No. 767,235. PATENTED AUG. 9, 1904.

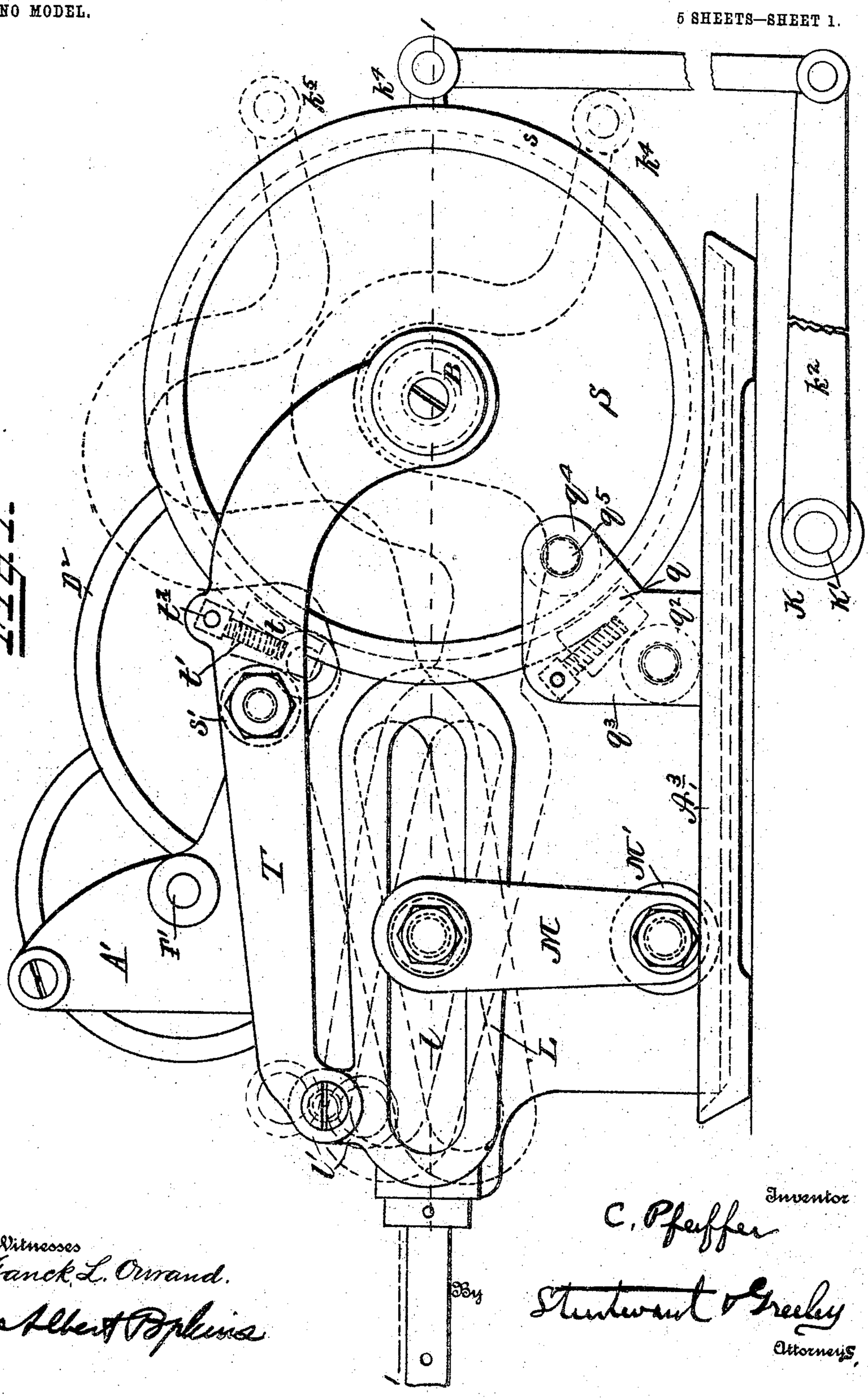
C. PFEIFFER.

SPRING MOTOR.

APPLICATION FILED FEB. 19, 1904.

NO MODEL. 5 SHEETS—SHEET 1.

FIG. 1.



Witnesses
Franck L. Orrand.
Albert Phelps

Inventor
C. Pfeiffer
Stinchcomb & Greeley
Attorneys.

No. 767,235. PATENTED AUG. 9, 1904.

C. PFEIFFER.

SPRING MOTOR.

APPLICATION FILED FEB. 19, 1904.

NO MODEL. 5 SHEETS—SHEET 2.

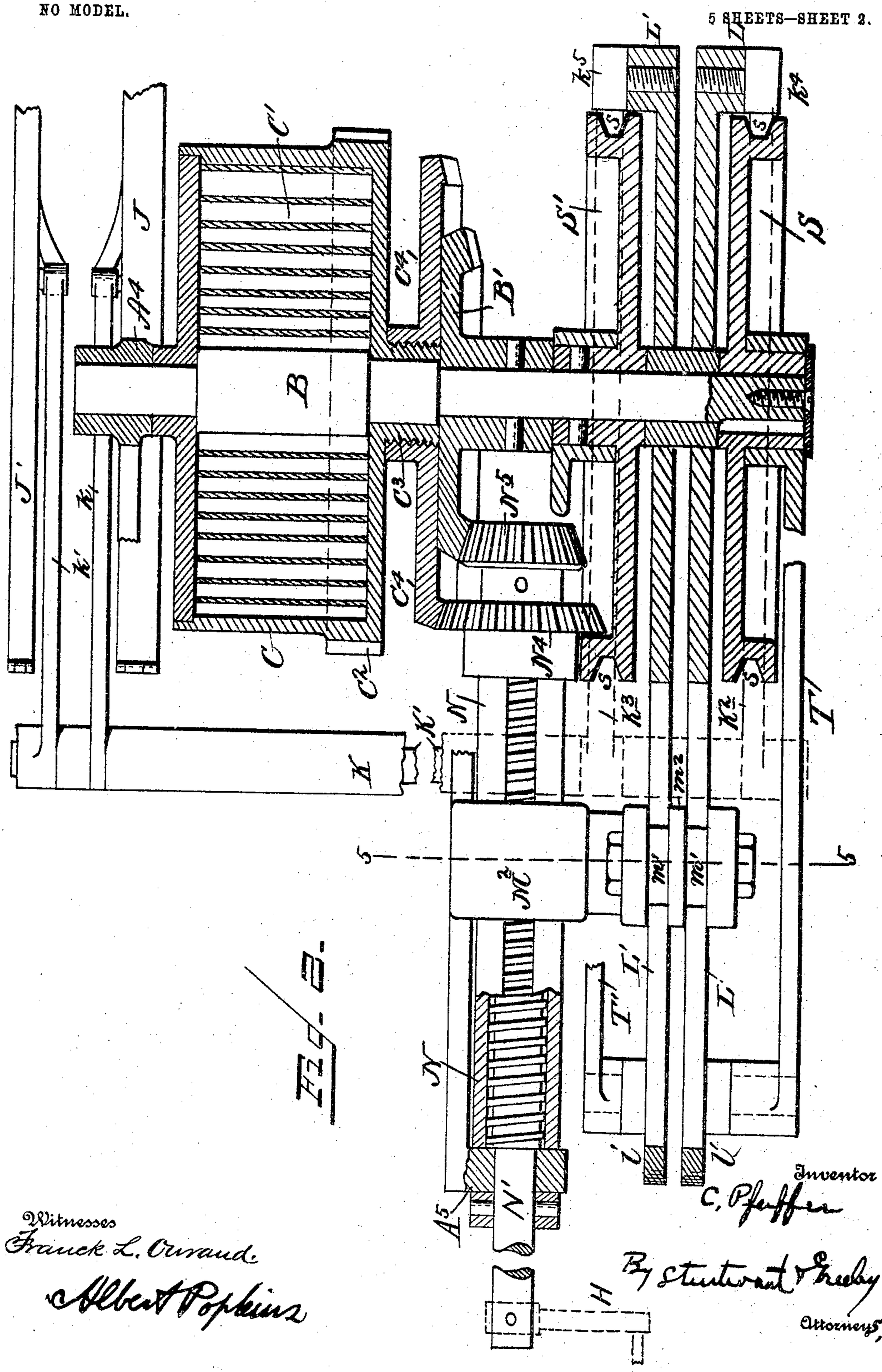


Fig. 2.

Witnesses
Franck L. Orraud.
Albert Popkins

Inventor
C. Pfeiffer

By Stuttevant & Freeby
Attorneys.

No. 767,235. PATENTED AUG. 9, 1904.

C. PFEIFFER.

SPRING MOTOR.

APPLICATION FILED FEB. 19, 1904.

NO MODEL. 5 SHEETS—SHEET 3.

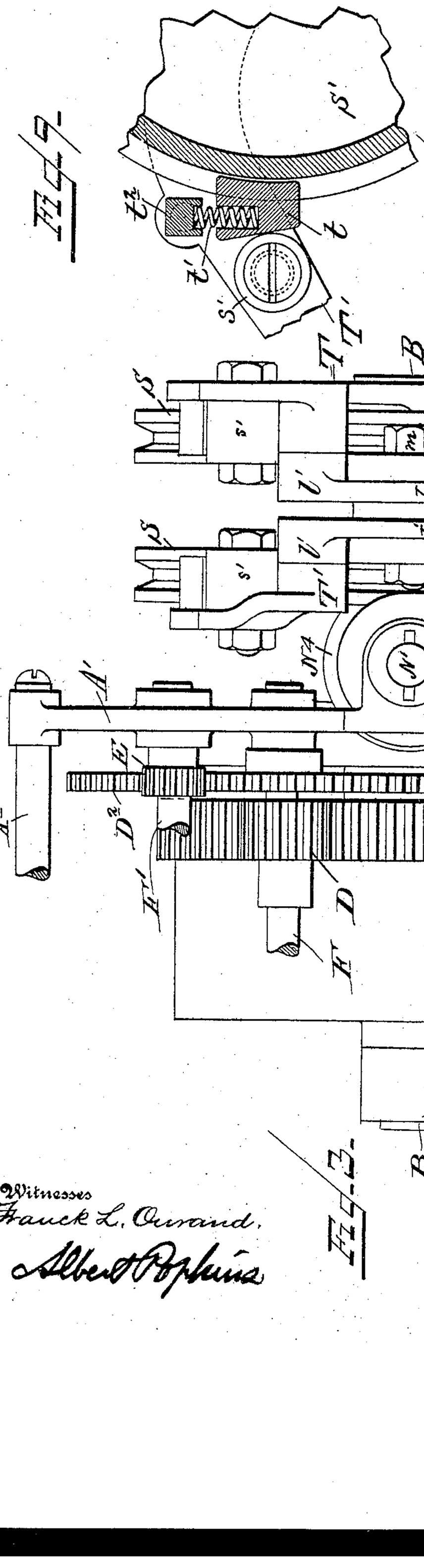


Fig. 2.

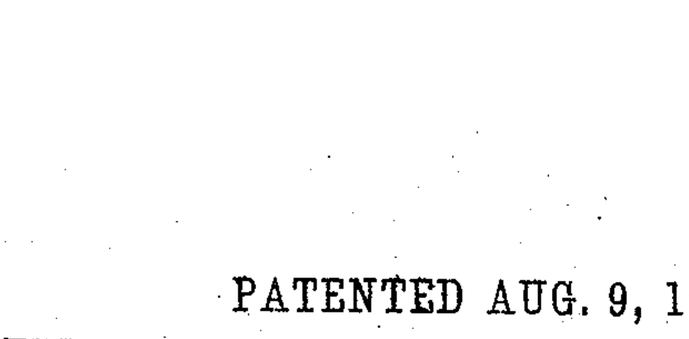


Fig. 3.

Witnesses
Hauck L. Durand.
Albert Popkins

Inventor
C. Pfeiffer

By Stuttevant & Greeley
Attorneys.

No. 767,235. PATENTED AUG. 9, 1904.

C. PFEIFFER.

SPRING MOTOR.

APPLICATION FILED FEB. 19, 1904.

NO MODEL. 5 SHEETS—SHEET 4.

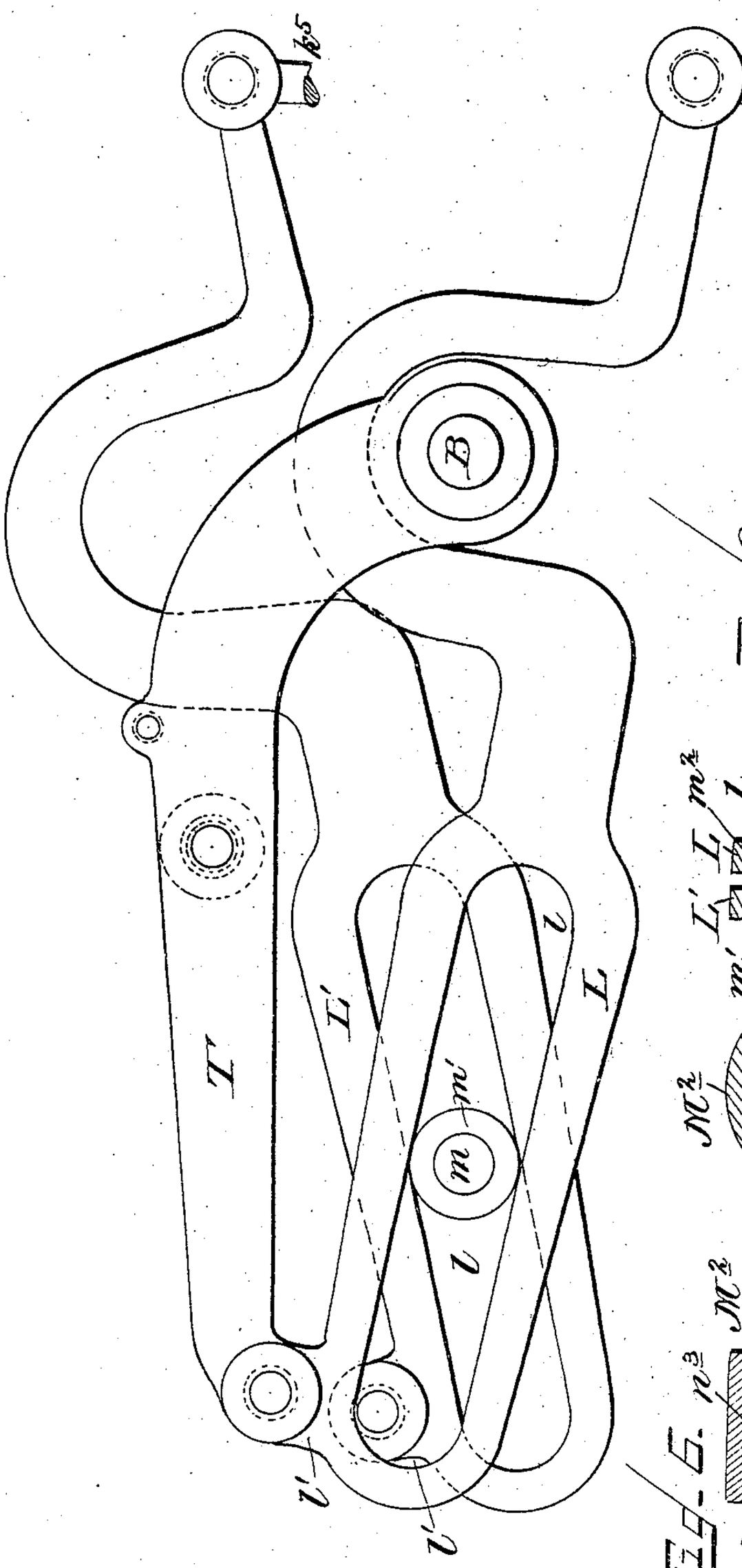


Fig. 8.

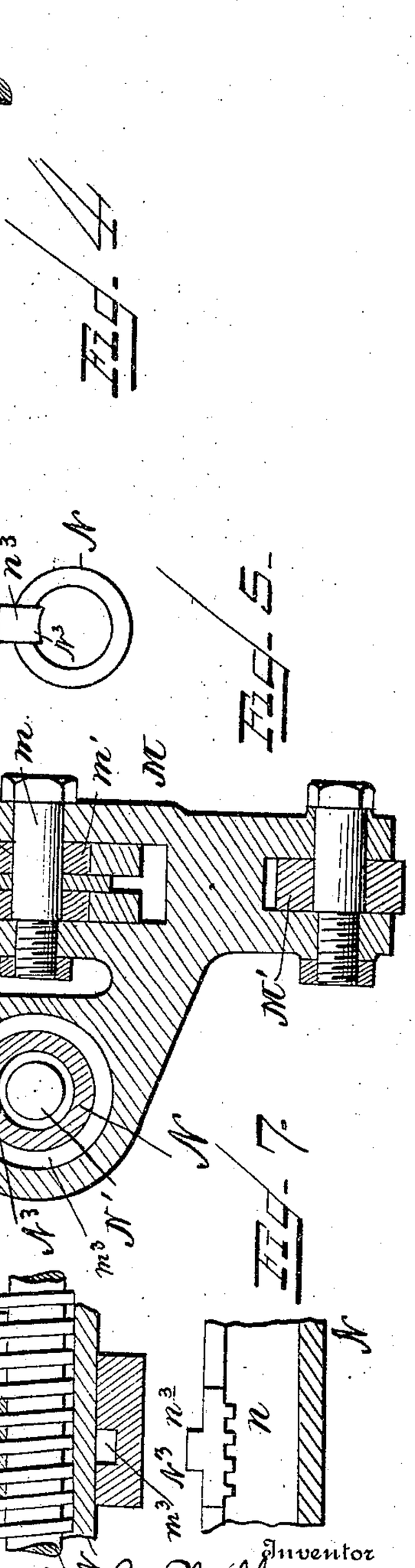


Fig. 4.

Fig. 7.

Fig. 6.

Fig. 5.

Witnesses
Franck L. Orsand
Albert Popkins

Inventor
C. Pfeiffer

By Shumway & Bruley
Attorneys.

No. 767,235. PATENTED AUG. 9, 1904.

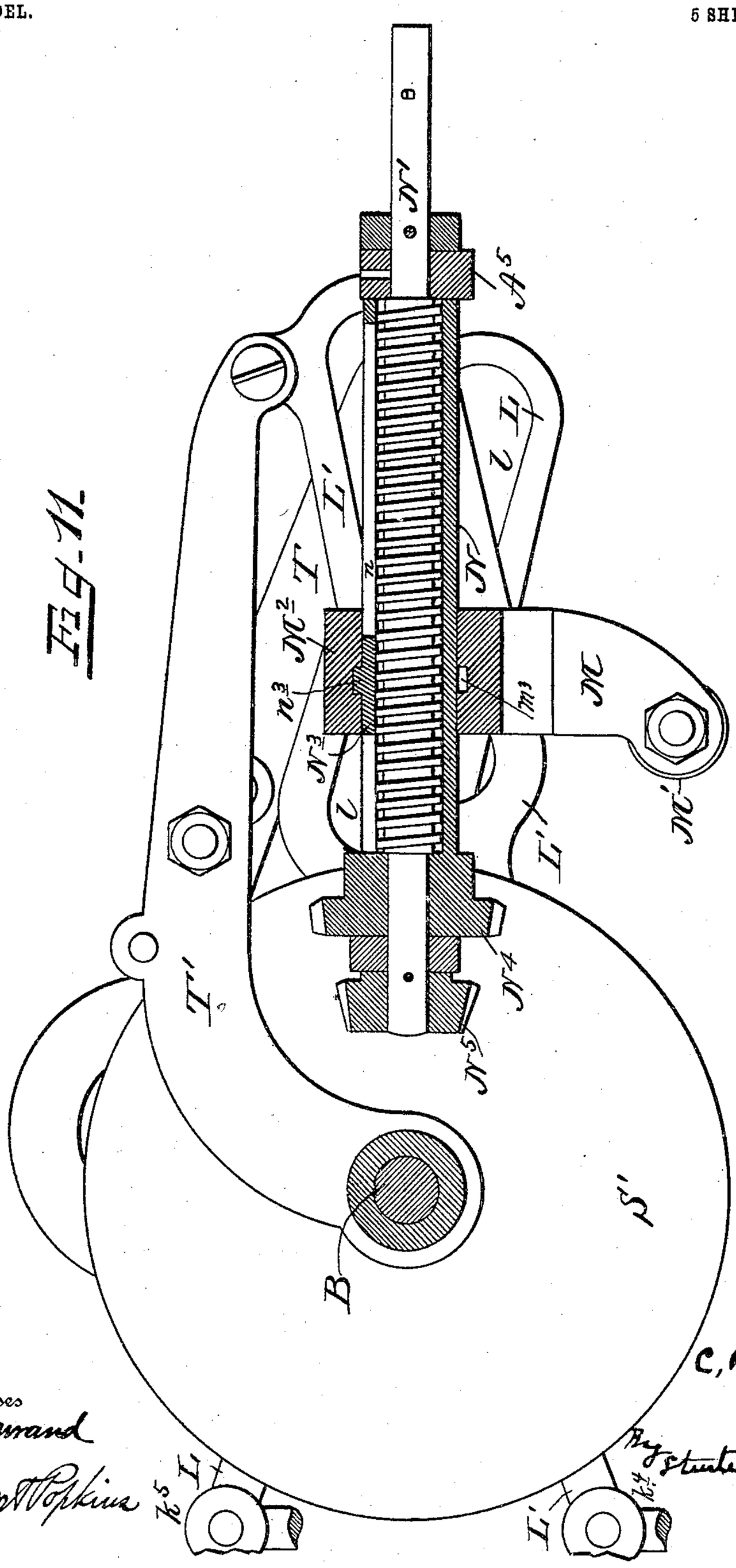
C. PFEIFFER.

SPRING MOTOR.

APPLICATION FILED FEB. 19, 1904.

NO MODEL. 5 SHEETS—SHEET 5.

FIG. 11.



Witnesses
F. L. Ourand
Albert Popkins

Inventor
C. Pfeiffer
By Stuntevant & Stanley
Attorneys.

No. 767,235. Patented August 9, 1904.

UNITED STATES PATENT OFFICE.

CHRISTIAN PFEIFFER, OF NEW BRITAIN, CONNECTICUT, ASSIGNOR TO NEW BRITAIN HARDWARE MANUFACTURING COMPANY, OF NEW BRITAIN, CONNECTICUT, A CORPORATION OF CONNECTICUT.

SPRING-MOTOR.

SPECIFICATION forming part of Letters Patent No. 767,235, dated August 9, 1904.

Application filed February 19, 1904. Serial No. 194,393. (No model.)

To all whom it may concern:

Be it known that I, CHRISTIAN PFEIFFER, a citizen of the United States, residing at New Britain, in the county of Hartford, State of Connecticut, have invented certain new and useful Improvements in Spring-Motors, of which the following is a description, reference being had to the accompanying drawings, and to the letters of reference marked thereon.

My invention relates to the class of motors shown in my application, Serial No. 181,701, filed November 18, 1903.

The object of this invention is to simplify the former construction and render it more compact and less expensive without in any way impairing its efficiency. This object I accomplish by the construction shown in the accompanying drawings, in which—

Figure 1 is a side elevation of the motor with my improvements applied. Fig. 2 is a horizontal section on the line 1 1, Fig. 1, the dotted lines showing the positions the levers assume in operation. Fig. 3 is a rear end elevation, the base-plate being in section. Fig. 4 is an enlarged side elevation of a portion of the winding mechanism. Fig. 5 is a transverse section on the line 5 5, Fig. 2; and Figs. 6, 7, and 8 are detail views of the traveling fulcrum. Figs. 9 and 10 are detail sectional views of the brake mechanism. Fig. 11 is a sectional side elevation line 11 11, Fig. 2, with bevel-gears B′ C^4 omitted for clearness.

A designates the framework, formed of parallel plates A′ A^2, base-plate A^3, brackets A^4 A^5, and cross-bar A^6.

B designates the winding-shaft of the motor, on which is loosely mounted a spring-drum C, connected to the shaft by means of the usual spring C′, as is commonly done in spring-motors.

The drum C is provided with a circumferential transmission-gear C^2, which in turn meshes with a small pinion D on a transmission-shaft F, parallel with shaft B. The shaft F is provided with a large gear D^2, which in turn meshes with a small gear E on a second shaft F′, which is the transmission-shaft for operating the music-rerolling shaft of a piano-player or like mechanism through wheels F^2 F^3, Fig. 1. As this rerolling-gearing forms no part of the present improvement and is fully shown and described in my other application, I will not further describe it nor the governor controlling the motor.

The foregoing mechanism being the same as that in my former application I will now describe the mechanism for winding the motor from the bellows-pedals. The motor-shaft B is extended considerably beyond one end of the drum C, which latter is provided with a threaded hub C^3, upon which is screwed and fixedly held a beveled gear C^4, while upon the shaft B alongside the gear C^4 is fixedly held a smaller beveled gear B′. Beyond these gears the shaft B carries two winding-wheels S S′, given a step-by-step rotation by means of the vertically-rocking clutch-levers T T′. These levers are loosely mounted at one end on the shaft B, at the opposite sides of the wheels S S′, and at their rear free ends l' are pivoted to the rear ends of the vertically-rocking operating-levers L L′, which levers L L′ are provided with longitudinal fulcrum-slots l and extend forwardly across the shaft B, at which point they are arched or recessed, as shown in Fig. 4. The forward ends of these operating-levers L L′ are connected by vertical links k^4 k^5 with the arms k^2 k^3, projecting from the shafts K K′, respectively. The opposite ends of these shafts are provided with arms k k', connected with the bellows-pedals J J′, as in my other application.

The clutch-levers T T′ are provided with beveled friction-blocks t, secured thereto by springs t' and studs t^2. These blocks engage the beveled grooves s in the peripheries of the clutch-wheels S S′, and rollers s' are secured to the levers T T′ to engage the outer inclined sides of the blocks t and force them into clutching action with the drive pulleys or wheels S S′ in the upward movement of clutch-levers T T′.

Reverse movement of the winding-wheels and shaft B is prevented by means of a wedge-

block q similar to the blocks t and held between the grooved rim of one wheel S and a roller q^2, mounted on a bracket q^3. On the bracket q^3 is mounted a second roller q^4 on a stud q^5, which roller engages the inner periphery of the rim of the wheel S. In the upward or forward rotation of the wheel S the block q rises and exerts no wedging action, but the instant the wheel starts to rotate in the reverse direction the block wedges tightly between the rim of the wheel and the roller and so locks the wheel and with it the shaft B. The roller q^4, in connection with block q, forms a double clutch during such backward rotation, and the axis of roller q^4 being in line with that of roller q^2 and shaft B it follows that any tendency of the wedge-block q to force the wheel S and shaft B away from roller q^2 will be prevented by the roll q^4.

The rocking of the levers L L′ through the medium of the intermittent clutch mechanism imparts rotary motion to the winding-shaft B to wind up the spring C, and in order that the winding of the spring may equal the unwinding and so keep the spring wound I provide the following equalizing or controlling mechanism for the lever mechanism:

M is a traveling fulcrum-piece having a roller M′ on its lower end running on the baseplate of the frame, and this fulcrum-piece is slotted at its upper end and there provided with a fulcrum pin or bolt m, which passes through the slots l of levers L L′ and is there provided with rollers m' m' and a spacing-washer m^2. The fulcrum-piece M is provided with an offset sleeve M^2, and this sleeve has an annular internal groove m^3, receiving a projection n^3 of a nut-segment N^3, which nut lies within a longitudinal slot n, formed in a tubular shaft N, mounted at right angles to the shaft B and passing through the sleeve M^2. This tubular shaft is provided with a bevel-gear N^4, meshing with the bevel-gear C^4 on the drum C, while within the tubular shaft works the screw-shaft N′, mounted at its ends in the brackets A^5 and also provided with a bevel-gear N^5, meshing with the bevel-gear B′ on the shaft B, the threads of the shaft N′ engaging the threads on said nut N^3. It follows from this construction that when the tubular shaft N is rotated by gear C^4 in the unwinding of the spring the nut N^3 will be carried around the screw-shaft N′ and so slide the fulcrum-piece M in one direction, and when the screw-shaft N′ is rotated from gear B′ on drum-shaft B the nut N^3 will be moved longitudinally along the slot n and so move the fulcrum-piece in the opposite direction. The shaft N′ is further provided with a handle H (see Fig. 2) to provide for hand-winding under certain conditions.

From the foregoing it will be seen that the winding and unwinding of the motor-spring are equalized or controlled by the shifting fulcrum mechanism, so as to maintain a constant tension on the spring. If desired, however, the winding may exceed the unwinding and the accumulated energy used to run the motor for a while without further winding. As stated in my former application, this stored energy is used to reroll the music-sheet when the pedals are not in use, and the motor does not have to be rewound by hand to effect such rerolling. The said traveling fulcrum will prevent overwinding and can be made to maintain any desired ratio between the winding and unwinding of the spring and between the speed of the motor and the movement of the pedals, as the leverage of levers L L′ is varied in direct proportion to the winding of the spring through the controlling mechanism, as above described. When the spring C is fully wound, the traveling fulcrum-piece M will have been shifted rearwardly till the fulcrum-pin m is in a vertical alinement with the pivots l, when the levers L L′ will no longer transmit motion to the clutch arms or levers T T′ and wheels S S.′ As the spring unwinds the opposite movement of the fulcrum takes place.

The relative sizes of the gears and pinions and the pitch of the thread of screw N are such that the number of revolutions necessary to wind the spring are just sufficient to move the nut and saddle from end to end of the lever-slots, so that if the spring is wound either by the pedals J J′ or by hand, by means of a handle h placed on shaft N, when the saddle is at the front end of the slot, adjacent to the connections l, the fulcrum-stud of the rocking levers L L′ being directly opposite the connections, the vibratory movement of the levers ceases at the clutch end, but continues the same at the free rearward ends, and so long as the parts are in this position the winder is inoperative; but when the motor is started the drum C turns the bevel-gear C^4 the bevel-pinion N^4, the tubular slotted shaft N, and nut N^3, the latter drawing the saddle rearwardly along the levers L L′, so that if the pedals are again operated the levers will again begin to move in proportion to the distance their fulcrums have moved.

If the movement of the pedals and winding-gears is slower than the transmitting-gear, the nut and saddle will continue to move rearwardly, thus increasing the throw of the levers and amount of rotation of the wheels S, and in like proportion the amount of winding of the motor-spring, until the point is reached where the winding and transmitting gears revolve at the same speed, when the motor can be run continuously by maintaining the same movement of the pedals, in which case the saddle will remain at a position where the movement of the pedals and the winding will equal the transmitting, and if the work being done or the music being played require a variable speed the saddle will adjust itself automatically by increasing or decreasing the

winding speed in the same proportion as the speed of the motor is changed, or if the movement of the pedals is not uniform, as in music where the volume of sound requires more or less power and motion of the pedals, the amount of winding is in proportion to the motor speed, being kept so by the automatic change of leverage. This equalizing of the winding and unwinding makes it unnecessary to have the spring fully wound, as the motor can be run with the spring at the least tension that is sufficient to do the work, as the automatic winding does not allow the spring to run down.

In a piano-player the music-sheet has to be rerolled after playing, so the equalizer may be made to wind faster than the transmitting-gear unwinds, so as to have enough spring to reroll and leave the spring at normal playing tension at the end, the transmitting-gear being so arranged that the rerolling only requires one-fourth as much movement at the spring as the playing movement.

It will be understood that I do not restrict myself to the particular construction shown and described, nor do I confine myself to the use of the motor with any particular instrument or apparatus.

It will be seen that by mounting the clutch-wheels L L′ directly on shaft B and by having the gears N^4 N^5 mesh directly with the gears C^4 B′, I have lessened the number of parts without sacrificing any function and, in fact, have rendered the operation more certain in that the parts are more directly connected.

Having thus described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. The combination with a motor having a bevel-gear, a shaft for winding the motor, also having a bevel-gear, and a lever mechanism for rotating said shaft, of a slotted tubular shaft having a bevel-gear meshing with the gear on the motor, a screw-shaft extending through the tubular shaft, and having a bevel-gear meshing with the gear on the winding-shaft, a traveling fulcrum for the lever mechanism provided with a sleeve encircling the tubular shaft, and having an internal annular groove, and a nut extending through the slot in the tubular shaft into engagement with the threaded shaft, and having a projection entering said annular groove; substantially as described.

2. The combination with a motor having a bevel-gear, a shaft for winding the motor also having a bevel-gear, and an intermittent clutch mechanism also on the shaft for rotating it to wind the motor, of levers for operating said clutch mechanism, a traveling fulcrum-piece for said levers, two shafts having bevel-gears at the same ends meshing respectively with the bevel-gears on the motor and winding-shaft, a traveling fulcrum for the levers and operative connections between said fulcrum-piece and said two shafts for moving the fulcrum-piece in opposite directions on the winding and unwinding of the motor; substantially as described.

3. The combination with a motor having a bevel-gear, a winding-shaft for the motor also having a bevel-gear, clutch-wheels on the motor-shaft, clutch levers or arms having clutches engaging said wheels to rotate them, and operating-levers connected to said clutch levers or arms, of a traveling fulcrum-piece for said operating-levers, provided with a sleeve having an internal annular groove, a slotted tubular shaft extending through said sleeve, and provided with a bevel-gear meshing with the corresponding gear on the motor, an inner threaded shaft having a bevel-gear meshing with corresponding gear on the winding-shaft, and a nut extending through the slot in the tubular shaft into engagement with the threaded shaft, and provided with a projection entering the said annular groove; substantially as described.

4. The combination with a motor having a bevel-gear, a winding-shaft for the motor having a bevel-gear, and also provided with clutch-wheels beyond said bevel-gears, rearwardly-extending clutch levers or arms loose on the winding-shaft, clutches on the levers to engage the clutch-wheels, longitudinally-slotted operating-levers pivoted at their rear ends to the rear ends of the clutch-levers, a traveling fulcrum-piece having a fulcrum-pin passing through the lever-slots, and provided at one side with an offset sleeve having an internal annular groove, a tubular shaft extending through said sleeve, and provided with a longitudinal slot, a bevel-gear on the forward end of said shaft meshing with the bevel-gear on the motor, an inner screw-shaft having a bevel-gear at its forward end, meshing with the bevel-gear on the winding-shaft, and a nut extending through the slot in the tubular shaft, and having a projection entering the groove in the sleeve; substantially as described.

5. The combination with the motor, a winding-shaft therefor, and rearwardly-extending clutch-wheels on the motor-shaft, of clutch-arms loose on the shaft, and provided between their ends with clutches engaging said wheels in one direction, operating-levers fulcrumed between their ends, and pivoted at their rear ends to the rear ends of the clutch-levers at their forward ends, and means for rocking said operating-levers; substantially as described.

6. The combination with the motor and its winding-shaft, of clutch-wheels on the motor-shaft, clutch-levers loose on said shaft, clutch-blocks, springs connecting the blocks to the levers, rollers on the levers with which the outer inclined sides of the blocks engage, operating-levers fulcrumed between their ends and pivoted at their rear ends to said clutch-

levers, and means for rocking said operating-levers; substantially as described.

7. The combination with the motor and its winding-shaft, of clutch-wheels on the shaft, and clutch-levers for rotating the wheels, and a bracket adjacent to one of said wheels and provided with a clutch-block engaging the periphery of the rim of one wheel to prevent reverse rotation, a roller on the bracket with which the outer face of the clutch-block engages, and a second roller on the bracket engaging the inner side of the wheel-rim opposite the working face of the clutch-block; substantially as described.

8. The combination with the motor and its winding-shaft, of an intermittent grip or clutch mechanism on the said shaft for rotating it, operating-levers for said grip mechanism, a traveling fulcrum for said levers, concentric shafts geared to the fulcrum to move it in opposite directions, the forward ends of the shafts being directly geared to the motor and winding-shaft respectively; substantially as described.

9. The combination with the motor and its winding-shaft, of an intermittent grip or clutch mechanism on said shaft for rotating it, operating-levers for said clutch or grip mechanism, a traveling fulcrum for said levers, concentric shafts geared directly at their inner ends to the motor and its shaft respectively, and a screw and nut connection between the shafts and traveling fulcrum, the inner shaft being extended at its rear end to receive an operating-handle; substantially as described.

10. The combination with the motor and its winding-shaft, of an intermittent clutch or grip mechanism on the shaft, including clutch-levers, longitudinally-slotted levers pivoted at their rear ends to the rear ends of said clutch-levers, an adjustable fulcrum having a fulcrum pin or stud in the lever-slots, and means for operating the slotted levers; substantially as described.

11. The combination with a motor, a winding-shaft therefor, and a lever mechanism for rotating said shaft to wind it, of a traveling fulcrum-piece having a roller at its lower end, a fulcrum at its upper end in sliding connection with the levers, and an offset sleeve to one side of the said fulcrum provided with an internal annular groove, a longitudinally-slotted tubular shaft extending through said sleeve and geared at its forward end directly to the motor, an inner screw-shaft geared at its inner end directly to the winding-shaft, and a nut extending through the slot in the tubular shaft into engagement with the threaded shaft, and provided with a projection entering the said annular groove; substantially as described.

In testimony whereof I affix my signature in presence of two witnesses.

CHRISTIAN PFEIFFER.

Witnesses:

JAMES S. NORTH,

JOHN H. KIRKHAM.