June 24, 1930. A. ARRAS 1,767,338

ELECTRICAL PRECIPITATING APPARATUS

Filed May 3, 1928

Fig. 1

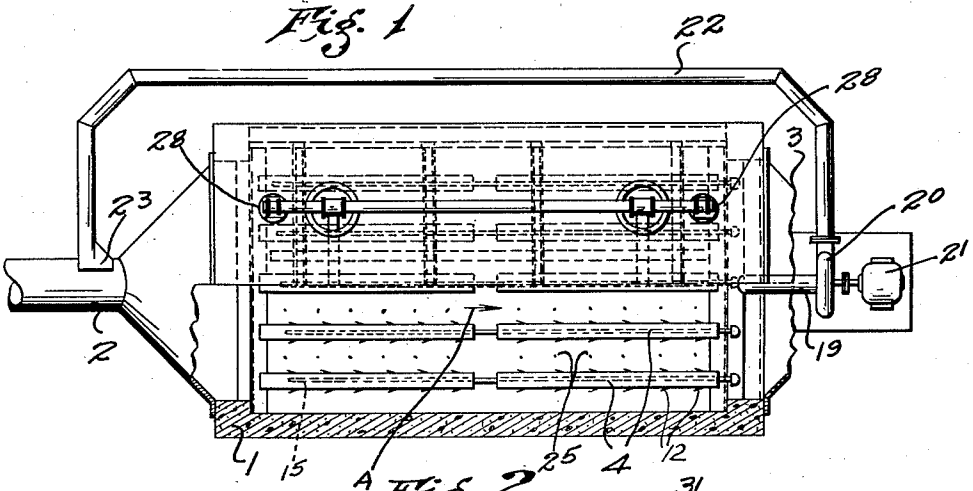


Fig. 2

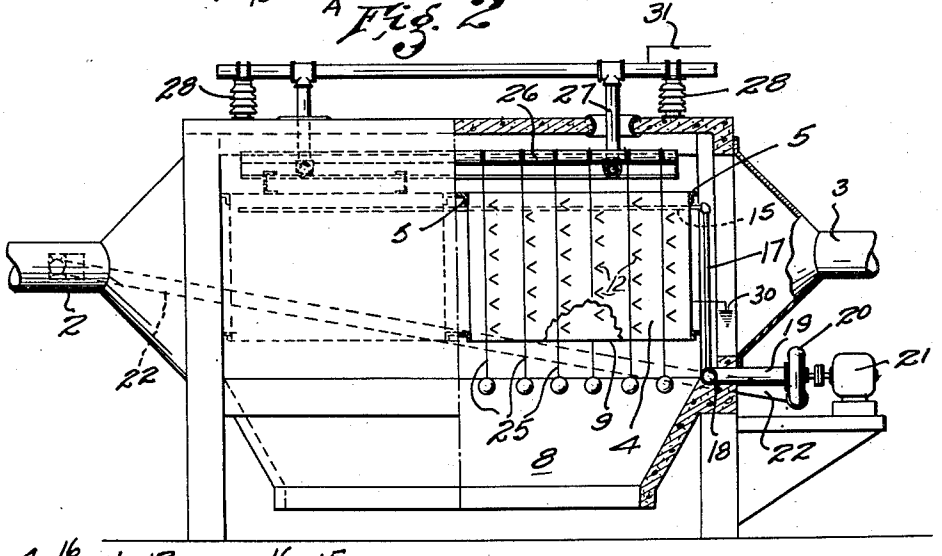


Fig. 4

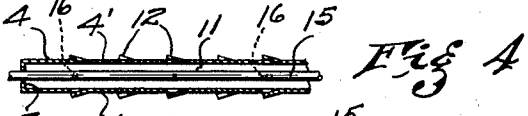
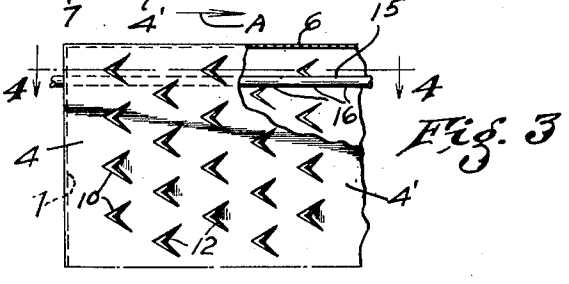


Fig. 3



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UNITED STATES PATENT OFFICE

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ELECTRICAL PRECIPITATING APPARATUS

Application filed May 3, 1928 Serial No. 274,929, and in Germany May 27, 1927.

This invention relates to apparatus for electrical precipitation of suspended particles from gases, and particularly to electrical precipitators of the type in which the collecting electrodes are provided with hollow spaces and the collecting surfaces are provided with openings leading into such hollow spaces and with baffles for assisting in collecting the precipitated material and directing the same into such hollow spaces.

One difficulty which may sometimes occur with such electrodes is that the precipitated material chokes up at the openings leading into the hollow space and the collecting electrodes, due apparently to creation of a gas cushion or zone of increased pressure at these points, as a result of which further precipitated material is prevented from entering said hollow spaces and may be again carried away by the gas stream. The principal object of this invention is to overcome this difficulty, which is accomplished by placing the hollow spaces or interior chambers of the collecting electrodes under a moderate or slight suction or reduced pressure, which need be only sufficient to prevent formation of gas cushions or regions of increased pressure in said openings, thus permitting free entrance of precipitated material therethrough.

The particular construction used for this purpose may be subject to great variation, but one form of electrical precipitating apparatus embodying the above feature is shown in the accompanying drawings, in which:

Fig. 1 is a partly sectional plan view of such apparatus.

Fig. 2 is a partly sectional side elevation thereof.

Fig. 3 is an enlarged side elevation of a part of one of the collecting electrodes, partly broken away.

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

The electrical precipitator shown in the drawings comprises a casing or housing 1 which may be of concrete construction as shown or may be constructed of any other suitable material. An inlet flue 2 is connected to one end of said housing and an outlet flue 3 to the other end so as to provide for passage therethrough of the gas containing the suspended material to be precipitated. The interior of said housing constitutes the main precipitating chamber, and within said chamber are mounted a plurality of collecting electrode members 4, supported for example by means of bars 5. Each of said collecting electrodes is of box-like construction and is provided with two side walls or plates 4′ and is closed at the top as indicated at 6 and at the ends as indicated at 7, so as to enclose a chamber 11 separate from the precipitating chamber. The bottom of each electrode, however, is open as shown at 9, so as to permit material collected therein to fall into hopper 8 which extends beneath the collecting electrodes, whence such material may be removed in any suitable manner.

Each side plate 4′ is provided with openings 10 distributed over the surface thereof and leading into the hollow chamber 11 of the electrode. The direction of gas flow is indicated by the arrows A in Figs. 1 and 4, and baffle members 12 are provided just beyond each opening 10 in the direction of gas flow so as to cause any material precipitated on the side walls 4′ and tending to move along the surface of such side walls due to the friction of the moving gas stream thereupon, to pass through said opening and into the chamber 11. Such openings and baffle means may advantageously be formed by making a plurality of V-shaped cuts at proper intervals on each side plate 4′ and outwardly bending or deforming the metal between the two sides of each cut, as shown in Figs. 3 and 4.

According to the present invention suitable means are provided for maintaining within the chamber 11 of each collecting electrode a suction or reduced pressure, that is to say, a pressure less than that existing in the precipitating apparatus and outside the collecting electrodes. For this purpose pipes 15 provided with openings 16 may extend throughout the length of the collecting electrodes and near the upper end of the hollow chambers 11 thereof. Said pipes may extend downwardly as at 17 at one end of the precipitator, entering a header or manifold 18 connected to the inlet 19 of a fan or exhauster 20, driven for example by electric motor 21.

The outlet 22 of said fan or exhauster may lead to any suitable point, but in order to provide for collection in the same precipitating apparatus of any suspended material removed with the gas through pipes 15, said outlet preferably communicates with the precipitator inlet flue 2 as shown at 23.

Suitable discharge electrode means such as wires or the like indicated at 25 are provided between the respective collecting electrodes, said discharge electrodes being hung from bars 26 supported by means of frame members 27 on insulating supports 28. The spacing of the individual discharge electrode members from one another, as well as the spacing of said members from the opposing side plates 4′ of the collecting electrodes, may conform substantially to the usual practice in electrical precipitating apparatus. Any suitable means may be provided for maintaining the necessary high potential difference between the discharge and collecting electrodes. For example, the collecting electrodes may be grounded as indicated at 30 and the discharge electrode system may be connected as by wire 31 to one side of a suitable source of high tension electric current, preferably rectified alternating current, the other side of said source being also grounded to complete the circuit. The spaces within the housing 1, and outside of and between the collecting electrodes, may be considered as comprising the precipitating chamber or chambers of the apparatus.

In the operation of the above described apparatus, with the electric circuit established, the suspended material contained in the gas passing between the discharge and collecting electrodes will become electrically charged and will be precipitated wholly or partially upon the side walls 4′ of the collecting electrodes and, due to the drag of the gas thereon, such precipitated material will move along the surfaces of such side walls and pass through openings 10 into the hollow spaces or chamber 11 of the collecting electrodes. With the fan or exhauster 20 in operation, gas will be continually withdrawn from the chambers 11 so as to maintain therein a pressure slightly less than that outside said chambers and thus cause a continual slight flow of gas through openings 10. This will not only prevent the creation of gas cushions or regions of increased pressure in these openings, which have heretofore tended to prevent free passage of precipitated material therethrough but may also actually promote the passage of such material through said openings by entrainment with the gas.

The precipitated material thus entering the chambers 11 falls, for the greater part, through the open bottoms of said chambers into hoppers 8, while the gas passes through pipes 17, 18 and 19 to fan 20 and hence through pipe 22 back to the main gas stream entering the precipitator. Any solid material carried out of the chambers 11 in suspension in this circulating gas will, therefore, not be lost or permitted to escape, but will be again precipitated and collected in the electrical precipitator. It will be understood, of course, that the amount of gas drawn in through openings 10 and returned through pipe 22 is relatively small as compared to the total amount of gas passing through the precipitator, so that the return of such gas to the inlet flue does not greatly increase the velocity of gas in the precipitator nor does the relatively small quantity of suspended material returned with such circulated gas materially increase the amount of material to be precipitated.

I claim:

1. In an electrical precipitating apparatus, a collecting electrode having an interior chamber and provided with opening means leading into said chamber and baffles cooperating with said opening means to direct precipitated material into said chamber, and means for maintaining within said chamber a pressure less than that in the precipitator and outside said chamber.

2. In an electrical precipitating apparatus, a collecting electrode having an interior chamber and provided with opening means leading into said chamber and with baffle means cooperating with said opening means to direct precipitated material through said opening means into said chamber, and means for withdrawing gas from said chamber so as to maintain therein a pressure less than that existing outside said chamber.

3. A construction as set forth in claim 2, and comprising in addition means for returning the gas so withdrawn from said chamber to the gas entering the precipitator.

4. In an electrical precipitating apparatus, housing means enclosing a precipitator chamber, a collecting electrode mounted in said precipitator chamber and having a chamber separate from the main precipitating chamber and provided with opening means leading from said precipitator chamber into said separate chamber, means for maintaining within said separate chamber a pressure less than that in the precipitator chamber so as to cause gas from the precipitator chamber, together with precipitated material, to pass through said opening means into said separate chamber, means for collecting precipitated material entering said separate chamber, and means for returning said gas, after removal of such precipitated material, to the precipitator chamber.

5. An electrical precipitating apparatus comprising housing means enclosing a precipitator chamber and provided with means for supplying gas containing suspended particles to said precipitator chamber and for removing gas from said precipitator cham-

ber, a collecting electrode and opposing discharge electrode means disposed within said precipitator chamber, means for maintaining a difference of potential between said collecting electrode and said discharge electrode means, said collecting electrode having a chamber separate from the precipitator chamber and being provided with opening means distributed over the collecting surface thereof and leading from said precipitator chamber into said separate chamber, means for maintaining within said separate chamber a pressure less than that in the precipitator chamber so as to cause a portion of the gas in said precipitator chamber adjacent said collecting electrode to pass together with precipitated material through said opening means into said separate chamber, means for collecting precipitated material entering said separate chamber, and means for returning said gas, after separation of such precipitated material, to said precipitator chamber.

In testimony whereof I have hereunto subscribed my name this 11th day of April, 1928.

ADAM ARRAS.