

(No Model.)

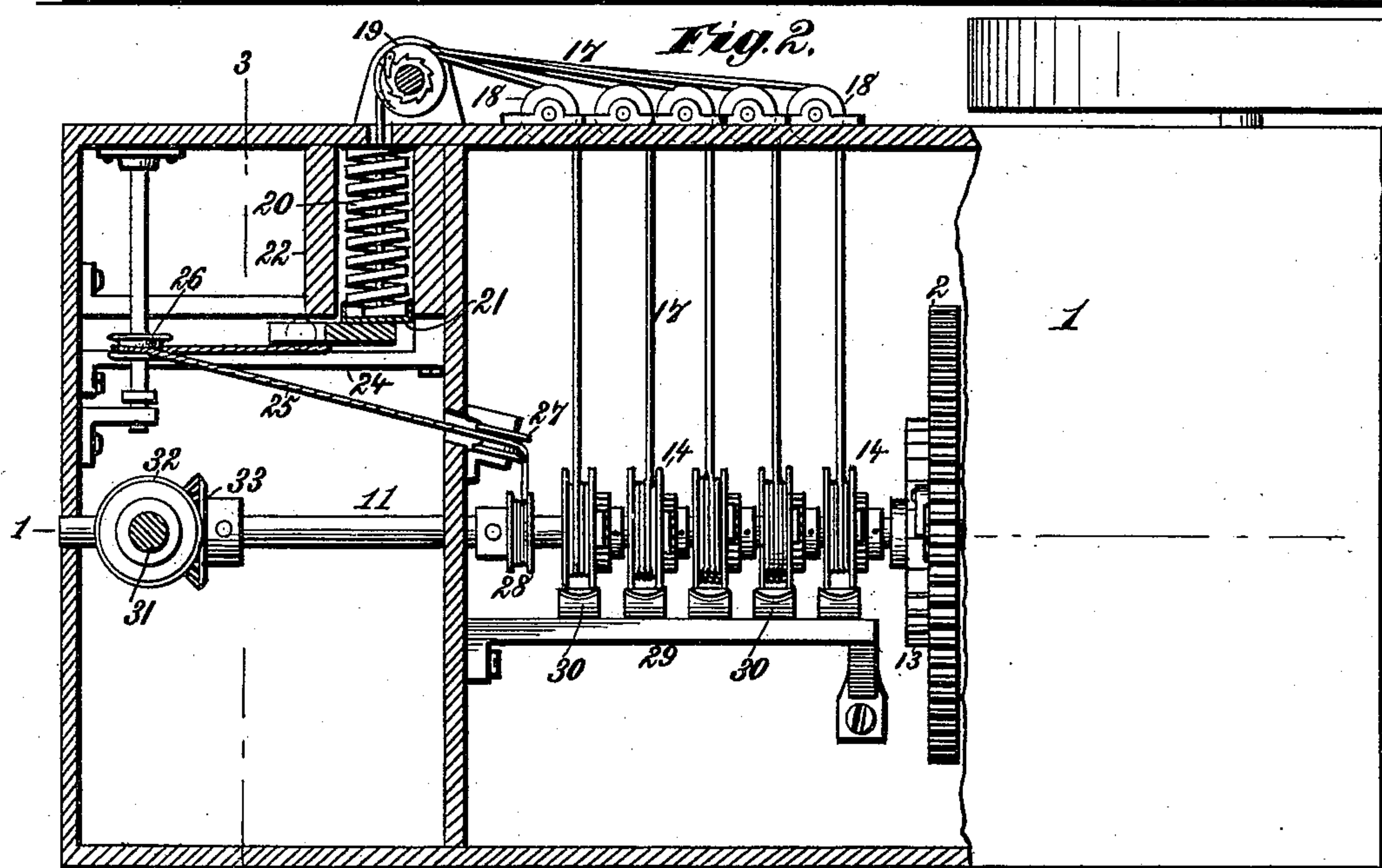
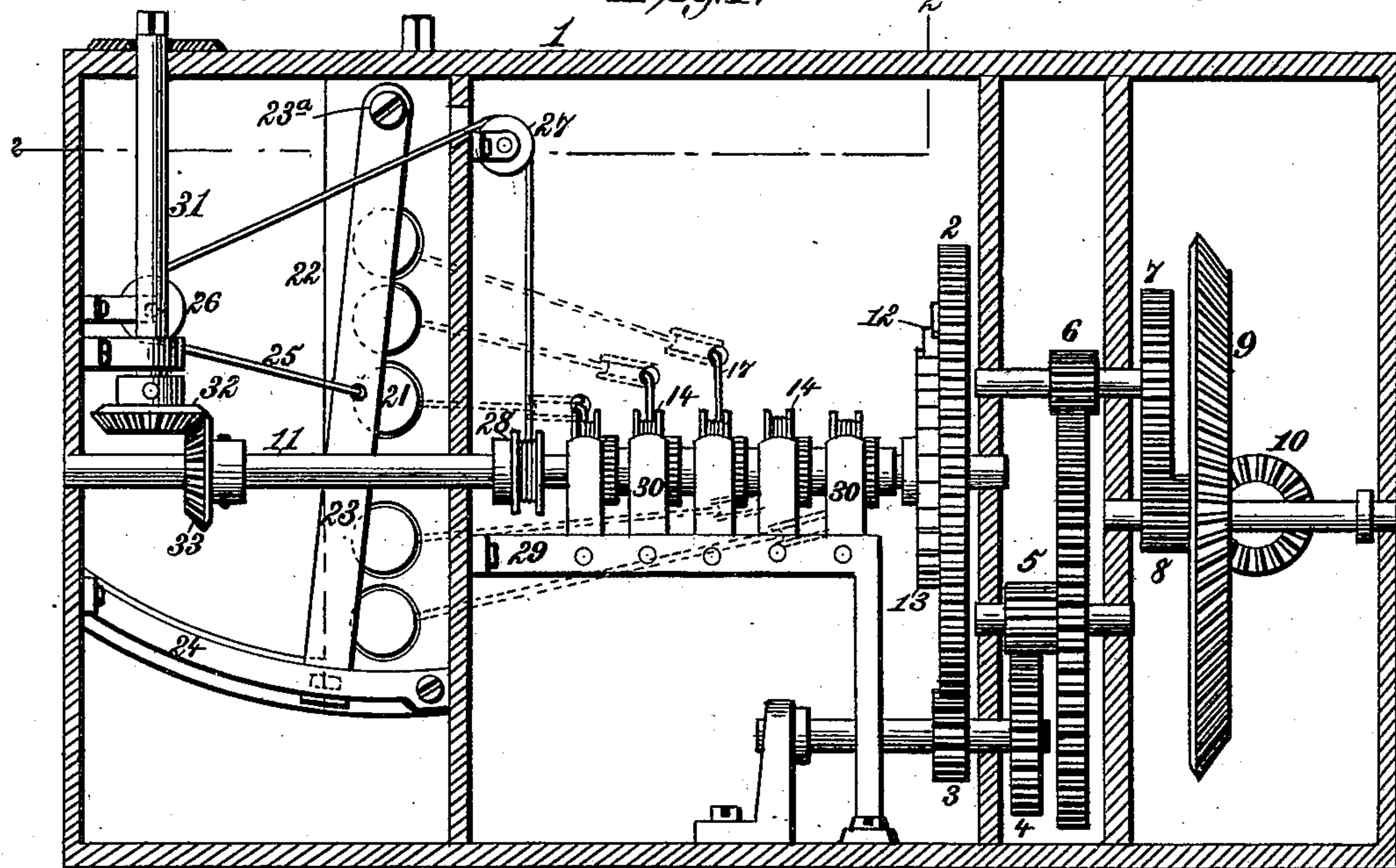
2 Sheets—Sheet 1.

H. E. MARCHAND.

SPRING MOTOR.

No. 337,177.

Fig. 1. Patented Mar. 2, 1886.



Witnesses.

Robert Everett.

Dennis Sumby.

Inventor.

Henry E. Marchand.

By

James L. Norris.

Atty.

(No Model.)

2 Sheets—Sheet 2.

H. E. MARCHAND.
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Fig. 3.

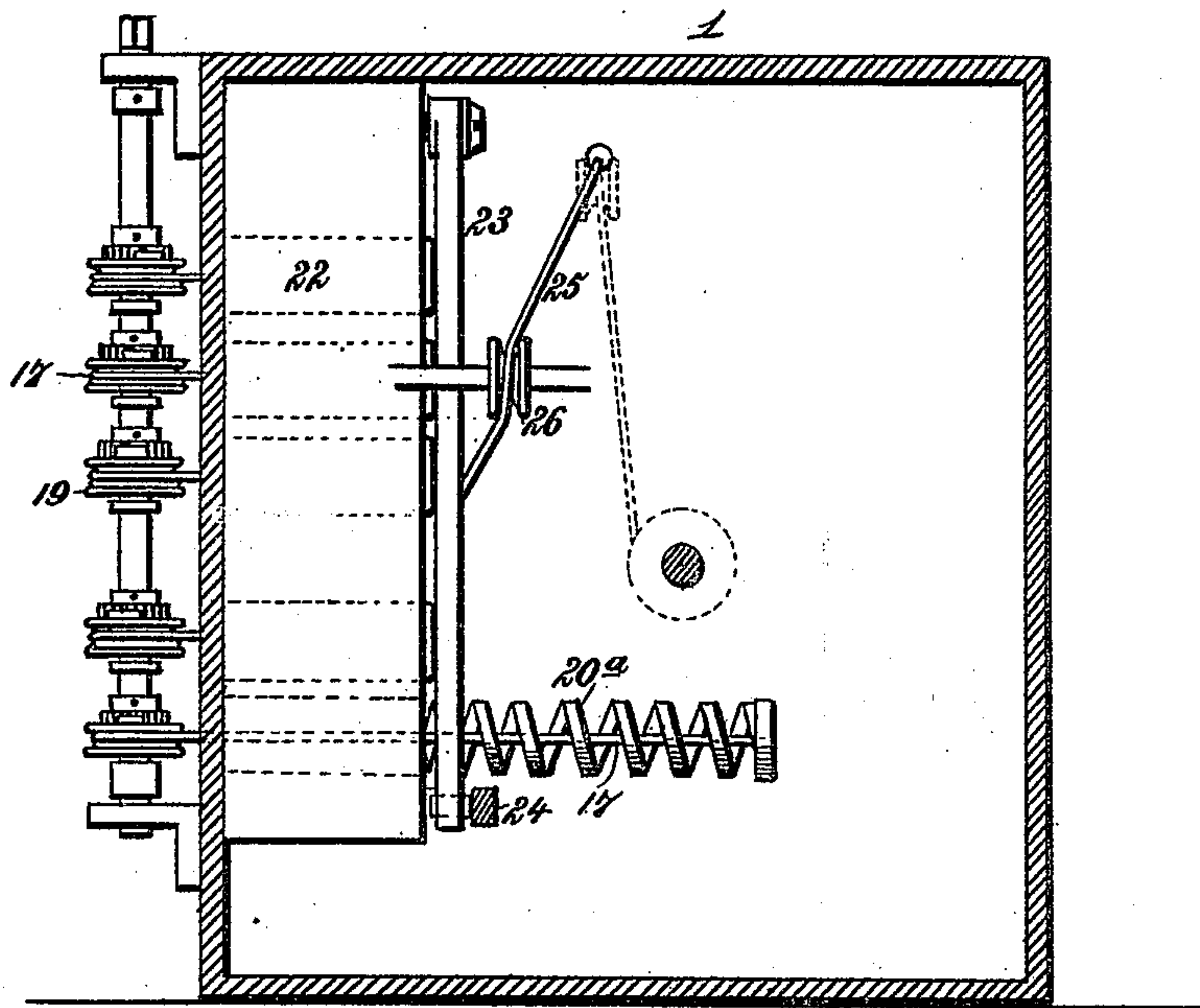


Fig. 5.

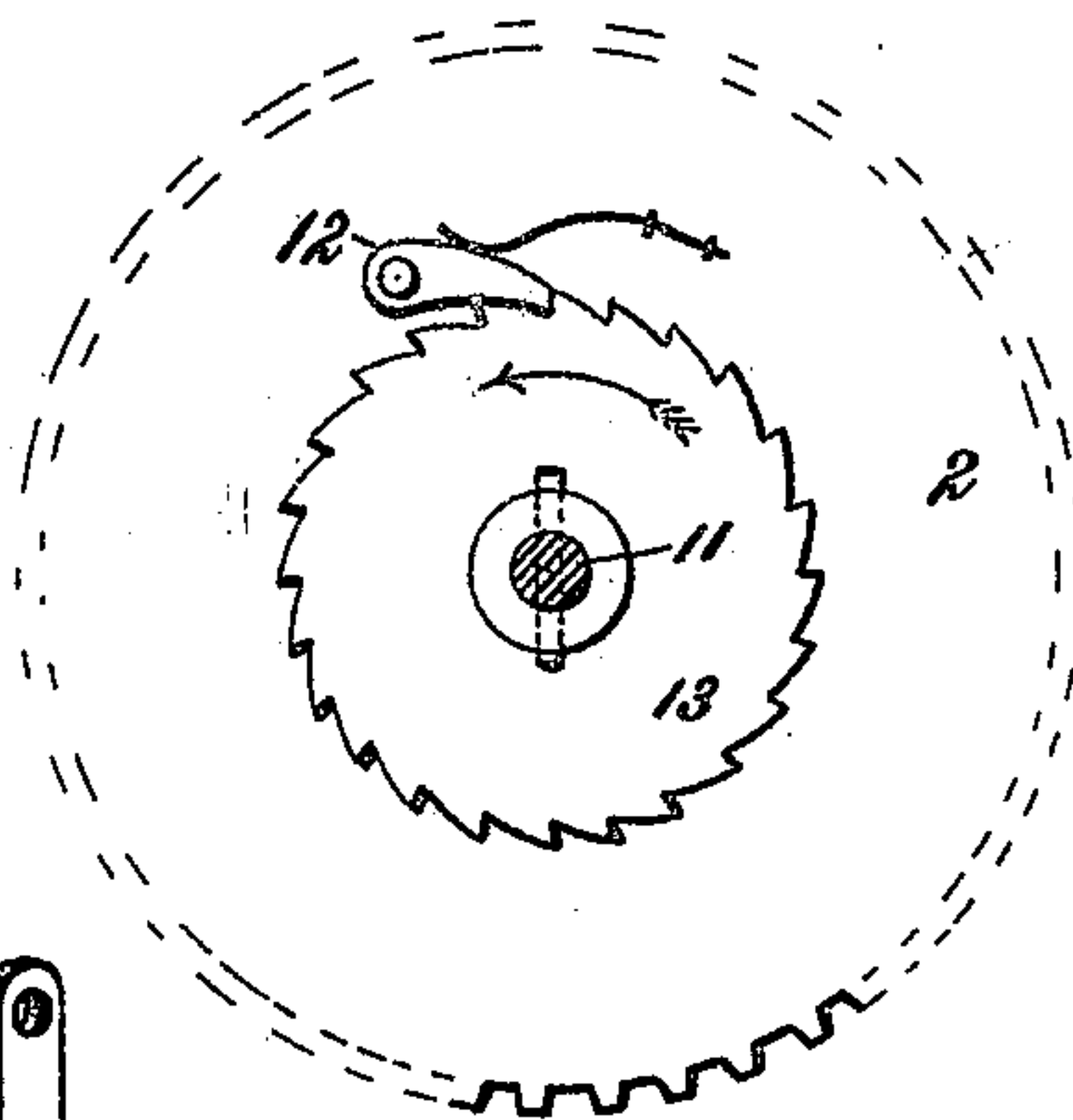


Fig. 4.

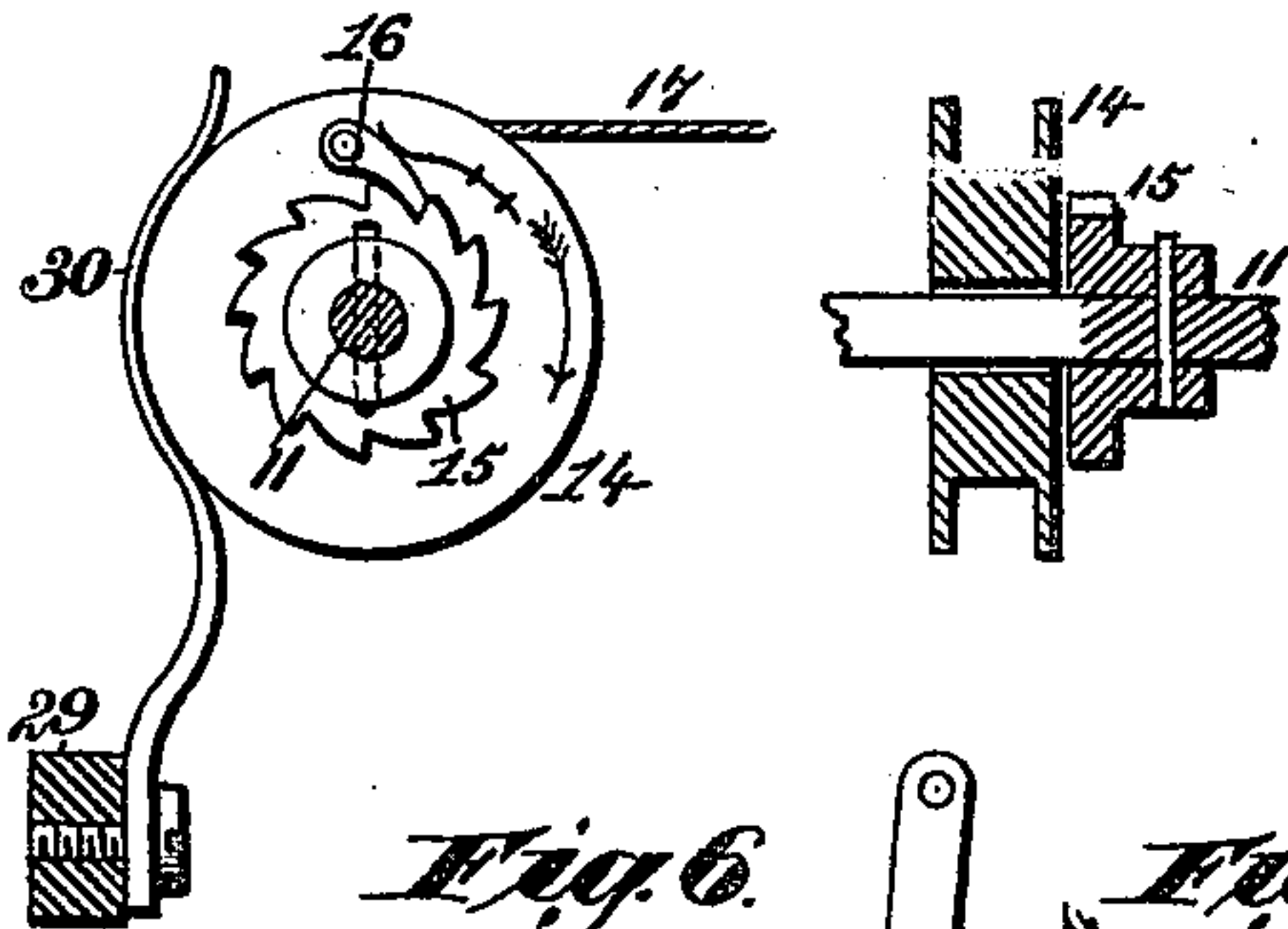


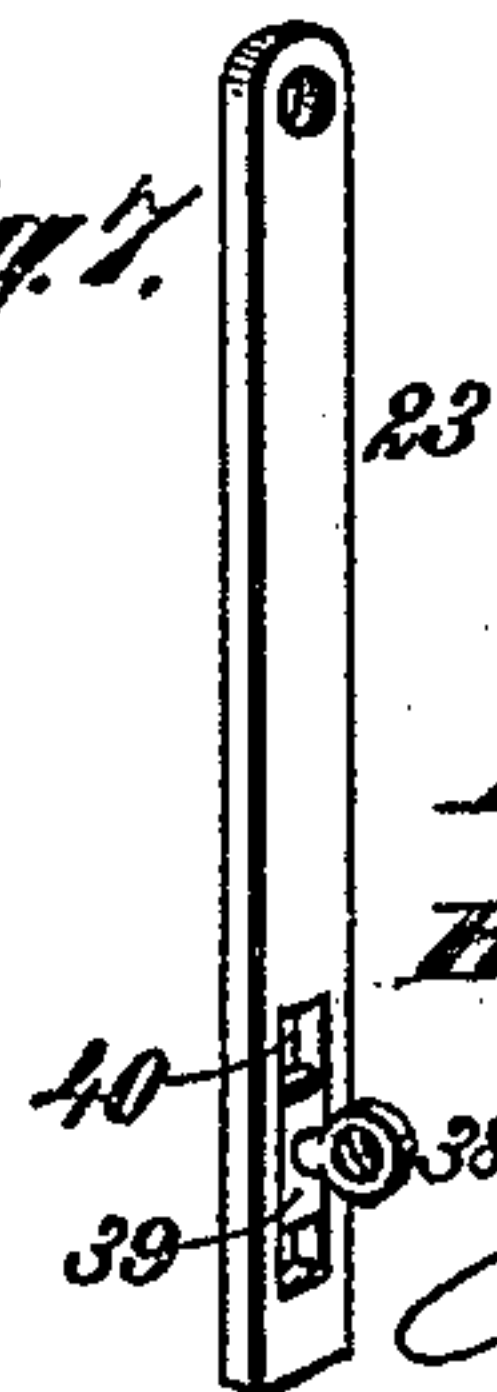
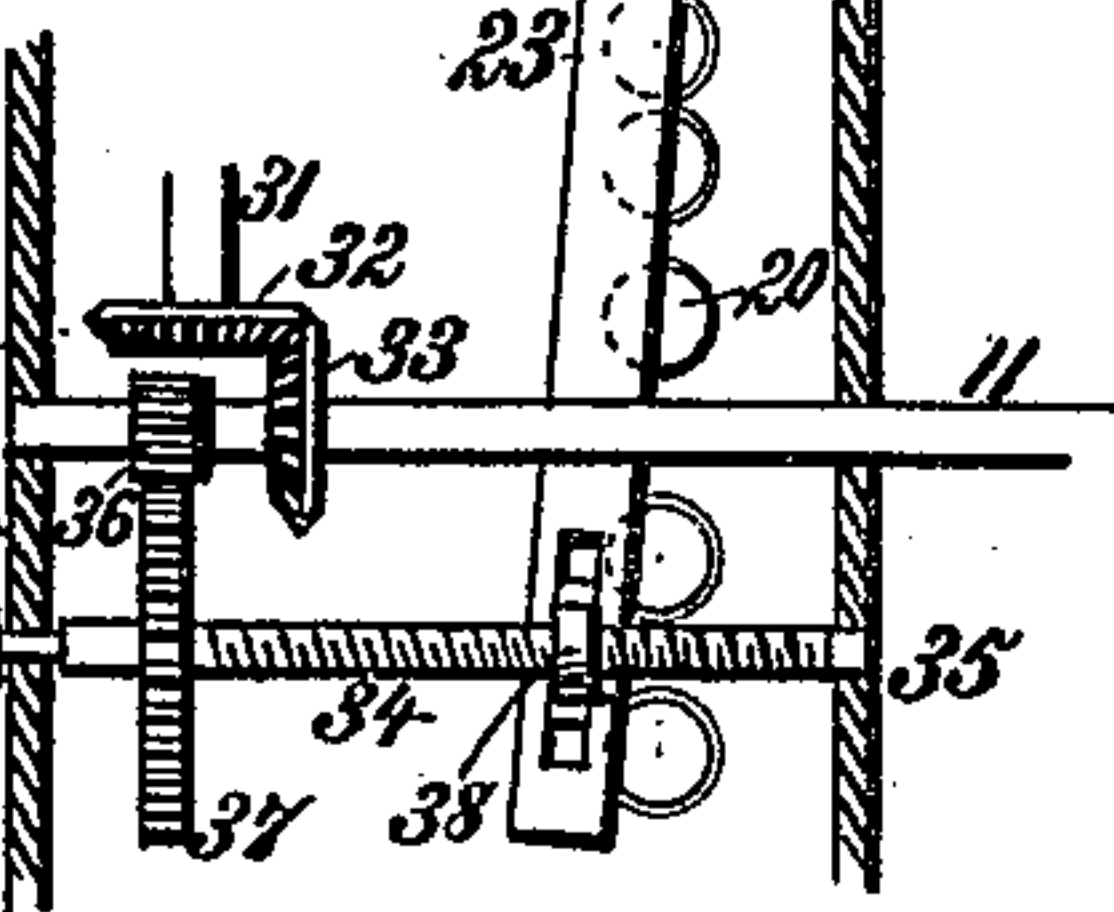
Fig. 6.

Fig. 7.

Witnesses

Robert Emmett

Dennis Cumby



Inventor

Henry E. Marchand

By

James L. Norris

Atty.

UNITED STATES PATENT OFFICE.

HENRY E. MARCHAND, OF PITTSBURG, PENNSYLVANIA.

SPRING-MOTOR.

SPECIFICATION forming part of Letters Patent No. 337,177, dated March 2, 1886.

Application filed October 31, 1885. Serial No. 181,507. (No model.)

To all whom it may concern:

Be it known that I, HENRY E. MARCHAND, a citizen of the United States, residing at Pittsburg, in the county of Allegheny and State of Pennsylvania, have invented new and useful Improvements in Spring Motive Powers, of which the following is a specification.

My invention relates to spring motive powers, and the purpose thereof is to supply a comparatively simple and efficient apparatus for driving light machinery, in which the motive power is supplied by a series of separate springs simultaneously compressed, and successively and automatically brought into action by the action of the mechanism.

It is also the purpose of my invention to provide means for setting or compressing the entire series of springs from which the motive power is derived simultaneously, and at the same time to set the releasing device whereby said springs are held until they are successively released.

My invention consists in the several novel features of construction and combinations of parts hereinafter fully set forth, and fully pointed out in the claims attached to this specification.

Referring to the accompanying drawings, Figure 1 is a vertical longitudinal section upon the line 1 1, Fig. 2. Fig. 2 is a view, partly in section and partly in elevation, showing the same parts, the section-plane in said figure being taken in the plane 2 2, Fig. 1. Fig. 3 is a section upon the line 3 3, Fig. 2. Fig. 4 is a double sectional view taken at any point across and upon the axis of the main or working shaft, Fig. 2. Fig. 5 is an elevation of the initial gear carried by the working-shaft. Fig. 6 is an elevation in detail, showing a modified construction of the releasing mechanism. Fig. 7 is a perspective of the releasing-bar shown in Fig. 6.

In the said drawings the reference-numeral 1 designates the casing within which the operative parts are arranged, said casing being of any suitable material, shape, and size whereby it may be rendered portable.

Supported within suitable bearings within the casing is a train of gears, 2 3 4 5 6 7 8 9, &c., meshing with each other, the final member, 10, of the series receiving from the intermediate members a multiplied rotation de-

rived from the initial gear 2. This gear is loosely mounted upon a shaft, 11, and has pivoted upon its face a pawl, 12, which engages with a ratchet, 13, keyed upon the shaft, as shown in Fig. 5, whereby rotation in one direction is allowed said shaft without actuating the gear 2, whereas rotation of the shaft in the direction of the arrow, Fig. 5, will carry the gear with it. Upon the shaft 11 are mounted in a similar manner a number of pulleys, 14, each independent of all the others, and each having operative connection with the shaft by means of a ratchet, 15, keyed to the latter, and a pawl, 16, pivoted upon the face of the pulley. From each of these pulleys is led a cord, 17, each cord passing over a friction-pulley, 18, thence over a second and similar pulley, 19, and thence entering the casing 1 and passing centrally through the coils of a spring, 20, having a cap, 21, to which the cord is attached.

The construction in each of the springs is the same, and therefore requires no separate description, the number of pulleys 14 being always equal to the number of separate motor-springs 20 which may be employed. Each of the said motor-springs is housed within a suitable casing, 22, the housing of each spring being separate from that of the remaining springs, and the whole series is arranged in or substantially in a right line in any part of the casing 1 to which the cords 17 may conveniently be led.

In front of the series of housings 22, which are open at their inner ends, is arranged a holding and releasing bar, 23, pivoted at one end, as 23^a, and so arranged that it may be turned over the open ends of the whole series of spring-housings. The free end of the said lever receives support in an arc-shaped guide-plate, 24, whereby the strain upon the bar is divided between said plate and the pivoted point 23^a thereof. Attached to said bar 23, between its ends, is a cord, 25, running from the point of attachment over a friction-pulley, 26, thence over a pulley, 27, and thence connected with a pulley, 28, rigid upon the shaft 11. The several springs 20 being compressed to their utmost tension, the holding-bar 23 is swung over the series, holding each of said springs compressed, with the exception of the initial spring 20^a of the series. This spring

being free to exercise its power, its tension upon the cord 17 gives rotation to the shaft 11, which causes a revolution of the pulley 28, upon which the cord 25 is wound. As the action of the initial spring 20^a continues the bar 23 is gradually drawn off the second spring of the series, the arrangement being such that the second spring shall be released just before the initial spring has exhausted its energy, and in like manner the third, fourth, and remaining springs are successively released, each in its order and time.

It will be seen that as the motor-springs are successively used an increasing movement of the releasing-bar 23 is required in order to set each free at the proper point of time, the several points upon said bar having a diminished movement in proportion to their proximity to the pivotal point of the bar. This accelerated motion is derived from the accumulation of the cord 25 upon the pulley 27, whereby an increase in the diameter of the winding-surface of said pulley is obtained at each turn of the shaft 11.

In order to give to each spring a full range of action, it is necessary that each of the cords 17 shall remain taut, or nearly so, during the action of those cords preceding it in the series. This is effected by loosely mounting the several pulleys 14 upon the shaft 11 and connecting said pulleys with the shaft of the pawls 16, engaging with ratchets 16^a, keyed to the shaft, as already described. In order to retain these cords in suitable tension during the action of the preceding springs and pulleys, I mount upon any suitable support, 29, a series of spring-brakes, 30, (shown in detail in Fig. 4,) each bearing upon one of the pulleys 14 with sufficient friction to prevent them from rotating during the forward movement of the shaft 11. The springs 20 may be separately compressed; but I prefer to effect their compression simultaneously, and for this purpose I mount in suitable bearings a shaft, 31, having a gear, 32, which meshes with a gear, 33, rigid upon the shaft 11. The end of the said shaft 31 is squared to receive a suitable key or crank, whereby revolution may be imparted thereto and thence to the shaft 11. By this movement each of the pulleys 14 is caused to draw upon its cord and compress the spring 20, to which it is attached, while at the same time the holding and releasing bar 23 is dropped by gravity into position to confine said springs under tension, the cord 25 being wound off the pulley 27 as the springs are drawn into their housings. The cords 17 are carried one or more times around the pulleys 19 to give a suitable frictional engagement therewith, and, if desired, the end of said shaft may be squared to receive a key, whereby the springs may be set, as shown in Fig. 1.

It is evident that instead of using a single motor spring in each of the housings I may employ two or more springs, one nested within the other. In this manner I may obtain a largely-increased motive power, and each

nest of springs will be released in the same manner already described in connection with the single springs.

Instead of the cord 25, which swings the releasing-bar, I may employ the construction shown in Figs. 6 and 7, in which the releasing-bar is actuated by a screw-shaft, 34, having bearing at its ends in suitable supports, 35. This shaft is driven by a gear, 36, on the working-shaft, meshing with a large gear, 37, on the screw-shaft, whereby a slow motion of the screw-shaft is obtained. The screw engages with an eye, 38, swiveled in a block, 39, which is mounted in an elongated slot, 40, in the releasing-bar. This construction permits the bar to swing upon its pivot, while the threaded eye 38 moves upon the screw and swings the bar to successively release the springs. This construction is in some respects preferable to that already described, as it requires less power and is more positive.

In order to compensate for the decreased movement of the bar as its pivotal point is approached, I may place the springs 20 closer together as they approach the pivotal point, or I may adopt any other construction whereby a similar result may be produced.

Having thus described my invention, what I claim is—

1. In a motor, the combination, with a working-shaft, of a series of pulleys having separate connection therewith, a corresponding series of devices for imparting power to said shaft, each having connection with the pulleys, and releasing mechanism actuated by the working-shaft, whereby each separate source of power is brought successively into action, substantially as described.

2. In a spring-motor, the combination, with a series of separate springs, each compressed to its highest tension, of a series of separate cords connected therewith, a series of pulleys, each having separate connection with the working-shaft, and a releasing-bar actuated by said shaft and bringing each spring successively into action, substantially as described.

3. In a spring-motor, the combination, with a working-shaft, of a series of actuating-pulleys loose upon said shaft, a series of ratchets keyed to the shaft, a series of pawls carried by the pulleys and engaging with the ratchets, a series of brakes arresting the movement of the pulleys in one direction, and a series of motor-springs adapted to be brought successively into action, and each connected by a cord with one of said actuating-pulleys, substantially as described.

4. In a spring-motor, the combination, with a working-shaft having a series of pulleys mounted thereon, of a series of motor-springs, each connected with one of said pulleys, a releasing-bar confining said springs under tension, and means, substantially as described, for releasing each successively a little before the previous spring has parted with its energy, substantially as described.

5. In a spring-motor, the combination, with a working-shaft, of a series of pulleys loosely mounted thereon, a series of ratchets keyed to the shaft and engaging with pawls pivoted upon said pulleys, a series of friction-brakes bearing upon said pulleys, cords or belts passing over the same and connected with separate compressed springs, a holding and releasing bar pivoted over said springs, and a cord

connected with said bar and winding on a pulley on the shaft, whereby the springs are successively released, substantially as described.

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

H. E. MARCHAND.

Witnesses:

ALBERT H. NORRIS,
J. A. RUTHERFORD.