

No. 784,508.

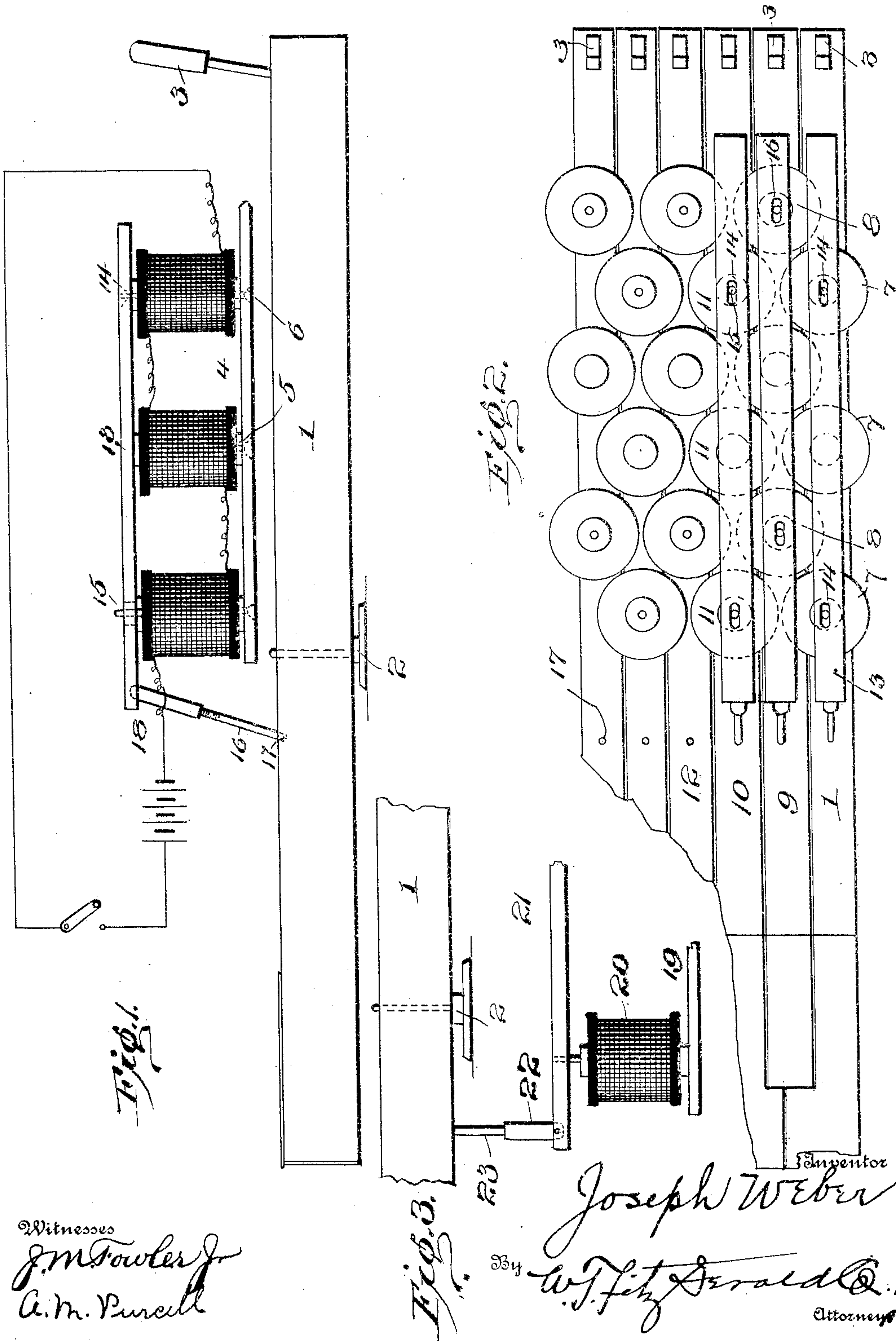
PATENTED MAR. 7, 1905.

J. WEBER.

ELECTRICALLY ACTUATED PIANO.

APPLICATION FILED AUG. 19, 1904.

2 SHEETS—SHEET 1.



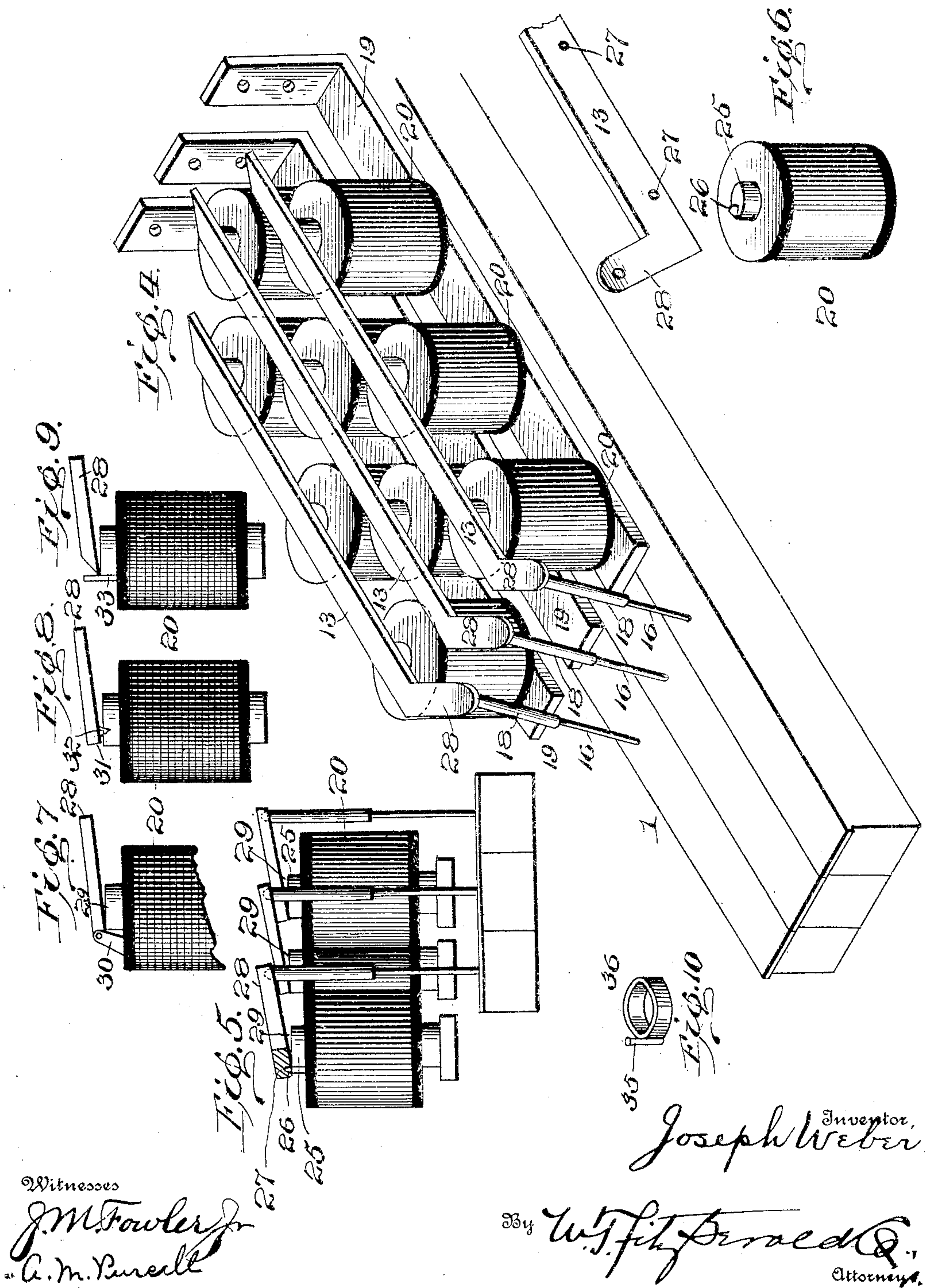
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2 SHEETS—SHEET 2.



Witnesses

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UNITED STATES PATENT OFFICE.

JOSEPH WEBER, OF BROOKLYN, NEW YORK.

ELECTRICALLY-ACTUATED PIANO.

SPECIFICATION forming part of Letters Patent No. 784,508, dated March 7, 1905.

Application filed August 19, 1904. Serial No. 221,389.

To all whom it may concern:

Be it known that I, JOSEPH WEBER, a citizen of the United States, residing at Brooklyn, in the county of Kings and State of New York, have invented certain new and useful Improvements in Electrically-Actuated Pianos; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

My invention relates to musical instruments, and more particularly to mechanically-operated pianos, organs, or the like; and it consists of certain novel combination and construction of parts, the preferred embodiment of which will be hereinafter fully set forth.

My object, among others, is to so group a series of actuating-magnets employed to coöperate with each individual key that the largest practical number of magnets may be assembled, each magnet performing its office without interference with or from a contiguous magnet. This result I accomplish by the peculiar disposition or arrangement of the magnets, whereby a staggered effect is produced, therefore confining the magnet of each key between the centers of next adjacent keys, and while the series of magnets employed to actuate each individual key are arranged so as to center coincident with the median line of the key above which they are located they are so disposed with respect to each other that they will be separated sufficiently to accommodate the arc of the circle described by the contiguous magnet secured to the adjacent key.

A further object, among others, is to provide convenient and reliably-efficient means for effecting a perfect adjustment whereby an absolutely true and intimately-responsive co-operation is assured between the armature and the key of the instrument which it is designed the magnet shall control.

Other objects and advantages will be made fully apparent in the following specification, considered in connection with the drawings, of which—

Figure 1 illustrates in side elevation a piano-key provided with a group of actuating-magnets, a diagrammatic view being also given of the controlling-circuit and battery. Fig. 2 is

a top plan view showing a series of piano-keys, each key being provided with three actuating-magnets, and also illustrating three rows of magnets provided with armatures and a link-section adapted to connect each armature with its respective key. Fig. 2 also shows three rows of magnets with the armature removed. Fig. 3 illustrates one of the many ways of actuating the keys from the under side thereof instead of from the upper side, as illustrated in Fig. 2. Fig. 4 is a perspective view showing a special adaptation of each armature designed to enable it to be operatively connected with one of the keys of the instrument the magnets are designed to control. Fig. 5 is a modification in front elevation, showing three armatures having lateral-extending branches and their coöperating magnets in their operative positions. Fig. 6 is a perspective view of a single magnet and a portion of the armature with which it is designed to coöperate ready to drop in place thereon. Figs. 7, 8, and 9 illustrate different ways by which the armature may be held in place upon its magnets. Fig. 10 illustrates a special form of post and anchoring-collar therefor.

While I have illustrated in the drawings that the keys of the instrument may be operatively connected with an armature of the usual construction, I desire to call special attention to that form of armature presented in Figs. 4, 5, and 6, wherein it will be observed that each armature is provided with a laterally-extending branch 28, and while it will be understood that the reach or extent of said branch is confined with better results to that point which will enable it to coöperate with the next adjacent key it is obvious that the length thereof may be extended so that it will coöperate with the second or even the third or fourth key next contiguous to that over which the magnets are disposed.

In order to conveniently designate the several features of my invention and their co-operating accessories, numerals will be employed, of which—

1 indicates a piano-key of the usual or any preferred construction, which is provided in the usual manner with the fulcrum-point 2

and a standard 3, designed to cooperate with the "action" proper of the instrument. In order to obtain the best results, I locate above each individual key a series of actuating-
 5 magnets designed to cooperate therewith. It is obvious that any preferred number of magnets which may be deemed productive of the best results may be employed for each key, and the magnets may be properly sustained
 10 in their operative position in any preferred way, as by the yoke or base 4, to which the core 5 of each magnet may be firmly anchored, as by a suitable bolt or screw, as indicated by the dotted line 6 in Fig. 1. The series of
 15 magnets employed to control each key may be supported and sustained wholly independent of the other magnets, inasmuch as the yoke or base 4 may extend inward sufficiently to connect with a suitably-disposed support-
 20 ing-bar (not shown) extending across the piano above the inner ends of the keys, as is usual.

By reference to Fig. 2 it will be observed that the key 1 is provided with three controlling-magnets (designated by the numeral 7)
 25 and that said magnets are separated sufficiently to permit the series of adjacent magnets (indicated by the numeral 8) above the next key 9 to reach between the magnets 7, and thereby extend over the keys 1 and 10.
 30 In like manner the series of magnets 11, located above the key 10, will extend between the magnets 8, and thus overlap the keys 9 and 12, the arrangement of the remaining magnets being continued in like manner, the
 35 result being that the series of rows of magnets for individual keys are regularly staggered, the effect being that a magnet of much greater power may be employed than would be possible if the diameter of the magnet were
 40 only coincident with the key it is designed to control. Each of the magnets has a diameter greater than the width of one key, but less than the width of two keys, and hence each magnet extends wholly across the top of one
 45 key and partly across the top of the next adjoining keys on each side.

By reference to Fig. 2 it will be observed that the armatures 13 are provided at each end with a slitted aperture 14, designed to receive
 50 the stem or pin 15, by means of which the armature is held in its operative position upon the magnets, and in order to operatively connect the end of the armature to the key with which it is designed to cooperate I provide an
 55 adjustable standard, which is clearly set forth in Fig. 1, comprising the body-section 16, properly threaded at its upper end and seated at its lower end in a suitable recess 17, provided in the central portion of the key. The
 60 upper threaded end of the body-section 16 is received by the adjustable cap 18, the upper rounded end of which is designed to be received by a suitable recess provided upon the under side of the end of the armature, as in-
 65 dicated by the dotted lines in Fig. 1. It is

clearly apparent by reference to Fig. 1 that a most accurate adjustment of the position of the armature with respect to its series of controlling-magnets and the key which it is designed to control may be readily effected by a
 70 proper rotation of the cap, and since the end of the standard rests in suitable recesses it is obvious that the standard is free to conform to the movements of the armature and key.

While I have illustrated in Fig. 1 the arma-
 75 ture as connected with the key near the fulcrum-point, it will be readily apparent that the said point of connection may be varied according to the amount of force necessary to apply to the key.
 80

The yoke 19, Fig. 3, may be sufficient in extent to accommodate any desired number of magnets and may be properly supported in its operative position in any desired way. Since
 85 in Fig. 3 the magnet 20 is located beneath the key, it will be necessary that the end of the armature 21 shall be pivotally connected to the cap 22, while in like manner the end of the body-section 23 cannot be left to play
 90 loosely in the end of the recess provided in the under side of the key, but must in some suitable way be pivotally connected to said key in order that the magnet may draw said key downward when the magnet 20 becomes
 95 energized.

Referring to Figs. 4, 5, and 6, it will be observed that each of the armatures (designated 13) is provided with an integral lateral extension of proper extent to reach over the center of the next key to the left of the key over
 100 which the magnets designed to actuate said armature are disposed, though it is clear that said lateral extensions may be directed toward the right, if preferred, the result being the same—namely, that the next key will be op-
 105 erated instead of the key over which the armature is located. The body proper of the armature 13 is preferably oblong in cross-section, though any preferred shape may be adopted, the object being to provide a flat surface for the
 110 under side of the armature in order that it may rest squarely upon the cores of the magnets, and in order that the armatures may be held reliably in their operative positions upon the series of magnets designed to control the same
 115 I form upon each core 25 of the magnets, and preferably upon one edge thereof, a lug or stud 26, preferably constituting an integral part of the core and designed to be received by suitable recesses 27, formed in a contiguous
 120 part of the edge of the armature 13. By thus mounting the armature upon the magnets designed to actuate the same the body portion 13 will have a rocking movement upon the magnets. The standard which forms a
 125 connection between the end of the lateral extension 28 and one of the keys of the instrument is of such extent that it will so dispose the body portion 13 of the armature that it will normally rest upon one edge only. When,
 130

however, the magnets are energized, the said body will be drawn into close contact with the ends of the cores, and thus cause said body to lie in a horizontal plane. After the armature
 5 has thus been drawn into close contact with the cores of its magnets the free end of the lateral extension 28 will be incidentally brought downward into the same plane occupied by said body, and thus force the key of the instrument downward and induce the operation
 10 or control of the action of the instrument. When the magnets controlling the armature have been energized, the force of the upward movement of the key when thus released will restore the body of the armature to its normal
 15 position, and thus leave it resting upon one edge or upon the studs 26.

In Figs. 7 and 8 I have illustrated three additional ways of reliably holding the armature upon its magnets. In Fig. 7 it will be observed that I have provided a lug 30, carried by the upper end of the magnet, to which I pivot the armature-body in any preferred way,
 20 it being understood that said lug and armature shall be so connected that the armature-body may be drawn truly in contact with the entire surface of the core when the magnets are energized. In Fig. 8 I have formed an integral
 25 lug or point 31 upon the extreme edge of the armature-body, said point being designed to be received by a recess 32, formed in the edge of one of the cores or in the end of a post erected adjacent to said core, as may be preferred and productive of the best results. In
 30 Fig. 9 it will be seen that the post 33 is erected adjacent to the edge of each armature, against which the beveled edge 34 of the armature-body is designed to play, said edge being properly beveled in order that the armature may
 35 have sufficient play to perform its office. Various other means may be employed to insure that the armature-body will be held in place upon its magnets and permit it to have the requisite movement to insure perfect control
 40 of the key with which it is designed to cooperate, though I deem it unnecessary to further illustrate this feature.

In order to render it unnecessary to accurately locate the lug 26 upon one side of the core, and thus necessitating that great care shall be taken while the cores are being mounted,
 45 a post (indicated by the numeral 35) may be secured to a suitable collar 36, which latter may be readily slipped over the end of the core and may be secured thereon by making said
 5 collar of sufficient size to tightly fit said core, as will be readily understood.

While I have illustrated in Fig. 1 a diagrammatic view of the circuit, it will be understood that within said circuit is placed the usual mechanism, as a rotating cylinder or its
 50 equivalent, commonly employed to energize and deenergize the magnets at such proper intervals as will cause the series of keys of the instrument to be manipulated in harmonic

sympathy with each other as will produce any selection or piece which it is desired the instrument shall perform.

I deem it unnecessary in this application to illustrate any part of the piano-action excepting what I have herein shown, inasmuch as the essential feature of novelty of my invention consists, as previously set forth, of a peculiar and novel arrangement of the magnets, as by such arrangement I am enabled to
 70 better utilize the power to be applied upon each individual key and yet at the same time confine the magnets within a minimum space, thus making it possible to dispose the magnets of great power within such a limited area
 75 that a construction of the piano will require no modification or special adaptation for the reception of such magnets.

While it is thought that the construction and nature of my invention will be fully understood in the foregoing specification, it may be stated that the operation thereof is as follows: The series of magnets employed for each key may be energized in the usual or any preferred way, as by rotation of the actuating-cylinder common to instruments of this character, when the elevated end or the edge of the armature is instantly brought downward
 85 in contact with all the cores of the magnets, incidentally forcing the key of the instrument downward and operating the action through the standard 3 or otherwise, and since said magnets are instantly deenergized by the rotation of said cylinder or other means the key
 90 is left to resume its normal position, thereby raising the outer edge of the armature out of close contact with the cores of the magnets ready for a repetition of the operation when the magnets shall have again become magnetized.
 95

In Fig. 4 I have shown each armature as being provided with three magnets, though it is obvious that any preferred number may be employed, and since the staggered effect in the disposition of said magnets is preserved it follows that the extent of the diameter of each magnet and the number thereof may be determined by the requirements in each case.
 100

While I have not illustrated how the several bases or yokes for each series of magnets is supported in its operative position, it will be understood that one or both ends of said yokes may be connected to any suitable support, as a bar or bars extending across the instrument at a point contiguous to said ends.
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While I have illustrated and described the preferred construction and combination of parts deemed necessary in the materialization of my invention, it will be understood that I desire to comprehend in this application all such substantial substitutes and equivalents as may be judged to fall fairly within the scope and purview of my invention, and I therefore do not wish to be confined strictly to the exact showing I have herein made.
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Having thus fully described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. In electrically-operated pianos or the like,
5 the keys of the instrument, combined with a plurality of magnets for each key, each magnet having a diameter greater than the width of one key, but less than the width of two keys, said magnets being arranged so as to present
10 a staggered effect, and an operating-armature for each series of magnets, said armature having a lateral extension formed at one end and a connection between the end of said extension and the key, substantially as shown.
- 15 2. In electrically-operated pianos or the like, the keys of the instrument, a plurality of electromagnets for each key and a rocking or tilting armature common to all the magnets for each key and having a lateral extension formed
20 at one end; said armature rocking about an axis parallel with the line joining the centers of the magnets; combined with means connecting the end of said lateral extension with one of the keys of the instrument, as set forth.
- 25 3. In electrically-operated pianos or the like, the keys of the instrument, a plurality of magnets located above each key and an armature common to the magnets of each key, said armature having a lateral extension formed near
30 one end, combined with suitable means for connecting the end of the armature to the key,

and means for loosely holding the armature in position above said magnets so that it will have a rocking or tilting movement in relation to its magnets substantially as shown. 35

4. In electrically-operated pianos or the like, the keys of the instrument, a series of magnets for each key located in line therewith, each magnet having a diameter greater than the width of one key and less than the width
40 of two keys, said magnets being arranged to present a staggered effect, and an armature common to each series of magnets, in combination with means adjustably connecting the end of the armature with its respective key,
45 said means comprising a standard having a body-section and an adjustable cap coöperating with the upper threaded end of said body-section and suitable means loosely holding each armature in line with its magnets where-
50 by they will have a movement relative thereto, said movement of each armature being designed to operate the key with which it is operatively connected, all substantially as specified and for the purpose set forth. 55

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

JOSEPH WEBER.

Witnesses:

WILMOT L. MOREHOUSE,
AGNES G. LARKIN.