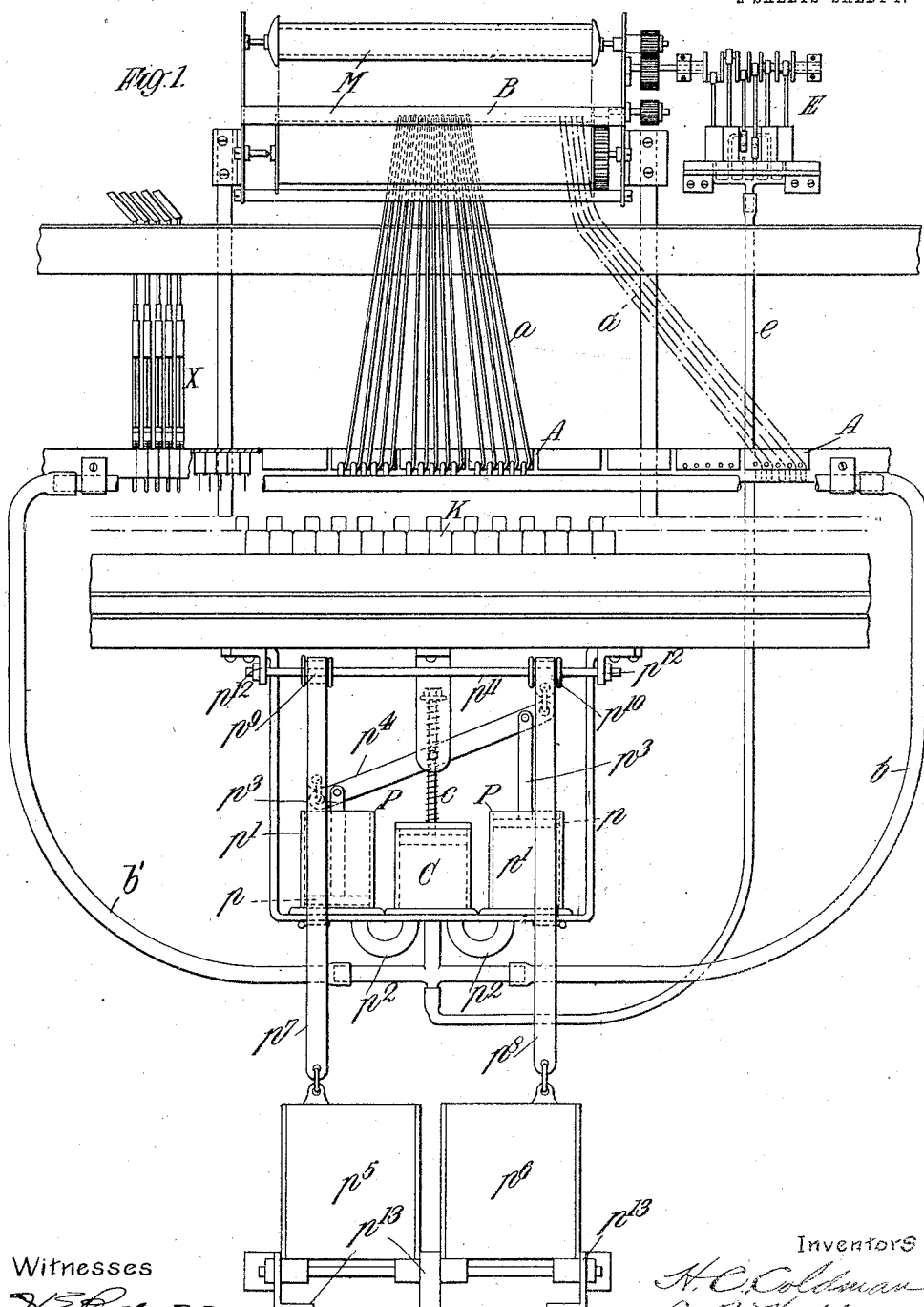


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MECHANICAL PLAYER FOR MUSICAL INSTRUMENTS.
APPLICATION FILED JULY 19, 1909.

1,035,532.

Patented Aug. 13, 1912.

2 SHEETS-SHEET 1.



Witnesses

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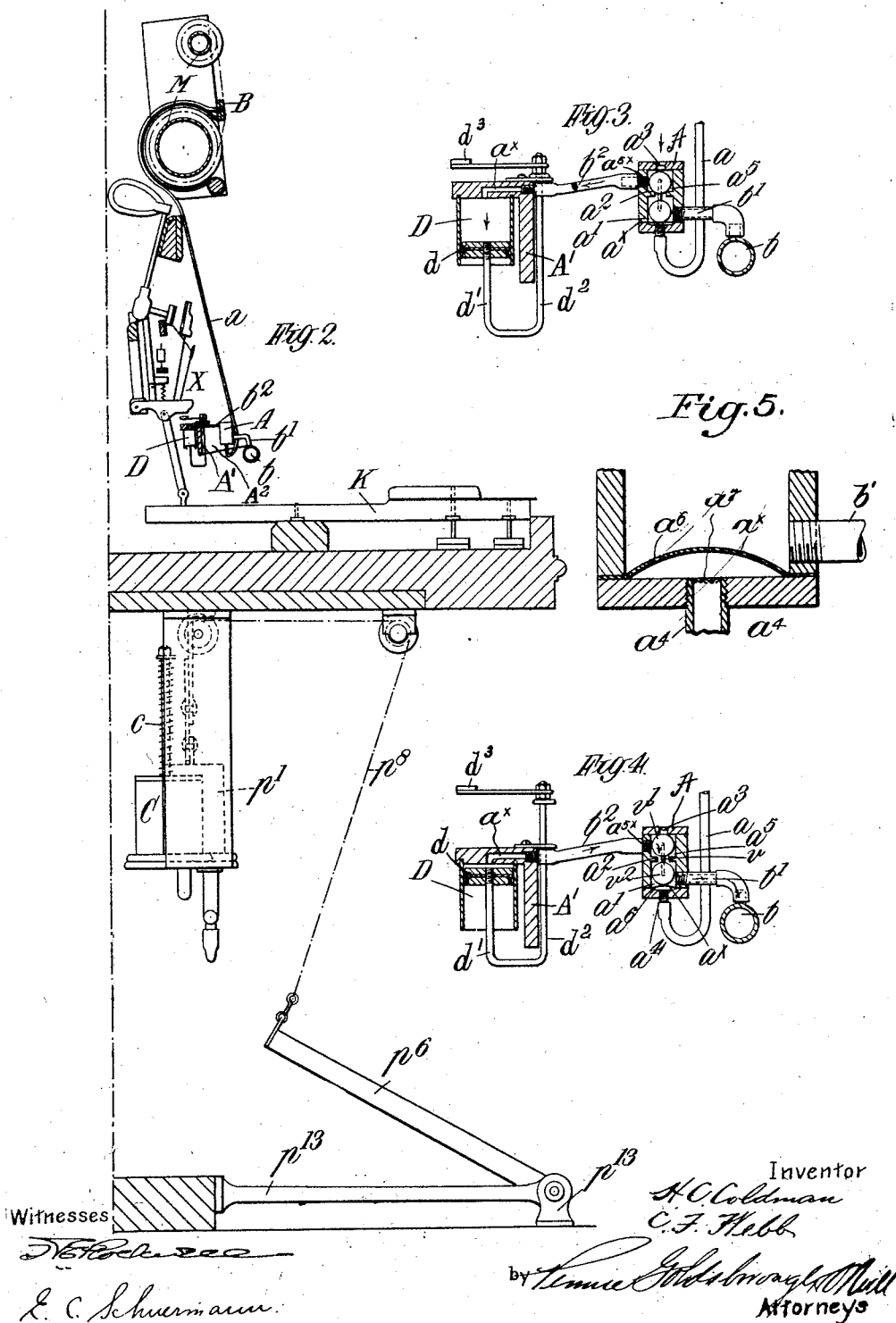
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UNITED STATES PATENT OFFICE.

HENRY CHARLES COLDMAN, OF CATFORD, AND CHRISTOPHER FREDERICK WEBB, OF LEWISHAM, ENGLAND.

MECHANICAL PLAYER FOR MUSICAL INSTRUMENTS.

1,035,532.

Specification of Letters Patent.

Patented Aug. 13, 1912.

Application filed July 19, 1909. Serial No. 508,365.

To all whom it may concern:

Be it known that we, HENRY CHARLES COLDMAN and CHRISTOPHER FREDERICK WEBB, subjects of the King of Great Britain, residing, respectively, at 127 Glenfarg road, Catford, and 107 Gilmore road, Lewisham, both in the county of Kent, England, have invented certain new and useful Improvements in and Relating to Mechanical Players for Musical Instruments, of which the following is a specification.

Our present invention relates to mechanical players of the pneumatic type for musical instruments, such as pianos and other keyboard instruments, and has for its objects to provide an effective player which is more simple and compact in construction and capable of being made more cheaply than the players heretofore proposed, with which we are familiar.

According to our present invention the apparatus is so constructed that a note is sounded by a blow imparted through the medium of an actuator acting directly on the piano action, thereby operating the hammer of the action, the actuator being actuated by an improved form of power pneumatic which consists of a cylinder in which a piston is mounted to freely reciprocate, the said piston being caused to move each time a hole in the music sheet registers with the corresponding hole in the tracker board by means of atmospheric suction from a reservoir through which air is drawn by a suitable pump operated by foot or other power.

It is also an object of our invention to arrange a set of power pneumatics and their associated actuators in the upper part of a piano casing, above the piano keys and in close proximity to the hammer action of the piano, it being possible by reason of the peculiar construction and arrangement of our improved pneumatics to make the whole mechanism as a unit and then incorporate the same easily in the casing of an upright piano.

More specifically, we contemplate mounting our improved actuating means, which is in the form of pneumatic cylinders and pistons freely movable in said cylinders, on a common carrier element, with which said pneumatics are combined prior to their installation in the piano, said carrier element being then capable of introduction into the

upper part of the piano casing in which it is mounted in the location previously indicated. The connections for operating said pneumatics from the tracker board and the usual pumps may then be easily connected up for operation with the tracker board which can readily be placed in any desired position, as for instance, in the upper part of a piano casing. The pistons of the power pneumatics are operatively connected with the wippens of the action with which they correspond in number and location.

In order that the said invention may be more clearly understood and readily carried into effect, we will describe the same more fully with reference to the accompanying drawings, in which—

Figure 1 is a front elevation of one form of our apparatus embodying the features of our invention, the view showing sufficient portions of a piano to give a clear understanding of the relative arrangement of the parts; Fig. 2 is a sectional elevation of the same; Figs. 3 and 4 are details in section, on a larger scale than Figs. 1 and 2, of parts of said apparatus; Fig. 5 is a detail view of the primary diaphragm pneumatic.

Referring to the drawings the reference letter K designates the keyboard of an ordinary upright piano and the letter X the piano hammer action.

A convenient form of the mechanism for actuating one hammer of the instrument (the mechanism being merely repeated for each hammer to be actuated) comprises a valve device A which is connected with the tracker board B by flexible or other tubes *a*, said valve device being connected by flexible or other tubes *b*, *b'* to the air reservoir C of the pump, and also by flexible or other tubes *b*² to the power pneumatic cylinders D in each of which a piston *d* is freely movable in such manner that when an aperture in the tracker board B is closed, air is admitted through an aperture in a valve device which will be hereinafter more particularly described, but when a slot in the music sheet opens a corresponding aperture in the tracker board, the aperture in the valve device closes and air is drawn out of the cylinder of the power pneumatic D, causing its associated piston *d* to withdraw into the cylinder carrying with it the piston rod *d'* and also moving its extension *d*², which latter is provided with an actuator

in the form of a hammer d^3 , the said actuator operating directly upon the wippen of the action to lift the same in precisely the same manner that the wippen is actuated through the medium of the piano keys K in ordinary manual playing of the piano.

The valve device A, comprises a chamber a' provided with a diaphragm or other suitable device a^x on one side and a double valve seat a^2 a^3 on the other side. The outer seat a^3 may be of some flexible material. The chamber a' is provided with a passage a^4 to which the tube a leading from the tracker board aperture is connected and said chamber also has a passage a^{5x} connecting the opposite tube b^2 extending from the power pneumatic cylinder D to a small chamber a^5 between the seats a^2 a^3 .

It will be noted that the pneumatic cylinders D are arranged in a single horizontal series extending in a line across the piano casing preferably in close proximity to the wippens to which they correspond in number and with which they are aligned. The carrier element previously mentioned may conveniently take the form of a bar or rail A' and on it all cylinders of the power pneumatics are mounted, and also the several valve devices A are connected to and supported from the bar or rail A' by means of brackets A², as shown in Fig. 2. It will be readily understood that the said cylinders and valve devices can be applied to or combined with said carrier element prior to the introduction of the latter into the piano casing in which said element is mounted in any convenient way. In the embodiment illustrated, the carrier element is bored out to afford passages or ducts a^x permitting the exhaust of the respective cylinders D, for which purpose they are connected with the tubes b^2 . The pistons d of the power pneumatics are vertically arranged in order that the actuators operated thereby (illustrated as comprising the piston rod d' , extension d^2 and hammer d^3) may cooperate with the wippens of the piano action in a direct and reliable manner.

When the tracker board aperture is closed by an imperforate part of the music sheet M, the pressure in the chamber a' being less than atmosphere causes the double valve v' v^2 to close the chamber a' and the tube a , leaving the outer seat a^3 open, thereby opening the said chamber a^5 between the seats to the atmosphere and allowing the aforesaid cylinder of the power pneumatic d to be open to the atmosphere which will cause the parts to assume the position shown in Fig. 3, this being the normal position of the parts.

As soon as the corresponding note slot or aperture in the music sheet registers with an aperture in the tracker board the pressure in the passage a^4 and the tube a between the

tracker board aperture and the valve device A is increased, thereby raising the diaphragm a^x and effecting the closing of the valve v' against the outer seat a^3 . This closing of the valve against the outer seat opens the inner seat a^2 and allows the air to be drawn from the cylinder D of the power pneumatic; thus direct suction is set up, as shown by the arrows in Fig. 4, between the reservoir C of the pump and the piston device D which operates in the manner heretofore described. Now, after the re-closing of the tracker board aperture, some air will remain in the space between the music sheet and the valve device, and in order to provide for the escape of this air a small bleed aperture or passage a^6 is formed in the diaphragm a^x . In order to prevent the escape aperture from being closed up by particles of dust or paper, a piece of silk or other porous material a^7 is placed between the diaphragm and the tracker board aperture so as to filter the air which may pass through the minute aperture in the diaphragm and so prevent the said aperture from being stopped up, as shown in Fig. 5.

The valve mechanism comprises a spindle v , on each end of which is mounted a ball v' and v^2 . For convenience of construction, the ball v' may be loosely mounted on the spindle v and the ball v^2 firmly fixed thereto. The ball v^2 serves to transmit the motion of the diaphragm to the ball v' through the spindle v . Again, after the re-closing of the aperture in the tracker board the air pressure on each side of the piston d of the power pneumatic is in balance, owing to both sides being open to the atmosphere. The piston is, therefore, allowed to fall or return by gravity (see Fig. 3). In some instances, and with a view to assisting the return of the piston, a spring may be associated therewith in any suitable manner.

The music roll is operated by any suitable form of cylinder or other motor E which may be connected up by a flexible or other pipe e with the reservoir C of the pump from which air is drawn by means of the pumps P which comprise pistons p operating in cylinders p' , both in air communication with the reservoir C through the pipes p^2 . The piston rods p^3 may be connected through the pivoted cross rod or bar p^4 , each end of which is respectively connected to the pedals p^5 , p^6 , by means of suitable straps p^7 and p^8 , or the like passing over pulleys p^9 , p^{10} , mounted on the shaft p^{11} carried in the bearings p^{12} , which are secured to the under side of the key base of the piano. The pedals, as shown, are mounted in a suitable frame p^{13} .

With the apparatus above described, many of the devices for accenting, accelerating and retarding and otherwise modifying and interpreting the various musical

compositions can be attached with little, if any, modification of the existing mechanism by anyone reasonably skilled in the art, and cylinders with pistons may be employed where desirable to operate any expression devices, but it may be observed here that our air reservoir is of such dimensions that while being sufficiently large and fitted with a spring-controlled regulator to prevent any unevenness, due to irregular pedaling, it is possible to obtain *p.*, *pp.*, *ppp.*, or *f.*, *ff.*, and *fff.* effects by varying the strength of the pedaling which may dispense with extra mechanism heretofore usually employed for that purpose, it being possible to obtain these effects because of the fact that our improved power pneumatics which consist of the cylinders and pistons are extremely active and sensitive in operation.

While we have described the apparatus as operating by suction, it will be obvious that the same may be readily adapted for operation by pressure. The pressure, under ordinary conditions, may vary in our apparatus from about one and a half pounds to twelve pounds per square inch.

The invention is applicable as an interior attachment to a piano or in the cabinet form of player or as a coin-operated automatic machine.

What we claim is:—

1. A piano having a playing attachment inclosed in the casing thereof, said attachment comprising a plurality of vertically arranged cylinders and pistons freely movable therein, said cylinders located transversely of the piano casing, above the plane of the piano-keys and below the wippen of the action, one of such cylinders being in vertical alinement with each wippen, an actuator between each piston and its associated wippen, and valve mechanism for controlling the operation of the said pistons.

2. A piano having a playing attachment inclosed in the casing thereof, said attachment comprising a plurality of vertically arranged cylinders and pistons freely movable therein, said cylinders located transversely of the piano casing, each such cylinder being in vertical alinement with the corresponding wippen to be actuated, an actuator between each piston and its associated wippen, and valve mechanism for controlling the operation of the said pistons.

3. An upright piano having a pneumatic hammer actuating mechanism inclosed in the piano casing, said mechanism consisting of a plurality of vertically disposed cylinders, pistons freely movable therein, con-

trolling valves therefor, and an independent actuator between each piston and a unit of the hammer action, the said mechanism being located in the upper part of the piano casing adjacent to and forward of the hammer action.

4. An upright piano having a pneumatic hammer actuating attachment inclosed in the casing thereof, said attachment including a plurality of power pneumatics consisting of a single horizontal series of vertically disposed cylinders and pistons freely movable therein, said cylinders arranged parallel to each other and transversely of the piano casing and located in the upper part of the casing adjacent to and forward of the piano action, and an independent actuator between each piston and a unit of the hammer action.

5. An upright piano having a pneumatic hammer actuating mechanism located in the upper part of the piano case above the piano keys and adjacent to and forward of the hammer action, said mechanism consisting of a single horizontal series of vertically disposed cylinders and pistons therefor which constitute the power pneumatics, the upper ends of all of said cylinders being arranged in the same plane and transversely of the piano, pneumatic air chambers and valve devices for controlling the operation of said power pneumatics and a lifting actuator between the respective pistons and the associated units of the hammer action.

6. An upright piano having a pneumatic hammer actuating mechanism located in the upper part of the piano case adjacent to and forward of the hammer action, said mechanism consisting of a single horizontal series of vertically disposed cylinders and cooperating pistons and an actuator between each piston and a unit of the hammer action.

7. An upright piano having a pneumatic hammer actuating mechanism located in the upper part of the piano case adjacent to and forward of the hammer action, said mechanism consisting of a single horizontal series of vertically disposed hammers and cooperating pistons and a substantially rigid lifting actuator between each piston and the wippen of the corresponding hammer action unit.

In testimony whereof we affix our signatures in presence of two witnesses.

HENRY CHARLES GOLDMAN
CHRISTOPHER FREDERICK WEBB.

Witnesses:

F. SELBY WONDLE,
GEORGE S. BRIDGES.