

No. 616,077.

Patented Dec. 20, 1898.

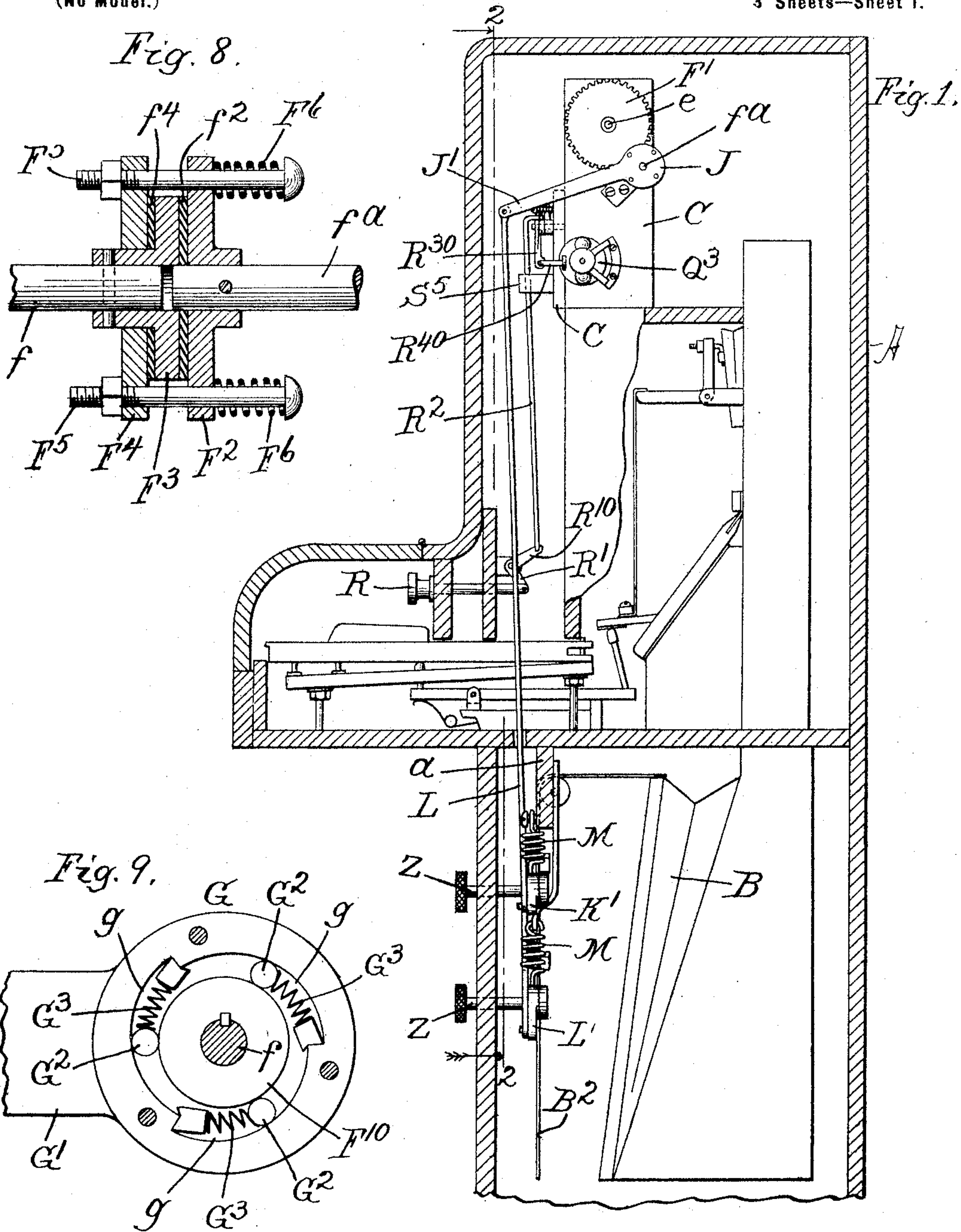
M. CLARK.

WINDING UP AND OPERATING MECHANISM FOR AUTOMATIC PLAYING DEVICES FOR MUSICAL INSTRUMENTS.

(No Model.)

(Application filed Feb. 25, 1897.)

3 Sheets—Sheet 1.



Witnesses.

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Jean Elliott

Malville Clark
by Burton & Burton
his attys.

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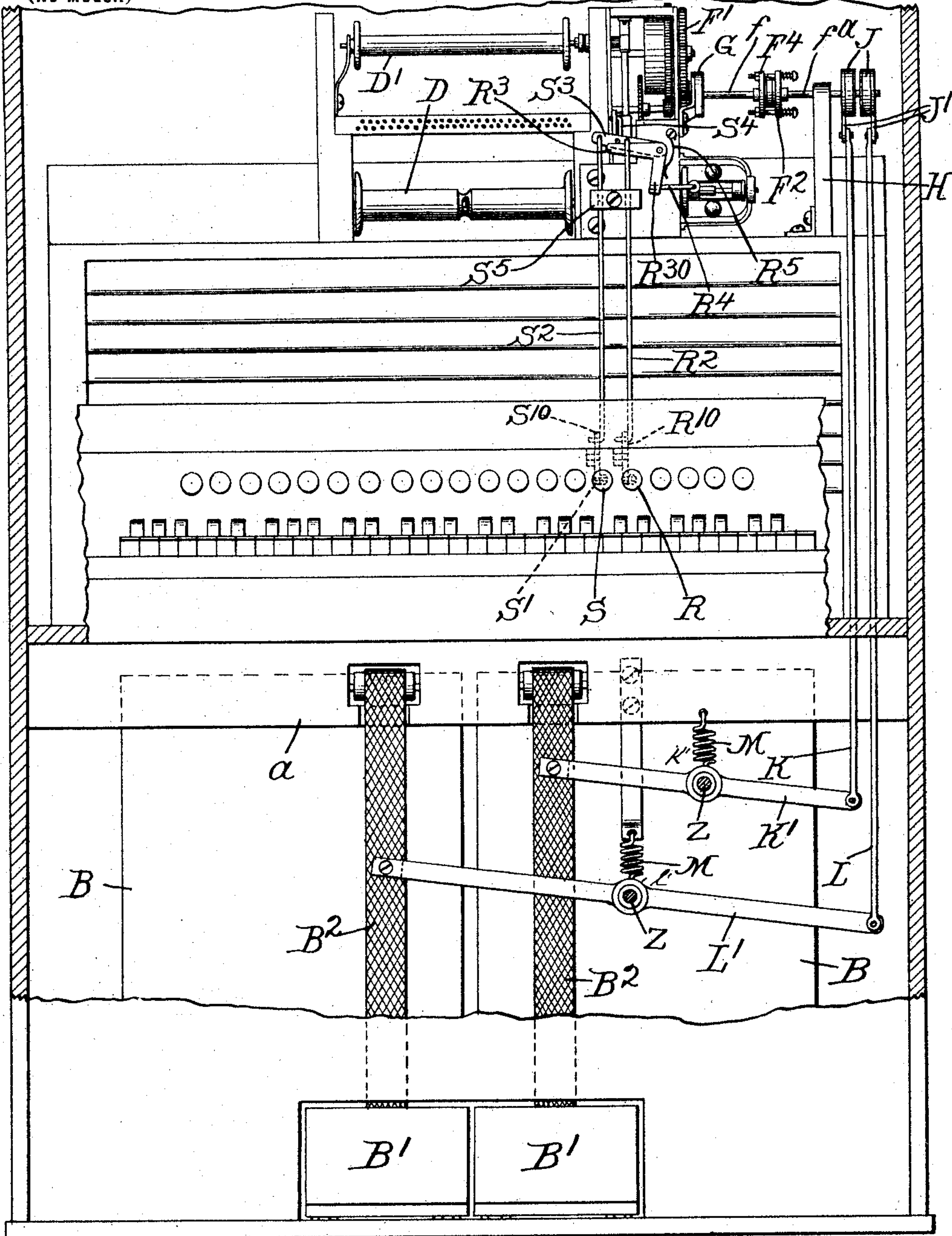


Fig. 2.

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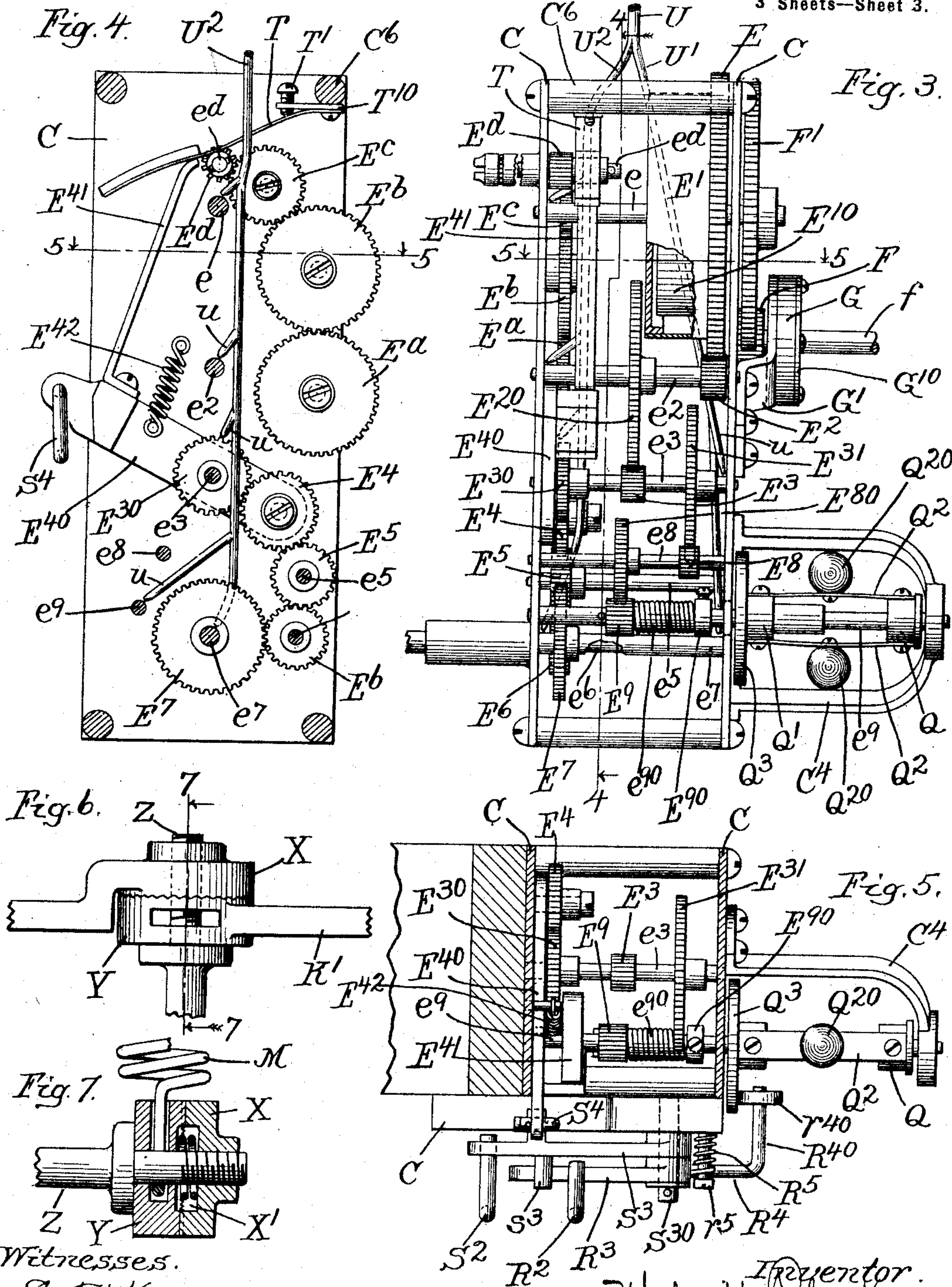
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UNITED STATES PATENT OFFICE.

MELVILLE CLARK, OF CHICAGO, ILLINOIS.

WINDING-UP AND OPERATING MECHANISM FOR AUTOMATIC PLAYING DEVICES FOR MUSICAL INSTRUMENTS

SPECIFICATION forming part of Letters Patent No. 616,077, dated December 20, 1898.

Application filed February 25, 1897. Serial No. 625,051. (No model.)

To all whom it may concern:

Be it known that I, MELVILLE CLARK, a citizen of the United States, residing at Chicago, county of Cook, and State of Illinois, have invented certain new and useful Improvements in Winding-Up and Operating Mechanism for Automatic Playing Devices for Musical Instruments, which are fully set forth in the following specification, reference being had to the accompanying drawings, forming a part thereof.

The purpose of this invention is to provide improved devices for winding up the motors which operate the perforated music-sheet or equivalent device in automatic playing attachments for musical instruments, particularly reed-organs or others having bellows operated by pedals.

It consists of mechanism connecting the winding-up devices with the bellows-operating mechanism and in specific features of construction in this respect, which are set forth in the claims.

In the drawings, Figure 1 is a fore-and-aft section of an organ having my improvements referred to. Fig. 2 is a section at the line 2 2 on Fig. 1. Fig. 3 is a detail front elevation, on an enlarged scale, of the mechanism for operating the perforated sheet and the winding-up mechanism for the same, the stop connections to the governing mechanism being omitted. Fig. 4 is a section at the line 4 4 on Fig. 3. Fig. 5 is a detail section of the frame in which the operating-train is mounted, section being made at the plane indicated by the line 5 5 on Figs. 3 and 4, the view showing, however, only parts of the mechanism which relate to the governing and reversing action. Fig. 6 is a detail plan of a joint in the levers which connect the pedals with the winding-up mechanism. Fig. 7 is a section at the line 7 7 on Fig. 6. Fig. 8 is an axial section of a friction driving connection in the train of connections from the pedals to the winding-up shaft. Fig. 9 is an interior view of one of the clutches in said train of connections, the same being shown with one side plate removed, the shaft and securing-bolts being in section at the plane of the surface of the shell shown.

A represents the case of an organ, having a pumping-bellows B B, operated by pedals B'

B', which are connected by customary straps B² B² with the fluctuating sides of the bellows, respectively. At a suitable position in the organ-face there is properly secured mechanism for winding and rewinding a perforated music-strip, by which the organ is automatically played. The supporting-frame for said mechanism and the rolls on which the perforated sheet is wound are shown at C C C C. In this mechanism, D is the roll onto which the sheet is wound in playing, and D' the roll from which it is unwound in playing and onto which it is rewound for removal or repeating. The roll D is for convenience termed the "winding-roll," and D' the "rewinding-roll." The train which rotates the roll D comprises the main wheel E on the shaft *e*, having the customary connection by means of a barrel E' with an actuating-spring E¹⁰ shown within the barrel and connected at its inner coil to the shaft *e*, which is the winding-shaft, the pinion E² on the shaft *e*², gear E²⁰ on the same shaft, pinion E³ on the shaft *e*³, gear E³⁰ on the same shaft, the gear E⁴, mounted on the lever E⁴⁰, which is fulcrumed on the shaft *e*³, the gear E⁵ on the shaft *e*⁵, the gear E⁶ on the shaft *e*⁶, and the gear E⁷ on the shaft *e*⁷, which carries the winding-roll D. On the shaft *e*⁸ is a gear E⁸¹, which meshes with the pinion E⁸ on the shaft *e*⁸, on which there is a gear E⁸⁰, meshing with the pinion E⁹ on the shaft *e*⁹, which is the shaft of the governor, hereinafter described. In rewinding, the portion of the train above described to and including the gear E⁴ on the lever E⁴⁰ coöperates with the rewinding-train. Said lever is adapted to be rocked on a shaft *e*³ to carry the gear E⁴ out of mesh with the gear E⁵, and thereby said gear is meshed with the gear E^a, which meshes with and drives the gear E^b, which meshes with and drives the gear E^c, which meshes with the pinion E^d on the shaft *e*^d of the rewinding-roll D'. The wheels E^a, E^b, E^c, and E^d, having no function except in rewinding, constitute the "rewinding-train" as distinguished from the "winding-train." The winding-up devices comprise a shaft *f*, on which is a pinion F, which meshes with the main winding-wheel F', which is rigid with the main spring-shaft *e* outside the right-hand plate of the frame C. The shaft *f* passes through the noiseless locking-clutch G, which has an arm G', by

means of which it is mounted rigidly on the frame-plate, and has a cap-plate G^{10} , between which and the clutch proper, G , and within the chamber of the clutch a circular collar F^{10} is secured fast to the shaft f . The chamber of the clutch has a plurality (as illustrated, three) of spiral recesses g g g , and within said recesses and between the peripheral wall of the chamber and the periphery of the collar F^{10} are lodged balls G^2 G^2 G^2 , whose diameter is greater than the least and less than the greatest width of the space between the collar and the wall of the chamber. The springs G^3 G^3 G^3 , reacting against the shoulders of the spiral recesses, tend to hold the balls toward the narrower ends of the recesses, respectively, and the rotation of the shaft f in the direction in which it is rotated to wind the spring tends by frictional engagement of the collar F^{10} to roll the balls back toward the wider ends of the respective recesses; but any rotation of said shaft in the opposite direction tends to wedge the balls in recesses, and thereby locks the shaft against rotation in such direction. The shaft f is divided intermediate the clutch G and a bearing provided for said shaft in the bracket II, the two parts being engaged by a friction-joint, (shown in Fig. 8,) the outer part (indicated by the letter f^a) having pinned fast to its inner end the disk or cross-head F^2 , while the inner part of the shaft f has pinned fast to it a disk F^3 . A ring F^4 is loosely mounted on the hub of the disk F^3 and extends beyond the periphery of said disk and is connected by bolts F^5 F^5 with the disk F^2 , said bolts being made fast in the ring F^4 , but extending loosely through the disk F^2 , and springs F^6 being interposed between said disk and the heads of the bolts, respectively, such springs tending to draw the ring toward the disk, and thereby to bring the disk F^3 into contact with such pressure as the springs afford at one side with the disk F^2 and at the other side with the ring F^4 . The disk F^3 may have both surfaces provided with suitable friction covering, (indicated at f^2 and f^4 ,) whereby rotation of the portion f^a of said shaft is communicated to the remainder of the shaft f , and thence to the winding-up mechanism. On said portion f^a of the shaft f beyond the bracket II are two clutches J J , similar to the clutch G , except that the arms J' J' of said clutches, instead of being mounted rigidly on a frame or other support, are connected by links K and L to levers K' and L' , respectively, said levers being fulcrumed at k' and l' , respectively, on yielding supports, which, as illustrated, are short spiral springs M M , which are supported at their upper ends by any convenient part of the cabinet-work of the organ, as by the transverse bar a , said levers at their forward ends being pivotally connected to the straps B^2 , pertaining to the bellows and connected to the pedals, respectively.

When the pedals are operated to operate the bellows, the levers K' and L' are oscillated

upon their respective fulcrums and in turn, through the links K and L , respectively, operate the clutches J J , the down motion of the pedals causing the clutches to engage and rotate the shaft f^a , and so long as the resistance to its rotation caused by the tension of the spring is not too great to overcome the friction between the disks F^2 and F^3 such rotation rotates the shaft f and winds up the spring. When the spring is fully wound or wound to such tension as the friction between the disks F^2 and F^3 permits, further action of the pedals causes slipping between said disks until the spring becomes sufficiently slackened by operating the train to be wound by the amount of power transmitted through the friction device. The same result—viz., cessation of the operation of the winding-up devices, without regard to the slipping of the friction-disks upon each other—may be attained by means of the yielding fulcrum, which the levers K' and L' obtain on the ends of the springs M —that is to say, when the spring is wound tight, further action of the bellows operating upon the levers K' and L' being resisted at the connection of said levers to the links K and L , respectively, said points of connection become the operative fulcrums of the levers and the yielding fulcrums obtained on the ends of the springs move as the pedals are operated. When the organ is to be operated without the use of winding mechanism, which would be the case whenever it is played by hand and the automatic playing devices are out of use, the power which would be necessary to wind up the train and keep it wound or to operate the pedals against the friction of the friction-disks F^2 and F^3 or against the tension of the springs M and M is saved by taking advantage of the construction illustrated in Figs. 6 and 7, which show releasable joints in the levers K' and L' at their fulcrums, respectively, said levers being made each in two pieces united at such a joint whereat the two parts terminate in disks X and Y , respectively, having serrated faces adapted to engage, the two parts being connected together by a bolt Z , and a short spiral spring lodged in a cavity X' in one of the disks tending to hold serrated faces out of engagement, but to be compressed by tightening the bolt to draw said faces into engagement, and thereby lock the two parts of the lever rigidly. The bolts Z have stems which extend out through the cabinet-work of the organ and are provided with handles at their outer ends, so that the operator may at will release the joints thus formed in the levers, whereby the forward portion of the levers connected to the pedal-straps alone is actuated by the action of the pedals, all the remainder of the levers and the mechanism being inactive.

The governor-shaft e^9 extends beyond the frame C at the right hand and obtains a further bearing in the outer end of the bracket C^4 , between which bearing and the right-hand plate of the frame C the centrifugal

governing device is mounted on the shaft. Said device consists of the collar Q, fast on the shaft, the collar Q', loose on the shaft, the springs Q² Q³, connecting said collars and connecting the centrifugal balls Q²⁰, and a friction-disk Q³, rigid with the collar Q'. The pinion E⁹ is loose on the shaft e⁹, but is connected thereto by means of the collar E⁹⁰, fast on the shaft, and a spring e⁹⁰, coiled about the shaft and attached one end to the collar and the other end to the pinion. This yielding connection adapts the train to operate promptly, the spring serving as a storage of power for overcoming the inertia of the governor and starting the latter after the train has started and coiled the spring E⁹⁰ somewhat. For controlling the governor there is provided a stop R, protruding from the organ-front and connected at the rear end to one arm of the bell-crank lever R' R¹⁰, whose arm is connected by a link R² to the horizontal arm R³ of the bell-crank lever R³ R³⁰, which is fulcrumed on the frame C and has rigid with it, protruding to the right from its depending arm R³⁰, a stem R⁴, which extends past the plane of the disk Q³ and is then bent to extend the finger R⁴⁰ behind the disk Q³—that is, between the same and the plane of the collar Q' of the governor—and is provided with a friction-button r⁴⁰, adapted to contact the rear—that is, the right-hand—surface of the disk Q³. A spring R⁵ on a stud r⁵ reacts against the bell-crank lever R³ R³⁰ to hold the button forward—that is, to the left—against the disk. The friction of the stop R in the organ-front is too great to be overcome by the spring R⁵, so that, notwithstanding said spring, when the stop is withdrawn the button is held away from the disk, the distance corresponding to that to which the stop is withdrawn. It will be understood that the greater the speed of the winding-train to which the governor is connected the farther the disk Q³ will be drawn toward the head of the bracket C⁴ and that the position at which the button r⁴⁰ stands, determining the distance to which the disk can thus be drawn by the centrifugal action of the governor-balls, determines the speed at which the train can run, not because the mere restraining of the movement of the disk along the shaft e⁹ has any tendency to check the speed, but because, being restrained by a device which imposes friction upon it, the speed of the governor is reduced by the friction, and the friction is in turn reduced by the reduction of pressure as the centrifugal force of the balls diminishes, causing the disk to run just barely in contact with the button and to increase or diminish its speed as the button is moved in one direction or the other. For the purpose of operating the lever E⁴⁰ to shift the power from the winding to the rewinding train, or vice versa, I provide a stop S at the organ-front connected at the rear end to a bell-crank lever S' S¹⁰, whose arm S¹⁰ is connected by a link S² to a lever S³, fulcrumed on the same stud S³⁰ on which the le-

ver R³ R³⁰ is fulcrumed. From this lever S³ a link S⁴ extends to the lever E⁴⁰. The lever S³ is behind the lever R³ R³⁰, and the stud s³, projecting forward from the lever S³, overhangs the arm R³ of the lever R³ R³⁰. Both the links R² and S² are suitably guided and restrained by a lock S⁵, mounted on the forward side of the frame C. When the stop S is pulled out, the linked end of the lever S³ is drawn down, and the pin s³ in that movement draws down the arm R³ of the lever R³ R³⁰ and thrusts the button r⁴⁰ away from the disk Q³ to the remote limit of the movement provided for by the construction. This movement of the stop S is the one which throws the gear-wheel E⁴ out of connection with the winding-train and into connection with the rewinding-train, and, as will be seen, the remote position of the governor r⁴⁰ permits the governor to run without restraint during the rewinding action. The rewinding-train, as will be observed, is constructed to give the roll D' much higher speed than the roll D would receive from the same speed of the governor-shaft, and the removal of all restraint from the governor therefore causes the rewinding to occur very rapidly, even as compared with the most rapid action of the winding process. The roll D', however, must be restrained during the unwinding therefrom of the perforated sheet or equivalent device which is wound onto the roll D in order that the sheet may be kept taut and wound closely—that is, without slack on the roll D. This is effected by a brake-spring T, attached to one of the posts C⁶ at the upper rear corner of the frame C and constructed to extend above and bear upon the hub of the pinion E^d on the shaft of the rewinding-roll D'. An adjusting-screw T', set through a block T¹⁰, rigid with the post C⁶, serves to regulate the tension of the spring T, adapting it to restrain the rotation of the rewinding-roll to any desired extent. The lever E⁴⁰ has a finger E⁴¹, which extends up under the spring T, and when said lever E⁴⁰ is pulled downward by the stop S the finger E⁴¹ swinging outward lifts the spring T off the hub of the pinion E^d and leaves the rewinding-train entirely free from restraint during the winding movement.

When the governor is entirely free from the restraint of the regulating device, as described, during the rewinding, the centrifugal balls, being spread to the utmost limit, adapt the governor to operate simply as a fly-wheel, storing energy and maintaining the momentum of the motor-actuated train, so that when the proper stop is actuated to restore said train to engagement with the winding-train its momentum becomes effective to cause the winding to start instantly instead of very slowly, as would be the case were it not for the acquired momentum and the governor acting as a fly-wheel.

For the purpose of oiling the important bearings of the winding and rewinding trains, which are inaccessible except at great incon-

venience when the mechanism is in place in the organ, I provide a system of oil-ducts of so small diameter that they operate practically as capillary ducts to conduct oil to the several bearings. These ducts are represented in Figs. 3 and 4, the system extending from a common trunk-duct U, which leads to a point at the top of the organ-case at the vent, where it may be injected, branching above the frame C into two limbs U' and U², extending, respectively, toward the right and left plates of the frame C, and each of said branches has subbranches *u u u*, &c., leading to such other bearings as require oiling. This system of ducts is made of fine brass tubing, which can readily be fashioned for the purpose and secured rigidly to the frame in proper position to deliver the oil at all the bearings for which branches are provided.

I claim—

1. In a pedal-operated musical instrument, in combination with the automatic playing device and the mechanism which operates it, a motor for such mechanism; winding-up devices for such motor; operating connections to the winding devices from the pedal; the pedal comprising a lever having an elastically-yielding fulcrum having a range of yielding adapted to accommodate the entire pedal movement, whereby, when the resistance to winding exceeds the resistance of said yielding fulcrum, the lever ceases to transmit movement to the winding-up devices.

2. In a pedal-operated musical instrument, in combination with the automatic playing device and the mechanism which operates it, a motor for such mechanism; winding-up devices for such motor; operating connections to the winding-up devices from the pedal, such connections comprising a lever having at its fulcrum a joint adapted to permit relative motion of the parts united at such joint in the plane of the movement which the lever receives from the pedal; and suitable means for making the lever rigid or the reverse at such joint at will, whereby at will the lever may be caused to transmit or not transmit from the pedals movement to the winding-up devices.

3. In a musical instrument, the combination with automatic devices which comprise a winding-roll and a rewinding-roll, trains connected with said rolls respectively, a train having a motor to actuate it adapted to be thrown into driving connection with either the winding-roll train or the rewinding-roll train at will, the winding-roll train being geared to transmit relatively slow movement to its roll, and the rewinding-train being geared to transmit relatively fast movement to its roll, a centrifugal governor in the motor-actuated train, regulating devices for such governor, a stop and connections therefrom

adapted to be operated to relieve the governor from regulation at will said governor remaining in the motor-actuated train during rewinding, whereby such governor operates as a fly-wheel to maintain the momentum of the motor-actuated train without restraining the speed during rewinding.

4. In combination with the winding-roll and the rewinding-roll, trains connected with said rolls respectively and a train having a motor to actuate it adapted to be thrown into driving connection with either the winding-roll train or the rewinding-roll train at will, a governor in said motor-train, a stop, and connections therefrom to regulate the governor, a stop and connections therefrom to shift the motor-train connection, and connections between the stops by which the shifting of the motor-train into the rewinding-train relieves the governor of the controlling-stop mechanism.

5. In combination with the winding-roll and the rewinding-roll, operating-trains for said rolls respectively; a motor-train and means for connecting said motor-train with either of said roll-operating trains at will, a friction-brake adapted to restrain the rewinding-roll, and means for relieving the roll of said restraint connected to and operated by the devices for shifting the motor-train into connection with the rewinding-roll train; whereby the rewinding-roll is not restrained during rewinding.

6. In combination with a winding-roll and a rewinding-roll and trains which operate said rolls respectively, and means for connecting it at will with either of said roll-operating trains; a governor in said motor-train; a stop and mechanism controlled thereby for operating such governor; a stop and mechanism operated thereby for shifting the motor-train into connection with the roll-operating connections respectively; a brake which is adapted to restrain the rewinding-roll; connections between the stop mechanisms, whereby the governor mechanism is operated to relieve the governor of control when the motor-train-shift stop is operated to connect the motor-train with the rewinding-roll, and means connected to and operated by said last-mentioned stop mechanism for lifting the brake from the rewinding-roll; whereby the motor-train and the rewinding-roll are relieved of restraint both of the governor and of the brake during the rewinding action.

In testimony whereof I have hereunto set my hand, in the presence of two witnesses, at Chicago, Illinois, this 22d day of February, 1897.

MELVILLE CLARK.

Witnesses:

CHAS. S. BURTON,
JEAN ELLIOTT.