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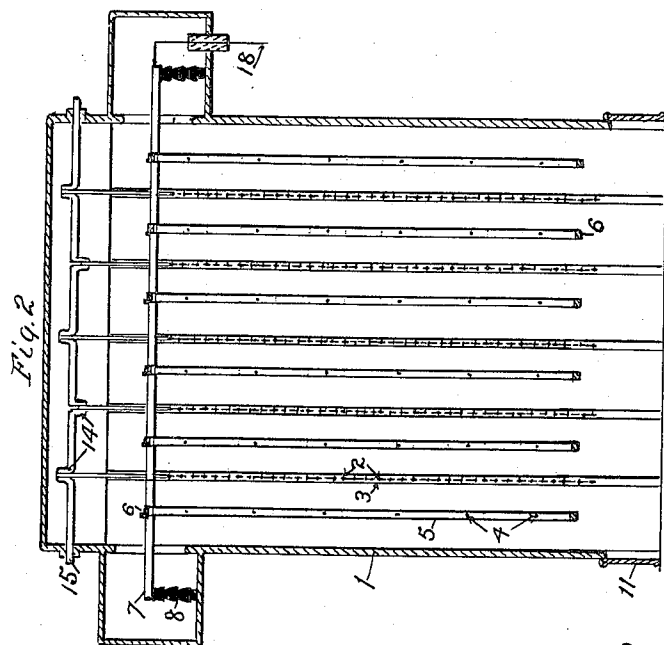
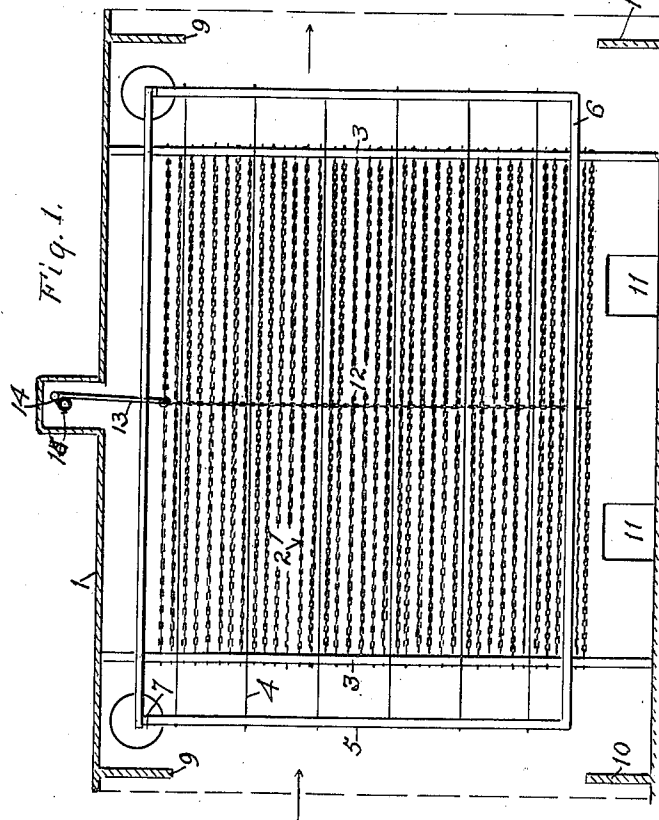
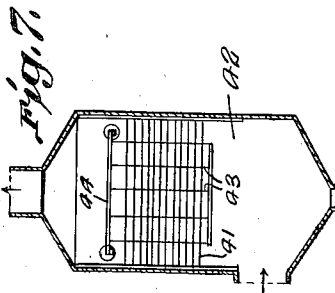
E. ANDERSON

1,444,997

APPARATUS FOR THE ELECTRICAL SEPARATION OF SUSPENDED MATERIAL FROM GASES

Filed Mar. 22, 1920

2 sheets-sheet 1



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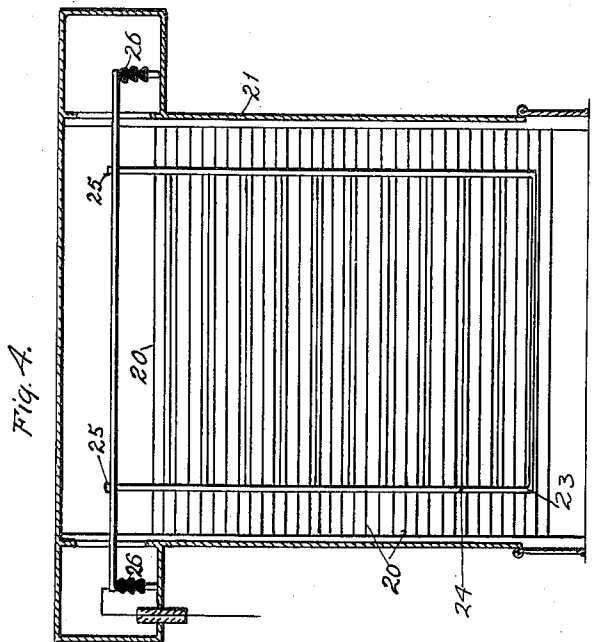
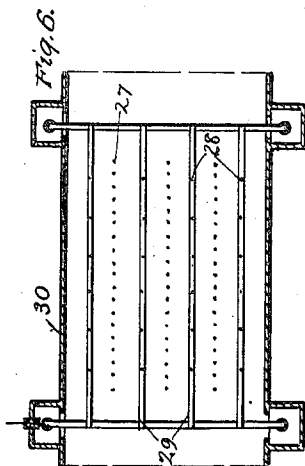
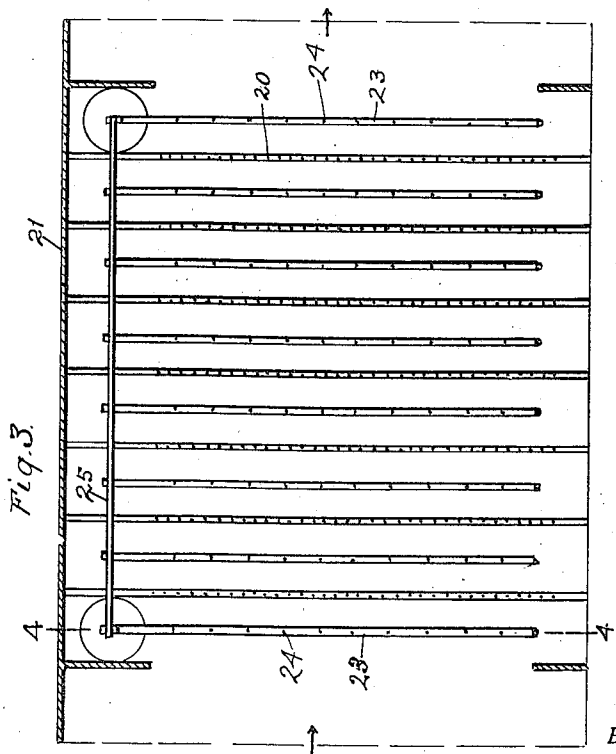
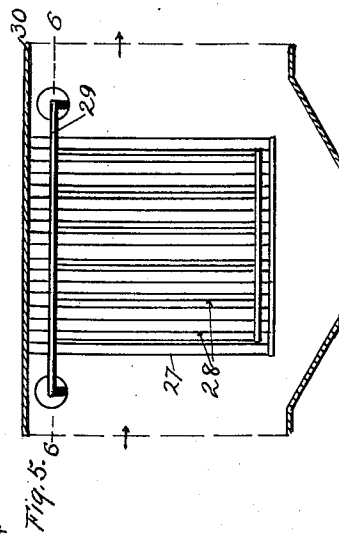
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2 sheets-sheet 2



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UNITED STATES PATENT OFFICE.

EVALD ANDERSON, OF BERKELEY, CALIFORNIA, ASSIGNOR TO INTERNATIONAL PRECIPITATION COMPANY, OF LOS ANGELES, CALIFORNIA, A CORPORATION OF CALIFORNIA.

APPARATUS FOR THE ELECTRICAL SEPARATION OF SUSPENDED MATERIAL FROM GASES.

Application filed March 22, 1920. Serial No. 367,768.

To all whom it may concern:

Be it known that I, EVALD ANDERSON, a citizen of the United States, residing at Berkeley, in the county of Alameda and State of California, have invented a new and useful Apparatus for the Electrical Separation of Suspended Material from Gases, of which the following is a specification.

This invention relates to improvements in apparatus for electrical precipitation, and the main object of the invention is to provide such a precipitator with improved electrode means of a construction adapted to facilitate removal or dislodgment of the precipitated material therefrom. In apparatus of this character the gases are passed between electrodes maintained at high potential difference, certain of said electrodes being of relatively extended area and serving as collecting or receiving electrodes, and the other electrodes being arranged opposite said collecting electrodes and being of relatively limited area and of such configuration as to facilitate electrical discharge therefrom. With such a construction the suspended particles in the gases are electrically charged by the action of the discharge from the discharge electrodes and are then driven into contact with the collecting electrodes by the action of the electric field.

The material precipitated on the collecting or receiving electrodes requires to be dislodged or removed in order to maintain operation of the treater or precipitator, and such removal is generally effected by jarring or hammering the collecting electrodes, which are usually formed as plates or pipes.

I have found that by forming these collecting electrodes of a multiplicity of flexible members, such as chains or wires, that the adhesion of the precipitated material thereto is considerably decreased, so as to facilitate the removal of the precipitated material from such electrodes; this is particularly the case when the said flexible electrode elements are extended horizontally, as they then present a less effective support to the precipitated material than when the said electrode elements extend vertically, and, moreover, with a horizontally extending wire or chain there is greater

tendency to vibration serving to dislodge the precipitated material.

The accompanying drawings illustrate embodiments of my invention, and referring thereto:

Fig. 1 is a longitudinal section of a precipitator or treater embodying the invention;

Fig. 2 is a vertical section thereof.

Fig. 3 is a longitudinal section of another form of the invention of such construction that the gases pass through the electrodes instead of between the same, as in the form shown in Figs. 1 and 2;

Fig. 4 is a section on line 4—4 in Fig. 3;

Fig. 5 is a vertical longitudinal section of a form of the invention in which the electrode elements are arranged as vertically extending flexible members;

Fig. 6 is a section on line 6—6 in Fig. 5;

Fig. 7 is a vertical section of a form of the invention in which the collecting electrodes are formed of horizontally extending members and the discharge electrodes of vertically extending members.

The form of the invention shown in Figs. 1 and 2 comprises a chamber or casing 1 formed, for example, as a horizontally extending flue adapted to receive and conduct the gases from a kiln, furnace or other source of gases containing suspended material. In said flue are mounted a series of collecting electrodes, each comprising horizontally extending flexible members, such as wires, chains or rods 2, secured at their ends to vertical frame bars 3, whereby said wires, chains or rods are held in substantially horizontal position and in parallel relation one above the other. Between and alternating with the successive collecting electrodes described are mounted the discharge electrodes consisting of horizontal flexible members, such as wires, chains or rods 4, secured at their ends to vertical frame bars 5, which are connected by horizontal frame bars 6 to form a rigid frame which is mounted on beams 7 carried by insulators 8. The casing 1 is preferably provided with suitable baffles 9 and 10 to direct the gases to be treated between the electrodes above described. Means are provided at the bottom of chamber 1 for removing the collected material, for example,

doors 11 may be provided for this purpose. Suitable means may be provided for shaking or vibrating either or both of the electrode systems above described, for example, as shown in Figs. 1 and 2, the horizontally extending flexible members 2 of each collecting electrode may be connected by a chain or cable 12 and link 13 to a crank 14 on the horizontal shaft 15, which is operated manually or mechanically by suitable means so as to raise and lower the central portion of each of said flexible electrode members periodically, or from time to time, as may be required to dislodge the precipitated material therefrom.

In order to provide the necessary differentiation in character between the discharge and collecting electrodes the flexible members 4 of the discharge electrodes may be formed with sharper curvature, for example, as wires, chains or rods, of small diameter as compared with the rods, chains or wires 2 of the collecting electrodes; moreover, the flexible members 2 of the collecting or receiving electrodes are preferably spaced sufficiently close together in each collecting electrode to approximate the effect of a continuous conducting surface as regards the distribution of the electrostatic lines of force produced thereby in the adjacent field. The successive electrode members 2 are preferably spaced apart a distance not greater than the distance between the discharge electrodes and the collecting electrodes, and in general the spacing of adjacent collecting electrode elements is considerably closer than the spacing between the discharge electrodes and collecting electrodes. The collecting electrode system, comprising the several sets or frames of the electrode members 2, is preferably grounded and the discharge electrode system, comprising the several sets of electrode members 4 with the supporting frames therefor, is connected by wire 18 to a suitable source of high tension current, preferably unidirectional, for example, in the manner disclosed in the patent to F. G. Cottrell, No. 895,729, August 11th, 1908; in some cases, however, where alternating current operation is desired, the wire 18 may lead directly to a source of high tension alternating current.

The operation of the apparatus above described is as follows:

The gas to be treated is assumed to pass through the flue 1 in the direction of the arrow and through the electrostatic field maintained between the discharge electrode members 4 and the opposing collecting electrode members 2 with the result that the suspended solid or liquid particles in the gases are caused to be precipitated by electrical action on the collecting electrode members. With some materials of a non-adherent nature the deposit so formed on the collect-

ing electrode members becomes dislodged automatically by the action of gravity and by vibration of the parts, and agitating actions due to the gas stream of the electric current.

In some cases where the material is more adherent the agitating means 14 is operated from time to time, or periodically, either by manual operation, or by suitable automatic mechanism, to shake the collecting electrode members producing a slight vertical movement, which serves to dislodge the material therefrom.

In the form of the invention above described, the gas flow is parallel to the planes of the several electrodes so that the gases pass between opposing electrodes.

My invention is also applicable, however, in connection with a system in which the gases pass transversely through the electrodes, as shown, for example, in Figs. 3 and 4, wherein collecting electrode elements 20 formed as horizontal wires, chains or flexible rods are stretched across the flue 21 adapted for collecting the gases to be treated, and discharge electrode elements 24, also extending horizontally and transversely of the flue 21, are stretched in a series of frames 23 carried by bus bars 25 mounted on suitable insulators 26. In other respects the construction may be substantially as above described and the operation may also be substantially the same with the exception that, in this case, the gases pass through the electrodes instead of between the same.

The gas stream flowing transversely of the electrode elements in this manner has a greater tendency to dislodge the material therefrom than in the case where the gas flows parallel to the electrode elements, and this form of the invention is particularly adapted for use where special shaking or agitating means for the electrodes is dispensed with.

While my invention has special advantages in connection with a horizontally extending flexible electrode, particularly in the case of collecting electrode elements, certain features of the invention with respect to the construction of the collecting electrodes are applicable, irrespective of the horizontality of such electrode elements, thus, as shown in Figs. 5 and 6, I may construct each collecting electrode of vertically hanging chains, wires or rods 27, the electrode elements of each electrode being arranged in rows extending longitudinally of the flue 30 for conducting the gases and being spaced sufficiently close together to present approximately the same electrical action as a continuous surface while at the same time retaining individual relative mobility, which facilitates dislodgment of the material from the electrodes by agitation produced by the gas stream, by electrical ac-

tion, or by suitable shaking means, if desired.

The discharge electrodes are also shown in this case as flexible vertically extending elements, consisting of wires, chains or rods 28 mounted on an insulated frame 29 and arranged in rows extending longitudinally in the flue 30, and alternating with the collecting electrodes, so that the gases pass parallel to and between adjacent collecting and discharge electrodes.

The collecting electrodes formed of horizontally extending wires, chains or other flexible members, may be used in connection with any suitable form of discharge electrodes, for example, as shown in Fig. 7, the collecting electrodes 41 may consist of wires, chains or other flexible members, extending transversely of a vertical flue or chamber 42 and arranged in successive vertical planes therein and the discharge electrodes may consist of vertical wires or chains 43 hung from an insulated frame 44. In this case, as in the forms shown in Figs. 1 to 6, the wire or chain elements of the collecting electrodes are spaced sufficiently close to present substantially the same electrostatic effect as a continuous conducting plate. Suitable means are provided, as in the case above described, for maintaining the discharge electrodes at high potential difference relative to the grounded collecting electrodes and the operation of the treater is substantially as above described, in connection with Fig. 1, except that the gases flow vertically instead of horizontally.

In each of the above described forms of my invention the discharge and collecting electrodes have their active portions consisting wholly of elongated members of small cross section, all extending parallel to one another in a single plane, and the component members of each discharge electrode are sufficiently far apart to permit of effective discharge therefrom, while the component members of the collecting electrodes are sufficiently close together to prevent approximately the same electrostatic effect as a continuous conducting surface, so as to prevent effective discharge therefrom.

What I claim is:

1. In an electrical precipitator, a chamber adapted for passage of gases therethrough, a discharge electrode mounted and insulated in said chamber and consisting wholly of elongated members of small cross section all extending parallel to one another in a single plane, and a collecting electrode opposed to said discharge electrode and consisting wholly of elongated members of small cross section, all extending parallel to one another in a single plane, the component members of the collecting electrode being spaced closer

together than the component members of the discharge electrode.

2. In an electrical precipitator, a chamber adapted for passage of gases therethrough, a discharge electrode mounted and insulated in said chamber and consisting wholly of elongated members of small cross section all extending parallel to one another in a single plane and spaced sufficiently far apart to permit them to act effectively as discharge members, and a collecting electrode mounted opposite said discharge electrode and consisting wholly of elongated members of small cross section all extending parallel to one another in a single plane, and sufficiently close together to approximate the effect of a continuous conducting surface.

3. A construction as set forth in claim 2, in which the component members of the collecting electrode are horizontal.

4. A construction as set forth in claim 2 in which the component members of the collecting electrode are flexible and horizontal.

5. A construction as set forth in claim 2 in which the component members of both the collecting and discharge electrodes are flexible.

6. An electrical precipitator comprising a flue adapted for passage of gases therethrough, a plurality of discharge electrodes mounted in said flue, a plurality of collecting electrodes arranged in alternation with the discharge electrodes, each of the collecting electrodes as well as each of the discharge electrodes, consisting in its active portion, wholly of elongated members of small cross section all extending parallel to one another in a single plane, the component members of each collecting electrode being closer together than the component members of the discharge electrodes.

7. A construction as set forth in claim 6, in which the electrodes all extend transverse to the direction of flow of gases in said flue, so that the gases pass through the electrodes.

8. In an electrical precipitator, a collecting electrode whose active portion consists wholly of elongated members of small cross sections, all extending parallel to one another in a single plane, and spaced sufficiently close together to approximate the effect of a continuous conducting surface.

9. In an electrical precipitator, a collecting electrode whose active portion consists wholly of elongated members of small cross sections all extending parallel to one another, horizontally in a single plane, and spaced sufficiently close together to prevent effective discharge therefrom.

In testimony whereof I have hereunto subscribed my name this 8th day of March, 1920.

EVALD ANDERSON.