(No Model.)

J. D. IHLDER.

MAGNETIZING COIL.

No. 516,204. Patented Mar. 13, 1894.

Fig. 1.

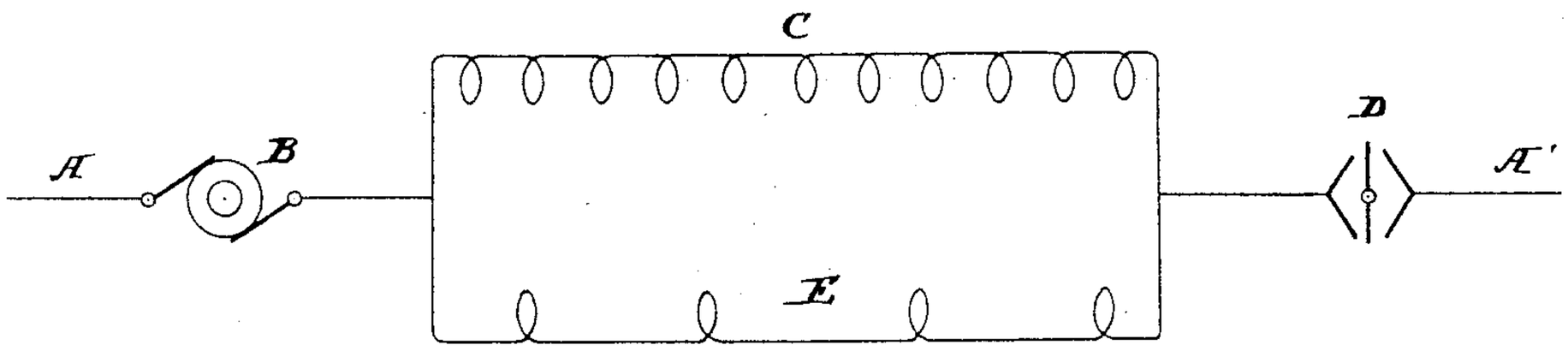
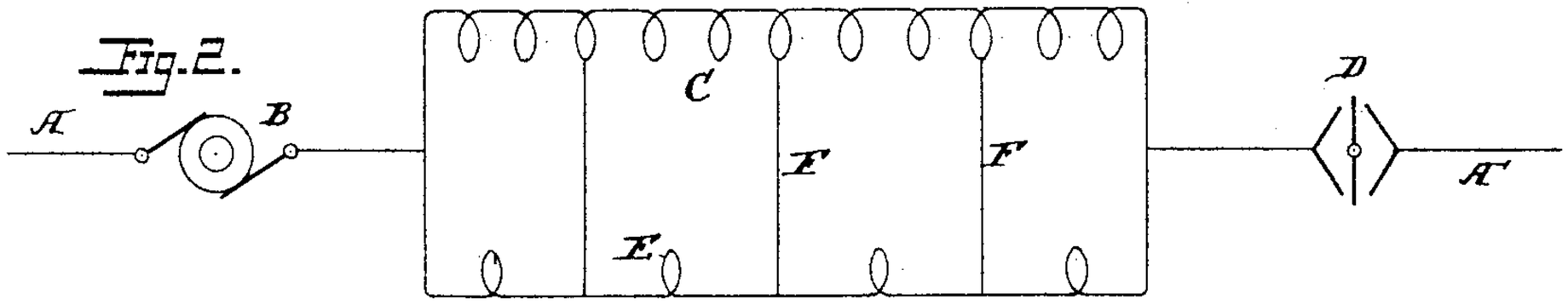


Fig. 2.



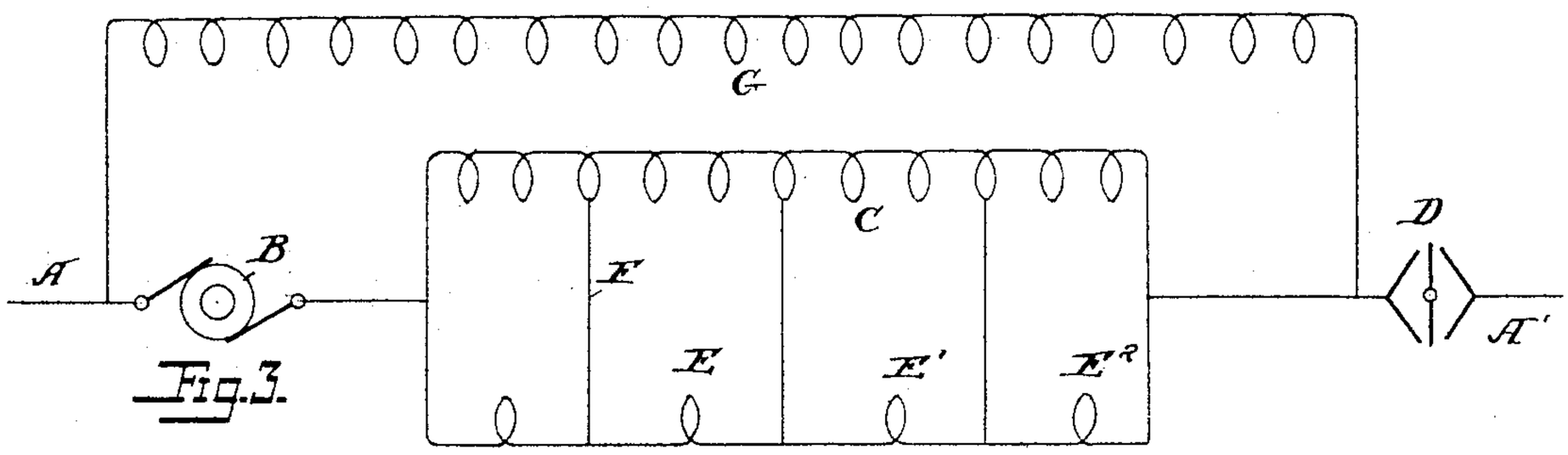
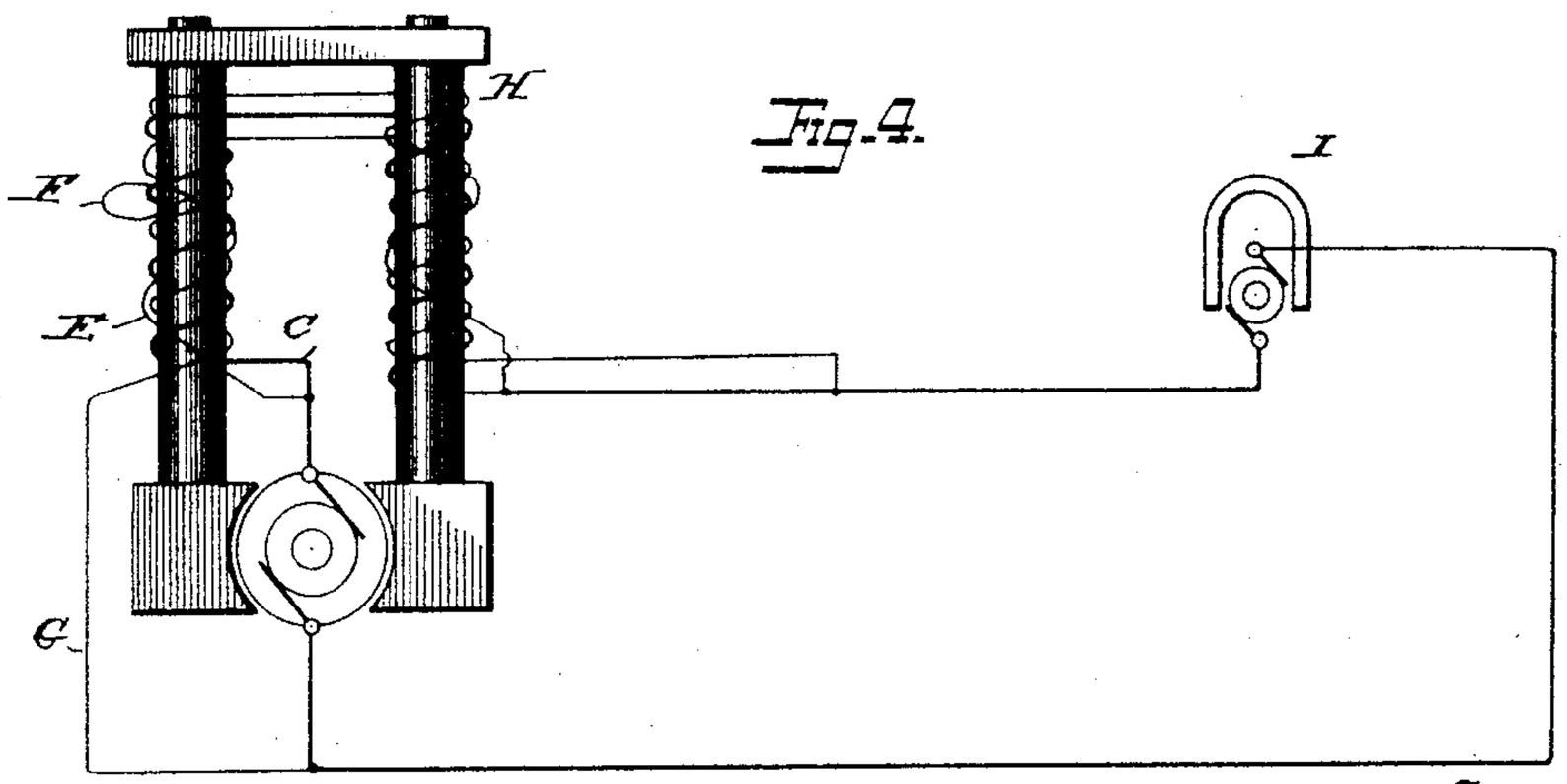


Fig. 3.

Fig. 4.



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MAGNETIZING-COIL.

SPECIFICATION forming part of Letters Patent No. 516,204, dated March 13, 1894.

Application filed November 18, 1892. Serial No. 452,440. (No model.)

To all whom it may concern:

Be it known that I, JOHN D. IHLDER, a citizen of the United States, residing at Yonkers, in the county of Westchester and State of New York, have invented certain new and useful Improvements in Magnetizing-Coils, of which the following is a specification.

My invention relates to magnetizing coils, and has for its object to overcome and prevent the evil effects which are due to an inductive current which is set up in the magnetizing coils when the circuit is broken or the lines of force are caused to rapidly collapse.

It consists in the various features of construction, arrangement and having the mode of operation, substantially as hereinafter more particularly pointed out.

Referring to the accompanying drawings I have illustrated diagrammatically one application of my invention sufficient to enable those skilled in the art to understand its general principles, and in the drawings--

Figure 1, is a diagram showing the circuits of a series motor or similar machine. Fig. 2, is a similar view showing a manner of connecting the coils. Fig. 3, is a diagrammatic view of a shunt of a compound motor. Fig. 4, is a conventional indication of circuits and coils applied to an electric machine.

In operating electric machines provided with magnetizing coils, it is well known that breaking the circuit of the conductor produces a collapse of the magnetic whirls or lines of force which were produced by the current, and this collapse of the magnetic whirls creates an electro motive force in the conductor which tends to send a current in the same direction as the primary current, and this is often designated the extra current or spark current. In a magnetizing coil of many turns especially one containing an iron core, the electro motive force of this extra current often becomes very high, and results in heavy flashing at the breaking point, and producing disruptive discharges which injure and sometimes destroy the insulation of the coil itself or other circuits or machines connected with the coil. While this is apparent in a magnetizing coil of whatever nature, it is particularly apparent and objectionable in the magnetizing coils of electric motors, and when such motors are connected in circuit with other translating devices, especially containing inductive resistance, the results are often quite serious. These results are particularly apparent in electric motors which are used to run elevators and the like, where the circuit of the motor has to be made and broken quite often in the ordinary operation of the elevator, and the result has been that not only is the motor of the elevator affected, but other motors in the same circuit or other translating devices suffer to a greater or less extent from these discharges. It is with the object of preventing these evil results that my present invention is made. The intensity of the electro motive force set up depends upon the suddenness of the collapse of the lines of force or magnetic whirls, if the lines of force collapse suddenly, the secondary or extra current often attains a much higher electro motive force than the electro motive force of the primary current, but when the collapse of the lines of force in the magnetizing coil is produced comparatively slowly, the evil effects are avoided, the electro motive force set up in the conductor being proportioned to the rate of decrease of the lines of force. Heretofore attempts have been made to overcome these objections by providing the magnetizing coil with a continuous band of sheet copper or other suitable conductor surrounding the core, and this copper shell acts in this case as a secondary coil of a single turn of large cross section short circuited on itself. On breaking the primary coils, the number of lines of force inclosed in both circuits is decreased, and an electro motive force is set up in both coils, and this electro motive force produces a current in the single turn short circuited coil, which current again produces lines of force the same as the primary current before breaking, and the sudden collapse of the lines of force of the magnetizing coil is overcome to a greater or less extent. I find however, that better results can be obtained by the use of a short circuited coil of many turns containing practically the same cross section of conductor, than by using a solid conductor. This seems to be based upon the fact that only the outside of the conductor is useful, and it, therefore, be-

comes advantageous to select a conductor of small size to present a large surface, and I sometimes employ a secondary coil of fine wire short circuited on itself wound with or connected to the magnetizing coil. There are, however some objections to this construction which need not be recited.

In order to overcome the objections spoken of, and especially in connection with an electric motor when used for elevators and the like, I wind the magnetizing coil in two directions, that is I apply coils so arranged as to act in opposition to each other and connected in shunt relation to the main magnetizing coil, and this opposing coil is of high resistance or of comparatively few ampère turns relatively to the main coil, so that the ampère turns of the main coil are a great many times more than the ampère turns of the opposing coil. Such a winding constitutes a closed circuit with all the coil magnetizing in the same direction when the secondary current flows through the coils thereby producing a decrease of the lines of force on breaking the primary magnetizing current, as all the turns of this winding will be active in making the rate of decrease of lines of force low. Of course it will be understood that this opposing coil reduces to a slight extent the effectiveness of the main magnetizing coil, but I find that the proportions may be readily so chosen and arranged that the lines produced by the action of the opposing coils is very small and can be practically ignored. Thus referring to Fig. 1, A represents the main current from any suitable source as a distributing circuit, and B, the armature of a motor for instance, while C, represents the main magnetizing coil of the field magnets of the motor. D is the break circuit, and A′ the continuation of the distributing circuit. E, represents the opposing coils, and it will be seen that the main magnetizing coil and the opposing coil are arranged in shunt relations to each other, and normally when the motor is operating, the current will flow through these coils in accordance with the well known laws, the resistance and number of turns of the coils E, being so proportioned as to produce little influence on the magnetizing effect of the main coil. When, however, the circuit is suddenly broken, as at D, the extra or secondary current finds a complete short circuit for itself, and being in the same direction in both the magnetizing coil and secondary coil, it prevents the sudden collapse of the lines of force, and the consequent destructive or disruptive spark or discharge. In order to prevent a high difference of potential between parts of the coils that might be placed in juxtaposition to each other, and also to insure the operativeness of the device in case of a breakdown, I further connect the conductor of the main magnetizing coil with the conductor of the opposing coils.

In Fig. 2, I have shown diagrammatically, portions of the conductor of the magnetizing coil C, and connected to portions of the conductor of the opposing coils E, by means of the connectors F, and it will thus be seen that in this way this prevents a high difference of potential between the portions of the two conductors, and if, for instance, a portion of either of the coils should be broken at one place, that section only would become inactive, and the other sections would operate together in the usual manner.

While I have thus shown my improvement as applied to a series wound motor, it is evident that the same effects and results would be obtained if the opposing coil was used in connection with an ordinary shunt wound motor, and this application of my invention needs no further description or illustration. At present, however, it is the usual practice to use in connection with electric elevators a compound wound motor, and in Fig. 3, I have illustrated diagrammatically such a winding, where the parts are indicated as before, with the addition of the shunt coil G, connected to the main circuits outside the armature and the series magnetizing coils, and I find this a very effective arrangement, as I find it is immaterial whether the coil itself has been active in producing the lines of force that must be prevented from decreasing rapidly, or whether another coil has produced these lines of force in part or in all.

In Fig. 4, I have shown a circuit including a conventional form of motor having the various coils indicated on the field magnets H, connected in circuit with the generator I, and the arrangement thus indicated will be readily understood by those skilled in the art, and while this may be a conventional way of arranging the coils, of course I do not limit my invention to any particular arrangement or construction, as various modifications will readily suggest themselves, and the principles of my invention can be applied in many and various ways which need not be recited.

While I have shown in the diagram the opposing coil as arranged and extending throughout the magnetizing coils, it is evident that the same effects may be produced to a greater or less extent by providing a part only of the magnetizing coil with the opposing turns. Thus for instance referring to Fig. 3, the turns represented by E′, E^2 might be omitted, and the action be substantially the same, and other variations of the arrangement of the coils can be employed to suit the exigencies of any particular case.

What I claim is—

1. As a means of producing a low rate of change of magnetic lines of force, a double magnetizing circuit in shunt relations to each other, and wound in opposite directions with terminals in permanent connection, substantially as described.

2. As a means of producing a low rate of change of magnetic lines of force, a double magnetizing circuit in shunt relations to each other and wound in opposite directions, the

terminals in permanent connection and in such proportions that one circuit has more ampère turns than the other, substantially as described.

3. As a means of producing a low rate of change of magnetic lines of force, a double magnetizing circuit in shunt relations to each other, and wound in opposite directions, and intermediate connections between these two circuits, substantially as described.

4. As a means of producing a low rate of change of magnetic lines of force, a double magnetizing circuit in shunt relations to each other and wound in opposition, and intermediate connections between a part only of the main magnetizing circuit and the opposing circuit, substantially as described.

5. In an electric machine the combination with the main magnetizing coil or coils, of an opposing coil with terminals permanently connected in shunt with the main coil or coils, and arranged to act with the main magnetizing coil when the circuit of the said coil is broken, substantially as described.

6. In a compound wound machine the combination with the main magnetizing coil, of an opposing coil with terminals permanently connected in shunt thereto and arranged to act with the main magnetizing coil when the circuit of said coil is broken, substantially as described.

7. In a compound wound machine the combination with the main magnetizing coil, of an opposing coil of high resistance arranged in shunt therewith, the conductors of the two coils being connected together at intervals, substantially as described.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

JOHN D. IHLDER.

Witnesses:
JAMES S. FITCH,
JAMES E. IRVINE.