

No. 687,141.

Patented Nov. 19, 1901.

A. R. EVEREST.  
CURRENT TRANSFORMER.

(Application filed July 29, 1901.)

(No Model.)

Fig. 1.

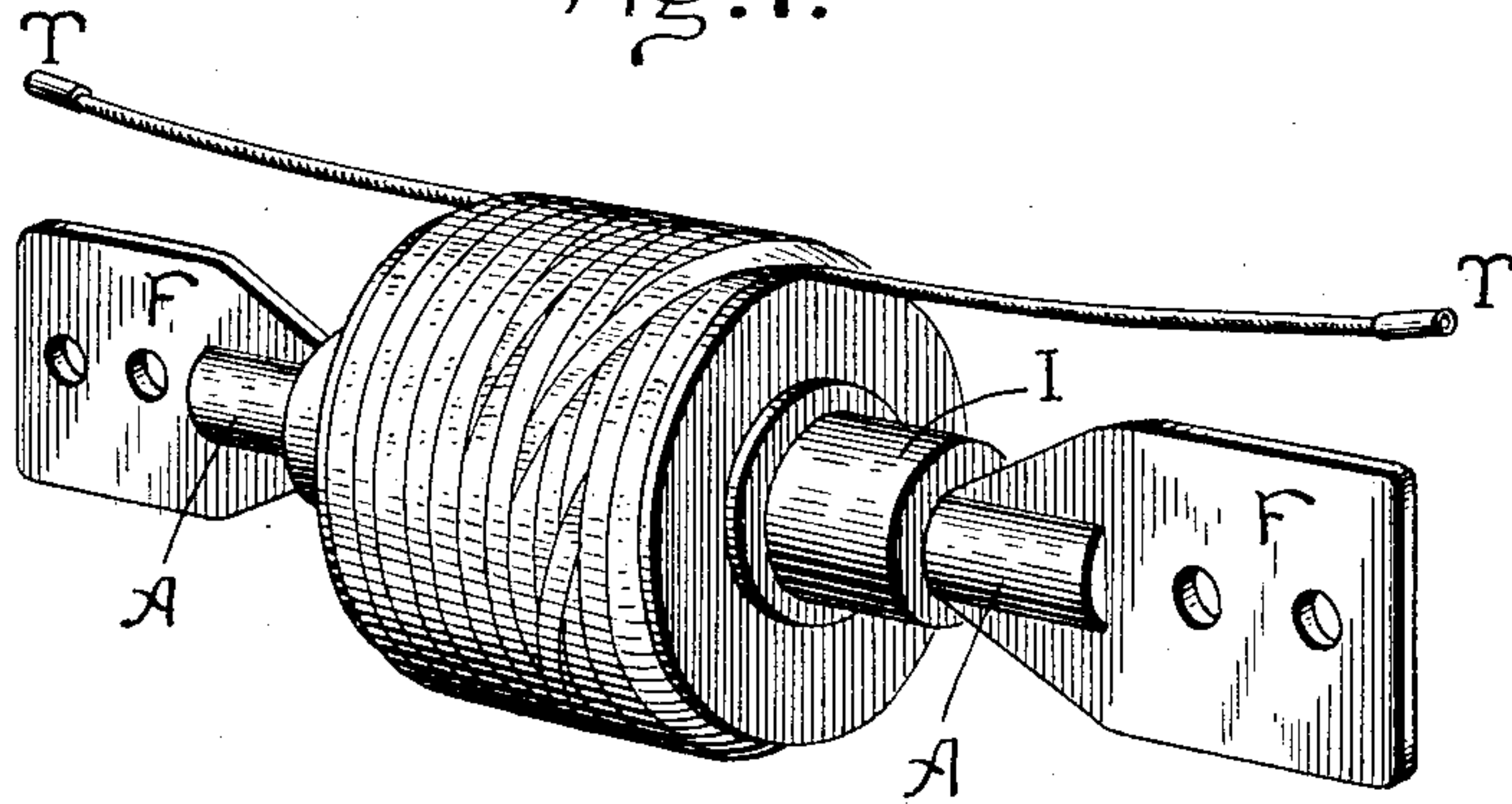


Fig. 2.

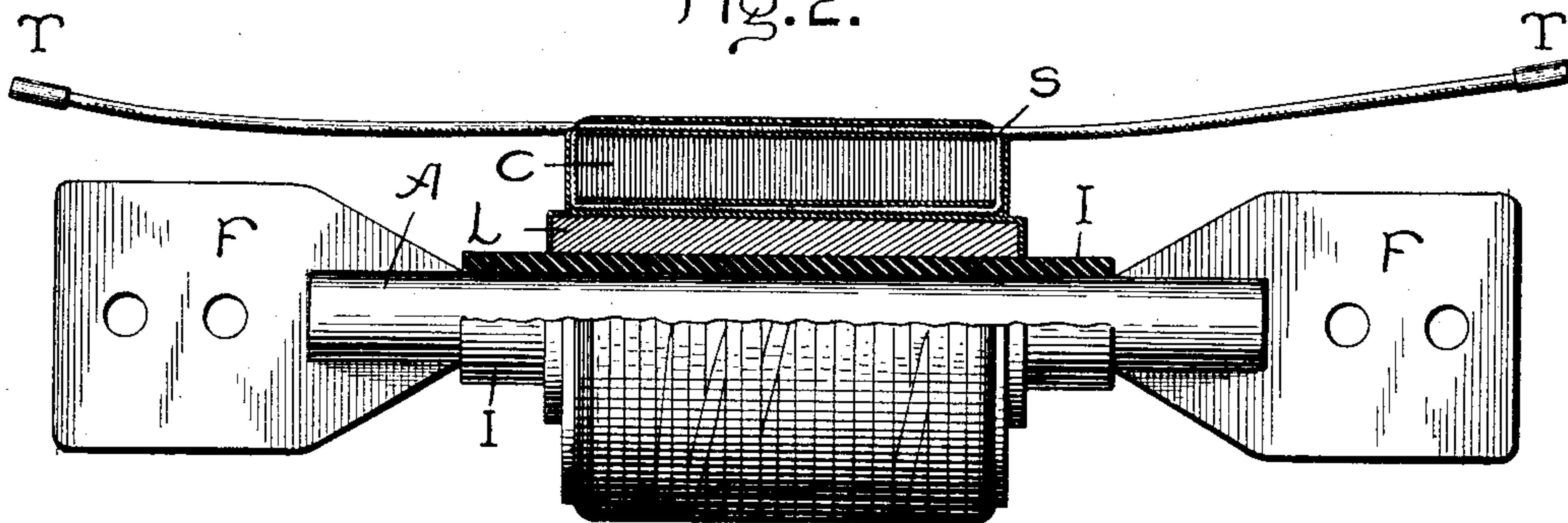
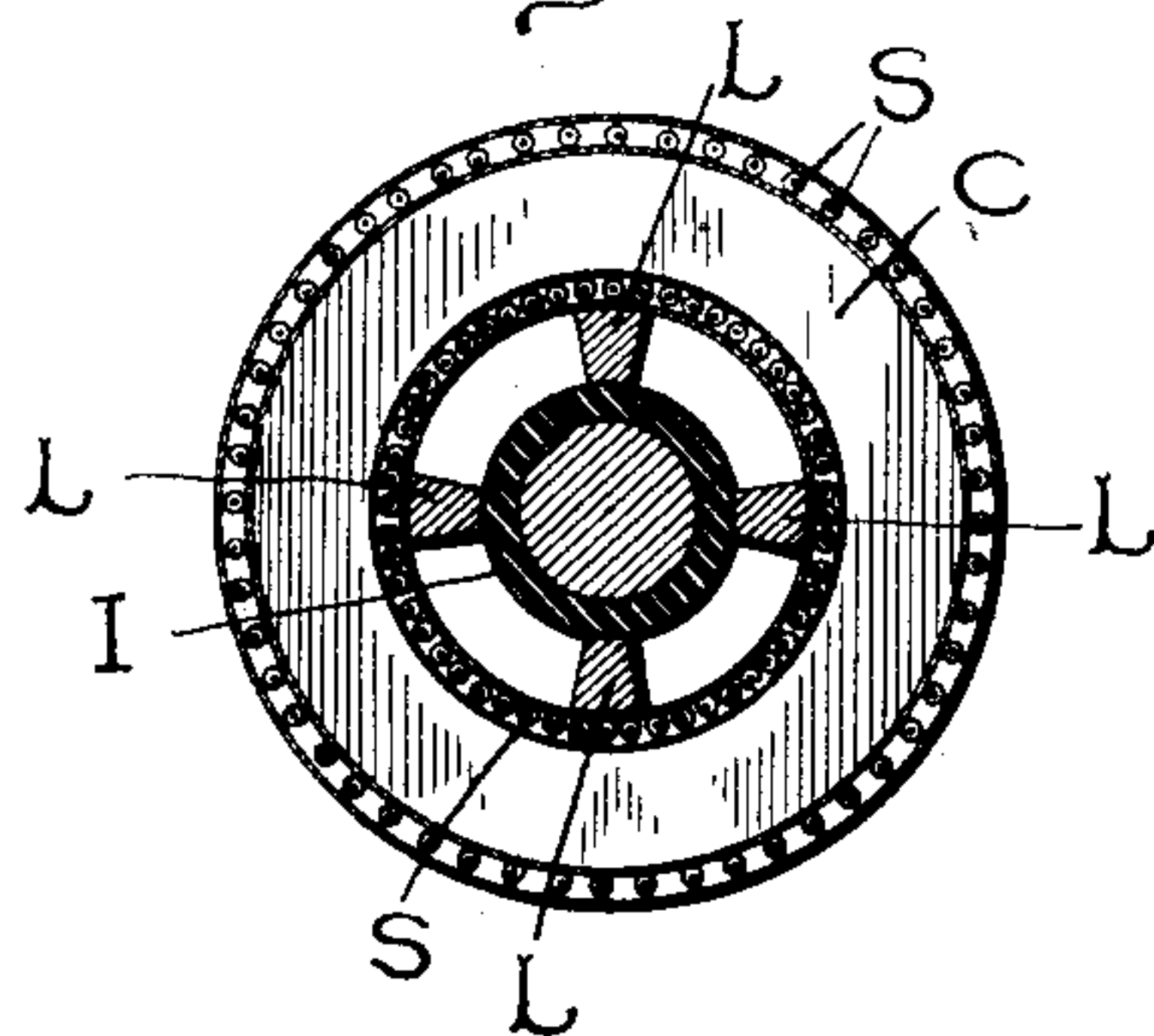


Fig. 3.



Witnesses.

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Att'y.



# UNITED STATES PATENT OFFICE.

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## CURRENT-TRANSFORMER.

SPECIFICATION forming part of Letters Patent No. 687,141, dated November 19, 1901.

Application filed July 29, 1901. Serial No. 70,023. (No model.)

*To all whom it may concern:*

Be it known that I, AUGUSTINE R. EVEREST, a subject of the King of Great Britain, residing at Lynn, in the county of Essex, State of Massachusetts, have invented certain new and useful Improvements in Current-Transformers, (Case No. 1,982,) of which the following is a specification.

This invention relates to improvements in the construction of current-transformers, the chief advantageous result of which is that the regulation of the transformer is improved in a very high degree. In addition, however, there is also effected an economy of material and a complete independent apparatus which can be installed as a whole in the desired manner.

Since current-transformers are used in connection with ammeters, their function being to transform a current of large volume or a current flowing under the influence of a high voltage down into one suitable to be measured proportionately by the ammeter, it is of the greatest importance that the apparatus should possess great accuracy of regulation. The greatest accuracy, as well as efficiency, of transformers operating at low loads, such as the ammeter provides, is attained in transformers having a magnetic circuit of minimum length, or, in other words, a core without any unnecessary air-gaps and of such shape that it may have the least possible length. There will be less leakage and less core loss in such a magnetic circuit, and therefore there will be better regulation. Furthermore, there will be considerably less material required in the construction of the core which comprises such a circuit, and hence the apparatus is cheaper to construct. It has been customary in the past to construct current-transformers with a core which was adapted to be slipped over the ordinary switchboard bus-bar, which might carry, for example, one thousand amperes or more, and which bus-bar, as familiarly known to those skilled in the art, consists universally of a wide flat copper strip. In such cases the bus-bar constituted what is known in practice as a "single-turn primary." It is obvious that in order to provide a minimum air-gap between the core and such primary of exaggerated oblong cross-section it

was necessary to provide for the transformer a core which formed a correspondingly unsymmetrical and oblong figure, by which construction not only was the magnetic circuit of great relative length, but it required in its construction a greater amount of material than that which it is necessary to employ in the execution of the present invention. In current-transformers constructed in accordance with this invention the core consists of an assemblage of symmetrical sheet-metal punchings or laminae, which, as shown, are preferably in the form of annuli or rings, and this core provides the shortest possible magnetic circuit. In order to provide a uniform air-gap between the core and the primary, the latter is preferably constructed to have an exterior outline similar to the interior configuration of the core. I consider that a transformer which has a primary having its cross-section of any symmetrical figure will possess some of the advantages of my invention; but it is evident that the factors of regulation and economy will be increased in proportion to the number of sides of such symmetrical figure, so that said factors are attained in the highest degree by an annular core and a cylindrical primary surrounded thereby. Inasmuch as the length of the primary within the core is very short compared with the bar to which the primary is secured the current density of the primary can be considerably higher than in the bar, so that by reducing the size of the primary to a minimum the length of the magnetic circuit and the amount of core material can be reduced to a minimum, while the highest degree of accuracy is attained. Furthermore, since the primary is of short length with respect to the bus-bar it is not absolutely essential that the primary be made solid, for in some instances a hollow primary will operate satisfactorily, owing to the so-called "skin effect" of the alternating current with which the transformer is used. To the ends of the primary above described are secured metallic pieces or flanges which are adapted to be mounted upon the ordinary oblong bus-bar, so that there is thus provided a complete independent apparatus capable of being applied in any desired place.

Of the drawings, Figure 1 is a perspective



view of a current-transformer constructed in accordance with this invention. Fig. 2 is an elevation, partly in section, of the same; and Fig. 3 is a central transverse section through the primary, the secondary, and the core.

A solid cylindrical copper bar A constitutes the primary and is slotted at the ends to receive the copper end pieces or flanges F, which are adapted to be secured to the ordinary oblong bus-bar, the cylinder and flanges being secured together in any suitable manner, such as by soldering.

The core C is composed of a number of laminæ, which are usually punched from sheet-steel, the assemblage forming a hollow cylinder, which is mounted around the primary A, being supported and separated therefrom by suitable insulation. In the example shown this insulation comprises an insulating-ring I and a number of bars L, of non-magnetic material, which include air-spaces between them. These air-spaces may be relied upon as the insulation, or, if desired, they may be filled up with a suitable fluid or solid insulating material or compound. The secondary conductor S is wound upon the core by threading in and out from end to end thereof, the terminals T being left free for the attachment of the ammeter connections.

The advantages of this structure, both functionally and with respect to cost, will be readily understood in connection with the general description noted above.

What I claim as new, and desire to secure by Letters Patent of the United States, is—

1. A current-transformer, which comprises a core consisting of an assemblage of annular or ring punchings or laminæ, a cylindrical bar constituting a primary and surrounded by said core, and a secondary disposed suitably in inductive relation with respect to said primary.

2. A current-transformer, which comprises a core consisting of an assemblage of sheet-metal ring punchings, a metal cylinder constituting a primary and surrounded by said core, and a secondary suitably disposed in

inductive relation with respect to said primary.

3. A current-transformer, which comprises a core consisting of an assemblage of sheet-metal laminæ, a cylindrical copper bar constituting the primary and surrounded by said core, a secondary suitably disposed in inductive relation with respect to said primary, and copper end pieces mounted on the ends of the primary and adapted to be secured to the ends of a bus-bar.

4. A current-transformer, which comprises an annular core of magnetic material, a metal cylinder constituting the primary and surrounded by said core, and a secondary suitably disposed in inductive relation with respect to said primary.

5. In combination, an annular core of magnetic material, a metal cylinder constituting a primary within the annular core, and a secondary wound around the core.

6. A current-transformer, which comprises a primary having a symmetrical cross-section, a core of magnetic material conforming in configuration with the cross-section of said primary, and a secondary suitably disposed in inductive relation with respect to the primary.

7. A current-transformer, which comprises a primary having the cross-section of a symmetrical figure, a core of magnetic material which conforms in configuration with the cross-section of said primary, and a secondary suitably disposed in inductive relation with respect to the primary.

8. In combination, an annular core consisting of sheet-metal laminæ, a metal cylinder constituting a primary and surrounded by said core, and a secondary suitably disposed in inductive relation with respect to the cylinder.

In witness whereof I have hereunto set my hand this 26th day of July, 1901.

AUGUSTINE R. EVEREST.

Witnesses:

DUGALD MCK. MCKILLOP,  
JOHN J. WALKER.