

M. GALLY.
MUSIC ROLL AND SPOOL THEREFOR.

(Application filed Mar. 18, 1902.)

(No Model.)

2 Sheets—Sheet 1.

Fig. 1

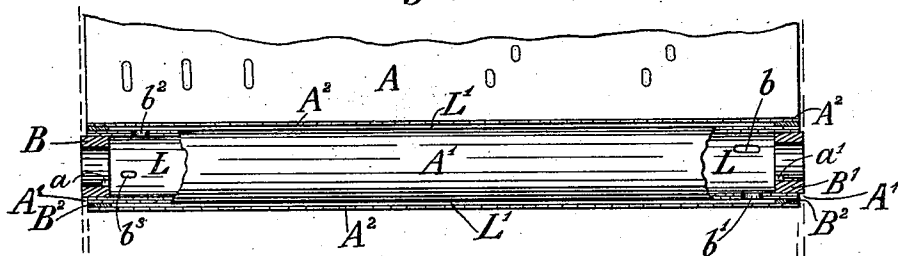


Fig. 2

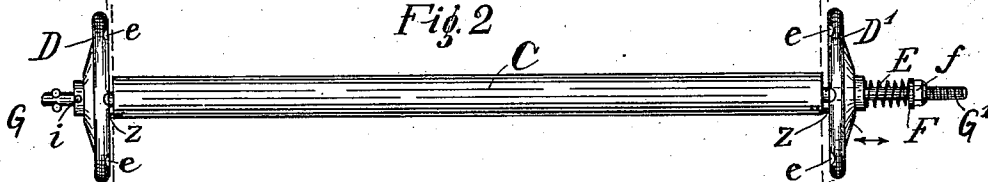


Fig. 3

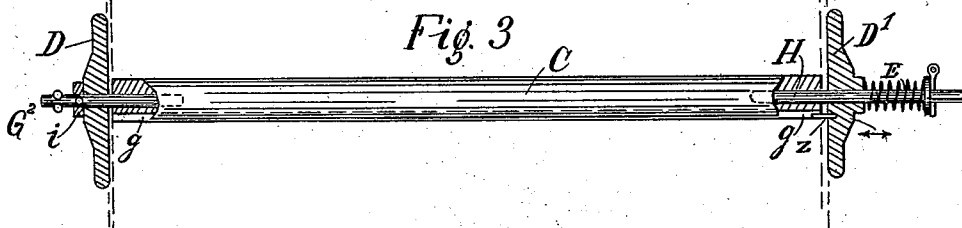


Fig. 4

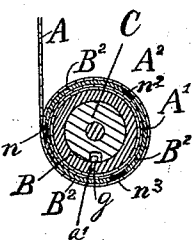


Fig. 5

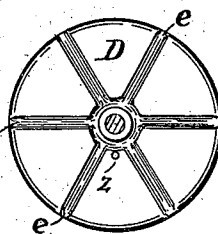


Fig. 6

Fig. 7

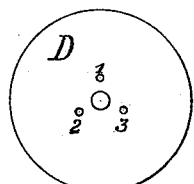
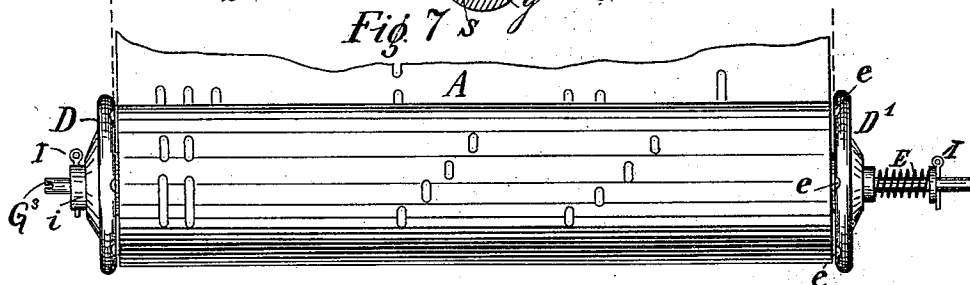


Fig. 8



Fig. 9

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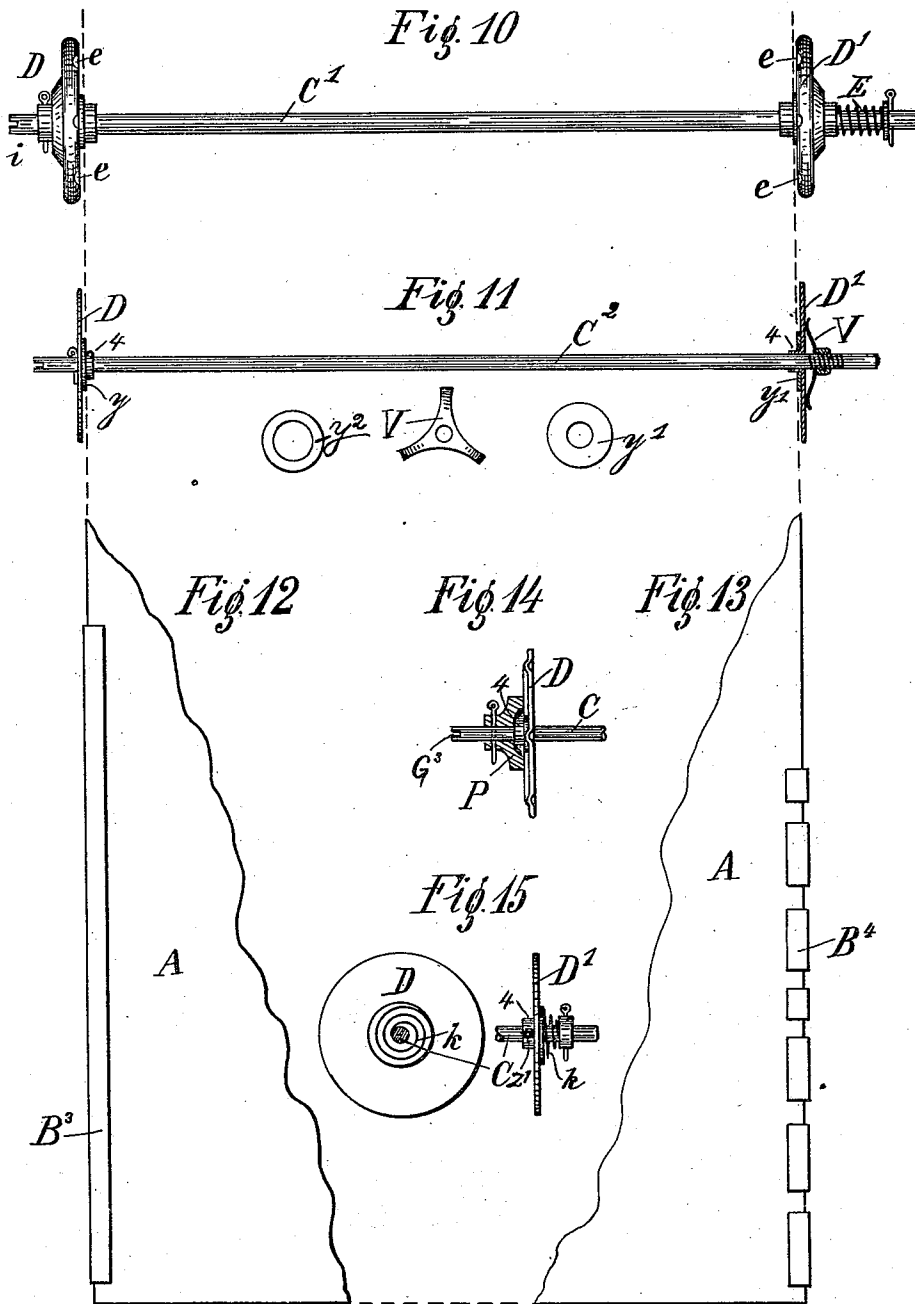
Meritt Gally

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(No Model.)

2 Sheets—Sheet 2.



WITNESSES

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UNITED STATES PATENT OFFICE.

MERRITT GALLY, OF BROOKLYN, NEW YORK.

MUSIC-ROLL AND SPOOL THEREFOR.

SPECIFICATION forming part of Letters Patent No. 713,870, dated November 18, 1902.

Application filed March 18, 1902. Serial No. 98,718. (No model.)

To all whom it may concern:

Be it known that I, MERRITT GALLY, 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 Music-Rolls and Spools Therefor, of which the following is a specification.

My invention relates to music-sheets which are wound upon spools and used for operating automatic or mechanical musical instruments; and it consists in an improved construction of music-roll and spool for securing automatic compensating adjustment.

In the accompanying drawings, Figure 1 represents part of an automatic music-sheet, showing, partly in section, its preparation for application to a compensating music-spool. Fig. 2 represents the compensating music-spool. Fig. 3 represents the spool, partly sectional, to show its detailed construction. Fig. 4 represents a cross-section, somewhat enlarged, of the part of the music-roll, as shown in Fig. 1, in combination with the roller proper or shaft of the spool of Fig. 2. Fig. 5 represents a cross-section, somewhat enlarged, of the roller proper or shaft of spool and cross-section of shaft and thimble. Fig. 6 is a face view, somewhat enlarged, of one of the spool heads or flanges. Fig. 7 is a full front view of the complete spool with music-roll thereon in condition for operation. Fig. 8 represents in face view and section one of the spool heads or flanges constructed of thin sheet metal or hard-paper card. Fig. 9 the thin plate or card spool head or flange embossed to form the air-vents, &c. Fig. 10 shows a modification of construction of spool. Fig. 11 is a modification of construction of spool, showing flat pressure-spring. Fig. 12 exhibits modified method of combining thimbles with sheet. Fig. 13 is a variation of Fig. 12. Fig. 14 represents spool-head with hub on shaft. Fig. 15 shows modification of pressure-adjusting spring.

Music-sheets which are used for operating automatic or mechanical musical instruments are usually made of paper or similar material which is liable to be changed in width by atmospheric changes, being wider in damp weather and narrower in dry weather, and unless the sheets are comparatively very narrow and for a very limited musical scale this

shrinkage and expansion produces unfavorable results in rendering the music on the instrument.

In music-rolls in which there are no means for adjusting the length of the spool between the spool heads or flanges to the changed width of the sheet great care has to be taken that surplus room must be had between the spool-heads when the spool is constructed to fully provide for all possible expansion and an additional surplus to allow room for relieving any possible pressure of the heads against the edges of the sheet, it being almost impossible to wind the several coils of the roll exactly in line. Any pressure of the spool-head against the edges of a single coil or a few projecting coils tends to turn such edge or edges and soon results in injury or destruction of the music-sheet.

Only with comparatively narrow music-sheets can spools be safely used without some means of adjustment. For wider music-sheets a hand adjustment has been common, and spools with heads or flanges loosely fitted to be moved toward or from each other by hand to thus adjust the spool to the music-roll before playing each piece of music have been in use and on sale in the market for at least ten years past.

Automatic or self-adjusting music-spools are of recent date, and although some progress has been made in their invention there is still much room for improvement, and in such improvement lies the gist of my invention.

One of the principal features of an automatic self-adjusting music-spool is a construction which provides for the movement of the spool heads or flanges by and to correspond with the contraction or expansion of the sheet. This is shown in patent to Robert A. Gally, March 5, 1901, in which the shaft or core of the spool is divided, a few coils of the sheet wound thereon and attached to the spool only at the flanges or near thereto, the spool shortening or lengthening automatically to correspond with the expansion or contraction of the part of the sheet coiled thereon. With this construction it is desirable that the external air be allowed access to the substance of these coils, so as to have a similar effect as on the outside coils of the roll, so that the

outside coils will be accommodated for their expansion and contraction by a corresponding expansion or contraction of the length of the spool. The spool is therefore provided
 5 with vents through the spool-heads and longitudinal or spiral grooves in the shaft on which the primary coils of the sheet are wound. This certainly produces to some extent the intended results; but to make the
 10 system of ventilation much more speedy in its operation and more extensive and complete I construct this part of the music roll and spool as follows:

In my construction I provide for two distinct results. First, I make when desirable the rolls interchangeable on the spool and not necessarily permanently attached thereto, and, secondly, I secure the greatest amount of ventilation for atmospheric effect.

20 Fig. 1 of the drawings shows the method of preparation of the music for interchangeable attachment to the music-spool, providing for the use of a number of music-rolls to be used interchangeably with a single music-spool, securing a saving of room, a saving of expense
 25 in construction, and a saving of expense in transportation, especially by mail.

Instead of attaching the music-sheet A, Fig. 1, directly to the shaft C or flanges D D',
 30 Fig. 2, I attach with paste or other suitable material one or more coils of the sheet A' A' to thimble B and B', forming the coils into a hollow cylinder. One or two coils of the sheet will be quite sufficient in this place if the material is proper, as it is desirable that not
 35 more than two coils be used on any one thimble to secure contact of air to the full surface of both coils. If more coils are necessary, I attach a secondary thimble B² on the
 40 outside of the two first coils at both ends of the hollow cylinder, as shown, splitting the thimbles, as shown at *n*, Fig. 4, so that the sheet can be passed through the slits to the outside of the secondary thimbles and coiled
 45 around and attached thereto. I show the secondary thimbles in Fig. 4 with three slits therein, dividing the thimbles into three sections, the several slits being used for air-vents from the ends of the hollow cylinder to the secondary air-chamber L' L'. From the
 50 large air-chamber L L air-passages *b b' b² b³* are made through the first two coils of paper into the secondary air-chamber L' L'. These air-passages may be made of equal size; but,
 55 preferably, to create draft of air I make those at one end of the cylinder larger than those at the other or use a greater number at one end than at the other. The external air passes into the large chamber L of the hollow
 60 cylinder through the openings *g* and thence through the air-passages *b b' b² b³* into the secondary chamber, coming in contact with one entire surface of all three coils of the sheet that make up the body of the hollow cylinder.
 65 One or more other openings, as S S S, for admission of air may be made in the thimbles, as shown in Fig. 5. The music-

sheet is rolled onto this hollow cylinder, as shown in Fig. 7, and the hollow cylinder is as
 70 expansible and contractable by atmospheric changes as the external coils of the music-roll.

One or both of the spool-heads D D' are made removable from the spool proper, C, Fig. 2, and the hollow cylinder of Fig. 1 with
 75 music-sheet wound upon it is placed thereon between the flanges to form the complete operative music-roll. A groove *g g* is made lengthwise in the shaft C, into which small
 80 stop-pieces *a a'* on the thimbles enter to keep the cylinder from turning on the shaft. These small stop-pieces *a a'* do not fully fill the groove *g*, as shown in Fig. 4, so that room is left for entry of external air through the
 85 ends of the slot into the chamber L L. Instead of venting the music-spool and its music-roll by means of holes passing through the spool heads or flanges, as shown in patent
 90 to R. A. Gally, I make grooves *e e e* in the face of the spool-head, Fig. 6, extending from its outer edge to a circular groove or recess near
 its center. The radial grooves I make sufficient in number, more or less, to not only supply all the air required for the internal ventilation of the music-roll, but also to ventilate
 95 as much as possible from their ends all the coils of the roll. The shaft C, Fig. 2, is made somewhat shorter than the hollow cylinder of Fig. 1, so that a free windway is provided for the passage of air from the grooves
 100 in the face of the spool-heads through the grooves in shaft C into the air-chambers of the hollow cylinder which forms the core of the music-sheet roll.

One end of the coiled hollow cylinder forming the core of the coiled music-sheet may be
 105 attached to one end of the shaft C, the other end being left free, and thus be fixed instead of interchangeable with other coiled rolls, or the coiled roll, with its core, may be
 110 loose and removable from the shaft C, as preferred.

Attempts have been made to produce music-spools which while not self-adjusting are
 115 automatically adjustable by and while acting in combination with the operating mechanism of the musical instrument on which they are used. Such, for example, is the device of Geo. B. Kelly in patent of December 3, 1901.
 120 In this device Mr. Kelly divides the shaft of the music-spool into two parts, a spool head or flange being permanently attached to each part. The music-sheet is attached to only
 one of the parts of the spool and a number of coils wound thereon and left free upon the
 125 other part of the shaft, a number of coils being wound in the ordinary way upon the shaft as a whole to form the foundation-core of the music-sheet roll. The flanges are set solidly
 130 against the edges of the music-sheet, and the pressure of these flanges against the edges of the sheet during the expansion of the sheet forces the flanges more or less apart, the return movement of the flanges depending (and

this only while the spool is in connection with the apparatus of the musical instrument) upon a spring device in the instrument, leaving the music-roll without any means of adjustment with the spool when detached. The defects of such construction are plainly apparent, and to obviate these defects and produce an improved construction is the gist of the second part of my invention.

It has been found in practice in the use of any kind of a music-spool that the spool heads or flanges must never be allowed to press against the edges of the music-sheet and that all the coils must be free to pile one on the other without friction; otherwise the following results are certain: It is almost impossible to make a music-sheet having edges on parallel perfectly-straight lines. The edges will of necessity be or become to more or less extent uneven or sinuous by certain parts of the material stretching more than others under tension or from differences in calendering or difference in texture or other causes. This unevenness must be provided for in placing the spool-heads quite as necessarily as to provide in any way for shrinkage or expansion. For example, in a non-adjustable roll a little more space must be provided between the spool-heads than will accommodate the greatest expansion of the sheet. In spools arranged with loose heads or flanges for hand adjustment the heads must be set in adjusting them a little space from the ends of the music-roll; otherwise the friction of the edges of the sheet against the flanges will deface or turn the edges here and there while the sheet is being wound or unwound from the spool, and this turning of the edges of the sheet in places, however slight, rapidly increases with succeeding use until in a very little time the sheet is entirely ruined.

In my self-adjusting roll and spool I avoid the above difficulties by the following construction:

In Fig. 1 it will be seen that the thimbles B B' are made to extend a little way beyond the edges of the music-sheet. The spool heads or flanges D D', Fig. 2, take their bearing against the thimbles B B', Fig. 1, when combined, as shown in Fig. 7, and thus is secured a constant freedom of the sheet from pressing against the flanges or the flanges from crowding against the edges of the sheet.

In the music-spool proper, Figs. 2, 3, 7, I fit one or both of the spool-heads sufficiently loose upon the spindle of the shaft to allow movement to right or left.

In Fig. 2 the spool-head D is made fast to the spindle and the head D' is fitted loosely. The head D limits and fixes the position of thimble B when the music-roll is on the spool. The spool-head D' may have movement to and from the thimble B' when in place together, being allowed to move to the right during the expansion of the music-sheet by the yielding of spring E or to move to the left when allowed to do so by the shortening

of the hollow cylinder forming the core of the music-roll acted upon by the pressure of the spring. A nut *f* is placed on the screw-threaded spindle G' not only to hold the spring and spool-head in place, but for setting the spring to greater or lesser tension, as the case may require, for perfect operation. This spring E and adjusting-nut are placed permanently on the music-roll spindle and form a constantly-operative part of the music-spool and are in no wise a part of the musical instrument or dependent in any way thereon.

In the construction shown in the patent of Kelly referred to above the pressure-spring forms a part of the apparatus of the musical instrument in which the spool is only occasionally used and is operative on the spool only while that particular spool is in the instrument. When the spool is removed, the adjusting device is inoperative, the spool-head may seek its furthest remove from the end of the music-roll, the coils of the roll be left free to shake about and become unevenly piled on the core of the spool, so that there are liable to be coils of even a single thickness of paper projecting beyond the other coils, and then the spool is placed in the instrument with the music-roll in such condition that the spring-pressure instead of properly adjusting the roll only mars and turns the edges of its straying coils, and so injures or destroys the roll.

In view of the foregoing facts the improvement shown and described in my drawings and specification in this case must be plainly apparent.

In Fig. 8 is shown a plain spool head or flange struck out of thin sheet metal or paper card. These may be used as cheap temporary heads for preserving the music-rolls when to be used interchangeably, especially during shipment or in cabinet or boxes, or for cheap rolls may be the permanent heads.

Fig. 9 shows a complete spool-head, with ventilating-grooves in its face struck from thin sheet metal or other suitable material, which may be applied to either temporary or permanent use.

The roller-shaft, as shown in the drawings, is not "divided," but is in one piece and may be made, as shown in Figs. 2 and 3, of any suitable material with its spindles set in, or the shaft and spindles may be of one piece, as shown in Figs. 10 and 11. Some of the features of my invention are applicable not only to spools having an undivided shaft, but also to spools having a shaft divided into two or more parts having relative movement for the adjustment of the spool to the width of the music-sheet—for example, the thimbles projecting from the core of the music-roll or the substitutes therefor, as the washer or hub described.

When the small shaft is used, as shown in Figs. 10 and 11, the hole in the thimble B, Fig. 5, is reduced to the size of the shaft, and the vents *s s s* are made in the outside rim of

the spool instead of the inside. The small pins 1 2 3, projecting from the face of the spool-head, Figs. 8 and 9, are for centering the hollow cylinder of the roll, Fig. 1, with the shaft C' C², Figs. 10 and 11, by entering pin-holes in the body of the thimble B or spanning its opening and fitting therein. Thus the spool-heads for the small shaft may be used with rolls having thimbles with either large or small holes.

The small pin Z, Figs. 2 and 3, projecting from the face of the spool-head D', enters the groove *g* of the shaft to hold the head in position and cause it to turn with the shaft. When the small shaft is used, as shown in Figs. 10 and 11, the spool-head is caused to turn with the shaft by means of a pin in the shaft in a slot in the hub Z', Fig. 15, on which pin the hub slides to right and left.

The pressure-spring, which makes the music-spool self-adjusting, I show made in three different styles, as E, Figs. 2, 3, 7, 10, 11, and 15, any of which may be used as preferred. Fig. 2 shows coiled spring with screw on roller-spindle with nut for adjustment. Figs. 3, 7, and 10 show coiled spring with washer and pin. Fig. 11 shows a tripod cupped spring *v*, occupying less room than the long coiled spring, and Fig. 15 shows a conical coiled spring occupying only a little space and sensitive in its action.

When the thin spool-heads are used, an abutting hub P, attached to the spool-shaft, may be used for holding the spool-head perfectly at right angles to the line of the shaft, if desired, as shown in Fig. 14.

In Figs. 7, 10, and 11 the spool-head at the left end of the spool-shaft is made removable, so that by its removal the cylinder of the music-roll can be taken off or put onto the spool-shaft without disturbing the permanently-placed adjusting devices at the opposite end of the spool.

The thimbles B B², Fig. 1, may be made complete before being combined with the connecting-coils of the music-sheet to form the hollow cylinder or core, or they may be made together with the end of the sheet in one operation, as follows:

Figs. 12 and 13 show a convenient method of combining the material as a substitute for the thimbles and making the hollow cylinder, with its thimbles, in one operation. When no air-vents are to be made through the thimbles, I attach a simple strip of material, as B³, to and projecting a little way over both edges of the sheet. Then commencing at a distance from the rear end sufficient to make the first coil I apply paste, glue, or other suitable adhesive on the remainder of the strip B³ and roll the sheet on proper-sized shafts to form the hollow cylinder with its thimbles.

When air-vents are desired in the thimbles, I place the strips of material at B⁴, divided in sections on the edges of sheet A, and paste and roll as in first case described.

If the vents are not to be of capacity of

full thickness of material B⁴, I make the sections thinner and first apply a plain strip, as B³, and upon this the sections, or place a plain strip upon the sections in addition thereto, or a plain strip underneath the sections and a plain strip on top, as the case may require.

The strips B³ or sections B⁴, Figs. 12 and 13, may extend farther than the part of sheet made into permanent cylinder and simply roll together with loose coils of the sheet for further ventilation.

The hollow cylinder of the music-roll may be used without the thimbles projecting beyond the edges of the music-sheet if other means are employed and placed between the ends of the hollow cylinder and spool-heads to prevent the spool-heads from pressing against the loose coils of the music-roll.

As a substitute for the projection of the thimble a thin hub, as *y*, may project from the face of the spool-head, as D, Fig. 11, and bear against the end of the hollow cylinder, forming the core of the music-roll, to prevent the remaining part of the face of the spool-head from pressing against the end of the loose coils of the roll.

Instead of the hub *y*, as referred to above, a thin washer, as *y'*, shown at the right-hand end of spool, Fig. 11, may be used. The washer is preferable to the hub, as different sheets may vary as to their requirements in the amount of this extra space, and a thicker or thinner washer be used, as the case may need.

The thimbles B B², hubs *y*, or washers *y'*, or other suitable means for the purpose may be used with a shaft on which the end of the music-sheet is directly coiled without the ventilating air chamber or chambers or with partial ventilation and only for the purpose of resisting the pressure of the spool-heads and still embody completely this particular feature of this part of my invention.

The use of the hub *y*, washer *y'* or *y²*, or other equivalent separating material when used either with an undivided spool-shaft, as shown in the drawings, or with a spool-shaft divided into parts for adjustment of its flanges to the shrinkage and expansion of the sheet, to which spools these washers or separating material are applicable for like purpose, I consider an embodiment of my invention.

The requirement to be provided for, either by the employment of thimble B B², hubs *y*, washers *y'*, is means for the prevention of pressure of the spool-head against the operative coils of the music-sheet of an adjustable music-roll, broadly, whether in combination with the apparatus of an instrument or in a self-contained self-adjusting music-spool, and being first to apply means for such purpose I do not wish to be limited in my claims therefor.

The action for the adjustment of the music-sheet is produced by the yielding of the adjusting device, as E, to allow for the expan-

sion in length of the music-roll or reacting pressure to make up for the contraction in length of the music-roll. The spring E is a pressure-spring, as shown in Figs. 2, 3, 7, 10, 11, but may be a draw-spring if placed on the opposite side of the spool-head. Other yielding elastic material may be used instead of a metallic spring, such as rubber, elastic felt, or similar material.

In Figs. 2 and 3 the clutches of the spool G & G² are finned, the fins intended to fit into the socketed driving-journal of the instrument. In Fig. 7 the end of the spindle is slotted to take in a cross-spline, allowing the removal of the spool-head D.

In applying my invention to music-rolls not having sufficient blank material at the end of the music-sheet to form the hollow core care should be taken to have the material used for the core to correspond as nearly as possible in quality as to tendency to expand or contract under atmospheric changes with the material of the music-sheet proper. In attaching the parts together glue or paste should not be applied to the entire width of the music-sheet, but only at one or a few points, so as not to interfere with the expansion and contraction.

Music-sheets are made of paper which is manufactured in long strips, and being drawn out in the process the fiber of the paper lies lengthwise of the sheet. The sheet has little tendency to expand or contract lengthwise, but mostly crosswise of the strip in which it is made, and therefore in the construction which I have described all the material used should have its fiber correspond as to direction.

What I claim as my invention, and desire to secure by Letters Patent, is—

1. In a self-adjusting music roll and spool; a music-sheet, having a tendency to contract and expand under atmospheric changes; a hollow cylinder forming the core of the music-roll, and having a tendency to contract and expand relatively to the music-sheet; thimbles in the ends of the hollow cylinder; a spool-shaft passing through the thimbles; an air-chamber between the shaft and hollow core; and air-vents through the thimbles, leading from the air-chamber to the external atmosphere.

2. In a music-sheet roll; a music-sheet, having a tendency to contract and expand under atmospheric changes; a hollow cylinder forming the core of the music-roll, and having a tendency to contract and expand relatively to the music-sheet; and at the ends of the core and between the coils which make up the core, material at each end of the core for separating the coils one from the other to form between the coils an air-space, open to the external atmosphere for affecting atmospherically the coils of the core.

3. In a music-roll; a music-sheet, having a tendency to contract and expand under atmospheric changes; a hollow cylinder forming

the core of the music-roll, and having a tendency to contract and expand relatively to the music-sheet; the core having a main air-chamber therein and having an air-space between the coils which make up the core; and an opening leading from the air-chamber into the said air-space.

4. A music-roll having a main recess or air-chamber in the core thereof, and a plurality of air-spaces between coils of material which make up the core.

5. The core of a music-roll made up of coils of material; having an air-space between the coils and an opening through the end wall of such air-space for the entry of external air; for affecting atmospherically the coils forming the side walls of the air-space.

6. In a music-spool, an undivided shaft; a spool-head loosely fitted to the shaft, to have movement thereon; a hollow core mounted upon the shaft, and free to contract or elongate under atmospheric changes; a recess or air-chamber in the body of the core and vents connecting the air-chamber with the external atmosphere.

7. A music-spool, having an undivided shaft; a spool-head loosely fitted to the shaft to have movement thereon; a hollow core of a music-roll mounted upon and free to contract or elongate on the shaft; a core recessed or chambered in the body thereof, external to the shaft; the spool-head or spool-heads having grooves in their face extending from the core of the music-roll to openings in the edge of the spool-head.

8. In an adjustable music roll and spool; a music-sheet, having a tendency to contract and expand under atmospheric changes; a hollow cylinder forming the core of the music-roll, and having a tendency to contract and expand relatively to the music-sheet; the spool of such music-roll having a yielding spool-head or spool-heads; and means for limiting the pressure of the spool-head or spool-heads to the core of the music-roll, and preventing pressure of the spool-head or spool-heads against the free coils of the music-roll.

9. The core of a music-roll, made of material similar to the music-sheet as to tendency to expand and contract under atmospheric changes; and a thimble, projecting from either or both ends of the core, for preventing pressure of the spool-head or spool-heads against the free coils of the music-sheet.

10. An adjustable music-spool, having a movable spool-head; a music-roll having a ventilated core, affected by atmospheric changes; means for limiting the pressure of the spool-head to the core; and a yielding spring device placed on the spool and forming a part thereof, for controlling the movement of the spool-head when affected by the expansion or contraction of the core.

11. In an adjustable music roll and spool; the music-roll; the spool head or flange; and material placed between the central coils or core of the music-roll and the spool head or

flange; to prevent pressure of the head or flange against the end of the free coils of the roll.

12. The combination with a music roll and
5 spool, of the thin plate disks with venting-grooves stamped therein, for use as heads for the spool.

13. A rolled music-sheet to be used on a
10 hollow core made longer than the width of the music-sheet, in order that the ends of the core abutting against the heads or flanges of the spool may prevent pressure of the heads or flanges against the free coils of the sheet.

14. The adjustable music-spool made up of 15
a shaft and spool heads or flanges, one or both of the spool-heads movable on the shaft for adjustment; the music-roll with cylindrical core mounted upon the shaft; and thimbles having projections as described; to form air- 20
space between the ends of the coils of the roll and the face of the spool-head by the projection of the thimble of the core.

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