No. 724,287. PATENTED MAR. 31, 1903.

J. J. HEILMANN.

MANUFACTURE OF ELECTRODES.

APPLICATION FILED SEPT. 6, 1900.

NO MODEL. 4 SHEETS—SHEET 1.

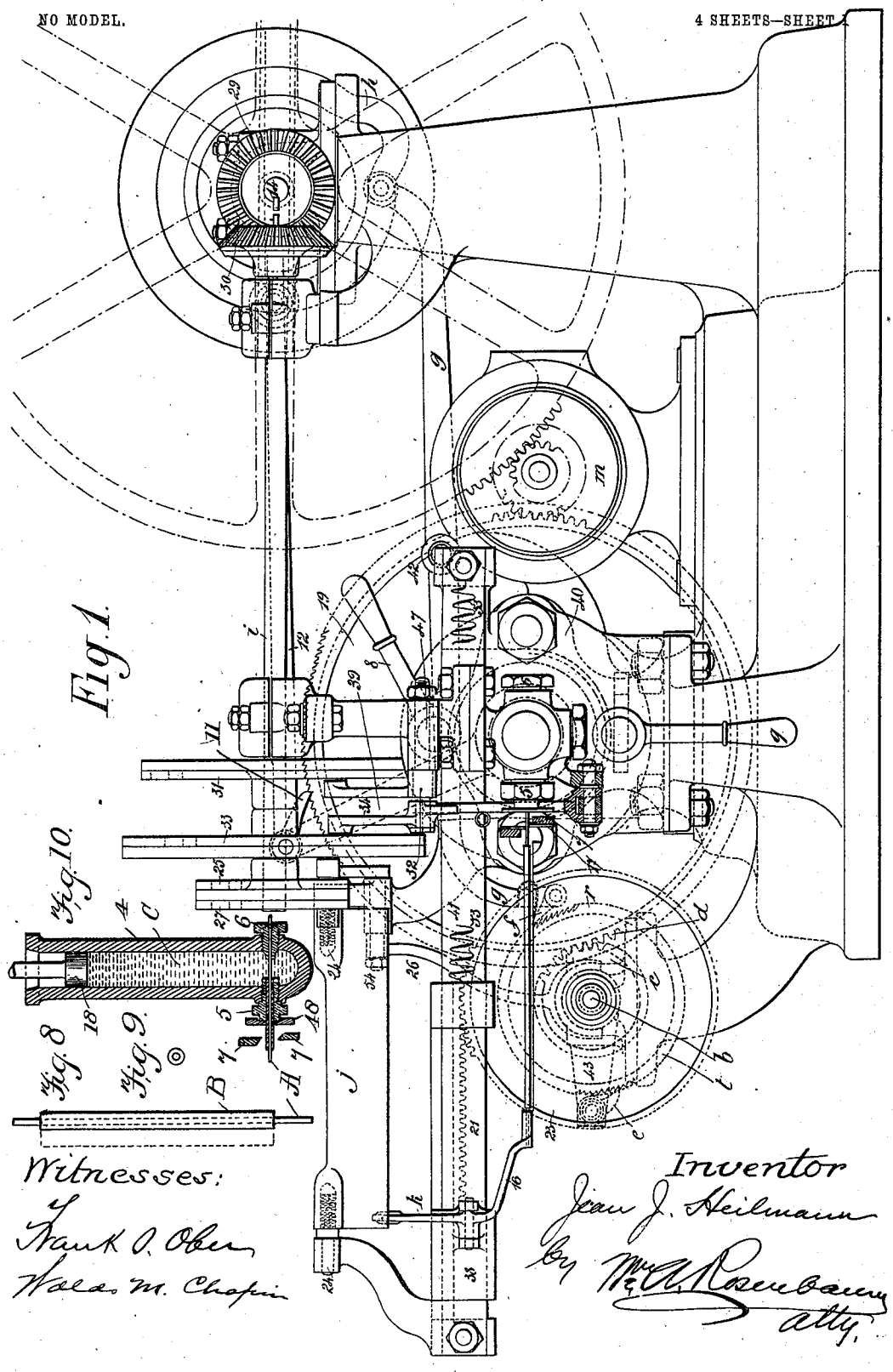


Fig. 1.

Fig. 10.

Fig. 8

Fig. 9.

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NO MODEL. 4 SHEETS—SHEET 2.

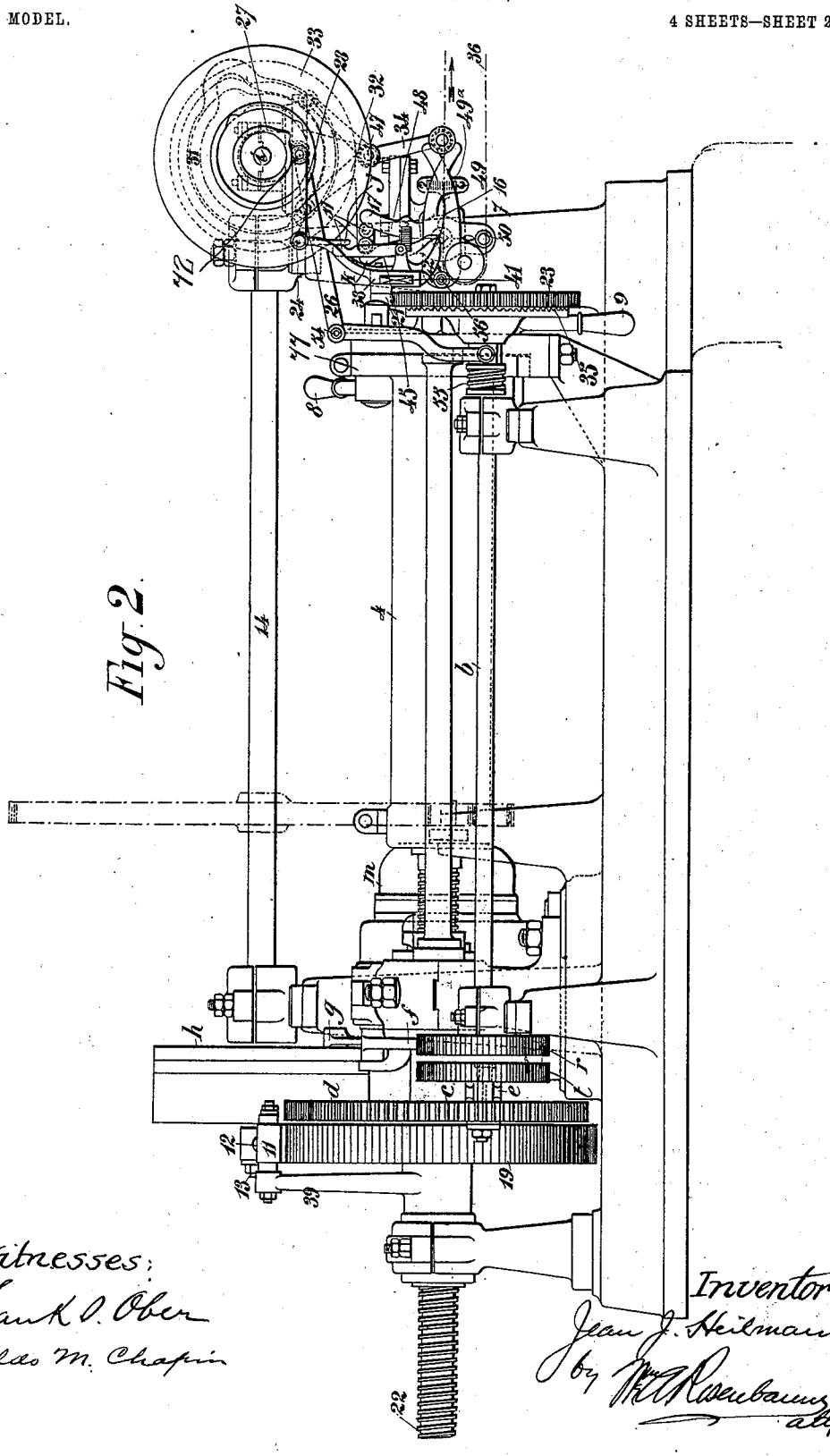


Fig. 2.

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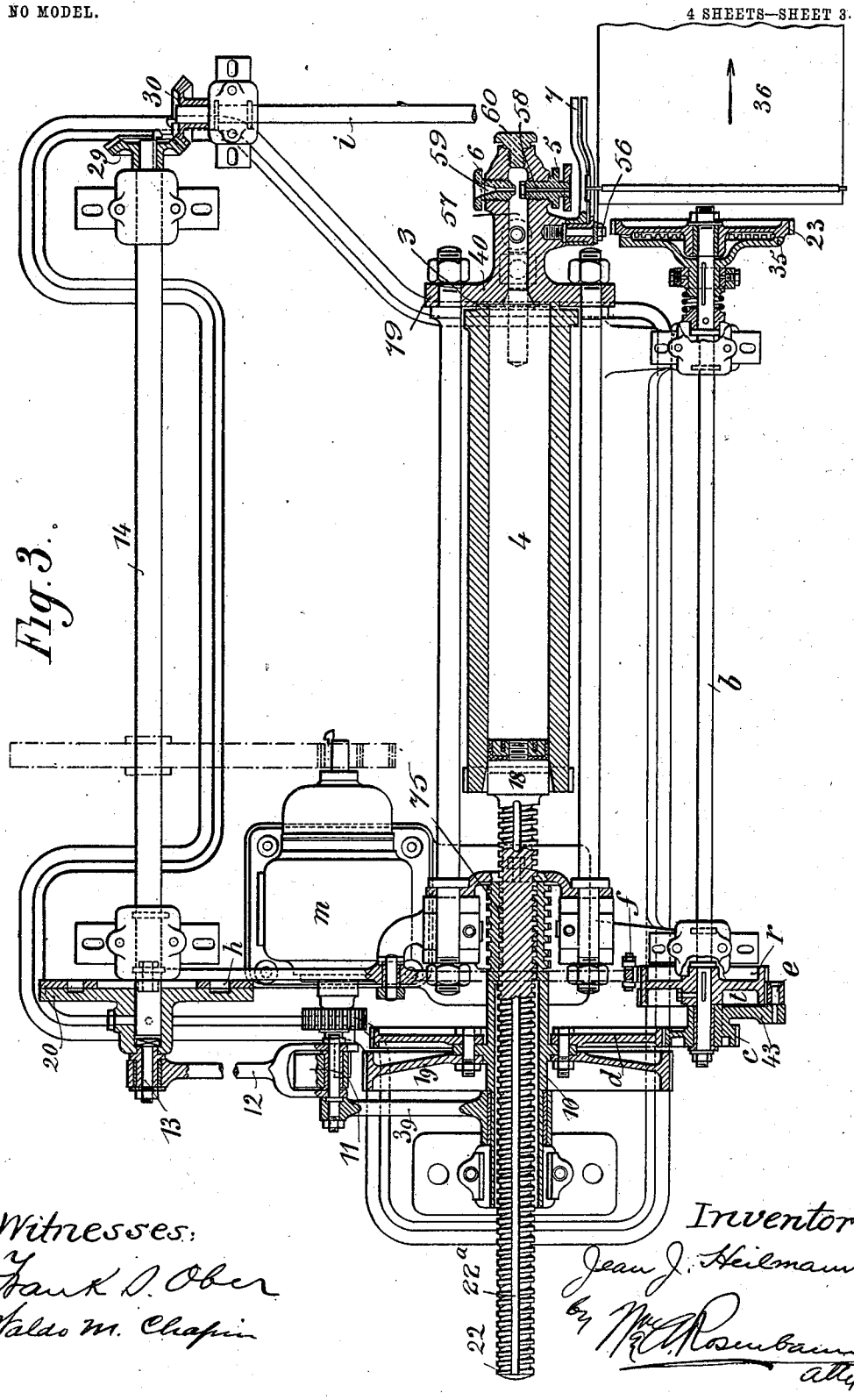
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NO MODEL. 4 SHEETS—SHEET 3.

Fig. 3.



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NO MODEL. 4 SHEETS—SHEET 4.

Fig. 7.

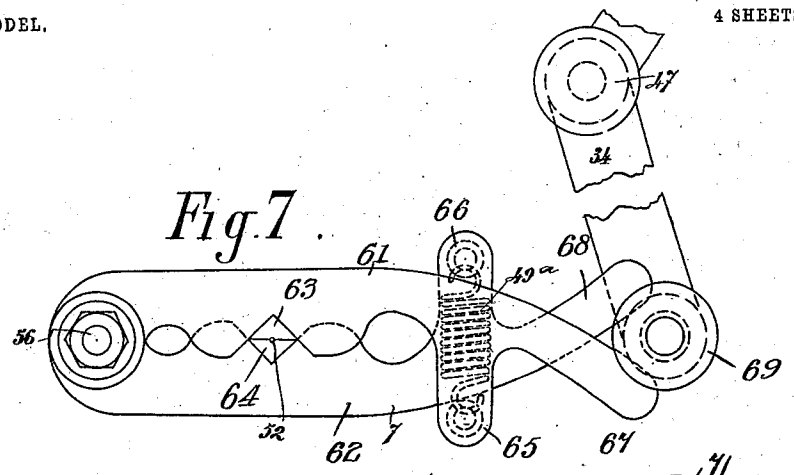
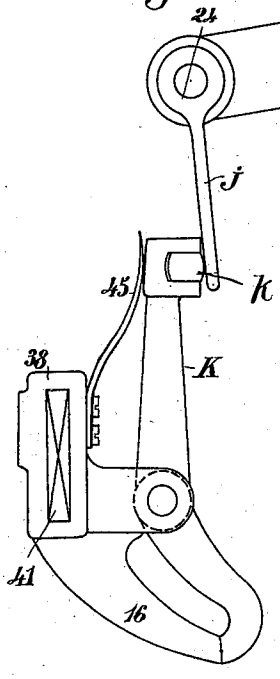


Fig. 5.



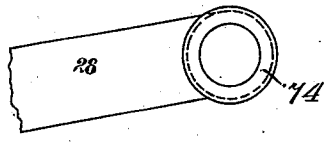
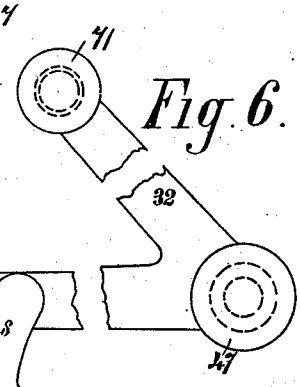


Fig. 6.



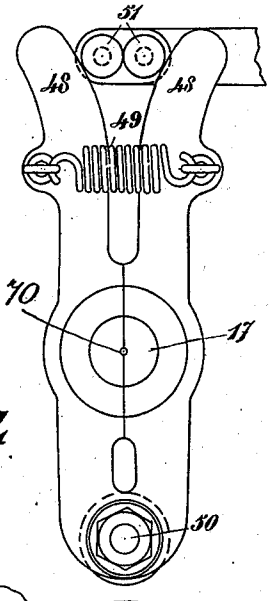
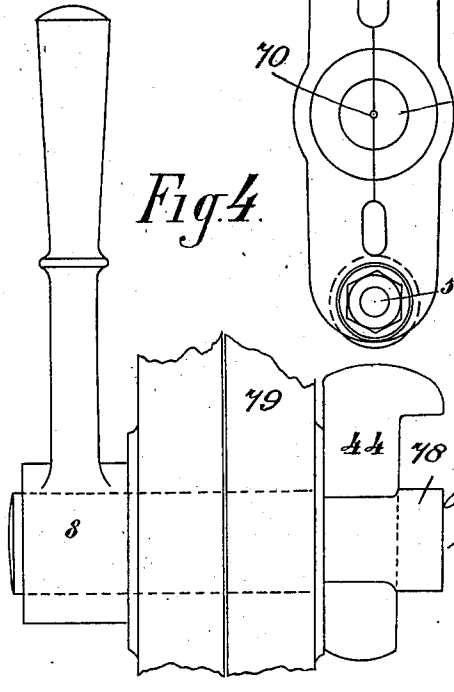


Fig. 4.



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UNITED STATES PATENT OFFICE.

JEAN JAQUES HEILMANN, OF PARIS, FRANCE, ASSIGNOR, BY MESNE ASSIGNMENTS, TO MARC LOUIS DE LA BONNINIÉRE, COMTÈ DE BEAUMONT, AND JONATHAN HOLDER.

MANUFACTURE OF ELECTRODES.

SPECIFICATION forming part of Letters Patent No. 724,287, dated March 31, 1903.

Application filed September 6, 1900. Serial No. 29,141. (No model.)

To all whom it may concern:

Be it known that I, JEAN JAQUES HEILMANN, a citizen of the French Republic, residing at Paris, France, have invented a new and useful Improvement in and Relating to the Electrodes of Accumulators and the Manufacture Thereof, (for which I have made application for Letters Patent in Great Britain, No. 13,656, dated July 30, 1900,) of which the following is a specification.

This invention relates to the art of manufacturing electrodes for accumulators, and more particularly to that class of electrodes comprising a central enveloped core and a coating of active material surrounding said core.

Among the objects of this invention is to provide a machine for manufacturing such electrodes mechanically, automatically coating the core for the proper length with the active material, and automatically cutting off the same in predetermined lengths.

Other objects and advantages more apparent to those skilled in the art to which this invention relates will hereinafter more fully appear, and in order that the said invention may be more fully described reference will be had to the accompanying drawings, wherein—

Figure 1 is a side elevation of a machine embodying my said invention. Fig. 2 is an elevation of the same. Fig. 3 is a plan view of the same, partly in section. Fig. 4 is an enlarged detail view of the device used in fastening the cylinder of the press in position. Fig. 5 is a similar view of the device for gripping the core and advancing the same through the press-cylinder. Fig. 6 is an enlarged view of the device for preventing the emission of the active coating material from the cylinder. Fig. 7 is an enlarged view of the shearing device. Fig. 8 is a view showing the finished electrode. Fig. 9 is an end view of the same; and Fig. 10 is a central vertical section through the press-cylinder, showing the electrode in the process of manufacture.

Referring particularly to Fig. 3, 4 represents the press-cylinder, into which fits the piston 18. This cylinder is provided with a flange 3 at one end adapted to fit into a recess 2, formed in the base portion 40. This base portion 40 is apertured, as at 57, in line with the bore of the cylinder 4. Fitted into this base portion 40 is a plug 5, provided with an exit-orifice 58, communicating with the aperture 57 of the base 40. This plug 5 may be screwed into the base portion 40 or otherwise secured. Entering said base portion 40 from a point directly opposite the plug 5 is a plug 6, provided with an aperture 59, somewhat smaller than the aperture 58, the aperture 58 of the plug 5 and the aperture 59 of the plug 6 being directly in alinement. A cap 60 may be screwed into the portion 40 to close the aperture. Pivoted to this portion 40 by the bolt 56 is a shearing device 7. (Shown in detail in Fig. 7.) This shearing device 7 comprises a pair of arms 61 62, both pivoted upon the bolt 56. These arms or blades 61 62 are provided with cutting edges 63 64, respectively, between which passes the core upon which the active material is deposited. These blades 61 62 are provided with arms 65 66, respectively, extending in opposite directions, and between these arms 65 66 is interposed the coiled tension-spring 49^a, the normal tendency of which is to draw the cutting edges 63 64 of the blades 61 62, respectively, apart. Curved overlapping arms 67 68 are provided upon the arms 61 62, respectively, and between these said arms a roller 69, rotatably mounted upon the bell-crank lever 34, is adapted to pass. The upper arm of this bell-crank lever 34 is provided with a roller or the like adapted to follow the cam-groove in the cam-plate 33. Interposed between this shearing device 7 and the portion 40, carrying the plug 5, is a device for cutting off temporarily the supply of coating material to the surface of the core. Such a device is shown in Fig. 6 of the drawings, comprising a pair of blades 48, pivoted upon the bolt 50. These blades 48 are each provided with a die 17, so arranged and shaped that when said blades are brought together an orifice 70 remains through which passes the core, the size of this aperture 70 being exactly the size of the core, so as to prevent the coating material from adhering upon the core and at

the same time preventing the shearing of the core. Between these blades 48 48 is interposed a coiled tension-spring 49, normally tending to draw said blades together. The ends of these blades 48 48 are divergently curved, and between these divergent ends are adapted to pass a pair of rollers or the like 51, carried upon the lower end of the bell-crank lever 32. This bell-crank lever 32 is pivoted upon the pivot-point 47, secured upon some stationary portion of the machine. The upper end of this bell-crank lever 32 carries a roller or the like 71, adapted to follow the cam-groove in the cam-plate 31. These cam-plates 31 and 33 are securely mounted upon the rotating shaft *i*, geared to the power-shaft 14 through bevel-gears 29 and 30, the parts being so arranged that said shearing device 7 and the device 48 for cutting off the supply of coating material to the core are operated once during each revolution of the shaft *i*. Mounted upon this shaft *i* is a cam 25, upon the cam-surface of which rides the roller 72, carried upon one end of the bell-crank lever 26, pivoted at the point 54. The lower end of this bell-crank lever 26 is adapted to operate a clutch to throw the gear-wheel 23 into and out of engagement with the intermittently-rotating shaft *b* once during each rotation of the shaft *i*. This gear-wheel 23 meshes with a rack 21, carried by the carriage 38, slidingly mounted upon the arm 41 of the machine. A spring 53 is interposed between this carriage and the opposite end of the bar 41, normally tending to return said carriage to its initial position.

Mounted upon the pivots 24 is a plate *j*, having a depending portion adapted to engage the upwardly-extending arm K of the gripping device. This gripping device is pivotally mounted upon the carriage 38 and is shown in detail in Fig. 5. In this view, 16 represents a depending arm carried by the carriage 38, upon which is adapted to bear the gripping-arm K. A spring 45 is carried by the carriage 38, normally tending to retain the upper end of the lever K, carrying the roller *k*, in engagement with the plate *j*. This plate *j* is adapted to be swung back and forth to open and close said gripping-jaws 16 and K by means of an arm 28, connected thereto and carrying at its end the roller 74, adapted to be operated by the cam 27, carried by the shaft *i*. Mounted upon the opposite end of the shaft *b* from which is carried the gear 23 is a ratchet-wheel carrying a double ratchet *r* and *t*. Immediately adjacent said ratchet-wheel *r* is loosely mounted a gear-wheel *c*, meshing with the gear-wheel *d*.

43 is an arm carried by the gear-wheel *c*, carrying the pawl *e*, adapted to engage the ratchet-teeth *t*. Bearing upon the ratchet-teeth *r* upon the opposite side of this wheel is a pawl *f*, carried upon the end of the lever *g*, pivoted at 42 and carrying upon its opposite end a roller adapted to follow the cam-groove *h*, carried by the disk 20, mounted rigidly upon the power-shaft 14. This arrangement will effect a partial rotation of the shaft *b* through the rotation of the shaft 14. Connected rigidly to this gear-wheel *d*, meshing with the gear *c*, is a ratchet-wheel 19. Upon the hub 10 of this wheel 19 is an internally-screw-threaded portion 75, adapted to mesh with the screw-threaded portion 22 of the piston 18 in such manner that when said ratchet-wheel 19 is rotated said piston 18 will be advanced into the cylinder 4. To prevent rotation of the piston 18, a longitudinal slot 22^a is provided throughout the screw-threaded portion 22 thereof. Rotatably mounted upon this hub portion 10 is an arm 39, carrying a pawl 11, engaging the ratchet-teeth upon said ratchet-wheel 19. To this arm 39 is connected a rod 12, which in turn is connected to the crank-pin 13 adjustably connected to the disk 20, carried by the power-shaft 14, whereby the rotation of this shaft 14 will reciprocate the rod 12, thereby advancing the rotation of the ratchet-wheel 19. This rotation of the ratchet-wheel 19 will advance the piston 18 into the cylinder 4, and as the wheel *d* is connected to the wheel 19 and meshes with the gear-wheel *c*, causing the pawl *e* carried thereby to advance the ratchet-wheel *t*, causing the shaft *b* and the gear-wheel 23 to be thrown into engagement therewith, thus drawing back the carriage 38. In the meantime the gripping device 16 is thrown into engagement with the core of the electrode, drawing the same through the coating-cylinder. When the advancing of the piston into the cylinder ceases after the shaft 14 has rotated one-half a revolution, the cam-groove *h*, into which rides the end of the lever *g*, carrying the ratchet-pawl *f*, engaging the ratchet-teeth *r*, will be thrown into operation, advancing said carriage still farther. The purpose of this supplemental advancement will be hereinafter more fully explained in describing the operation of the machine.

In order to enable the rapid removal of an empty cylinder 4 and the replacing of a filled one, flanges may be provided upon the end of each cylinder, a bolt being passed through a perforation in said flange and through the flanged portion 79 of the portion 40. One end of this bolt is screw-threaded to receive the threaded handle 8, and the other end is transversely slotted to receive the cotter 44. When the cylinder is placed in position, the bolt 78 is passed through the flanges, the cotter is driven in, and the parts finally tightened by turning the handle 8.

In Figs. 8, 9, and 10 is shown in diagram the method or process of forming the electrodes. In these views, 4 represents the cylinder, filled with the coating material C in a plastic or semifluid condition. The bare core A enters the cylinder near the bottom thereof through the plug 6 and passes through the plug 5, having an aperture therein the size of the outside diameter of the finished electrode.

Into this cylinder is adapted to be forced a plunger or piston 18, which forces the fluid out through the aperture in the plug 5, forming a coating B upon the outside of the electrode. These electrodes are preferably manufactured in lengths such as shown in Fig. 8, a bare or uncoated portion being left upon each end of the electrode to allow the same to be secured in place in the accumulator, such as by soldering or otherwise. To form these uncoated portions upon the core, a device (shown in Fig. 6 of the drawings) is provided immediately adjacent the orifice in the plug 5, adapted to close upon the core and prevent the flow of the coating material upon the core, after which the shearing mechanism (shown in Fig. 7) is closed upon the core to cut the same off into the required length. In this manner the electrodes may be cut into suitable lengths, the length being varied at will through the adjustment of the parts.

The operation of the device is as follows: The cylinder 4 having been placed in position filled with the plastic coating medium and the electric motor *m* or other suitable source of power being connected to the shaft 14 and the core upon which the material is to be coated being passed through the apertured plugs 5 and 6, the ratchet-wheel 19, connected to said shaft 14 through the connecting-rod 12, will be partially rotated, advancing the piston 18 into the cylinder 4. At the same time the shaft *b* will be rotated through the ratchet-wheel *t*, upon which bears the pawl *e*, carried by the gear-wheel *c*, meshing with the gear-wheel *d*, connected with the ratchet-wheel 19. As the shaft 14 rotates the shaft *i* connected thereto will also rotate, causing the cam 27 carried thereby to swing the plate *j* to one side, throwing the gripping device 16 into operation to engage the core. At the same time the cam 25 will operate the bell-crank lever 26 to throw the clutch 73 into engagement with the shaft *b*. This will cause the carriage 38 to be drawn back, and as the gripping device will now be in engagement with the core of the electrode the same will be drawn through the coating-cylinder. This action takes place simultaneously with the advance of the piston into the cylinder 4. After the piston ceases to advance into the cylinder by reason of the crank 13 reaching its dead-center the advancement of the carriage is continued by the lever *g*, operated through the cam *h* and carrying at its opposite end the pawl *f*, engaging with the ratchet *r* upon the shaft *b*. Before this supplemental movement ceases the lever 32, having its end bearing upon the cam-surface of the cam 31, will be thrown into action, throwing the rollers 51 between the outwardly-curved ends of the blades 48 48, closing said blades upon the core. This will cut off the coating material from the core. After the core has been drawn out for a predetermined distance the lever 34 is operated by the cam 33, the roller 69 carried thereby wedging between the converging arms 61 62 of the shearing mechanism, closing said blades upon the core, severing the electrode thus formed. The continued operation of the parts will open the shearing mechanism and the device for cutting off the supply of coating medium from the core. The gripping device 16 will be released from the core by the plate *j* being restored to its original position through the cam 25, and the carriage 38 is allowed to return to its original position under the influence of the spring 53 by reason of the clutch 35 being thrown out of engagement with the gear-wheel 23 through the bell-crank lever 26 following the cam 25, the parts now being in position to repeat the foregoing cycle of evolutions.

If desired, an endless band 36 may be provided, which removes the finished electrodes to any suitable place for undergoing the necessary subsequent treatment.

Various details may be omitted or varied to suit varying requirements in the herein-before-described machine, as while I have shown and described my invention as embodied in but one form it will be understood that I do not limit myself to such form, as many changes and modifications may be made in the said machine, which changes and modifications could be effected without departing from the spirit of the said invention.

I claim—

1. In a machine of the character described, the combination of a cylinder, means for passing a core through said cylinder, means for coating active material upon said core and means for shearing off electrodes thus formed into predetermined lengths.

2. In a machine of the character described, the combination of a cylinder, a core adapted to pass through said cylinder, means for advancing said core through said cylinder, means for coating active material upon said core and means for shearing off electrodes thus formed into predetermined lengths.

3. In a machine of the character described, the combination of a cylinder, means for passing a core through said cylinder, means for coating active material upon said core, means for temporarily preventing the deposit of material upon said core at predetermined intervals and means for shaving off electrodes thus formed into predetermined lengths.

4. In a machine of the character described, the combination of a cylinder, a core adapted to be passed through said cylinder, means carried by said cylinder for expressing active material contained by said cylinder upon said core, means for advancing said core through said cylinder in predetermined lengths, means for preventing the deposit of coating material upon said core at predetermined intervals and means for cutting off said electrodes in predetermined lengths.

5. In a machine of the character described, the combination of a coating-cylinder, means contained within said cylinder for expressing

the material from said cylinder at predetermined intervals, a core adapted to be passed through said cylinders, means for molding said material around said core, means for advancing said core through said cylinder in predetermined lengths, means for preventing the deposit of material upon said core at predetermined intervals and means for cutting off the electrodes thus formed into predetermined lengths.

6. In a machine of the character described, the combination of a coating-cylinder, means contained within said cylinder for expressing the material from said cylinder at predetermined intervals, a core adapted to be passed through said cylinder, means for molding said material around said core, means for advancing said core through said cylinder in predetermined lengths, means for preventing the deposit of material upon said core at predetermined intervals, means for imparting a supplemental movement to said core and means for cutting off the electrodes thus formed into predetermined lengths.

7. In a machine of the character described, the combination with the coating-cylinder, means for detachably securing said cylinder in position, means contained within said cylinder for expressing the coating material contained therein at predetermined intervals, a core adapted to pass through said cylinder, means for molding said material thus expressed about said core, means for advancing said core in predetermined lengths, means for preventing the deposit of coating material upon said core at predetermined intervals, means for imparting a supplemental movement to said core, and means for cutting off the electrodes thus formed into predetermined lengths.

8. In a machine of the character described, the combination with the coating-cylinder, means for detachably securing said cylinder in position, means contained within said cylinder for expressing the coating material contained therein at predetermined intervals, a core adapted to pass through said cylinder, means for molding said material thus expressed about said core, means connected to and adapted to operate with said expressing means, means for advancing said core in predetermined lengths, means for preventing the deposit of coating material upon said core at predetermined intervals, means for imparting a supplemental movement to said core, and means for cutting off the electrodes thus formed into predetermined lengths.

9. In a machine of the character described, the combination of an expressing-cylinder adapted to contain the coating material, a core adapted to be passed through said cylinder, means contained by said cylinder for forming said coating material about said core, a piston carried by said cylinder, means for advancing said piston a uniform distance into said cylinder at predetermined intervals, means connected to said piston, advancing mechanism for advancing said core through said cylinder simultaneously with the movement of said piston, means for preventing the deposit of material upon said core after the movement of said piston has ceased, supplemental means for advancing said core, and means for cutting off the electrodes thus formed in uniform lengths.

10. In a machine of the character described, the combination of an expressing-cylinder adapted to contain the coating material, a core adapted to be passed through said cylinder, means contained by said cylinder for forming said coating material about said core, a piston carried by said cylinder, adjustable means for advancing said piston a uniform distance into said cylinder at predetermined intervals, means connected to said piston, advancing mechanism for advancing said core through said cylinder simultaneously with the movement of said piston, means for preventing the deposit of material upon said core after the movement of said piston has ceased, supplemental means for advancing said core, and means for cutting off the electrodes thus formed in uniform lengths.

In witness whereof I subscribe my signature in presence of two witnesses.

JEAN JAQUES HEILMANN.

Witnesses:
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HENRY DANTERY.