2 Sheets—Sheet 1.

H. J. SMITH.

MAGNETO-ELECTRIC APPARATUS.

No. 173,682. Patented Feb. 15, 1876.

Fig. 1.

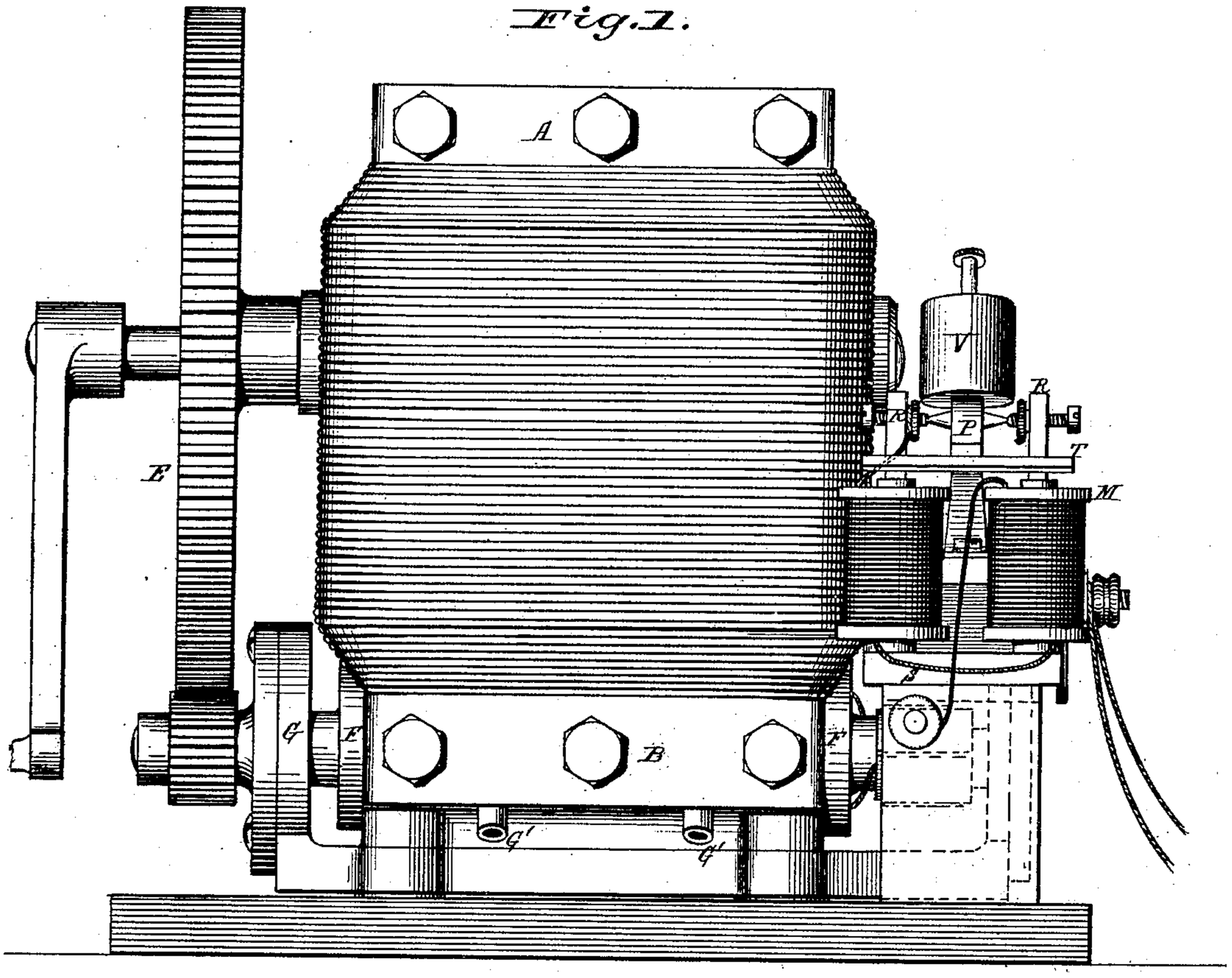
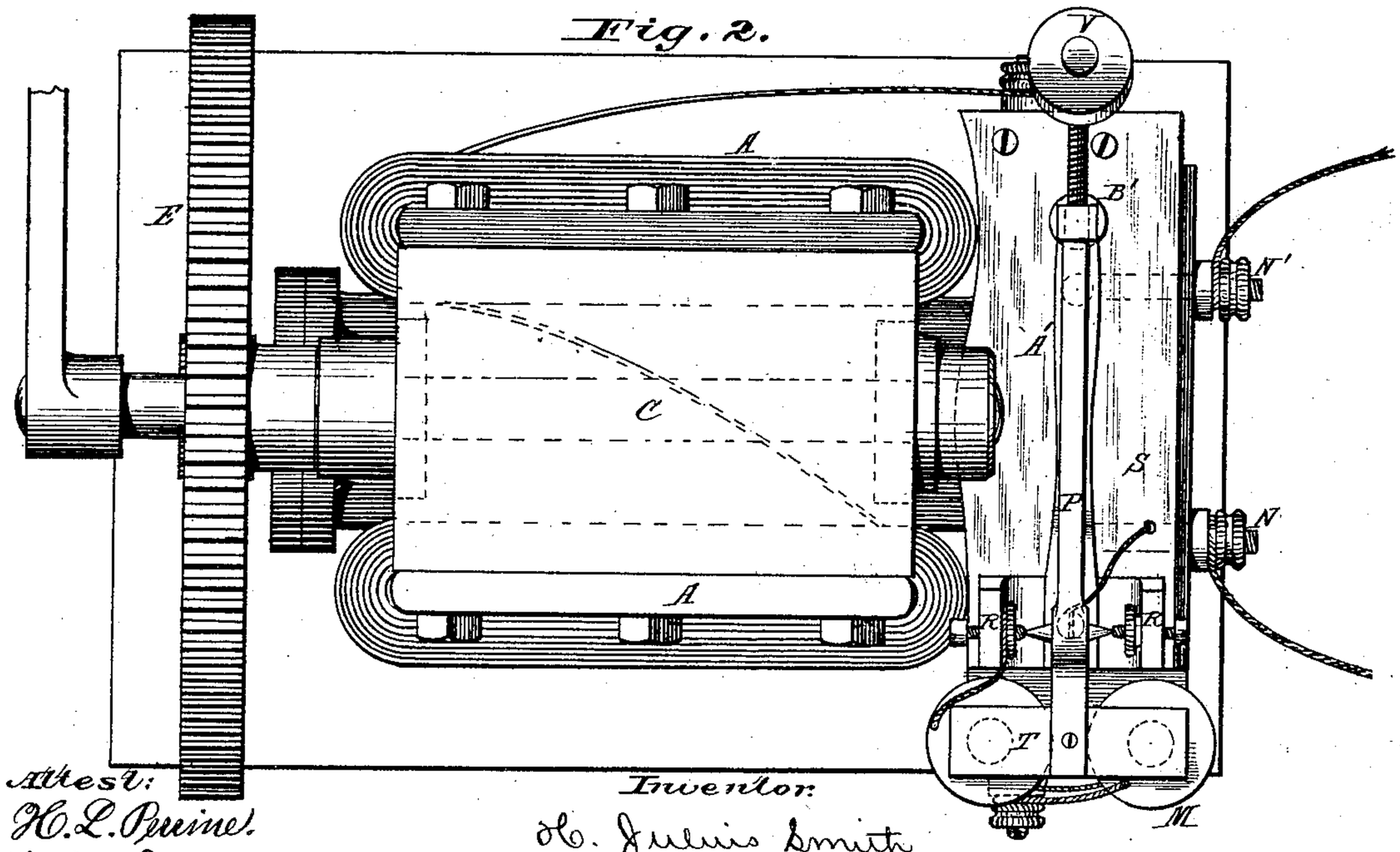


Fig. 2.



Attest:
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2 Sheets—Sheet 2.

H. J. SMITH.

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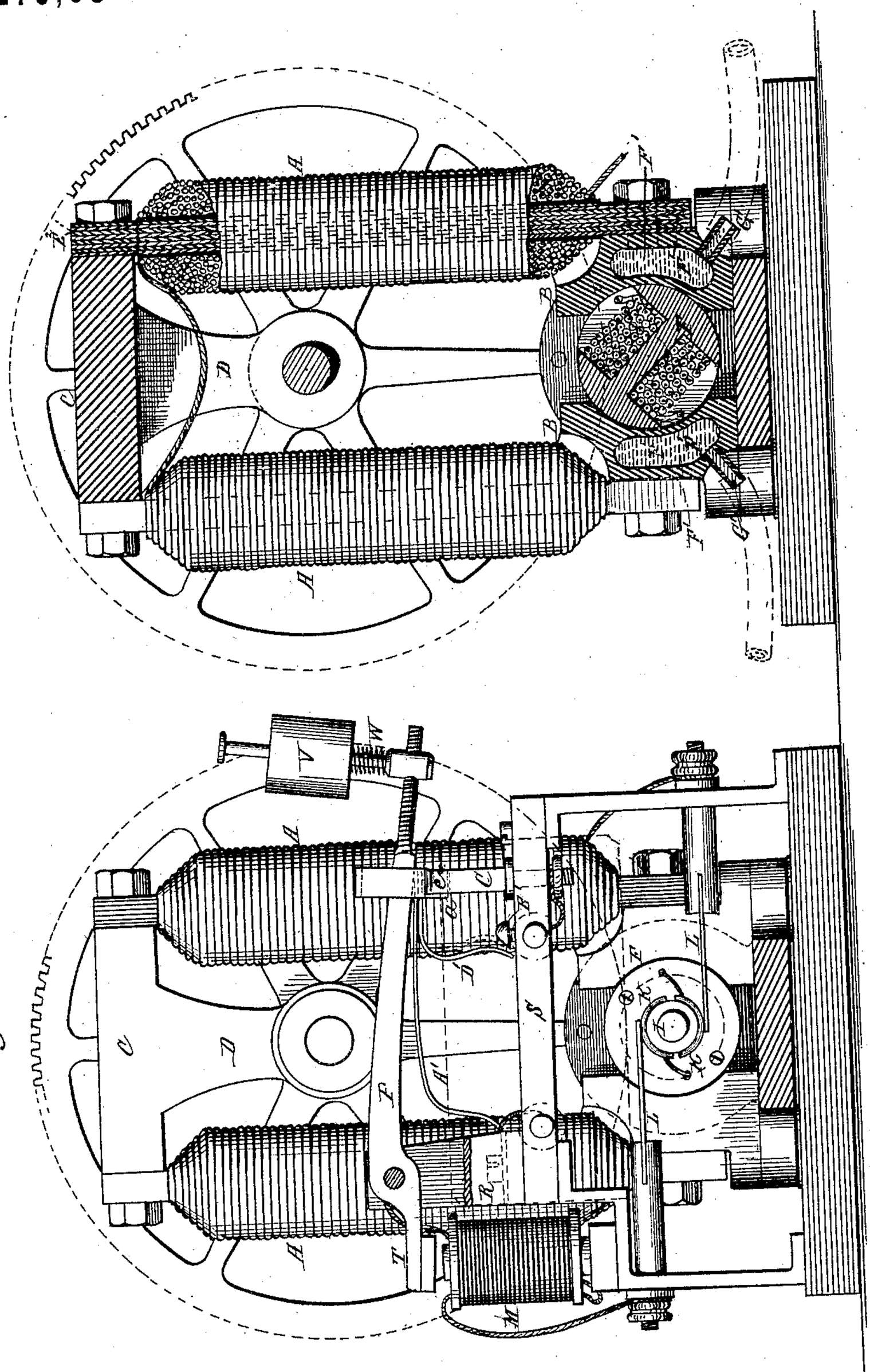

Fig. 4.

Fig. 3.

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UNITED STATES PATENT OFFICE.

H. JULIUS SMITH, OF BOSTON, MASSACHUSETTS.

IMPROVEMENT IN MAGNETO-ELECTRIC APPARATUS.

Specification forming part of Letters Patent No. **173,682,** dated February 15, 1876; application filed February 5, 1876.

To all whom it may concern:

Be it known that I, H. JULIUS SMITH, of Boston, in the county of Suffolk and State of Massachusetts, have invented certain new and useful Improvements in Magneto-Electric Apparatus, of which the following is a specification:

This invention relates to certain improvements in that class of machine for developing electricity known as the "dynamo-magneto machine," involving certain novel principles discovered by Messrs. Wheatstone and Siemens. In machines of this class, when used for blasting and other similar purposes, the electricity is developed and accumulated in the electro-magnets until a sufficient quantity to fire a series of fuses or ignite a series of gas-jets has been obtained, the current being shifted at the proper moment to bring in connection the outside or fuse circuit. It is well known that the strength of the current produced by a magneto-electric machine depends upon the rapidity with which the armature is rotated, and, in order to get the full effective current of the machine, it is important that the rapid rotation of said armature should be continuously maintained. In the machines heretofore constructed the shifting of the current has been accomplished by hand, requiring the attention of the operator at the moment he should be giving his greatest attention to keeping up the motion of the machine, and almost invariably causing him to slacken the motion of the armature, and, by diminishing the current of electricity, to fail to discharge the whole of the series of fuses.

My invention is designed, principally, to overcome this objection, and also to prevent the heating of the poles of the electro-magnets, and maintain the polarity of said electro-magnets, and overcome the tendency of the decomposing bath to reverse the polarity of the same, when the apparatus is employed for electro-plating.

My invention consists, first, in an automatic device, governed and operated by the electric current, for switching the current from the main circuit through another circuit of fuses, gas-jets, or the like, or through the primary wire of an induction-coil, as will be more fully hereinafter specified; second, in the combination with the electro-magnets of a permanent steel magnet, forming part of said electro-magnets, for the purpose of maintaining the polarity of the magnets and counteracting any tendency of the currents from the decomposing bath to reverse the magnetism; third, in constructing the poles of the electro-magnets with chambers, through which a current of cold water to prevent heating may be passed; and, fourth, in the construction and arrangement of the various parts of the apparatus, as more fully hereinafter specified.

In the drawing, Figure 1 represents an elevation of my improved machine. Fig. 2 represents a top view of the same. Fig. 3 represents an end elevation of the same, and Fig. 4 a view partially in elevation and partly in section.

The letter A represents two electro-magnets composed of soft iron plates, or, in certain instances, partly of iron and partly of steel plates, as will be presently more fully explained, and wrapped, as usual, with insulated wire. Said magnets are secured to the cast-iron poles B B, which form the base of the apparatus, at their lower ends, their upper ends being secured to an iron plate, C, provided with depending hangers D D, in which the shaft of the driving-wheel E is journaled. The cogs or teeth of said wheel gear into a pinion on the end of the rotating armature F, which is journaled in standards G G. Said armature consists of a cylinder of soft iron, slotted longitudinally on opposite sides for the reception of the coil of wire H with which said armature is wrapped. The armature is arranged to rotate between the poles B B of the electro-magnets as nearly as possible to the sides thereof, which are formed to correspond to the cylindrical shape of the armature for the purpose.

At the first semi-rotation of the armature a minute electric current is evolved, which is turned into the electro-magnetic coil, slightly exciting the electro-magnet, producing a slightly stronger induced current in an opposite direction during its second semi-rotation, and so on, successively, until the currents induced in the rotating armature and accumulated in the electro-magnets' coil acquire a very high degree of energy, the direction of the al-

ternate induced currents being changed into a continuous current by means of a commutator, I, of the ordinary construction, which consists of two semi-cylindrical plates, K, of metal, attached to the end of the rotating armature, and suitably insulated from each other and from the armature. Each plate is connected with one end of the wire with which the armature is surrounded, and on said plates, at opposite sides of the same, the springs L L are made to bear, one of said springs being connected to the coil of the electro-magnet and the other with the coil of an auxiliary magnet, M, which connects with the automatic shifting device and with one of the binding-screws N, which serve as the connections for the fuse-circuit.

The letter P represents a lever, pivoted near one end between suitable standards R R secured upon a plate, S, of rubber or other proper insulating material. The front end of said lever is provided with an armature, T, which sets directly over the auxiliary electro-magnet, the other end being provided with an upright arm, upon which is fitted a weight, V, which is supported upon a spiral spring, W, surrounding said arm. The letter A′ represents a metallic spring, secured to the base of the standards R R and directly under the lever P. At the extremity of said spring is formed a yoke, B′, which embraces loosely the lever P near its end. C represents a standard with spring-jaws *c c*, between which a projection, *a*, on the end of the spring A′, is clasped when the long arm of the lever P is dropped. Said standard projects through the plate S, and connects with the end of the wire proceeding from the electro-magnet, and also with the binding-screw N′, by means of which the fuse-current is put in connection with the apparatus. The letter D′ represents a downwardly-projecting spring secured to the spring A′, to prevent the same from vibrating when the lever is suddenly raised, which it accomplishes by its bearing against the beveled stud E secured to the plate S′.

The operation of my machine will be readily understood from the foregoing description. Upon rotating the cylindrical armature alternate induced currents of electricity are generated in opposite directions, which are converted into a continuous current by means of the commutator. These currents are continually augmented in quantity, and are turned into the electro-magnet coils and auxiliary electro-magnet coils, and are accumulated until of sufficient energy to magnetize the auxiliary magnet sufficiently to attract the armature on the lever, and, by raising the spring A′, shift the current to the binding-screws to which the wires of the fuse-circuit are attached.

In order to maintain the magnetism in the electro-magnets and counteract the tendency of the decomposing bath to reverse the magnetism of said magnets when the apparatus is employed for plating, I sometimes construct one portion of the electro-magnets of a series of steel plates, E′, as shown in Fig. 4, which become permanently magnetized, and retaining such a high degree of magnetism that it cannot be reversed by the slight currents of an ordinary decomposing bath, and to prevent the heating of the poles, I construct water-spaces F′ in the body of the same, through which a current of cold water may be made to circulate, nipples G′ being provided for the purpose of connecting the poles with the proper water-supply.

In order to give the current sufficient time to act through the fuse-circuit, the lever should in most instances, after shifting the circuit, occupy a sensible amount of time in returning to its normal position. To accomplish this is the object of the yoke B′ and the movable weight, which allow the lever to move the required distance before dropping, to secure the necessary amount of time for the current to pass through the fuse-circuit. If this play were not provided for, the moment after the shifting device had begun to act the lever would fall back before it had moved the thousandth part of an inch, owing to the shifting of the circuit the moment the connection between the conductor and standard is broken, allowing so limited a time for the current to act on the fuse-circuit as to prevent the apparatus from working practically.

In the present instance I have described and shown an auxiliary electro-magnet for operating the lever for the purpose of shifting the current so as to bring the outside circuit into the main circuit, but it is evident that the same object may be accomplished by utilizing the electricity and magnetism of the main electro-magnets for the purpose, and various modificatations of devices for shifting the current may be employed for carrying out this part of my invention; therefore, I do not limit myself to the precise details as set forth; but

What I claim, and desire to secure by Letters Patent, is—

1. An automatic switch, governed or operated by the electric current, for switching or bringing into connection an outside conductor, as in a series of electric fuses, the primary wire of an induction-coil, or a series of gas-jets.

2. In a magneto-electric apparatus, a switch automatically controlled and operated by the current generated therein, and operating to throw a current onto a circuit outside the apparatus when the desired strength of current has been obtained, substantially as described.

3. The hardened-steel plate or plates, in combination with and forming part of the electro-magnet, for the purpose of maintaining the magnetism and overcoming any tendency of the decomposing bath reversing the magnetism.

4. The poles of an electro-magnet formed with water-spaces directly in the same, to per-

mit of the circulation of a current of water through the same to prevent heating, substantially as described.

5. In combination with the lever operated by an electric current, the switch operated by said lever to shift the current automatically at the proper moment, substantially as described.

6. The combination of the auxiliary electromagnet, with the weighted armature-lever and the switch, the whole arranged substantially as described, to shift the current when of sufficient strength and cause it to pass through another circuit, substantially as described.

7. In combination with the armature-lever, the adjustable weight elastically seated or attached thereto, substantially as described.

In testimouy that I claim the foregoing I have hereunto set my hand in the presence of the subscribing witnesses.

H. JULIUS SMITH.

Witnesses:

JAMES L. NORRIS,

JOS. L. COOMBS.