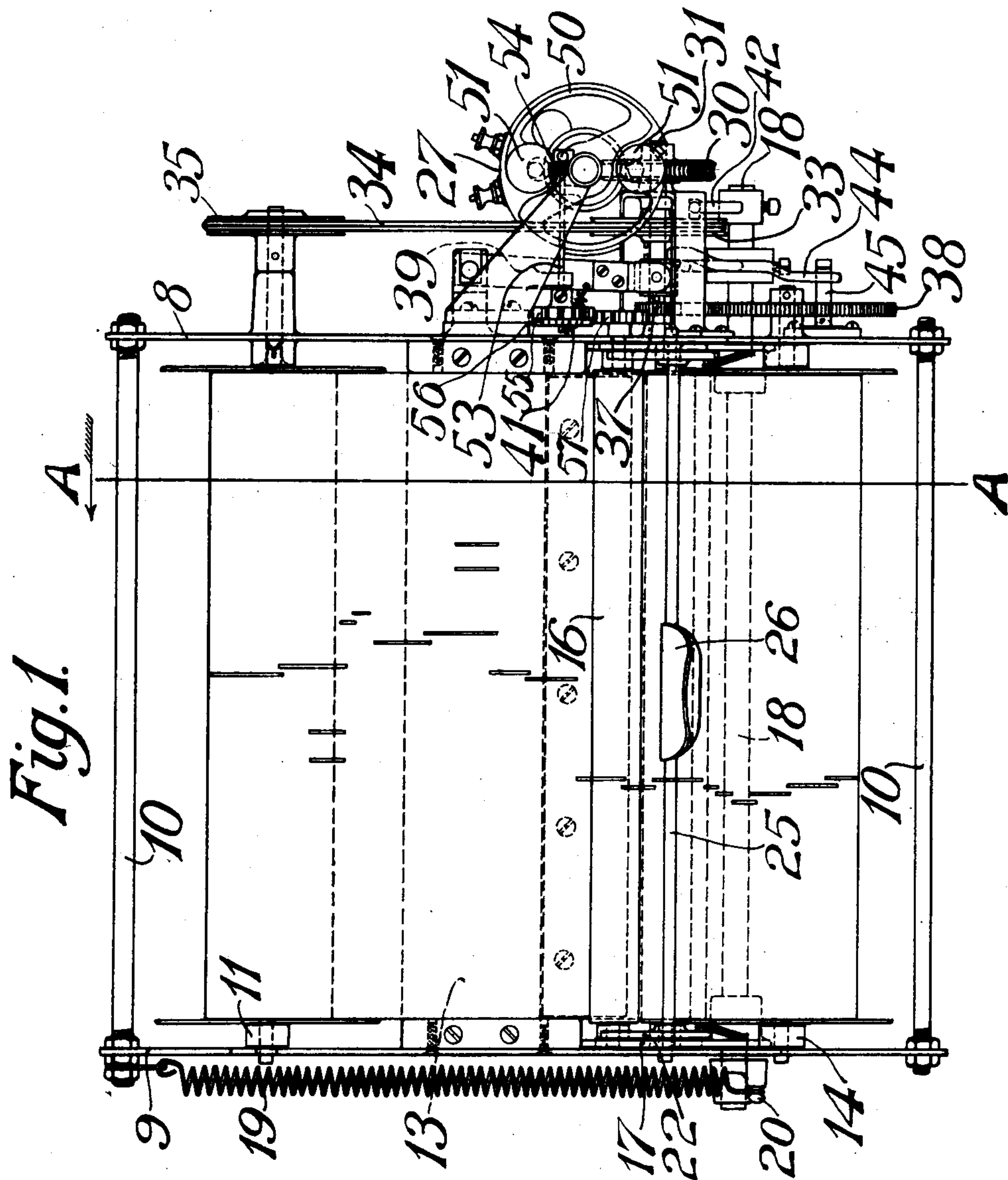


H. K. SANDELL.
ELECTRIC MUSIC SHEET FEEDING DEVICE FOR SELF PLAYING INSTRUMENTS.
APPLICATION FILED SEPT. 24, 1910.

998,264.

Patented July 18, 1911.

5 SHEETS—SHEET 1.



Witnesses

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Ralph A. Schaefer.

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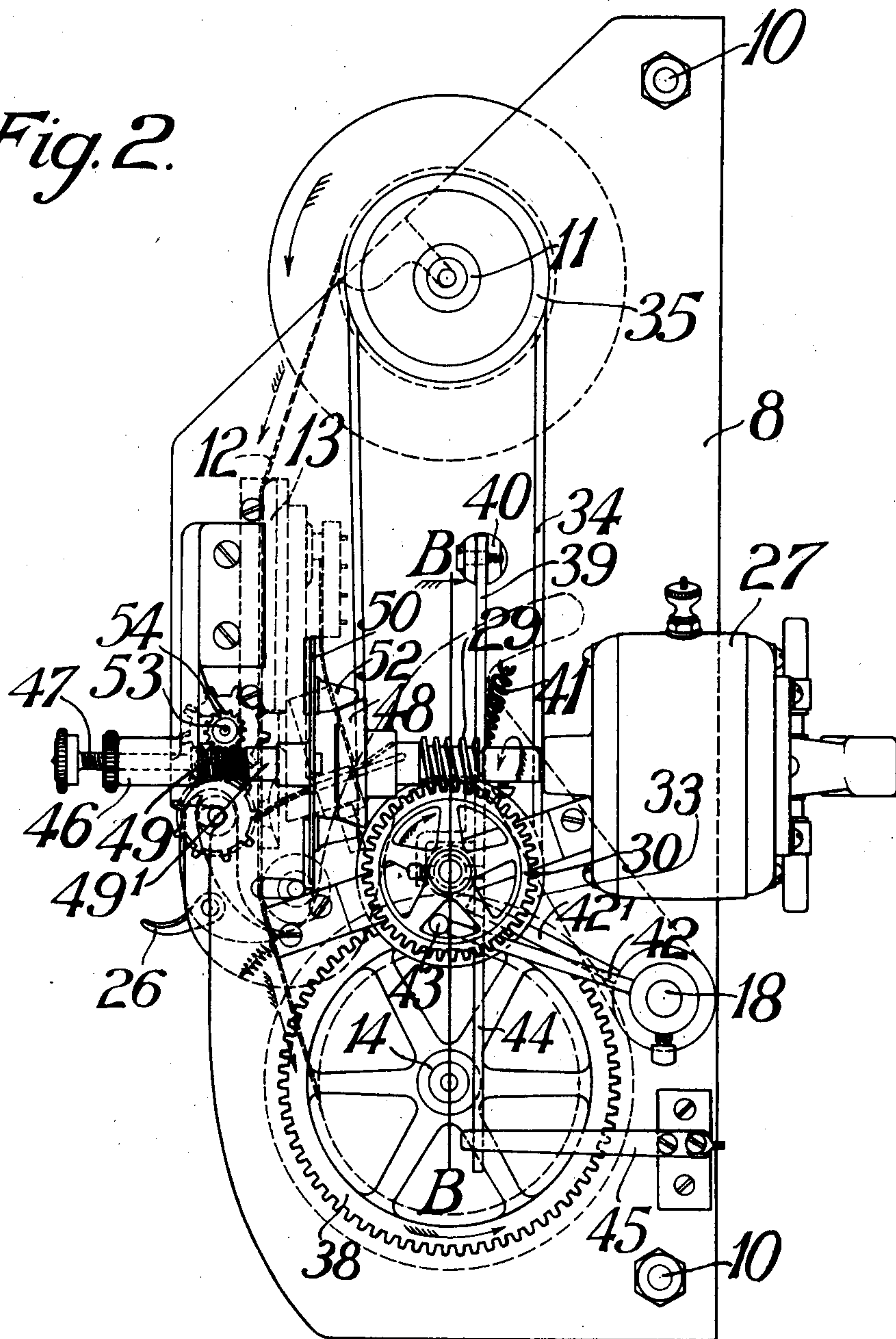
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5 SHEETS-SHEET 2.

Fig. 2.



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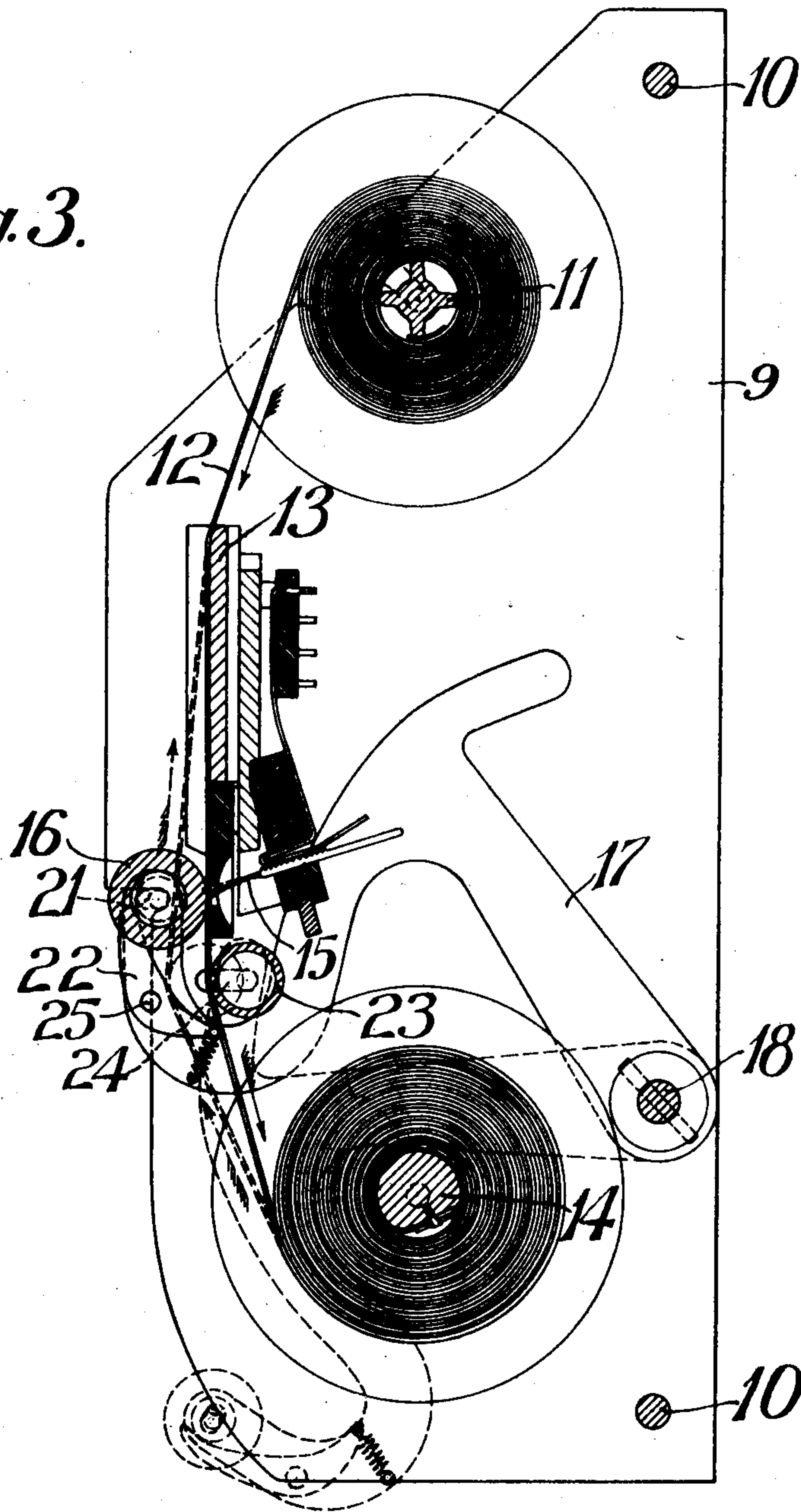
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5 SHEETS—SHEET 3.

Fig. 3.



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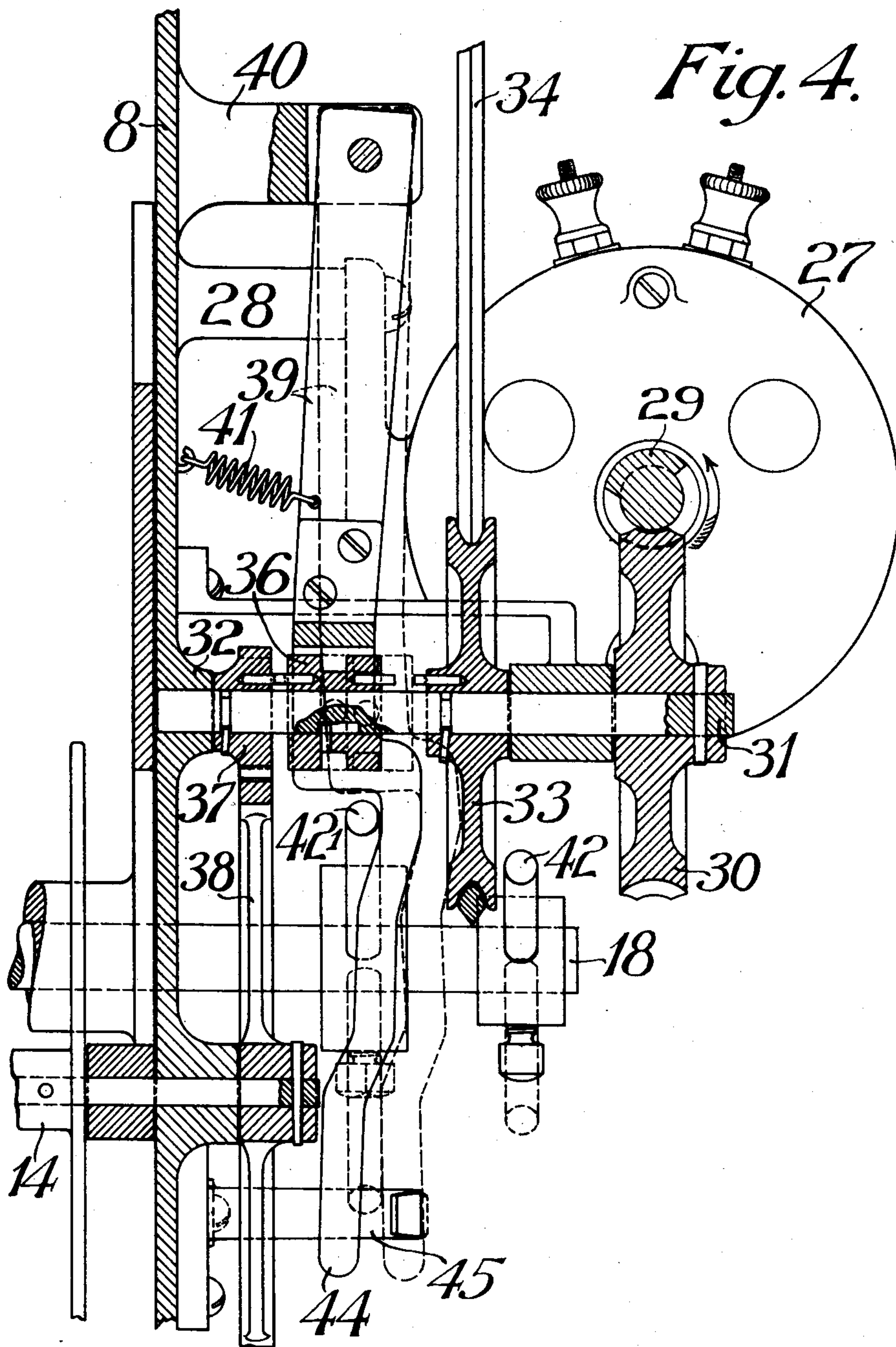
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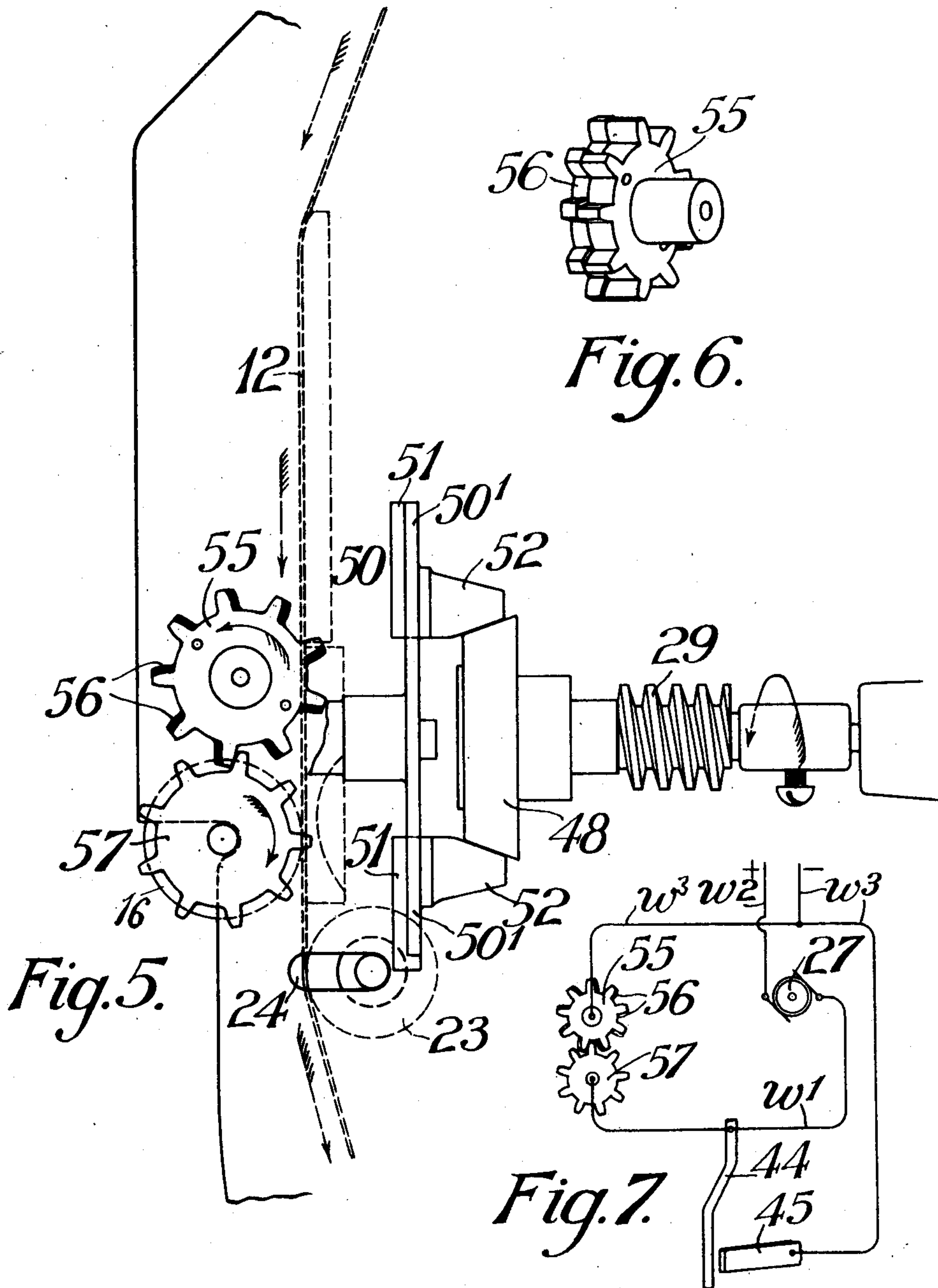
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5 SHEETS—SHEET 5.



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UNITED STATES PATENT OFFICE

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ELECTRIC MUSIC-SHEET-FEEDING DEVICE FOR SELF-PLAYING INSTRUMENTS.

998,264.

Specification of Letters Patent.

Patented July 18, 1911.

Application filed September 24, 1910. Serial No. 583,548.

To all whom it may concern:

Be it known that I, HENRY K. SANDELL, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented a new and useful Improvement in Electric Music-Sheet-Feeding Devices for Self-Playing Instruments, of which the following is a specification.

10 In self-playing instruments wherein a traveling perforated or other music-sheet is employed for playing the instrument electrically or otherwise, it is important that the speed of travel of the sheet in playing
15 shall be uniform, or practically so; and the primary object of the present invention is to provide an electrically-operated feed-device for the sheet, which shall accomplish that purpose.

20 Further objects accomplished by the invention will appear from the description hereinafter contained with reference to the accompanying drawings, in which—

Figure 1 shows the improved device by a
25 view in front elevation with the parts in condition for moving the music-sheet for playing; Fig. 2 is an enlarged view of the same in side elevation; Fig. 3 is an enlarged section on line A—A, Fig. 1, showing the
30 lowered position of the contact-roller by dotted representation; Fig. 4 is an enlarged broken sectional view on line B—B, Fig. 2; Fig. 5 is a broken view in elevation of the toothed wheels employed for opening and
35 closing the motor-circuit, and the friction-drive cooperating therewith; Fig. 6 is a perspective view of the member of the pair of toothed wheels provided with insulating material on one side of each tooth, and Fig.
40 7 is a diagram of the motor-circuit containing the toothed wheels.

The entire mechanism is supported on a frame comprising two vertical side-plates 8 and 9 secured together in parallel relation
45 by spacing-rods 10. The upper roller 11, which carries the music-sheet 12 in a roll, to be paid out, is journaled in the upper ends of the plates, whence it is passed over a guide-bridge 13 extending between the
50 plates to a take-up roller 14 journaled in the lower part thereof, with the center of its axis in vertical alinement with that of the roller 11. The music-sheet shown is of the perforated variety and travels between a

horizontal series of contact-brushes 15 and 55 a contact-roller 16. These brushes and the contact-roller are contained in the circuit of an electric generator, not shown herein, but which may be the same as is shown and described in Letters Patent No. 807,871, dated 60 December 19, 1905, for energizing electromagnets to play the strings of a violin.

The contact-roller is journaled in the upwardly-curved ends of a pair of similar arms 17, 17 extending from near the ends of a 65 rock-shaft 18 journaled near the rear edges of the plates and yieldingly held in their normal, raised position, shown by their full-line representation, by a spiral spring 19 fastened at its upper end to a rod 10 and 70 at its lower end to a crank 20 on an end of the rock-shaft, the spring thus overcoming the weight of the contact-roller and its supporting-arms 17. The bearing for one end of the roller 16 is a slot 21, and a spring- 75 pressed finger 22, journaled between its ends on the adjacent arm 17, bears against the journal of the roller to press it yieldingly against the music-sheet to cause the frictional contact of the latter, in traveling with 80 the roller, to revolve it. A guide-roller 23 is journaled in horizontal slots 24 in the opposite plates 8 and 9 in position to be pressed outwardly against the back of the music-sheet by cam-like advance-edges of 85 the arms 17 bearing against the end-portions of the guide-roller. A rod 25 connects the forward ends of the arms 17 and carries a handle 26 by which to turn the arms for manually lowering the contact-roller out of 90 its operative position for the purpose hereinafter explained.

An electric motor 27 is supported on posts 28 extending from the outer face of the plate 8. The motor-shaft is provided with a 95 worm 29 meshing with a worm-wheel 30 fastened on a stub-shaft 31 journaled in a bearing 32 on the plate 8 and carrying a loose pulley 33 geared by a belt 34 to a pulley 35 on an extension of the corresponding end of the music-sheet roller 11. The stub-shaft also carries a clutch-device 36, which may be of the ordinary construction illustrated, between the pulley 33 and a pinion 37 loosely surrounding the shaft 31 and 105 meshing with a large gear-wheel 38 fastened on the adjacent journal-end of the take-up roller 14. A lever 39 fulcrumed at one end

in a bifurcated stud 40 projecting from the outer face of the plate 8, engages at its lower end with the clutch for shipping it and is normally held by a spring 41 to connect the
 5 clutch with the pinion 37 to drive the take-up roller. The rock-shaft 18 carries on one end a finger 42, extending, in the normal position of the rock-shaft, against a stud 43 projecting from the face of the pulley 33
 10 to stop it against rotation with the shaft 31 while the music-sheet is unwinding from the roller 11, for the purpose of tautening the sheet. The clutch-shipping lever is extended at its lower end into a cam-finger 44
 15 crossing another finger 42¹ extending from the rock-shaft to enable the last-named finger, in turning downwardly when the rock-shaft is turned by the handle 26 for shipping the clutch, to move the cam-finger
 20 against a spring contact-finger 45 on the plate 8 for causing the motor to wind the sheet from the roller 14 upon the roller 11.

Rigidly supported in a suitable bearing 46 on the outer face of the plate 8, to aline
 25 with the motor-shaft, is a shaft 47 adapted to be screwed in its bearing to adjust it toward and from the motor-shaft, which carries on its end a beveled friction-wheel 48 (as of leather) while the shaft 47 carries
 30 loosely a worm 49 on the end of a sleeve 49¹ carrying on its opposite end a governor device 50. This device is a disk of springy metal, as brass like that in the electric-current governor of my Patent No. 796,935,
 35 dated August 8, 1905, having sections cut out of it at opposite sides of its center to form similar curved resilient arms, 50¹, 50¹, each terminating at its free end in a circular head 51 to weight that end; and from the
 40 faces of the heads 51, thus at diametrically-opposite points on the disk, project rigid circular and tapering metal studs 52 embracing the beveled periphery of the friction-wheel.

45 On a stub-shaft 53 journaled in a bearing on the plate 8 is fastened a worm-pinion 54, engaging the worm 49. The shaft 53 has loosely mounted upon it a toothed electrical contact-wheel 55 (Fig. 6) provided on its
 50 face with a similar toothed wheel 56 of insulating material (as vulcanized fiber), the teeth of which register with the metal teeth but project beyond the rear edges of the latter, as represented. A toothed contact-wheel 57, like the metal wheel 55, is secured
 55 to mesh with the latter on one end of the contact-roller 16. These toothed wheels are included with the motor, the cam-finger 44 and the contact-finger 45, in an electric circuit shown diagrammatically in Fig. 7 and
 60 which may be traced as follows: On the line w^2 through the motor to wire w^1 connected to the finger 44 and wheel 57, and on line w^3 , connected with the wheel 55 and the
 65 contact-finger 45. Thus, as will be seen,

whenever two adjacent metallic teeth of the wheels 55 and 57 become separated, or a tooth of the wheel 57 comes into contact with a tooth of the facing 56, the motor-circuit is opened. 70

The operation is as follows: With the motor in operation and the parts in the relative positions represented by the full lines in Figs. 2, 3 and 4, the music-sheet is caused to travel by unwinding it from the upper roll 75 and winding it upon the lower roll. To produce this movement of the sheet, the worm 29 drives the shaft 31 and, with the clutch 36 engaging the pinion 37, also drives the take-up roller 14; and as the brushes 80 bear upon the contact-roller through the perforations in the sheet, the playing of the instrument ensues, as usual. To render the feed of the music-sheet uniform, notwithstanding variations in the speed of the motor 85 under the usual or any extraordinary variations in the current-supply thereto, or from any other cause, the friction-drive, consisting of the wheel 48 and governor 50, which is joined to the worm 49, rotates the latter at 90 uniform speed, since any increase in the speed of the motor will expand the arms 50¹ of the governor 50 to lighten, by the centrifugal action of the governor arms, the contact of its studs 52 with the wheel 48, 95 thereby avoiding transmission of the increased motor-speed to the worm 49, so that the latter, by its engagement with the pinion 54, will continue to turn the toothed wheel 55 at the uniform speed. As will be understood the light contact of the studs with the wheel 48 reduces the frictional engagement between the contacting surfaces and permits the wheel-surface to slip sufficiently against the stud-surfaces to avoid imparting to the 105 latter the increased speed of the wheel. The governor-arms are so adjusted that the studs 52 engage very lightly with the wheel 48 during most of the time, so that the number of rotations per minute of the governor 110 50 is, say, only one-tenth that of the wheel 48; therefore the toothed wheel 55 will always be driven up to the standard speed which it cannot exceed. However, since the contact-roller is driven by frictional contact with it of the music-sheet, the instant that the increased motor-speed is transmitted, through the shaft 31 and gears 37, 38 to the take-up roll, the resultantly-increased sheet-motion will increase the speed of rotation of 120 the contact-roller, which carries the toothed wheel 57 and separate the tooth of the wheel 57 from the adjacent tooth of the wheel 55, thereby opening the motor-circuit and slackening the speed of the motor, causing it to be 125 driven, for the moment, by the inertia of its armature until the tooth of the wheel 55 catches up to and again engages that of the wheel 57 to close the motor-circuit and thus continue its driving action. As will there- 130

fore be seen, with each increase in the speed of the motor, the circuit is broken until the wheel 55 again closes it. Should the increase in speed of the motor ever become greatly excessive, the contact-roller and toothed wheel 57 upon it will momentarily turn so fast as to quickly bring a tooth of that wheel into engagement with an adjacent projecting tooth of insulating material on the facing 56, thereby opening the motor-circuit until a tooth on the wheel 55 shall catch up to and contact with one on the wheel 57. This will be understood from the foregoing explanation of the cause for the uniform speed of the wheel 55 notwithstanding the increased speed of the motor, so that when the motor-circuit is thus opened the resultant reduced speed of the motor, then running under inertia, does not vary the speed of the shaft 53 and wheel 55, but does reduce the speed of the roller 14 and therefore that of the contact-roller 16 and wheel 57 thereon, whereby a tooth on the wheel 55 will catch up in the manner stated. The described breaking and making of the circuit-closing contacts through the medium of the toothed wheels is so momentary as not to appreciably affect the uniformity of travel of the music-sheet. The action of the governor-device, moreover, obviously tends to maintain uniformity in the travel of the music-sheet, notwithstanding the constant changing of the diameters of the two rolls by winding from one upon the other.

Preparatory to re-winding the music-sheet from the lower roll upon the upper one, the contact-roller is pulled downwardly at the handle 26, thereby correspondingly turning the rock-shaft 18 and taking the finger 42 out of the path of the stud 43. By thus lowering the contact-roller the toothed wheel 57 is withdrawn from engagement with the companion-wheel 55 and the motor-circuit is opened, but only momentarily, to be again closed, since the turning of the rock-shaft turns its finger 42¹ against the cam-end 44 of the lever 39 to move it against the contact-arm 45 and thus close the motor-circuit; and the lever 39 furthermore ships the clutch into engagement with the pulley 33, whereby the motor, by rotating the shaft 31, drives the upper roller 11 to rewind upon it the music-sheet from the lower roller. The further result ensues, in turning the rock-shaft to lower the contact-roller, of forcing the guide-roller 23 forwardly against the back of the music-sheet in its bearing-slots 24 to the dotted position in Fig. 3, to remove the sheet from its normal proximity to the contact-brushes, which would otherwise tend to tear it by engaging with its perforations, this result being produced by the engagement with the guide-roller, to so push it forward, of the cam-like edges of the arms 17 in their downward turning.

What I claim as new and desire to secure by Letters Patent is—

1. In an electric music-sheet feeding-device, the combination of a motor-circuit, a motor therein, a music-sheet take-up roller, driving-connections between the motor and roller, a contact-roller in the path of the music-sheet to be frictionally rotated thereby, and a pair of cooperating circuit opening and closing contact-devices included in said circuit, one member of said pair being carried by the contact-roller for the purpose set forth.

2. In an electric music-sheet feeding-device, the combination of a motor-circuit, a motor therein, a music-sheet take-up roller, driving-connections between the motor and roller, a contact-roller supported in the path of the music-sheet to be frictionally rotated thereby, and intermeshing circuit-opening-and-closing toothed contact-wheels in said circuit, one being on the contact-roller, for the purpose set forth.

3. In an electric music-sheet feeding-device, the combination of a motor-circuit, a motor therein, a music-sheet take-up roller, driving-connections between the motor and roller, a contact-roller supported in the path of the music-sheet to be frictionally rotated thereby, and a pair of intermeshing circuit-opening-and-closing toothed contact-wheels in said circuit, one being on the contact-roller and one carrying insulating material projecting beyond its teeth, for the purpose set forth.

4. In an electric music-sheet feeding-device, the combination of a motor-circuit, a motor therein, a music-sheet take-up roller, driving-connections between the motor and roller, a contact-roller supported in the path of the music-sheet to be rotated thereby, and a pair of intermeshing circuit-opening-and-closing toothed contact-wheels in said circuit, one being on the contact-roller, and a toothed facing of insulating material on the other contact-wheel having its teeth registering with and projecting beyond the adjacent edges of the wheel-teeth, for the purpose set forth.

5. In an electric music-sheet feeding-device, the combination of a frame, a motor-circuit, a motor in said circuit, driving-connections between the motor and one of said rollers, a contact-roller journaled in the frame to extend in the path of the music-sheet and be frictionally rotated thereby, and a pair of rotary cooperating circuit-opening-and-closing contact-devices included in said circuit, one member of said pair being on the contact-roller, for the purpose set forth.

6. In an electric music-sheet feeding-device, the combination of a frame, a motor-circuit, a motor in said circuit, music-sheet pay-out and take-up rollers supported on

the frame, driving connections between the motor and one of said rollers, a contact-roller supported on the frame to extend normally and withdrawably in the path of the music-sheet and be frictionally rotated thereby, and a pair of intermeshing circuit opening-and-closing toothed contact-wheels in said circuit, one member of the pair being on the contact-roller and the other member journaled on the frame, for the purpose set forth.

7. In an electric music-sheet feeding-device, the combination of a frame, a motor-circuit, a motor in said circuit, music-sheet pay-out and take-up rollers supported on the frame, driving-connections between the motor and one of said rollers, a clutch for controlling said connections, a contact-roller supported on the frame to extend normally and withdrawably in the path of the music-sheet and be frictionally rotated thereby, a pair of intermeshing circuit-opening-and-closing toothed contact wheels in said circuit, one member of the pair being on the contact-roller and the other member journaled on the frame, and clutch-shipping connections actuated by withdrawing the contact-roller, for the purpose set forth.

8. In an electric music-sheet feeding-device, the combination of a frame, a motor-circuit, a motor in said circuit, music-sheet pay-out and take-up rollers supported on the frame, driving-connections between the motor and one of said rollers, a clutch for controlling said connections, a spring-controlled rock-shaft supported on the frame, arms extending from the rock-shaft, a contact-roller journaled in said arms to extend into the path of the music-sheet and be frictionally driven thereby, a pair of circuit-opening-and-closing toothed contact-wheels in said circuit, one member of the pair being on the contact-roller and the other member journaled on the frame, and a circuit-closing device on the frame with connections actuated to close the circuit by shipping the clutch in one direction, for the purpose set forth.

9. In an electric music-sheet feeding-device, the combination of a frame, a motor-circuit, a motor in said circuit, music-sheet pay-out and take-up rollers supported on the frame and geared together, driving-connections between the motor and one of said rollers, a clutch for controlling said connections, a spring-controlled rock-shaft supported on the frame, arms extending from the rock-shaft, a spring-pressed clutch-actuating lever fulcrumed on the frame, a circuit-closing contact-spring to cooperate with said lever, a finger extending from the rock-shaft to encounter said lever and move it against said contact-spring in turning the lever to ship the clutch, a contact-roller journaled in said arms to extend into the path

of the music-sheet and be frictionally driven thereby, and a pair of circuit opening and closing toothed contact-wheels in said circuit, one member of the pair being on the contact-roller and the other member journaled on the frame, for the purpose set forth.

10. In an electric music-sheet feeding-device, the combination of a frame, a motor-circuit, a motor in said circuit, music-sheet pay-out and take-up rollers supported on the frame, driving-connections between the motor and rollers, a spring-controlled rock-shaft supported on the frame, arms extending from the rock-shaft, a contact-roller journaled in said arms to extend normally in the path of the music-sheet and be frictionally driven thereby, a guide-roller shiftably journaled in the frame and engaged by said arms to bear outwardly against the music-sheet, and a pair of intermeshing circuit opening-and-closing toothed contact-wheels in said circuit, one member of the pair being on the contact-roller and the other member journaled on the frame, for the purpose set forth.

11. In an electric music-sheet feeding-device, the combination of a motor-circuit, a motor therein, a music-sheet take-up roller, driving-connections between the motor and said roller, a friction-drive on the motor-shaft, a governor-device actuated by the friction-drive, a contact-roller supported in the path of the music-sheet to be frictionally driven thereby during its winding upon said take-up roller, a toothed contact-wheel on the contact-roller, and a toothed contact-wheel meshing with said first-named contact-wheel and geared to said friction-drive, said contact-wheels being included in the motor-circuit, for the purpose set forth.

12. In an electric music-sheet feeding-device, the combination of a motor-circuit, a motor therein, a music-sheet take-up roller, driving-connections between the motor and said roller, a friction-drive comprising a friction-disk on the motor-shaft and a governor-head having resilient centrifugally-acting arms with studs projecting from them to embrace said disk, a contact-roller supported in the path of the music-sheet to be frictionally driven thereby during its winding upon said take-up roller, a toothed contact-wheel on the contact-roller, and a toothed contact-wheel meshing with said first-named contact-wheel and geared to the governor-head, said contact-wheels being included in the motor-circuit, for the purpose set forth.

13. In an electric music-sheet feeding-device, the combination of a motor-circuit, a motor therein having a worm-shaft, a friction-wheel on said shaft, a music-sheet take-up roller, driving connections between said roller and shaft, a worm alining with said motor-shaft, a governor-head connected with

the worm having resilient arms provided with fingers embracingly engaging said friction-disk, a toothed contact-wheel having a driven connection with said worm, a
5 contact-roller supported in the path of the music-sheet to be frictionally driven thereby, and a toothed contact-wheel on the contact-roller meshing with the first-named contact-wheel and included therewith in said circuit,
10 for the purpose set forth.

14. In an electric music-sheet feeding-device, the combination of a frame, a motor-circuit, a motor in said circuit having a worm-shaft, a friction-wheel on said shaft,
15 a music-sheet take-up roller, driving-connections between said roller and shaft, a worm-shaft alining with said motor-shaft, a metal

disk united to said worm-shaft having resilient arms weighted on their free ends, with metal fingers extending from them to
20 embrace said wheel, a toothed contact-wheel journaled on the frame and having a driven connection with said second worm-shaft, a contact-roller supported in the path of the music-sheet to be frictionally driven there-
25 by during its winding upon said take-up roller, and a toothed contact-wheel on the the contact-roller meshing with the first-named contact-wheel and included therewith in said circuit, for the purpose set forth.

HENRY K. SANDELL.

In presence of—

R. A. RAYMOND,

R. A. SCHAEFER.

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."
