

No. 827,116.

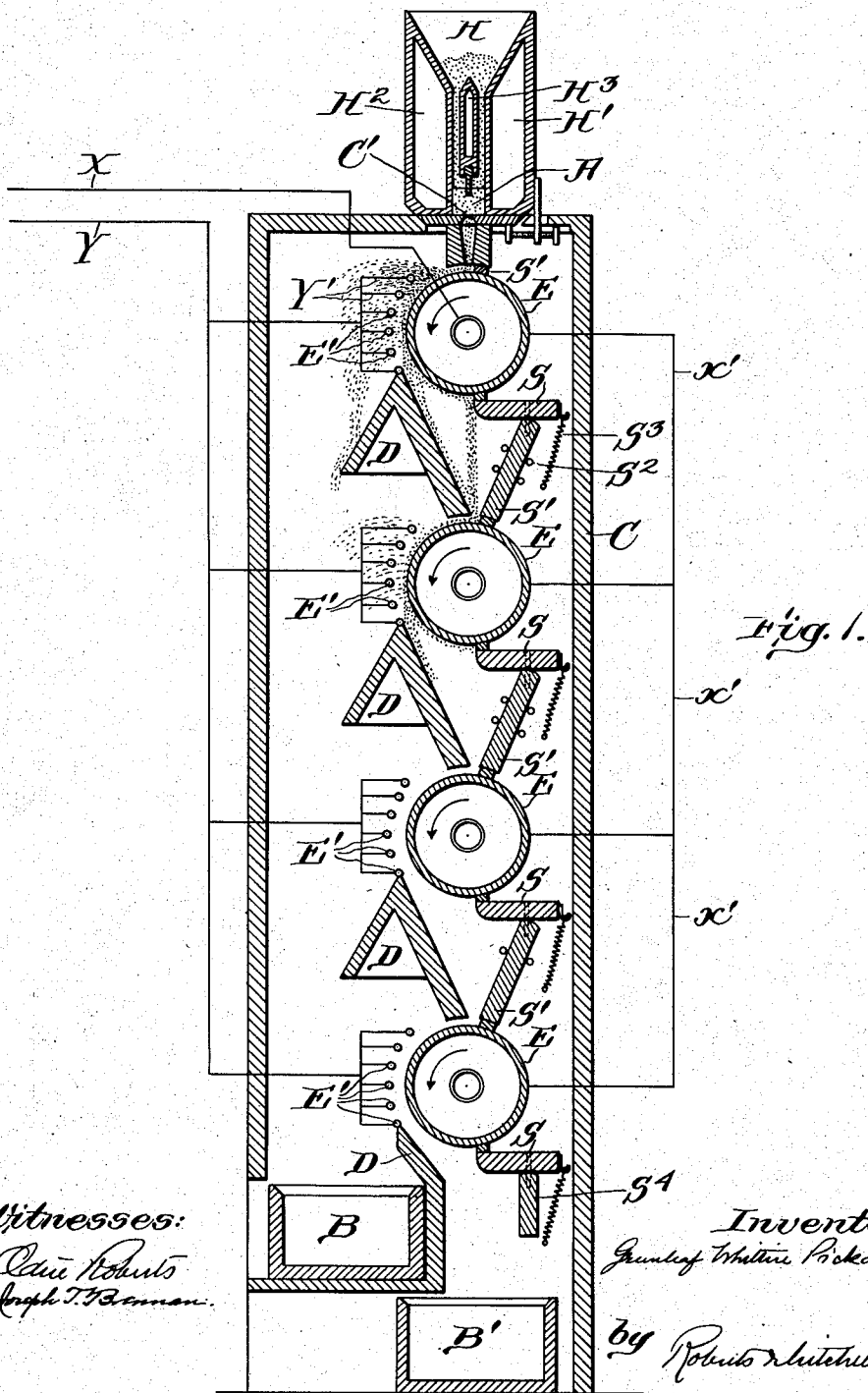
PATENTED JULY 31, 1906.

G. W. PICKARD.

APPARATUS FOR ELECTROSTATIC SEPARATION.

APPLICATION FILED SEPT. 27, 1905.

2 SHEETS—SHEET 1.



Witnesses:  
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Inventor:  
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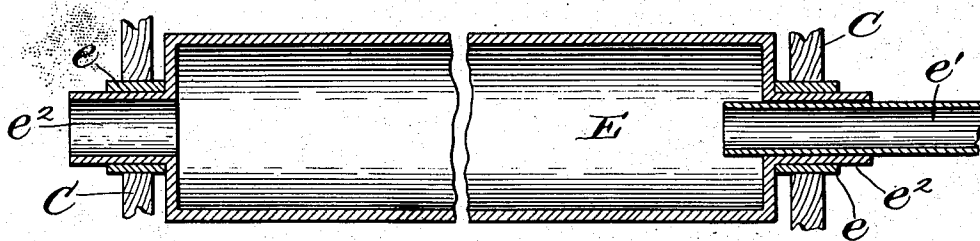
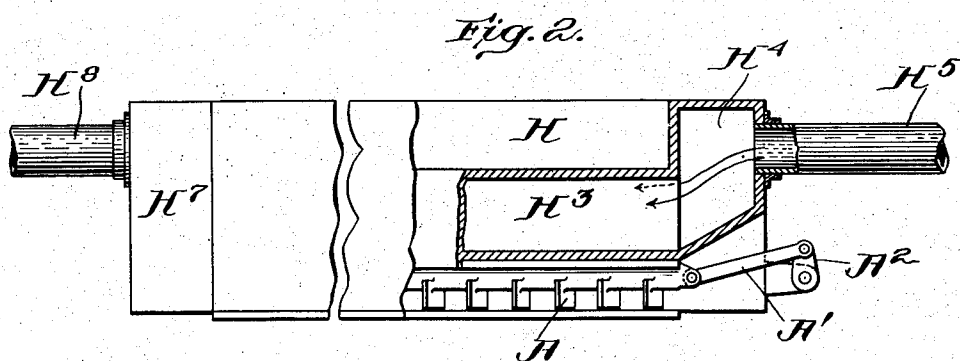
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2 SHEETS—SHEET 2.



*Fig. 3.*

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# UNITED STATES PATENT OFFICE.

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ASSIGNOR, BY MESNE ASSIGNMENTS, TO HUFF ELECTROSTATIC  
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## APPARATUS FOR ELECTROSTATIC SEPARATION.

No. 827,116.

Specification of Letters Patent.

Patented July 31, 1906.

Application filed September 27, 1905. Serial No. 280,323.

*To all whom it may concern:*

Be it known that I, GREENLEAF WHITTIER PICKARD, a citizen of the United States, and a resident of Amesbury, in the county of Essex and State of Massachusetts, have invented new and useful Improvements in Apparatus for Electrostatic Separation, of which the following is a specification.

My invention relates to the art of electrostatic separation; and it consists in improvements in apparatus whereby separation or concentration may be more effectively accomplished than heretofore.

The operation of the apparatus hereinbelow described, which embodies my invention, involves the employment of an improved method which is described and claimed in an application filed concurrently herewith by me, (Serial No. 280,322, filed September 27, 1905.)

In the drawings hereto annexed, which illustrate a structure which embodies my invention and improvements, Figure 1 is a vertical cross-section of an apparatus by which my method is carried out. Fig. 2 is a vertical longitudinal section of a portion of the hopper for feeding material, and Fig. 3 is a detail showing in longitudinal section one of the electrodes of the apparatus.

The separating devices consist of a vertically-arranged series of cylindrical metallic electrodes E, mounted upon bearings to rotate in the direction indicated by the arrows. These electrodes are connected, as shown conventionally, with one terminus of an exciting-machine, these wires being shown as X X'. The opposed electrodes E' are arranged in series, there being a plurality of such opposed electrodes for each of the main cylindrical electrodes E. These opposed electrodes E' are of much smaller superficial extent than the electrode E and consist, preferably, of quite fine metal wires inclosed in relatively thick glass tubes or envelops. These wires are connected, as by Y Y', with the other terminal of the exciting-machine. Below the electrodes E E' there are located the dividers D. These are secured in any suitable manner to the inside of the casing C. Upon the top of the casing C is mounted the hopper H, this hopper being constructed with longitudinal heating-chambers H', H<sup>2</sup>, and

H<sup>3</sup>, the latter extending from end to end inside the hopper, so that the material must pass on either side of the heating-chamber H<sup>3</sup> and next to the chamber H' on one side and H<sup>2</sup> on the other. Near the bottom of this hopper there is mounted the agitator A, which, as shown in Fig. 2, is operated by a crank and connecting-rod and serves to scrape and sift the comminuted material through the slot C', so that it will fall in a regular stream upon the surface of the upper electrode E. Upon the end of the hopper H there is formed the chamber H<sup>4</sup>, and upon the opposite end a similar chamber H<sup>7</sup> is provided. A pipe H<sup>5</sup> serves to conduct heated gases, such as steam or hot air, into the chambers H' H<sup>2</sup> H<sup>3</sup>, so that the material falling through the hopper H will become thoroughly and effectively heated in its passage over the surfaces of the heating-chambers. A vent H<sup>6</sup> at the chamber H<sup>7</sup> at the opposite end serves to conduct the hot gases away to any desired point. The electrodes E are mounted on bearings e in the ends of the chamber C, and tubular trunnions e<sup>2</sup>, secured to the electrodes E, serve to carry the electrodes and also as openings wherethrough to induct heated gases to the interior of the electrodes E. Nozzles e' are provided for this purpose. The bearings for the electrodes are shown at e. At the opposite end the hollow trunnions e<sup>2</sup> serve to allow the gases to escape from inside the electrode.

It has been recognized from the initiation of the art of electrostatic separation that the processes are assisted materially by presenting the substances to be treated in a perfectly dry state, and consequently it has been the practice for a long time to heat materials before they are fed to the electrodes of an electrostatic separator, this heating serving to facilitate the separation of many materials. I have discovered, however, that if a heated atmosphere be maintained also near and around the electrodes themselves, especially if the electrodes themselves are heated, so that the atmosphere is hottest at the surface of the electrodes, the resulting separations are far more thorough than under any other condition observed by me, and, moreover, many mixtures of material which, as far as I am aware, have heretofore resisted effectual

separation by the electrostatic method are by this improvement completely and easily separated.

The value of the plurality of electrodes E' resides in their successful operation upon the material as it passes over or along the surface of the larger electrode E. There is a concentration of field in close proximity to each one of the smaller electrodes, and while the great bulk of separation apparently takes place when the material is passing between the electrode E and the first of the smaller electrodes e', nevertheless separation continues thereafter, the successive small electrodes searching out the conductive particles from the mass and gleaning, as it were, after the separation effected at the first opposed electrode. If the desired separation cannot be completed by a single set of electrodes E E', the material which has not been repelled from the upper electrode E is conducted by the sloping side of the divider D to a second electrode E, and so on, the electrical conditions at all the electrodes usually being preferably the same, the electrodes E being connected to one terminus of the exciting apparatus and the electrodes E' to the other. At the close of this operation the heads are collected in a proper receptacle, such as a box B, while the tails fall into another receptacle, as B'. As has been observed in connection with the operation of such electrostatic separation apparatus as that described in the Dolbear patent, No. 685,508, dated October 29, 1901, frequently some of the unrepelled particles cling to the rotating electrode E and are carried thereby and might be carried around through a complete rotation of the electrode. Therefore I provide rubbers or scrapers S S' to clean the electrodes E at the bottom and top thereof, respectively. For simplicity of construction the rubbers S may be pivotally attached to the rubbers S', the latter being loosely guided, as by pins S<sup>2</sup> set into the ends of the casing C, a spring S<sup>3</sup>, attached to the rubber S, serving to hold both into contact with their respective electrodes.

The exciting apparatus which I prefer to employ in connection with this separator is such a one as described in Letters Patent of the United States No. 796,001, dated August 1, 1905.

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

1. In an electrostatic separator, a source of electrical energy, electrodes, means to supply material thereto, means to heat the material before it reaches the electrode, and means to heat the electrode to which the material is delivered.

2. In an electrostatic separator, a source of electrical energy, electrodes, means to sup-

ply material thereto, means to heat the material before it reaches the electrode, and means to maintain a heated atmosphere about the electrode into contact with which the material is delivered.

3. In an electrostatic separator, a source of electrical energy, electrodes, a hopper to feed material, heating-chambers in the hopper and means to heat the same, and a casing surrounding the electrodes, to provide a substantially confined atmosphere around the same.

4. In an electrostatic separator, a source of electrical energy, electrodes, a hopper to feed material, a heating-chamber on each side of the hopper, and an intermediate heating-chamber therein, and means to heat the several chambers.

5. In an electrostatic separator, a source of electrical energy, a plurality of electrode pairs, means to feed material to the first pair and thence to the others in succession, means to heat the material before it passes to an electrode, and means to heat an electrode of each pair.

6. In an electrostatic separator, a source of electrical energy, electrodes, a hopper to feed material, and means to heat that electrode to which the material is delivered.

7. In an electrostatic separator, a source of electrical energy, electrodes, whereof one is a hollow cylinder, means to supply material thereto and means to pass hot gases into the interior of said cylinder.

8. In an electrostatic separator, a source of electrical energy, a hopper, heating-chambers adjacent said hopper, electrodes whereof one is a hollow cylinder, and means to pass hot gases into the interior of said cylinder.

9. In an electrostatic separator, a source of electrical energy, a hopper, heating-chambers adjacent thereto, electrodes, whereof one is a hollow cylinder, means to pass hot gases into the cylinder, and a casing surrounding the electrodes.

10. In an electrostatic separator, a source of electrical energy, means to deliver material to an electrode, means to heat the material before delivering, the electrode, opposed electrodes, each of the opposed electrodes being superficially much smaller than the first electrode, and the several opposed electrodes arranged to act successively on the material passing on the first electrode, and means to heat the first electrode.

Signed by me at Boston, Massachusetts, this 23d day of September, 1905.

GREENLEAF WHITTIER PICKARD.

Witnesses:

ODIN ROBERTS,  
JOSEPH T. BRENNAN.