(Model.) 5 Sheets—Sheet 1.

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ELECTRICAL APPARATUS FOR MEDICAL PURPOSES.

No. 259,691. Patented June 20, 1882.

Fig. 1.

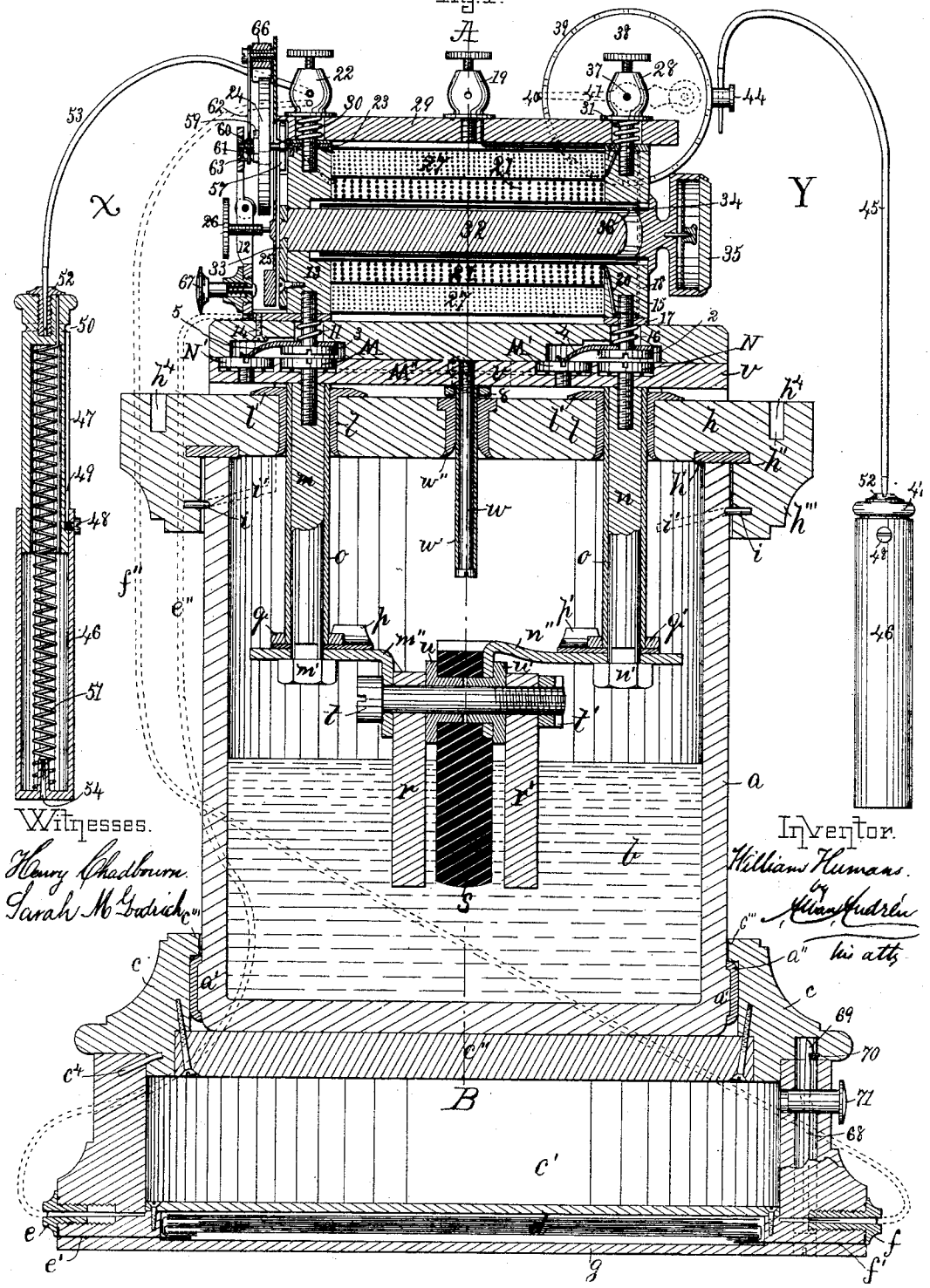

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Fig. 10.

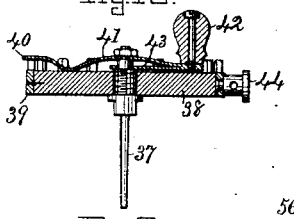


Fig. 8

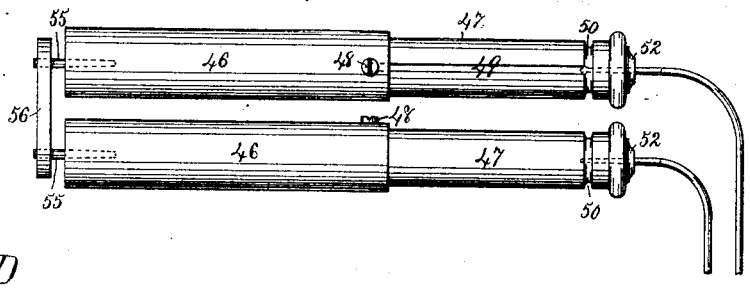


Fig. 9.

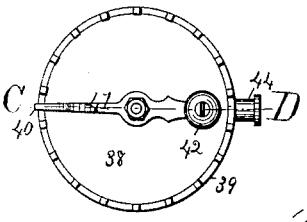
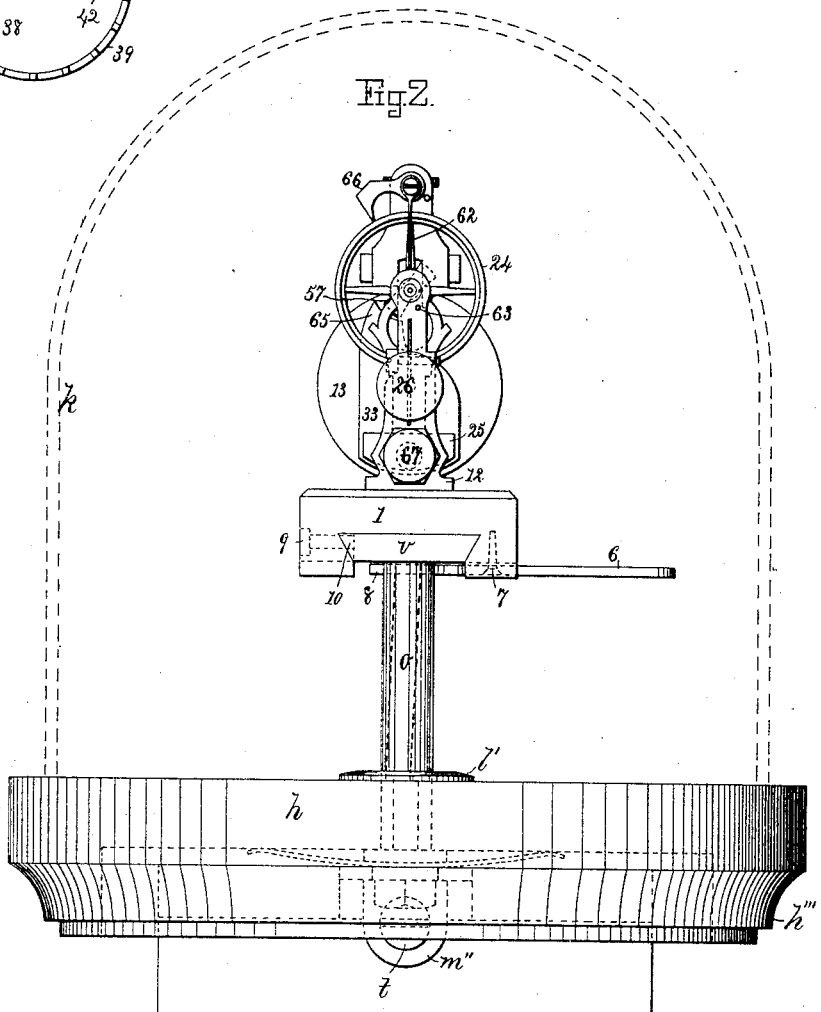


Fig. 7.



Witnesses.
Henry Chadbourn.
Sarah M. Goodrich

Inventor.
William Humans.
by Albert Andrews his atty.

(Model.) 5 Sheets—Sheet 3.

W. HUMANS.

ELECTRICAL APPARATUS FOR MEDICAL PURPOSES.

No. 259,691. Patented June 20, 1882.

Fig. 3.

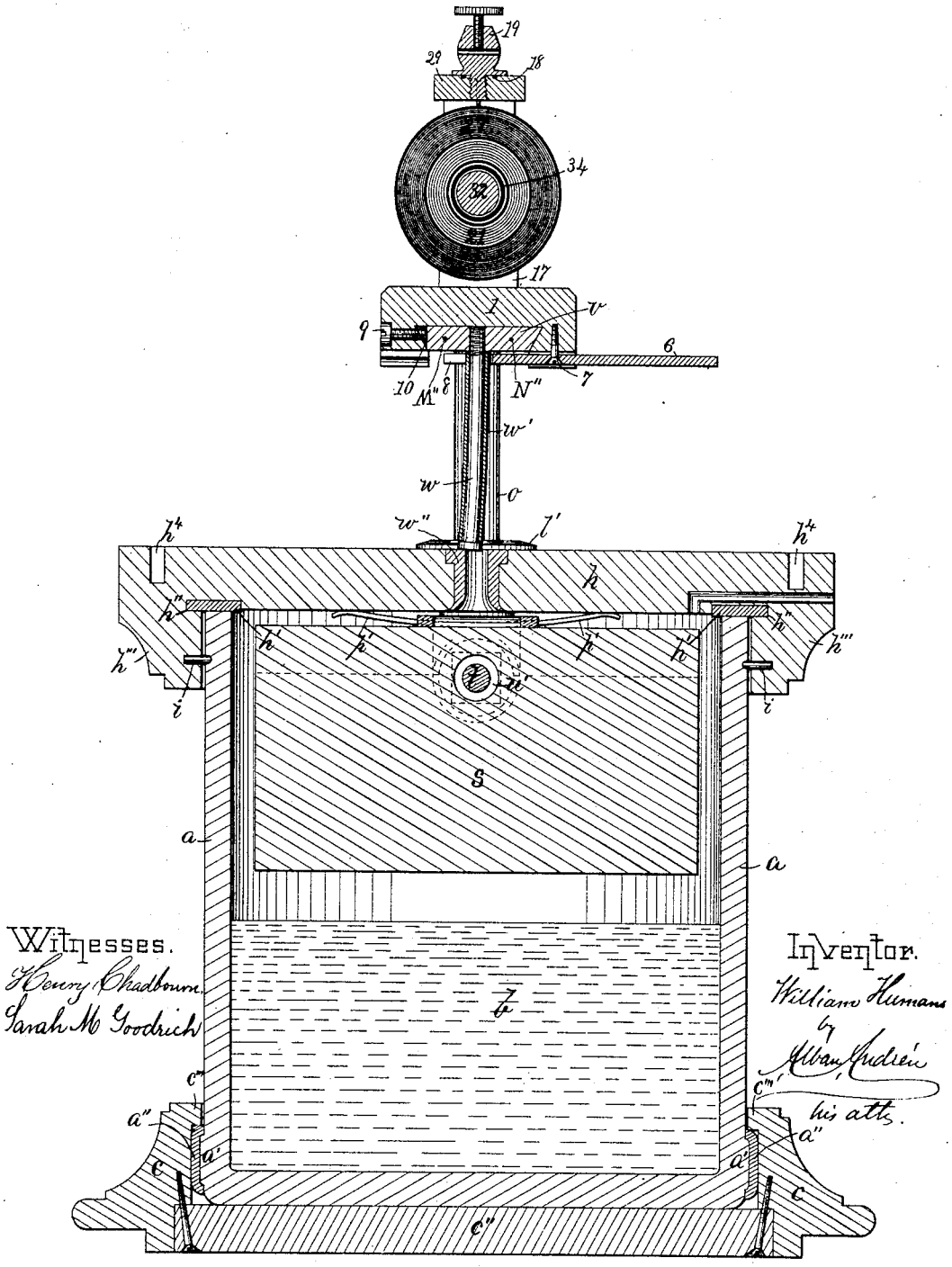


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Fig. 5.

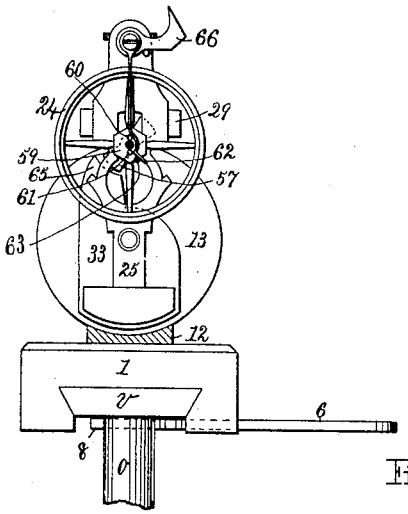


Fig. 4

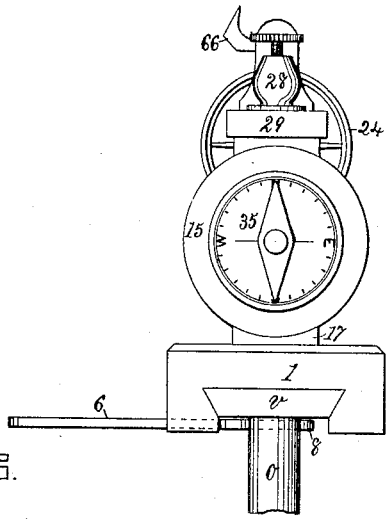


Fig. 6.

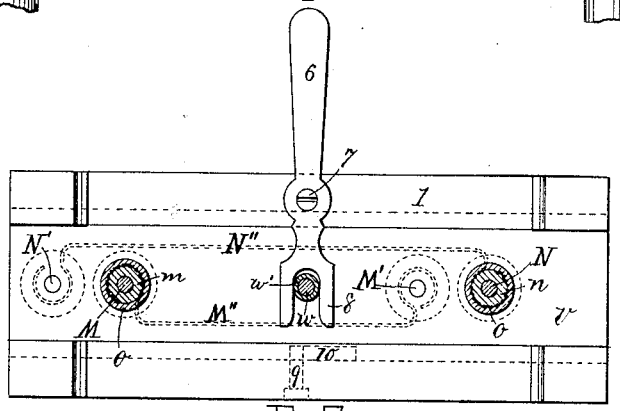
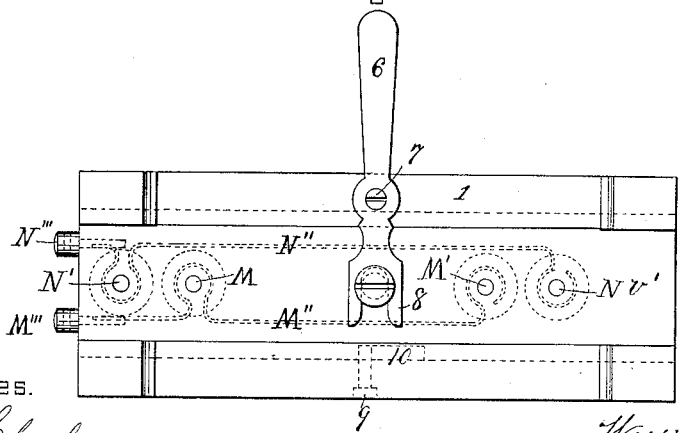


Fig. 7.



Witnesses.

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(Model.) 5 Sheets—Sheet 5.

W. HUMANS.

ELECTRICAL APPARATUS FOR MEDICAL PURPOSES.

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Fig. 12.

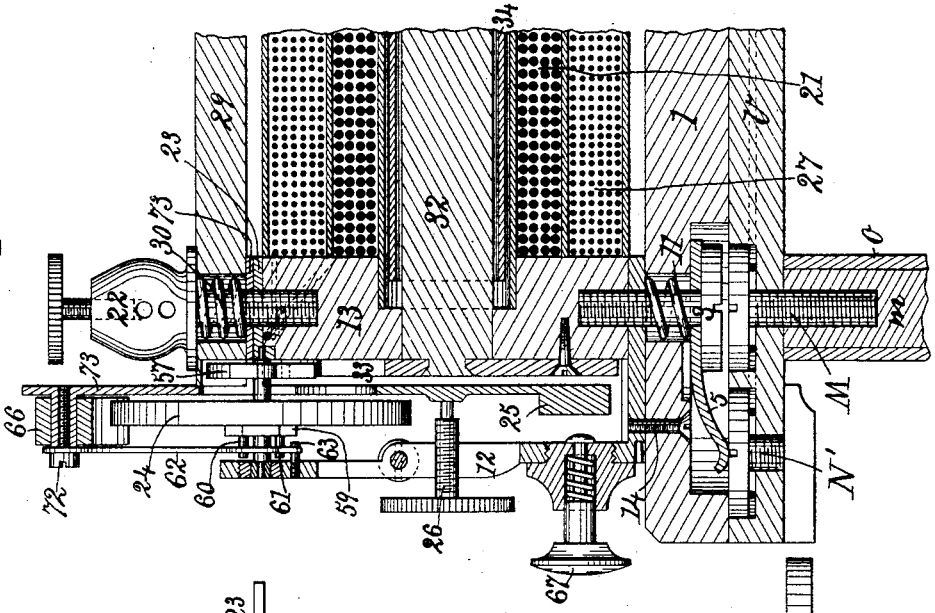

Fig. 13.

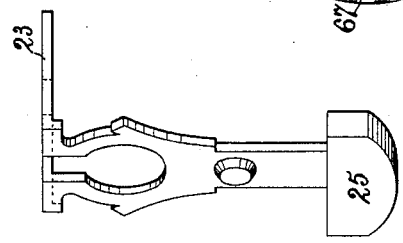

Fig. 11.

Witnesses.

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by Munn & Co

his attys.

UNITED STATES PATENT OFFICE.

WILLIAM HUMANS, OF CAMBRIDGEPORT, MASSACHUSETTS.

ELECTRICAL APPARATUS FOR MEDICAL PURPOSES.

SPECIFICATION forming part of Letters Patent No. 259,691, dated June 20, 1882.

Application filed January 9, 1882. (Model.)

To all whom it may concern:

Be it known that I, WILLIAM HUMANS, a citizen of the Dominion of Canada, now residing at Cambridgeport, in the county of Middlesex and State of Massachusetts, have invented certain new and useful Improvements in Electrical Apparatus; and I do hereby declare that the same are fully described in the following specification and illustrated in the accompanying drawings.

This invention relates to improvements in electrical apparatus for medical purposes, and it is carried out as follows, reference being had to the accompanying drawings, on which—

Figure 1 represents a central longitudinal section of the said apparatus. Fig. 2 represents an end elevation, seen from X in Fig. 1. Fig. 3 represents a cross-section on the line A B, shown in Fig. 1. Fig. 4 represents an end view of the shocking-machine as seen from Y in Fig. 1. Fig. 5 represents an end view similar to the one shown in Fig. 2, with the circuit-closer removed. Fig. 6 represents a bottom view of the base of the shocking-machine. Fig. 7 represents a bottom view of the base of the shocking-machine, with an auxiliary slide inserted, so that it can be used away from the battery. Fig. 8 represents a side elevation of the handles as drawn out and connected together with a yoke. Fig. 9 is a plan view of the detachable interrupter; and Fig. 10 represents a cross-section on the line C D, shown in Fig. 9. Fig. 11 represents an enlarged end view as seen from X in Fig. 1. Fig. 12 is an enlarged sectional view of a part of the shocking apparatus, and Fig. 13 is a detailed view of the vibratory armature.

Similar letters refer to similar parts wherever they occur on the different parts of the drawings.

a is the glass jar, containing the bichromate acid *b* or other suitable acid. The lower end of the jar is provided with an annular projection, *a'*, cast in one piece with the jar, around which is fitted the india-rubber band *a''*, which rests against the inside of the top ring, *c*, of the battery-box *c'*, so as to prevent the contraction of the ring *c* from breaking the glass jar *a*. The ring *c* has a detachable plate, *c''*, to enable the jar *a* to be inserted through the ring *c* from below until the india-rubber band *a''* comes to rest against the inwardly-projecting annular lip *c'''* of the ring *c*, as shown in Fig. 1, after which the plate *c''* is secured in position by means of screws or nails, or otherwise, as shown in said Fig. 1, to hold the battery-jar *a* in its place.

d is the condenser in the bottom of the box *c'*, which condenser is composed of alternate sheets of tin-foil and paraffine-paper in the usual manner of making condensers, and is provided with cups *e* and *f* and connections *e'* *f'* from said cups *e f* to the condenser *d* and connecting-wires *e'' f''*, which may be connected to the shocking-machine, as shown in dotted lines in Fig. 1.

g is the bottom board of the box *c'*.

h is the top board or cover of the glass jar *a*, and serves to support the shocking-machine, and is provided on its under side with a rubber packing-ring, *h'*, resting against the top of glass jar *a* to make a close-fitting joint between the jar and cover. The outer edge of the ring *h'* projects into an annular groove, *h''*, in the cover *h*, so as to prevent it from dropping out when said cover is removed.

The cover *h* is provided with a downward-projecting flange, *h'''*, having inwardly-projecting pins *i i*, adapted to fit into inclined grooves *i' i'* on the outside of the glass jar, to secure the cover and glass jar together and to detach them easily from each other when desired to put the liquid in said jar *a*. On the top of the cover *h* is a groove, *h*[4], in which the lower edge of the glass shade *k* (shown in dotted lines in Fig. 2) is made to rest loosely, such glass shade being made to cover and inclose the entire shocking apparatus, so as to keep it clean and free from dust and dirt when not in use. In operating the machine the glass shade is to be removed.

To the cover *h* are secured the hard-rubber tubes *l l*, having flanges *l' l'* in their upper ends and swelled out in their lower ends, as shown in Fig. 1, to prevent their getting detached from the cover *h*. Through the tubes *l l* the metal posts *m n* are vertically adjustable, said parts being covered with hard-rubber shields *o o*, to prevent corrosion of said parts when fitted tightly thereon.

In case the cover *h* is made of metal, the shields *o o*, as well as the tubes *l l*, serve as insulators between the posts and cover.

The lower end of the post *m* is screw-threaded

and provided with a nut, m', by means of which the metal bracket m'' and spring p are secured to the lower end of said post. In a similar manner the lower end of the post n is screw-threaded and provided with a nut, n', by means of which the metal bracket n'' and spring p' are secured to the lower end of said post n.

The springs p p', secured respectively to the brackets m'' n'', serve for the purpose of preventing that portion of the apparatus which is above the cover h from tipping over sidewise when it is raised to the position shown in Fig. 3, and held up by the spring-rod w, with the battery-plates raised out of the liquid in the jar a.

In case the shields o o are dispensed with on the posts m n, the soft-rubber washers q q' serve as valves to prevent the acid-gas from passing up through the space between said posts and each of the rubber tubes l l when the metal and carbon elements are raised out of the acid. r and r' are the zinc plates, and s is the carbon. These are secured to the brackets m'' n'' by means of the single screw t and check-nut t', as follows: The screw t passes through the bracket m'' and zinc plate r, and then passes through insulated hard-rubber bushings u w', which serve to insulate the zincs r r' from the carbon s, as shown. The outer end of the screw t is screw-threaded and screwed through the zinc plate r', and secured by the check-nut t', as shown, and in this manner the bracket m'' is in metallic connection with both of the zinc plates r r', and insulated from the carbon by the bushings u w'. The bracket n'' is in contact with the carbon s, and insulated from the zinc plate r' by means of the hard-rubber bushing w', by which arrangement the positive and negative poles of the battery are properly separated.

v is the pole-changing board, to the center of which is secured the downwardly-projecting spring-rod w, covered with a shield, w', of hard rubber, to keep the spring-rod w from corroding. The spring-rod w is made to pass through a metal bushing, w'', secured in the cover h, as shown in Fig. 1, in a similar manner as the bushings l l are secured. The spring-rod w is slightly bent to one side, as shown in Fig. 3, so that when the shocking apparatus is raised from the cover h, and the zincs r r' and carbon s raised with it out of the acid, it will serve as a stop or catch to keep the whole in such raised position until the apparatus is again needed for use, which may be done by simply pushing the lower end of spring-rod w into the opening in the bushing w'', when the shocking apparatus drops down onto the cover h by its own gravity, and the carbon and zincs at the same time descend into the acid to the position shown in Fig. 1.

The pole-changing board v is secured to the posts m and n by means of the set-screws M N, as shown in Figs. 1, 6, and 7.

M′ and N′ are set-screws secured to the pole-changing board v, and connected respectively to the set-screws M N by means of wires M″ N″, as shown in Figs. 6 and 7.

1 is the longitudinally-adjustable base, to which the shocking apparatus is secured, which base has a pair of set-screws, 2 and 3, as shown in Fig. 1. The set-screw 2 is provided with a metallic spring, 4, the lower end of which is in metallic connection with the set-screw M′, and by means of the wire M″ connected with the screw M and post m. A similar spring, 5, is connected with set-screw 3, the lower end of which spring is in metallic connection with the set-screw N′, and by means of the wire N″ connected with the screw N and post n, as shown. By sliding the base 1, to which the coils are attached, in such a manner that the lower end of spring 4 comes in contact with set-screw N and the lower end of spring 5 in contact with set-screw M, the poles of the apparatus are changed to reverse the positive and negative current, respectively, from one hand to the other, and this may be done by taking direct hold of the base 1, or by means of the switch-lever 6, movable on fulcrum 7, and having a forked end, 8, embracing the upper end of the spring-bar w, as shown in Figs. 6 and 7.

9 is a set-screw passing through the side of the base 1, and having its inner end projecting into a slot, 10, in the pole-changing board v, to serve as a stop to regulate the distance of the motion of the adjustment of the base 1 from one pole to another.

If it is desired to use the apparatus without the pole-changer, one of the boards v or 1 may be dispensed with and the coils made rigid to the posts m and n by means of screwing the said posts into the coil-heads. The set-screw 3 passes up through the base 1, holding the spiral spring 11 to connect the spring 5 to the circuit-breaker bracket 12, and passes up into the head 13 for the coils, and in this manner one single screw, 3, serves to hold the spring 5, spiral spring 11, and circuit-breaker bracket 12 together, as well as securing one end of the base 1 to the head 13.

14 is a screw or steady-pin to keep the bracket 12 in position.

The upper end of the screw 2 is secured to the opposite head, 15, and it is surrounded by a coiled spring, 16, to make a proper connection between the spring 4 and the intermediate metallic disk, 17, which is in contact with the primary coil of the apparatus. From the plate 17, up through the head 15, leads a wire, 18, to the middle cup, 19, for giving primary shocks.

20 is one of the termini of the primary coil 21 in connection to the wire 18 and cup 19, the other terminus being connected with the cup 22, armature 23 25, and circuit-breaker of the wheel-interrupter 24, which wheel and armature-interrupter 25 are made to operate at the same time; but they may be made each to operate separately by releasing the screw 26 from contact with the armature 25.

27 is the secondary coil, surrounding the primary coil 21. One end of said secondary coil goes to the cup 28, which has an interrupter worked by hand attached to it. The other end of the secondary coil 27 is connected to the armature 23 25 and cup 22. The armature-piece 23 25 has its lower part, 25, made of iron. Its upper part, 23, is made of brass, and is bent in its upper end at a right angle, where it is held by the screw-cup 22, as shown in Figs. 12 and 13.

29 is the top board, secured to the heads of the coils for the purpose of holding the middle cup, 19, and as many more cups as may be placed thereon.

30 is a coiled spring on the screw-threaded shank of the cup 22 to connect the armature-piece 23 to said cup, so as to make a sure connection, and 31 is a similar coiled spring to connect the cup 28 to one end of the secondary coil 27.

32 is the central soft-iron core, secured in one end firmly to the head 13 by means of the plate 33, at a right angle to the core 32, and a suitable screw going into the head 13, as shown in Fig. 1. The plate 33 is for the purpose of attracting the armature 25 and breaking the circuit, which operation renders the shock.

34 is a shield surrounding the magnet, as usual, and provided in its outer end with a compass, 35, which compass, when the shield is removed from the core 32, is used to ascertain the condition of the battery.

36 is a perforation in the shield 34 to allow the air to pass out when the shield is pressed into position shown in Fig. 1. The hand-interrupter shown in Figs. 9 and 10 in detail, and connected to cup 28 of the secondary coil in Fig. 1, is composed of metal shank 37, adapted to be attached to any of the screw-cups of the shocking apparatus. The upper end of the metal shank 37 is secured to the center of the hard-rubber disk 38, and provided with a metal toothed ring, 39, having teeth on its circumference for the purpose of making and breaking the circuit as the outer end, 40, of the spring-lever 41 passes over it by the manipulation of the lever-handle 42, as shown in Fig. 10. The spring-lever 41 is provided on its under side with a metal spring, 43, so as to insure metallic connection between the spring-lever 41 and the central metallic shank, 37.

To the toothed ring 39 is attached a screw-cup, 44, for connecting a wire, 45, leading to one of the handles of the shocking apparatus, as shown in Fig. 1.

The handles of the machine are each made as follows: Each is composed of a metal sleeve, 46, and wooden sleeve 47, adapted to be inclosed within the metal sleeve 46, as shown in right-hand side of Fig. 1, and held in such position by means of a screw, 48, passing through metal sleeve 46 and into a groove, 49, made lengthwise on the wooden sleeve 47, and terminating at the top as an annular groove, 50, communicating with the longitudinal groove 49, into which the inner end of the screw 48 may be locked by pressing the wooden tube 47 into the metal tube 46, and when pressed fully together, as shown in right-hand side of Fig. 1, they may be locked together by turning the metal sleeve 46 slightly around the wooden sleeve 47, causing the screw 48 to rest in the annular locking-groove 50.

Within the handle is located a spiral spring, 51, resting against the bottom of metal sleeve 46, and connected in its upper end to a screw-cup, 52, by means of which the wire 53 is connected to a cup, 22, which answers for the primary and secondary shock. In the bottom of the metal sleeve 46 is a split tube, 54, adapted to receive firmly the peg 55 of the yoke 56, made of insulating material, if desired, to connect both handles together, as shown in Fig. 8, if desired to take the shock in one hand. The upper screw cup, 52, in the wooden tube 47 is made split in the same manner as described in relation to lower tube, 54.

The utility of the wooden piston 47 of the handles is to protect the operator from getting a shock when handing the handles to the patient, and also answers the same purpose as the insulated yoke 56 to prevent the current from short-circuiting when both handles are held in one hand and the enlarged outer ends of the wooden handles are pressed together.

The apparatus is provided with a revolving armature, 57, and fly-wheel 24, and a disk, 59, provided with two pins, 60 and 61, opposite each other, which pins are for the purpose of operating the curved spring 62 upon a pin, 63, in the bracket 12, which bracket takes one terminus of the battery. While the pin 60 passes round the curve in the spring 62 it holds the lower end of said spring off of the pin 63 in the bracket 12, and by that means the current is broken as soon as the velocity of the wheel 24 brings round the opposite end of the armature 57 within the attractive field of the curved magnet 65, which is the upper end of the plate 33.

66 is a hinged pawl, located above the wheel 24 on a fulcrum-pin, 72, secured to the support 73, the lower end of which is bent and in contact with armature-piece 23, as shown in Fig. 12. The pawl 66 may be swung down to hold the wheel 24 in a rigid position, for which purpose a hole is made in the circumference of said wheel for the pawl to drop into for the purpose of disconnecting the revolving armature from the vibrating armature; but both may be operated together to increase the power of the shock.

67 is a press-knob on the lower end of the bracket 12, the inner end of the spindle of which knob may be brought in contact with the vibrating armature 25 for the purpose of arresting the armature 25, and while arrested the current passes through the press-knob 67, which makes a close circuit. The press-knob 67 also acts as an interrupter when manipulated upon. When the inner end of the press-knob 67 is brought in contact with armature

25 the current is cut off from the handles held by the patient. The vibratory armature 25 and the revolving armature 57 on the shaft of the fly-wheel 24 increase the volume of the shock, and are both connected together and acting in the primary circuit in order to increase the volume of shock in secondary circuit.

When I use the condenser *d*, I use it in connection with a secondary coil, 27, of high tension for making experiments with Geisler tubes or for other similar experiments.

v' in Fig. 7 represents a slip, which is a pole-changer, and is intended to be used when the shocking-machine is removed from the cover of the battery, for which purpose the wire N″ from the screw N, after leading to the cup N′, is made to terminate in a cup, N‴, and the wire M″ from the screw M′, after leading to the cup M, is made to terminate in a cup, M‴, which cups M‴ and N‴ are to be connected to the battery, if located at any distance away from the shocking-machine.

The base-ring *c* of the battery-jar is hinged to the box *c'* by means of one single pin, c^4, (shown in Fig. 1,) diametrically opposite to which is a locking device composed of a vertical rod, 68, screwed into the bottom of the box *c'*, and having a catch, 69, adapted to lock on a staple or projection, 70, in the base-ring *c*.

71 is a laterally-adjustable press-knob, having an inclined slot on its side, (shown in dotted lines in Fig. 1,) the upper and outer edge of which slot presses against the spring-bar 69 when the knob 71 is pressed in to release the catch 69 from the projection 70.

The general circuit of the machine is as follows: from carbon S to post *n* and spring 4, to primary coil 21, and through bracket 73, spring 62, pin 63, through press-knob bracket 12, part of the current passing through armature-piece 23, set-screw 26, bracket 12, where the currents connect and flow down through press-knob bracket 12, spring 5, post *m*, and zincs *r r'*, by which the circuit is completed.

What I wish to secure by Letters Patent, and claim, is—

1. In an electrical apparatus, the combination of coils 21 27, base-board 1, pole-changer board *v*, spring-rod *w*, posts *m n*, springs *p p'*, and battery-plates *r r' s*, as and for the purpose set forth.

2. In combination, the sliding base-board 1, carrying the coils 21 27, and having screws 2 3 and springs 4 5, adapted to connect respectively with the buttons M N′ and M′ N, so as to change the direction of current from one handle to the other connected to the terminals of coil 27 by sliding the said base-board 1 and its springs 4 5, as set forth.

3. In an electrical apparatus, the combination of the battery-plates *r r' s*, posts *m n*, coil 21, core 32, armature 57, wheel 24, spring-lever 62, pin 63, vibrating rheotome 25, and circuit-connection 26, as and for the purpose set forth.

4. In an electrical apparatus, the primary coil 21 and secondary coil 27, having one end of their wires connected to the screw-cup 22, in combination with the opposite end of secondary coil 27, connected to screw-cup 28, and opposite end of primary coil 21, connected to spring 4 and battery, as set forth.

5. The electrode-handles as composed of metal shield 46, wooden shield 47, and internal spring, 51, as set forth.

6. In combination with cup 28, board 29, coils 21 and 27, the hand-interrupter as composed of hard-rubber disk 38, metal toothed ring 39, spring-lever 41, handle 42, spring 43, and shank 37, as described.

7. In combination, the battery-plates *r r' s*, brackets *m″ n″*, posts *m n*, springs *p p'*, cover *h*, spring *w*, pole-changing board *v*, coils 21 27, and electrical connections, as set forth.

8. In combination with a pair of electrode-handles 46, the insulated yoke 56 and pins 55 55, as described.

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

WILLIAM HUMANS.

Witnesses:
ALBAN ANDRÉN,
HENRY CHADBOURN.