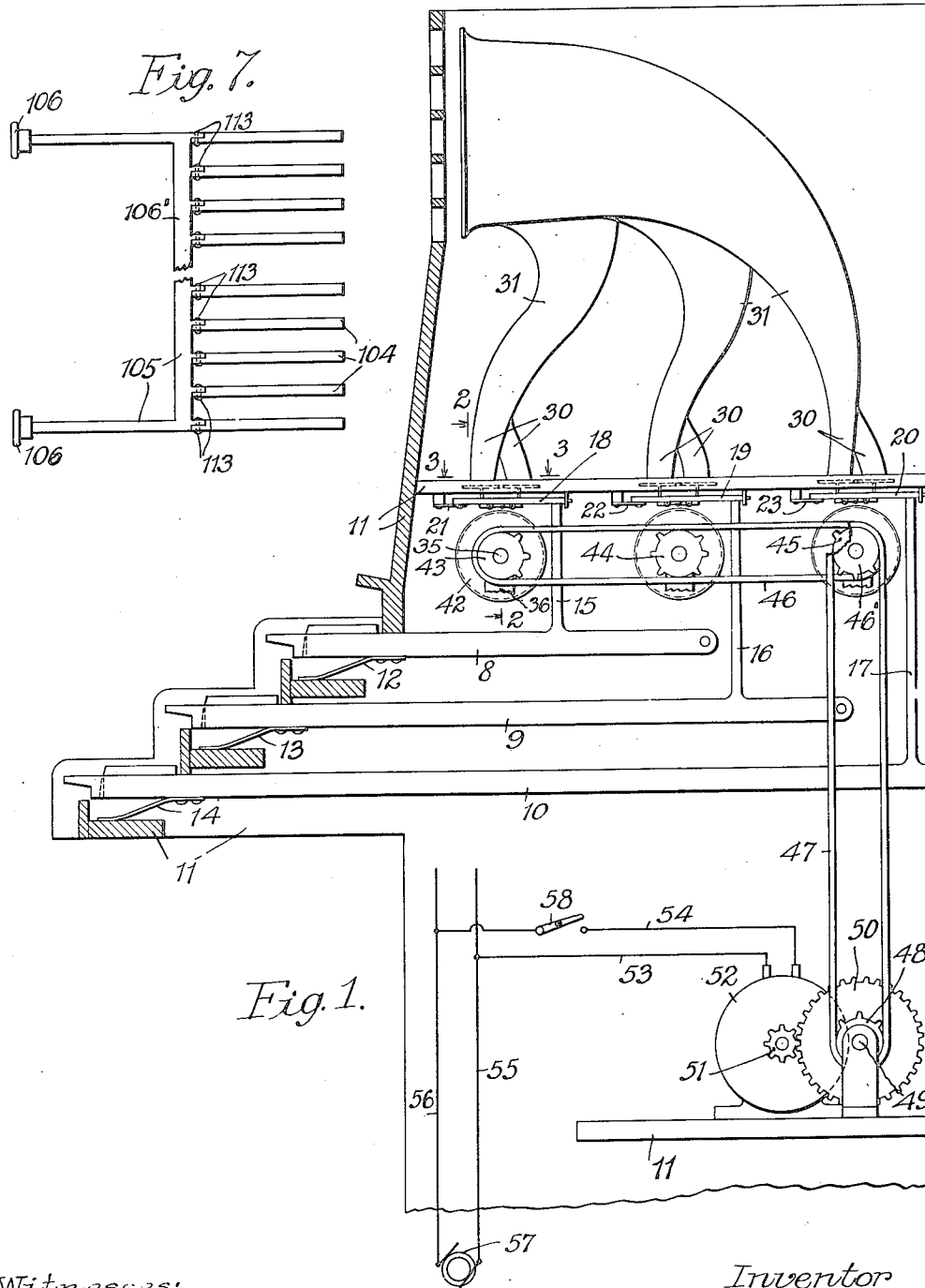


P. HESSELIUS.
MANUALLY CONTROLLED PHONOGRAPHIC MECHANISM.
APPLICATION FILED FEB. 21, 1914.

1,132,092.

Patented Mar. 16, 1915.
4 SHEETS—SHEET 1.



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4 SHEETS—SHEET 2.

Fig. 4.

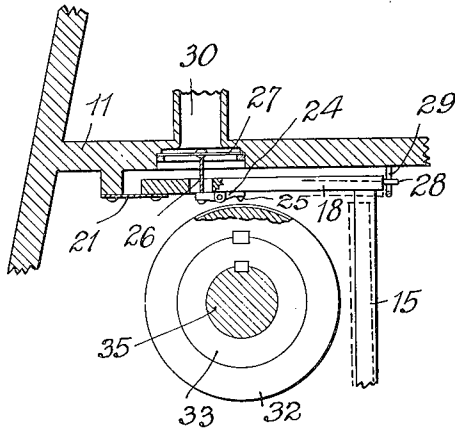


Fig. 3.

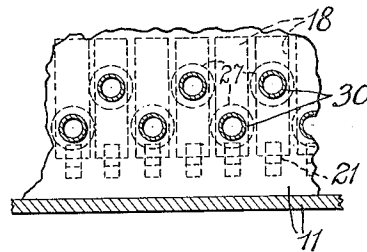
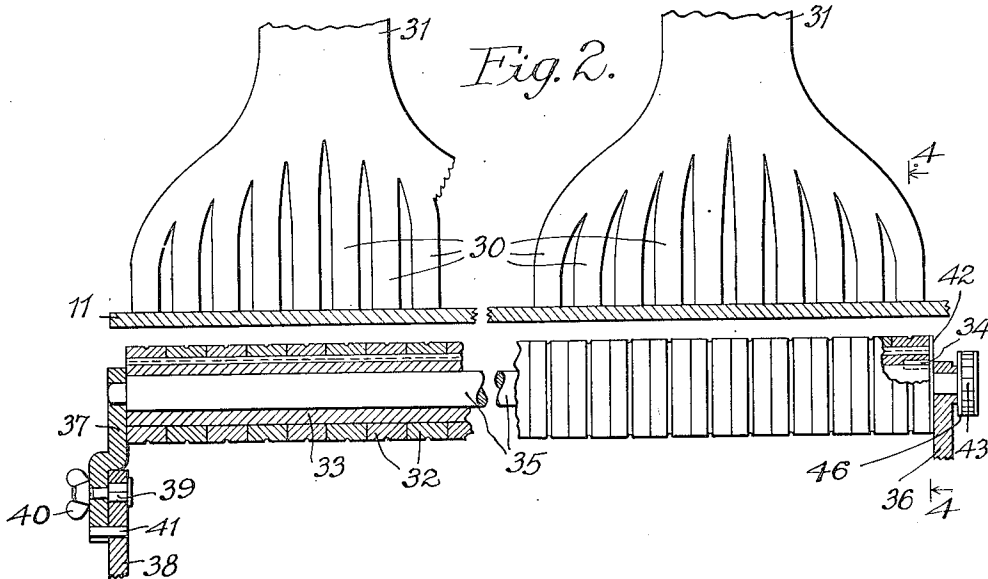


Fig. 2.



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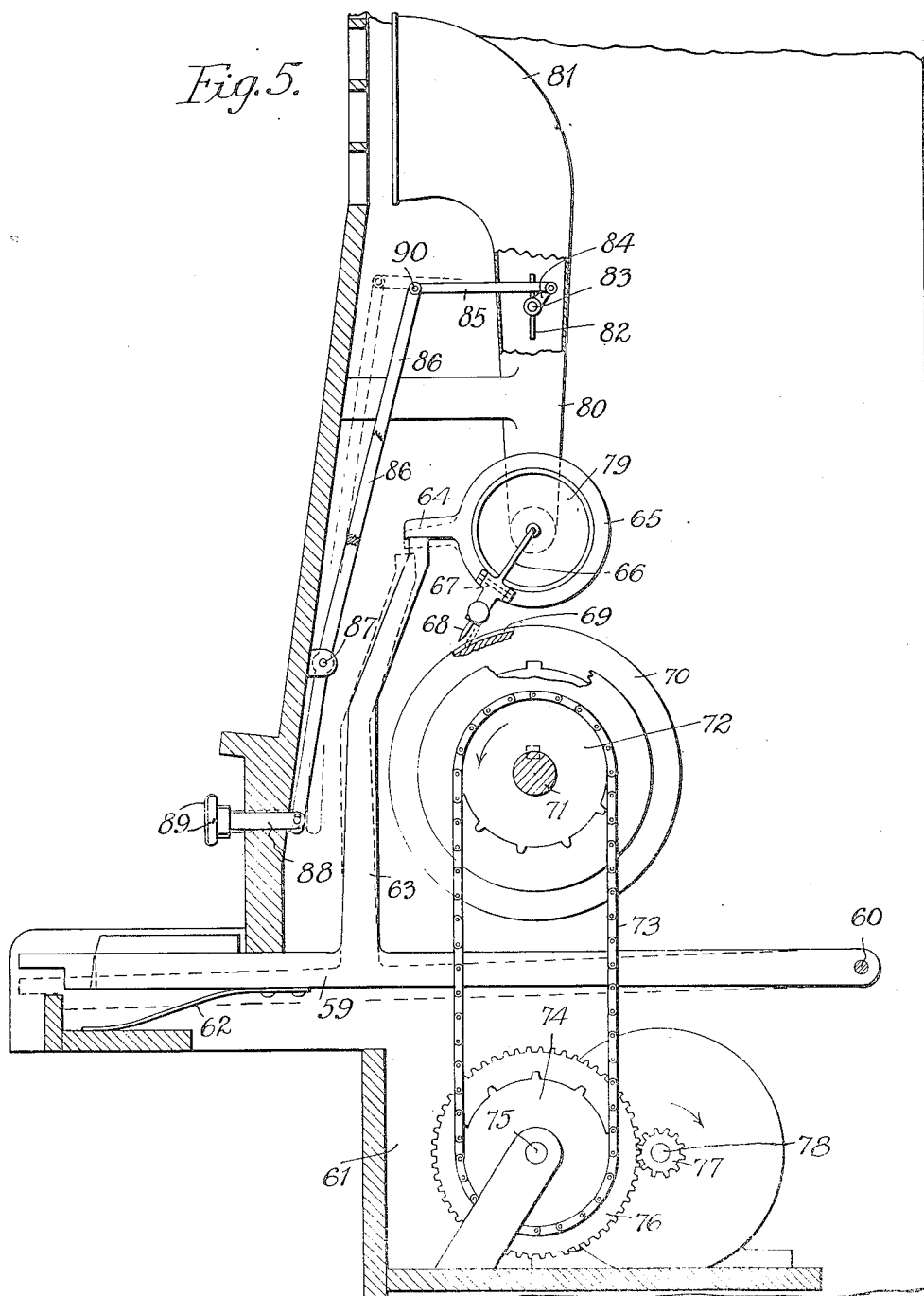
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4 SHEETS—SHEET 3.



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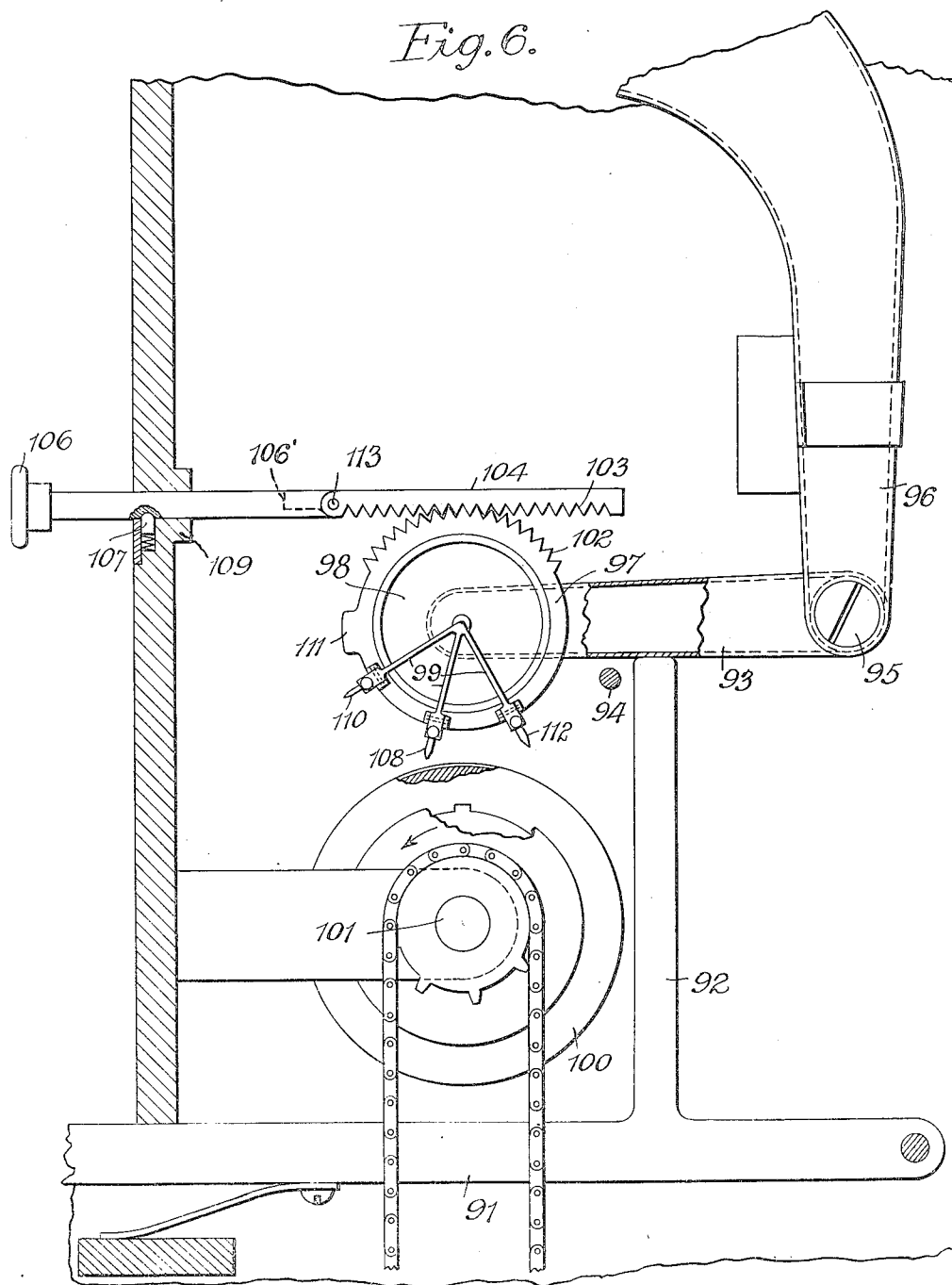
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4 SHEETS—SHEET 4.

Fig. 6.



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UNITED STATES PATENT OFFICE.

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MANUALLY-CONTROLLED PHONOGRAPHIC MECHANISM.

1,132,092.

Specification of Letters Patent.

Patented Mar. 16, 1915.

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To all whom it may concern:

Be it known that I, PETER HESSELIUS, residing at Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Manually-Controlled Phonographic Mechanism, of which the following is a full, clear, concise, and exact description, reference being had to the accompanying drawings, forming a part of this specification.

My invention relates to musical instruments incorporating phonographic mechanism and has for its object certain new improvements to be presently set forth.

My invention may be applied to pianos or organs either manually played or mechanically played.

The underlying idea of my invention may readily be explained in connection with a pipe organ. Such an organ is provided with one or more manual key-boards in which the several keys denote the several tones and intervals of the diatonic musical scale. The organ is provided also with a number of stops, the operation of any one of which will connect its own set of reeds or pipes with the key-board, so that the manipulation of the keys will control the supply of air to the pipes or reeds of the organ which may be connected with the keys by means of the stops.

There are certain limitations as to the variety of tones or tone qualities which can be secured from the reeds, pipes, bells, etc., with which an organ may be equipped and consequently there are limitations upon the tone quality which it is possible to secure in a pipe organ. While for example, it may be an easy matter to construct a set of reeds to simulate the tone quality of a clarinet or flute, it is difficult if not impossible, to construct a set of reeds or pipes which will closely simulate the tone quality of a violin or cornet.

In accordance with my invention, I may equip an organ with phonographic apparatus for reproducing any desired note of any desired tone quality. The organ is equipped with phonographic apparatus which may be placed under the control of the manual key which represents middle C, whereby the depression of the key will cause the phonographic apparatus to produce a tone having the pitch of middle C, the phonographic apparatus acting to produce the requisite tone

as long as the key may be depressed. The organ is equipped with another phonographic record which when reproduced will sound a tone having the pitch of the musical note D. Other phonographic apparatuses will produce the other tones of a complete diatonic scale, the phonographic reproduction of each note being under the control of the manual key assigned to each such tone or pitch.

If one set of phonographic records is made by recording the notes of the diatonic scale, as produced upon a violin, then the phonographic mechanism may be made to sound notes or tones having the violin quality, but under the control of the manual keys of the organ. By means of this arrangement it is possible for an organist to play a piece of music in the usual way by manipulation of the organ keys, the music being produced with the tone quality of a violin, the succession and duration of notes being controlled at will by the organist in accordance with his manipulation of the organ keys.

The organ may be equipped not only with phonographic apparatus containing records of the different notes as produced upon a violin, but it may be equipped also with a diatonic scale of phonographic tones, as produced by a cornet, a bassoon, a trumpet, etc. The phonographic reproductions of the tones recorded upon the phonographic records simulate very closely the tone qualities of the original sounds used in making the phonographic records. As a result, therefore, it is possible to equip an organ with phonographic records which will enable an organist, by manipulating the stops which control the connection between the keys and the several sets of phonographic records, to reproduce orchestral music with surprising fidelity.

The tone quality of the sounds recorded upon the phonographic records is not limited to the tone qualities of the usual orchestral instruments. For example, the organ may be equipped with a set of phonographic apparatus in which the phonographic record of each note is produced by a human voice or by human voices. Thus a soprano voice can sing a continuous vowel sound, for example "ah" with the pitch of each of the notes of the diatonic scale within the range of the soprano voice. An alto or contralto voice may sing the notes of the diatonic scale

next lower in register, a tenor voice may sing the next lower notes and a bass voice may sing the lowest notes of the set. There may be produced in this way a phonographic voice record of each of the notes of a diatonic scale, each of the notes or tones having the quality of the voice or voices when singing the vowel sound "ah". When this set of phonographic records, together with the appropriate reproducers is put under the control of the manual keys, by means of a suitable stop, then the manipulation of the organ keys will cause the organ to "sing" in conformity with the organist's manipulation of the keys. The music thus produced in the operation of the phonographic reproducing apparatus may be used alone or in conjunction with music produced by the ordinary pipes and reeds of organs heretofore constructed.

My invention may be embodied in pianos as well as in organs, and the tone producing mechanism whether incorporated in a piano or in an organ, or in a wholly distinct and separate musical instrument of a new class, may be operated by perforated music rolls and pneumatic or electrical actuating mechanism, which may be substantially identical with that with which pianos and organs of the prior art have been automatically "played."

A pipe organ embodying my invention does not differ essentially from pipe organs of the prior art, except as to the mechanism involving the phonographic reproduction of sounds. I have not thought it necessary or desirable therefore to illustrate the old and well known features of pipe organ constructions in illustrating my invention. I have, however, prepared the accompanying drawings in which—

Figure 1 is a view showing more or less diagrammatically one arrangement of the phonographic reproducing mechanism, in which I have employed three sets of keys in conjunction with a like number of cylinders, which coöperate with reproducing needles which produce sounds or notes of different tone qualities. Fig. 2 is a cross-sectional view taken on line 2—2 of Fig. 1, some of the parts being removed for the sake of clearness; this view showing particularly the arrangement of the phonographic record cylinders upon which the tones of the diatonic scale are recorded, and also the device through which the sounds are conveyed to the horns. Fig. 3 is a cross-sectional view taken on line 3—3 of Fig. 1. Fig. 4 is an enlarged cross-sectional view taken on line 4—4 of Fig. 2. Fig. 5 is a view of a modified arrangement wherein a different set of sound boxes is employed in connection with a rotating cylinder upon which the musical tones or notes have been recorded. Fig. 6 is another modification, illustrating more or less

diagrammatically an arrangement whereby three different volumes or tone qualities are secured by means of three different needles on each sound box. Fig. 7 is a top view of the mechanism for adjusting the sound boxes employed in the modification illustrated in Fig. 6.

Referring now to Figs. 1 to 4 inclusive, I have shown three banks of keys 8, 9 and 10, which are pivoted to the frame 11 of the instrument. These keys conform with the arrangement of keys as heretofore embodied in pianos and organs. Each key is held in its normal position by means of a spring as indicated at 12, 13 and 14. Each of the keys is provided with an upwardly extending arm as shown at 15, 16 and 17, these arms coöperating with the sound box levers 18, 19 and 20, each associated with a phonographic sound box of any appropriate type. The sound box levers are secured to the frame 11 by means of springs 21, 22 and 23, the arrangement being such that the sound box levers may be moved up and down in conformity with the depression and spring controlled elevation of the keys, 8, 9 and 10. As illustrated more particularly in Fig. 4, each sound box lever, as for example 18, has pivoted thereto a stylus lever 24, which carries at one end a pointed stylus 25, and the other end of which has secured thereto a wire or rod 26, or other suitable connection with the diaphragm 27 of the sound box. The outer end of the sound box lever 18 is provided with a tongue 28, which projects through a U-shaped stirrup 29 extending downward from the frame 11, this U-shaped stirrup member being provided for the purpose of limiting the downward movement of the sound box lever 18. The sound box has secured thereto, the tone arm 30 which leads to a horn as indicated at 31 in Fig. 1. As indicated in Figs. 2 and 3, there is a tone arm leading from each sound box, so that when any one of the stylus points 25 is in engagement with its associated cylinder 32, the sound produced will be carried through the associated tone arm to the horn. The weight of the sound box levers 18, 19 and 20 maintains the reproducing stylus points in proper engagement with the record grooves in the peripheries of the phonographic cylinders 32.

The cylinders 32 of any composition suitable for phonographic reproduction, are splined upon a sleeve 33 as shown in Fig. 2, this sleeve being keyed at 34 to the shaft 35, which is supported at one end in a fixed bearing 36, and at the other end in a removable bearing 37. The removable bearing 37 is held upon a support 38, by means of a bolt 39, tightened in place by means of a fly nut 40, and in addition to which there is a pin 41 coöperating with the removable bearing 37 to fix the bearing firmly in position.

The right-hand end of the shaft 35 is provided with a thin flange 42, which serves to take the end thrust of the sleeve 33 and the cylinders 32.

Each of the cylinders 32 is provided as shown with a phonographic record groove. One of the phonographic grooves is adapted when its cylinder is operated at normal speed to produce the note C. The next adjacent cylinder is provided with a record groove which when operated at the same speed will produce the note C sharp, the next cylinder is provided with a groove which will produce the note D, the next one which will produce the note D sharp, the next with a groove which will produce the note E and so on. The tone quality of the notes produced by the phonographic record grooves will depend of course upon the tone quality of the sounds which have been employed in making the phonographic records. If the grooves have recorded the notes as played on a violin, the sounds reproduced will have a violin tone quality. If the phonographic record grooves have been produced by the sounds of a human voice, the reproductions will have a corresponding tone quality. In any event, the grooves of the record cylinders when run at the proper speed, will produce the several tones or notes of the diatonic scale.

When the instrument is played, the phonographic record cylinders are rotated at constant speed by means of the sprocket wheels 43, 44 and 45, connected by means of the sprocket chains 46 and 47 with a sprocket wheel 48, mounted upon a shaft 49, which shaft carries a gear 50 in mesh with a pinion 51 carried upon the shaft of the motor 52. While I have indicated an electrical motor connected by means of the wires 53 and 54 to line wires 55 and 56, and thus with a source of power 57, and with a switch 58 to control the flow of current, it will be understood that this representation of motor mechanism is purely diagrammatical, and that any suitable motor mechanism operated or governed to run at constant speed may be employed to drive the phonographic cylinders, the several phonographic cylinders being in constant rotation at the proper speed. The depression of any one of the keys 8, 9 or 10 will effect an engagement of the stylus needle of the associated sound box with its cooperating phonographic cylinder, to cause the production of a tone dependent in quality and pitch upon a record graved upon the periphery of the cylinder. This arrangement puts it within the power of the operator to play any desired selection by manipulation of the manual keys which control the phonographic production of tones conforming in pitch with the position of the keys in the key-board. In Fig. 1, I have illustrated three sets of cylindrical records.

The three sets of cylinders may be regarded as equipped with grooves adapted to produce notes of different tone qualities, or they may be regarded as graved to produce tones having the same quality but different degrees of loudness.

I have not illustrated the usual organ stop mechanism by means of which the phonographic reproducers may be connected or disconnected at will from the control of the manual keys, but the inter-position of such mechanism is well understood in the organ building art, and it would add nothing to the disclosure of my invention, to illustrate this somewhat complicated mechanism.

When it is desired to replace any one of the cylinders 32, as for example when it becomes worn, the removable bearing 37 is withdrawn from the supporting member 38, and the sleeve 33 is removed from the shaft 35 whereupon any one of the cylinders 32 may be replaced.

Referring now to Fig. 5, I have shown a modified arrangement wherein the several keys 59 are pivoted to a rod 60, suitably supported by the frame 61, the springs 62 serving to maintain the keys in their normal elevated positions. Each of the keys is provided with an upwardly extended arm 63, each arm cooperating with a stud 64 extending outwardly from a sound box 65. Each sound box is provided with a lever 66, pivoted to the sound box at 67, and carrying a needle 68 which is arranged to be dropped into the record groove 69 of a record cylinder 70, upon the depression of the associated key 59. The cylindrical record shown at 70 is one of a number of records substantially like those shown in Fig. 2, the cylinder 70 being mounted upon a shaft 71 which shaft is provided with a sprocket wheel 72 connected by means of a chain 73 with the sprocket wheel 74 mounted upon a shaft 75, suitably supported from the frame. The shaft 75 is provided with a gear wheel 76, meshing with a pinion 77 carried upon a motor shaft 78. The rotation of the motor when properly governed in the well known manner imparts a uniform rotation to the record cylinders mounted upon the shaft 71. When therefore, any of the keys 59 is depressed, the needle of the associated sound box is dropped into the groove of the associated record cylinder whereupon the diaphragm 79 of the sound box will be caused to vibrate to produce a sound which is carried through the tone arm 80 and the horn 81. The tone arm is supported as shown from the frame 61 and carries the associated sound box upon a pivoted connection which permits the sound box to rotate to bring its needle into engagement with the associated record cylinder. In order to regulate the loudness of the sounds delivered from the

phonographic reproducing mechanism, I have illustrated a sound damper 82 which is carried by the pin 83 just at the junction of the tone arms and the horn 81. An arm 84 secured to the pin 83 carries a rod 85, pivoted to a lever 86 which in turn is pivoted to the frame at 87, and it is connected at the far end to a push rod 88 upon the front end of which may be mounted a button 89. This mechanism provides means whereby the operator may regulate the position of the damper to control the loudness of the sound delivered through the horn. It is only necessary to have one damper for each horn inasmuch as there are several tone arms connected to each horn. If only two horns are employed it is necessary to employ but two levers 86, which levers may be rotated to different positions by means of the buttons 89.

Referring now to Figs. 6 and 7, I have shown in diagrammatic fashion an arrangement in which each of the keys 91 is provided with an arm 92 upon which rests the tone arm 93 of a phonographic reproducer. The downward movement of the tone arms in this arrangement is limited by stops 94. One end of each tone arm is pivoted at 95 to a horn 96 suitably mounted upon the frame of the instrument. The other end of the tone arm is provided with a sound box 97, which carries a diaphragm 98 and this diaphragm coöperates with a triplicate stylus lever 99, the several stylus levers being mounted upon the periphery of the sound box, as shown. One arm of the triplicate stylus lever is provided with a comparatively light needle, another with a heavy needle and still another with a needle of medium thickness. The sound box is rotatably mounted upon the end of the tone arm whereby any one of the three needles may be brought into engagement with the record groove formed in the periphery of the phonographic record cylinder 100. In this modification, as in the others, the record cylinder or cylinders or set of cylinders is provided upon its periphery with a set of record grooves, each groove adapted to produce a note of the diatonal musical scale. The cylinders or set of cylinders is mounted upon a shaft 101, whereby they may be rotated in any suitable manner such for example, as by means of an electrical or spring motor suitably governed and controlled to produce a uniform speed of cylinder movement.

Each of the sound boxes in the arrangement shown in Figs. 6 and 7, is provided with peripheral gear teeth 102 which mesh with the teeth 103 upon the associated regulating rack 104. The several racks 104 are joined to a frame 105 which in turn is provided with a pair of adjusting knobs 106, projecting through the face of the instrument. The frame 105 together with the

racks 104 may be placed in any one of three different positions, that is to say an intermediate position as shown in the drawings, an inner-most position where the buttons 106 engage the face of the instrument, and the other and outer-most position, where the cross-piece 106' engages the frame of the instrument. The intermediate position of the frame 105 is determined by a spring actuated plunger 107, which is pressed into a notch in the frame as shown in the drawing.

Assuming that the sound boxes of the set adapted to reproduce the several notes of the diatonic scale are in their intermediate positions as controlled by the racks 104 and as shown in Fig. 6, the depression of a key 91 will cause the associated tone arm 92 to be lowered until the stop 94 is engaged, under which condition the medium tone needle 108 will be dropped into the groove of the associated cylinder 100, whereupon the constant speed rotation of the cylinder will cause the production of a uniform note, having a pitch and tone quality dependent upon the undulations of the groove into which the needle has been dropped. The sound will be delivered from the tone arm, and the horn as in the horns heretofore described. When the pressure has been removed from the key 91, the spring will return the key to its normal position, whereupon the tone arm 92 will be raised to withdraw the needle of the sound box from the grooves shown in Fig. 6, thereby terminating the production of the sound controlled by that phonographic record.

If the operator desires a louder sound having the same pitch and tone quality, he will draw out the buttons 106 until the cross piece 106' engages the sleeve 109, whereby all of the sound boxes of the set will be rotated to bring their needles 110 into the position formerly occupied by the needles 108. Under these conditions as before, the notes sounded by the phonographic apparatus may be controlled by the manual keys, the only difference being that the sound will not be as loud as was formerly the case. If on the other hand, the operator desires an increased volume of tone, he will push the buttons 106 inwardly until they engage the face of the instrument. This movement will cause the sound boxes to be rotated upon their axes to bring their needles 112 into such positions, that the depression of the associated tone arms will bring them into engagement with the record grooves on the face of the cylinder 100. The sound boxes may desirably be slightly weighted at 111, to assist in maintaining their balance. The racks 104 are desirably hinged at 113 to the frame 105 so that there may be no disengagement between the gear teeth of the racks and those on the peripheries of the sound

boxes, when the sound boxes are depressed by means of the keys 91.

It will be apparent that I have not endeavored to illustrate the details of the design in which the various parts of the mechanism would be constructed in practice. For example the phonographic sound boxes are well known articles of manufacture, which those skilled in the art can adapt to suit the conditions imposed. It will be apparent also that other details, as well as cylindrical records may be adapted for use in an instrument of my invention.

It should perhaps be emphasized that the phonographic record; whether engraved upon a cylinder or upon a disk, must be substantially uniform throughout the entire length of the groove, that is to say the cylindrical grooves in the cylinders shown in the accompanying drawings must cooperate with their reproducers to produce steady, uniform tones of fixed pitch so long as the reproducing needles remain in the engagement with the record grooves.

While I have herein described the essential concept of my invention and have illustrated certain modes in which it may be embodied, I do not wish to be limited to the precise details of construction herein set forth, because obviously many modifications and many refinements may be made by those skilled in the art.

What I claim is:

1. In a phonographic instrument, the combination of a casing, a record engaging device, a key lever pivoted to the casing, and an arm carried by said lever disposed between the pivot and finger piece arranged to engage the under side of the said record

engaging device to normally prevent the engagement of the same with the record, the record engaging device being caused by gravity to engage the record when the arm is moved to release the under side of the same.

2. In a phonographic instrument, the combination of a casing, a key lever pivoted to the casing, a record engaging device swivelly mounted at substantially its central portion and adapted to swing in a vertical plane, an extension on said device, and an arm carried by said lever arranged to engage the under side of the said extension to normally prevent the engagement of said device with the record, the record engaging device being caused to engage the record when the arm is moved to release the under side of the extension.

3. In a phonographic instrument, the combination of a casing, a key lever pivoted to the casing, a record engaging device swivelly mounted at substantially its central portion and adapted to swing in a vertical plane, an extension on said device, and an arm carried by said lever disposed between the pivot and finger piece arranged to engage the under side of said extension to normally prevent the engagement of said device with the record, the record engaging device being caused to engage the record when the arm is moved to release the under side of the extension.

In witness whereof, I hereunto subscribe my name this 18th day of February A. D., 1914.

PETER HESSELIUS.

Witnesses:

A. G. DAHLQUIST,
AUGUST H. L. ARNDT.