

No. 713,605.

Patented Nov. 18, 1902.

A. CHURCHWARD.
TRANSFORMER.

(Application filed Nov. 13, 1899. Renewed Dec. 9, 1901.)

(No Model.)

Fig. 1

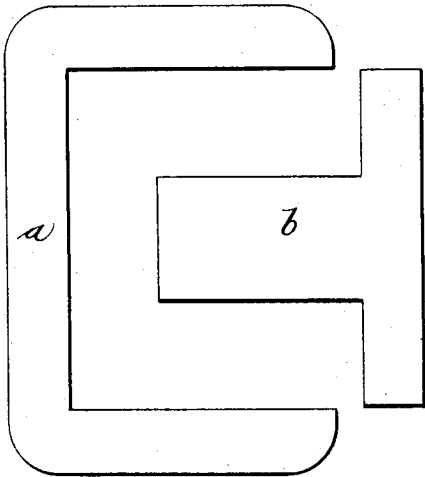


Fig. 2

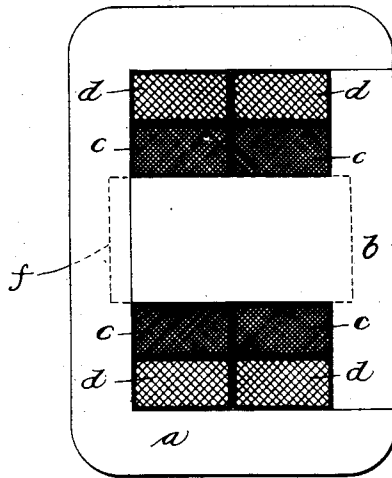


Fig. 3

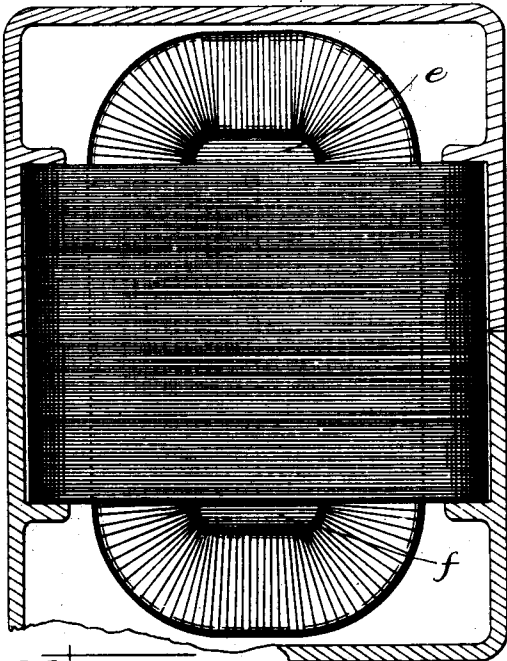
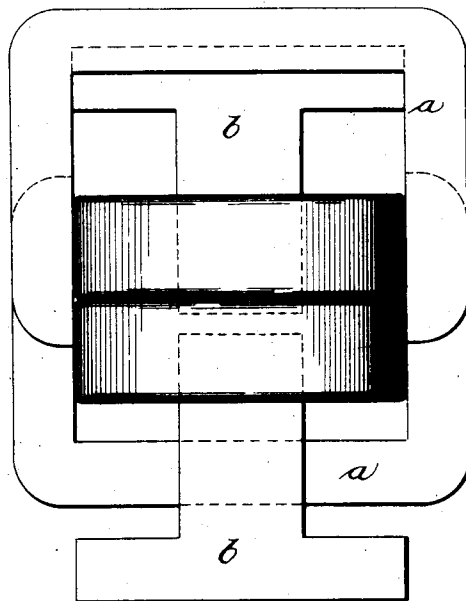


Fig. 4



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UNITED STATES PATENT OFFICE.

ALEXANDER CHURCHWARD, OF CHICAGO, ILLINOIS, ASSIGNOR TO GENERAL ELECTRIC COMPANY, A CORPORATION OF NEW YORK.

TRANSFORMER.

SPECIFICATION forming part of Letters Patent No. 713,605, dated November 18, 1902.

Application filed November 13, 1899. Renewed December 9, 1901. Serial No. 85,151. (No model.)

To all whom it may concern:

Be it known that I, ALEXANDER CHURCHWARD, 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 Transformers, (Case No. 295,) of which the following is a full, clear, concise, and exact description, reference being had to the accompanying drawings, forming a part of this specification.

My invention relates to transformers for employment in the distribution of alternating electric current, and has for its object the improvement in the construction of the shell type of transformers where the primary and secondary coils are completely inclosed by the core of the transformer, the coils being disposed about a central core-rib, which forms a common side of two rectangular core portions.

The object of my invention is so to construct the laminae of which the core is made up that the core may readily be built about formed transformer-coils, while at the same time the magnetic resistance in the core is reduced to a minimum.

It is the further object of my invention to provide a shell type of transformer which shall be very compact and whereby great efficiency may be secured with a transformer of small size for a given capacity.

In its preferred embodiment my invention consists in a transformer of the shell type, having its core composed of laminae made up of U-shaped and T-shaped portions and formed transformer-coils, the U-shaped core-plates being assembled alternately from opposite sides of the coils, as are also the T-shaped plates, the arrangement of the plates being such that the U-shaped plates lie in the same planes with the T-shaped plates, so that gaps between the laminae are avoided, while by the insertion of the plates, as specified, alternately from opposite sides of the coils the gaps between the U and T plates are closed to reduce and practically eliminate the resistance in the magnetic circuit that would otherwise be due to these gaps.

A shell type of transformer constructed in accordance with my invention is of very simple construction, as the laminae when assembled

may be secured closely together by very simple fastening means, the coils being secured in place by simple wedges interposed between the curved ends thereof and the central rib or core portion of the transformer-core.

I will explain my invention more particularly by reference to the accompanying drawings, in which—

Figure 1 is a view showing U and T core-plates. Fig. 2 is a sectional view showing the transformer-coils in place about the central rib of the shell-core. Fig. 3 is a plan view of a complete transformer constructed in accordance with my invention; and Fig. 4 is an end elevation of the transformer-coils, core-plates being shown slightly removed from each side of the coils to illustrate the manner in which they are assembled.

Like parts are indicated by similar letters of reference throughout the different figures.

The core-plates *a* are of U shape, the outer corners of the base portions being preferably rounded, as are also the outer corners of the free ends of the legs of the said plates. The plates *b* are stamped in the form of the letter T, the stems of the T-plates being preferably twice as wide as the portions of the core-plates *a* and *b* making up the shell that incloses the transformer-coils. As has been said, the U and T plates are assembled together, one plate *a* and one plate *b* completing a lamina of the transformer-core. The stems of the T-plates are preferably of such length that when they are brought into contact with the bases of the U-plates the heads of the T-plates form with the legs and bases of the U-plates a complete rectangle, the heads of the T-plates being disposed between the free ends of the legs of the U-plates.

I have shown two sets of coils, each set comprising a primary winding *c* and a secondary winding *d*. Each set of coils is preferably separately formed and inclosed in a suitable insulating-wrapper. In the instance shown the two sets of coils are assembled side by side. In building a transformer in accordance with my invention the coils are first assembled in alinement. A U-plate may then have its base engaged with one side of the coils and the head of a T-plate with the opposite side of the coils, the stem of the T-plate

engaging the base of the U-plate, while the head of the T-plate engages the coils and is disposed between the legs of the U-plate, the U and T plates being thus assembled in a single plane. The next U-plate is then preferably placed in position to have its base engaged with the same side of the coils that is engaged by the said T-plate. The stem of a second T-plate is then inserted through the coils from the opposite side, the head of this T-plate engaging the side of the coils engaged by the base of the first aforesaid U-plate. Thus the plates are assembled alternately on opposite sides of the coils. The gaps that exist between the head of each T-plate and the legs of the aligned U-plate are closed by the base portions of adjacent U-plates.

After the core-plates have been assembled in position the coils and core may be firmly united by means of wedges *e* and *f*, interposed between the rounded ends of the coils and the central core portion formed of the stems of the T-plates.

I do not wish to be limited to the precise construction shown; but,

Having thus described my invention, I claim as new and desire to secure by Letters Patent—

1. In a transformer, the combination with the transformer-coils, of a shell-core therefor comprising U and T shaped plates, the T-plates being inserted through the coils alternately from opposite sides thereof and engaging the base portions of the U-plates placed about the coils from opposite sides thereof, and fastening means for securely uniting the transformer coils and core, the head portions of the T-plates being disposed between the

legs of the U-plates, substantially as described.

2. In a transformer, the combination with the transformer-coils, of a shell-core therefor comprising U and T shaped plates, the T-plates being inserted through the coils alternately from opposite sides thereof and engaging the base portions of the U-plates placed about the coils from opposite sides thereof, and fastening means for securely uniting the transformer coils and core, substantially as described.

3. In a transformer, the combination with transformer-coils, of a shell-core therefor comprising U and T shaped plates, the stems of the T-plates being inserted through the coils and engaging the base portions of the U-plates, the head portions of the T-plates and the base and leg portions of the U-plates forming a shell which incloses the transformer-coils, and fastening means for firmly uniting the transformer coils and core, substantially as described.

4. In a transformer, the combination with primary and secondary coils, of a shell-core therefor comprising U and T shaped plates, the stems of the T-plates being inserted through the coils, the heads of the T-plates with the base and leg portions of the U-plates serving to inclose the coils, and clamping means for firmly uniting the coils with the core, substantially as described.

In witness whereof I hereunto subscribe my name this 10th day of November, A. D. 1899.

ALEXANDER CHURCHWARD.

Witnesses:

CHARLES A. BROWN,
CHARLES E. HUBERT.