(No Model.) 2 Sheets—Sheet 1.

F. H. SANDER.

MUSICAL BOX.

No. 565,093. Patented Aug. 4, 1896.

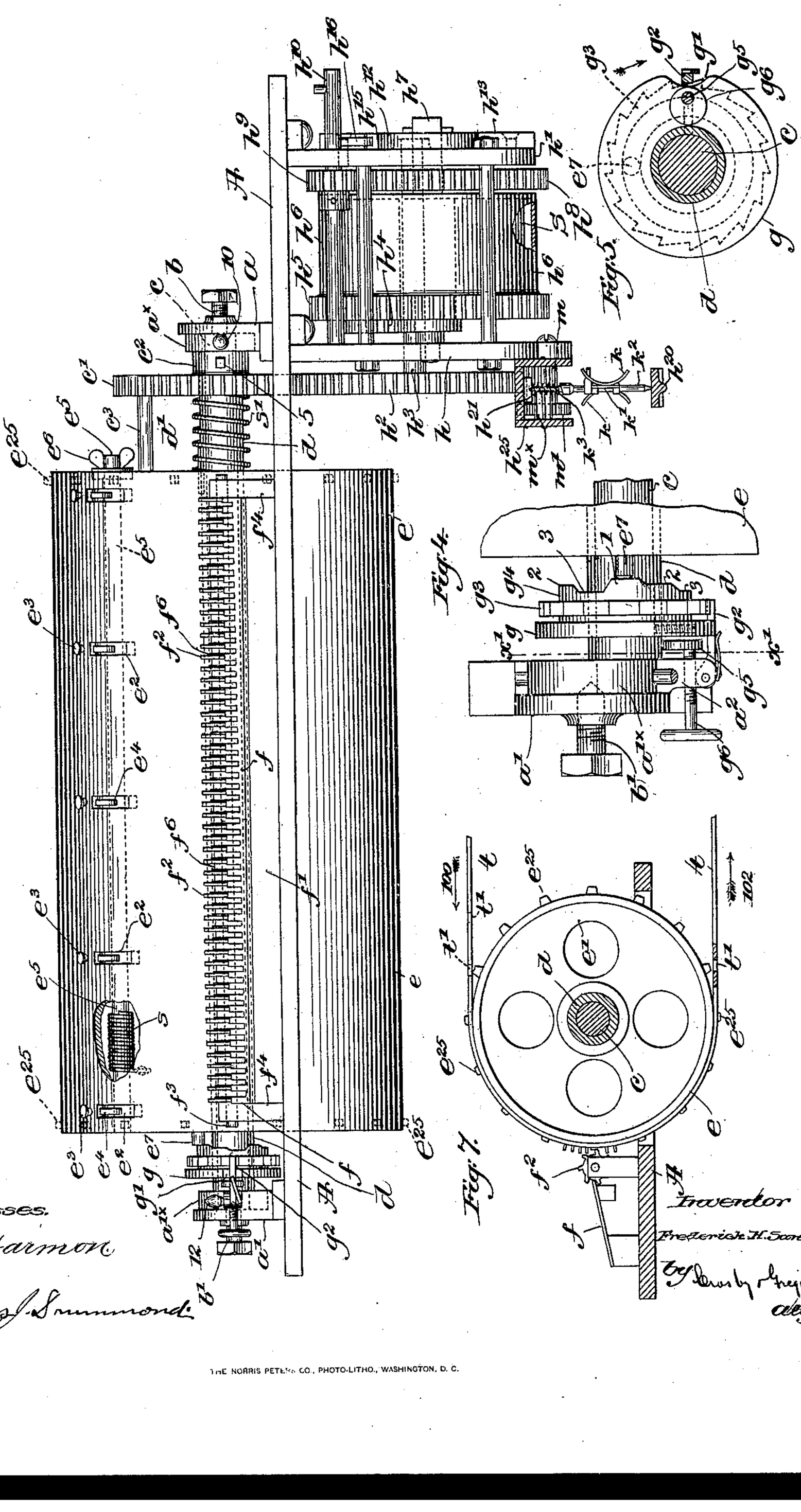

Fig. 1.

Fig. 5.

Fig. 4.

Fig. 7.

Witnesses.

A. C. Harmon.

Thomas J. Summond.

Inventor

Frederick H. Sander

by Church & Gregory.

Attys

(No Model.) 2 Sheets—Sheet 2.

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Fig. 6.

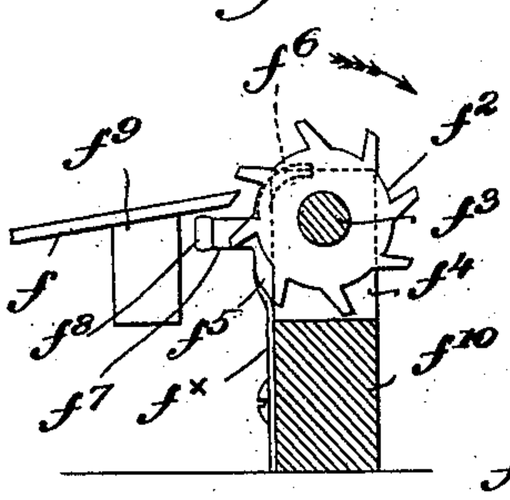


Fig. 2

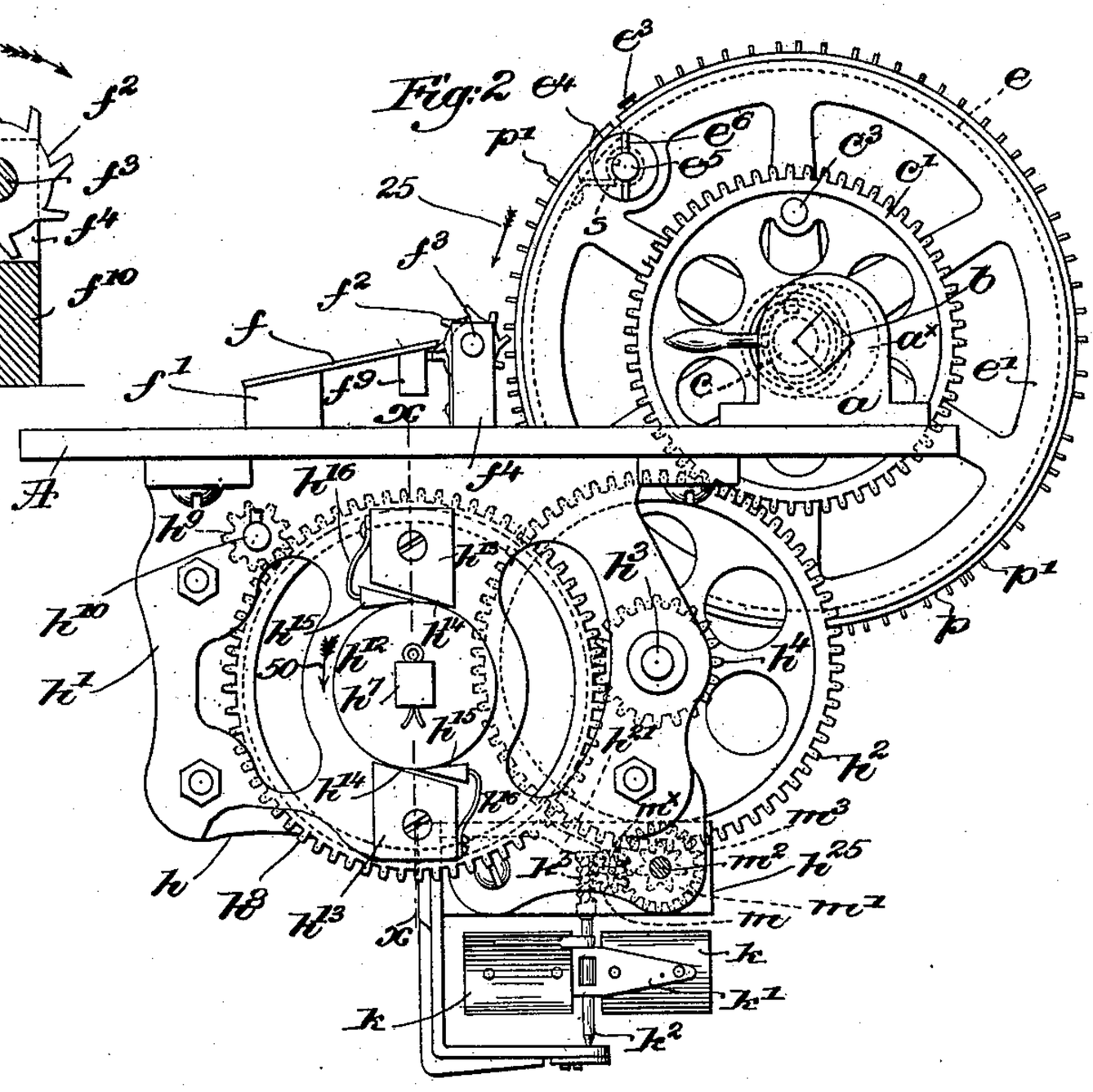
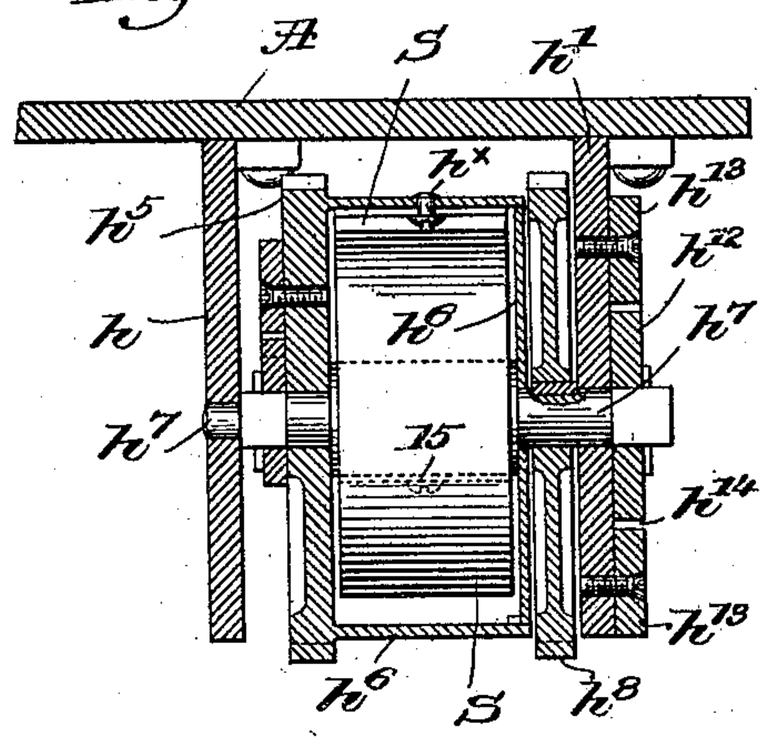


Fig. 3.



Witnesses:

A. C. Harmon.

Thomas J. Drummond.

Inventor:

Frederick H. Sander.

by Busby & Gregory. Attys.

UNITED STATES PATENT OFFICE.

FREDERICK H. SANDER, OF MALDEN, MASSACHUSETTS.

MUSICAL BOX.

SPECIFICATION forming part of Letters Patent No. 565,093, dated August 4, 1896.

Application filed April 13, 1895. Serial No. 545,601. (No model.)

To all whom it may concern:

Be it known that I, FREDERICK H. SANDER, of Malden, county of Middlesex, State of Massachusetts, have invented an Improvement in Musical Boxes, of which the following description, in connection with the accompanying drawings, is a specification, like letters on the drawings representing like parts.

This invention has for its object the production of a simple, strong, and comparatively inexpensive musical box adapted to the use of metallic or other tune-sheets now coming into extensive use as a substitute for the old and expensive metal cylinder having the note-pins driven thereinto. These metallic tune-sheets are now made either circular, to be mounted on a holder and rotated beneath the teeth of the musical comb, or they are in the form of elongated sheets, which are moved by suitable mechanism to operate the teeth of the comb. The circular tune-sheet contains but a single tune each, and thus a separate sheet is required for every tune, while the long sheets in the other form have to be mounted on a particular apparatus and if more than one tune is to be produced by a sheet the length of the latter is increased, the tunes following one after another in the direction of the length of the tune sheet or strip.

By my invention, to be hereinafter described, I make use of either an elongated tune-sheet or I can surround the carrier with a split cylindrical sheet, in either case being enabled to produce a plurality of tunes from a single sheet in a simple and efficient manner, whereby the number of tune-sheets required for the production of a large number of tunes is greatly reduced.

In accordance therewith my invention consists in a musical box to be hereinafter described, and particularly pointed out in the claims.

Figure 1, in front elevation and partially broken out, represents the working parts of a musical box embodying my invention, the tune-sheet, however, being omitted for the sake of clearness. Fig. 2 is a right-hand end elevation of the apparatus shown in Fig. 1 with a tune-sheet held in position on the carrier. Fig. 3 is a transverse sectional view taken on the line $x\,x$, Fig. 2, through a portion of the motor or driving mechanism. Fig. 4 is an enlarged plan view of the automatic tune shifting or changing device shown at the left-hand end of the apparatus in Fig. 1. Fig. 5 is a sectional detail taken on the line $x'\,x'$, Fig. 4, looking toward the right. Fig. 6 is an enlarged detail of one of the dampers and its coöperating star-wheel, and Fig. 7 is a detail of a modification to be described.

I have omitted the case or box, which may be of any usual or well-known construction, adapted to receive therein a base-plate A, having thereon two standards $a\,a'$, recessed at their inner faces to receive circular disks $a^\times\,a'^\times$, eccentrically secured to a shaft c, (see dotted lines, Figs. 1 and 2, and full lines, Fig. 4,) the disks being centrally journaled upon preferably pointed bearing-screws $b\,b'$, extended through threaded openings in the standards in alinement with each other, through and by which wear may be taken up. Handles 10 12, secured to the disks, enable them to be rotated on their bearings to thereby lift and move the shaft c and the carrier, to be described, away from the comb. The shaft c is loosely surrounded by a sleeve d, extended from one to the other of said disks and prevented from longitudinal movement thereby, and a gear c' is mounted upon and secured to the sleeve by a set-screw 5, (see Fig. 1,) extended through the hub c^2 of the gear, rotation of the gear c' rotating the sleeve upon the shaft.

A cylindrical carrier e, preferably hollow to save weight, and having end frames or spiders e', is longitudinally movable on the sleeve d, but it is prevented from rotation thereon by a spline or key d' on the sleeve engaging the hub of one of the end frames. A pin c^3 on the inner side of the gear c' is adapted to enter a pin-hole in the adjacent end frame of the carrier e to positively effect the rotation of the carrier in unison with the gear. A series of circumferential slots e^2 are made in the carrier e, (see Fig. 1,) through which project catches e^4, fast on a rod e^5, journaled in the end frames. A stout spring s (see full lines, Fig. 1, and dotted lines, Fig. 2) is coiled about the rod and fastened thereto at one end, the other end of the spring be-

ing secured to the inner side of the carrier, the spring normally tending to press the catches e^4 toward preferably headed pins or projections e^3 adjacent the upper ends of the slots e^2, a suitable damper-nut e^6 on the projecting end of the rod enabling the latter to be partially rotated in the opposite direction.

The catches and the pins or projections constitute one form of locking device to retain a note-sheet p (shown only in Fig. 2) upon and drawn tightly about the cylindrical surface of the carrier e. These note-sheets may be substantially cylindrical and split longitudinally, so that they may be passed about the carrier to be applied to or removed therefrom.

One edge of the note-sheet p is provided with openings to receive the pins e^3, the other edge having openings adjacent thereto to receive the catches e^4.

When a note-sheet is to be placed upon the carrier, the sheet is flattened out and slipped about the carrier and the openings, one edge is caught about the openings e^3, and by turning the rod e^5 against the spring s the catches e^4 can be brought into position to enter the opening in the free end of the sheet, release of the rod e^5 permitting the spring to act to draw the two edges together, thus smoothly and tightly stretching the note-sheet upon the carrier.

A toothed comb f of usual construction is attached to a support f' on the base-plate, and between the comb and the carrier are interposed a series of star-wheels f^2, independently rotatable on a shaft f^3, held in the upturned end f^4 of the bar f^{10}, the teeth of the wheel being located in the paths of movement of the note projections p' of the note-sheet p, (clearly shown in Fig. 2,) each wheel also cooperating with a tooth of the comb f and damper $f^\times$. A damper for each tooth is herein shown as a piece of spring metal $f^\times$ secured to the bar f^{10} and twisted at f^5 across the path of the star-wheel and bent at its upper end, at f^6, to bear against the wheel and act as a friction-brake therefor, an arm f^7 having thereon a piece of felt or other suitable material f^8, if desired, and adapted to bear against the "lead" f^9 of the tooth at the proper time to stop the vibration of the tooth.

Referring to Fig. 6, it will be seen that a tooth of the star-wheel is just about to spring the damper outward against the lead f^9 to stop the vibration of the comb-tooth, which has just been released by a preceding tooth of the star-wheel, the damper normally being withdrawn from contact with the lead.

The projection on the note-sheet rotates the star-wheel step by step in the rotation of the carrier in the direction of the arrow 25, Fig. 2, thus operating the teeth of the comb.

Each tune-sheet may be prepared for a plurality of tunes, the note projections p' forming each tune being offset on the plate, so as to play one tune after another, the carrier and its attached note-plate must be moved longitudinally in front of the comb to present a new set of note projections to act upon the star-wheel, and this shifting is herein accomplished automatically.

A disk g, (see Figs. 1, 4, and 5,) having a notch g' therein, is secured to the sleeve d between the disk $a'^\times$ and the adjacent end of the carrier, said notch being adapted to be entered at every revolution of the carrier by a spring-controlled pawl g^2, pivotally mounted in an ear a^2 on the standard a', the end of said pawl projecting over the notched periphery of the disk over the periphery of a notched wheel g^3, having on its inner face or secured thereto an annular face-cam g^4, the hub of the wheel g^3 being held by friction on and to rotate with the sleeve d unless positively prevented. The face-cam, as herein shown, has three dwell portions 1, 2, and 3 at different elevations, three such groups being herein shown on the cam.

A pin or stud e^7 on the end of the carrier e is held against the face of the cam g^4 by a spring s', surrounding the sleeve d between the other end of the carrier and the gear c', said spring moving the carrier toward the cam whenever the face of the latter will permit. As the sleeve rotates the controlling-disk g and the cam-carrier g^3 move therewith until the pawl g^2 can enter the notch g' in the controlling-disk, the notch being deep enough to permit the pawl to also enter a notch of the cam-carrier g^3, thus positively preventing its rotation with the sleeve and disk g so long as the pawl g^2 is in the notch g'. When, however, the continued rotation of the controlling-disk acts to lift the pawl out of the notch g', it also releases the cam-carrier, which then is free to rotate in unison with the carrier. The step-by-step movement thus given to the cam g^4 brings the portions 1, 2, and 3 thereof successively opposite the end of the stud e^7, the spring s' moving the carrier from one to the next lower portion. Each longitudinal move shifts the carrier and tune-sheet sufficiently to bring a new series of tune projections into position to act on the star-wheel, and as long as the rotation of the carrier is continued the tunes will be repeated in regular order.

If desired, the shifting mechanism may be thrown out of operation by means of a cam-head g^5 on a screw-stud g^6, mounted in the ear a^2, rotation of the screw causing the head to lift the pawl g^2 and prevent it from entering the notch g' in the controlling-disk.

The carrier is moved toward or from the star-wheels by means of either or both of the handles, as described, to facilitate the application or removal of the tune-sheet.

The motor or driving mechanism, now to be described, is mounted in side plates h h', secured to the under side of the base-plate A and of suitable shape to provide bearings for the usual parts.

The gear c' meshes with a large gear h^4, fast

on an arbor h^3, rotatable in the side plates and provided with a pinion h^4 in mesh with a large gear h^5, secured to or forming a part of a spring-case h^6, surrounding the mainspring S, one end of which is secured at $h^\times$ (see Fig. 3) to the case and its other end (see dotted lines, Fig. 3) is secured at 15 to the arbor h^7, on which the spring-case is revolubly mounted. A gear h^8 is shown in Fig. 3 as splined to the spring-arbor, and a pinion h^9 on the winding-arbor h^{10} meshes with the gear h^8 to wind up the spring by means of a suitable handle. In winding, the arbor h^7 will be rotated in the direction of the arrow 50, Fig. 2, and to prevent unwinding except through the train of mechanism I have provided a noiseless friction-detent. A friction-disk h^{12} is attached to the spring-arbor outside of the plate h', and to the said plate are secured, preferably, two diametrically-arranged abutments h^{13} with their faces h^{14} contiguous and substantially tangent to the disk. Wedge-like detents h^{15} are controlled by or supported on springs h^{16} (see Fig. 2) to enter between the disk and the abutments, the springs keeping the wedges in place while permitting the disk h^{12} to move freely during the winding of the spring S. As soon as the mainspring S is free to act it tends to turn the disk h^{12} opposite to the arrow 50, Fig. 2, and the friction between the disks and the detents h^{15} forces the latter in against the abutments, stopping the rotation of the disks, and the greater the force exerted by the mainspring the more firmly are the detents wedged into operative position. In operation the friction-detent is entirely noiseless and thus does not interfere with the playing of the tune. To insure the steady and uniform movement of the motor from the beginning to the end of the unwinding of the spring, I have provided a regulator, (shown as two oppositely-extended and curved wings k, Figs. 1 and 2,) of thin spring metal, oppositely concaved and secured to arms k', loose on the shaft k^2, and having bearings in a depending foot h^{20} of the cam, and in a block h^{21}, a worm k^3 on the shaft being engaged by a gear m, rotatable in an extension h^{25}, attached to the side plate h, the said gear having secured thereto a smaller gear $m^\times$, meshing with the teeth of a spur-gear m', and an arbor m^2 has fast thereon a pinion m^3, (shown in dotted lines in Fig. 2,) in engagement with the large gear h^2, very even rotation being imparted to the regulator or governor by the air against the expanding wings k. As the speed of rotation increases or decreases the resistance of the air flattens out or permits more or less contraction of the wings to present a greater or smaller surface to the air.

By a slight modification of the carrier I can use a long tune-sheet with equal facility, as shown in Fig. 7, the said carrier e having preferably at or near its ends a peripheral series of projections e^{25}, adapted to engage, one after another, suitable openings t' longitudinally extended along the tune-sheet t, the rotation of the carrier by the motor drawing the sheet t toward the comb f in the direction of the arrow 100, and moving it away therefrom in the direction of arrow 102.

When a tune is finished, the carrier is shifted, as hereinbefore described, carrying the tune-sheet laterally with it.

It will be obvious that, if desired, the tune-sheet may be detachably connected at its two ends to form an endless band, the case or box having any suitable openings therein to permit the passage of the tune-sheet.

My invention is thus adapted for use with either long tune-sheets or split cylinders having the tunes thereon, uniting in one apparatus the capability to use either form of tune-sheet with equally good results.

I have herein indicated in Fig. 1 by dotted lines where the projections e^{25} may be located, and they may be either permanently fixed in the carrier or they can be made to screw into suitable threaded openings in the carrier.

The locking device used for the split-cylinder form of tune-sheet will not interfere in the least with the proper operation of a long tune-sheet, as the latter will ride over the lugs e^3 and the catches e^4, or the lugs may be threaded to be removed, if desired.

My invention is not restricted to the construction and arrangement of parts herein shown and described, for it is obvious that changes or modifications may be made therein without departing from the spirit and scope of my invention.

Star-wheels, hereinbefore described, and shown in the drawings, may be omitted, if desired, and the tune-sheets on the carrier may act directly on the comb by means of the note projections or pins thereon.

I claim—

1. In a musical box, a comb, a rotatable cylindrical carrier for the tune-sheet, a shaft for the carrier, and bearings for said shaft in which it is eccentrically mounted, to move the carrier toward and from the comb, substantially as described.

2. A rotatable cylindrical carrier, a series of fixed lugs thereon parallel to the axis, a comb extended longitudinally adjacent the carrier, and a tune-sheet having openings therein at one end to be entered by the lugs on the carrier, to positively engage the tune-sheet and bend it around the carrier by rotation thereof, substantially as described.

3. In a musical box, a rotatable cylindrical carrier, a locking device thereon to engage and hold the ends of a tune-sheet, and a tune-sheet adapted to be bent around and detachably secured to the carrier, substantially as described.

4. In a musical box, a shaft, bearings in which it is eccentrically mounted, a sleeve loose on the shaft, and a cylindrical carrier on and rotatable with the sleeve, combined

with a comb, and a tune-sheet adapted to be moved by the carrier to actuate the comb-teeth, substantially as described.

5. A cylindrical tune-sheet carrier for musical boxes, having a series of fixed lugs thereon to engage one end of a tune-sheet, and catches to engage the other end of the sheet and draw the same closely about the carrier, substantially as described.

6. A positively-rotated sleeve, a tune-sheet carrier rotatable therewith and longitudinally movable thereon, a carrier-shifting cam frictionally held on the sleeve, a pawl to at times prevent rotation of the cam with the sleeve, and a controlling-disk rotating with the sleeve, to determine the operation of the pawl, substantially as described.

7. A rotatable sleeve, a tune-sheet carrier movable longitudinally thereon, and a shifting mechanism for the carrier, comprising a controlling member fast on the sleeve, a shifting cam frictionally held on the sleeve and provided with a notched carrier, and a pawl governed by the controlling member to intermittingly stop rotation of the cam-carrier, substantially as described.

8. A rotatable sleeve, a tune-sheet carrier movable longitudinally thereon, and a shifting mechanism for the carrier, comprising a controlling member fast on the sleeve, a shifting-cam frictionally held on the sleeve and provided with a notched carrier, a pawl governed by the controlling member, to intermittingly stop the rotation of the cam, and independent means to render the pawl inoperative, substantially as described.

9. In a musical box, a rotatable sleeve, a cylindrical carrier longitudinally movable thereon, and a locking device on the carrier to engage and hold the ends of a tune-sheet, a shifting device to automatically move the carrier longitudinally on the sleeve, a comb the teeth of which are operated by the tune-sheet, and means to rotate the carrier, substantially as described.

10. In a musical box, a comb, a series of independently-rotatable star-wheels having plane sides and adapted each to actuate a comb-tooth, and a damper for each star-wheel located in front thereof and to be moved away therefrom by its teeth to positively damp the coöperating comb-teeth, the upper end of the damper resting against the plane side of the star-wheel, substantially as described.

11. In a musical box, a comb, a series of independently-rotatable star-wheels having plane sides and adapted each to actuate a comb-tooth, and a series of upright spring-metal dampers located in front of the star-wheels and twisted across the paths of and to be engaged by their teeth, to be positively moved by the latter into damping position, and bent at their upper ends to bear continuously on the sides of and to act as friction-brakes for the star-wheels, substantially as described.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

FREDERICK H. SANDER.

Witnesses:
JOHN C. EDWARDS,
AUGUSTA E. DEAN.