No. 748,534. PATENTED DEC. 29, 1903.

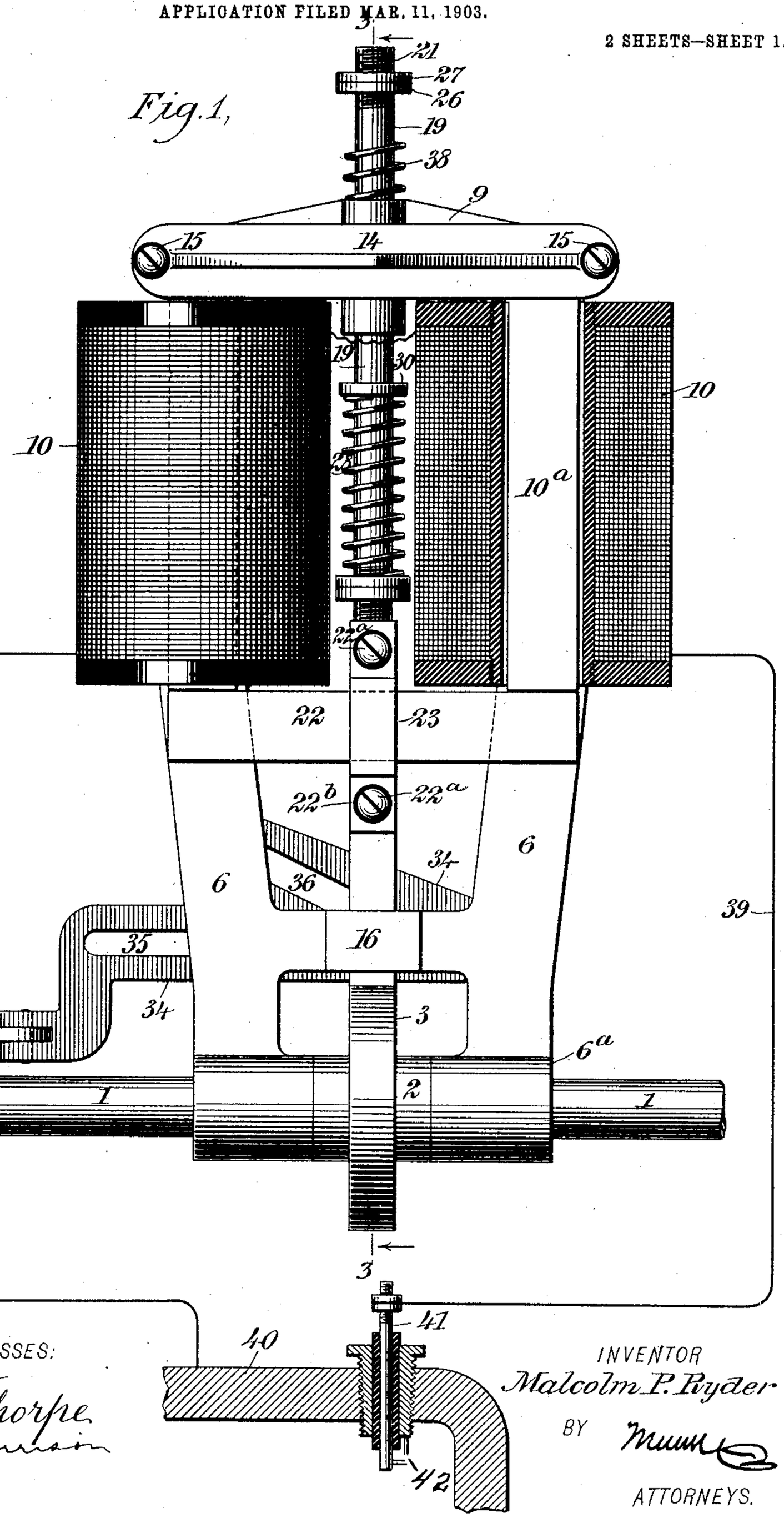
M. P. RYDER.

ELECTRIC GENERATOR FOR INTERMITTENT CURRENTS.

APPLICATION FILED MAR. 11, 1903.

NO MODEL. 2 SHEETS—SHEET 1.

Fig. 1,



WITNESSES:

Edward Thorpe

Walter Harrison

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NO MODEL. 2 SHEETS—SHEET 2.

Fig. 2,

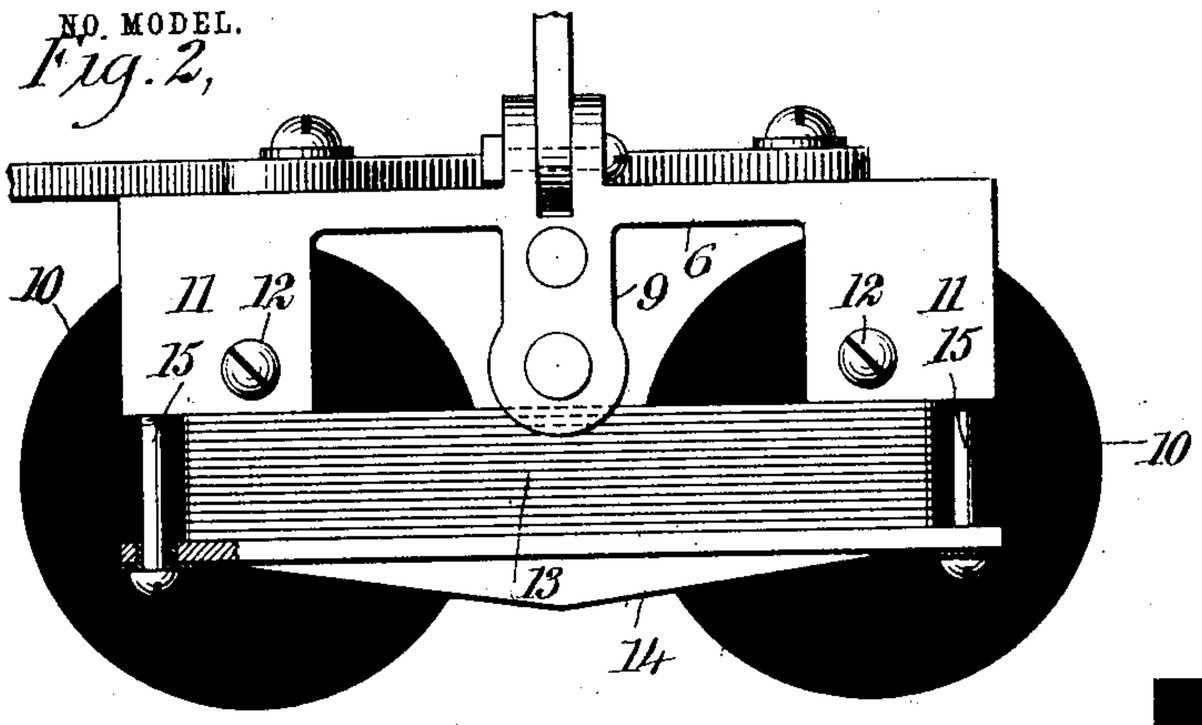


Fig. 3,

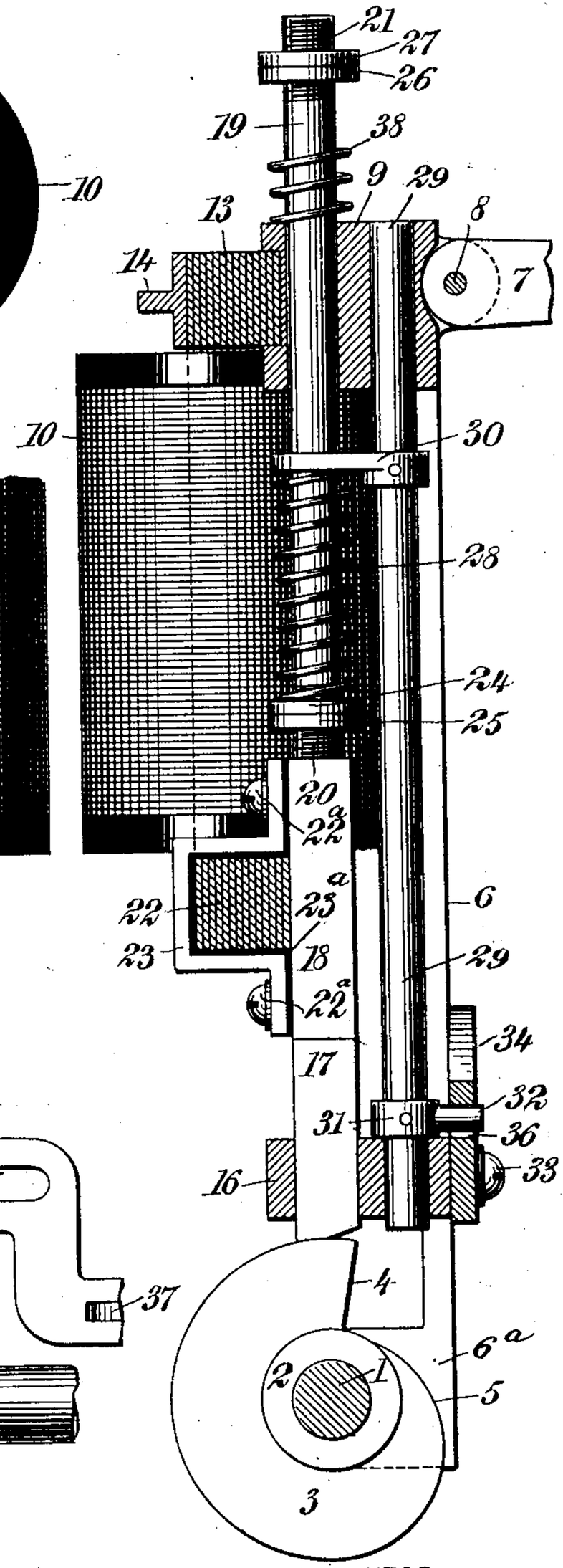
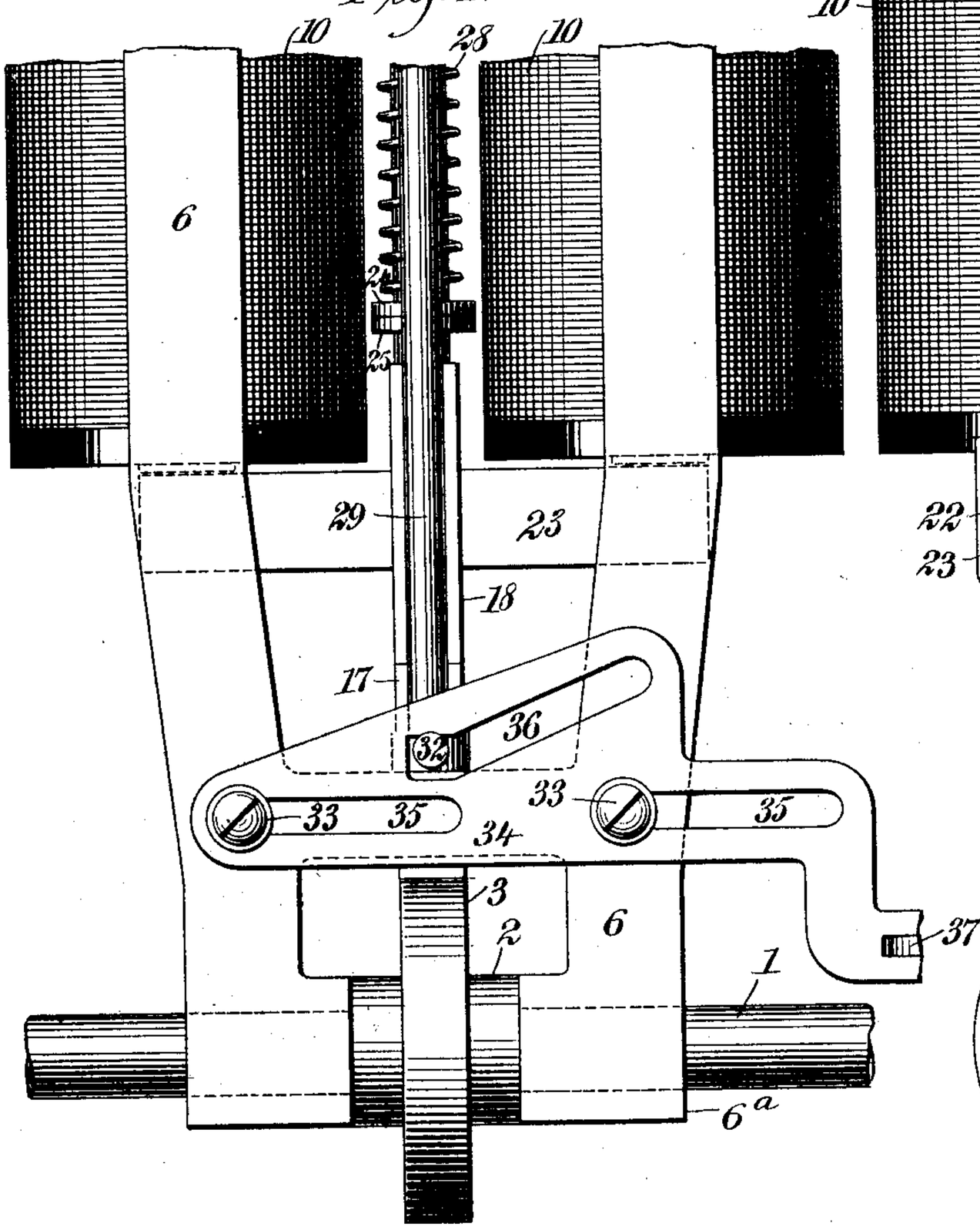


Fig. 4.



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UNITED STATES PATENT OFFICE.

MALCOLM P. RYDER, OF WHITEPLAINS, NEW YORK.

ELECTRIC GENERATOR FOR INTERMITTENT CURRENTS.

SPECIFICATION forming part of Letters Patent No. 748,534, dated December 29, 1903.

Application filed March 11, 1903. Serial No. 147,266. (No model.)

To all whom it may concern:

Be it known that I, MALCOLM P. RYDER, a citizen of the United States, and a resident of Whiteplains, in the county of Westchester and State of New York, have invented a new and Improved Electric Generator for Intermittent Currents, of which the following is a full, clear, and exact description.

My invention relates to an electric generator for intermittent currents capable of general use, but specially adapted for service upon locomobiles, gas-engines, &c., in which it is desirable to supply a powerful spark for the purpose of igniting an explosive charge. My apparatus may be made in various forms and is susceptible of divers applications. I will not attempt to enumerate the many diversified forms which it may assume and will content myself with describing my preferred form of apparatus. The principle once being made clear may be employed within reasonable limits by persons skilled in various arts to which the invention relates.

Reference is to be had to the accompanying drawings, forming a part of this specification, in which similar characters of reference indicate corresponding parts in all the figures.

Figure 1 is a fragmentary elevation, partly in section, showing my device as applied to an explosive-engine and operated automatically by movements thereof. Fig. 2 is a fragmentary plan view of the same. Fig. 3 is a vertical section upon the line 3 3 of Fig. 1 looking in the direction of the arrow, and Fig. 4 is a fragmentary rear elevation otherwise similar to Fig. 1.

A revoluble shaft 1, which may, if desired, be a shaft connected with the engine-valve, is provided with a collar 2 and a spiral cam 3, preferably integral with the collar and having an abrupt shoulder 4, together with a gradually-inclined surface 5, thus being a typical form of the so-called "spiral" cam. A frame 6, provided with a bearing 6^a, is journaled upon the shaft 1 and is free to rock or to be inclined at different angles relatively thereto, a link 7 being provided for this purpose. The link is secured to the frame 6 by means of a pivot 8 and may be moved at will in a manner well known in various analogous arts. The frame 6 is provided at its top with a head 9. Mounted upon the frame is a magnetic member consisting, preferably, of the magnets 10. Each of these magnets is preferably provided with a laminated core 10^a, the laminæ being used, as in other magnets, for the purpose of preventing undue formation of eddy-currents. The cores 10^a are preferably permanent magnets made of hardened steel. Also mounted integrally at the top end of the frame 6 are the heads 11, provided with the screws 12. The magnetic yoke is shown at 13 and is connected with the heads 11 by means of screw-bolts 15. The lower portion of the frame 6 is provided with a bearing 16, as shown more particularly in Fig. 1. Within this bearing is slidably mounted a steel block 17, integrally connected with a steel bar 18, detachably connected with a cylindrical portion 19, as shown more particularly in Fig. 3, the whole constituting a sliding rod. The armature is preferably made of laminæ of steel.

The cylindrical portion 19 is provided with threads 20 21. Mounted upon the bar 18 is an armature 22, held upon the bar by means of a strap 23, this strap being secured in position by means of screws 22^a, so as to render the armature comparatively rigid relatively to the bar. The strap 23 is separated by a layer 23^a of insulation from the block 18 and also by the insulating-bushings 22^b from the screws 22^a. Revoluble nuts 24 and jam-nuts 25 are mounted upon the threaded portion 20. Somewhat similarly a revoluble nut 26 and a jam-nut 27 are mounted upon the threaded portion 21. A spiral spring 28 encircles the cylindrical portion 19 of the sliding rod, the lower end of this spring resting upon the nut 24. Slidably mounted within the bracket 16 and the head 9 is a rod 29, provided with a bracket 30, this bracket normally resting upon the spring 28. The insulation 23^a by completely separating the strap 23 from the block 18 prevents the formation of eddy-currents which might otherwise flow in a closed circuit consisting of the strap 23 and block 17. The bushings 22^b, of insulating material, prevent the screws 22^a from making electrical contact with the strap 23, this step being necessary to prevent the closing of the metallic circuit just mentioned.

Mounted upon the lower end of the rod 29

is a bracket 31, provided with a boss 32. By means of screw-bolts 33 a plate 34 is held upon the frame 6. This plate 34 is provided with horizontal slots 35 and with an inclined slot 36, through which the boss 32 projects, as indicated more particularly in Fig. 4. A pitman 37 is used for sliding the plate 34 at will for the purpose of raising and lowering the rod 29—that is to say, the slot 36 acts in the manner of a closed cam and forces the rod 29 upward or downward, as the case may be. The purpose of this arrangement is to tension the spring 28 at will, the pitman 37 being drawn to the left with the apparatus, as indicated in Fig. 1, or to the right, as indicated in Fig. 4. The plate 34 of course moves into the position indicated in Fig. 4, the boss 32 then being in its lowermost position. This causes the bracket 30 to press upon the spring 28, so as to enable the same to exert its maximum tension. If the plate 34 be moved toward the left from the position shown in Fig. 4, so that the rod 29 is raised and the pressure upon the spring 28 is relaxed, a single revolution of the cam 3 lifts the armature 22 into the grasp of the magnet, where it is securely held out of the way until the plate 34 is again restored to the position indicated in Fig. 4, whereupon the reciprocal action of the spring 28 and cam 3 again cause the armature to move periodically, as explained.

By adjusting the nuts 24 25 the maximum and minimum tensions of the spring 28 may be controlled at will. A spring 38 encircles the cylindrical member 19 and serves as a cushion for the same upon its descent, thereby preventing undue jarring of the steel block 17 upon the cam 3 and also preventing crystallization of the shaft 1 due to the incessant and rapid jarring. Wires 38ª 39 are connected, respectively, with the explosion-chamber 40 and the spark-plug 41 in the usual manner, the spark-gap being at 42 and within the explosion-chamber.

The operation of my device is as follows: The engine being in motion, the cam 3 is rotated in a contra-clockwise direction from the viewpoint of Fig. 3, the steel block 17, bar 18, and cylindrical member 19 being gradually raised by virtue of the inclined surface of the cam. When the shoulder 4 passes under the block 17, however, the slide-rod is suddenly released and under tension of the spring 28 is abruptly driven downward with a hammer-like blow. The result is that the armature 22 is withdrawn abruptly from the magnetic member, so that a powerful momentary current is generated in the coils 10 and transmitted through the wires 38ª 39, causing a spark to occur in the spark-gap 42 within the explosion-chamber 40. The possibility of premature explosion may be avoided in two ways. In the first place the gradual inclination of the surface 5 prevents any powerful current from being generated as the armature is lifted by means of the cam. In the second place the shape of the cam 3 is such that should a spark occur upon the upstroke of the armature it will occur at a moment when no explosive mixture is contained within the explosion-chamber. In other words, the armature 22 is raised after the explosion takes place and before another charge is ready. The shape of the cam 3 also prevents the descent of the block 17 and armature 22 until the shoulder or edge 4 clears the block 17. In other words, the cam, because of its shape, constitutes a positive back for preventing the descent of the armature at an inopportune moment, and thus avoids the possibility of a premature explosion. In order to accelerate or retard the period of explosion, so as to cause the explosion to occur at the proper moment for different speeds of the engine, the swinging frame 6 is moved, by means of the link 7, into slightly different angular positions relatively to the shaft 1. If, for instance, the member 7 be drawn slightly to the right from the viewpoint of Fig. 3, the cam 3 will release the slide-rod slightly earlier than would be the case if the link 7 were pushed to the left. By this means the moment of explosion can be governed to a nicety, as will be well appreciated by persons skilled in the art. The buffer-spring 38 rests upon the head 9 and helps to arrest the slide-rod upon its descent. This spring 38 may of course be of any desired tension and being comparatively short does not come into play until the armature has moved an adequate distance from the magnetic member to furnish the desired current through the wires 38ª 39. Of course after the current has been sent through the spark-gap no harm can ensue from checking the motion of the slide-rod with as little shock as possible. By movements of the pitman 37 the plate 34 can be made to raise or to lower the rod 29 independently of the angular position occupied by the frame 6—that is to say, the frame 6 need not be movable through a wide angle, and consequently the plate 34, which is at the lower end of the frame 6, and therefore comparatively near the shaft 1, has a very small lateral movement. The pitman 37 is therefore merely twisted to a slight angle, so that its thrusting movement toward and from the center of the frame 6 and in a line substantially parallel with the axis of the shaft 1 is not interfered with in the slightest degree.

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

1. An electric generator for intermittent currents, comprising a magnetic member provided with a winding and with terminal connections therefor, an armature slidably mounted adjacent to said magnetic member and free to reciprocate directly toward and from the same in a straight path, and automatic mechanism for actuating said armature relatively to said magnetic member.

2. An electric generator for intermittent

currents, comprising a magnetic member provided with a winding and with terminal connections therefor, an armature disposed adjacent to said magnetic member, means for guiding said armature in a straight path toward and from said magnetic member, and automatic mechanism for actuating said armature within said path.

3. An electric generator for intermittent currents, comprising a magnetic member provided with a winding and with terminal connections therefor, an armature mounted adjacent to said magnet, cam mechanism for moving said armature toward said magnetic member, and spring mechanism for moving said armature away from said magnetic member.

4. An electric generator for intermittent currents, comprising a magnetic member provided with a winding and with terminal connections therefor, an armature mounted adjacent to said magnetic member, means for actuating said armature toward and from said magnetic member, and mechanism for cushioning the movements of said armature in its travel away from said magnetic member.

5. An electric generator for intermittent currents, comprising a magnetic member provided with a winding and with terminal connections therefor, an armature mounted adjacent to said magnetic member, means for actuating said armature toward said magnetic member at a comparatively slow rate of speed, a spring for retracting said armature abruptly, and a second spring for cushioning the motion of said armature as the same is retracted.

6. An electric generator for intermittent currents, comprising a magnetic member provided with a winding and with terminal connections therefor, a slide-rod mounted adjacent to said magnetic member, an armature mounted upon said slide-rod and movable therewith, a spring for forcing said slide-rod abruptly in one direction, a second spring for cushioning the movements of said slide-rod in such direction, and cam mechanism for gradually forcing said slide-rod in the opposite direction.

7. An electric generator for intermittent currents, comprising a magnetic member provided with a winding and with terminal connections therefor, a slide-rod mounted adjacent to said magnetic member, an armature mounted upon said slide-rod and movable therewith, a spring for forcing said slide-rod abruptly in one direction, means controllable at will for adjusting the tension of said spring, a second spring for cushioning the movements of said slide-rod in such direction, and cam mechanism for slowly forcing said slide-rod in the opposite direction.

8. An electric generator for intermittent currents, comprising a magnetic member provided with a winding and with terminal connections therefor, a slide-rod mounted adjacent to said magnetic member, an armature mounted upon said slide-rod and movable therewith, a spring for forcing said slide-rod abruptly in one direction, means controllable at will for adjusting the tension of said spring, a second spring for cushioning the movements of said slide-rod in such direction, cam mechanism for slowly forcing said slide-rod in the opposite direction, and means controllable at will for adjusting the tension of said second-mentioned spring.

9. In an electric generator for intermittent currents, the combination of a magnetic member provided with a winding, a slide-rod disposed adjacent to said magnetic member, an armature mounted upon said slide-rod, a support provided with a bracket, said bracket being mounted adjacent to said slide-rod, means for adjusting said support relatively to said slide-rod, and a spring connected with said slide-rod and with said support.

10. In an electric generator for intermittent currents, the combination of a magnetic member provided with a winding, a slide-rod disposed adjacent to said magnetic member, an armature mounted upon said slide-rod and movable therewith, a spring connected with said slide-rod, and means controllable at will for adjusting the tension of said spring.

11. In an electric generator for intermittent currents, the combination of a magnetic member provided with a winding, a slide-rod disposed adjacent to said magnetic member, an armature mounted upon said slide-rod and movable therewith, a spring connected with said slide-rod, and manually-operated cam mechanism for varying at will the tension of said spring.

12. In an electric generator for intermittent currents, the combination of a revoluble shaft, cam mechanism actuated thereby, a swinging frame, a magnetic member mounted upon said frame and actuated by said cam, and means for shifting the angular position of said swinging frame relatively to said cam for the purpose of accelerating or retarding the action of said magnetic mechanism relatively to the movements of said cam.

13. In an electric generator for intermittent currents, the combination of a revoluble shaft, cam mechanism actuated thereby, a frame journaled upon said shaft and free to move relatively thereto, mechanism connected with said frame for inclining the same to different angles relatively to said revoluble shaft, and magnetic mechanism mounted upon said frame and actuated by said cam.

14. In an electric generator for intermittent currents, the combination of a rovoluble shaft, a movable frame inclined to different angles relatively thereto, means for actuating said frame, magnetic mechanism mounted upon said frame for producing currents, and mechanism connected with said revoluble shaft for intermittently actuating said magnetic mechanism.

15. In an electric generator for intermittent currents, the combination of a revoluble

shaft, a cam mounted thereon, a frame journaled upon said shaft and inclined at different angles relatively thereto, a magnetic member mounted upon said frame, an armature mounted upon said frame and movable relatively to said magnetic member, mechanism connecting said armature with said cam for the purpose of intermittently moving said armature toward said magnetic member, a compressible member for intermittently moving said armature away from said magnetic member, and means controllable at will for tensioning said compressible member.

16. In an electric generator for intermittent currents, the combination of a magnetic member, an armature normally movable relatively thereto for generating currents, mechanism for moving said armature in one direction relatively to said magnetic member, and a cam for moving said armature in the opposite direction, said cam being of such conformity as to prevent, during a considerable part of its revolution, the movement of said armature in one direction.

17. In an electric generator for intermittent currents, the combination of a magnetic member, an armature normally movable relatively thereto for generating currents, mechanism for intermittently actuating said armature, and means controllable at will for locking said armature against movement except at predetermined regular intervals.

18. In an electric generator for intermittent currents, the combination of a magnetic member, an armature movable relatively thereto, a movable metallic member for actuating said armature, a metallic strap connected with said metallic member and partially inclosing said armature, and insulating material disposed between said strap and said metallic member.

19. In an electric generator for intermittent currents, the combination of a magnetic member, an armature movable relatively thereto, a metallic rod for actuating said armature, a strip of insulating material engaging said metallic rod and partially inclosing said armature, and a metallic strap mounted upon said strip of insulating material and also partially inclosing said armature.

20. In an electric generator for intermittent currents, the combination of a frame, means controllable at will for inclining said frame to different angles, a magnetic member mounted upon said frame and provided with terminals, an armature movable relatively to said magnetic member, and mechanism connected with said armature and free to actuate the same at different moments according to the degree of inclination of said frame.

21. In an electric generator for intermittent currents, the combination of a frame, means controllable at will for inclining said frame to different angles, a magnetic member mounted upon said frame, an armature movable relatively to said magnetic member, a resilient member for normally pressing said armature in a predetermined direction relatively to said frame, and means controllable at will for tensioning said resilient member.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

MALCOLM P. RYDER.

Witnesses:

WM. MACDONALD,

J. MONROE JONES.