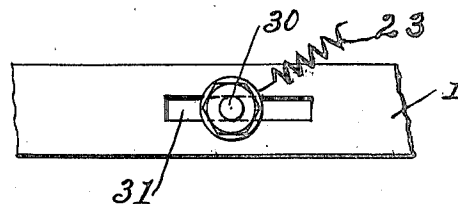
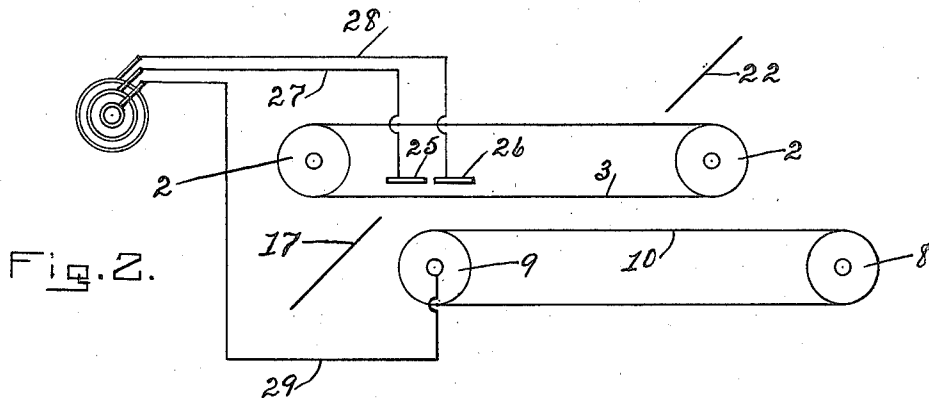
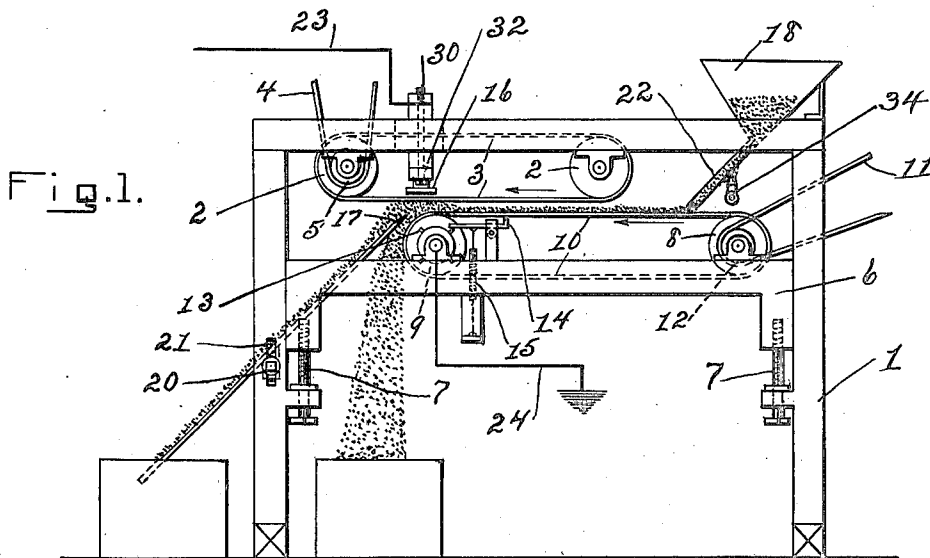


H. COMSTOCK.
ELECTROSTATIC SEPARATOR.
APPLICATION FILED JUNE 9, 1911.

1,110,896.

Patented Sept. 15, 1914.



Witnesses:

J. E. Donabach.
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Fig. 3.

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UNITED STATES PATENT OFFICE.

HARRY COMSTOCK, OF MINEVILLE, NEW YORK.

ELECTROSTATIC SEPARATOR.

1,110,896.

Specification of Letters Patent.

Patented Sept. 15, 1914.

Application filed June 9, 1911. Serial No. 632,184.

To all whom it may concern:

Be it known that I, HARRY COMSTOCK, a citizen of the United States, residing at Mineville, county of Essex, and State of New York, have invented certain new and useful Improvements in Electrostatic Separators, of which the following is a specification.

The invention relates to such improvements and consists of the novel construction and combination of parts hereinafter described and subsequently claimed; also the hereindescribed method.

Reference may be had to the accompanying drawings, and the reference characters marked thereon, which form a part of this specification.

Similar characters refer to similar parts in the several figures therein.

Figure 1 of the drawings is a view in side elevation of my improved electrostatic separating mechanism. Fig. 2 is a diagrammatic view illustrating my invention wired for the employment of a three-phase current. Fig. 3 is a top plan view of part of the frame, showing the manner of mounting the electrostatic plate.

It is well known that mixed particles of materials of different electric conductivity can be separated from one another by the use of electrostatic apparatus; and various devices for this purpose have been devised wherein a statically charged body has been employed for repelling particles attracted to its surface and charged thereby.

The principal object of the present invention is to render more effective and certain the separation electrostatically of particles of different degrees of conductivity. This I am able to accomplish by combining with an electrostatically charged plate, and means for conveying the mixture of particles to be separated into the electrostatic field of said plate, a traveling body interposed between said electrostatically charged plate and said mixture of particles, adapted to intercept and mechanically remove from the electrostatic field those particles which are most strongly attracted by said plate.

Other objects of the invention will appear in connection with the following description.

Referring to the drawings wherein the invention is shown in preferred form, 1,

represents the frame of the apparatus, upon which is rotatively mounted a pair of rolls or drums, 2, carrying a belt, 3, of non-conductive material. Power is applied to one of said rolls through the belt, 4, and pulley 5. A platform, 6, is mounted upon said frame by means of adjusting screws, 7, whereby the height of said platform can be altered from time to time as desired. Rotatively mounted upon said platform are a pair of rolls or drums, 8 and 9, carrying a belt, 10, of conductive material such as metal. Power is applied to one of said rolls, 8, by means of a belt, 11, and pulley 12. The roll or drum, 9, is of conductive material, as metal. Carried by the roll, 9, are a series of tappets, 13, adapted to operate in one direction an agitator, 14, one end of which is adapted to jarringly engage the upper stretch of belt, 10, when released to the action of its controlling spring, 15, each time a tappet, 13, passes from beneath said agitator.

The belts and rolls are so arranged that the lower stretch of the belt 3, overlaps and extends in close proximity to the upper stretch of the belt 10.

An electrostatic plate, 16, is supported just above the lower stretch of belt, 3, approximately in vertical line with the outer edge of the roll or drum 9.

The plate, 16, is mounted upon the top bar of the frame by means of a screw-bolt, 30, which passes through a slot, 31, extending longitudinally of the frame, whereby the position of the plate, 16, can be adjusted longitudinally of the machine with reference to the roll or drum, 9; and, by using a washer, 32, of greater or less thickness, the distance of the plate, 16, from the lower stretch of belt, 3, can be varied as desired.

A dielectric or division-plate, 17, extends more or less into the angle where the belts, 3 and 10, diverge adjacent to the roll or drum 9.

The dielectric divider, 17, is pivotally mounted at, 20, in a slot, 21, in the frame of the machine, whereby the upper end of said dielectric divider can be located at any desired point in said angle.

A feed-hopper, 18, is adapted to deliver the mixed material to be separated upon the upper stretch of belt, 10, at a point remote from the roll or drum, 9, toward which said

upper stretch of belt travels. The neighboring stretches of the belts, 3 and 10, travel in the same direction, but the speed of the belt, 3, is much greater than that of belt 10.

5 A gas-burner, 34, is located beneath the chute, 22, leading from the hopper, 18, and serves as a means for heating the material to be separated as the same passes down the chute.

10 The electrostatic plate, 16, is connected by wire, 23, with a known form of generator of electric potential, and the roll, 9, is connected by wire, 24, with the ground, or the same may be a return wire connected with
15 said generator. The belt, 10, and roll or drum, 9, being of conductive material, are in electrical connection with each other.

The operation of the apparatus is as follows: The material to be separated is deposited in the hopper, 18, and passes gradually down the chute, 22, being thereby deposited in a thin sheet or layer upon the upper stretch of belt, 10, which carries the material so deposited along beneath the
25 lower stretch of belt, 3, to a point opposite the electrostatic plate 16. The more conductive particles in said mixture are strongly attracted by the electrostatic plate, 16, and drawn toward the same until they
30 are brought into contact with the lower stretch of the belt, 3, which by frictional engagement with said attracted particles quickly carries them out of the static field to a point beyond the dielectric division-
35 plate, 17, upon which said particles fall from the belt, 3, as they are relieved from the attractive influence of the plate 16. The less conductive particles either remain in contact with the belt, 10, until they fall
40 by gravity as said belt passes around the roll, 9, or if said particles leave the upper stretch of the belt, 10, they do not do so with sufficient force to pass over the upper edge of the division-plate 17.

45 Agitating the belt, 10, by means of the agitator, 14, tends to uncover the more conductive particles, so as to permit them to be freely attracted by the plate, 16, without interference by overlying less attracted particles.
50

It is well known in the art that certain materials, such as quartz, tourmaline, &c., are more easily electrified while under such conditions that their temperature is changing. In treating such materials as have
55 this characteristic, I prefer to impart to the material to be separated, before introducing the same into the electrostatic field, an abnormal temperature, that is a temperature
60 materially higher or materially lower than that of the space between the electrostatic poles, so that as the material is passing through the electrostatic field its temperature will be changing and tending to again
65 become normal.

The burner, 34, or other known heating means may be conveniently employed to impart to the material such an abnormal temperature. When it is not desired to heat the material, the burner, 34, may be omitted. 70 By means of the screws, 7, the upper stretch of the belt, 10, can be moved nearer to or further from the lower stretch of the belt, 3, to meet different conditions in use. The relative speeds of the belts, 3 and 10, can 75 also be varied in use.

For certain purposes of the invention any source of electric potential can be employed for electrifying the plate, 16, and the current may be either direct or alternating. 80 I prefer, however, to use an alternating current; and, for certain purposes of the invention, I prefer to employ a polyphase alternating current, and in Fig. 2 I have illustrated the use of a three-wire three- 85 phase circuit with two electrostatic plates, 25 and 26, connected, respectively, with two of the wires, 27 and 28, a third wire, 29, being connected with the roll 9.

The difference in potential and the frequently changing potential relationship between the plates, 25 and 26, serve to further agitate the material attracted by said plates, as such material is carried past said plates successively, thus facilitating the 95 separation of the more conductive particles from less conductive particles which might otherwise adhere thereto.

What I claim as new and desire to secure by Letters Patent is— 100

1. In a static separating apparatus, and in combination, an electrostatically charged plate; means for carrying material to be separated into the field of said plate; and traveling means interposed between said 105 material and said electrostatically charged plate for preventing contact of the material with said plate, and for carrying out of the static field material attracted by said plate.

2. In a static separating apparatus, and 110 in combination, a belt of non-conductive material; an electrostatically charged plate supported above the lower stretch of said belt; means for moving said belt; and means for carrying material to be separated beneath 115 said belt into the field of said plate.

3. In a static separating apparatus, and in combination, a belt of non-conductive material; an electrostatically charged plate supported above the lower stretch of said belt; 120 means for moving said belt; and an electrostatically charged belt beneath said non-conductive belt for carrying material to be separated into the field of said plate.

4. In a static separating apparatus, and 125 in combination, a belt of non-conductive material; an electrostatically charged plate supported above the lower stretch of said belt; means for moving said belt; an electrostatically charged roll beneath said belt and 130

plate; and a conveying-belt of conductive material passing around said roll in electrical connection therewith.

5 5. In a static separating apparatus, and in combination, a belt of non-conductive material; an electrostatically charged plate supported above the lower stretch of said belt; means for moving said belt; an electrostatically charged belt beneath said non-conductive belt for carrying material to be separated into the field of said plate; and means whereby one of said belts can be adjusted toward and from the other.

10 6. In a static separating apparatus, and in combination, a belt of non-conductive material; an electrostatically charged plate supported above the lower stretch of said belt; means for moving said belt; an electrostatically charged belt beneath said non-conductive belt for carrying material to be separated into the field of said plate; means whereby said plate can be adjusted toward and from said lower stretch of non-conductive belt; and means whereby one of said belts can be adjusted toward and from the other.

15 7. In a static separating apparatus, and in combination, a belt of non-conductive material; an electrostatically charged plate supported above the lower stretch of said belt; means for moving said belt; an electrostatically charged belt beneath said non-conductive belt for carrying material to be separated into the field of said plate; and a dielectric separating plate extending into the angle of separation of said belts.

20 8. In a static separating apparatus, and in combination, a belt of non-conductive material; an electrostatically charged plate supported above the lower stretch of said belt; means for moving said belt; an electrostatically charged belt beneath said non-conductive belt for carrying material to be separated into the field of said plate; and a dielectric separating plate extending into the angle of separation of said belts.

cally charged belt beneath said non-conductive belt for carrying material to be separated into the field of said plate; a dielectric separating plate extending into the angle of separation of said belts; and means whereby said separating plate can be adjusted more or less into the electrostatic field.

9. In a static separating apparatus, and in combination, a belt of non-conductive material; an electrostatically charged plate supported above the lower stretch of said belt; means for moving said belt; an electrostatically charged belt beneath said non-conductive belt for carrying material to be separated into the field of said plate; means whereby said plate can be adjusted toward and from said lower stretch of non-conductive belt; means whereby one of said belts can be adjusted toward and from the other; a dielectric separating plate extending into the angle of separation of said belts; and means whereby said separating plate can be adjusted relatively to said belts.

10. In a static separating apparatus, and in combination, a lower belt of conductive material; an upper belt of non-conductive material, said belts being arranged with the upper stretch of the lower belt approximately parallel and in proximity to the lower stretch of the upper belt; two electrostatic plates supported above the lower stretch of said upper belt; and means for connecting said electrostatic plates and said lower belt with the respective elements of a three-wire three-phase electric circuit.

In testimony whereof, I have hereunto set my hand this 31st day of May, 1911.

HARRY COMSTOCK.

Witnesses.

H. F. PIGG,
T. SWIFT.