No. 709,205. Patented Sept. 16, 1902.

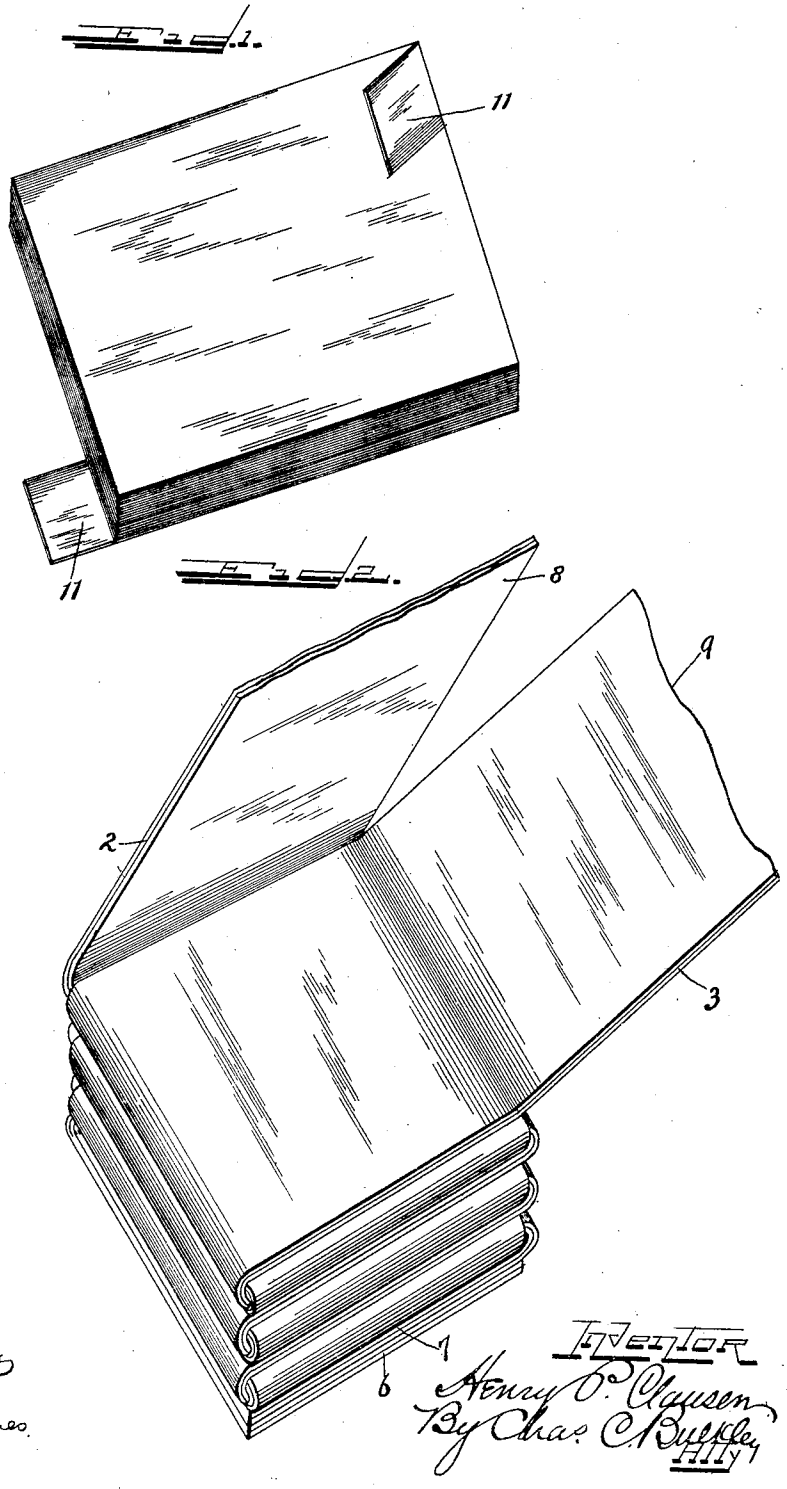
H. P. CLAUSEN.

ELECTRIC CONDENSER AND METHOD OF MAKING SAME.

(Application filed Apr. 6, 1901.)

(No Model.)

2 Sheets—Sheet 1.



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(No Model.) 2 Sheets—Sheet 2.

Fig. 5.

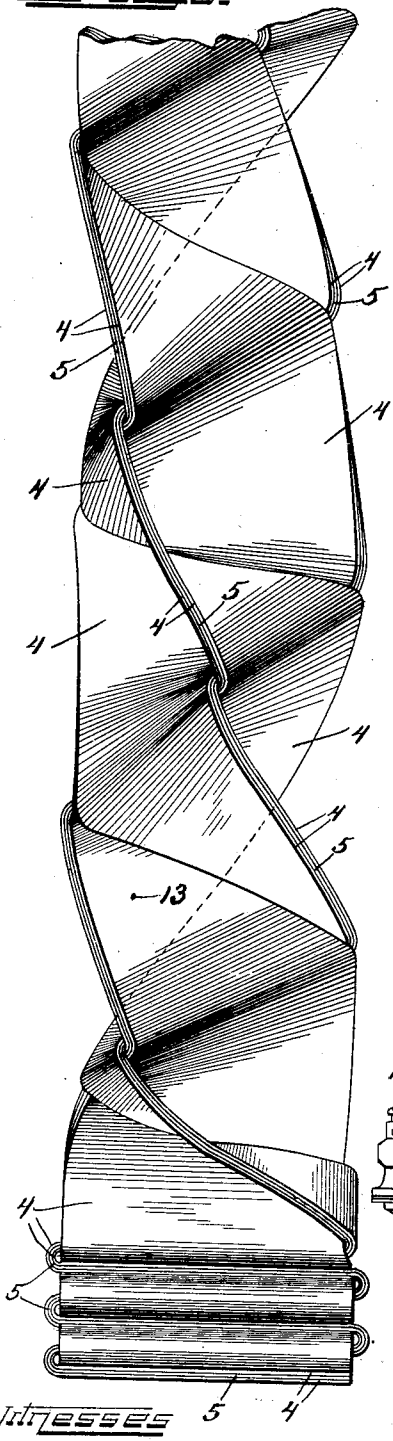


Fig. 3.

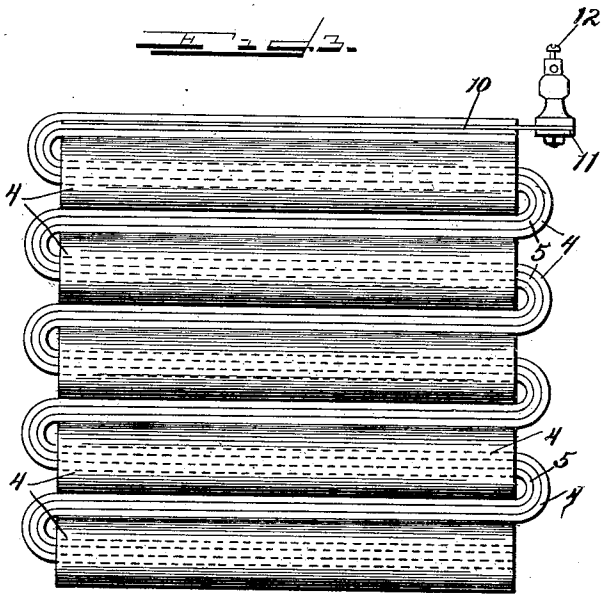
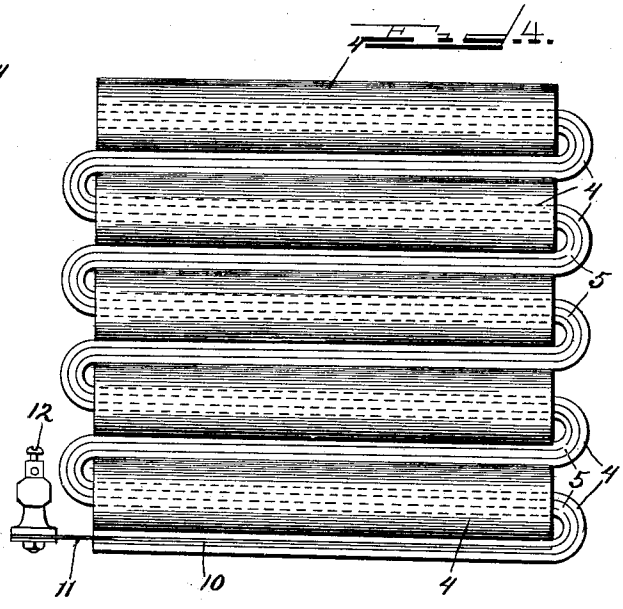


Fig. 4.



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UNITED STATES PATENT OFFICE.

HENRY P. CLAUSEN, OF CHICAGO, ILLINOIS, ASSIGNOR TO AMERICAN ELECTRIC TELEPHONE COMPANY, A CORPORATION OF NEW JERSEY.

ELECTRIC CONDENSER AND METHOD OF MAKING SAME.

SPECIFICATION forming part of Letters Patent No. 709,205, dated September 16, 1902.

Application filed April 6, 1901. Serial No. 54,607. (No model.)

To all whom it may concern:

Be it known that I, HENRY P. CLAUSEN, a citizen of the United States of America, and a resident of Chicago, Cook county, Illinois, have invented a certain new and useful Improvement in Electric Condensers and Methods of Making the Same, of which the following is a specification.

My invention relates to electric condensers and the method of making the same, and has for its object the provision of a condenser of the class described that shall be cheap and simple to manufacture, efficient in operation, and one that can be easily inspected and repaired without entirely unfolding or unwrapping the same. The use and advantage of such condensers in and about telephone systems are well understood at the present day; but it has been impossible to construct them of an efficient pattern or type and at the same time provide a simple and easy method of inspecting and repairing them without a complete dismembering or unwrapping of the whole device. Such a method of inspection or repair is expensive, and it is found about as cheap to substitute new condensers as to undergo this laborious and expensive process. Again, in the old style of condenser in which each layer consists of a separate metallic sheet and the several layers are laid one upon another with an interposed dielectric, besides other disadvantages considerable effective space or surface of the tin-foil or material forming the condenser-plates is lost, owing to the fact that it is necessary to keep it some distance away from the four edges of the dielectric in order that the condenser sheets or plates cannot by any possibility come into contact with each other. A condenser of the well-known roll type avoids to a certain extent this objection, since in it it is only necessary to keep the metal plates at a distance from the two edges of the continuous sheets of dielectric; but there is no facility in such a condenser for making repairs or inspecting the interior of the same in case the dielectric becomes broken down or for any other reason without unrolling the condenser. My invention is designed to avoid these several objections by providing a condenser embodying the advantages of a roll or other condenser as regards effective plate-surface, cheapness of manufacture, and efficiency of operation, while at the same time permitting a ready means of inspecting and repairing the same at any point without unwrapping or unfolding the other parts thereof or opening the same at any point except at the places desired.

It therefore consists, preferably, of continuous sheets of paper or other dielectric, with an interposed sheet or layer of tin-foil forming the condenser-plate or any other suitable material and combinations of material to form the dielectric and condenser-plates, and at least two strips or sheets of such layers are placed at right angles to each other and are folded over each other alternately back and forth to build up the condenser, each such metallic sheet when thus folded providing a number of the condenser-plate strips. After being doubled or folded up in this way to the required extent the pack or bundle of folded sheet material is compressed to the desired degree, and it may then be boiled in paraffin or otherwise treated to keep out the dampness and make a finished product. Terminals may then be added and the whole inclosed and sealed in a suitable tin or other case to also keep it dry and prevent mechanical injury.

The invention further consists in the novel construction and parts hereinafter fully described, and particularly pointed out in the claims, reference being had to the accompanying drawings, forming a part hereof, in which the same reference-figures designate like parts throughout the several views, and in which—

Figure 1 is a perspective view of the condenser in compressed form. Fig. 2 is a similar view showing the first stages of manufacture or folding. Fig. 3 is a side elevation of the device before being compressed, showing the terminal attached to one of the condenser-plates. Fig. 4 is a similar view of the side at right angles to the other, showing the terminal attached to the other plate; and Fig. 5 is an elevation view showing how the condenser may be stretched out for purposes of inspection or repair.

Referring to Fig. 2, the sheets or strips 2

and 3, which form the layers of the condenser, are each composed, preferably, of two sheets or strips of paper 4, (see Figs. 3, 4, and 5,) suitable for a dielectric with an interposed sheet or strip 5 of tin-foil, which latter are designed to act as the plates of the condenser. Other arrangements of these several plates could be employed, the only requirements being that when completed the plates of the condenser shall be continuous sheets or strips and that there shall be a dielectric between the plates of the several folds or layers of the condenser. Any suitable substance instead of paper may be used for the dielectric, and other substances could be used for the condenser-plate, but those described are considered preferable for the purposes. As stated, the combination of two sheets or strips of paper and one of tin-foil placed together to form a continuous sheet or strip is preferred; but other combinations might exist, as several sheets of paper to one of the dielectric and others. It will be understood, too, that the condenser-plate, so far as contact with the other plates is concerned, can reach substantially to the edges of the dielectric sheets, thus gaining over both the old forms mentioned; but they are preferably a little narrower, so as not to reach quite to the edges thereof to prevent injury thereto or connection therewith from outside sources. Again, the metallic sheets at the folds extend entirely therearound and that much plate is gained over the old built-up or separate-sheet structures. When "continuous sheets" are referred to herein, it is of course intended to distinguish thereby from separate sheets for the several layers and not that the plates or dielectric may not consist of spliced sheets or more than one sheet connected together end to end or overlapping or in any other desired manner, for such an arrangement would obviously be the equivalent of the other. The term "continuous sheet" must therefore be so understood. In the first stages of manufacture these built-up sheets or strips 2 and 3 are placed, preferably, at right angles to each other, as in Fig. 2, their ends overlapping, as at 6 and 7, Fig. 2. The free ends 8 and 9 are then folded back and forth alternately over each other to form the several layers of the condenser until the desired amount is thus folded or stacked up, or until the wanted number of layers is obtained, as in Figs. 3 and 4, when the same is compressed to any desired degree, forming a compact quadrangular block, as seen in Fig. 1. This compressing may not be a necessary step in the manufacture, according to the care taken in folding the strips over, but is recommended as making the condenser more compact. The packs are so terminated that a different strip and therefore different plate forms the outer layer at each end, whereby to connect an electric circuit therewith a sheet of copper 10, preferably of the size of the layers of the pack, may be inserted beneath the dielectric at each end and in contact with the tin-foil, said sheets having projecting tabs 11, with which the wires from an electric circuit may be connected, as by soldering, by means of binding-posts 12 or in any other preferred manner. Other means could be employed for this purpose, so far as some aspects of my invention are concerned, but that described is preferred. It will be seen that these metallic sheets or strips constitute the corresponding plates of the condenser and are carried throughout the whole series of layers with but little waste material at the edges of the same, since, as explained above, the plate-sheets may reach practically to the edges of the dielectric sheets without fear of contact, and that substantially the only waste surface of the condenser-plate is at the two aforesaid faces of the pack or the upper and lower faces, each plate acting upon the other adjacent plate throughout the series. There is also no waste at the folds, since the plate extends entirely around the fold. In fact, an advantage results therefrom, since the size of the plates are increased just that much. After the strips are so folded up they are preferably compressed to any desired extent and may as a further improvement then be treated as is usual in condensers by boiling them in paraffin or by any other desired treatment to accomplish the results—that is, of keeping the condenser dry and in working order under all conditions of use. This step may be omitted and good results obtained, but its addition is advantageous. If preferred, the same may be inclosed in a tin or other case and hermetically sealed to provide a condenser which will be free from all mechanical injury; but such a case is not shown, as it forms no part of my invention.

It is not necessary to use built-up strips of equal widths, which results in a square condenser, as shown, but the strips may be of different widths, which results in a rectangular condenser. It will also be understood that the thicknesses of the several metallic and paper sheets are greatly exaggerated in the drawings.

When it is desired to repair the condenser, it may be pulled open endwise, as shown in Fig. 5, by a sort of bellows or accordion action, which gives access to any part of the sheet or dielectric for inspection and which can be readily repaired by simply inserting a small sheet of paper or other substance over the injured portion. For example, if a break in the dielectric occurs at 13, Fig. 5, it is only necessary in order to repair it to pull the condenser open at this fold and insert a sheet or piece of the paper over it. When this is done, the condenser can be again compressed and restored to its normal condition, all in a very simple, convenient, and easy manner. Should this operation become necessary before the treatment with paraffin, as above referred to, it would only be necessary to open the sheets or layers of the pack; but if it is necessary after the said treatment the condenser

would probably have to first be heated in order to melt the paraffin before it could be opened for inspection and repairs.

By constructing the condenser-plates of strips of material which are arranged crosswise or at right angles and folded back and forth upon each other it will be seen that I provide a condenser composed of superimposed plates or sheets of suitable metal and dielectric and that when finished and compressed into suitable form the alternate plates have oppositely-arranged flexible or yielding connections at their edges, whereby the mass of plates or sheets may be drawn apart to an extent sufficient to expose their surfaces, but without disconnecting them from each other. In other words, the condenser thus constructed is practically composed of two series of insulated metal plates, the plates of each series being flexibly or yieldingly connected at their edges, so as to permit of a folding or hinge-like action. This, as stated, permits the condenser-plates to be drawn apart for the purpose of exposing their surfaces, and, as shown in Fig. 5, this separation of the plate-surfaces is accomplished without disconnecting the plates from each other. Furthermore, this construction and method of manufacture insures compactness and rigidity and tends to prevent the condenser from getting out of shape. The sheets or strips of material when properly folded present a plurality of bends of flexible connections on all four sides of the condenser. This, as explained, permits the condenser to be drawn apart or extended substantially in the manner shown in Fig. 5, wherein it will be seen that the surfaces of the plates are drawn apart to an extent to permit inspection and cleaning. It will also be seen, however, that, owing to the method of folding, the relative positions or arrangements of the plates are practically retained, the plates dropping or falling naturally into their places as soon as the inspection is over and the distended part of the condenser is adjusted back into place. In this way the method of folding not only insures a maximum of condensing-surface, but it also insures an arrangement and construction which will afford ample opportunity for ready and convenient inspection of the condenser-plates.

What I claim as my invention is—

1. An electric condenser comprising superimposed plates of suitable metal and dielectric arranged in two series, the said plates or sheets of each series being flexibly connected together, and the said sheets or strips when in place presenting flexible connections on all four sides of the condenser, whereby the superimposed plates or sheets of metal and dielectric of which the condenser is composed can be drawn apart without disconnecting the plates or sheets of one series from the plates or sheets of the other series, substantially as described.

2. An electric condenser composed of suitable sheets or plates of metal and dielectric, the said dielectric being in the form of two strips of suitable material arranged crosswise and folded back and forth alternately upon each other, the superimposed sheets or plates thus arranged presenting flexible connections on all four sides of the condenser, whereby the condenser plates or sheets may be drawn apart without disconnecting them from each other, substantially as described.

3. An electric condenser composed of superimposed sheets or plates of suitable metal and dielectric, the said metal sheets or plates being in the form of two strips arranged crosswise of each other and folded back and forth alternately in such manner as to present bends or flexible connections on all four sides of the condenser, substantially as and for the purpose set forth.

4. An electric condenser composed of superimposed sheets or plates of suitable metal and dielectric, the said sheets or plates being so folded and arranged as to present a plurality of bends or flexible connections on all four sides of the condenser, whereby the condenser can be extended for the purpose of exposing the surfaces of said sheets or plates, substantially as described.

5. The method of making electric condensers, which consists in combining suitable sheets or strips of metal and paper, arranging said sheets or strips crosswise and folding them back and forth alternately upon each other, so as to provide a condenser composed of superimposed plates or sheets of metal and dielectric so connected and arranged as to present a plurality of bends or flexible connections on all four sides of the condenser, suitably compressing this mass or bundle of sheet material, and then suitably treating the same with paraffin, substantially as described.

6. The method of making electric condensers, which consists in suitably preparing and combining sheets or strips of suitable metal and dielectric, arranging these said strips or sheets of metal and dielectric crosswise of each other, folding the said strips or sheets alternately back and forth upon each other, thereby causing the same to present a plurality of bends or flexible connections on all four sides of the condenser, and then suitably compressing or otherwise treating this mass or bundle of sheet material, substantially as described.

7. In an electric condenser, the combination with strips of metal at right angles and folded back and forth over each other alternately and forming the plates of the condenser, of a dielectric between the folds.

8. In an electric condenser, the combination with strips of metal at right angles to each other and folded back and forth alternately over each other to form superimposed layers, of a dielectric between the layers, and terminals for connecting with the plates.

9. A condenser, comprising continuous sheets or strips composed of tin-foil and pa-

per, said sheets or strips being at right angles to each other and folded back and forth alternately over each other, the whole being compressed into a compact bundle.

10. A condenser composed of continuous strips of tin-foil and paper on both sides of the tin-foil, said strips being at right angles and folded back and forth alternately over each other, the whole being compressed into a compact mass, and boiled or soaked in paraffin or like substance.

11. In a condenser, two continuous strips composed of strips of paper with an interposed strip of tin-foil, said strips being at right angles to each other and folded back and forth alternately over each other, and terminals for the condenser comprising a metallic plate, as copper, placed next the tin-foil at one end of each strip.

Signed by me, at Chicago, Cook county, Illinois, this 23d day of March, 1901.

HENRY P. CLAUSEN.

Witnesses:
CHAS. C. BULKLEY,
HARRY P. BAUMGARTNER.