key-bed, said

56. In a player mechanism for musical instruments, 130

control means comprising control-shafts supported by said supporting member and extending upwardly through the key-bed to player parts above the key-bed.

5 64. In a player mechanism for keyed musical instruments, a player structure comprising two separable superposed units with player parts, above and below the key-bed, and control means for said player parts, below the key-bed, in combination with means 10 for supporting the unitary upper portion of said player structure from the unitary lower portion thereof.

15 65. In a player mechanism for keyed musical instruments, a player structure comprising two separable superposed units with player parts, above and below the key-bed, and control means for said player parts, below the key-bed, and a case, in combination 20 with means for attaching the unitary lower portion of said structure rigidly to said case, and means for supporting the unitary upper portion of said structure on the lower portion thereof.

25 66. In a player mechanism for keyed musical instruments, the combination of a wind-way beneath the key-bed, expression control means and the control-manuals thereof associated with said wind-way, and supporting 30 means for the control-manuals removably connected with the wind-way, said supporting means having upwardly-extending portions for attachment to the key-bed.

35 67. In a player mechanism for keyed musical instruments, the combination of a wind-way beneath the key-bed, expression control means and the control-manuals thereof associated with said wind-way, and supporting 40 means for the control-manuals removably connected with the wind-way, said supporting means having upwardly-extending portions, and said upwardly-extending portions being secured to the wind-way and the key-bed.

45 68. In a player mechanism for musical instruments, the combination of a wind-way having an outwardly-extending shelf, tracker-tubes, and parts formed integrally with said shelf to support said tubes.

50 69. In a player mechanism for musical instruments, the combination of a wind-way having a rearwardly-extending shelf, tracker-tubes and tracker-tube supports on said shelf for maintaining said tubes in 55 alinement with the openings in the wind-way, through which openings said tubes enter said wind-way.

70. In a player mechanism for musical instruments, the combination of a wind-way 60 having a rearwardly-extending shelf, pneumatics attached to said shelf, and means for stiffening said shelf, comprising tracker-tubes rigidly connected with the tracker.

65 71. In a player mechanism for musical instruments, a wind-way having an upright

hollow header or cheek, in combination with an expression-valve located in said header, and means for operating said valve.

72. In a player mechanism, a wind-way having an upright header or cheek, said 70 header being provided with a transverse orificed valve-seat, in combination with an expression-valve to control the orifice and located in said header, said valve having a depending stem, and means adapted to act on 75 said stem for operating said valve.

73. In a player mechanism, a wind-way having an upright hollow header or cheek, in combination with a hollow head or pouch at the lower end of said header, and a valve 80 operable from within said head or pouch.

74. In a player mechanism, a wind-way, in combination with a puff or motor-pneumatic, connected with and located at an end of said wind-way, and a valve operable by 85 said puff or pneumatic.

75. In a player mechanism, a wind-way having an upright hollow header or cheek, in combination with a hollow head or pouch at the lower end of said header, a flexible 90 diaphragm in said head or pouch, a transverse orificed valve-seat in said header, an expression-valve located in said header and having a depending stem resting on said diaphragm through the gravity thereof and 95 said valve, and means adapted to act on said diaphragm for operating said valve through said stem.

76. In a player mechanism for musical instruments, the combination of a wind-way, 100 a rigid depending neck on the same, the air-reservoir of the pumping bellows in front of and seated against the front wall of said neck, and means for removably fastening the air-reservoir and pumping bellows in 105 position against said front wall.

77. In a player mechanism for musical instruments, the combination of a wind-way, a depending neck on the same, both of sheet metal and forming a substantially rigid 110 structure, the air-reservoir of the pumping bellows, and means for removably fastening the air-reservoir and said bellows to the lower end of said neck.

78. In a player mechanism for musical instruments, the combination of a wind-way, 115 a rigid depending goose-neck on the same, having its bend presented rearwardly, and its lower end inclined forwardly, the air-reservoir of the pumping bellows in front of 120 and seated against the front wall of said inclined end of the neck, and means for removably fastening the air-reservoir and pumping bellows in position against said neck. 125

79. In a player mechanism for musical instruments, a wind-chest section, and manually-operated control means and the control-manuals thereof, supported from said wind-chest section and constituting an assemblage 130

of parts which are removable as a unit from the instrument.

80. In a player mechanism for keyed musical instruments, the combination with the key-bed of the instrument, of a wind-chest section, means for detachably connecting said section with said key-bed, and manually-operated control means and the control-manuals thereof supported from said section.

81. In a player mechanism for keyed musical instruments, a wind-chest section towards the rear ends of the keys, and manually-operated expression control means and the control-manuals thereof supported on said section, said parts constituting a bodily movable unitary assemblage which may be positioned in the instrument to dispose the said manuals in front of the keys.

82. In a player mechanism for keyed musical instruments, a wind-chest section, supporting means detachably connected therewith, manually-operated control means on said section and supporting means, and control-manuals for said control means, mounted on said supporting means.

83. In a player mechanism for keyed musical instruments, a wind-chest section, supporting means detachably connected therewith, manually-operated control means on said section and supporting means, and control-manuals for said control means, mounted on said supporting means, all underneath the keys.

84. In a player mechanism for keyed musical instruments, the player action proper, rigid supporting means on said player action proper and located under the key-bed, control action connections on said means, said connections extending approximately to the front of the instrument, and control-manuals for the front ends of said connections.

85. In a player mechanism for keyed musical instruments, the player action proper, rigid supporting means thereon, located under the key-bed and detachably connected with the key-bed, for removal without movement of the key-bed, control action connections on said supporting means, and control-manuals for the front ends of said connections and which are removable with the removal of said supporting means.

86. In a player mechanism for musical instruments, the combination of a wind-chest section, pneumatics and valves, such as those for expression and for varying the style of playing, but other than the action-striker-pneumatics and valves, mounted on the wind-chest section, control parts for said first-mentioned pneumatics and valves, a depending neck permanently attached to said wind-chest section, a motor wind-trunk leading laterally from the neck, and a bel-

lows attached to said neck at a point beyond said motor wind-trunk.

87. In a player mechanism for keyed musical instruments, a player structure comprising player parts, above and below the key-bed, said structure having a supporting member below the key-bed, control means for said player parts and mainly positioned below the key-bed but including control-shafts for some of the player parts above the key-bed, which shafts are mounted on said supporting member and extend upwardly through the key-bed, and control-manuals for the control means, located at the front of the key-bed.

88. In a player mechanism for musical instruments, a key-bed and the keys, a unitary supporting means extending below the key-bed, expression devices, and control means, as for tempo and spool mechanism, extending above the keys, the said devices and control means being supported by said unitary supporting means.

89. In a player mechanism for musical instruments, a key-bed and the keys, a unitary supporting means extending below the key-bed and provided with means for detachably supporting the same, as a unit, from the case of the instrument, expression devices, and control means, as for tempo and spool mechanism, extending above the keys, the said devices and control means being supported by said unitary supporting means.

90. In a player mechanism for musical instruments, a key-bed and the keys, a unitary supporting means extending below the key-bed, expression devices, and control means, comprising upright rock-shafts extending above the keys, the said devices and shafts being supported by said unitary supporting means.

91. A pneumatic player mechanism for keyed musical instruments, consisting of a unitary player-action proper, a unitary control action having control means for the player action and control-manuals for the control means, and a unitary air-pumping device, the said three units having rigid wind-ways directly connectible at separable joints, means for rigidly and directly connecting the said units, as separable units, in their assembled operative relation in an instrument case, and means for rigidly mounting them in the case, whereby a rigid wind-way structure, free from separate wind-way extensions in the said wind-ways and between the units, is produced throughout the player mechanism, and a self-contained, removable, player mechanism is provided.

92. In an upright player-piano, a unitary player action proper therein above the key-bed, a unitary control action for said player action, comprising separate control means,

and located in the piano case, control-manuals for the control action, and a unitary air-pumping device in the case, the said three units having rigid wind-ways directly  
 5 connected at separate joints, means for rigidly and directly connecting the said units, as separable units, in their assembled operative relation, in and upon the upright piano case, and means for rigidly mounting them  
 10 in the case, each of said units being separately removable from the case.

93. In combination with an upright piano, a complete self-contained pneumatic player mechanism in the case thereof, having operative  
 15 player parts above and below the key-bed, said complete mechanism containing within itself all necessary wind-ways and consisting of not more than three operatively associated units, and means for supporting  
 20 said units from the piano case for separate removal, whereby all of said complete mechanism is removable from said case.

94. In player mechanism for keyed musical instruments, the combination of a unitary, pneumatic, player action proper, and  
 25 therebelow a unitary control assembly therefor, comprising supporting means and pneumatic means for controlling the expression or the like mounted on said supporting  
 30 means and having control-manuals at the key-bed, the said units having wind-ways with joints mutually and separably connecting said units directly, and means for removably securing the supporting means for  
 35 the said control unit to the key-bed, said manuals being directly detached from the key-bed.

95. In a player-piano, the combination with an upright piano, of a pneumatic

player therefor extending above and below  
 40 the key-bed and having its various parts secured together independently of the piano case, an air-pumping device secured to, and having operative connection with, the  
 45 player, and means for securing the combined player and pumping device to the piano in operative relation with the piano action.

96. An upright, pneumatic, player piano, comprising two main parts, one part comprising  
 50 the piano, including its keys, action and case, the other comprising the player and a support for the pumping device, and detachable connections securing the player  
 55 in the case in operative relation with the piano, the control-manuals of the player being wholly carried by it whether the player is or is not in the said case.

97. In an upright, pneumatic, player piano, a main part including the piano case, 60  
 keys, and hammer and damper devices, another main part comprising the player parts, hammer and damper control-manuals and actuating connections therefrom, means for  
 65 detachably securing the two main parts together with the piano action in operative relation to the player and the actuating connections in relation to the hammer and damper devices, and means for detachably  
 70 and operatively connecting the said actuating connections with the hammer and damper devices.

Signed at Cambridge, Massachusetts, in the county of Middlesex, and State of Massachusetts, this 29th day of July A. D. 1919. 75

WILLIAM A. WATSON.  
 WARNER EUSTIS.