

(No Model.)

W. H. HORNBERGER.
CURRENT TRANSFORMER.

No. 508,422.

Patented Nov. 14, 1893.

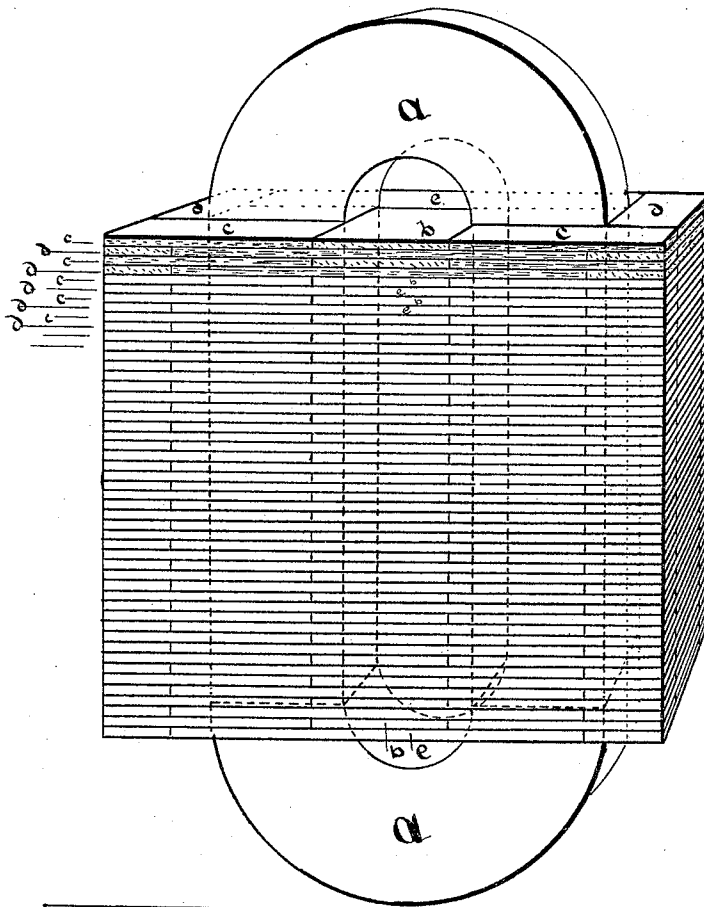


Fig. 1.

Fig. 2.

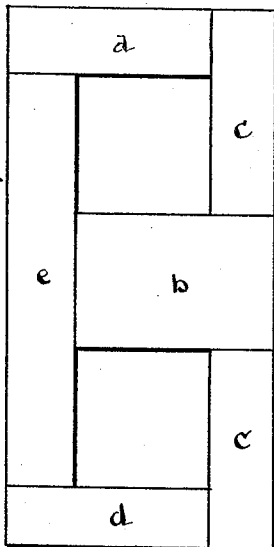


Fig. 4.

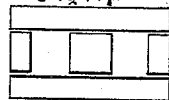


Fig. 5.

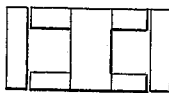
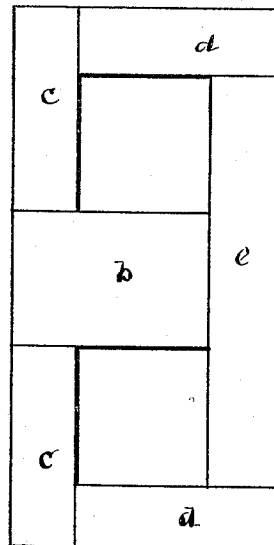


Fig. 3.



Attest

Aug. Haerstmann
Chas. W. Gile

Inventor.

William H. Hornberger
By his Atty.
R. D. Smith

UNITED STATES PATENT OFFICE.

WILLIAM H. HORNBERGER, OF ELKHART, INDIANA.

CURRENT-TRANSFORMER.

SPECIFICATION forming part of Letters Patent No. 508,422, dated November 14, 1893.

Application filed December 17, 1892. Serial No. 455,535. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM H. HORNBERGER, of Elkhart, in the county of Elkhart and State of Indiana, have invented new and useful Improvements in Current-Transformers; and I do hereby declare that the following is a full and accurate description of the same, reference being had to the accompanying drawings, wherein—

Figure 1 is a perspective view of my invention removed from its case. Figs. 2 and 3 are illustrative diagrams showing the structure of the envelope and core. Figs. 4 and 5 are illustrative of modified arrangement of members of alternating laminæ.

A current transformer or converter consists of a primary coil in close juxtaposition with a secondary, or induction, coil, and a contiguous mass of magnetizable material. The passage of an electric current through the primary coil, magnetizes the magnetizable material and this in turn acts upon the secondary to set up a sympathetic or induced current therein. By proper proportions of wire and magnetic material any desired relation or ratio or transformation, voltage to voltage may be secured. This is well understood by electrical engineers.

At the occurrence of each electrical impulse in the primary coil, the envelope and core are magnetized thereby, and at the cessation of said impulse the envelope must demagnetize. These magnetic pulsations must be entirely coincident with the electrical pulsations, and the consequent induced currents will also obey the same periods.

The smaller the mass of the magnetic material, the more rapidly it may acquire or discharge its magnetism, and hence it has been found advisable to build up the magnetic envelope or core of material in thin sheets insulated from each other to prevent eddy currents within the magnetic mass. For this purpose, thin sheets of soft iron are usually employed, and by some, insulating material such as mica or paper, is also employed, but it is supposed that the scale always present on the surface of sheet iron as it comes from the rolls is a sufficient insulator and therefore most makers omit other insulating precautions.

In the manufacture of transformers two typical modes of preparing the magnetizable

material have been employed. First. These several laminæ are each formed entire from one sheet, two spaces being punched out to receive the coils. This entails expense in two directions, which materially enhances the cost of the product. The portions which are removed are wasted and as some part of each sheet must be bent out of place to permit it to be located on the coil, and then bent back again, the labor cost is increased. But by this method of construction several points of excellence are attained. All parts of each lamina are retained in their own integrity and plane. The largest possible quantity of magnetizable material is brought within the desired space; the magnetizable material is uniformly disposed on all sides of the coils. This last is a point of great importance, and these qualities go to offset the extra cost of construction. Second. The laminæ are composed of rectangular pieces of sheet iron, cut without noticeable waste and built up around the coils, cob house fashion. This method secures economy of construction, but the metal is not uniformly distributed and the envelope contains materially less metal than is contained in the first mentioned structure because the cob house structure involves many vacant spaces. While the second named structure is superior to the first named in point of economy, it is inferior in point of efficiency, and this is shown by the greater conversion of electro motive force into heat in the envelope.

My invention attains the efficiency of the first named method, with the economy of the second; that is to say, I avoid waste in preparing my material by cutting my sheets into rectangular pieces, and I secure individual integrity and plane for each lamina and a solid construction without cob-house interstices by the method of packing up now to be described, but without intending to limit myself to the number or exact arrangement of the pieces which conjointly make up one lamina. The number and arrangement are such as I employ but it is evident the result above named may be attained by modifications of that arrangement.

The coil A includes the primary and secondary coils bound together, as is usual. The magnetic envelope is made up of the rectangular pieces of thin soft iron sheet, *b, c, d, e,*

and their arrangement is shown in Fig. 2, constituting one lamina of said envelope. The arrangement shown in Fig. 2, is reversed in Fig. 3 which represents the adjoining lamina, whereby it will be observed that every abutting joint of Fig. 2 is covered by one of the parts of Fig. 3 and it is evident if the layers be alternately placed as Figs. 2—3—2—3 and so on, the parts of each lamina will confine and keep in plane all the parts of the adjoining laminae, and that this service will be mutually performed by all the laminae so that when the mass shall be forcibly pressed together, a substantially solid mass will result devoid of cob-

house interstices, and therefore capable of the highest efficiency with the lowest structural cost.

Having described my invention, I claim—

In a current transformer, an envelope and core of magnetizable material in thin rectangular sheets packed together substantially as shown; that is to say with alternate layers breaking joints, substantially for the purpose set forth.

WM. H. HORNBERGER.

In presence of—

R. D. O. SMITH,

AUGUST HOERSTMANN.