

C. W. NYSTRÖM.
SOUND RECORDING AND REPRODUCING ATTACHMENT FOR
KEY INSTRUMENTS.

No. 520,894.

Fig. 1. Patented June 5, 1894

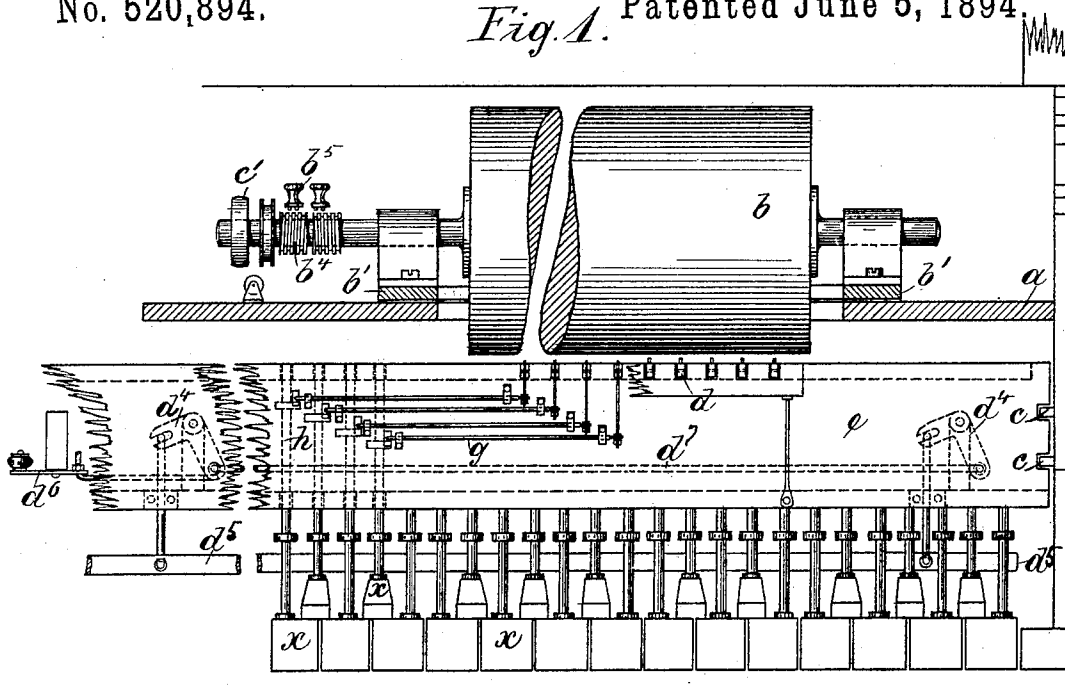
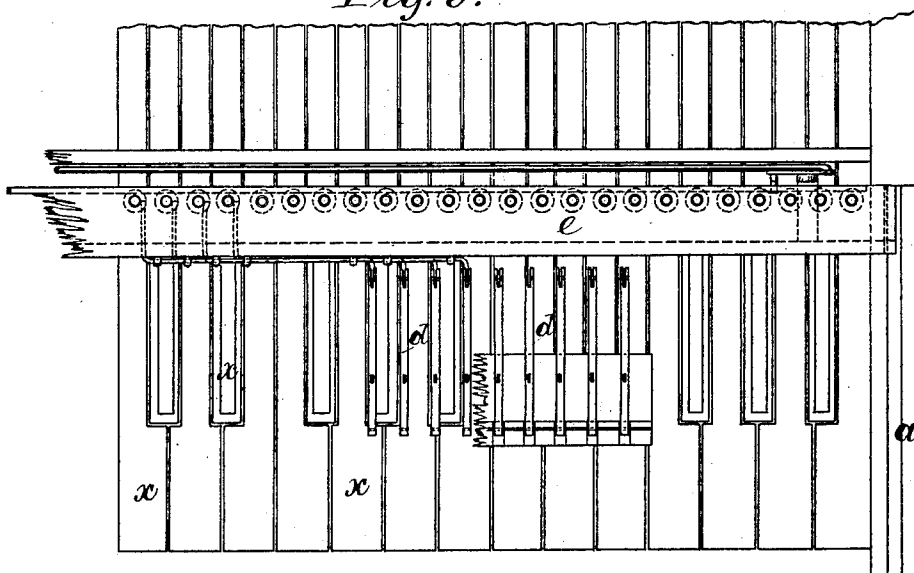


Fig. 3.



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Fig. 2.

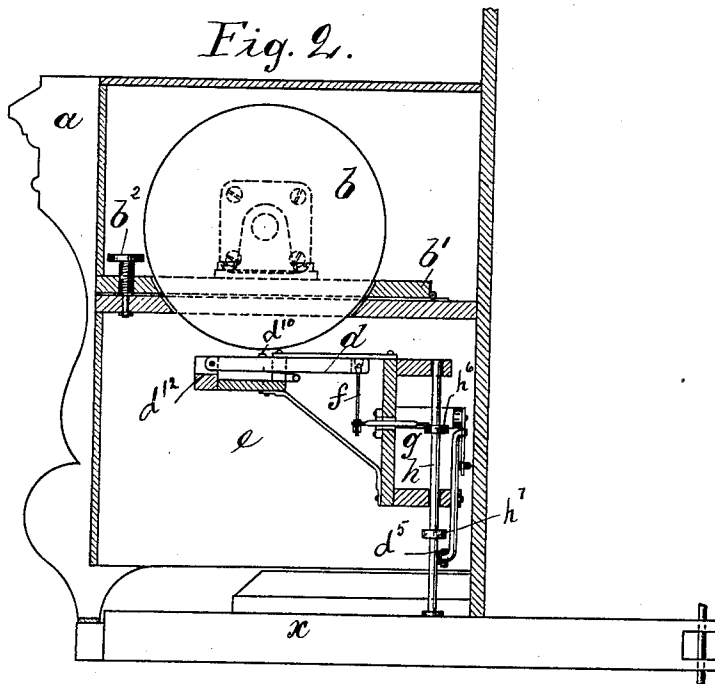
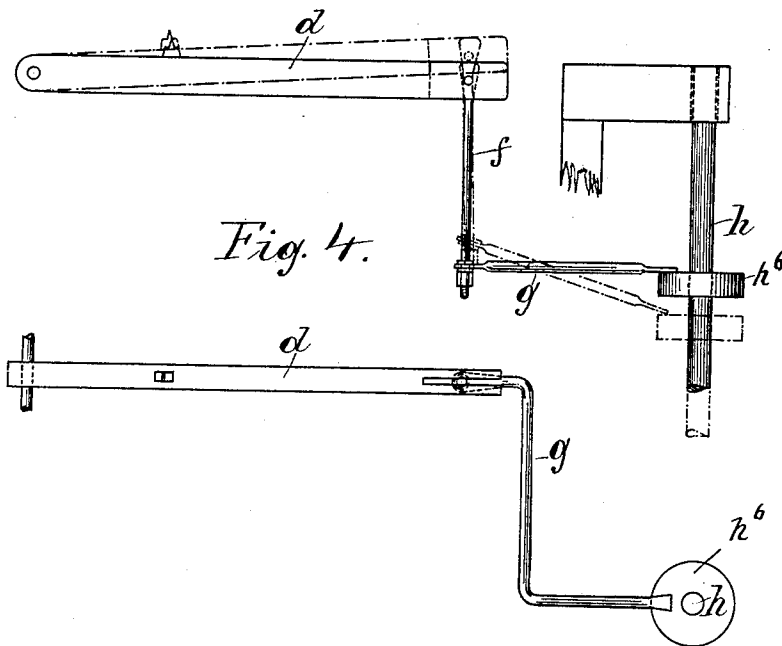


Fig. 4.



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Fig. 5. Patented June 5, 1894.

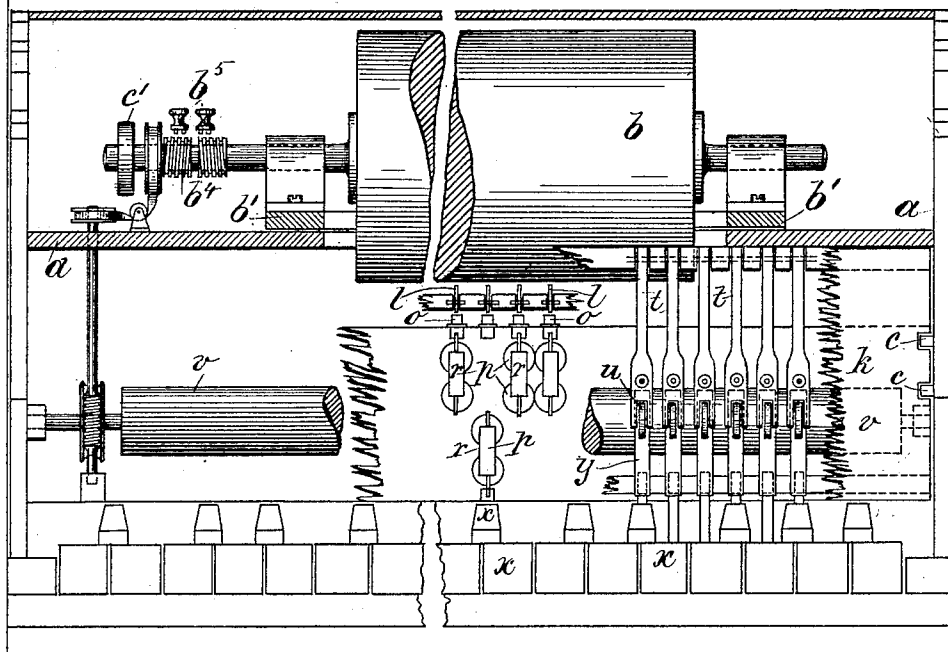
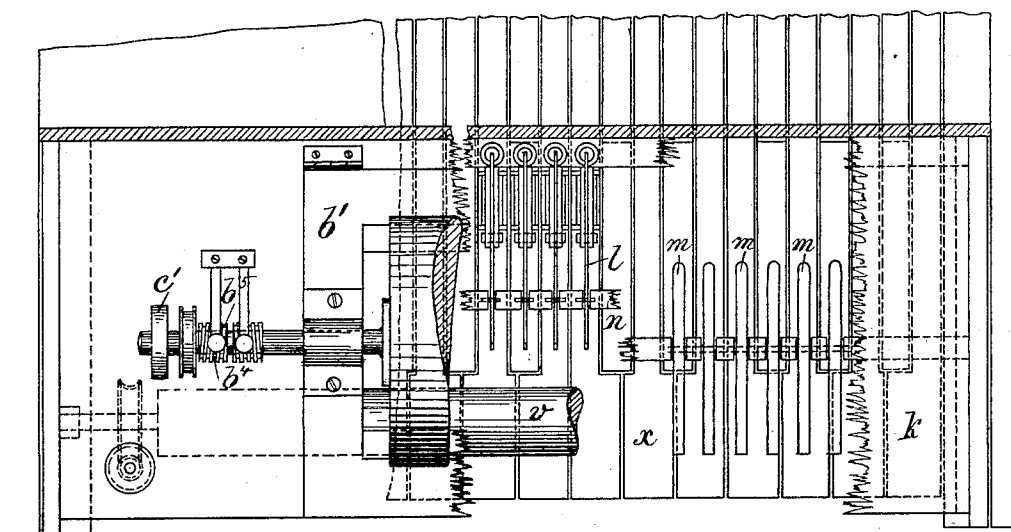


Fig. 7.



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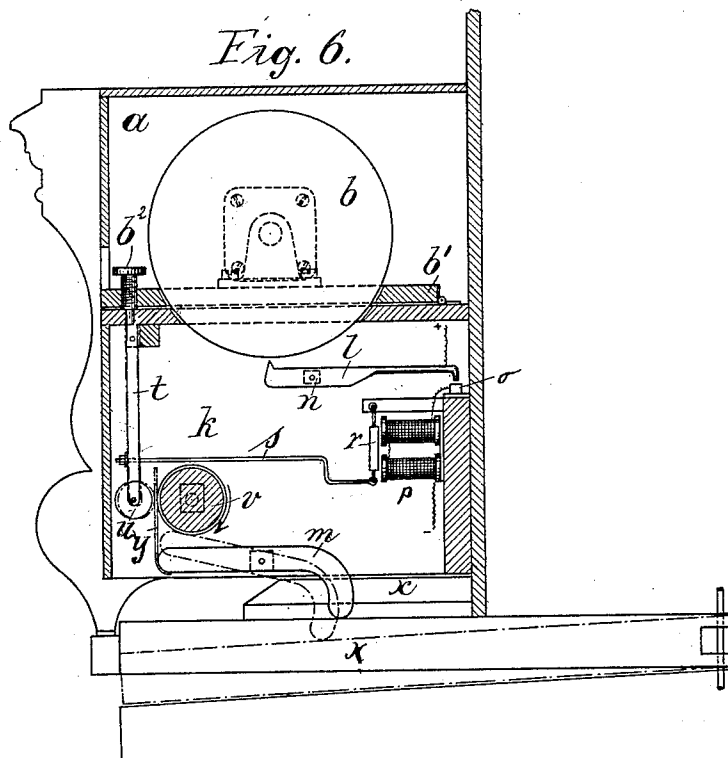
(No Model.)

5 Sheets—Sheet 4.

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Fig. 8.

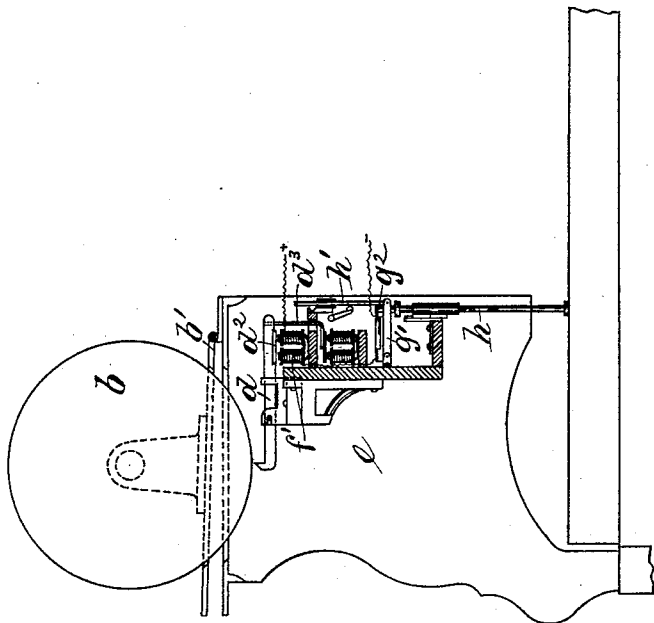
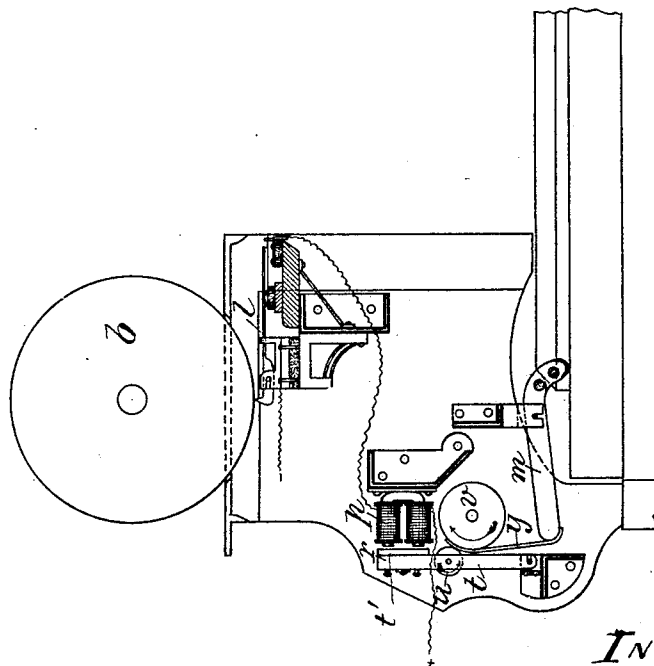


Fig. 9.



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UNITED STATES PATENT OFFICE.

CARL WILHELM NYSTRÖM, OF CARLSTAD, SWEDEN.

SOUND RECORDING AND REPRODUCING ATTACHMENT FOR KEY-INSTRUMENTS.

SPECIFICATION forming part of Letters Patent No. 520,894, dated June 5, 1894.

Application filed December 17, 1892. Serial No. 455,546. (No model.) Patented in Sweden November 7, 1891, No. 3,879.

To all whom it may concern:

Be it known that I, CARL WILHELM NYSTRÖM, a subject of the King of Sweden and Norway, residing at Carlstad, in the Kingdom of Sweden, have invented certain new and useful Improvements in Sound Recording and Reproducing Attachments for Key-Instruments, (for which I obtained Letters Patent in Sweden, No. 3,879, dated November 7, 1891,) of which the following is a specification.

The object of my invention is to provide a new and improved apparatus that can be applied on key instruments, for example, on a piano, an organ and the like, and by means of which apparatus a record of the keys struck can be produced and the same tones that were produced in making this record can then be reproduced on the same key instrument or on another instrument to which the apparatus is applied. If a piece of music is played on a piano, for example, the apparatus can reproduce the piece played on the same instrument or on an organ, or vice versa.

In the accompanying drawings, Figure 1 is a longitudinal elevation of my improved apparatus for recording the keys depressed, parts being broken out. Fig. 2 is a vertical transverse sectional view of the same. Fig. 3 is a plan-view, parts being broken out. Fig. 4 is a detail side and plan-view, on an enlarged scale, of the means for making the impressions on the recording cylinder. Fig. 5 is a detail longitudinal sectional view of the apparatus for reproducing the musical sounds. Fig. 6 is a vertical transverse sectional view of the same. Fig. 7 is a plan-view, parts being broken out. Fig. 8 is a modified construction of the device for recording the keys struck, and Fig. 9 is a modified construction of the device for reproducing the sounds.

Similar letters of reference indicate corresponding parts.

The apparatus is composed of a casing *a*, in which a cylinder *b* is mounted. This cylinder is provided with a coating of soft metal, wax, tin-foil, paper or other suitable substance in which an impression can be made by means of a style. Said cylinder is rotated by means of a belt passed over a belt-pulley *c'* on the shaft of the cylinder from a clock-work mechanism, electro-motor or any other

suitable motor. The cylinder is as long as the key-board of the instrument, in which case the casing *a* can rest on the end-brackets of the keyboard; or in case it is desired to have the roller only the length of a certain number of keys, suitable extensions of the casing are to be provided for supporting the casing on the end-brackets. In case a record of a piece played is to be produced on the cylinder *b*, the frame *e* is inserted into the casing *a* and is held by the cleats *c c* projecting from the end-walls of the casing, as shown in Figs. 1 to 4. In said frame *e* a series of levers *d* are pivoted on a rail *d*¹², each lever *d* having a style *d*¹⁰. For each lever *d* a vertically-movable and suitably guided spindle *h* is provided, that has a collar *h*⁶ on which one end of an angle-lever *g* rests, the other end of which angle-lever is connected with the lower end of a rod *f* having its upper end pivotally connected with the corresponding lever *d*, said angle lever being supported in bearings on the frame *e*, see Fig. 1. If the spindle *h* is depressed, the lever *d* will thus rise as indicated in dotted lines in Fig. 4. The said system of levers *f g* and *d* and the spindles *h* are so arranged that when the parts are in a position of rest—that is, when the keys are not depressed—the lower ends of the spindles rest on the tops of the keys *x* of the instrument and the styles *d*¹⁰ are close to the surface of the cylinder *b*.

If any one of the keys *x* is struck or depressed, the spindle *h* resting on said key descends, whereby the corresponding lever *d* is raised and its style *d*¹⁰ makes an impression or mark in the coating of the rotating cylinder *b* (see Fig. 4). In this manner an impression or mark is made for each tone that is produced, and the length or size of this impression depends upon the length of time that the key remains depressed and the speed with which the cylinder rotates. When the performer has played the piece, the cylinder *b* is provided on its surface with marks or depressions, and these marks or depressions can be copied and translated into ordinary musical notation, thus permitting of readily producing a transcript of a "phantasia" or other composition, and this copy will be precisely the same as the piece that was played.

If it is desired to reproduce the piece that has been played, the frame *e* is removed from the casing *a* and another frame *k* (Figs. 5 to 7) is placed upon the cleats *c c*. This frame *k* contains a series of levers *l* pivoted on a rod *m*, which levers are provided at one end with points that can rest against the surface of the cylinder *b* and can pass into the depressions in the same, and whenever they thus pass into a depression cause the mechanism to operate a series of pressers *m* to act on the keys and press the same so as to produce the desired sounds. The levers *l* are each provided at the end opposite the one provided with the point with the platina contact, which whenever the point-end of the lever passes into one of the depressions in the cylinder *b* comes in contact with a platina contact *o* connected with one end of the coil of an electro-magnet *p*. The levers *l* are connected with one pole of the battery, and the other pole of the battery is connected with the several electro-magnets *p*. Any other source of electricity can be used in place of a battery. The armature *r* of each electro-magnet *p* is connected by means of a rod or wire *s* with a pivoted rod *t*, the lower end of which carries a roller *u*. Between the roller *u* and the rotating drum *v* a strap *y* of roughened rubber, fabric or like material passes, which strap has one end fastened to one end of one of the above mentioned pivoted pressers *m*, the other end of the presser resting on the key. Whenever the hook or point of a lever *l* passes into one of the depressions of the cylinder *b* the other end of said lever closes the circuit with the contact *o*, whereby the armature *r* is attracted and presses the roller *u* on the lower end of the rod *t* against the strap *y* and presses the latter against the drum *v*, which rotates in the direction indicated by the arrow in Fig. 6. Said drum *v* is covered where the several straps *y* rest against it with the same material of which the straps are made or is roughened in any other way, so that the strap *y* when pressed between the drum *v* and the roller *u* on the lower end of the pivoted rod *t* is drawn upward and draws upward one end of the corresponding presser *m*, whereby the other end of the presser is pressed downward so as to depress the key and produce the desired sound. Whenever the hook-end of a lever *l* leaves the depression in the cylinder *b* the circuit is broken, the electro-magnet releases the armature, the rod *t* swings back and the presser *m* assumes its normal position and draws the strap *y* downward.

If desired, the effects of the forte and piano pedals can be recorded on the recording cylinder *b* while playing and can also be reproduced on another instrument. For this purpose the frame *e* is provided with two levers *d*, which are connected with the forte and piano pedals, and they are preferably arranged at the end of the cylinder *b*. Whenever any one of said pedals is depressed a corresponding mark is made on the cylinder

b. In the frame *k* a pair of extra corresponding levers *l* are provided, each of which acts on a pedal, and whenever these extra levers *l* pass into one of the corresponding depressions on the cylinder *b* the corresponding forte and piano effects are produced.

The drawings show a number of details, which, although not essential, will now be described. The cylinder *b* is mounted on a frame *b'*, which can be adjusted by means of a screw *b²* in such a manner as to raise or lower the cylinder more or less so as to get it in proper position for the styles *d'* of the levers *d* and the hook-ends of the levers *l*. On the end of the shaft of the cylinder *b* two collars *b⁴* having spiral grooves are fixed, which spiral grooves run in opposite directions. By engaging the points or projections from the lower ends of two heads *b⁵* with one of the other of said spirally-grooved collars the cylinder *b* is moved in the direction of its length while rotating. This mechanism is provided to permit of recording and playing a piece that requires more length than the diameter of the roller for recording it. A rod *d⁵* is arranged below the several collars *b⁶* of the spindles *h* and it is suspended by suitable rods from angle-levers *d⁴*, which are connected by a rod *d⁷* with an angle-lever *d⁶* having a handle, so that by swinging said angle-lever *d⁶* the rod *d⁵* is raised and acting on the said collars *b⁷* raises the several spindles *h* clear of the keys, so as to be out of the way when moving the device out of the casing *a*.

The drum *v* is rotated, as shown in Figs. 5 and 6, from the cylinder *b* by means of a worm and worm-wheel and a belt-pulley.

Fig. 8 shows a modification of the construction shown in Fig. 2. In this modification the levers *f g* are omitted, and in place of the same the levers *d* are operated by electro-magnets *f'* connected with contacts *g'*, which are closed when the keys move downward. The electro-magnets *f'* act on the levers *d* either directly, in which case the levers are provided with the armatures *d²*, or they act on them by means of a rod *d³* connected with said levers *d* and carrying an armature at its lower end; or the levers *d* can be acted upon by two electro-magnets, of which one acts directly on the lever and the other acts by means of the rod *d³*. The contact-piece *g'* is pivoted at one end and its other end is connected with the spindle *h'*, which rests on the disk of the spindle *h*. The contact spring *g²* rests on the upper end of the spindle *h*. If a key is depressed the corresponding spindle *h* descends, whereby the contact between the contact-piece *g'* and the contact-spring *g²* is made and thereby the electro-magnets are excited and attract the armatures, so that an impression is made by the hook-end of the lever *d* in the coating of the cylinder *b*. The spindles *h'* only serve for regulating the distance between the contact-spring *g²* and the spindle *h*.

Fig. 9 shows a modification of the construc-

tion shown in Fig. 6. The electro-magnets are so placed that they act directly on the lever *t*, thus dispensing with the rod or wire *s*, and for this purpose the said lever *t* is provided with an armature *t'*, which can be attracted by the said electro-magnets. As shown in Fig. 9, the levers *t* are pivoted at their lower ends and the roller *u* is arranged at about half the height of said rods.

Having thus described my invention, I claim as new and desire to secure by Letters Patent—

1. In a sound recording and reproducing attachment for key instruments, the combination, with a casing, of a cylinder mounted in the same, a series of levers pivoted below the cylinder and provided with projections for making impressions in the surface of the cylinder, a series of vertically-movable spindles in the casing, means for transmitting motion from said spindles to the levers below the cylinder and mechanism for raising

the several spindles simultaneously, substantially as set forth.

2. In a sound recording and reproducing attachment for key instruments, the combination, with a casing, of a cylinder mounted in the same, a detachable frame containing levers for making impressions on the surface of the cylinder, means for operating said levers from the keys, an additional detachable frame in said casing containing pressers for operating the keys and means for operating said pressers from the above mentioned cylinder on which the impressions have been made by the levers, substantially as set forth.

In testimony that I claim the foregoing as my invention I have signed my name in presence of two subscribing witnesses.

CARL WILHELM NYSTRÖM.

Witnesses:

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J. GUST. LUNDELL.