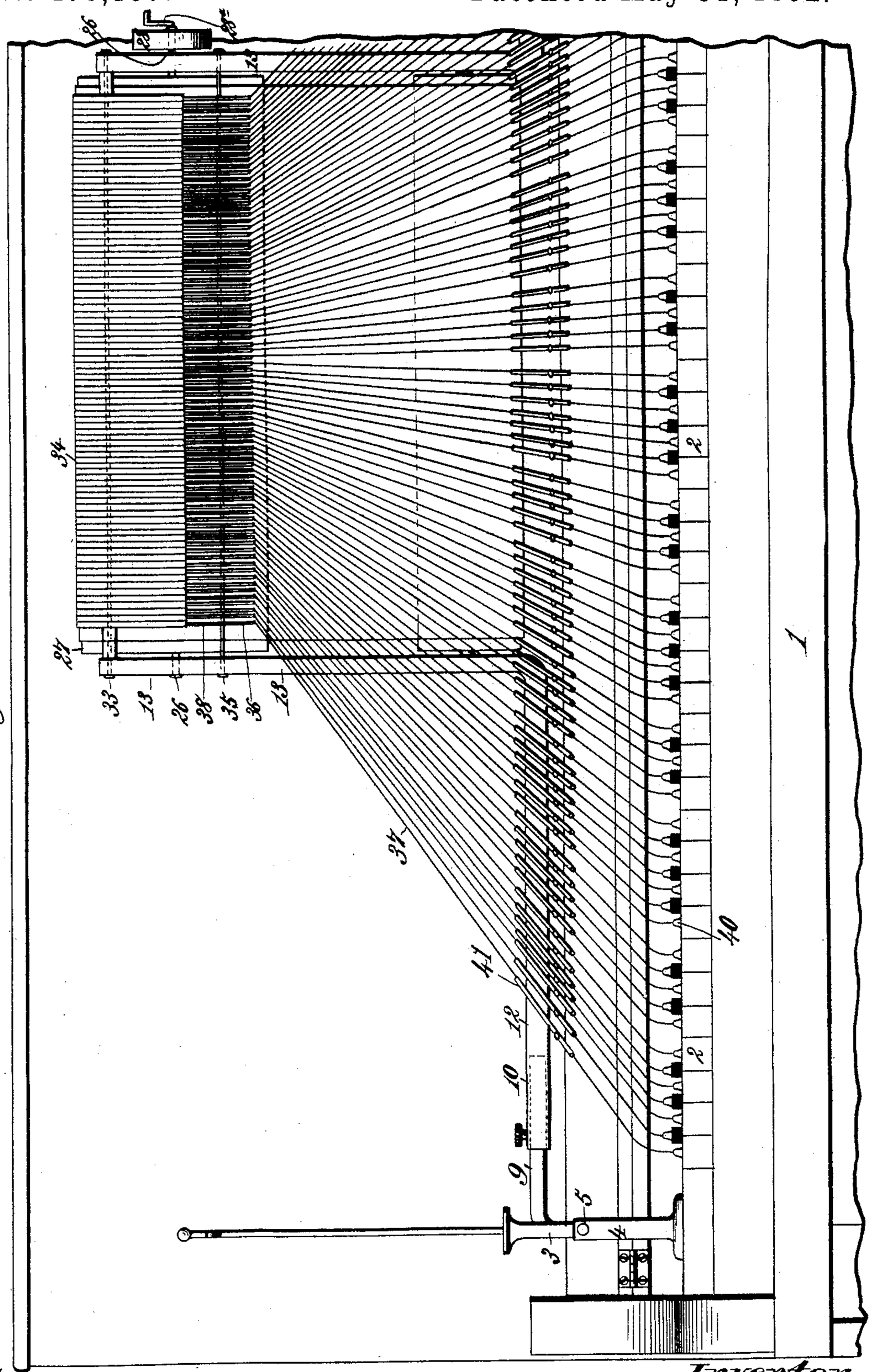
(No Model.) 5 Sheets—Sheet 1.

J. E. HARRIMAN, Jr.

MECHANICAL ATTACHMENT FOR PIANOS AND ORGANS.

No. 476,197. Patented May 31, 1892.

Fig. 1.



Witnesses,
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Geo. W. Rea.

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By James L. Norris
Atty.

(No Model.)

5 Sheets—Sheet 2

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MECHANICAL ATTACHMENT FOR PIANOS AND ORGANS.

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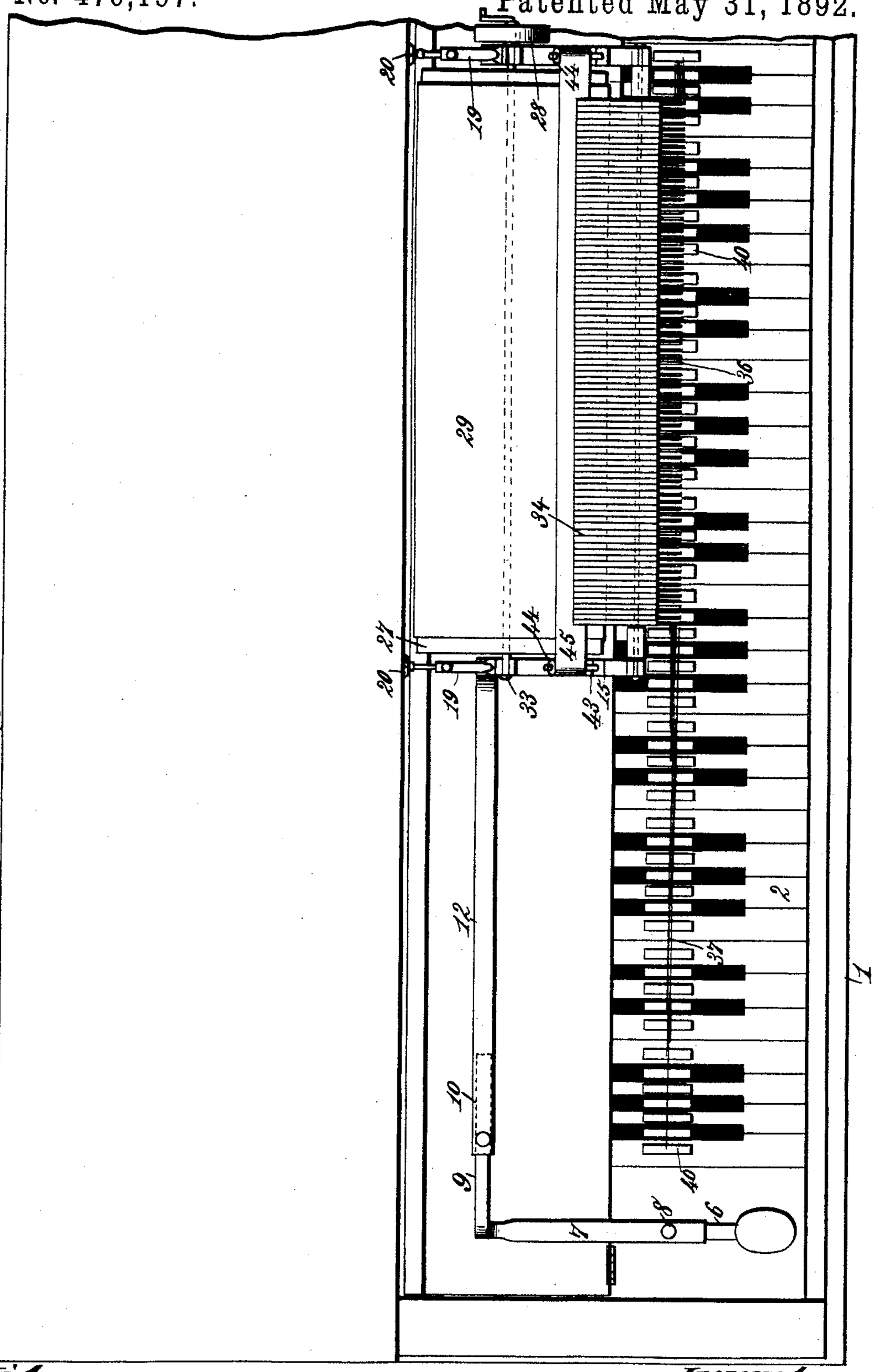

Fig. 2.

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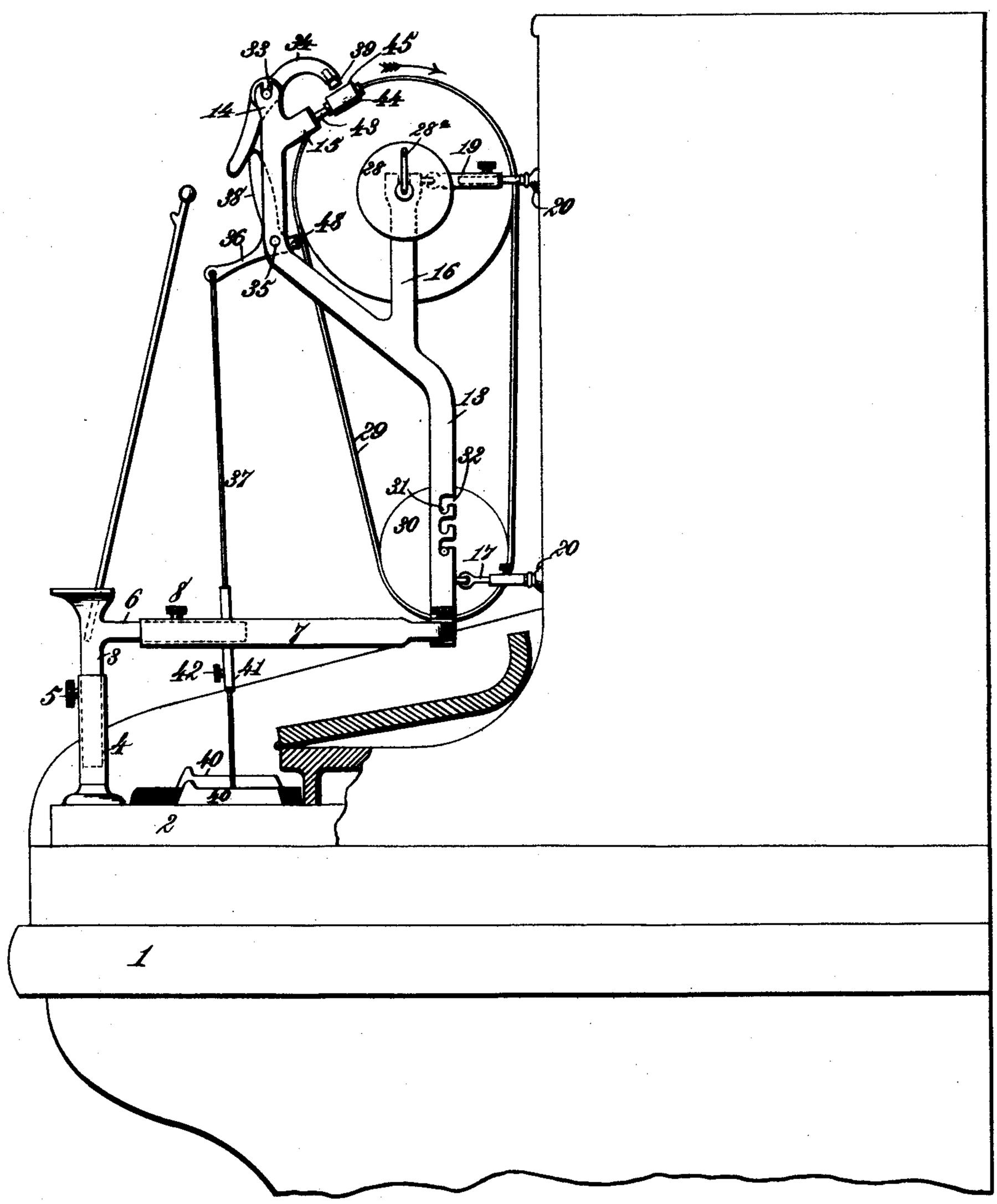
(No Model.) 5 Sheets—Sheet 3.

J. E. HARRIMAN, Jr.

MECHANICAL ATTACHMENT FOR PIANOS AND ORGANS.

No. 476,197. Patented May 31, 1892.

Fig. 3.



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(No Model.) 5 Sheets—Sheet 4.

J. E. HARRIMAN, Jr.

MECHANICAL ATTACHMENT FOR PIANOS AND ORGANS.

No. 476,197. Patented May 31, 1892.

Fig. 4.

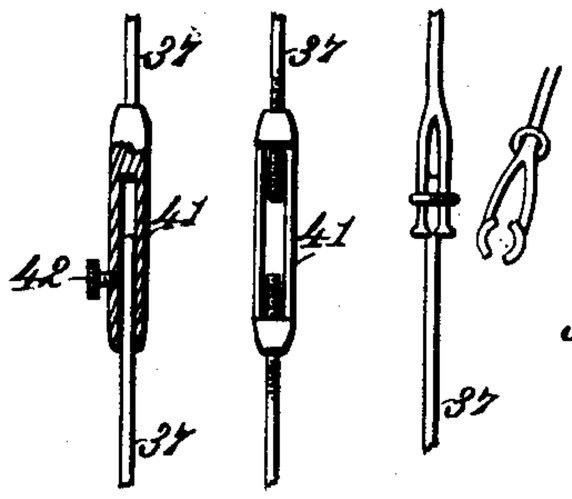


Fig. 5.

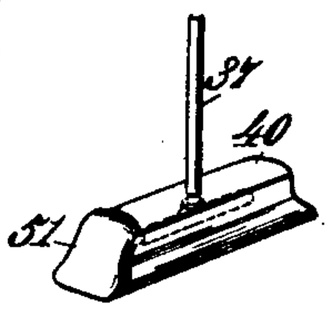


Fig. 6.

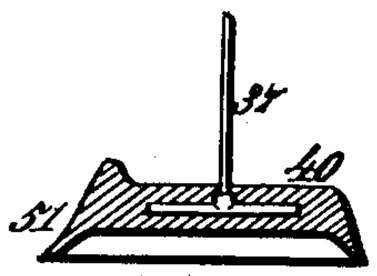
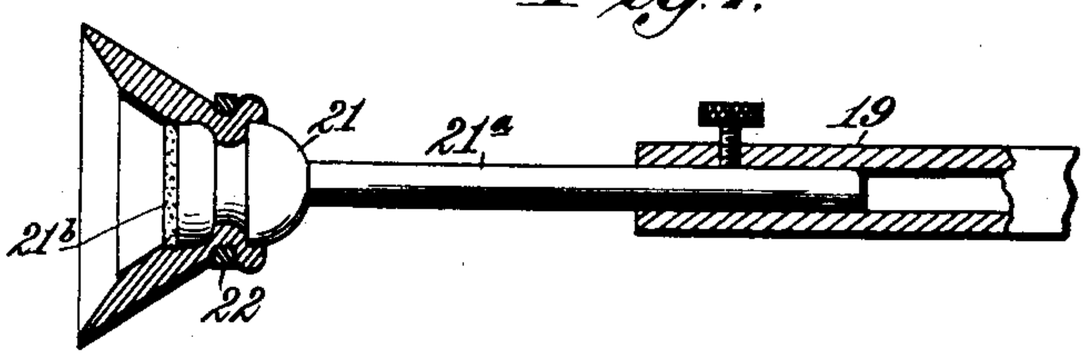


Fig. 7.



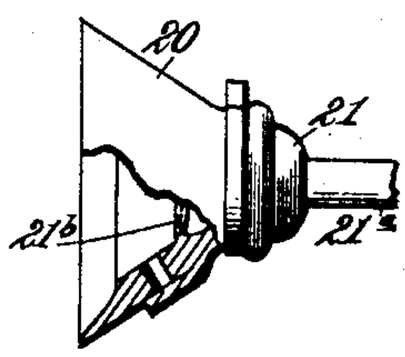


Fig. 11.

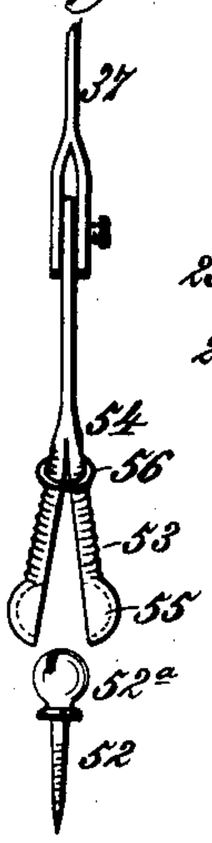


Fig. 8.

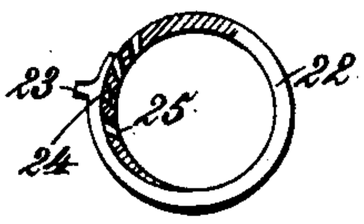


Fig. 9.

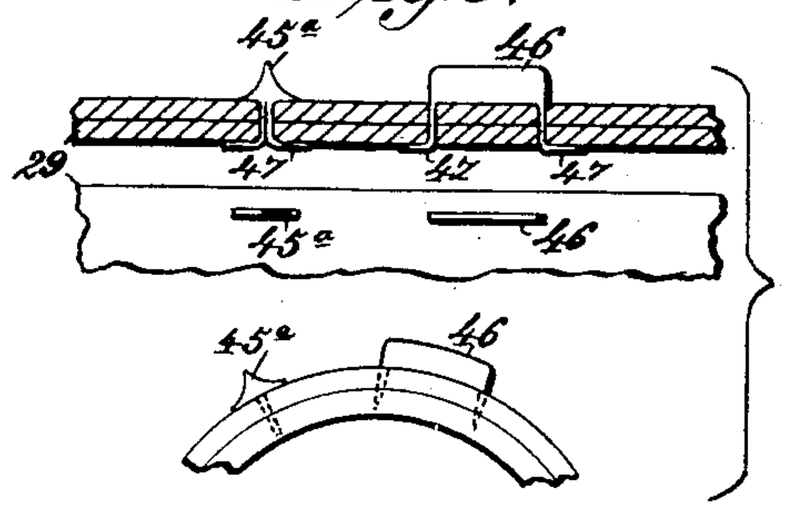
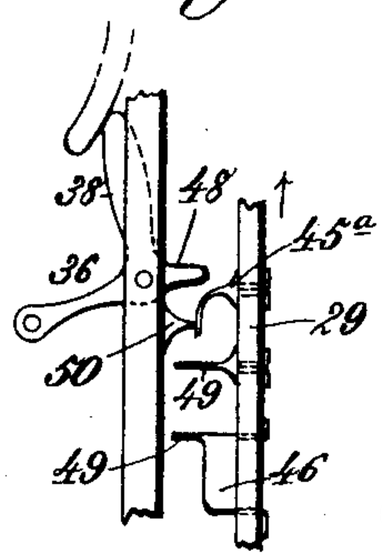


Fig. 10.



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J. E. HARRIMAN, Jr.

MECHANICAL ATTACHMENT FOR PIANOS AND ORGANS.

No. 476,197. Patented May 31, 1892.

Fig. 12.

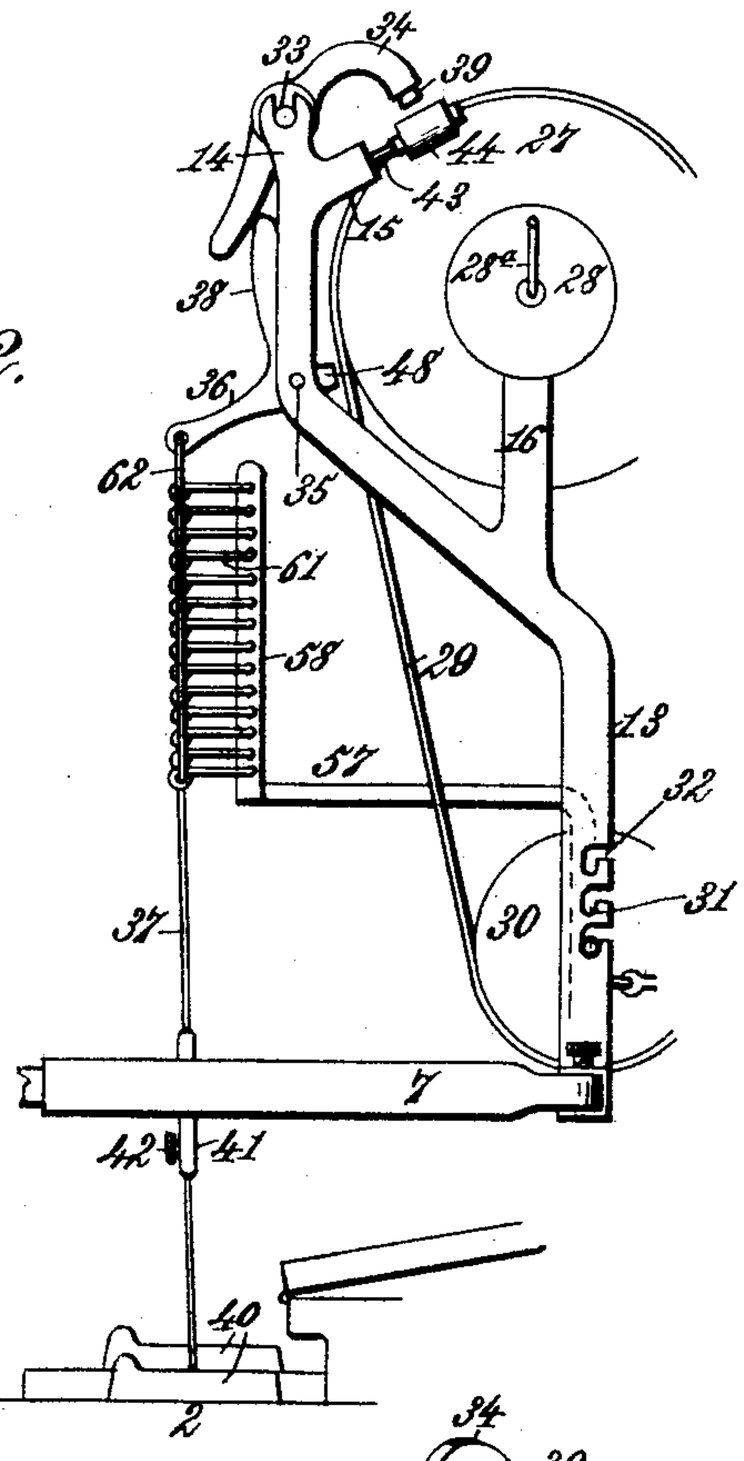
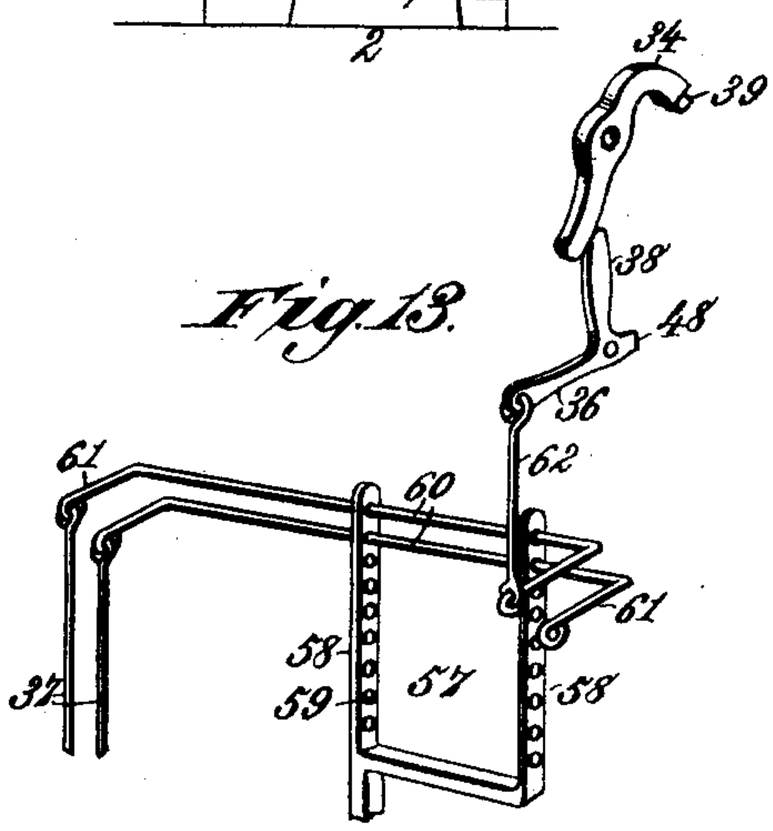


Fig. 13.



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UNITED STATES PATENT OFFICE.

JOHN EMERY HARRIMAN, JR., OF DALLAS, TEXAS, ASSIGNOR OF ONE-FOURTH TO JOHN N. WEBB, OF WASHINGTON, DISTRICT OF COLUMBIA.

MECHANICAL ATTACHMENT FOR PIANOS AND ORGANS.

SPECIFICATION forming part of Letters Patent No. 476,197, dated May 31, 1892.

Application filed February 28, 1891. Renewed January 19, 1892. Serial No. 418,544. (No model.)

To all whom it may concern:

Be it known that I, JOHN EMERY HARRIMAN, Jr., a citizen of the United States, residing at Dallas, in the county of Dallas and State of Texas, have invented new and useful Improvements in Mechanical Attachments for Pianos and Organs, of which the following is a specification.

It is the purpose of my invention to provide a mechanical attachment for pianos and organs whereby any musical composition executed upon the instrument shall be automatically recorded upon a traveling strip or band or, if preferred, upon the cylindrical surface of a revolving drum, the difference in value of the respective notes being represented by the length of the impression or of the mark or other symbol used to distinguish said note, whereby musical compositions may be recorded as they are executed upon the instrument.

It is a further purpose of my invention to provide simple means whereby a strip of flexible material upon which a musical composition has been recorded may be converted by being combined with said devices into an instrumentality for actuating certain parts of the recording mechanism in such manner as to automatically reproduce the said composition upon the instrument by means of which it was first rendered.

It is a further object of my invention, also, to provide a simple apparatus for recording the notes and combinations of notes by which harmony is produced exactly as they are sounded by a composer or player by the manual of a piano or organ; to combine therewith means whereby the clefs may be denoted, the time indicated, and the key in which the composition is written; to provide means whereby the occurrence of accidental sharps or flats shall be recorded, and to provide, also, simple means for attaching the connections intermediate of the manual and recording devices to the keys of the former and for adapting the length of each connection to the keys of different instruments.

It is my purpose, broadly speaking, to provide automatic recording mechanism which may be attached to and detached from a piano or organ for the purpose of recording upon the staff the relative position of each note or the notes of each chord struck upon the manual, the value of each of said notes, and the time.

The invention also has for its purpose the provision of novel means for connecting, adjusting, and operating the several parts of the mechanism and for adjustably and detachably securing the same in position without marring or otherwise injuring the woodwork, keys, or other part or parts of the instrument.

To these ends my invention consists in the several novel features of construction and new combinations of parts hereinafter fully described, and then particularly pointed out and defined in the claims following this specification.

To enable others skilled in the art to which said invention appertains or to which it is most nearly related to make, construct, and use the same, I will proceed to describe the invention in detail, reference being made to the accompanying drawings, in which—

Figure 1 is a front elevation of the manual of a piano or organ, showing my invention connected therewith, part of the manual being broken away. Fig. 2 is a plan view of the parts shown in Fig. 1. Fig. 3 is an end elevation of an upright or cottage piano or organ, illustrating the devices by which the recorder is attached and supported, the means by which the required adjustments are made, and showing the recording mechanism. Fig. 4 is a detail view in four parts, showing devices by which the connecting rods or wires may be lengthened or shortened. Fig. 5 is a detail view of a form of device whereby the rods or wires may be detachably connected with the keys of the manual. Fig. 6 is a further detail view, more fully showing the construction of the device illustrated in Fig. 5. Fig. 7 is a detail view in two parts, showing the construction of the devices adjustably connecting the supporting-frames or end brackets to the face of the musical instrument. Fig. 8 is a detail view of the collar shown in Fig. 7, illustrating the manner of fastening the same. Fig. 9 is a detail section in two parts, showing one construction of the detachable

points or tappets by which the belt or drum on which the recording devices act is converted into a device by which the points or tappets covering the indications recorded thereon may be rendered active elements in automatically reproducing the sounds or combinations of sounds recorded. Fig. 10 is a detail side elevation showing a modified construction of the devices illustrated in Fig. 9. Fig. 11 is a detail perspective view of the ball-and-socket attachment, which may be substituted for the detachable rubber vacuum fastenings. Figs. 12 and 13 are views showing modified forms of devices for supporting and operating the wires or rods connected to the keys, whereby a vertical action is secured throughout the series.

In the said drawings the reference-numeral 1 designates the frame of a musical instrument having a manual or bank of keys by the depression of which by the fingers of the player hammers are thrown against the strings to produce vibrations of the latter and the emission of a sound corresponding to the number of vibrations in a given period. The class or type of instruments referred to is represented by the piano and the organ.

The reference-numeral 2 denotes the manual or range of keys, which may be of any extent usually employed and of any known or preferred construction, that illustrated being the form now in general use, consisting of the bank of white keys and the series of black keys, corresponding to the sharps and flats of the natural tones.

The recording mechanism to be described is supported by uprights formed in two parts 3 and 4, the upper member 3 being adjustable vertically in a socket in the lower member 4 of the upright, which has a broadened base to permit it to rest firmly upon the horizontal portion of the frame of the instrument. The part 3 of the upright is held at any point of adjustment by a set-screw 5, tapped through the socket of the lower piece and resting against the movable part 3. From the upper portion of the part 3 a bar 6 extends horizontally toward the rear, its end entering a socket formed in the end of a bar 7, in which it is fastened at a suitable point by a set-screw 8. The bar 7 extends rearward in the same line with the bar 6 until it passes some distance behind the visible portion of the manual, where it is bent at right angles, its end 9 entering a socket 10 of suitable length, forming part of the horizontal bar 12, which is extended toward the middle portion of the manual and at a suitable distance from the center thereof bent upward, forming a substantially vertical arm 13, extended upward to any suitable point, where it is bent somewhat toward the front and then again bent vertically, the upper extremity of said bar being forked to provide arms 14 and 15, the former inclining slightly toward the front, while the latter inclines toward the upper portion of the instrument. From the inclining portion of the bar 13 springs a vertical arm 16, having at its extremity an open slot forming a bearing for a purpose presently to be described. At the opposite end of the manual is placed a similarly-constructed frame having its parts in duplicate with those already described. The vertical arms 13 of each frame are steadied and in some degree supported by an arm 17, adjustable as to length by means of a socket formed in an attaching portion, which will be described hereinafter. The arm 17 is connected in any suitable manner with the upright 13 and is held in the socketed portion by a set-screw. At the upper end of the bar 16 is attached an arm 19, also adjustable inward and outward and held by a set-screw, its connection with the instrument being effected by a device similar to that employed with the arm 17, which will now be described.

The removal of the recorder being desirable in almost all cases and it being also necessary to avoid the danger of marring the high polish and varnish of the case, I provide a rubber vacuum fastening consisting of a bell-shaped cup 20, formed of rubber, having sufficient thickness and having a low degree of vulcanization to give it a large degree of elastic strength. The edge of the bell-shaped cup 20 is trimmed off inside and cut as accurately as possible to prevent danger of leakage. Within the contracted end of the cup, which has an opening, is inserted an enlarged circular head 21, having a groove or channel, which lies when the head is inserted within the opening in the contracted end of the cup. When inserted therein, a metallic ring 22 is slipped over the rubber surrounding the head and so placed as to lie in the same plane with the groove. The ring is then drawn tight, forcing the rubber closely into the groove, and the ends of the ring are then fastened. This forms a practically air-tight joint.

The ring 22, although not claimed, broadly, in this application, consists of a metallic annulus formed of any suitable spring metal, the ends thereof overlapping, as shown in the detail figures. On the outer member of the overlapped parts is formed a lug 23, projecting from the outer face, and a catch-piece 24 projects from its inner face, said catch having an inclined face and a square or hooking shoulder adapted to engage any one of a series of openings 25, formed at such an angle that the tension upon the ring will tend to draw the catch-piece 24 more fully into said openings 25. Forming part of or attached to the head 21 is a straight bar 21^a, having a socket and a set-screw tapped through the wall of the socket. The parts thus described form the attachments for supporting the arms 17 and 19 and are applied in the manner following: Taking the arm or bar 21^a in one hand the operator places the open mouth of the cup 20 against the vertical face of the instrument and presses thereon until the air is wholly expelled from the cup, or as nearly so as possible. This is accomplished by

bringing the flat end of the head 21, which has a facing of rubber or other suitable material 21^b, against the point of attachment on the face of the instrument, thereby spreading the rubber of the flaring cup and giving a comparatively large area for atmospheric pressure, which firmly holds the bars 21^a and the drums 17 and 19 in position. The standards 4 may be also provided with these rubber vacuum fastenings at their lower ends to provide means of attachment to the casing. I propose, however, to use any fastening suitable for the purpose, and I may also substitute any suitable attachment in place of the vacuum fastenings for the bar 21^a and arms 17 and 19.

In the open slots or bearings at the upper ends of the arms 13 are placed the ends of a shaft 26, upon which is mounted a roll or pulley 27 of suitable diameter and length. This roll is in this instance rotated in the direction indicated by the arrow in Fig. 3 by means of a spring inclosed within a housing 28, said spring being spirally wound up to the required tension by means of a crank or key 28^a. Other means may, however, be employed, such as a weight, a cord and pulley, or a train of gearing operating by means of any suitable motor.

Over the roll or pulley 27, which is usually not less than two octaves in length and may be as much larger as is thought desirable, passes an endless band 29, having any suitable width and carried, also, by a smaller roll 30, the shaft-bearings thereof being formed in the vertical arms 13. These bearings consist of seats 31, arranged in a series at short intervals. Access to these seats is given by means of a corresponding series of slots 32, cut at an angle with the vertical, whereby the band, which may be of any length, may be stretched and operated.

The band 29 may be formed of any suitable material, such as leather, rubber, or other substance, and, if preferred, it may be made of paper. Moreover, it may be possible to use a strip instead of joining the ends to form an endless belt. When material other than paper is used for the belt, the paper may, if desired, be laid upon the outside of the belt. This paper is ruled with a full score, and intermediate lines also may be dotted between the upper and lower staff.

In the extremity of the arm or branch 14 of the forked end of the bar 13 is mounted the end of a rod or strong wire 33, which is supported at its other end in the corresponding arm 14 of the other frame. Upon this rod is arranged a series of strikers, each consisting of a lever 34, having the fulcrum-rod 33 passing through it not far from its central point. At its upper end the striker is curved so that its end is presented squarely to the cylindrical face of the roll. The other end of the striker is straight, or nearly so, and normally hangs with a slight inclination, as shown in Fig. 3. The strikers, numbering in all the same or about the same as the whole number of keys of the manual, are separated from each other upon the rod 33 by means of washers. At or near the angle between the arm 13 and the vertical arm carrying the strikers is inserted the end of a rod 35, its other end being similarly supported by the corresponding portion of the opposite frame. On this rod and separated by washers, like the strikers, are arranged a series of bell-crank levers, one arm 36 of each one thereof being connected to a strong wire 37, which is carried downward in a nearly vertical direction and attached to the key of the manual corresponding in position with the place occupied by the bell-crank. The other arm 38 of the latter lies against the inner face of the lower end of the striker. It will be seen that by pulling upon the wire 37 the arm 38 will be thrown outward and the curved extremity of the striker will be thrown toward the surface of the roll or cylinder. In or upon these curved ends of the strikers are formed or mounted impression-blocks 39. These blocks may have removable shanks socketed in the strikers, and the form of the impressions imprinted by them may vary in order to indicate the different notes or other signs presented by the impressions.

The wires 37 are detachably connected to the keys of the manual by means of a rubber block 40, into which the end of the wire is molded. The block is provided with a hollow or concave bottom, and the block may be pressed upon the key and held there by suction, or it may be applied in any other way preferred. If, however, the attachment is to be permanent, the wires may be fastened by other means. In order to provide for their easy adjustment as to length, I may provide each wire with a turnbuckle 41, or I may employ a simple sleeve or tube, in one end of which a part of the wire is secured permanently, while the other portion of the wire is inserted in the open end of the tube and held at any point by a set-screw 42.

Upon the arms 15 of the fork on the end of the vertical bar 13 are mounted spindles 43, upon which are placed spools 44, between which is stretched an ink-ribbon 45, against which the striking-blocks impinge, thus forming the impressions. If a note is of more value than another, it will be held a relatively longer time, and the prolonged impression thus made upon the paper or upon the drum, as the case may be, will mark the value of the note. The time may be indicated by transverse spaces ruled across the staff. The greater the force, also, with which the key is struck the darker will be the impression upon the recording-strip, and in this manner both the value and force of the note will be substantially represented. After a complete record has been made of a new composition or after a known composition has been rendered and recorded the record-strip may be converted into a device for reproducing the melody automatically by attaching to the

belt or recording-strip a series of metallic, rubber, wooden, or other points of various length, according to the represented value of the notes. For example, for an eighth or a sixteenth note a point 45ª would be enough, while for a quarter or perhaps a half note a prolonged block 46 of proper relative length would be necessary. When each recorded impression has been covered by a point or tappet provided with staple-points 47, which pass through and are bent down upon the band or strip, the band is replaced and its movement is produced by the spring, as before. As the points reach the bell-crank levers they strike points or lugs 48 on said levers, thereby throwing their arms 36 downward and depressing the corresponding keys of the manual. In this manner any recorded composition may be automatically reproduced upon the instrument by which it was rendered by a player or composer. When this automatic reproduction is practiced, the series of strikers 34 must be removed by lifting the rod 33 out of its bearings.

To vary the force with which the notes are struck, the points or tappets may be provided with elastic or spring tips 49, Fig. 10. Upon the arm 13 is arranged a support provided with a row of projections 50, arranged in the lines of travel of the points 45ª and 46 and just beneath the lugs 48 on the bell-cranks. As the spring-points engage the projections 50 they are bent, and when the point 45ª is brought just beneath the lug 48 the spring-point passes off the projection 50, and, springing up, strikes the said lug 48 with a force sufficient to express the note struck. These spring-points are made of various strength and may be changed to suit different musical compositions. In reproducing melodies in this manner the strikers are removed to give free play to the bell-crank levers.

In forming the rubber air-cushions 40 I prefer to make them in the form shown in Figs. 5 and 6, the sloping and extended front end 51 being adapted to receive a plate or strip of paper containing a symbol or character.

I may substitute for the rubber cushions already described the ball-and-socket screws shown in Fig. 11 as means for securing the wires 37 to the keys of the manual. This device consists of a small screw 52, having a round head 52ª, with a slot therein for the screw-driver. These screws are set in the keys at a suitable point, for which purpose small holes may be drilled through the ivory or celluloid of said keys. To the rounded head 52ª of each screw is attached a cleft or divided socket composed of two arms 53, which unite or are joined to form part of a solid shank 54. These arms are elastic, so that they will normally spring open or separate from each other, and at their free ends are formed or mounted heads having hemispherical sockets 55, adapted to inclose or engage the rounded head of the screw. A sliding ring 56, encircling the divided arms 53, is pushed down thereon close to the socketed heads and holds them close upon the screw-head. The wires 37 are attached to the shanks 54 by any suitable means, such as the turnbuckle or clamp already mentioned. I may make connection, also, with the pedals and stops of an organ or with the pedals of a piano. Moreover, where an organ is provided with a pedal-base similar connections may be made with each of the foot-keys of such base.

I have shown the series of wires 37 diverging from the support upon which the bell-crank levers are fulcrumed in order to reach both ends of the manual. Should the leverage be insufficient because of this arrangement, the support 35 for the bell-crank levers may be extended to such a length that the wires will drop vertically, or nearly so, throughout the series; or, if preferred, a horizontal extension may be made from which the wire will drop vertically, or substantially so, upon all the keys of the manual, thus giving substantially the same force of action to each key and being operated by an equal force to depress or strike the keys.

In order that all the wires connected with the keys of the manual may stand and exert their action vertically, or nearly so, without extending the base of support, I may adopt the construction shown in Figs. 12 and 13.

Upon each of the uprights 13 of the supporting-frame is mounted an auxiliary bracket 57, having two parallel arms 58, provided with a series of openings 59, which form bearings for horizontal rock-shafts 60, having arms 61 at their ends, said arms extending horizontally, or substantially so. One of these arms upon each rock-shaft is connected by a link 62 to the arm of one of the bell-crank levers 36, while the other arm is flexibly connected to one end of one of the wires 37. Each rock-shaft 60 is of increased length, their ends extending one beyond the other to connect with the bell-crank levers and having a similar but greater extension at the other ends for connection with the wires 37.

The auxiliary brackets may be mounted partly upon the uprights 13 and supported in part by the end standards 3.

What I claim is—

1. The combination, with a musical instrument having a manual, of a recording attachment attachable to and detachable from said instrument, said attachment consisting of a frame, a removable and replaceable rod or shaft set in open bearings in said frame and having a series of strikers loosely mounted thereon, a series of bell-crank levers pivoted upon a separate supporting-shaft and having their arms on one side of the shaft bearing against the ends of the strikers, and a series of wires detachably connected at one end to the keys of the manual and at the other ends to the bell-crank levers, substantially as described.

2. The combination, with a musical instrument having a manual, of a frame detachably

connected thereto, a rod or shaft supported in open bearings in said frame, a series of strikers loosely mounted on said rod or shaft, a corresponding series of bell-crank levers pivoted on a separate parallel rod or shaft and having one arm on each bearing against the end of one of the strikers, said bell-crank levers having each a lug or point projecting from its angular portion, a roll adapted to support a music-sheet and having its periphery in proximity to said lugs, and a series of wires or rods connecting the keys to the bell-crank levers, substantially as described.

3. The combination, with a musical instrument having a manual, of bars detachably and rigidly connected to said instrument, arms having sockets to receive said bars and provided with set-screws to fasten the said bars at any point to which they are adjusted, paper-supporting rolls having their journals supported in bearings in the frame, a series of strikers pivoted upon a rod or shaft mounted on the frame, a series of bell-crank levers bearing upon the ends of the strikers, and a series of rods or wires connecting the other ends of the bell-crank levers to the keys of the manual, substantially as described.

4. The combination, with a musical instrument having a manual, of a detachable frame, rolls journaled in said frame to support an endless band or sheet, a series of bell-crank levers having arms adapted to act upon a series of strikers and provided with lugs extending from the angular parts of said levers toward the periphery of one of the rolls, a series of rigid rods or wires connecting the said levers with the keys, and a sheet or band mounted on the rolls and provided with tappets moving in the vertical planes in which said lugs lie, substantially as described.

5. The combination, with a musical instrument having a manual, of a detachable frame, paper-supporting rolls journaled therein, a series of strikers pivoted upon a rod or shaft removably supported in the frame, a series of bell-crank levers pivoted upon a rod or shaft attached to the frame, said levers having lugs or points upon their angular portions extending toward the periphery of one of the rolls, and a series of rods or rigid connections between the ends of the bell-crank levers and the keys, whereby the notes of a musical composition may be recorded upon the paper passing over the roll, and a series of tappets mounted on said sheet over said recorded notes and used after removing the series of strikers to operate the keys and reproduce the melody recorded, substantially as described.

6. The combination, with a musical instrument having a manual, of a detachable frame, rolls journaled therein to support a band or sheet, a series of strikers pivoted upon a rod detachable from said frame, a series of levers operating the strikers, said levers having points or lugs extending toward the periphery of one of the rolls, a series of rigid connections between said levers and the keys of the instrument, and a sheet or band adapted to receive the impressions made by the strikers and to carry projecting tappets mounted on said sheet and covering the notes recorded, whereby the instrument may be caused to produce the recorded melody automatically, substantially as described.

7. The combination, with a musical instrument having a manual, of a frame detachably connected therewith, rolls journaled in said frame to support an endless sheet or band, a series of strikers pivoted on a removable rod or shaft, a series of bell-crank levers actuating said strikers and having lugs which project from their angular parts toward one of the rolls, a series of rigid connections between the power-arms of said bell-crank levers and the keys, and a sheet having tappets mounted thereon and provided with elastic points which move with the sheet in line with projections arranged a little in front of the lugs on the bell-crank levers, by which the elastic points are bent before reaching said lugs and released at such points as to strike said lugs with a force graduated by the resilient force of the points, substantially as described.

8. In a musical instrument having a manual or range of keys, the combination, with one or more rolls or pulleys carrying a sheet, strip, or band of material capable of receiving impressions, of a series of strikers, a series of levers operating said strikers, said levers being connected to the keys by wires buried at their ends in rubber suction-blocks, and means for feeding the strip or band, substantially as specified.

9. In a musical instrument, the combination, with a sheet, band, or other surface capable of receiving impressions and having recorded thereon the relative position and value of the notes of a musical composition, of a series of points or tappets attachable to and detachable from said sheet or surface, each having a length equal to that of the recorded impression it covers and each provided with an elastic point, a series of levers arranged in the lines of travel of the said points or tappets, and a frame having a series of projections arranged just below the point where the tappets engage said levers, substantially as specified.

In testimony whereof I have hereunto set my hand and affixed my seal in presence of two subscribing witnesses.

JOHN EMERY HARRIMAN, JR. [L. S.]

Witnesses:
T. S. MILLER,
F. W. STEBER.