

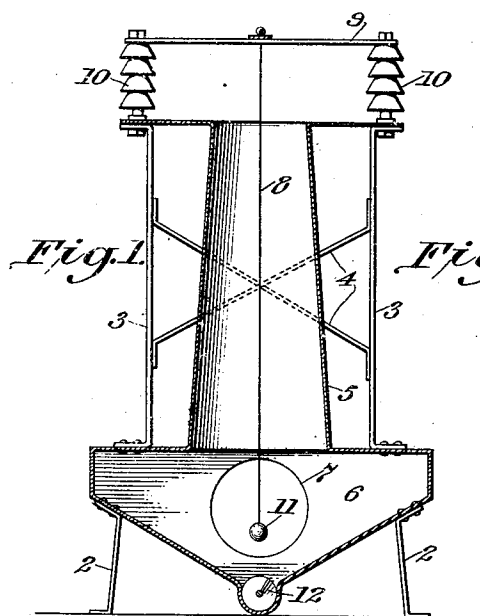
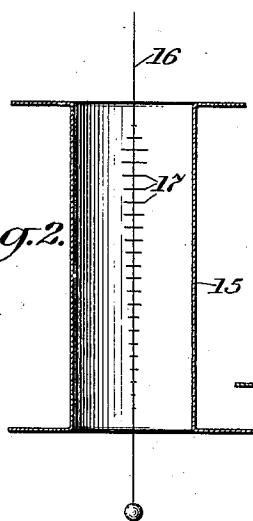
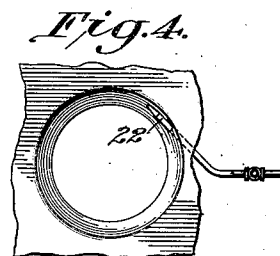
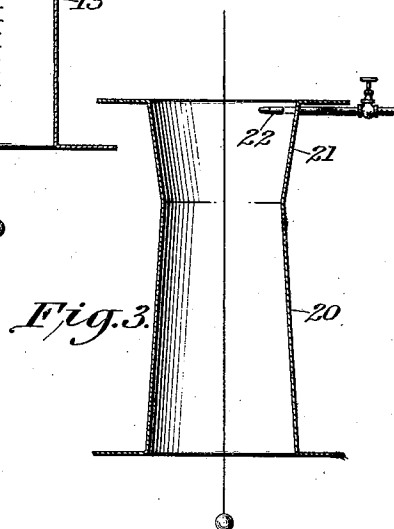
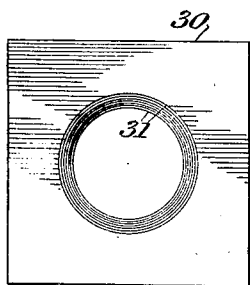
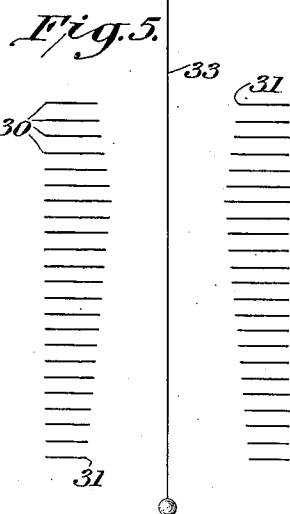
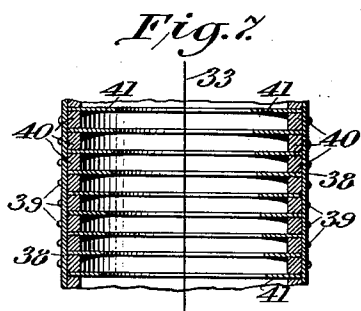
Jan. 16, 1923.

1,442,052.

L. DANE.

APPARATUS FOR ELECTRICAL TREATMENT OF GASES.

FILED MAR. 14, 1918.



Inventor

Louis Dane,

By *Byrnes, Townsend & Brichman*,

Attorneys

UNITED STATES PATENT OFFICE.

LOUIS DANE, OF BROOKLYN, NEW YORK, ASSIGNOR TO RESEARCH CORPORATION, OF NEW YORK, N. Y., A CORPORATION OF NEW YORK.

APPARATUS FOR ELECTRICAL TREATMENT OF GASES.

Application filed March 14, 1918. Serial No. 222,423.

To all whom it may concern:

Be it known that I, LOUIS DANE, a citizen of the United States, residing at Brooklyn, in the county of Kings and State of New York, have invented certain new and useful Improvements in Apparatus for Electrical Treatment of Gases, of which the following is a specification.

The present invention relates to apparatus for the electrical treatment of gases and more particularly to apparatus for the electrical precipitation of suspended particles from fluid streams.

In the practical use of electrical precipitators it is often found that all disruptive charges occur in one particular part of the treater apparatus. With some gases it was found that the spark-over occurred adjacent the entrance end of the treater chamber and with others at the exit end thereof. It was therefore not possible under these conditions to obtain a uniform field of electric stress.

It is the object of this invention to provide means whereby the electric strength of the gas path between the electrodes is substantially uniform throughout the length of the electrodes.

I accomplish this object by so constructing and dimensioning the electrodes that the electrical field varies in proportion to the conductivity of the fluid stream as the fluid stream passes through the electric field.

For a fuller understanding of the invention reference is had to the accompanying drawings in which

Figure 1 represents one form of precipitator embodying the invention;

Figure 2 is a fragmentary view of another form;

Figures 3 and 4 are elevation and plan view respectively of a modification of the apparatus shown in Figure 1;

Figures 5 and 6 are elevation and plan view respectively diagrammatically illustrating still another form and

Figure 7 is a fragmentary sectional view of a mechanical construction for carrying into effect the idea disclosed in Figures 5 and 6.

In Figure 1 legs 2, uprights 3 and braces 4 represent a conventional arrangement for supporting the flue or collecting electrode 5 which terminates at its lower end in a hop-

per 6 and is open at its top. Through an opening 7 the gases are conducted into this hopper from which they pass up through the flue. From the top of the flue is, as usually, suspended a thin wire 8 which forms the discharge electrode. This wire may be conveniently supported on a cross-frame 9 resting on insulators 10 which in turn are mounted on the top of the general supporting structure. The wire 8 carries at its lower end a weight 11 to keep it taut and hold it in position. A conveyor 12 may be provided at the bottom of the hopper for removing the collected particles. The structure so far described is merely a conventional arrangement to indicate the relation of the precipitator elements and may be varied in numerous ways.

The collecting electrode in the particular form of apparatus is shown as tapering from bottom to top. This form of the flue structure is intended for the treatment of gases which carry electrically conductive particles. When the gases enter, the fluid stream has therefore a minimum dielectric strength and as the stream reaches the top, when nearly all the suspended particles are precipitated, the dielectric strength has increased to a certain limit. In the zones intermediate the ends the dielectric strength which varies with the content of suspended particles has values which gradually increase from the minimum at the lower end to the maximum at the upper end.

The particular taper to be given to a flue depends therefore on the difference in the dielectric strength between the upper and lower limit of the gas to be treated and to a certain extent upon the voltage employed.

By properly tapering the flue in accordance with the characteristics of the gas the voltage necessary for disruptive spark-over will be substantially uniform throughout the length of the treater chamber.

In Figure 2, in which 15 represents the collecting electrode and 16 the discharge electrode, the discharge distance is varied by providing on the discharge electrode prongs or disks 17 of gradually varying diameter. It is again assumed that the gas to be treated contains electrically conductive particles suspended in the gas stream. At the bottom of the flue the discharge distance is that be-

tween the wire proper and the flue, which is substantially cylindrical from top to bottom. This distance is such that spark-over occurs there at a voltage just above that at which it is found desirable to run the precipitator.

The diameters of the successive disks 17 are then so chosen that the critical disruptive voltage is the same throughout the treater.

In Figure 2 the diameters of the disks 17 are shown as increasing from the bottom to near the top of the flue and then decreasing again. By this arrangement the danger of spark-over at the top is considerably decreased. As the gases approach the exit end of the flue, they are substantially clean and it is not absolutely essential that the electric stress should in this zone be kept near the critical point of disruptive discharge. There is, moreover, at the end of the flue a tendency to spark-over due to the sharp edge of the flue. By increasing the discharge distance again at the edge of the flue, this danger is avoided. The same effect could be obtained, of course, by rounding the edge of the flue, but it is much simpler, mechanically, to make the adjustment in the manner indicated.

Figures 3 and 4 depict an arrangement similar to that shown in Figure 1, but having the upper portion 21 of the flue 20 flaring outwardly, partly for the purpose mentioned in connection with the description of Figure 2 and partly for the purpose of admitting of the introduction of a flushing system. A nozzle 22 connected to a supply pipe 23 may be used to flush the walls of the collecting electrode 20 to continuously remove the particles collected thereon or for other purposes. This nozzle is preferably arranged in a direction substantially tangential to the wall of the flue so as to force the liquid, for instance water, around the whole flue and form a substantially uniform film.

Figures 5 and 6 show in simple outlines an electric treater in which the discharge distance between the discharge electrode 33 and the collecting electrode is varied by varying the diameter of orificed plates forming a part of the collecting electrode. The flue may be angular, as indicated, or round or of any desired form. The square plates 30 have central orifices 31. It is assumed again that the gases enter at the bottom of the treater and contain electrically conductive suspended particles. For this reason the bottom plate has the greatest orifice and the orifices in the other plates gradually decrease in diameter toward the upper end in proportion to the change of dielectric strength of the gas in its passage through the treater, as has been explained in connection with the description of the other figures.

Adjacent the upper end of the flue, the

orifices increase again in diameter for a purpose previously stated. By this arrangement, like in the previously described arrangements, the electric stress may be made substantially uniform throughout the treater.

Figure 7 shows a practical embodiment of the idea disclosed in Figures 5 and 6. The treater flue may be built up of a plurality of plates 38 forming the walls thereof. Bars or blocks 40 may be uniformly spaced along two opposing plates 38 to define transverse grooves for receiving the orificed plates 41. The blocks 40 may be secured to the plates in any suitable manner as for instance by means of screws 39. While the structure may be formed in various ways, I prefer to permanently assemble three walls of the flue, two of which carry the blocks 40 as previously indicated. The plates 41 can then be easily placed in position in the grooves and when they are in place the fourth plate 38 can be attached to complete the flue. By this construction it is easy to remove the orificed plates 41 for cleaning.

The operation is obvious. The uniformity of the electric field in point of strength does not only lead to a high degree of efficiency and economy, but also eliminates to a great extent the undesirable local eddies and other disturbances which are due to different stresses existing in the electric field.

While the change of dielectric strength was in the foregoing assumed to be due to the presence of electrically conductive suspended particles in the gases, there may be other causes for such changes. Gases and particles may enter with residual electric charges and leave with these charges neutralized, increased or changed. Blast furnace gases and other hot gases are apt to carry a charge. Gases may enter without appreciable charge and take on and hold one in the course of their passage. Also the change of temperature of the gases may bring about a difference in the electrical characteristics of the gases and such change may take place while passing through the treater chamber.

The present disclosure is not intended to cover all possible embodiments of which the invention is susceptible. Obviously various changes may be made in the forms of the electrodes within the scope of the disclosure.

I claim:—

1. An apparatus for the electrical treatment of gases, comprising a flue element acting as a collecting electrode, said flue element being formed to define a conical passage terminating at its upper end in a flaring mouth, and a discharge electrode extending into said flue.

2. In apparatus for the electrical treatment of gases, comprising a flue element acting as a collecting electrode, a discharge electrode extending into said flue and a plu-

ality of plates connected to one of said electrodes for gradually varying the dielectric distance therebetween.

3. In apparatus for the electrical treatment of gases, comprising a flue element acting as a collecting electrode, a discharge electrode extending into said flue and a plurality of plates on the said flue for gradually varying the dielectric distance between the said electrodes.

4. In apparatus for the electrical treatment of gases, comprising a flue element, a plurality of plates transversely of said flue having aligned orifices of gradually varying diameter and a discharge electrode extending into the space defined by said orifices.

5. In apparatus for the electrical treatment of gases, comprising a flue element, a

plurality of closely spaced plates transversely of said flue having aligned orifices of gradually varying diameter and a discharge electrode extending into the space defined by said orifices.

6. An apparatus for the electrical treatment of gases, comprising a flue element acting as a collecting electrode, a plurality of orificed plates in the flue, said orifices being formed to define a substantially conical passage terminating at its top in a flaring mouth, and a discharge electrode extending through said mouth into the passage.

In testimony whereof I affix my signature in presence of two witnesses.

LOUIS DANE.

Witnesses:

A. F. MESTON,
J. HUFF.