

J. L. ADAMS, JR.

TRANSFORMER.

APPLICATION FILED JULY 5, 1902.

NO MODEL.

2 SHEETS--SHEET 1.

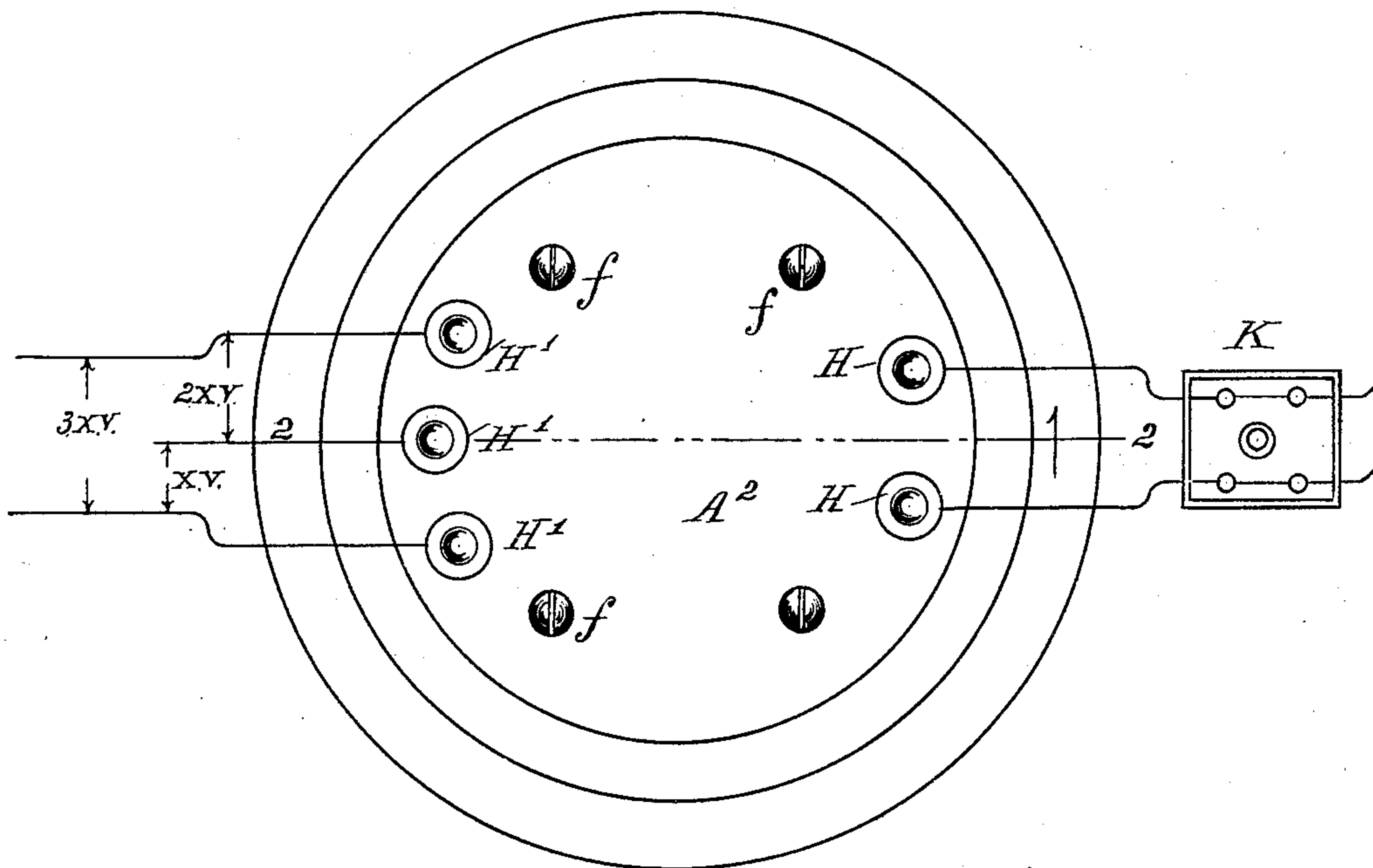


Fig. 1.

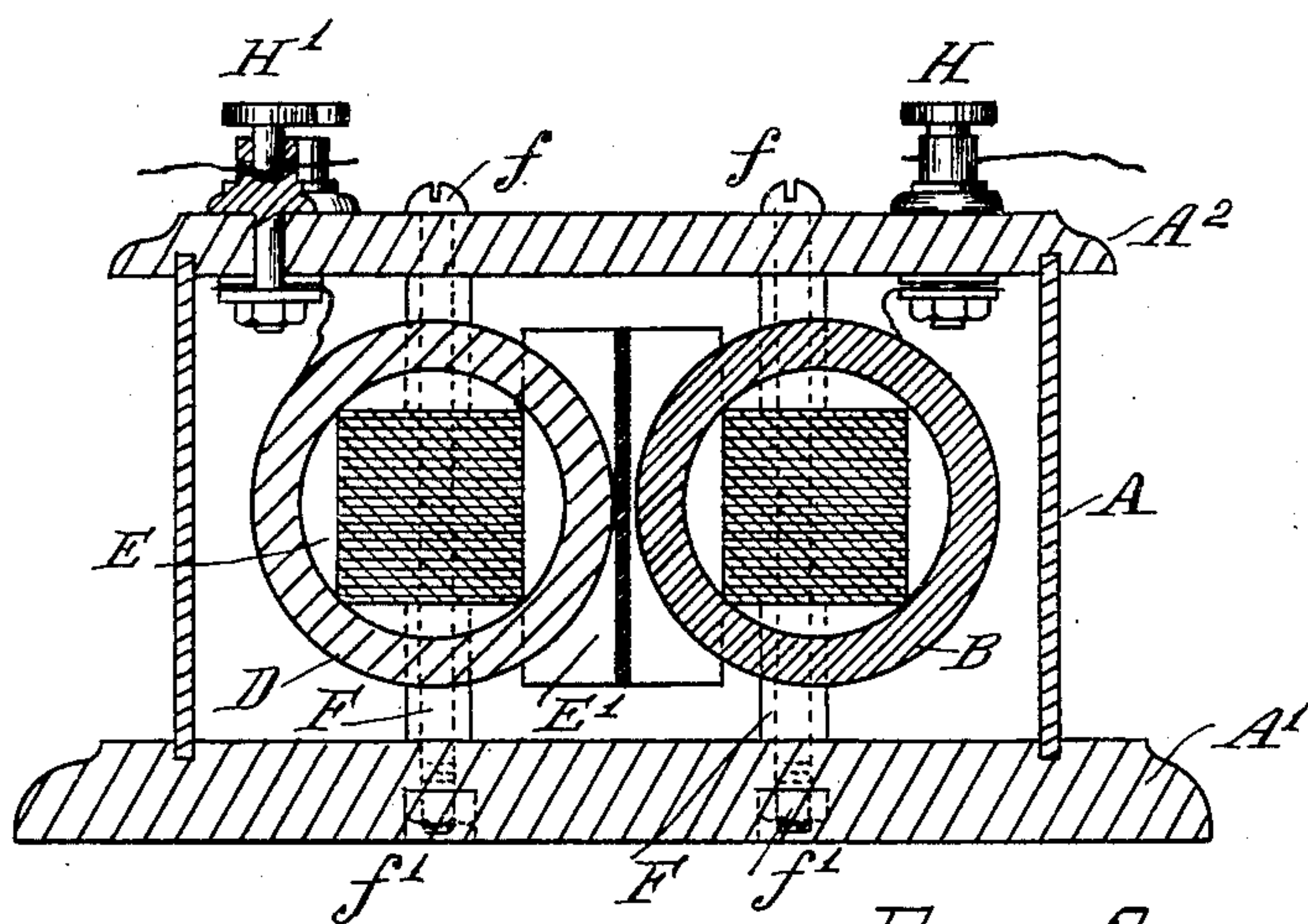


FIG. 2.

WITNESSES.

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Margaret M. Donald.

*INVENTOR.*

JAMES L. ADAMS JR.  
By Atty N. DuBois.

No. 734,791.

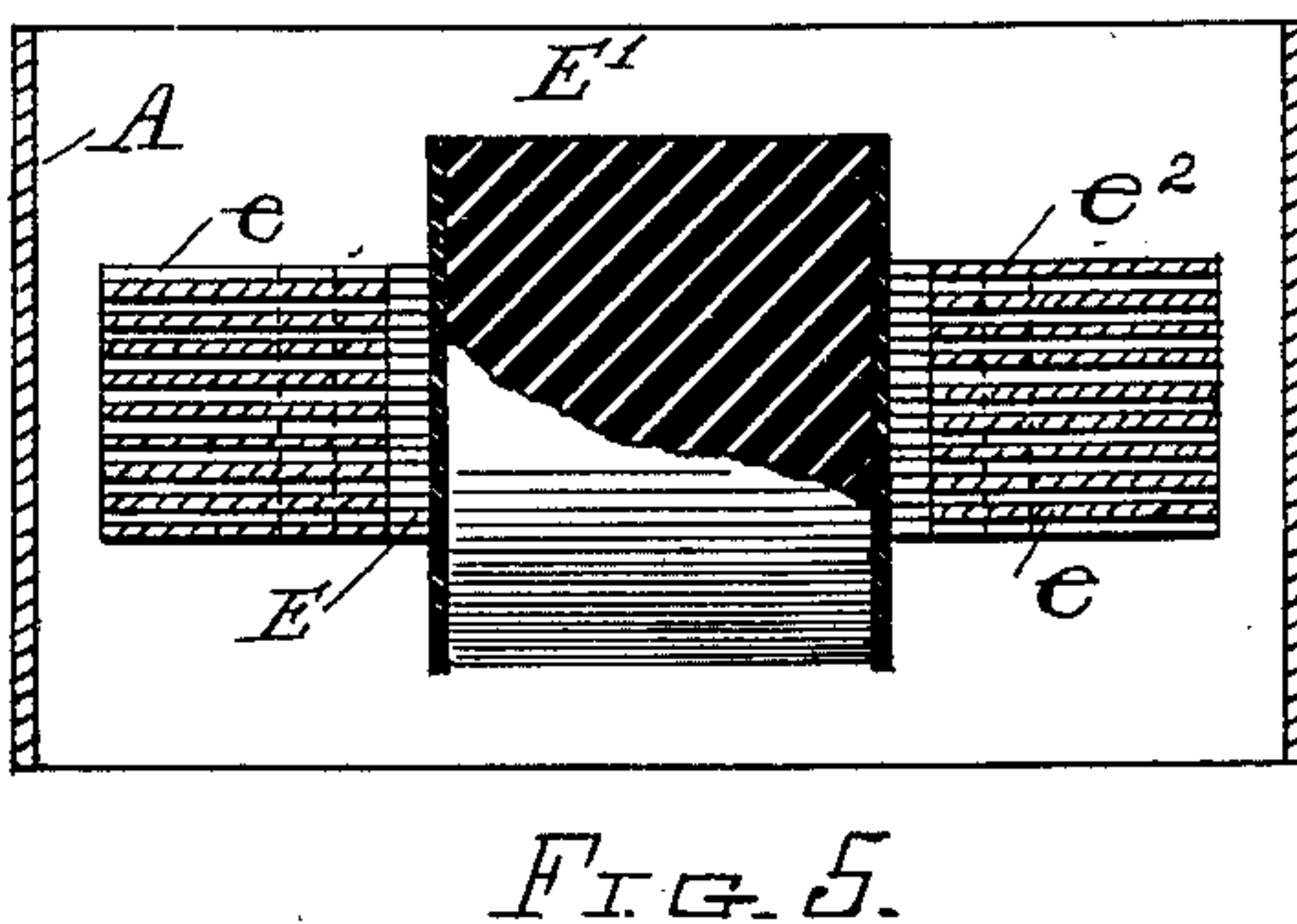
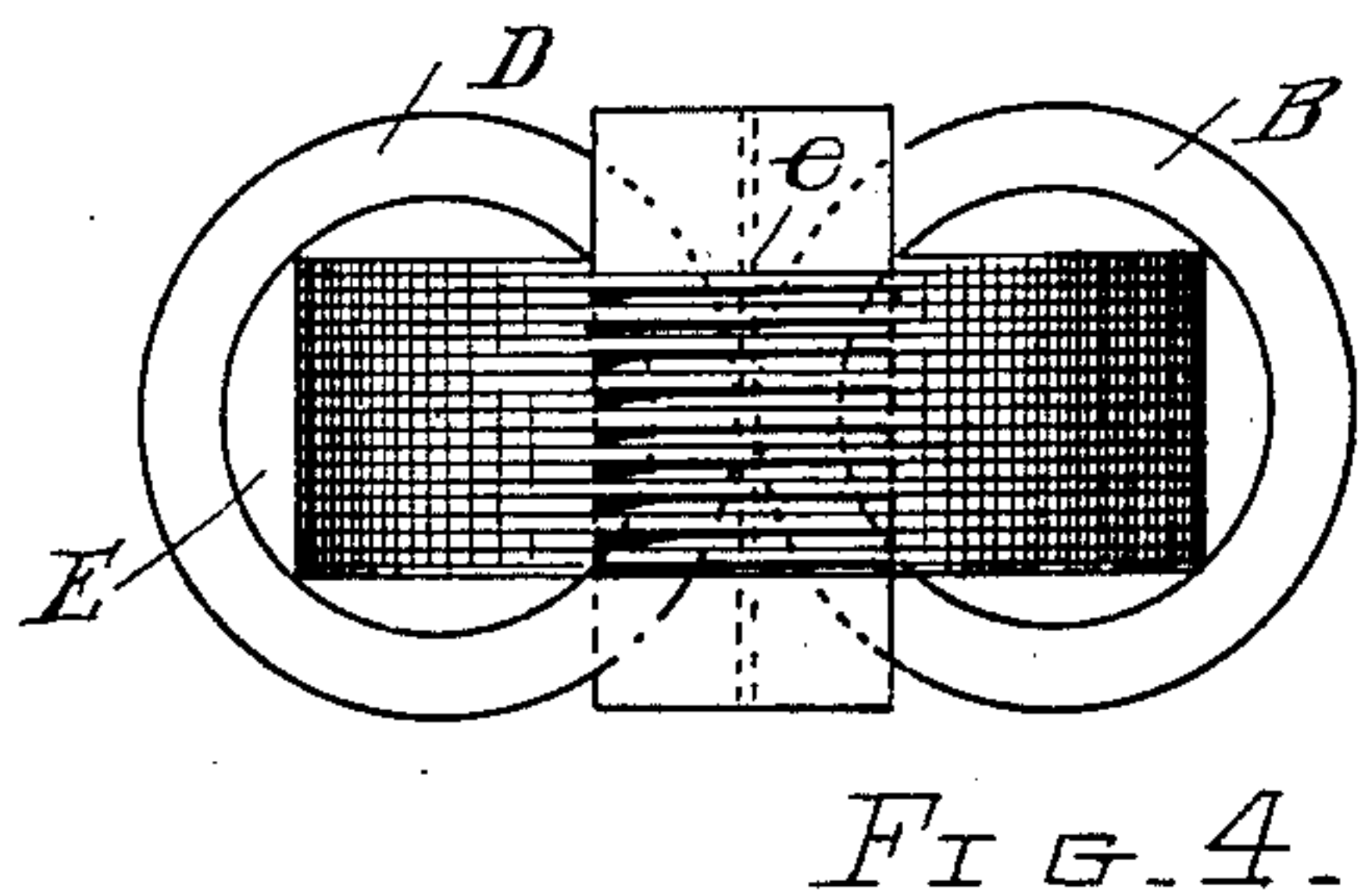
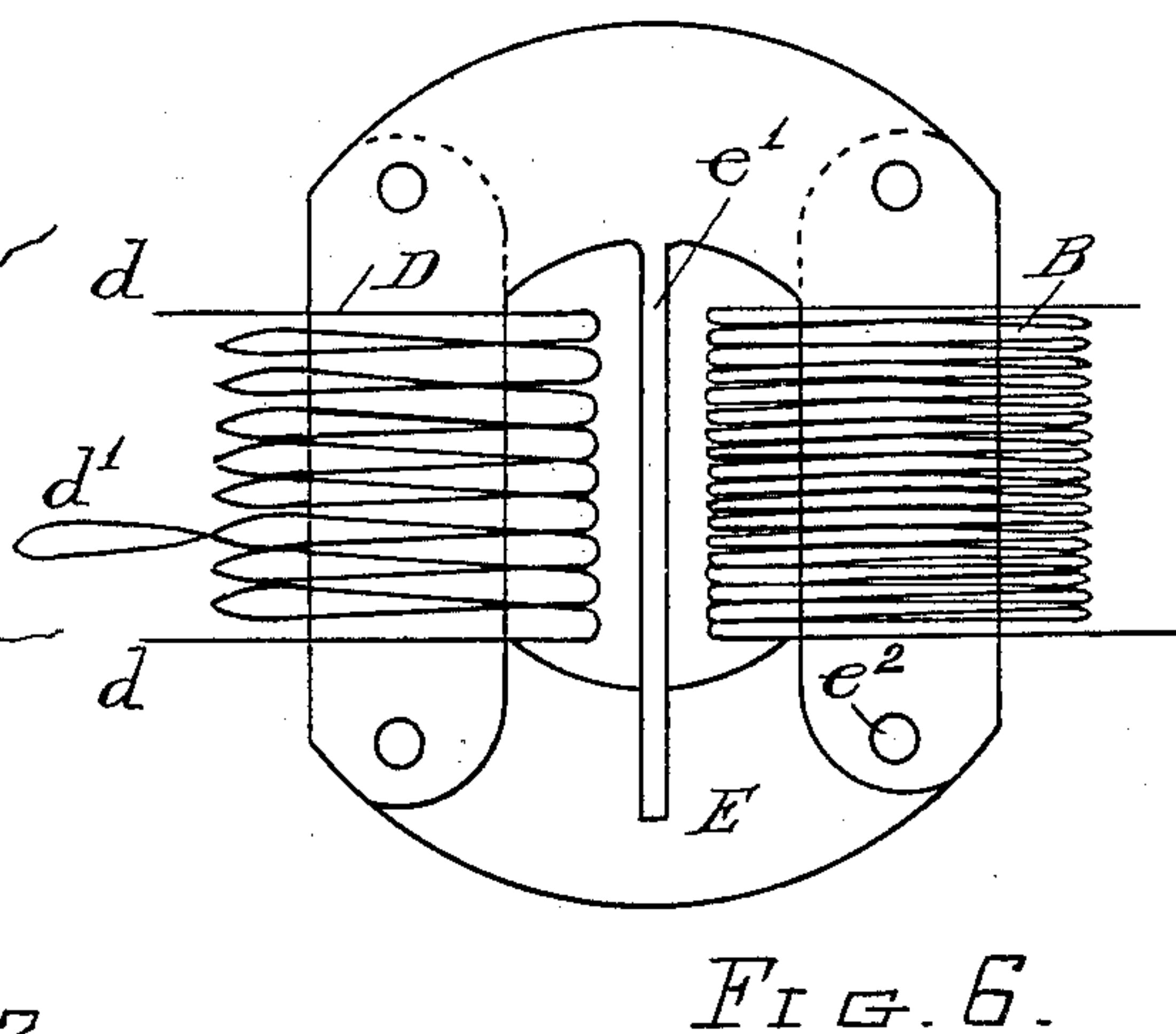
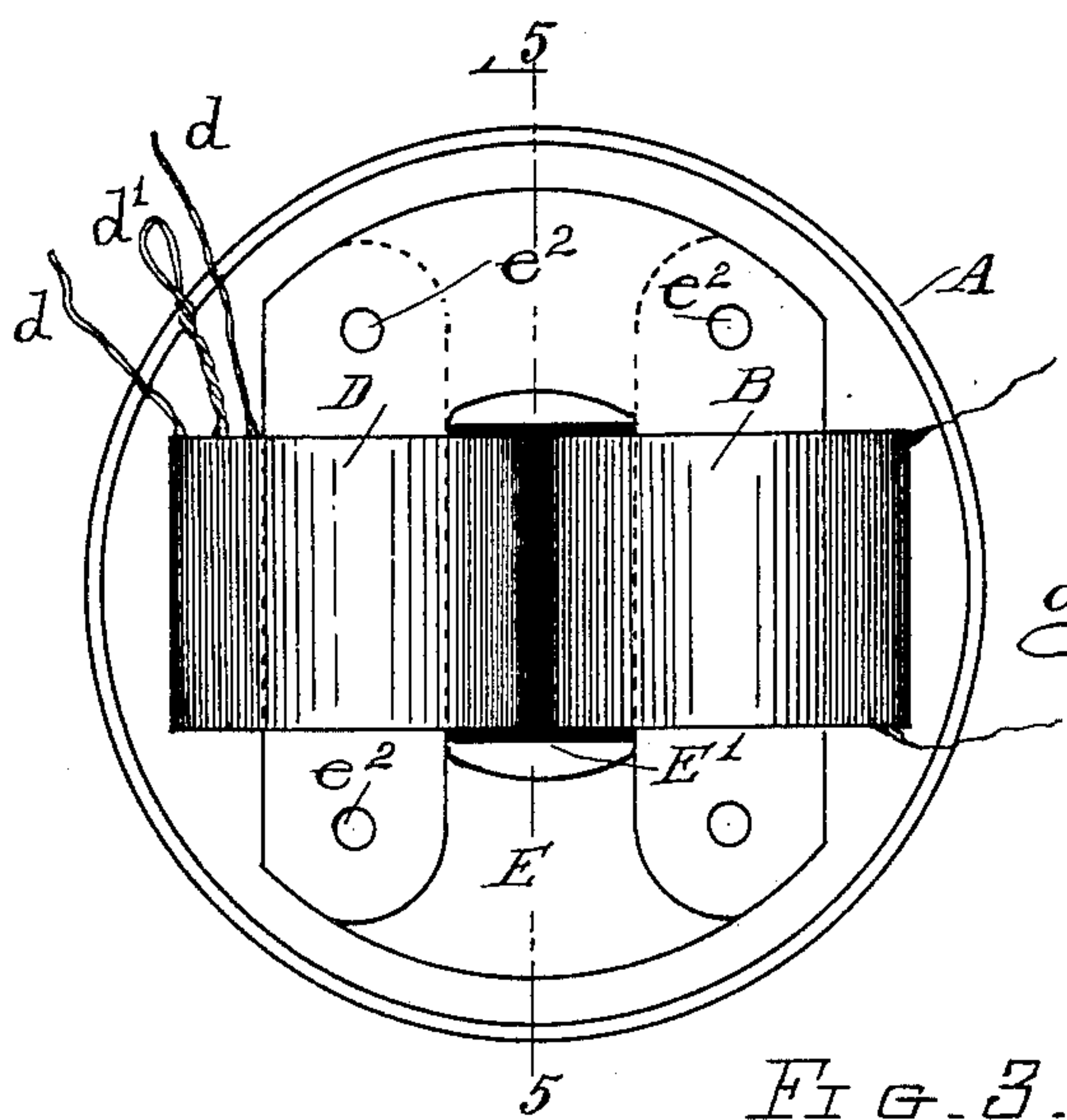
PATENTED JULY 28, 1903.

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TRANSFORMER.

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NO MODEL.

2 SHEETS—SHEET 2.



WITNESSES.  
R. H. Dooling,  
Margaret McDonald.

INVENTOR.  
JAMES L. ADAMS, JR.  
By Atty N. DuBois.



## UNITED STATES PATENT OFFICE.

JAMES L. ADAMS, JR., OF SPRINGFIELD, ILLINOIS.

## TRANSFORMER.

SPECIFICATION forming part of Letters Patent No. 734,791, dated July 28, 1903.

Application filed July 5, 1902. Serial No. 114,435. (No model.)

*To all whom it may concern:*

Be it known that I, JAMES L. ADAMS, Jr., a citizen of the United States, residing at Springfield, in the county of Sangamon and State of Illinois, have invented certain new and useful Improvements in Transformers, of which the following is such a full, clear, and exact description as will enable others skilled in the art to which it appertains to make and use my said invention.

My invention relates to transformers such as may be employed to operate or furnish the necessary current for operating electric bells, annunciators, gas-lighters, door-openers, burglar-alarms, railway-signals, and other devices of a similar nature by means of power derived from the ordinary alternating-current electric-light service-wires.

The purposes of my invention are to provide a transformer of simple construction adapted to the uses stated and so constructed and arranged as to limit the maximum consumption of current by the primary coil and the output of the secondary coil in such manner that accidental or prolonged short-circuiting of the secondary will not result in permanent injury to the windings or excessive overheating thereof.

With these ends in view my invention consists in the novel features of construction and combinations of parts shown in the annexed drawings, to which reference is hereby made, and hereinafter particularly described and finally recited in the claims.

Referring to the drawings, Figure 1 is a top plan of the transformer and connections. Fig. 2 is a vertical section on the line 2 2 of Fig. 1. Fig. 3 is a top plan of the mechanism within the case, the cover of the case being removed. Fig. 4 is a side elevation of the core and the coils mounted thereon. Fig. 5 is a partial vertical section on the line 5 5 of Fig. 3. Fig. 6 is a diagram showing an alternative form of core provided with a shunt and also illustrates the winding of the secondary coil.

Similar reference-letters designate like parts in all the views.

The case A may be of any suitable form and of any suitable fireproof material and is

adapted for the protection and insulation of the apparatus within the case, said apparatus being so mounted and insulated within the case as to make a breakdown of insulation between the coils or from either or both coils to the case practically impossible. I preferably use an iron case, for the reason that such a case may be utilized to shunt the magnetic lines, as hereinafter more fully explained.

The essential elements of the apparatus are a primary coil B and a secondary coil D, mounted on a laminated magnetic core, so constructed and arranged as to provide for a considerable magnetic leakage at full load, or thereabout, between the primary and secondary coils. This magnetic leakage, in conjunction with the impedance in the primary coil, serves to limit the current consumption of the primary and also serves to modify the output of the secondary, so as to make it effective for the purposes intended while guarding against permanent injury to the parts or danger from fire by overheating in case of accidental or prolonged short-circuiting of the secondary. The primary coil B is of the usual construction and is of a size suitable for the purposes intended. The secondary coil is wound to provide for one or more voltages, preferably three, arranged for by two outside terminals  $d$  and a loop  $d'$  in the winding, located about one-third of the coil distance from one of said terminals. The core E consists of a series of U-shaped stampings or laminations  $e$ , superimposed on each other and having holes  $e^2$  to receive securing devices for securing the core in place in the case. The laminations are so arranged as to be in contact with each other in those parts of the core which are inclosed in the coils and so that in those parts of the core external to the coils there is an air-space between each pair of laminations, the cross-sectional area of the magnetic yokes between said coils being consequently less than that of the parts of the core which are inclosed in the coils.

By employing the construction shown and described I produce a closed magnetic circuit having twice as many layers of iron in the parts covered by the coils as there are in the



yokes connecting said parts. The practical effect of this construction is to promote considerable magnetic leakage between said coils, thereby limiting the secondary current at full load to such extent as to make it available for the use intended.

I have shown and described a core having yokes formed with air-spaces between the laminations thereof; but it is obvious that without departing from my invention diamagnetic or partially-diamagnetic material other than air may be employed to maintain a condition favorable to magnetic leakage. The core E is supported within the case on tubes F. Bolts  $f$  pass through the cover  $A^2$ , through the insulating-tubes F, and through the holes  $e^2$  in the laminations and screw into nuts  $f'$  in the base A, and the bolts clamp all of the parts firmly together in proper position relative to each other. Binding-posts H connect the terminals of the primary coil with the service-wire through an intermediate cut-out K. Binding-posts H' connect the terminals  $d$  and the loop  $d'$  with the annunciator or other appliance with which the transformer may be used.

Means for making available the magnetic leakage is of the essence of my invention. I prefer to employ a construction in which the reduced cross-sectional area of the core in its uninclosed parts will promote said leakage; but the same end may be attained by other means—such, for example, as a magnetic shunt adapted to diminish the number of magnetic lines passing through the secondary coil.

I have shown in the drawings and will now describe means for shunting the magnetic lines.

I preferably employ a case A, of iron or other magnetic material, so proportioned and so situated relative to the coils and magnets contained in the case that the case itself will serve as a magnetic shunt to diminish the number of magnetic lines passing through the secondary. I may also employ as a shunt a series of tongues  $e'$  integral with the laminations of the core E, as clearly shown in Fig. 6. In practice I utilize both the magnetic leakage and the shunting of the magnetic lines, and the constructions shown in Figs. 3 and 6 both provide for both the leakage and the shunting of the magnetic lines. In practice the terminals  $b$  of the primary coil are connected with an alternating-current service-line by means of a suitable cut-out K, safeguarded by a fuse of ordinary construction. The terminals of the secondary coil are connected with the bell or other instrument to be operated. By employing the loop  $d'$  the electromotive force of the secondary circuit may be varied according to circumstances—that is to say, if small voltage is required the loop and one of the terminals may be placed in circuit, thereby

utilizing only that part of the coil which is between the loop and the terminal, and if increased voltage is required both of the terminals may be placed in circuit, so as to utilize the entire number of turns of the coil.

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

1. In a transformer, the combination of U-shaped laminations superposed and alternately reversed on each other to form a magnetic core having two core members connected by magnetic yokes, the cross-sectional area of said magnetic yokes being less than the cross-sectional area of the parts of the core surrounded by the coils, a primary coil mounted on one member of said core and a secondary coil mounted on the other member of said core, as set forth.

2. In a transformer, the combination of U-shaped laminations superposed and alternately reversed on each other to form a magnetic core having two members joined by magnetic yokes, a primary coil mounted on one member of said core, a secondary coil mounted on the other member of said core and insulation between said coils and said core, as set forth.

3. In a transformer, the combination of U-shaped laminations having tongues and superposed and alternately reversed on each other to form a two-member core having an intermediate shunt; in combination with a primary coil mounted on one member of said core and a secondary coil mounted on the other member of said core, as set forth.

4. In a transformer the combination of U-shaped laminations superposed and alternately reversed on each other to form a two-member magnetic core, a primary coil mounted on one member of said core, a secondary coil mounted on the other member of said core and a case of magnetic material surrounding said core and said coils within the magnetic field of said core and forming a partial magnetic shunt between said coils, as set forth.

5. In a transformer, an inclosing case of magnetic material so proportioned and situated relative to the inclosed coils and core that the case itself will serve as a magnetic shunt to divert some of the magnetic lines which otherwise would pass through the secondary coil; in combination with a primary coil, a secondary coil and a core on which said coils are mounted, as set forth.

6. In a transformer the combination of U-shaped laminations superposed and alternately reversed on each other to form a core having two members joined by yokes, a primary coil mounted on one core member, and a secondary coil mounted on the other core member and having two outside terminals and an intermediate loop, as set forth.

7. In a transformer, the combination of a primary coil, a secondary coil of form and di-

5 mensions adapted by its reactance to produce at full load magnetic leakage between the coils and impedance in the primary to a degree to prevent overloading of the secondary and limit current consumption of the primary, a magnetic core having a yoke and a case inclosing said coils and core, as set forth.

In witness whereof I have hereunto subscribed my name, at Springfield, Illinois, this 27th day of February, 1902.

JAMES L. ADAMS, JR.

Witnesses:

MAY F. RYAN,  
R. HAAS.