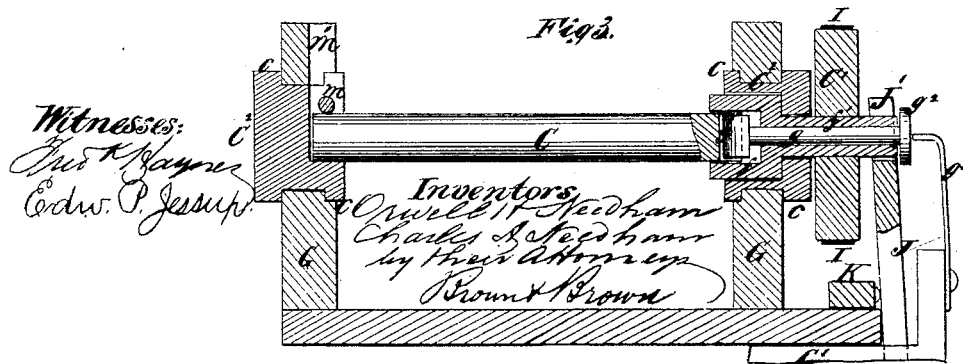
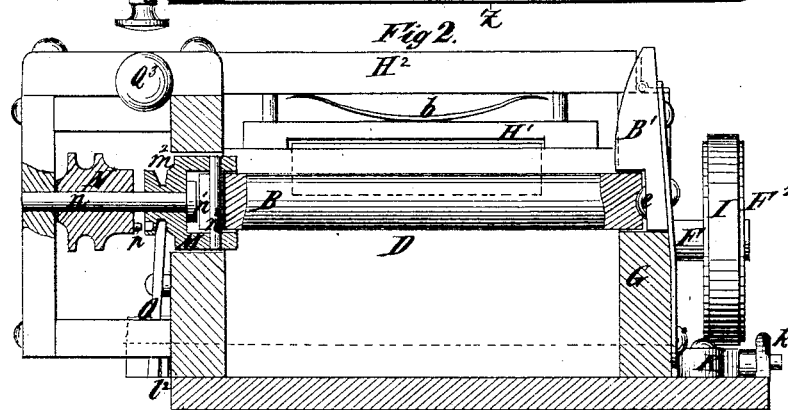
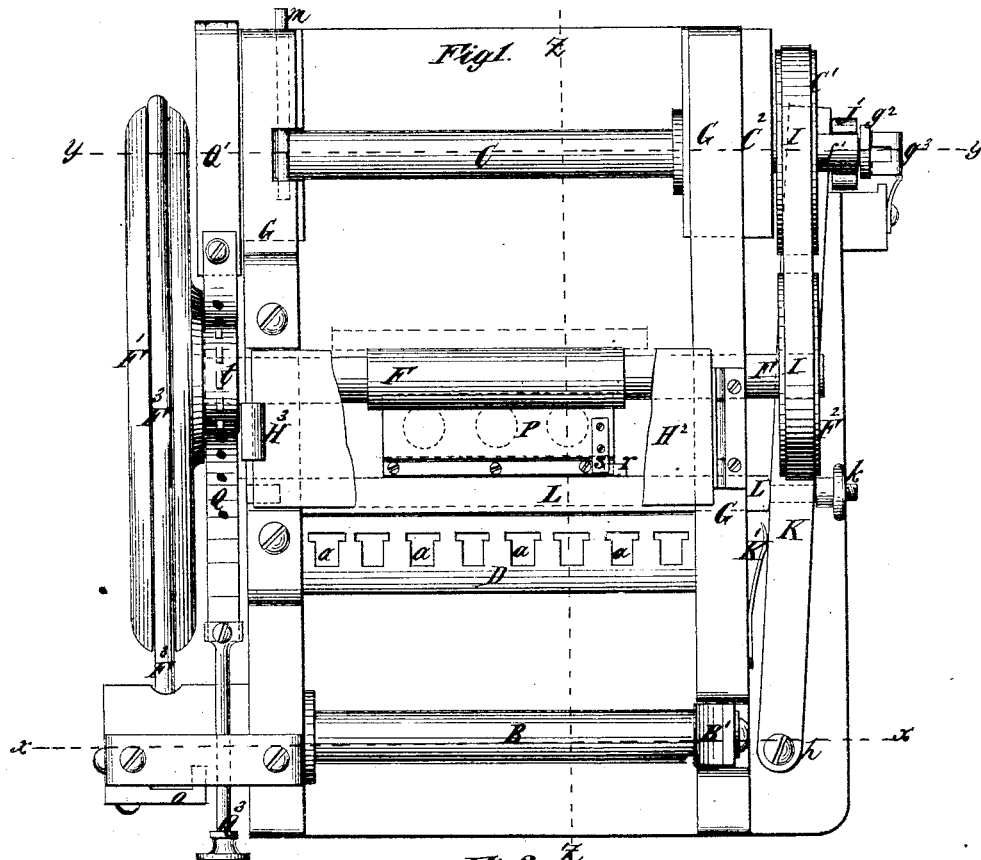
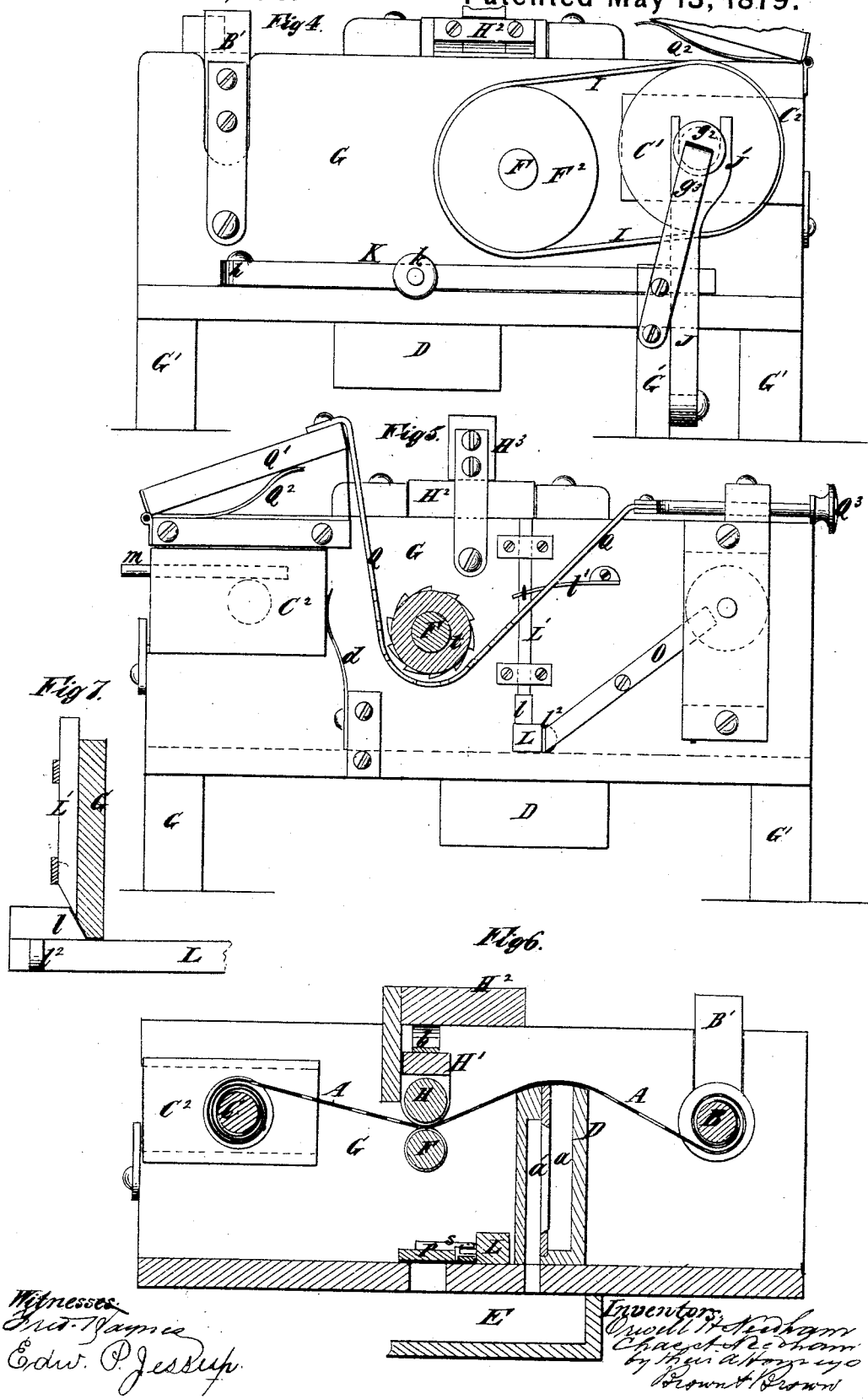


O. H. & C. A. NEEDHAM.
 Mechanical Musical-Instrument.
 No. 215,284. Patented May 13, 1879.



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UNITED STATES PATENT OFFICE.

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IMPROVEMENT IN MECHANICAL MUSICAL INSTRUMENTS.

Specification forming part of Letters Patent No. **215,284**, dated May 13, 1879; application filed February 20, 1879.

To all whom it may concern:

Be it known that we, ORWELL H. NEEDHAM and CHARLES A. NEEDHAM, both of the city, county, and State of New York, have invented certain new and useful Improvements in Mechanical Musical Instruments, of which the following is a specification.

Our invention relates to that class of mechanical organs and other mechanical musical instruments in which the playing is automatically effected by the passage of a strip of perforated paper or a music-sheet through the instrument.

In instruments of this kind the perforated paper or music-sheet is usually placed in the instrument upon a roll, which may be called the "music-roll," and is fed therefrom through the instrument, after which it is rolled upon another roll, called the "take-up roll." As the paper is rolled upon the take-up roll the same becomes larger in diameter, and if rotated at a uniform rate of speed would produce unnecessary strain upon the paper.

One object of this invention is to provide a simple means for causing the take-up roll to revolve at a slower speed as the diameter of the roll of paper thereon increases. Another object is to provide for rapidly rewinding the music sheet or paper upon the music-roll after the same has all been fed therefrom to the take-up roll without removing either of said rolls from their bearings and without stopping the driving mechanism or changing the direction of its motion. Another object is to provide means for admitting air to the wind-chest while the music-sheet is being rewound, thus permitting a free action of the bellows and preventing sounds which arise from a great diminution of pressure in the wind-chest.

Our invention consists in various combinations of parts and details of construction, whereby the desired end is attained.

In the accompanying drawings, Figure 1 represents a plan of an instrument embodying our improvements, certain parts being broken away to better illustrate the construction. Fig. 2 is a vertical section of the same upon the dotted line *xx*, Fig. 1. Fig. 3 is a vertical section of the same upon the dotted line *yy*, Fig. 1. Fig. 4 is an elevation of one side of the instrument. Fig. 5 is an elevation of

the other side thereof. Fig. 6 is a transverse section on the dotted line *zz*, Fig. 1; and Fig. 7 is a detail view of certain parts of the instrument.

Similar letters of reference designate corresponding parts in all the figures.

A designates the perforated music-sheet, B designates the music-roll upon which it is wound preparatory to its being fed through the instrument, and C designates the take-up roll upon which it is wound after passing through the instrument.

These improvements are applicable to wind instruments of various kinds—such as reed and pipe organs—and, slightly modified in form, are also applicable to other kinds of musical instruments. We have shown them here as embodied in a reed instrument.

D designates a reed-board, over which the music-sheet passes. It is provided with a series of reed-tubes, *a*, in which are reeds *a'* (see Fig. 6) of the kind usually employed in instruments of this class. E designates a wind-chest arranged under the instrument, and communicating with the several reed-tubes. A bellows or other apparatus may be employed to exhaust the air from the wind-chest. F designates the main driving-shaft of the instrument. It is supported in suitable bearings in the frame G, is shown as provided with a fly-wheel, F', upon one end, and may be operated by one or more cranks and treadles. The shaft F is represented as passing under the music-sheet A, (see Fig. 6,) and preferably constitutes the feed-roll of the instrument. A presser-roll, H, arranged over the music-sheet holds the same tightly against the feed-roll F, and causes it to be fed along by the revolution of the roll F.

The roller H is carried in a holder, H¹, and upon the top of said holder we have arranged a spring, *b*, for exerting a proper amount of pressure upon the music-sheet, and against the resistance of which the presser-roll may be raised. This presser mechanism is represented as secured to a hinged bridge-piece, H², extending from side to side of the machine, and which may be turned upward to entirely relieve the music-sheet from pressure and prevent the feed-roll F from feeding it along.

We will now proceed to describe the mech-

anism for operating the take-up roll C. F^2 designates a pulley arranged upon the main shaft F, and C^1 a similar pulley arranged upon the shaft of the take-up roll C. A belt, I, passes over the two pulleys, and transmits motion from the pulley F^2 to the pulley C^1 . As the diameter of the take-up roll increases it is desirable that the number of revolutions of the pulley should decrease, in order that an undue strain may not come upon the paper music-sheet and the same be torn. This may be effected by the belt I slipping over the pulley C^1 . To permit this slipping of the belt I, we have represented the roll C as supported in sliding bearing-blocks C^2 in the frame G. These bearing-blocks are provided with flanges c , (see Fig. 3,) for preventing their lateral displacement, and with springs d (shown clearly in Fig. 5) for pushing them outward. When the strain upon the music-sheet becomes sufficient to overcome the resistance of the springs d , the roll C is moved toward the feed-roll F, thus permitting the belt I to slip over the pulley C^1 .

If desirable, the bearings of the take-up roll C may be pivoted to the frame of the instrument and the roll vibrate through an arc. In lieu of the springs d any equivalent device, such as a weight, may be used, or the bearing-blocks C^2 may be held by friction against undue displacement.

While the music-sheet is being fed from the music-roll B the roll is free to revolve by the pull of the paper; but in order that it shall not deliver the paper any faster than it is fed forward by the feed-roll F a brake may be applied to the said music-roll. As here represented, this brake consists of a button, e , (see Fig. 2,) arranged to press against the end of the roll, though other arrangements of the brake may sometimes be desirable.

When the music-sheet has been fed from the music-roll B to the take-up roll C, and it is desired to rewind it upon the music-roll, it is necessary that the take-up roll should be disengaged from its driving mechanism, so as to run free, and that the music-roll should be connected with driving mechanism, so as to be revolved positively. The disengagement of the take-up roll from, and the engagement of the music-roll with, driving mechanism are preferably effected simultaneously and automatically by raising the presser-roll H, and thus at the same time stopping the feed of the music-sheet and releasing the same. It is very desirable, also, that these changes should be effected and the rewinding of the music-sheet upon the music-roll performed without stopping the driving mechanism or changing the direction of its motion. Although we have only shown one method of accomplishing these results, various other means may be employed with equally good results.

We will first proceed to describe the mechanism whereby the take-up roll may be made to engage with and disengage from its driv-

ing mechanism, the same being clearly represented in Figs. 1 and 3.

The take-up roll C is represented as held loosely at one end in a socket, f , in the end of a hollow shaft, f' , which is supported in one of the bearing-blocks C^2 , and upon which the pulley C^1 is secured. g designates a smaller shaft or spindle, passing through the hollow shaft f' , and having longitudinal motion therein, but connected to the shaft f' , so as to rotate with it. The shaft or spindle g is provided upon its inner end with a T-shaped head, g^1 , which, when the shaft g is adjusted inward, enters a slot in the end of the roll C and connects the said roll with the hollow shaft f' , so as to rotate therewith. At its outer end the shaft g is provided with a head, g^2 , upon which impinges a spring, g^3 , for holding the shaft g in engagement with the roller C when not otherwise actuated.

J (see Fig. 4) designates a lever pivoted to one of the standards, G' , of the instrument, and provided at its upper end with a fork, J' , embracing the shaft f' , and impinging against the inner side of the head g^2 of the shaft g .

K (see Fig. 1) designates a lever pivoted at one end, h , to the frame of the instrument, so as to swing laterally, and bearing at the other end against the lever J.

L designates a rod, extending transversely across the instrument, adjustably secured at one end to the lever K by means of a screw-thread and nut, k , and provided at its other end, outside the frame of the instrument, with an inclined face, l . (Clearly represented in Fig. 7.)

L' (see Figs. 5 and 7) designates a rod or push-piece inserted in a groove in the side of the frame G, and capable of vertical adjustment therein. The rod or push-piece L' has at its lower end an inclined face (see particularly Fig. 7) corresponding to the incline upon the end of the rod L, and, when not otherwise actuated, is kept in a raised position by the spring l' , so that its upper end will extend above the top of the frame G.

When the bridge-piece H^2 is raised, the rod L and lever K are moved toward the right by the action of a spring, K' . (Represented in Fig. 1.) As the spring K' is stronger than the spring g^3 , which holds the roll C in engagement with the driving mechanism, the lever K will push the forked lever J and shaft g toward the right, and thereby disengage the roll C from the driving mechanism. When the bridge-piece H^2 is pushed down and locked in position by the latch H^3 , the rod or push piece L' is forced down and the rod L moved to the left by the action of its inclined face. This moves the lever K also to the left against the resistance of the spring K' , and, releasing the lever J, permits the spring g^3 to move the shaft g inward, so that its head g^1 will enter the slot in the end of the roll C, thus locking the same positively to the driving mechanism, so as to be rotated therewith.

The roll C may be removed from the instrument by taking out the pin *m* (see Figs. 1 and 3) and lifting that end of the roll vertically out of the recess *m*¹, in which it is supported.

We will now describe the mechanism for effecting the engagement of the music-roll B with its driving mechanism.

M (see Fig. 2) designates a hub supported upon a fixed shaft, *n*, so that it may be free to rotate, and also to be adjusted longitudinally thereon. It is shown as provided with a socket, *n*¹, for the reception of the roll B and a fixed pin, *n*², which fits into a slot in the end of the roll.

When the music-sheet is being drawn from the roll B the same is left free to rotate under control of the brake *e*, affixed to the latch B', by which the roll is secured in position.

N designates a small pulley fitted so as to rotate upon the fixed shaft *n*, and deriving motion from the fly-wheel F¹ by means of a band, F³.

If desirable, however, friction-gearing may be substituted for the band, in which case the pulley N should be adjustable relatively to the fly-wheel F¹. This pulley N is securely held against longitudinal movement by a stop, *o*, (see Fig. 1,) impinging against the side of the pulley, and it is provided upon its inner face with a pin, *p*, which may enter a corresponding recess in the hub M when the latter is moved longitudinally up to the pulley N, thus forming a clutch, whereby the music-roll is locked positively to the driving mechanism, so as to be rotated at a rapid speed for the purpose of rewinding the music-sheet upon it.

By the longitudinal movement of the music-roll it is moved away from the brake *e*, and hence the rewinding is not retarded by the action of such brake. For effecting this longitudinal movement of the music-roll, we have represented a lever, O, (see Fig. 5,) pivoted to the frame G. One end of said lever engages with a groove, *m*², in the hub M, and the other end engages with a projection, *l*², upon the rod L, so that a longitudinal movement of the rod L vibrates the lever O, and moves the music-roll B longitudinally.

In order to permit the bellows to be operated while the music-sheet is being rewound without danger of discordant sounds from the leakage of air into the wind-chest, and without the increased labor of working the bellows when the air in the wind-chest is very much rarefied, we provide the wind-chest with a valve, P. While the rewinding of the music-sheet is being accomplished this valve remains open, but as soon as the presser-roll is pressed down the valve is closed by the longitudinal movement of the rod L. This rod is provided with a projection, *r*, having an inclined upper face, and as the rod L is moved the projection bears upon the under side of a piece, *s*, extending from the valve and closes the same.

As the mechanism of the instrument is preferably inclosed, it is desirable to have some means whereby the main shaft may be oper-

ated if the crank by which motion is imparted to it should stop upon the center. The means here represented for accomplishing this consists of a series of projections, shaped similarly to ratchet-teeth, arranged upon the hub *t* of the fly-wheel, (see particularly Fig. 5,) and a strap or band, Q, provided with a series of perforations, and partly encircling the hub *t*. This strap or band is secured at one end to a support, Q¹, hinged to the frame G, and adapted to yield against the resistance of a spring, Q². The strap or band is provided at its other end with a handle or pull, Q³, by which it may be drawn tightly around the hub *t*, in which case the perforations in the strap or band will engage with the projections upon the hub *t*, and, owing to the yielding support Q¹, a further pull upon the strap or band will rotate the main shaft.

It is obvious that the projections on the hub might be dispensed with, and the strap or band adapted to engage with the shaft in other ways.

By our invention we provide an instrument in which the liability of tearing the music-sheet, incident to great strain upon it, is very much lessened, and which may be operated with very little labor, as the rewinding of the music-sheet may be very quickly effected without removing the rolls from their bearings, and without stopping the driving mechanism or changing the direction of its motion.

We do not claim the combination, with a perforated music-sheet and mechanism for feeding the same, of a take-up roller having motion imparted to it by a slipping driving device to cause its take-up movement to correspond with the proper movement of the music-sheet; but

What we claim as our invention, and desire to secure by Letters Patent, is—

1. In a mechanical musical instrument, the combination, with a take-up roll upon which the music-sheet is wound after passing through the instrument, sliding bearings therefor, and springs or their equivalent acting upon said bearings, of a pulley arranged upon the shaft of said take-up roll, a driving-pulley, and a belt for transmitting motion from said driving-pulley to said take-up roll, substantially as and for the purpose specified.

2. The combination, with a music-sheet and a feed-roll for imparting motion thereto, of a take-up roll automatically adjustable relatively to said feed-roll, and deriving motion therefrom by means of a belt, substantially as and for the purpose specified.

3. The combination, with a music-sheet and feeding mechanism therefor, of a take-up roll and driving mechanism therefor, so connected with the feeding mechanism that when the feed is rendered inoperative the said take-up roll is disconnected from its driving mechanism, substantially as specified.

4. The combination, with a music-sheet and feeding mechanism therefor, of a music-roll, from which the music-sheet is fed, provided

with a brake for retarding its motion, the said music-roll being so connected to the feeding mechanism as to be released from the action of said brake when the feeding mechanism is rendered inoperative, substantially as specified.

5. The combination, with a music-sheet, of a music-roll, from which the music-sheet is fed, and driving mechanism for imparting a reverse motion to said music-roll for rewinding the music-sheet, whereby the same may be rewound without removing the music-roll from its bearings, substantially as specified.

6. The combination, with a music-sheet and feeding mechanism therefor, of a music-roll, from which the music-sheet is fed, and driving mechanism, which may be made to engage therewith, for imparting a reverse motion to said music-roll, the said driving mechanism being so connected with the feeding mechanism as to be made to engage with the music-roll when the feeding mechanism is rendered inoperative, substantially as specified.

7. The combination, with a music-sheet, of a music-roll, from which the music-sheet is fed, driving mechanism for imparting a reverse motion to said music-roll, a take-up roll, and driving mechanism therefor, the said music-roll and take-up roll being so connected that when one of them is made to engage with its driving mechanism the other is released therefrom, substantially as specified.

8. The combination of the feed-roll and presser-roll for giving motion to the music-sheet, the music-roll, and take-up roll, with their driving and disengaging mechanism, and a movable holder for the presser-roll, arranged to operate as described, to effect the engagement of the music-roll and take-up roll with,

and their disengagement from, said driving mechanism, substantially as specified.

9. The combination, with a music-sheet, of a music-roll, from which the music-sheet is fed, driving mechanism for imparting a reverse motion to said music-roll, a clutch, and means for adjusting said roll longitudinally, whereby it may be made to engage with said driving mechanism, substantially as specified.

10. The combination, with a music-sheet and feeding mechanism therefor, of a wind-chest and a valve for said wind-chest, so connected with the said feeding mechanism that it will be opened when the feeding mechanism is rendered inoperative, but closed when the feeding mechanism is operative, substantially as specified.

11. The combination, with the roll B, of the latch B', brake *e*, hub M, pulley N, lever O, rod L, and push-piece L', substantially as specified.

12. The combination, with the roll C, of the pulley C', sliding bearing-blocks C², springs *d*, shaft F, pulley F², and belt I, substantially as specified.

13. The combination, with the roll C, of the hollow shaft *f*, shaft *g*, spring *g*³, forked lever J, lever K, spring K', rod L, and push-piece L', substantially as specified.

14. The combination, with the music-sheet A, of a feed-roll, F, presser-roll H, movable cross-piece H², music-roll B, and take-up roll C, arranged and operating substantially as and for the purpose specified.

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