No. 890,730. PATENTED JUNE 16, 1908.

M. O. TROY.

VARIABLE VOLTAGE TRANSFORMER.

APPLICATION FILED JULY 26, 1906. RENEWED FEB. 5, 1908.

2 SHEETS—SHEET 1.

Fig. 1

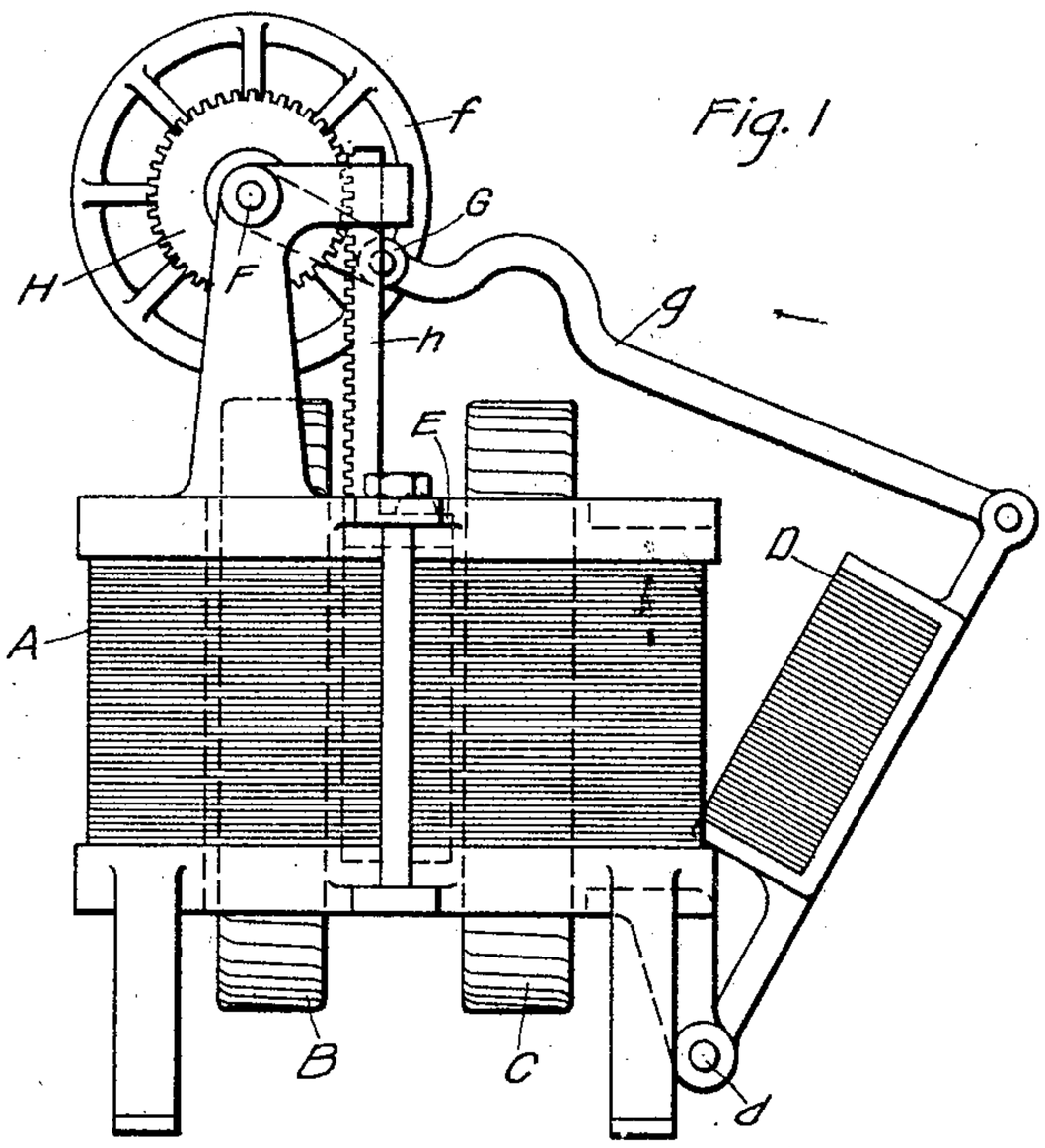
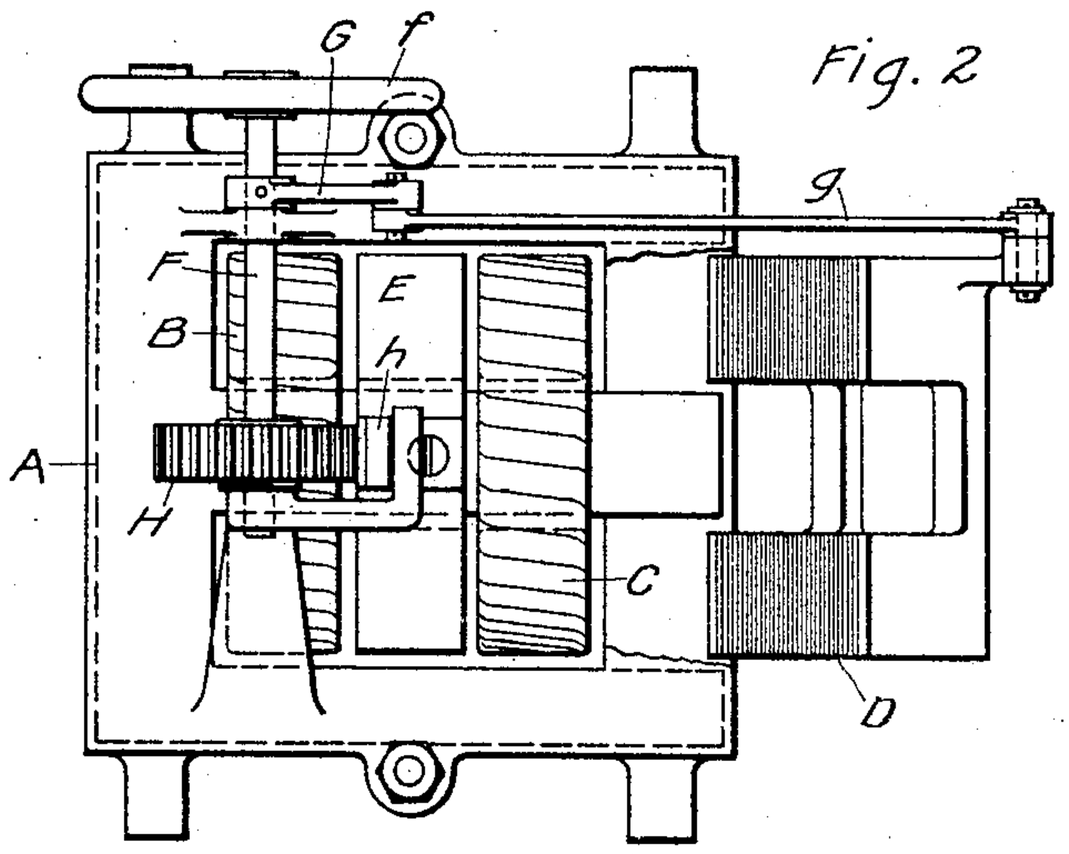


Fig. 2



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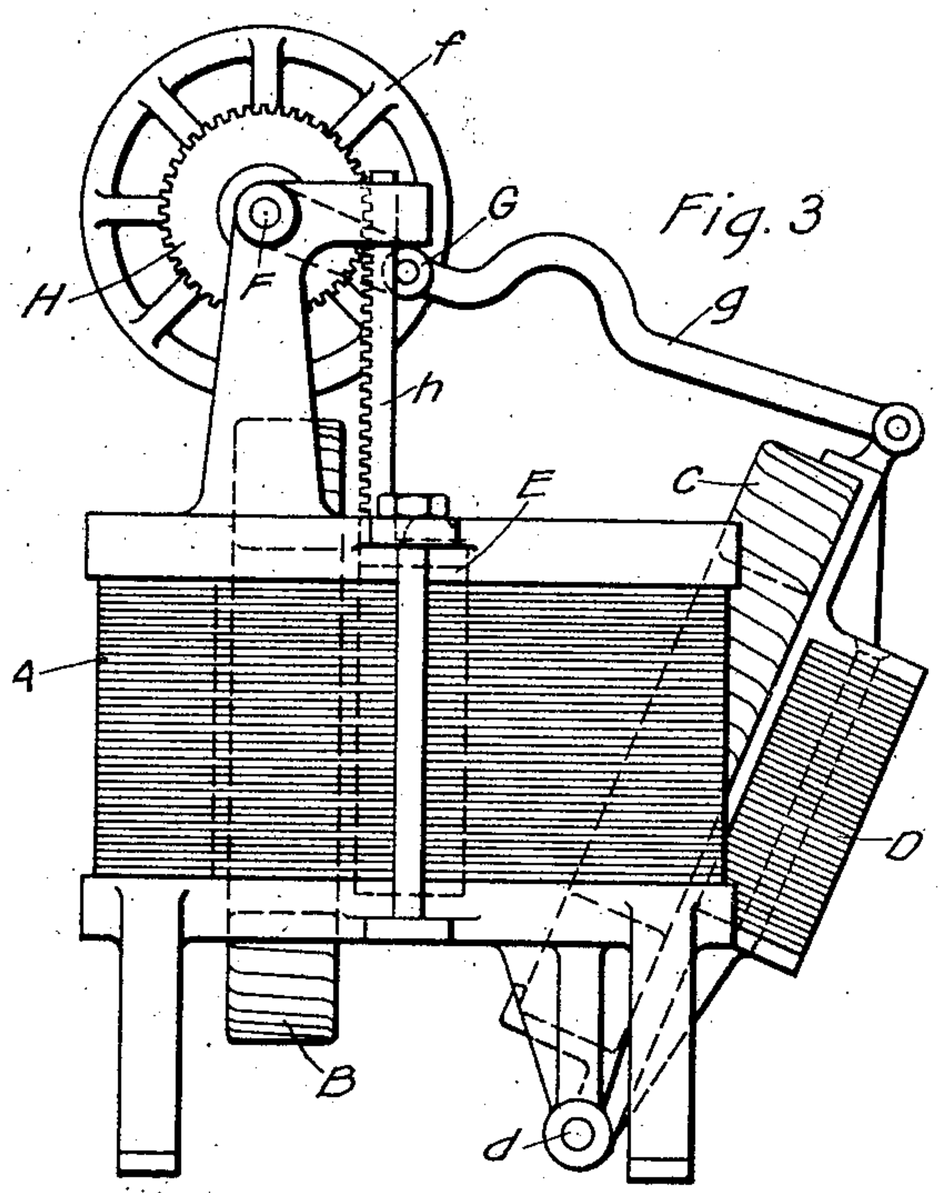

Fig. 3

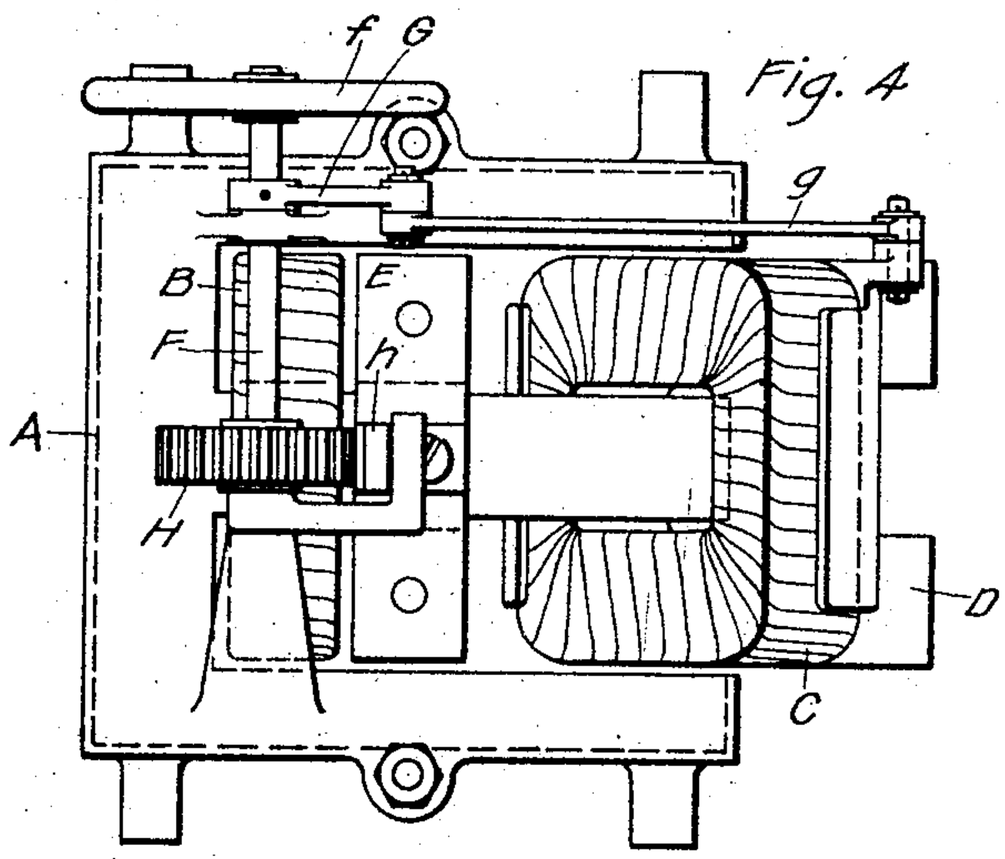

Fig. 4

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UNITED STATES PATENT OFFICE.

MATTHEW O. TROY, OF SCHENECTADY, NEW YORK, ASSIGNOR TO GENERAL ELECTRIC COMPANY, A CORPORATION OF NEW YORK.

VARIABLE-VOLTAGE TRANSFORMER.

No. 890,730. Specification of Letters Patent. Patented June 16, 1908.

Application filed July 26, 1906, Serial No. 327,877. Renewed February 5, 1908. Serial No. 414,449.

To all whom it may concern:

Be it known that I, MATTHEW O. TROY, a citizen of the United States, residing at Schenectady, county of Schenectady, State of New York, have invented certain new and useful Improvements in Variable-Voltage Transformers, of which the following is a specification.

My invention relates to variable-voltage transformers of the type described in my former ~~application, Serial~~ No. 292,906, filed December 22, 1905, and its object is to provide a transformer of this type having certain novel and useful features. In my former application I described a variable-voltage transformer having a magnetic core with primary and secondary coils and two magnetic movable members, one arranged to vary the reluctance of the magnetic circuit, passing through both coils, and the other to vary the reluctance of the magnetic circuit shunting the secondary coil. In the arrangement of my former application both members were rectilinearly movable.

One feature of my present invention consists in pivotally mounting one of the two movable members. This arrangement renders it possible with a simple mechanical construction to obtain any desired relative rates of movement of the two members so as to obtain a more uniform graduation of the secondary voltage.

A second feature of my invention consists in moving the secondary coil as well as the magnetic members or core portions. This feature is particularly valuable where it is desired to reduce the induced secondary voltage entirely to zero. I have found that when only portions of the core are moved a certain leakage flux still passes through the secondary coil when the core portions are in position of minimum secondary voltage. By moving the secondary coil entirely away from the influence of the primary coil the secondary induced voltage may be reduced entirely to zero.

My invention will best be understood by reference to the accompanying drawings, in which

Figure 1 is a side elevation of a transformer arranged in accordance with my invention; Fig. 2 shows a plan view of the same; Fig. 3 shows a side elevation of a modification in which the secondary coil is movable; and Fig. 4 shows a plan view of the same.

Referring first to Figs. 1 and 2, A represents the stationary portion of the magnetic core, which is E-shaped, as clearly shown in Fig. 2, with the primary coil B and the secondary coil C spaced apart on its central member.

D represents a movable portion of the core, which is pivoted at *d* and arranged by its movement to open and close the magnetic circuit between the ends of the three parallel members of the stationary core A, so as to vary the reluctance of the magnetic circuit passing ~~through~~ the primary and secondary coils.

E represents a second movable magnetic member, which is similar in construction to the member D, but which is rectilinearly movable between the coils B and C. When the member E is in its highest position above the core A, it has little effect upon the flux in core A, but when it is lowered to the position shown in Fig. 1, it makes an effective flux shunt for the secondary coil, closing a magnetic circuit around the primary coil alone. Members D and E are simultaneously movable to reduce the induced secondary voltage. Member D is moved outward to the positions shown in Figs. 1 and 2, thereby opening the magnetic circuit threading both primary and secondary coils, while member E is moved to its lowest position, as shown in Figs. 1 and 2; thereby affording a substantially closed circuit for the flux of the primary coil.

For operating members D and E a shaft F is provided with a hand-wheel *f*. This shaft is connected by the crank G and a connecting rod *g* to member D, and by the gear H and rack *h* to member E. With this arrangement it will be seen that the rate of movement of the member E bears a fixed relation to the rate of movement of the shaft F, while the rate of movement of member D varies according to the position of the crank G. Thus, by properly positioning the crank on the shaft the relative rates of movement of members D and E may be made anything desired, so as to obtain a uniform variation of the secondary induced voltage with a given movement of shaft F.

It will be seen that even with the members D and E in the position shown in Fig. 2, a certain amount of flux may leak across the air-gap opened by the outward movement of member D. This leakage flux will induce a small electromotive force in the secondary

coil C. If it is desired to reduce the secondary induced voltage wholly to zero, the arrangement shown in Figs. 3 and 4 may be employed. In these figures the secondary coil C is mounted on and movable with the pivoted member D, so that in the position of minimum induced voltage the coil C is carried partly or wholly outside of the core A. Aside from the change in the mounting of the secondary coil C, the arrangement shown in Figs. 3 and 4 is the same as that already shown for Figs. 1 and 2.

I do not desire to limit myself to the particular construction and arrangement of parts here shown, but aim in the appended claims to cover all modifications which are within the scope of my invention.

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

1. In a variable-voltage transformer, a magnetic core, primary and secondary coils spaced apart on said core, said core having a pivotally-mounted portion adapted to open by its movement the magnetic circuit threading both coils, and a rectilinearly-movable magnetic member between said coils adapted by its movement to shunt the primary flux away from the secondary coil.

2. In a variable-voltage transformer, a magnetic core, primary and secondary coils spaced apart on said core, said core having a pivotally-mounted portion adapted to open by its movement the magnetic circuit threading both coils, a rectilinearly-movable magnetic member between said coils adapted by its movement to shunt the primary flux away from the secondary coil, and means for moving said core portion and said member simultaneously.

3. In a variable-voltage transformer, a magnetic core, primary and secondary coils spaced apart on said core, said core having a pivotally-mounted portion adapted to open by its movement the magnetic circuit threading both coils, a rectilinearly-movable magnetic member between said coils adapted by its movement to shunt the primary flux away from the secondary coil, and operating means mechanically connected to both said core portion and said member.

4. In a variable-voltage transformer, a magnetic core, primary and secondary coils spaced apart on said core, said core having a pivotally-mounted portion adapted to open by its movement the magnetic circuit threading both coils, a rectilinearly-movable magnetic member between said coils adapted by its movement to shunt the primary flux away from the secondary coil, an operating shaft, a crank on said shaft connected to said core portion, and a gear on said shaft connected to said member.

5. In a variable-voltage transformer, a magnetic core, primary and secondary coils spaced apart on said core, two movable magnetic members arranged to vary the reluctances respectively of the magnetic circuit of the secondary coil and of a magnetic circuit shunting said coil, one of said members being pivotally mounted and the other rectilinearly-movable, and operating means mechanically connected to both members.

6. In a variable-voltage transformer, a magnetic core, primary and secondary coils spaced apart on said core, said core having a pivotally-mounted portion adapted to open by its movement the magnetic circuit threading both coils, the secondary coil being secured to and carried by said core portion, and a rectilinearly-movable magnetic member adapted by its movement to shunt the primary flux away from the secondary coil.

7. In a variable-voltage transformer, a magnetic core, primary and secondary coils spaced apart on said core, said core having a pivotally-mounted portion adapted by its movement to open the magnetic circuit threading both coils, the secondary coil being secured to and carried by said core portion, a rectilinearly-movable magnetic member adapted by its movement to shunt the primary flux away from the secondary coil, and operating means mechanically connected to both said core portion and said member.

In witness whereof, I have hereunto set my hand this 25th day of July, 1906.

MATTHEW O. TROY.

Witnesses:

BENJAMIN B. HULL,

GRACE M. HANIGAN.