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M. WOODSOME.

ELECTROSTATIC SEPARATOR.

APPLICATION FILED JAN. 29, 1906.

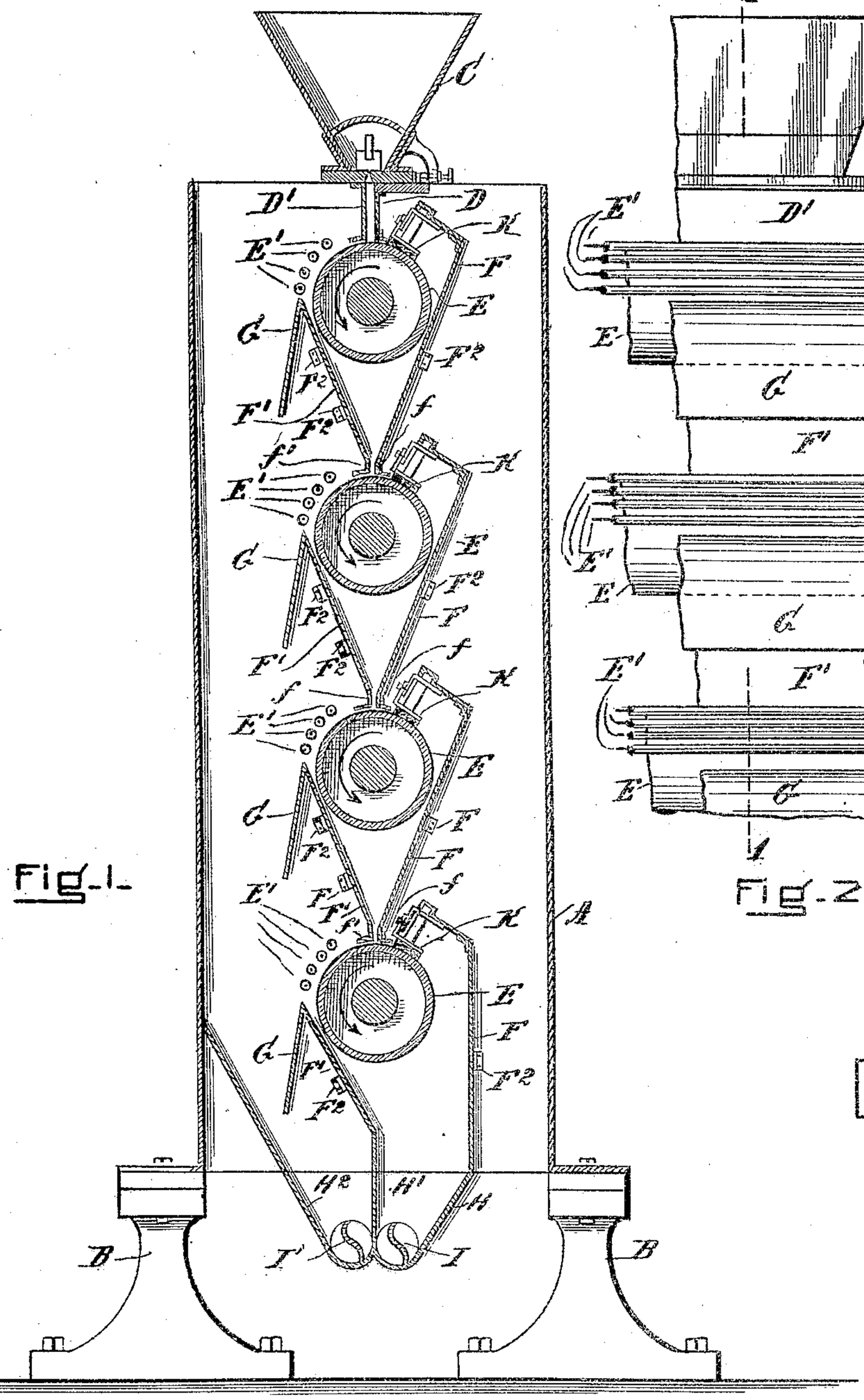


Fig-1-

Fig-2.

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ELECTROSTATIC SEPARATOR.

No. 827,770 Specification of Letters Patent. Patented Aug. 7, 1906.

Application filed January 29, 1906. Serial No. 298,382.

To all whom it may concern:

Be it known that I, MILLARD WOODSOME, a citizen of the United States, and a resident of Boston, in the county of Suffolk and State of Massachusetts, have invented new and useful Improvements in Electrostatic Separators, of which the following is a specification.

My invention relates to electrostatic separators; and it consists in certain improvements hereinbelow to be described whereby the electrical conditions at the separator-electrodes are improved and the contrast in electrical condition of those portions of the repelling-electrode which are immediately opposed to the opposite electrode in relation to such portions as are not so immediately opposed is enhanced.

In the drawings hereto annexed, which illustrate an embodiment of my invention and improvements, Figure 1 is a vertical cross-section of the entire machine, taken at the line 1 1 of Fig. 2; and Fig. 2 is a side elevation of the same, one of the sides of the casing thereof being removed.

The source of electrical energy whereby the electrostatic separator is excited is not herein shown. Any desired exciting devices may be employed; but I prefer to use the electrical machinery which is shown and described in its essential components in United States Letters Patent No. 796,011, dated August 1, 1905, issued to Charles H. Huff as assignee of Greenleaf W. Pickard.

The casing A is a rectangular box of conductive material composed, preferably, of sheet iron or steel, with a suitable angle-iron frame. This case is mounted upon insulating-supports B, which are preferably of earthenware or porcelain or which may under some conditions be composed of wood. Upon the top of the casing A there is mounted the hopper C, into which the material to be fed to the separator-electrodes is deposited. The hopper C terminates in a delivery-chute composed of two parallel plates D D′, which are constructed of electrically-conducting material, preferably sheet-steel. Four sets of electrodes are shown in the drawings, each set consisting of a pair—namely, the large metallic rotary electrode E and a gridiron of stationary electrodes E′, the latter consisting, preferably, of small copper wires, each inclosed in a thick glass tube. The electrode E of each pair is a metallic cylinder having, by preference, a brass or copper surface, which may be of sheet metal or be electroplated upon an iron roller. The electrodes E are rotatively mounted in the ends of the casing, as at M, and are provided with suitable mechanism (not shown) for giving the electrodes E a rotary movement, (indicated by arrows,) so as to carry material fed thereto from the hopper C toward the electrode E′. The electrode E′—that is to say, the group of glass-insulated copper wires—is sustained by the casing, the ends N of the glass tubes passing through suitable perforations in the end walls of the casing A. All of the electrodes E′ are connected with one pole of the generating or exciting mechanism, as by a wire P, and the ends of all the roller-electrodes E are connected, as by a wire O, with the opposite pole or terminal of the exciting mechanism. Upon suitable metallic clips F^2, secured to the inside of the end walls of the casing A, there are mounted the inclined plates F, F′, and G, the plates F being continued upwardly and then inwardly toward the electrode E, where they provide a proper mounting for the wipers K. The plates F, F′, and G are composed of metal, preferably sheet-steel, and the lower set of plates F and F′ terminate in plates H and H′, while a sheet-metal plate H^2 extends downward, converging toward the plate H′ from the side of the casing A. In the bottom of the apparatus there are shown spiral conveyers I I′, which are rotatively mounted and serve to convey the separated materials endwise of the case to suitable points of delivery.

The plates F, F′, G, D, and D′ are all in electrical metallic contact with the casing A and are therefore in parallel electrical communication with the electrodes E and the terminal of the exciting apparatus (shown conventionally at *x*, Fig. 2) to which the wire O leads, (and also the wire P,) while the electrode E′ is insulated from the rest of the apparatus. These plates, taken collectively, form an electric shield or inclosure around those parts of the repelling-electrode E which are not in immediate opposition to the opposed elec-

trode E′, so that these plates constitute in substance an inclosing case or box for the rotary electrode. The lines of force established between the two electrodes proceed directly from the electrode E to the electrode E′ in the region of their greatest density, but indirectly from the plates D, D′, F, F′, and G to the electrode E′ from those regions where the density of lines of force is least, and that portion of the surface of the repelling-electrode E which is inclosed by this metallic sheath is electrostatically shielded from the electrode E′ and is therefore electrically inert, and thus in its electrical condition is much more sharply contrasted with the electrical condition of that portion which is immediately opposed to the electrode E′ than has heretofore been the case when the electrode E or its equivalent has not been inclosed in any electrically-active sheath.

In the construction herein shown there is provided a series of electrode pairs E E′, to which the material is conducted in vertical succession, the lower pairs of electrodes in the series serving to supplement the separation accomplished by the first pair. Thus the plates F, F′, and G in this embodiment of my invention are made to perform a mechanical as well as an electrical function in that the plate G diverts the heads of the separated material into one region in the casing, while the plates F and F′ collect the tails which fall from the surface of the electrode E or are brushed therefrom by the wipers K and deliver them at the narrow chutes formed by the lower edges F F′ of these plates to the next succeeding electrode.

By the means above described the heterogeneous material delivered to the surface of the rotary repelling-electrodes E is subjected to the full separative effect of the electrical field while it is passing through that region which lies immediately opposed to the electrode E′; but in its further progress that portion of the material which has not been repelled while passing through this region goes into an inclosed space, wherein no electrical excitation is manifested, this inclosed space being, in effect, the interior of a hollow conducting-body within which, however great the external excitation may be, no electrical charge can penetrate. It has been observed in actual practice that, other things being equal and other conditions remaining the same, a more effective separation of materials is accomplished with the designedly inactive areas of the repelling-electrode inclosed by an electrically-conducting shield than when these improvements are not employed.

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

1. In an electrostatic separator, the combination of a repelling-electrode, means to feed material thereto, an opposed electrode, electrical exciting mechanism and connections therefrom to the electrodes, and an electrostatic shield inclosing and shielding portions of the repelling-electrode which are not in immediate opposition to the opposed electrode.

2. In an electrostatic separator, the combination of a repelling-electrode, means to feed material thereto, an opposed electrode, electrical exciting mechanism and connections therefrom to the electrodes, and an electrically-conducting shield, surrounding portions of the repelling-electrode which are not in immediate opposition to the opposed electrode, said shield being electrically connected with the exciting apparatus in parallel with the repelling-electrode.

3. In an electrostatic separator, the combination of a repelling-electrode, an opposed electrode, means to feed material to the electrode including a metallic delivery-chute, metallic plates to distribute separated products, said plates surrounding portions of the repelling-electrode which are not in immediate opposition to the opposed electrode, and electrical exciting mechanism, with connections to the electrodes and to the metallic delivery-chute and distributing-plates, the chute, plates, and repelling-electrode being connected to the same terminal of the exciting mechanism.

4. In an electrostatic separator, the combination of a metallic casing, insulating-supports therefor, a repelling-electrode, an opposite electrode, a hopper, a metallic delivery-chute therefor to deliver material to the repelling-electrode, a metallic shield protecting such portions of the repelling-electrode as are not in immediate opposition to the opposite electrode, the repelling-electrode, hopper-delivery chute, and shield being within and in electrical contact with the casing, and electrical exciting mechanism and connections therefrom to the several electrodes.

Signed by me at Boston, Massachusetts, this 24th day of January, 1906.

MILLARD WOODSOME.

Witnesses:
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