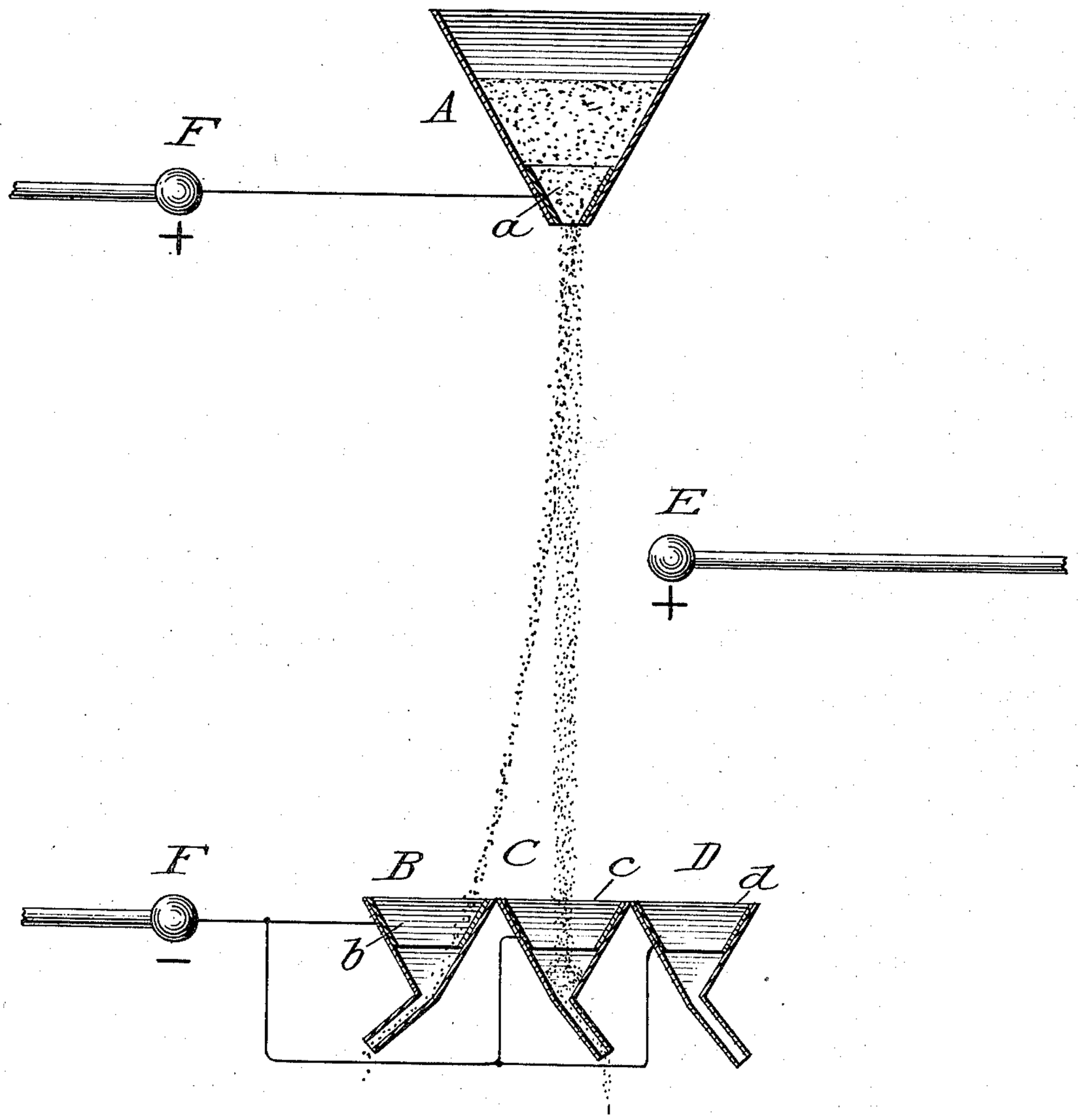
No. 653,343. Patented July 10, 1900.

E. GATES.

ELECTROSTATIC SEPARATION.

(Application filed Dec. 2, 1899.)

(No Model.)



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UNITED STATES PATENT OFFICE.

ELMER GATES, OF CHEVY CHASE, MARYLAND, ASSIGNOR TO THEODORE J. MAYER, OF WASHINGTON, DISTRICT OF COLUMBIA.

ELECTROSTATIC SEPARATION.

SPECIFICATION forming part of Letters Patent No. 653,343, dated July 10, 1900.

Application filed December 2, 1899. Serial No. 739,006. (No specimens.)

To all whom it may concern:

Be it known that I, ELMER GATES, a citizen of the United States, residing at Chevy Chase, in the county of Montgomery, State of Maryland, have invented certain new and useful Improvements in Electrostatic Separation; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

In an application for Letters Patent of the United States filed by me September 26, 1899, Serial No. 731,762, I have described and claimed a method for separating diamagnetic particles from a mixture containing the same by causing said particles to travel from an intense part of a magnetic field into a relatively-weak part thereof, and in an application filed of even date herewith, Serial No. 739,007, I have described and claimed a method of intensifying said diamagnetic action by charging the moving particles electrostatically.

My present invention concerns itself wholly with electrostatic separation—*i. e.*, separation due wholly to the action of electrostatic charges upon the moving particles of the mixture treated. It is well known that all substances, if insulated, may be electrified and that the insulators or idioelectrics or nonconductors may by rubbing be caused to develop a noticeable charge of electricity. Insulators are such substances as amber, sulfur, resin, shellac, glass, silk, sand, &c. Another class, called "anelectrics" or "conductors," consists mostly of metals. If uninsulated, a metal does not hold its charge of electricity, it being rapidly discharged or conducted away. If, however, a metal be insulated, an electrostatic charge may be readily imparted to it and will be retained thereby. I have found that when a falling stream of pulverized substances containing a mixture of anelectrics (or conductors) and idioelectrics (or nonconductors) is subjected to an electrostatic charge these substances become electrified to different degrees and are differently attracted or repelled by electrically-charged poles placed near the path of the falling stream of substances. I have made available this discovery for the practical separation of said substances—as, for instance, the separation of particles of gold from placer-sand in which they are contained.

In the accompanying drawing I have represented an apparatus adapted for the practice of my invention.

Referring to the drawing, A represents a supply-hopper provided with an exit-aperture adapted to permit a stream of placer-sand containing particles of gold to fall from a quarter-inch aperture for a distance of eighteen inches to certain lower hoppers or receptacles B C D. The upper receptacle is provided with a metallic lining *a*, and the lower receptacles are provided with like metallic linings *b c d*. E indicates the positive pole of a static machine arranged in proximity to the falling stream of placer-sand from the hopper A, and F F represent terminals or electrodes for supplying an electrostatic charge to the falling stream through the intermediacy of the metallic linings of the upper and lower hoppers, as indicated. Under these circumstances by the employment of Leyden jars in tension in connection with an eighteen-inch ten-plate static machine, so as to get the equivalent of a three-foot spark, the mixture will be repelled from the vertical path; but the particles of gold will be repelled much farther than the particles of sand, which latter are in reality but slightly affected. I prefer to locate the terminal E midway between the upper and lower hoppers, for the reason that that is the location of approximately no polarity with reference to the upper and lower hoppers. The sand and metal particles falling from the upper hopper from the insulating medium of the air retain the charge which they acquired in the upper hopper and are repelled by the pole or terminal E, the repulsion of the metal particles being sufficient to divert them from the main stream or flow and cause them to drop into the hopper B as heads, while the particles of sand drop into the hopper or receptacle C as tailings, the repulsion of the latter being practically negligible. If the pole or terminal E is charged negatively instead of positively, it will attract the particles and will attract the me-

tallic particles to the greater degree, so that the latter will be diverted into the receptacle D, the particles of sand dropping into the hopper or receptacle C, as before. I have found it immaterial to successful separation by this method whether the upper receptacle be connected to the positive terminal of the source of high-tension static electricity and the lower receptacles be connected to the negative terminal thereof or whether the upper hopper be connected with the negative terminal and the lower hoppers or receptacles be connected to the positive terminal.

Having thus described my invention, what I claim is—

1. The method of separating from a mixture particles of relatively-greater electrostatic capacity than the remainder, which consists in passing the mixture through a field of convective discharge of static electricity, thereby charging said mixture electrostatically, and diverting the particles of greater electrostatic capacity by causing the electrified mixture to pass through another field of convective discharge of static electricity, the direction of whose lines of force intersects that of the first, substantially as described.

2. The method of separating from a mixture particles of relatively-greater electrostatic capacity than the remainder, which consists in passing the mixture through a field of convective discharge of static electricity, thereby charging said mixture electrostatically, and diverting the particles of greater electrostatic capacity by causing the electrified mixture to pass through another field of convective discharge of static electricity, the direction of whose lines of force intersects that of the first, and whose discharge-terminal is located midway between the terminals of the first, substantially as described.

In testimony whereof I affix my signature in presence of two witnesses.

ELMER GATES.

Witnesses:
THEODORE J. MAYER,
HUGH M. STERLING.