C. L. VAN TENAC.

DRY ELECTRIC PILES.

No. 184,932. Patented Nov. 28, 1876.

FIG. 3.

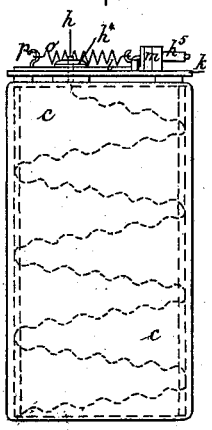


FIG. 4.

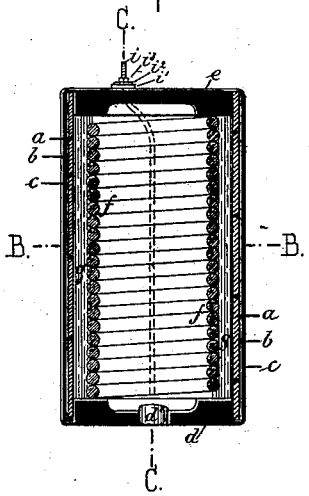


FIG. 6.

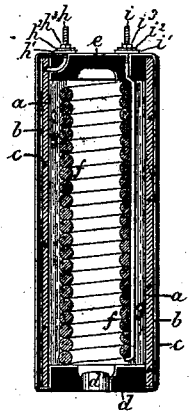


FIG. 1.

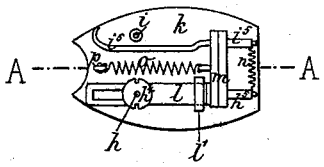


FIG. 5.

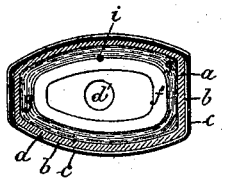
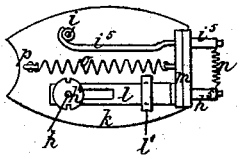


FIG. 2.



Witness R. H. Brandon
Witness D. H. Brandon
69 rue Lafayette Paris.

Inventor.
Charles Louis Van Tenac

THE GRAPHIC CO. N.Y.

UNITED STATES PATENT OFFICE.

CHARLES LOUIS VAN TENAC, OF PARIS, FRANCE, ASSIGNOR TO ALEXANDER M. HAYS, OF NEW YORK, N. Y.

IMPROVEMENT IN DRY ELECTRIC PILES.

Specification forming part of Letters Patent No. **184,932**, dated November 28, 1876; application filed October 24, 1876.

To all whom it may concern:

Be it known that I, CHARLES LOUIS VAN TENAC, engineer, of No. 1 Rue Lafitte, Paris, France, have invented certain new and useful Improvements in Dry Electric Piles; and I do hereby declare that the following is a full and exact description thereof, reference being made to the accompanying drawings, and the letters of reference marked thereon.

My new pile consists in an outer shell in chloride of silver, within which I place a coil of zinc wire, or a perforated sheet of zinc, reserving a certain space between these two elements, which I fill with blotting-paper, sawdust, sand, or other absorbent material. For the purpose of better insulation, I cover this outer shell with one or two rounds of paper, preferably pasted thereto, and over the paper I pass a tube of soft rubber or other insulating material. I close the two ends with hard-rubber covers, or other hard insulating material, in one of which I make a small opening, which I close hermetically by means of a plug, and through the other I pass two small wires, one of which is the continuation of an undulated silver or platinum wire, incorporated in the chloride-of-silver shell, in which it is wound from bottom to top, and the other constitutes the upper extremity of a similar wire, which runs up from the bottom of the zinc element, in contact with each individual coil of which the latter is composed. Both protrude to a certain distance outside the hard-rubber cover, and are, when required, connected together by a small sliding mechanism attached to the cover aforesaid, and as hereafter described.

The exciting liquid which I make use of is chloride of zinc at from five to ten per cent., or a saturated solution of marine salt. For the purpose of charging my pile after having withdrawn the plug aforesaid, I fill the battery therewith, allowing it to remain therein until the absorbing material aforementioned has been entirely saturated, and then pour out all the remaining liquid and reinsert the plug.

My new pile can be made of any shape or size within reasonable limits; however, in order to produce an available practical result, the inner surface of the chloride-of-silver case should not be less than six square inches, and of that size it is capable of reddening a platinum coil for industrial or other purposes. As it is only brought into action when the circuit is closed, it is of very long duration in consequence of such intermittent action. For instance, it can be made available thirty thousand times, and even more, for producing a light, as it is hereafter explained, without its being necessary to recharge it with the exciting liquid.

In the accompanying drawing I have represented one of my new piles, Figure 1 being a plan thereof with the circuit open; Fig. 2, a similar plan with the circuit closed; Fig. 3, a lateral elevation; Fig. 4, a similar elevation, in section, through A A, Fig. 1; Fig. 5, a plan, in section, through B B, Fig. 4; and Fig. 6, a front elevation, in section, through C C, Fig. 4.

In these figures, *a* is the outer shell, in chloride of silver; *b*, its first insulating-envelope, in paper; and *c*, its outer insulating-envelope, in soft rubber; *d*, the lower cover with its plug *d'*, and *e* the upper cover, both of which are sealed hermetically in their places by means of gutta-percha, cement, or other similar and appropriate material. *f* is the inner element, consisting in a coil of zinc wire placed centrally with the chloride-of-silver case *a*, and separated therefrom by an absorbent material, such as blotting-paper, sawdust, sand, or similar product, *g*, inserted in the space existing between *a* and *f*. *h* and *i* are the poles passing through the cover *e*, the one *h* being connected with the chloride case *a*, and the one *i* with the zinc coil, as shown in Fig. 6. In order to intercept the passage of the liquid where these wires *h* and *i* pass through the cap, I place around each end, on the upper surface of the cap, soft-rubber washers h^1 and i^1, and on these rubber washers metallic washers h^2 and i^2. The wires being screw-threaded, I run down thereon, by means of pliers or otherwise, small nuts h^3 and i^3, which, by compressing the metallic and the soft-rubber washers, produce a tight joint, as required. The pole *h* forms, as aforesaid, the upper extremity of an undulated silver or platinum wire, which is wound round in the chloride of silver from bottom to top, and which is thus

coiled in a mold, wherein the chloride of silver is poured in a liquid state, and when solidified, the undulations of the wire, both on the outer and inner surfaces of the shell, form numerous points of contact, thereby augmenting the development of the electricity, and strengthening the chloride-of-silver shell. For the purpose of further developing the generation of the electricity, I prefer, before placing the covers or wrappers *b* and *c* aforesaid, to cover externally the shell *a* with a sheet of silver-foil. In order to make and break contact, I place on the cover of the pile a plate, *k*, in hard rubber, bone, ivory, or any other appropriate material, fixing it thereto by piercing two small holes therein, through which the poles *h* and *i* pass. A metallic washer, h^4, screwed on *h*, and a metallic cap pinned or soldered on *i*, serve to maintain this plate *k* in its place. On this plate *k* I adapt a metallic slide, *l*, to which I attach a non-conducting cross-bar, *m*, and I pass through this bar the metallic continuation *h* in the shape of a wire, h^5, and a wire, i^5, terminated at its rear in the shape of a hook, and I connect h^5 and i^5 with a fine platinum wire or coil, *n*. The slide *l* is passed under a guide, *l'*, and is slotted at the place where it is passed over the pole *h*, so that it can be pushed forward (see Fig. 2) until the hook of i^5 comes in contact with the metallic cap on the pole *i*, at which instant, the current being closed, the coil *n* is heated to redness by the passage of the electricity, whereby fire or light may be produced, and, by the removal of this upper mechanism, employed for industrial or scientific purposes. A spiral spring, *o*, one extremity of which is attached to the cross-bar *m*, and the other to a hook, *p*, fixed to the plate *k*, serves to bring the parts in the position shown at Fig. 1, thereby breaking the contact.

I wish it specially to be remarked that in my new pile I reserve a central space or chamber within the zinc coil, for the purpose of receiving or housing the gases formed by the chemical decompositions of the elements of the pile, allowing such to combine in order to react on the elements, thus insuring a long period of duration of the pile and a greater power. I further remark that, by placing the chloride externally and the zinc internally, contrary to previous practice, I obtain a relatively much larger surface of chloride than of zinc, whereby I obtain, in a relatively very small volume, the same power as actually obtained with piles of a considerably larger volume. Again, these piles, being perfectly hermetic and dry, are available for being carried in the pocket, and for producing flame by contact with a wick saturated with an inflammable liquid, or fire by contact with a dry fibrous wick.

Thanks to the general mode of construction of these piles, as above described, they can be made to assume any form or size, and thereby produce any intensity of electricity requisite for any industrial, military, naval, or other purposes, under a smaller compass than other dry piles hitherto known.

Having thus explained the nature of my improvements, and the best means I am acquainted with for carrying the same into practical operation, I claim—

1. In a dry electric pile, the combination, with the external element, of the internal zinc element *f*, constructed of a coil of zinc wire, or a perforated zinc plate, to allow of the passage of the gases formed between the two elements, as shown and described, and for intensifying the electricity produced.

2. The construction of the external chloride-of-silver shell *a* with an internal undulated silver or platinum wire, for the purpose of augmenting the production of the electricity, and of strengthening the shell itself, as above described and illustrated.

3. The bottom *d*, provided with the hole, and with plug *d'*, for charging and recharging the pile, as above described and illustrated.

4. The combination of the parts h^4, *l*, *m*, h^5, i^5, *n*, *l'*, *o*, and *p*, for the purpose of making or breaking contact, as above described and illustrated.

CHARLES LOUIS VAN TENAC.

Witnesses:

F. ELIPPOT,

J. GUENOT.