(No Model.)

S. BORDEN.

ELECTRIC CONDENSER.

No. 260,646. Patented July 4, 1882.

FIG. 1.

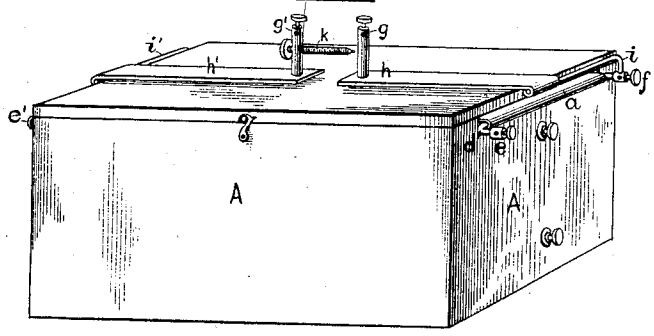


FIG. 2.

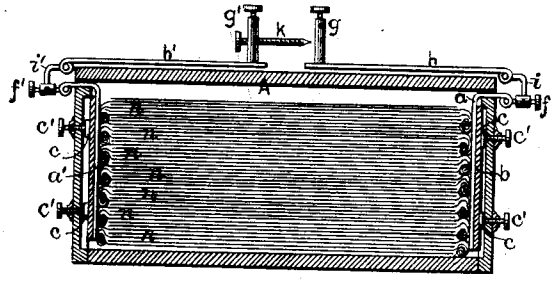


FIG. 3.

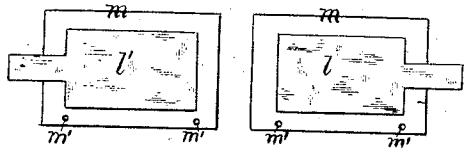


FIG. 4.

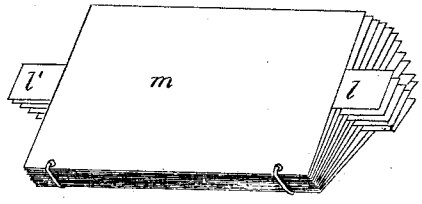
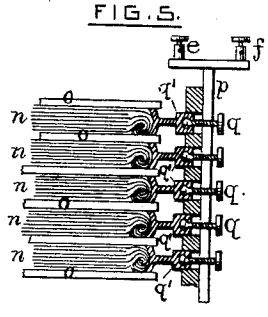


FIG. 5.



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ELECTRIC CONDENSER.

SPECIFICATION forming part of Letters Patent No. 260,646, dated July 4, 1882.

Application filed June 9, 1881. (No model.)

To all whom it may concern:

Be it known that I, SPENCER BORDEN, of the city of Fall River, in the county of Bristol and State of Massachusetts, have invented certain new and useful Improvements in Electric Condensers; and I do hereby declare that the following specification, taken in connection with the drawings furnished and forming a part of the same, is a clear, true, and complete description thereof.

One object of my invention is to obviate many of the difficulties attendant upon the discovery and correction of faults (incident to sudden shocks) in the insulating-plates of mica, paraffined paper, or other insulating material known to be suitable for separating the sheets of foil in condensers. Another object is to facilitate the careful examination of the sheets of foil and insulating material with a minimum of liability of injury thereto in handling. Another object is to so far provide against sudden shocks in the charging of the condenser as to greatly reduce the liability of injury to the plates in the condenser from such shocks; and, still further, to provide for the separate use of one portion of a charged condenser without interfering with other charged portions thereof. In the attainment of these ends various novel features in construction and arrangement have been developed, which, after being fully described, will be designated in the several claims hereunto annexed.

Referring to the drawings, Figure 1 is an exterior view of a condenser embodying my invention. Fig. 2 is a vertical central longitudinal section thereof. Fig. 3 represents insulating-plates and foil sheets as preferably employed by me. Fig. 4 is a perspective view of a series of foils and insulating-plate. Fig. 5 represents in vertical section one end of a condenser constructed in sections and arranged for the separate connection of each section with the poles of the condenser in accordance with one feature of my invention.

The condenser-case A is preferably rectangular in form, and composed of wood or other good insulating material. At the inner surface of the ends of this box there are heavy conducting-sheets *a a'* of block-tin or other good conductor, constituting the opposite poles of the condenser, and at the rear side of each sheet there is a plate of wood, *b*, to which the conducting sheet or pole is attached. To the rear side of said plate *b* there are attached one or more rubber springs, *c*, each provided with a swiveled set-screw, *c'*, which extends outward through the ends of the box and through tapped collars, whereby said conducting sheets or poles *a a'* may be withdrawn or advanced under a yielding pressure. The upper ends of the sheets *a a'* are bent at right angles, and project through apertures in the ends of the case, and each sheet at said projecting end embraces a coupling-bar, *d*, on which, at the ends thereof, there are binding-screws or posts *e e'* and *f f'*, by which sundry electric connections may be made.

Upon the top of the case there are two vertical screw-posts, *g g'*, with which electric connections may be made with the apparatus supplied through the condenser, and each of said posts rests upon one end of a plate, *h h'*. These plates, at their opposite ends, have wire tips *i i'*, connected respectively to the screw-posts *f f'* of the conducting sheets or poles *a a'*.

In the vertical post *g'*, there is a horizontal conducting-screw, *k*, having an insulated head and sufficient length of shank to reach the post *g*, if desired. I term this screw a "safety-connection." This safety-connection, instead of being in the form of a screw, may be in the form of a laterally-swinging curved bar pivoted to one of the posts, so that its outer end will travel in the arc of a circle toward and from the opposite post, in which case an insulated finger button or knob should be provided on said lever, near its outer end, for convenient manipulation.

As thus far described, let it be supposed that the box or case is filled with condensing-sheets of foil, as ordinarily piled for condensers, and the two end plates or poles, *a a'*, by their set-screws, properly advanced so as to be in good contact with the projecting ends or tongues of the foil sheets, one half thereof (alternating with the other sheets of the other half) being in contact with the pole *a*, and the other half with pole *a'*. For charging the condenser the poles or screw-posts *e e'* can be connected with galvanic battery, induction-coil, Holtz machine, or any other suitable dynamo-electric machine, so that one half of

the sheets will be charged positive and the other half negative, or either of said posts may be thus connected and the opposite post grounded, all in a manner well known.

It is during the charging of condensers that the liability of injury to the insulating plates or sheets mainly occurs, and I obviate this liability by means of the safety-connection or conducting-screw *k*, as follows: Before the charging operation begins this screw electrically connects the posts *g g'*, and through them the end plates, *a a'*, are also electrically connected. As soon as the battery or other generator of electricity has been applied this conducting-screw, which affords a relieving-circuit, is turned backward slowly, breaking the electric-connection between the posts and plates, sparks meantime flying between screw and post in the equalization of the opposing currents until the safety-screw has been sufficiently retracted to prevent the passage of the relieving-current, whereupon the charging of the condenser is safely continued until completed. As these condensers sometimes contain many hundreds of foil sheets and intermediate insulators, it has been a labor of much consequence to handle each for inspection whenever a fault occurs therein, and the foil being delicate and the insulating-sheets also more or less delicate, they are greatly liable to injure in handling. The foils and insulators are piled in separate sections or books, as indicated in the drawings, Figs. 2 and 4. The foils *l* of one series and the foils *l'* of the other series in each section are provided with tongues, which project alternately at opposite ends from between the insulating-sheets *m*, of mica, paraffined paper, or other well-known suitable material.

The insulating-sheets *m*, in accordance with my invention, are punctured near one edge, as at *m'*, for the passage of silken or other twine, whereby all of said sheets in a section may be connected after the manner of a book, so that they may be laid on edge and carefully but readily turned sheet by sheet for inspection without the danger of injury thereto heretofore incident to handling. The tongues of the several sheets of foil in each section are united at one end and carefully rolled or doubled together into a mass, and preferably wrapped in additional foil. When the several sections or books *n* are placed within the case and the poles *a a'* properly advanced into good contact therewith, the several sections are combined to co-operate as fully as if they were piled in mass, as heretofore. Whenever a break occurs the electric connections are detached, the sections may be removed, and each tested by the usual means until the faulty one is found. A few extra sections being on hand, a perfect one may be substituted, the whole replaced, and service at once resumed, leaving the faulty section to be inspected and repaired at leisure. The organization of the condenser-foils and insulating-sheets in sections enables me to simultaneously use all of the divisions or any proportion thereof—as, for instance, between each section of the condenser a thin plate of insulating material, such as hard rubber, may be inserted, as illustrated at *o*, Fig. 5.

Instead of having the end plates, *a a'*, for poles, as before described, a properly-protected vertical rod or bar, *p*, of block-tin or other suitable material, is located outside the case, at the end thereof, and upon the top of said bar there is a horizontal rod having the screw-posts *e* and *f*, substantially as before described. Through this bar *p* horizontal screws *q*, with insulated knobs, are tapped, and each is swiveled at its inner end in a sliding metal block, *q'*, which, at its inner end, is concaved, forming a seat for properly and smoothly engaging in electrical contact with the tongues of the foils of the coincident section *n*. The opposite end of the case being similarly provided, it will be seen that when all of these screws *q* are turned inward the bars *p* will occupy precisely the same relation to their respective sectional series of foils as the end plates, *a* and *a'*, in the condenser, as first described, and that all of said sections may be charged and discharged simultaneously, as before; but it will also be seen that by turning outward the screws *q* at any one or more sections they may be separated from all the others. With this construction all of said sections may be charged as one, and may be drawn from or exhausted collectively or separately, as may in each instance be desirable.

In coupling one or more inactive sections to those already electrically connected the safety-screw may be so adjusted that relief from sudden shock will be afforded, as before described, in connection with the charging of the condenser. With the sections thus capable of separate connection, as described, if a fault occurs in either section, it may be readily located by the usual tests if the screws *q* of all the sections but one are withdrawn and that section tested, and so on separately through all of them. When the faulty one is thus found it may be uncoupled and left in place and the condenser continued in use at a lesser capacity, if desirable, instead of immediately replacing the faulty with a perfect section.

In the construction of condensers of unusually great capacity I find my improvements of special value; but they also will be found of practical importance in small condensers, especially such as are designed for laboratory and experimental uses.

I prefer to embody in my condenser all of the features shown and described; but it is obvious that some of them may be profitably employed separately from other features.

Having thus described my invention, I claim as new—

1. In an electric condenser, the combination, with the alternating series of foil sheets and their insulating-sheets, of posts connected respectively with the opposite poles of the con-

denser, and the safety-connection for affording a direct relieving-current from one series of foils to the other series, substantially as described, and for the purposes specified.

2. An electric condenser, or a section thereof, composed of sheets of foil and alternating sheets of insulating material bound together at one edge, after the manner of a book, substantially as described.

3. The combination, with the foil sheets of a condenser and a case inclosing the same, of the end plates or poles controlled by screws for forcing said poles into good contact with said foils and retracting the same, substantially as described.

4. The combination, with the foil sheets of a condenser, and a case inclosing the same, of the end plates or poles controlled by screws cushioned with reference to said poles or plates, substantially as described, whereby electric contact of poles and foils is maintained under a yielding pressure, as set forth.

5. In an electric condenser, the combination of separated sections of foils and insulating-plates, opposite poles common to all of the sections, and separate adjustable electrical connections between each section and said poles, substantially as described.

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