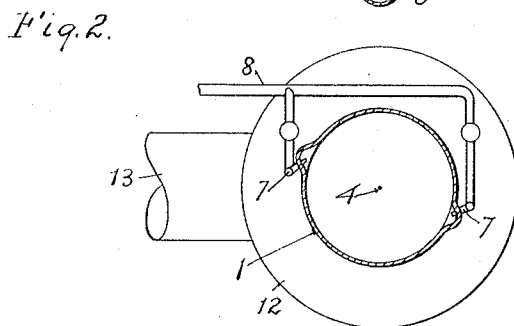
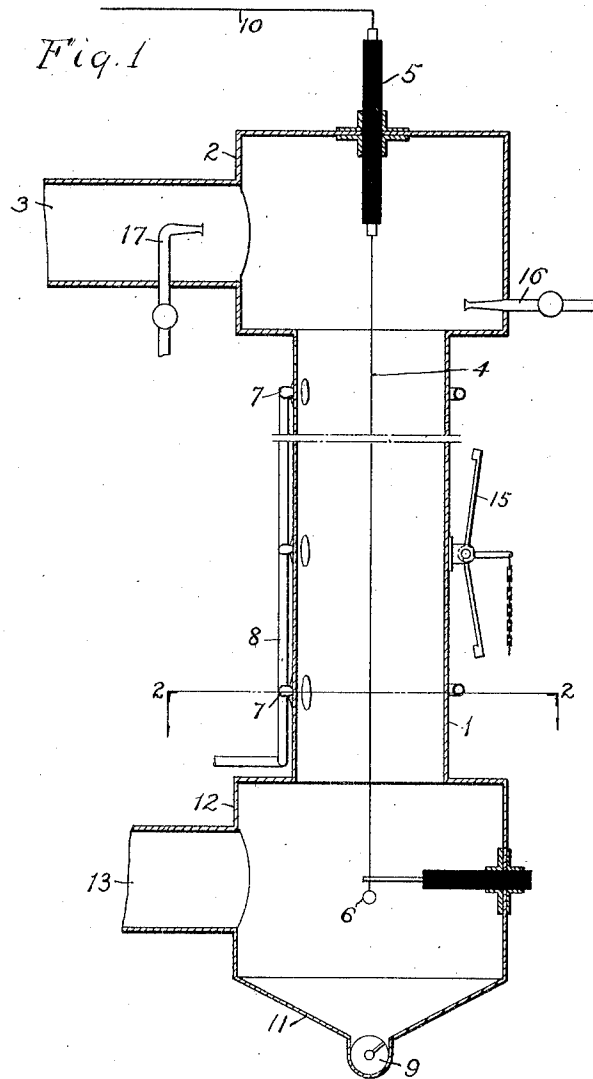


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 ART OF PRECIPITATING SUSPENDED MATERIAL FROM GASES.
 APPLICATION FILED MAY 28, 1919.

1,331,225.

Patented Feb. 17, 1920.



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Specification of Letters Patent.

Patented Feb. 17, 1920.

Original application filed July 5, 1917, Serial No. 178,838. Divided and this application filed May 28, 1919. Serial No. 300,300.

To all whom it may concern:

Be it known that I, EDSON RAY WOLCOTT, a citizen of the United States, residing at Los Angeles, in the county of Los Angeles and State of California, have invented a new and useful Improvement in the Art of Precipitating Suspended Material from Gases, of which the following is a specification.

This application is a division of my application, Serial No. 178,838, filed July 5th, 1917, for "Improvement in the art of precipitating suspended material from gases"; this application covering a specific method of carrying out the invention disclosed in said prior application.

This invention relates to the precipitation of dust or fume from gases by the action of an electrical field, and the main object of my invention is to overcome certain difficulties which arise in the precipitation of certain materials, particularly those which are substantially non-conducting under conditions usually existing in processes of this kind.

In the electrical precipitation of suspended material from gases, the process now in general use involves production of an electrical field between one or more discharge electrodes and one or more collecting or receiving electrodes, the electrical field being maintained between said electrodes by applying to said electrodes unidirectional current of sufficiently high tension to produce discharge of electricity from the discharge electrodes in such manner as to charge the particles of suspended material in the gas and cause precipitation of such particles on the collecting or receiving electrodes. In order to insure effective precipitating action, it is usual to make discharge electrodes of such form as to produce a concentrated field adjacent thereto, and to thereby facilitate discharge of electricity therefrom, while, on the other hand, the collecting or receiving electrodes are usually formed with comparatively extended surfaces so as to minimize the field intensity adjacent thereto, and prevent as far as possible, any discharge therefrom. In order to provide for the greatest possible efficiency in precipitation, it is desirable to maintain as high a potential difference between the elec-

trodes as possible without causing disruptive discharge or arcing between the electrodes. For this purpose, it is desirable in general to apply the current to the electrodes in such manner that the discharge electrodes are negative, as ordinarily it is possible with this arrangement to maintain a higher potential difference between the electrodes than is practicable with the reverse polarity. In the operation of precipitating apparatus of this kind, there is, in general, in the case of deposits of solid material, continuous precipitation of the suspended particles on the collecting or receiving electrode under the electrical action and in most cases, the deposit so precipitated tends to remain on the collecting or receiving electrodes until it is forcibly removed by jarring or otherwise.

In the operation of electrical precipitation apparatus, it has been found that as the deposit accumulates on the receiving electrodes, there is, in some cases, a marked decrease in the efficiency of precipitation or the "clearance" of the gas, and this has also been found, in general, to be associated with a decrease in the arcing voltage—that is, the maximum voltage that can be maintained between the electrodes without arcing. This effect varies with the nature, material and condition of the deposit, being especially marked in the case of deposits, such as those of zinc oxid produced in zinc smelting furnaces, wherein the deposit is of poorly conducting material and is of a light porous nature, and the effect also depends on the configuration of the deposit, being increased by any roughness or projection on the deposit tending to produce localization of the electric field, and in this connection, it may be stated that a much slighter degree of roughness or surface projection of any part of the receiving electrode is sufficient to cause break down of the electrical field under given voltage conditions, in case of a poorly conducting deposit than in case of an effectively conducting surface.

What ever may be the cause of the phenomenon above referred to, it may be stated that it only occurs to a degree sufficient to cause serious lowering of the arcing voltage when the deposit is of non-conducting or poorly conducting material, and I have

found that in such cases, normal precipitation conditions may be restored and full electric voltage may be maintained by applying to the deposit a suitable agent which increases its conductivity to a certain extent.

An investigation of the phenomenon herein described has led me to the conclusion that it requires, for its production, a configuration of surface, by reason of roughness or porosity, which leads to local ionization, and that there is also required, a sufficiently low conductivity of the deposited material to enable the ionization to build up or accumulate an electric charge on the material, which eventually becomes of sufficient intensity to break down the dielectric. As far as I have found, the lowering of the arcing voltage is only marked when the discharge electrode is negative and the effect of the deposit is, in general, to lower the arcing voltage to or toward the limit that could be maintained in case the discharge electrode were positive, and to thus lose the advantages of working with negative discharge electrode, as set forth in the United States patent to F. G. Cottrell, No. 1,067,974, dated July 22, 1913.

It may, therefore, be stated that in the case of electrical precipitation of fumes or dust of non-conducting material, there is a tendency to an accumulation of an electrical charge by the deposit produced on the collecting or receiving electrodes and this charge tends to ionize gases in the vicinity of the collecting electrode, with the result that there is a considerable lowering of the voltage that can be maintained between the discharge electrode and the collecting or receiving electrode, and this lowering of the "arcing voltage" considerably decreases the efficiency of precipitation.

My present invention consists essentially in providing for conduction of the electrical charge from the deposit so as to prevent accumulation of charge thereon. I provide for this by applying to the deposit a suitable agent which increases the electrical conductivity thereof sufficiently to prevent accumulation of a charge thereon.

According to the present invention, the precipitate or deposit on the collecting electrodes is rendered conducting by causing a solid conducting material to be mixed with or distributed on such deposit in such manner as to render the deposit or body of material conducting, as a whole. The solid conducting material used for this purpose may be any solid material having required conductivity, such as carbon or metallic particles, or a metallic oxid, such as oxid of iron (haematite or magnetite) in suitable finely divided state, which are supplied to the gases in sufficient quantity to render the deposit precipitated on the collecting electrodes slightly conducting.

The accompanying drawings illustrate a form of apparatus suitable for carrying out my invention, and referring thereto:

Figure 1 is a vertical section of a precipitating apparatus provided with means for injecting conducting material into the gases to be treated.

Fig. 2 is a section on line 2—2 in Fig. 1.

In Fig. 1 I have shown my invention as applied in connection with the operation of a treater or precipitator having a single pipe or flue, but it will be understood that it is applicable in connection with any of the usual forms of electrical precipitators, whether of the so-called multiple pipe form, or of the form in which the collecting electrodes consist of plates or screens.

Referring to Fig. 1, the collecting electrode 1 is shown as a vertical flue, of cylindrical or other suitable shape and provided, for example, at its upper end, with a chamber or header 2, into which leads a flue 3 for supplying the gas to be treated. The electrode flue 1 may be provided at its lower end with a suitable chamber or header 12 communicating with an outlet flue 13. If desired, the apparatus may be arranged for upward flow of the gases. Suitable means, such as hammer device 15, may be provided for dislodging the deposit from the receiving electrode and causing it to fall into a collecting bin 11, from which it may be removed by screw conveyer 9, or other means.

A discharge electrode 4 is mounted axially in electrode flue 1 and may consist of a wire suspended from an insulated support 5 and tensioned by means of a weight 6 at its lower end. Any other suitable form of discharge electrode may be used.

A supply means for conducting agent is provided at the upper end of the electrode flue 1, and also, if desired, at one or more levels below the upper end, such supply means consisting, for example, of nozzles 7 opening tangentially or obliquely into the electrode flue and adapted to receive finely divided conducting material and an injecting agent from a suitable supply pipe 8, and to deliver such finely divided conducting material in the form of a cloud into electrode flue 1. Similar nozzles 16 and 17 may be provided in the inlet header 2 and in the inlet flue 3. Electrode flue 1 is preferably grounded and discharge electrode 4 may be connected by wire 10 to suitable means for supplying high tension unidirectional current, for example, in the manner set forth in patent to F. G. Cottrell, No. 895,729, dated August 11, 1908.

In the operation of the invention as carried out in this apparatus, the gas to be treated is passed downwardly through the collecting electrode or flue 1, and suitable high tension unidirectional current is supplied to the electrodes in such manner as

to cause fume or dust suspended in the gas to be precipitated by the action of the electrical field, on the collecting electrode 1, and finely divided solid conducting material, such as carbon, metallic particles, or oxid of iron, is injected by means of nozzles 7, etc., into the gases so as to be distributed therein and to be precipitated by the action of the electrical field along with the dust suspended in the gases in such manner as to be mixed with the deposited or precipitated material and render the same sufficiently conducting to prevent accumulation of electric charge thereon.

15 What I claim is:

1. In the art of electrical precipitation of suspended material from gases, the method of maintaining the dielectric strength of the precipitating electrical field in cases where
20 the precipitated material is nonconducting

and tends to accumulate a charge by the action of the electrical field, which consists in applying to the deposit a solid conducting agent capable of increasing the conductivity thereof sufficiently to discharge the same. 25

2. In the art of electrical precipitation of suspended material from gases, the method of rendering the deposit conducting, which consists in injecting into the gases a finely divided solid conducting material and precipitating such material along with the said
30 suspended material.

3. A process, as set forth in claim 2, wherein finely divided oxid of iron is used as the material for rendering the deposit conducting. 35

In testimony whereof I have hereunto subscribed my name this 22nd day of May, 1919.

EDSON RAY WOLCOTT.