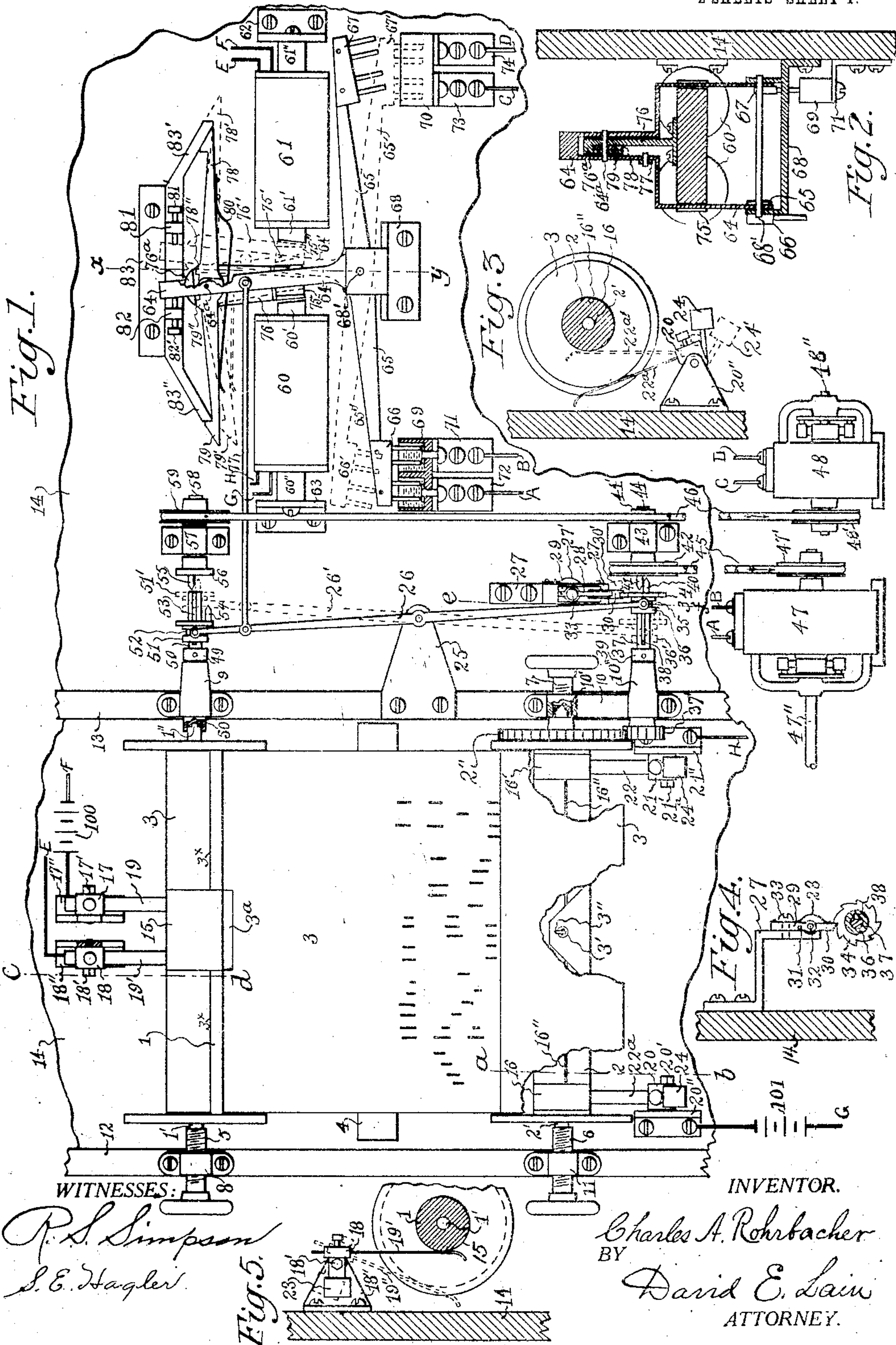


C. A. ROHRBACHER.
AUTOMATIC MUSICAL INSTRUMENT.
APPLICATION FILED JAN. 14, 1909.

958,318.

Patented May 17, 1910.

2 SHEETS—SHEET 1.



UNITED STATES PATENT OFFICE.

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AUTOMATIC MUSICAL INSTRUMENT.

958,318.

Specification of Letters Patent.

Patented May 17, 1910.

Application filed January 14, 1909. Serial No. 479,884.

To all whom it may concern:

Be it known that I, CHARLES A. BOHRBACHER, a citizen of the United States, and a resident of Bellingham, in the county of Whatcom and State of Washington, have invented certain new and useful Improvements in Automatic Musical Instruments, of which the following is a specification.

My invention relates to an improvement in automatic musical instruments, more especially to means for rerolling the perforated strip of music used in said instruments and consists in automatic means whereby said strip is rerolled without the use of the special perforations in the same as ordinarily employed.

Hitherto it has been customary to make special perforations in the blank end of said strip, following the perforated part of the same, and when said special perforations pass over a certain hole in the tracker board pneumatic means are operative to inaugurate the rerolling of said strip. It has been found that the arrangements provided for this purpose are easily disarranged and frequently fail to operate. Furthermore, this mechanism is so located that it is not readily accessible for repairs.

My improvement in the apparatus is positive in operation and so located that, should it become deranged, it is easily accessible for repairs.

My invention is illustrated in the accompanying two sheets of drawings in which similar characters refer to similar parts throughout.

Figure 1 is a front elevation illustrating my improved mechanism, Fig. 2 is a sectional view of the controlling electro-magnet on a medial vertical plane perpendicular to the plane of Fig. 1 and on line *a y* when 64 occupies a medial position; Fig. 3 shows a partly sectional end elevation of the lower music roll and one of the brushes for making electric contact with the same said section being made on line *a b* of Fig. 1; Fig. 4 shows an end elevation of a device for stopping the revolution of said lower roll, said view being made on line *e f* of Fig. 1; Fig. 5 shows a sectional end elevation of the upper roll and one of the brushes for making electric contact with the same, said section being made on line *c d* of Fig. 1. Fig. 6 is an enlarged view of a portion of Fig. 1,

also illustrated in Fig. 2 and Fig. 7 is an enlarged view of a portion of Fig. 1.

More particularly:—14 is the back board of the removable case on which the major portion of my apparatus is mounted. This is designed to stand in a vertical position in the upper part of the instrument case. 12 and 13 are two vertical rails attached to said back board.

1 is the upper music roll rigidly attached to shaft 1'. One end of the music sheet 3 is permanently attached to roll 1 along the line 3*.

9 is a bracket attached to rail 13 and serves as a pillow block for horizontal shaft 50. The left-hand end of shaft 50 is enlarged to form a shoulder with a bearing against the left-hand end of pillow block 9. This enlarged end of shaft 50 is bored to receive the right-hand end of shaft 1' which has a tenon 1'' on this end suited to match in a mortise in the bottom of said bore, thus joining the two shafts in revoluble relation in the usual way. The left-hand end of shaft 1' is suited to enter a bore in hand screw 5. Hand screw 5 is mounted in threaded bracket 8 attached to rail 12 in such manner that hand screw 5 is in a right line with shaft 50. Thus roll 1 is easily removable from its bearings.

2 is the take-up roll rigidly attached to its shaft 2'. The right-hand end of shaft 2' is finished with a conical end and enters a bore in hand screw 7. Hand screw 7 is screwed into lug 10' of bracket 10. Bracket 10 is secured to rail 13. The left hand end of shaft 2' is similarly finished and enters a bore in hand screw 6 which is mounted in threaded bracket 11, which in turn is secured to rail 12. Hand screws 6 and 7 are so mounted that shaft 2' is parallel to shaft 1'. Also on bracket 10 is lug 10'' which provides a bearing for a short shaft 37 in such manner that shaft 37 is parallel to shaft 2'. To the left hand end of shaft 37 is rigidly attached spur gear 37' which meshes with spur gear 2'' rigidly attached to shaft 2'. On the right hand end of shaft 37 is clutch 36 having annular groove 35; ratchet flange 34, and engaging pin 40. This clutch is movable longitudinally on said shaft on feather 38. Collar 39 attached to shaft 37 in conjunction with spur gear 37', prevents longitudinal movement of the same in bearing 10''. On

shaft 50 is clutch 51 having annular groove 52 and a flange on the right hand end in which is secured engaging pin 54; clutch 51 is movable longitudinally on feather 53. Collar 49 attached to shaft 50, in conjunction with said enlarged left-hand end, prevents longitudinal movement of said shaft in bearing 9. Shifting lever 26 is fulcrumed in its middle on the bracket 25, which is attached to rail 13. One end of this lever engages in the annular groove 52 in clutch 51 and the other end engages in annular groove 35 in clutch 36 in such manner that the movement of lever 26 to dotted position 26' carries clutch 51 to dotted position 51' and clutch 36 to dotted position 36', whether or not said clutches are revolving with their shafts.

In a horizontal bearing in bracket 57, which is attached to back board 14, is shaft 58, to the left-hand end of which is attached flanged collar 56, having engaging pin 55, and to the right-hand end of said shaft is attached sheave 59. Shaft 58 is so mounted that it is in right line with shaft 50 and when clutch 51 is in its dotted position 51' pin 55 may engage with pin 54 and impart the revolution of shaft 58 to shaft 50.

In a horizontal bearing in bracket 43, which is attached to back board 14, is shaft 44 to the right-hand end of which is attached collar 44' and to the left-hand end of which is attached sheave 42. Shaft 44 is in right line with shaft 37 and so mounted that when clutch 36 is in the position shown in full lines pin 41 in sheave 42 may engage with pin 40 in clutch 36, and the rotation of shaft 44 be transmitted to shaft 37.

Mounted on bracket 27, which is attached to back board 14, Figs. 1 and 4, is piece 29 which may swing about a horizontal screw pin 33 from stop 31 toward the right. Spring 27' is attached to bracket 27 and bears against piece 29 tending to hold the same against stop 31. Dog 30 is hinged in piece 29 by horizontal pin 32. The lower end of bracket 27 serves as a stop to prevent dog 30 turning about pin 32 farther backward than a vertical pendent position. Spring 28 attached to piece 29 tends to hold dog 30 against said stop. Dog 30 is so placed that it may engage with ratchet flange 34 on clutch 36 when the same is in engagement with pin 41, and allow counter-clock-wise revolution of said clutch, but prevent clock-wise revolution of the same. Said dog can swing one side with piece 29 when said clutch is moved into engagement with said pin, if the teeth of said ratchet chance to strike against said dog, then engage with said ratchet when it has revolved to permit the same.

Electric motor 47 is secured in the bottom of the instrument case. Rigidly attached to the right-hand end of its shaft 47' is

sheave 47' in belting relation with sheave 42. Belt 45 is placed on sheaves 42 and 47' and conveys the power from motor 47 to shaft 44. Electric motor 48 is secured in the lower part of the instrument case. Rigidly attached to the left-hand end of its shaft 48' is sheave 48' in belting relation with sheave 59 on shaft 58. Belt 46 is placed on sheaves 48' and 59 and conveys power from motor 48 to shaft 58. In Fig. 1 a portion of each of belts 45 and 46 is removed and motors 47 and 48 are shown nearer the other mechanism than they are ordinarily in practice. Portions of back board 14 and rails 12 and 13 are not shown for lack of space.

Around the middle portion of roll 1 is placed the wide copper band 15. One end of music strip 3 is glued to this roll in the usual way except that a portion of said end is cut away forming the notch 3^a, in order to expose said band during at least one turn of said strip on the roll. Brushes 19 and 19', Figs. 1 and 5, are clamped in housings 17 and 18, revoluble on screw pins 17' and 18', screwed in to brackets 17'' and 18'', respectively, which are secured to back board 14. Housing 18 is counterweighted by weight 23. Housing 17 is similarly counterweighted. These brackets are so situated that brushes 19 and 19' may make electric contact with copper band 15 when the music strip is unrolled as shown. But when there are a plurality of turns of the music strip wrapped about roll 1 these layers electrically insulate said brushes from said band and said electric contact is broken. The counterweights 23 retain said brushes in contact with the copper band 15 or permit the brushes to assume the dotted position illustrated in Fig. 5 when the several turns of the music strip intervene.

On the ends of music roll 2 are the narrow, copper bands 16 and 16' electrically connected by embedded wire 16'', Figs. 1 and 3. Brushes 22^a and 22 are clamped in housings 20 and 21, revoluble on screw pins 20' and 21', screwed into brackets 20'' and 21'', respectively, which are attached to back board 14. Brackets 20'' and 21'' are so situated that brush 22^a may make electrical contact with copper band 16, when the turns of music strip 3 do not intervene, and brush 22 may at the same time make electrical contact with copper band 16'. Housings 20 and 21 are counterweighted by weights 24 and 24^a, respectively, so that said brushes are either pressed against said bands or they may turn outward to accommodate the intervening turns of the music strip 3 as shown respectively in full and dotted lines in Fig. 3.

The corners of the free end of music strip 3 are cut off or turned over to form a tapering end which is reinforced with an eyelet 3' in the usual manner, as shown in Fig. 1, where a portion of the rolled strip 3 is re-

moved from roll 2. Strip 3 is engaged with
 roll 2 by putting eyelet 3' on hook 3'' which
 is fastened into roll 2. Because of the cut off
 corners on the free end of music strip 3,
 5 brushes 22^a and 22 may make electric con-
 tact with bands 16 and 16' while a few turns
 of the strip are yet on the roll. In the illus-
 tration in Fig. 1 music strip 3 is shown with
 its perforated part entirely rolled on roll 2.
 10 Controlling electro-magnets 60 and 61 are
 constructed as follows:—The pair of cores
 60' are joined at the rear by heel piece 60'',
 which is attached to bracket 63, which is in
 turn secured to back board 14. Over these
 15 cores are the spools of insulated wire 60.
 The pair of cores 61' are joined at the rear
 by heel piece 61'', which is attached to
 bracket 62, this bracket being secured to
 back board 14. Over these cores are the
 20 spools of insulated wire 61. The pairs of
 cores with connecting heel pieces lie in the
 same horizontal plane, and the free ends of
 the pairs of cores are so placed that they
 face each other and stand a short distance
 25 apart. These two electromagnets are sup-
 plied with a single keeper 75. Keeper 75 is
 hung on swinging arm 76, which is pivoted
 to the upper part of rocker arm 64 on pin
 64'. Rocker arm 64 is supported on shaft
 30 68' mounted in bracket 68, which is secured
 to back board 14. Fig. 2 is a view of a sec-
 tion cut by a medial vertical plane passed
 between controlling electromagnets 60 and
 61 when rocker arm 64 occupies a vertical
 35 position. The ends of keeper 75 are re-
 cessed and in each of these recesses lies one
 of the legs of the bifurcated standard of
 rocker arm 64.

The upper end of swinging arm 76 is bent
 40 over to form the stop 76^a. On the pin 64^a
 are hinged the two latches 78 and 79, these
 are pressed upward by spring 80, attached
 to latch 78, until lugs 78'' and 79'' normally
 lie against stop 76^a. On bracket 83, which
 45 is attached to back board 14, are the two
 standards 81 and 82. Standard 81 contains
 the stop screw 81' which limits the right-
 hand movement of rocker arm 64. Stand-
 ard 82 contains the stop screw 82' which
 50 limits the left-hand movement of rocker arm
 64. Catch 83' is a lateral extension of
 standard 81, and catch 83'' is a lateral ex-
 tension of standard 82. Catch 83'' is so
 placed that when rocker arm 64 lies against
 55 stop screw 82' and keeper 75 is near cores
 60', latch 79 is in engagement with catch
 83'', thus holding 64 against stop screw 82'.
 But when keeper 75 is carried over to dot-
 ted position 75' latch 79 is carried down to
 60 dotted position 79' and rocker arm 64 is
 free to move over against stop screw 81'
 when latch 78 engages with catch 83', as
 shown in dotted position at 78', where it is
 in position to retain 64 against stop screw
 65 81'; at this time keeper 75 is in dotted posi-

tion 75''. Similarly latch 78 is released
 from engagement with catch 83' by the
 movement of keeper 75 toward the left
 which permits 64 and 75 to return to the
 positions illustrated in full lines in Fig. 1. 70
 The rocker arm 64 is bifurcated at the lower
 end and to the rear branch a walking beam
 65 is attached. To the right-hand end of
 65 is attached copper comb 67 and to the
 left-hand end of the same is attached cop- 75
 per comb 66. A pair of slate, mercury-cups
 are shown in sectional elevation at 69, Fig.
 1, also in full lines in Fig. 2. They are sup-
 ported on brackets 71 and 72 to which they
 are attached by screws that engage with 80
 nuts in the bottom of said cups. Brackets
 71 and 72 are attached to back board 14.
 Mercury cups 70 are similarly attached to
 brackets 73 and 74 which are secured to the
 back board. Mercury cups 69 are so located 85
 that the prongs of comb 66 dip beneath the
 mercury in said cups when rocker arm 64
 lies against stop screw 82' as shown in full
 lines. And mercury cups 70 are so located
 that when rocker arm 64 lies against stop 90
 screw 81' the prongs of comb 67 dip be-
 neath the surface of the mercury in said cups
 as shown in the dotted position at 67', mean-
 while comb 66 is in its dotted position at 66'
 and out of contact with the mercury in cups 95
 69. A link 77 connects rocker arm 64 with
 shifting lever 26 in such manner that the
 described movements of said rocker arm car-
 ries said lever 26 to and from its illustrated
 positions. 100

Wires G and H from magnet spools 60
 are respectively each a continuation of wires
 G and H shown as electrically connected to
 brackets 20'' and 21''. Wire G includes the
 battery 101. Wires E and F from magnet 105
 spools 61 are respectively each a continua-
 tion of wires E and F shown as electrically
 connected to brackets 18'' and 17''. Wire F
 includes battery 100. Power wires A and B
 from motor 47 are respectively each a con- 110
 tinuation of wires A and B shown as elec-
 trically connected with brackets 72 and 71.
 Power wires C and D from motor 48 are re-
 spectively each a continuation of wires C
 and D shown as electrically connected with 115
 brackets 73 and 74.

The shaft 47'' of motor 47 is only partly
 shown. This shaft is assumed to make
 proper mechanical connections for operat- 120
 ing the mechanism for producing the vacu-
 um used in connection with perforated music
 strip 3 and tracker board 4. As my inven-
 tion is not directly connected with this part
 of the apparatus it is not illustrated.

The operation of my improvement is as 125
 follows: The full line illustration of the
 parts as shown in the drawings indicates a
 stage in the operations when the perforated
 part of music strip 3 is entirely unrolled
 from roll 1 and the process of rerolling said 130

strip on roll 1 must begin at once. Since the brushes 19 and 19' are now both in contact with the copper band 15, the circuit including coils 61 is complete and a current from battery 100 may flow therethrough. The energizing of magnet 61 attracts keeper 75, first to position 75' when latch 79 is depressed to dotted position 79', then to position 75'' when 64 is carried over against stop screw 81'. This movement of 64 draws shifting lever 26 to dotted position 26', disengaging clutch 36, thus removing the power from shaft 37; and removing copper comb 66 from mercury cups 69, thus breaking the circuit to motor 47 and throwing the power off of the same. It also causes copper comb 67 to enter mercury cups 70 and thus closes the circuit to motor 48, starting the same and causing shaft 58 to rotate in a counter-clock-wise direction. At the same time as shifting bar 26 is carried to dotted position 26', clutch 51 is caused to engage with pin 55 and the rotation of shaft 58 is transmitted to roll 1. Thus the rerolling of the strip 3 is begun by power from motor 48. As soon as a few turns of the strip 3 has accumulated on roll 1 electric contact between brushes 19 and 19' is interrupted by the intervention of the strip 3 between said brushes and the copper band 15. Thus the circuit from battery 100 through magnet 61 is broken and the battery rests. Since latch 78 is now in dotted position 78', in engagement with catch 83', rocker arm 64 will remain in contact with stop screw 81'. Meanwhile rerolling continues until copper bands 16 and 16' on roll 2 are uncovered. Then brushes 222 and 22 come into contact with said bands and the circuit through wires 16'', G and H, battery 101 and the coils of spools 60 is made, allowing current from said battery to energize electromagnet 60. This magnet attracts keeper 75 from the position 75''. The first movement of this keeper toward the left disengages latch 78 from catch 83'. Continued left-hand movement of keeper 75 carries rocker arm 64 over against stop screw 82', which removes copper comb 67 from mercury cups 70, thus breaking the circuit to motor 48 and throwing the power off of the same. Also at the same time link 77 is carried toward the left, moving shifting lever from the dotted position at 26' to the full-line position at 26, which disengages clutch 51 from engagement with pin 55 and separates roll 1 from its source of power. Hence roll 1 ceases to revolve. Also clutch 36 has meanwhile been thrown into engagement with pin 41, and the ratchet flange of said clutch into engagement with dog 30, thus stopping further counter-clock-wise revolution of roll 2 and preventing eyelet 3' from disengaging with hook 3''. And since comb 66 now closes the circuit between mercury cups 69

power is again supplied to motor 47 and the several parts of the apparatus are in such relative positions that they are now in order for the rendering of the music indicated by the perforations in music strip 3.

In addition to the greater positiveness of action and accessibility for repairs of my improved apparatus as compared to those now in use, there is a further advantage gained by having the rerolling done by a motor independent of the one used to operate the vacuum bellows in that, during the rerolling, the vacuum apparatus may remain at rest thus the noise, wear, and use of power attending its operation is avoided.

Having thus described one practical way of using my improvement, I claim,

1. In an automatic musical instrument, the combination of a roll adapted to hold a perforated music strip; a metallic surface covering a portion of said roll; a perforated music strip attached to said roll, said strip being cut away in places adapting it to uncover portions of said metallic surface before said strip is entirely unrolled; metallic pieces adapted to make a running electric contact with said metallic surface when the same is uncovered by said strip and mounted to permit the several turns of said strip when on said roll to lie between said metallic surface and said pieces; an electric motor; an electro-magnetic circuit breaker electric connections between said metallic pieces and the coils of the controlling electromagnet of said circuit-breaker said connections including a source of electricity; electrical connections between the armature terminals of said motor and said circuit-breaker; and mechanical connections between the shaft of said motor and said roll.

2. In an automatic musical instrument, the combination of a music roll; a take-up roll; a metallic surface on each of said rolls; a perforated music strip having one end attached to each of said rolls, portions of said ends being cut away adapting them to expose parts of said metallic surfaces before said strip is entirely unrolled; a pair of insulated metallic pieces supported near each of said rolls and being adapted to make a running electric contact with the metal surface on each of said rolls when the same are exposed by the cut-away ends of said music strip, and mounted to permit the several turns of said strip when on said rolls to lie between said surfaces and said pieces; two electric motors; a double circuit breaker comprising two electro-magnets for operating it; electrical connections between the metallic pieces supported near said music roll and the coils of one of the electro-magnets, said connections including a source of electricity; electrical connections between the armature of one of said electric motors and the circuit-breaker closed by the said electro-magnet;

mechanical connections between said motor shaft and said music roll; electrical connections between the metallic pieces supported near said take-up roll and the coils of the other electro-magnet of said double circuit-breaker, said connections including a source of electricity; electrical connections between the armature of the other electric motor and the circuit-breaker closed by said other electro-magnet; and mechanical connections between the shaft of said other motor and the take-up roll.

3. In an automatic musical instrument, the combination of a music roll; a take-up roll, bearings for said rolls being adapted for the easy removal of the same; a perforated music strip having an opening at one end, said end being permanently attached to said music roll, also having openings at its other end, said end being removably attached to said take-up roll; a metallic surface on said music roll; metallic surfaces on said take-up roll being electrically connected together and being adapted to lie in the openings caused by the cut-off or turned-over corners of the detachable end of said music strip; two insulated metallic brushes adapted to make a running electric connection with the metallic surface on said music roll and being mounted to permit the turns of said music strip to lie between said metallic surface and said brushes; two insulated metallic brushes adapted to make a running electric contact with the metallic surfaces on said take-up roll and being mounted to permit the turns of said music strip to lie between said metallic surfaces and said brushes; a double, circuit-breaker having two electro-magnets, each being connected to close one and open the other of said circuit-breakers; means operative to latch each of said circuit-breakers in closed position; electrical connections between each pair of said brushes and one of said electro-magnets; a source of electricity in each of said connections; two electric motors; electrical connections between the armature of one of said motors and the circuit-breaker controlled by the brushes mounted near said music roll; electrical connections between the armature of the other of said motors and the circuit-breaker controlled by the brushes mounted near said take-up roll; power connections between the shaft of the one of said motors and said music roll; power connections between the shaft of the other of said motors and said take-up roll; and mechanical connections between said rolls and said circuit-breakers whereby only one of said power connections is operative on said rolls at a time.

4. In an automatic musical instrument, the combination of a music roll, a take-up roll; a tracker board; a perforated music strip, said music roll and take-up roll being

together adapted to retain said perforated music strip in close relation to said tracker board; two electric motors one being adapted to revolve said music roll and the other being adapted to revolve said take-up roll; a source of electricity adapted to cause the revolution of said electric motors; an electro-magnetic circuit-breaker, having two electro-magnets, adapted to establish connection between said source of electricity and one of said motors and simultaneously break electrical connection between said source of electricity and the other of said motors; an electric battery; a circuit breaker being electrically connected through said battery to one of the electromagnets of said electro-magnetic circuit breaker and being adapted to close the circuit through said battery when said music strip is nearly unwound from said music roll whereby said electro-magnetic circuit breaker closes the circuit through the motor adapted to revolve said music roll; means being adapted to electrically connect said circuit breaker, said battery and one of the magnets of said electro-magnetic circuit breaker; another electric battery; another circuit breaker electrically connected through said other battery to the other magnet of said electro-magnetic circuit breaker and being adapted to close the circuit when said music strip is nearly unwound from said take-up roll whereby said electro-magnetic circuit breaker closes the circuit through the motor adapted to revolve said take-up roll; and means being adapted to electrically connect said other circuit breaker, said other battery and the other magnet of said electro-magnetic circuit breaker.

5. In an automatic musical instrument, the combination of a music roll; a take-up roll; a tracker board; a perforated music strip, said music roll and take-up roll being together adapted to retain said perforated music strip in close relation to said tracker board; two electric motors one being adapted to revolve said music roll and the other being adapted to revolve said take-up roll; a source of electricity adapted to cause the revolution of said electric motors; an electro-magnetic circuit breaker, having two electro-magnets, adapted to establish connection between said source of electricity and one of said motors and simultaneously break electrical connection between said source of electricity and the other of said motors; an electric battery; a circuit breaker being electrically connected through said battery to one of the electromagnets of said electro-magnetic circuit breaker and being adapted to close the circuit through said battery when said music strip is nearly unwound from said music roll whereby said electro-magnetic circuit breaker closes the circuit through the motor adapted to revolve said

music roll; means being adapted to electrically connect said circuit breaker, said battery and one of the magnets of said electro-magnetic circuit breaker; another electric battery; another circuit breaker electrically connected through said other battery to the other magnet of said electro-magnetic circuit breaker and being adapted to close the circuit when said music strip is nearly unwound from said take-up roll whereby said electro-magnetic circuit breaker closes the circuit through the motor adapted to revolve said take-up roll; means being adapted to electrically connect said other circuit breaker, said other battery and

the other magnet of said electro-magnetic circuit breaker, and mechanical connections between said electro-magnetic circuit breaker and said rolls being adapted to cause said rolls to cooperate in passing said music strip back and forth over said tracker board.

Signed at Bellingham, in the county of Whatcom, and State of Washington, this sixth day of January, A. D. 1909.

CHARLES A. ROHRBACHER.

Witnesses:

R. S. SIMPSON,
S. E. HAGLER.