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F. E. COLE.

COMPENSATING SPOOL.

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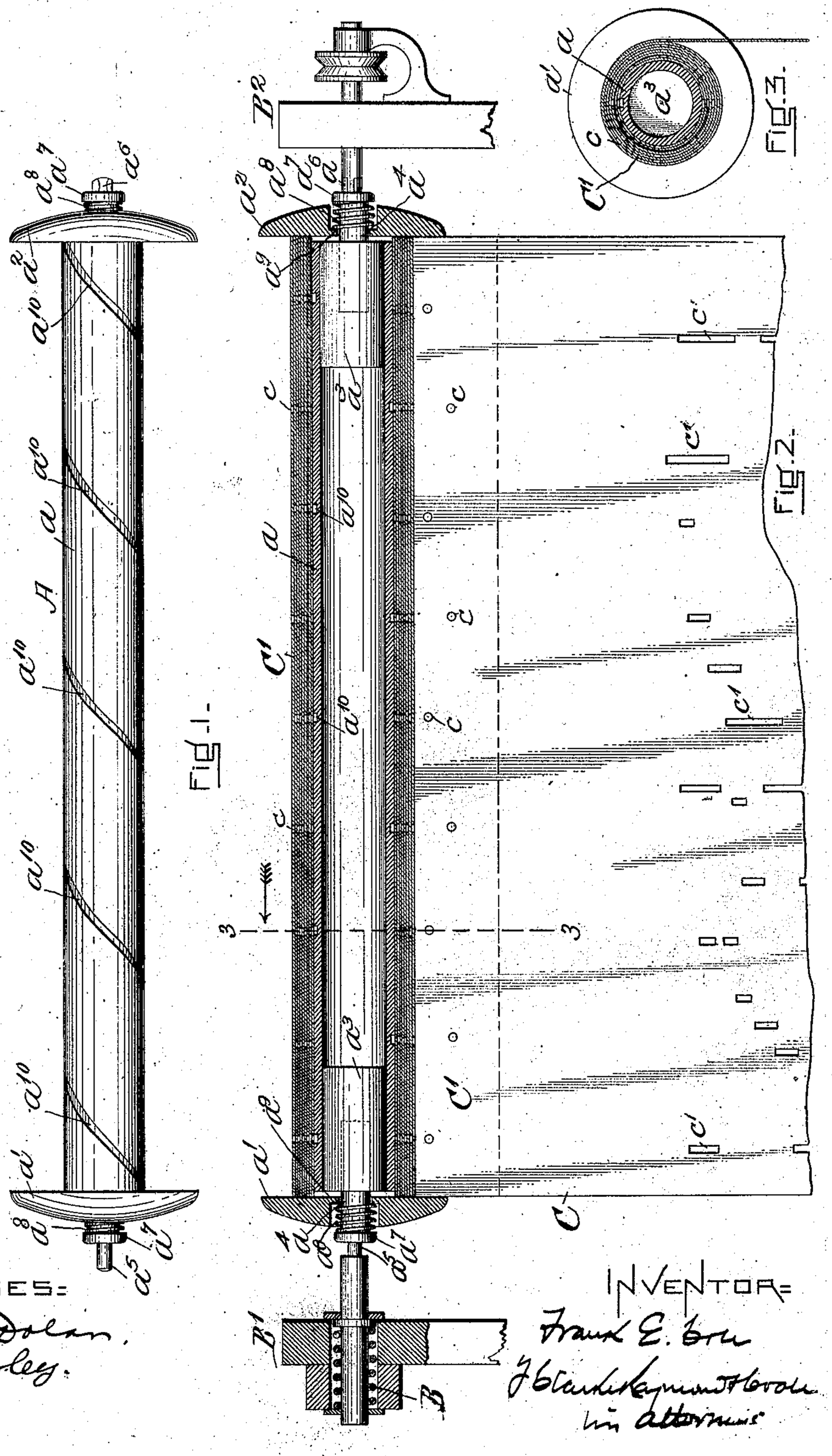

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COMPENSATING SPOOL.

No. 815,511. Specification of Letters Patent. Patented March 20, 1906.

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To all whom it may concern:

Be it known that I, FRANK E. COLE, a citizen of the United States, residing at Boston, in the county of Suffolk and State of Massachusetts, have invented a new and useful Improvement in Compensating Spools, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, forming a part of this specification, in explaining its nature.

My invention relates to an improvement in compensating spools, being especially designed for a spool on which is wound a perforated sheet used in musical or other instruments pneumatically actuated. According to its usual mode of operation in these instruments the perforated sheet is borne by one spool, off from which it moves to pass over the end of a "tracker-board," so called, or other member having wind-channels, and thence passes onward to be wound upon another or take-up spool. In the normal running of the machine the sheet is retained in such manner that its perforations will properly coincide or track right with respect to the channels of the tracker-board, and such retention is obtained by the flanges of the spools laterally engaging with the sides of the paper and so acting as guides therefor with respect to the tracker-board. Owing to uncontrollable inaccuracies in the size of the perforated sheet or to difficulties naturally resulting from its manner of retention, as before stated, the sheet is very likely to become laterally displaced from its normally true position relatively to the tracker-board when its perforations will not track right with the ways or wind-channels in said tracker-board, and the entire instrument accordingly fail to operate properly. This is especially true by reason of the fact that the paper comprising the perforated sheet is extremely sensitive to atmospheric conditions, either swelling or contracting from its normal proportions, when it will either wear against the flanges of the spool and be displaced thereby when the paper is swollen, or upon contraction of the paper the spool-flanges will become practically inoperative in laterally controlling the sheet in so far as its proper tracking is concerned relatively to the channels in the tracker-board. With a perforated sheet thus liable to displacement it was found necessary that some provision be made for adjustably widening the spool between its flanges or, in other words, for adjusting one or both flanges by which compensation might be made for any inaccuracy or abnormal variation in the paper or sheet and the flanges continue to retain and guide the perforated sheet instead of displacing it from its correct position with respect to the tracker-board. The adjustment of the flange or flanges of the spool has been obtained in various ways. In some spools one flange has been adjustable, in others both flanges. In order, however, that the flanges may be permitted to follow the increasing or diminishing width of the paper, it has been found necessary that they should be controlled by some spring or other tensional device against which the flange may be forced out by the swelling paper or the flange restored by said spring upon the paper contacting. Accordingly the spring which held the spool in the instrument has been used also as the spring for controlling its adjustable flange or flanges. The difficulty has been, however, with this spring at one side of the spool that the paper still becomes displaced for the following reasons: The paper normally swells in both directions from the center of the sheet. On the one side of the spool swelling against the flange backed by the spring holding the spool in place the paper would press this spring out against the tension of the spring. Upon the other side of the spool, however, the flange remaining fixed, there being no spring-backing, the flange itself if made adjustable with respect to the spool would not be pressed out by the swelling paper; but the paper bearing against the flange would act to throw the entire spindle and paper thereon over to the other side against the other flange, adjusting it still farther back against the tension of the spring, with the effect that the paper or sheet would be displaced toward that side and so its perforations of course would not track right with the holes in the tracker-board. True, the adjustment would be such that the edges of the paper would not become crimped as it swelled. At the same time there would be the displacement of the sheet with respect to the tracker-board, as above explained. Another difficulty existed in the spool, and this was that while the expansion of the paper might hold back and affect the adjustment of the flanges without its edges becoming crimped when the paper was wound upon the spindle, yet when the peforated sheet had been unwound it was very often found impossible to rewind it, for the reason that

there being no paper upon the spindle to hold back the flanges they become restored, as it were, by the tension of the spring which acted to crimp up the edges of any slight amount of paper which might then be left upon the spindle and prevented the paper from being rewound. In view of these considerations, therefore, by my invention I have provided an improved means by which an adjustment of the flanges at both ends of the spool each, respectively, may be obtained by a spring tension independent of the spring which holds the spool in the instrument, by which means a compensating adjustment of the flanges at both ends of the spool is obtained, with the effect that the paper may expand from the center in both directions and whatever its expansion or contraction will still track right with respect to the holes in the tracker-board. Furthermore, and perhaps more essentially, a means is provided by which after the playing portion of the sheet has become unwound a sufficient amount of paper will still be left upon the spool to prevent its flanges being restored by the spring tension by which they are controlled, with the effect that the paper may be rewound upon the spool without difficulty.

My relation to various other incidental details of construction, all of which can best be seen and understood by reference to the drawings, in which—

Figure 1 shows the spool in side elevation. Fig. 2 shows the spool with the paper thereon in longitudinal vertical section, the spool being shown also as placed in the instrument. Fig. 3 shows a cross-section on the line 3 3 of Fig. 2.

In the drawings, A represents the spool, having a body portion or spindle a and heads or flanges a' a^2. The spindle I prefer to make hollow and of paper which gives a desirable lightness to the spindle and which paper also will not warp or bend out of shape, as some other substances might do. Into the ends of the hollow spindle are fixed plugs a^3 a^3. From the center of each of these plugs there projects a short shaft a^4, which shafts at either end of the spool bear, respectively, the pins a^5 a^6, by which the spool is mounted in the instrument. The flanges a' a^2 are mounted upon the shafts a^4. In their adjustment the flanges when moved inwardly are adapted to fit flush up against the ends of the spindle. When adjusted outwardly, the flanges move each to a stop a^7, which takes the form of an annular collar turned upon the ends of the shafts. The flanges are yieldingly held each by a tension-spring a^8, arranged upon the shaft upon which the flange is adjustable and between it and the stop on the end of the shaft against which the spring bears. Instead of bearing against the outside of its flange each spring bears against an annular shoulder a^9 inside the flange, for it is to be noted that each flange is made recessed to receive the spring. The advantage is that the spring is for the most part concealed, with the additional advantage also that the shaft upon which the flange moves can be made very short, for the recess in the flange is made larger than the stop on the end of the shaft, so that when the flange is pressed back in its adjustment it may slip in part over the stop. By thus constructing the spool it becomes provided with end flanges having a yielding spring retention independent of the spring B, which holds the spool in the instrument, which spring and the usual manner of its holding the spool in the instrument is shown in Fig. 2, B' and B^2, in said figure representing the usual fixings for the retention of the spool. On account of the flanges being thus independently adjustable, when the paper swells or contracts, as it does equally in both directions from the center of the shaft, it will act when swelling or expanding to press out both flanges equally on either end of the spool, or upon the contraction of the paper both flanges will be equally forced or pressed in by the tension of the spring to follow the contracting edges of the paper. In either case, whether swelling or contracting, the paper will be retained in proper center of position that its perforations will track right with respect to the holes of the tracker-board.

A spool thus constructed is of superior utility in addition to its special adaptation above described. The parts of the spool are permanently combined. There is nothing to drop away or get out of order even when the perforated sheet is not wound upon the spindle. In other words, the sheet has nothing to do with holding the parts of the spindle in place. The flanges of the spool are maintained in a manner to be easily adjustable and are sensitive to the least variation in the paper, this especially by reason of the fact that the springs controlling the flanges may be of just sufficient tension to hold the paper in place. The spool can also be made at very little cost, As before stated, the spindle is preferably made of paper or strawboard. The plugs in the end of the spindle and shaft may be turned out of wood, while the springs are a mere item of cost. The parts of the spool can be easily put together, and in this connection it is to be observed that in order that the springs and flanges may be placed upon their shafts in practice the shafts are made as a part separate from the plugs in the ends of the spindle into which the shafts are fitted.

Having thus provided for the adjustment of the flanges of the spool that compensation may be made for any variation in the size of the paper until the paper becomes wound off the spindle, it is the further object of my invention to provide a means which will pre-

vent the flanges being pressed back by their springs after the paper has become unwound, for, as before stated, difficulty has heretofore been encountered in the fact that after the perforated sheet had become unwound from the spool the tendency was for the flanges to become restored by the tension of their springs, which acted to crimp up the edges of any slight amount of paper which might then be left upon the spindle and in any case would prevent the paper from being rewound in the instrument or at least until by some manual manipulation the flanges could be held back and the paper rewound upon the spindle with a sufficient number of thicknesses to hold back the flanges. By my invention I provide a means by which after the playing portion of the sheet has been unwound a sufficient amount of paper will still be left upon the main spindle to prevent the flanges being restored by the spring tension. This paper I prefer to be of the same composition and consistency as the paper of the perforated sheet in order that it may be susceptible to the same atmospheric and other conditions. The paper in so far as the scope of my invention is concerned may be a part wound around the main spindle and separate from the perforated sheet to which the said sheet may be attached. I prefer, however, that this paper be made integral with the perforated sheet or, in other words, that the perforated sheet proper, C, be made longer by a blank extension C′ beyond its playing or perforated part, which extension C′ shall be adapted after being wound upon the main spindle to remain practically as a part thereof, forming an auxiliary spindle. The windings of paper forming this auxiliary spindle should be sufficient in number to properly hold back the flanges, and for this purpose I prefer that a dozen or more windings of paper be made or left upon the main spindle, the number depending in a measure, of course, on the strength of the paper and the tensional stress bearing upon or controlling the flanges. It is also to be observed by reference to the drawings that the windings of paper forming the auxiliary spindle are made slightly longer than the main spindle in order to allow for either the expansion or contraction of the paper, the adjustable flanges then following the edge of the paper when contracting or becoming pressed out thereby upon its expansion. In order that air may reach this auxiliary spindle, so that its windings of paper may be subject practically to the same atmospheric conditions as the playing portion of the sheet, I prefer to provide it with holes or perforations *c* as distinct from the perforations *c′* of the playing portion of the sheet. A further means for providing for the ingress of air for the paper remaining upon the spindle is by a spiral channel a^{10}, formed around the surface of the main spindle itself, which when the spindle is formed of paper can easily be made by slightly separating the edges of the outer coil of paper of which the spindle is made. By this means the flange or flanges of the spool are kept from being tensionally pressed back or restored after the playing portion of the perforated sheet has become unwound, so that the paper or sheet can be rewound in the instrument without difficulty.

Having thus fully described my invention, I claim and desire to secure by Letters Patent of the United States—

1. A spool of the character specified having a main spindle, adjustable flanges under tension upon either end thereof, and in combination with said main spindle, paper wound around the same to form an auxiliary spindle slightly wider than said main spindle, and around which the perforated music-sheet is wound, which auxiliary spindle bears against said flanges and with coils sufficient in number to withstand the tension thereof when the perforated music-sheet has been unwound in the operation of the spool, substantially as and for the purposes set forth.

2. A spool of the character specified having a spindle, adjustable flanges under tension upon either end thereof, and in combination with said spindle, a music-sheet slightly wider than said main spindle, a portion of which sheet is wound around said main spindle to form an auxiliary spindle with the edges thereof bearing against said flanges and with coils sufficient in number to withstand the tension thereof when the playing portion of the sheet has become unwound in the operation of the spool and which auxiliary spindle or portion of said sheet remains on said main spindle when the playing portion of said sheet has become unwound in the operation of the spool, substantially as and for the purposes set forth.

3. A spool of the character specified having an adjustable flange and mounting therefor, a stop on said mounting for limiting the adjustment of said flange, and a spring on said mounting between said stop and flange, which spring extends into a recess on said flange to bear against a shoulder inside the same and which recess is made larger than said stop, substantially as described.

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