No. 825,405. PATENTED JULY 10, 1906.

M. K. McGRATH.

CONDENSER AND PROCESS OF MAKING SAME.

APPLICATION FILED NOV. 28, 1902.

Fig. 1.

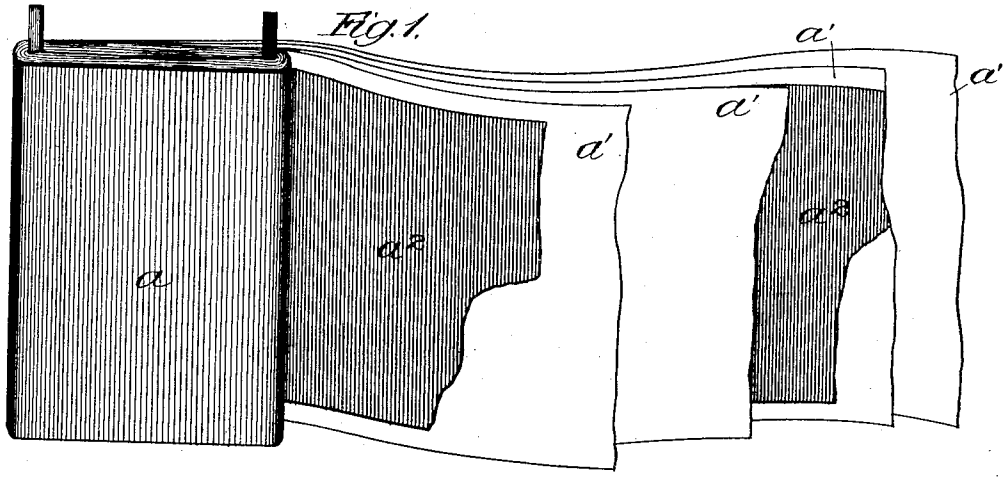


Fig. 3.

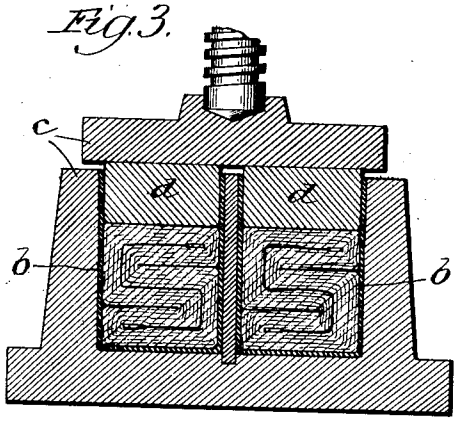


Fig. 2.

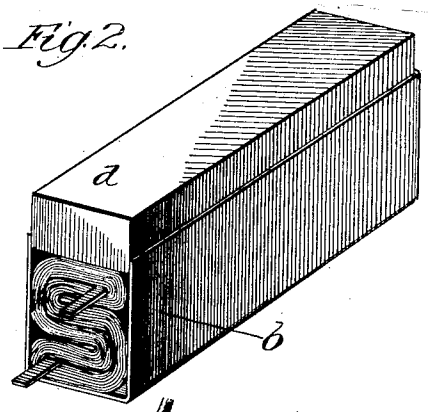


Fig. 4.

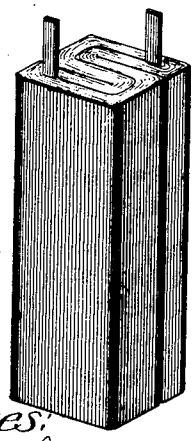
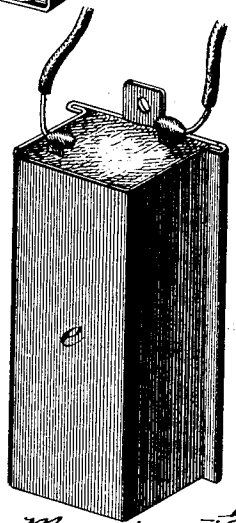


Fig. 5.



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UNITED STATES PATENT OFFICE.

MAURICE K. McGRATH, OF CHICAGO, ILLINOIS, ASSIGNOR TO WESTERN ELECTRIC COMPANY, OF CHICAGO, ILLINOIS, A CORPORATION OF ILLINOIS.

CONDENSER AND PROCESS OF MAKING SAME.

No. 825,405. Specification of Letters Patent. Patented July 10, 1906.

Application filed November 28, 1902. Serial No. 133,014.

To all whom it may concern:

Be it known that I, MAURICE K. McGRATH, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented a certain new and useful Improvement in Condensers and Processes of Making the Same, of which the following is a full, clear, concise, and exact description.

My invention relates to a condenser and process of making the same; and its object is to produce an improved condenser which shall be extremely compact, of small dimensions, and cheap to manufacture, while possessing increased efficiency, permanence, and durability.

In accordance with my invention I preferably first assemble the strips of foil and paper by rolling them together upon a flat arbor, then fold this flat roll reversely into an **S** shape or complete zigzag, and finally, after having boiled the folded condenser in melted paraffin-wax or the like, I subject it to pressure on all sides in a mold, while allowing the wax to cool and set. The completed condenser in the form of a prism may be inclosed in a suitable metal case for protection and to prevent it from unfolding.

I will describe my invention particularly by reference to the accompanying drawings, and that which I consider to be novel with me will be pointed out broadly in the appended claims.

Figure 1 is a perspective view illustrating the paper and tin-foil strips assembled in a flat roll. Fig. 2 shows this roll reversely folded into an **S** shape and placed in the square mold, in which it is to be boiled in paraffin and finally pressed. Fig. 3 shows the pressing operation. Fig. 4 is a view of the condenser after pressing, and Fig. 5 shows the same inclosed in its protecting tin case.

Similar letters of reference are used to designate the same parts wherever shown.

It has been usual heretofore in making condensers to roll up four sheets of paper a' and two sheets of tin-foil a^2 of the required width into a flat roll a, as shown in Fig. 1, this roll then being boiled in paraffin and pressed flat on two sides. Condensers have also been made by rolling the flat roll into substantially cylindrical shape and inclosing the same directly in a cylindrical case without pressure; but in accordance with my invention the flat roll a is folded reversely into an **S** shape, as shown in Fig. 2, and placed in the rectangular mold or trough b, with the doubled ends of the roll at the top and bottom. A rectangular wooden block d is then placed in the trough on top of the roll a and the whole boiled for, say, two or three hours in melted paraffin. After the boiling a number of the troughs containing the folded condensers are placed side by side in a press c and pressure applied to top and bottom, forcing the blocks d downward into the troughs or molds in the manner of plungers, so that the folded roll is compressed in the bottom of the trough and subjected, in effect, to pressure on all four sides. The pressure is maintained until the paraffin has thoroughly hardened, after which the condenser, appearing as shown in Fig. 4, is removed and finally placed in its tin protecting-case e, as shown in Fig. 5. Said case is constructed and sealed in a manner to hold the condenser tightly and prevent the leaves from separating.

A condenser of two microfarad capacity can be made, as above described, in the form of a prism an inch and a half square and four inches long, while a condenser of the same capacity, made according to the old plan, would be twice as long, twice as wide, and a third as thick, using twice the material and costing, approximately, twice as much as mine. The increased capacity with a given amount of material in my condenser is probably due to the fact that the pressure upon the folded roll forces the leaves into much more intimate contact with one another. The capacity of an ordinary flat condenser is liable to become reduced with age, due to the separation of the leaves; but in my folded form this will not be so liable to happen, because the leaves cannot separate to any appreciable extent without a straightening out of the folds, which is of course prevented by the inclosing case. There are many ways in which the paper strips may be folded into a square form; but I prefer the **S**-shaped fold, because here the laminæ are nearly all of equal length and there is less tendency for the foil to wrinkle and separate than in the other forms. In general the distortion of the laminæ and displacement at the ends may

be prevented by reversely folding the flat roll two times or any multiple of two times; but a complete zigzag fold, whether two or more times, is desirable.

Having described my invention, I claim—

1. The herein-described process of making condensers, which consists in assembling the strips of foil and insulating material in a flat roll, folding said flat roll, treating the same with melted wax or the like, and finally subjecting the folded roll to continual pressure on all sides while allowing the wax to cool and set.

2. The herein-described process of making condensers, which consists in assembling strips of foil and paper in a flat roll, reversely folding the flat roll into an S shape, treating the same with melted paraffin-wax or the like, placing the folded roll in a narrow rectangular mold and subjecting the same to continued pressure while allowing the wax to cool and set.

3. An electric condenser consisting of a flat roll of alternate layers of conducting and insulating material reversely folded two times or a multiple thereof, whereby distortion of the laminæ is prevented.

4. A condenser comprising a flat roll of strips of foil and paper reversely folded in a complete zigzag, paraffined, and pressed.

5. A condenser comprising strips of paper and tin-foil, assembled and folded reversely into an S shape, and finally pressed on four sides, the pressure being sufficient to produce intimate contact between the strips of foil and insulating material where the same are folded.

6. The herein-described process of making condensers, which consists in rolling and folding strips of paper and tin-foil reversely into an S shape, treating the same with melted wax, and subjecting the same to pressure on all sides in a mold while allowing the wax to cool and set, the pressure being applied in such a way as to force all adjacent portions of said strips into intimate relation; whereby maximum capacity for a given amount of material is obtained.

In witness whereof I hereunto subscribe my name this 13th day of September, A. D. 1902.

MAURICE K. McGRATH.

Witnesses:
DE WITT C. TANNER,
GEORGE P. BARTON.