G. GALLOT AND P. POUSSIN.

APPARATUS FOR THE ELECTRICAL SEPARATION OF SUBSTANCES IN SUSPENSION IN FLUIDS.

APPLICATION FILED MAY 21, 1918.

1,332,981.

Patented Mar. 9, 1920.

4 SHEETS—SHEET 1.

Fig.1.

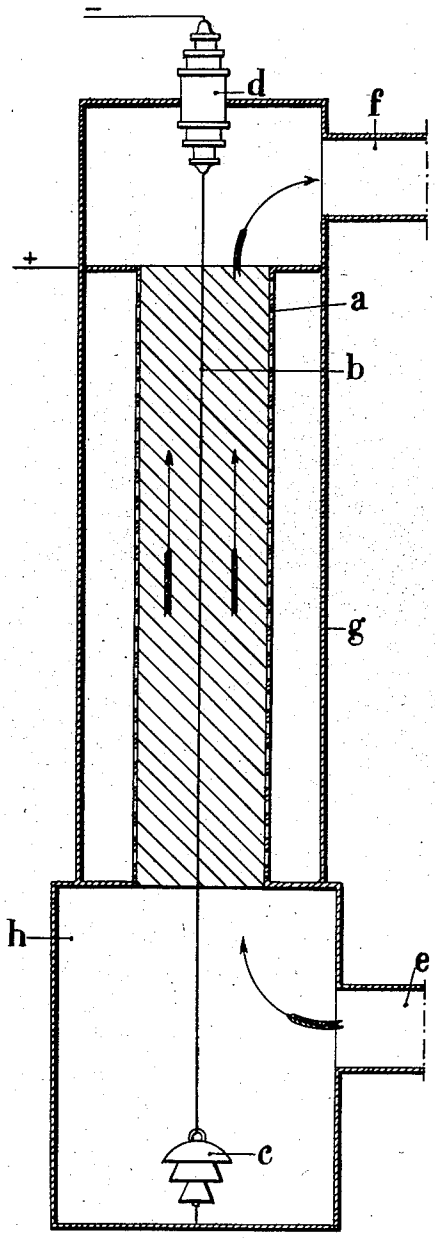
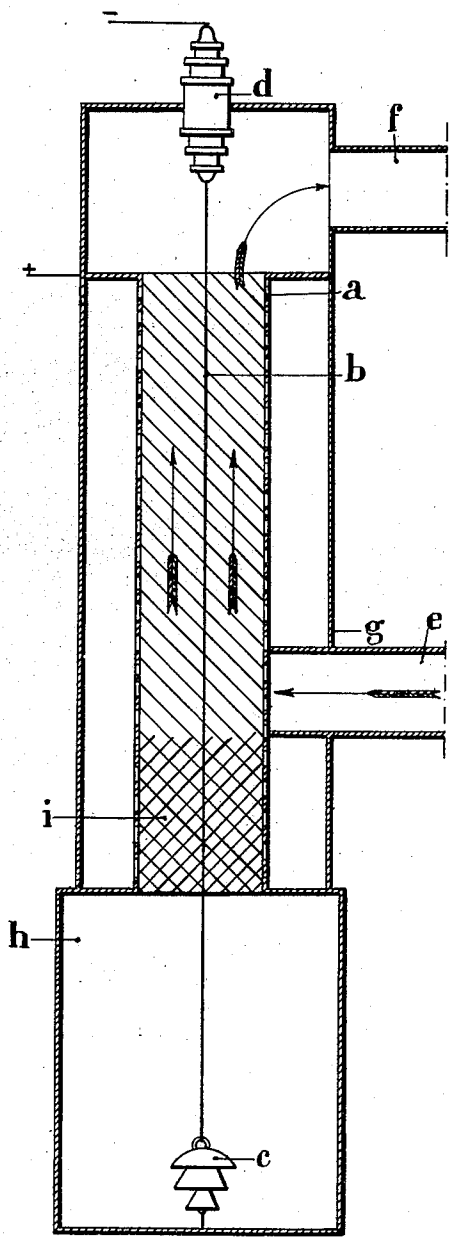


Fig.2.



Inventors:
Georges Gallot & Paul Poussin
per H. W. Plucker
Attorney.

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4 SHEETS—SHEET 2.

Fig.3.

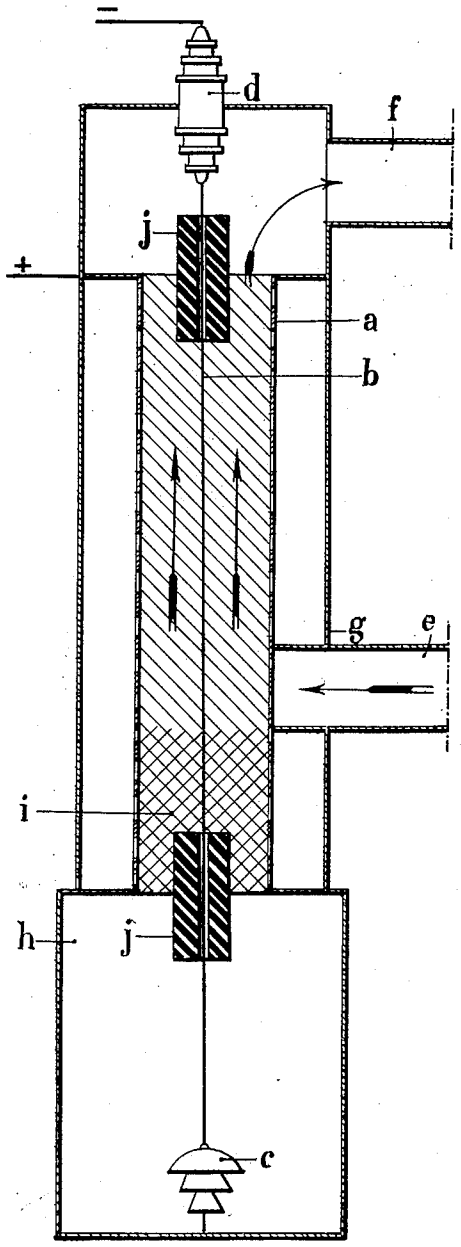
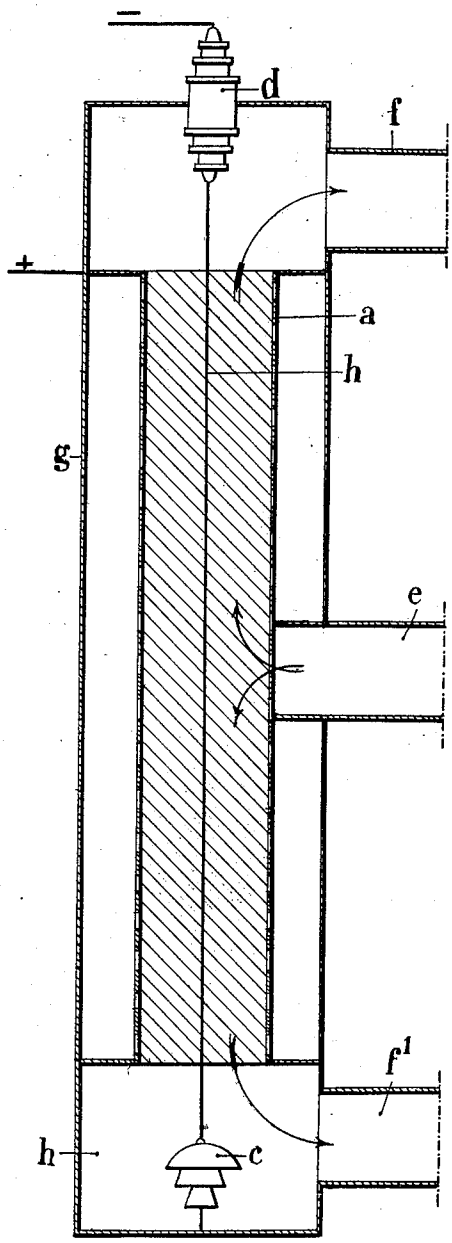


Fig.4.



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Attorney.

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4 SHEETS—SHEET 3.

Fig 5.

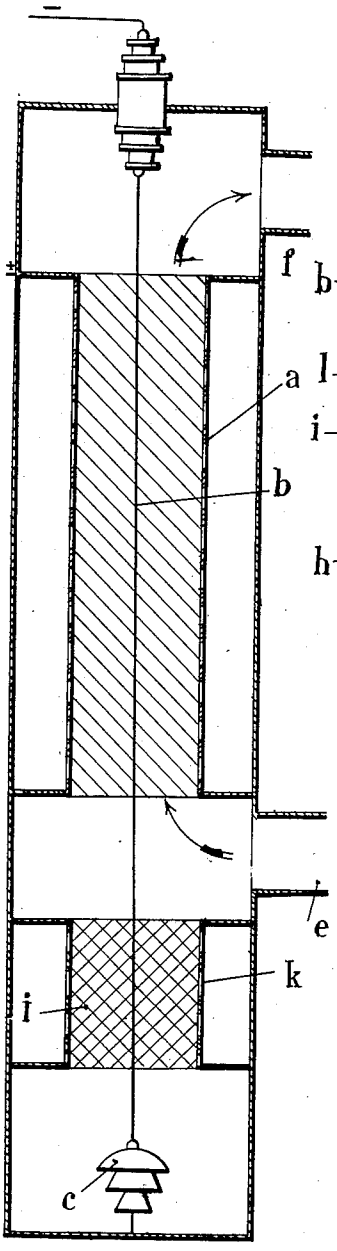


Fig. 7.

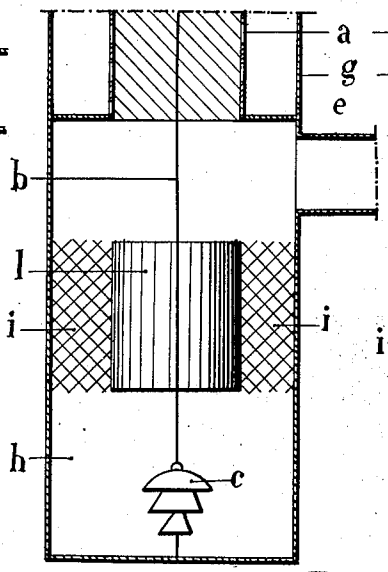


Fig. 8.

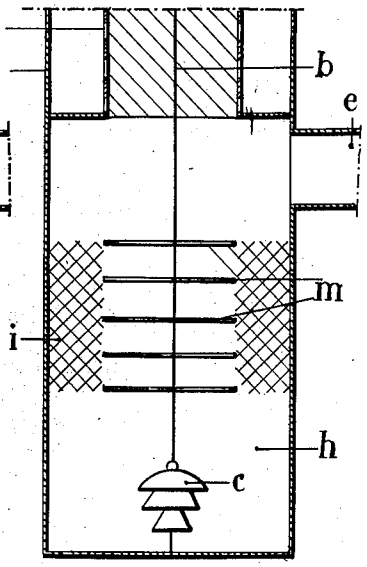
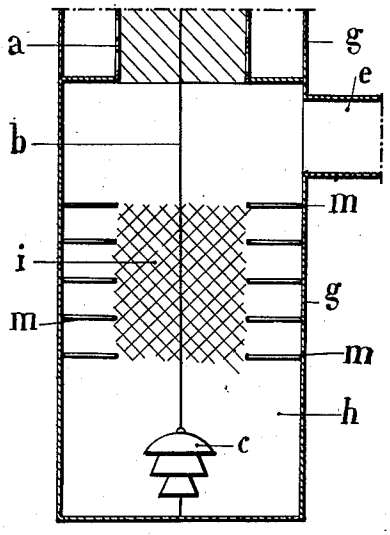


Fig. 9.



Inventors:
Georges Gallot & Paul Poussin
per
H. W. Plucker
Attorney.

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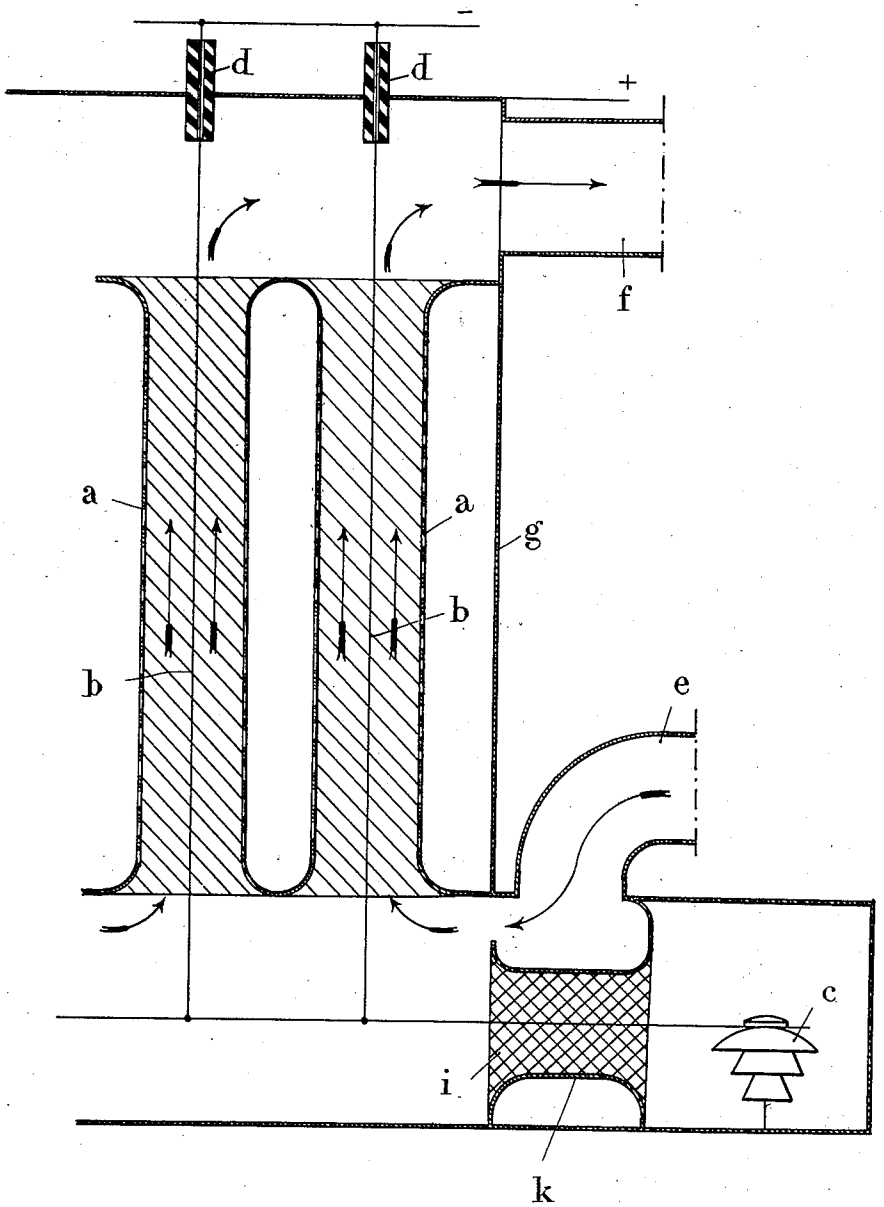
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4 SHEETS—SHEET 4.

Fig.6.



Inventors:
Georges Gallot & Paul Poussin
per
H. W. Plucker
Attorney.

UNITED STATES PATENT OFFICE.

GEORGES GALLOT, OF PARIS, AND PAUL POUSSIN, OF PANTIN, FRANCE, ASSIGNORS TO SOCIETE PURIFICATION INDUSTRIELLE DES GAZ, OF PARIS, FRANCE.

APPARATUS FOR THE ELECTRICAL SEPARATION OF SUBSTANCES IN SUSPENSION IN FLUIDS.

1,332,981. Specification of Letters Patent. Patented Mar. 9, 1920.

Application filed May 21, 1918. Serial No. 235,862.

To all whom it may concern:

Be it known that we, GEORGES GALLOT, of 9 Rue Méchain, Paris, in the Republic of France, scientific instrument maker, and PAUL POUSSIN, of 29 Rue Etienne Marcel, Pantin, Seine, in the Republic of France, manufacturer, have invented Improvements in Apparatus for the Electrical Separation of Substances in Suspension in Fluids, of which the following is a full, clear, and exact description.

Apparatus for the electrical separation of substances in suspension in any gaseous or fluid medium are generally constituted by two electrodes charged at a high electric potential between which the materials to be separated circulate.

Under the influence of the simultaneous or consecutive action of the ionizing electrical emanations and of an intense electrical field, the substances to be separated are electrified and precipitated by one electrode toward the other electrode which is arranged to receive them.

In these apparatus the two electrodes must be carefully insulated from each other and this insulation is particularly difficult to obtain owing on the one hand to the very high differences of potential of the electrodes and on the other hand to the position of certain insulators supporting these electrodes in a medium charged with products capable of being conductors.

The object of the present invention is an improvement made in such apparatus for the electrical separation of substances in suspension in a gaseous or liquid fluid for the purpose of insuring perfect insulation of the two electrodes.

In order to enable it to be more readily understood, the invention will be described hereinafter with reference to the drawing hereto annexed and in which:—

Figure 1 represents in vertical section and diagrammatically the arrangement usually employed.

Fig. 2 shows in vertical section the improved arrangement forming the subject matter of this invention.

Figs. 3, 4, 5, 6, 7, 8 and 9 represent modified constructional forms.

As shown in Fig. 1 the apparatus for electrically separating dust in suspension in a gaseous medium have in a general way a tubular perforated electrode *a* in the axis of which is stretched a wire *b* supported by the insulators *c d* and constituting the second electrode; these two electrodes are connected respectively to two poles of a source of electricity of high tension.

The gases to be freed from dust arrive in the apparatus by the pipe *e* and leave it by the pipe *f*.

Under the simultaneous action of the ionizing electrical emanations produced by the electrode *b* and of the intense electrical field created between this latter and the electrode *a*, the substances in suspension in the gases, which pass through the apparatus, are electrified and projected by the electrode *b* toward the tubular electrode *a*, then, passing through the perforations of this latter, collect in the interior of the jacket *g* surrounding the electrode *a*.

The shaded portion shown in Fig. 1 shows the active region of the apparatus.

As will be seen in this figure the insulator *c* which supports one of the ends of the electrode *b*, is situated in the gaseous medium containing in suspension the particles which are to be separated by the apparatus, and consequently there is formed at the end of a very short time of use a deposit of these particles both on the outer face and the inner face of the bells constituting this insulator.

Under these conditions if these particles are conductors of electricity, the surface of the insulator is no longer insulating, and the two poles of the source of high tension electricity are short circuited so that the apparatus is no longer in a condition to work.

The upper insulator *d*, being situated on the contrary in a current of purified gas preserves a clean and consequently an insulating surface.

For the purpose of maintaining good insulation of the insulators exposed to dust various means have been proposed, namely heating to a temperature sufficient to vaporize or burn the dust which is deposited on these insulators or continuously cleaning them by the blast of a current of gas; all these methods, however, besides the complication which they cause to the apparatus, do not give any result in cases where the dusts are constituted by combustible substances

such as metallic dusts or salts on even greasy substances forming a very adherent coating such as soot from smoke.

The improvement forming the subject matter of the present invention consists in principle in the production, between the arrival of the gases from which the dust is to be removed and the insulator situated on the side of this arrival, of a protective zone of electrical separation arranged in such a way as to hinder the dust contained in the gases entering the apparatus from reaching this insulator.

Fig. 2 shows a method of carrying out this improvement.

The gas supply pipe *e* instead of opening, as in the general case shown in Fig. 1, into a chamber *h* arranged below the electrode *a* supporting the lower end of the electrode *b*, opens directly into the electrode *a* at a certain distance from the lower chamber *h* so that there exists between this chamber and the point of entrance of the gases from which the dust is to be removed, into the apparatus a zone of protection *i*, (represented in the drawing by crossed shading) which separates the dust which has a tendency to be directed toward the lower chamber *h*.

It should be noted that the speed of the gaseous current capable of being directed toward this chamber *h* is zero when the chamber is completely closed and consequently the protecting zone *i* may be very short while yet being very efficacious.

The length of this protecting zone *i* may also be reduced by arranging and placing the supply pipe *e* in such a way as to reduce to a minimum eddies in the gaseous current on its arrival in the tubular electrode *a*.

This arrangement is in particular especially advantageous in certain apparatus having insulators *j*, *j* mounted between the axial electrode *b* and the perforated tubular electrode *a* for the purpose of producing a uniform distribution of the electrical field as shown in Fig. 3.

The insulator *j* like the insulator support *c* placed also behind the zone of protection *i* is withdrawn from all deposit of dust.

Fig. 4 shows a modified form of construction designed on the same principle as that of the preceding arrangement. In this modification the gases from which the dust is to be removed arrive by a pipe *e* opening at the center of the active region of the apparatus and the gases freed from dust quit the apparatus by the pipes *f f'* mounted on the two ends of the apparatus.

By this arrangement the two insulators *c d* are each situated in an atmosphere of dust free gas and under these conditions are not exposed so as to be covered with dust.

The zone of protection *i* of the insulators may also be carried in such a way as to be independent of the active region of the apparatus.

In this case the apparatus has, as shown in Fig. 5, an auxiliary tubular electrode *k* perforated like the principal tubular electrode and interposed between the supply pipe for the gases to be freed from dust and the insulator to be protected.

Fig. 6 shows the application of this latter arrangement to an apparatus of multiple units.

The zone of protection *i* of the insulators may also be carried out by means of a cylindrical body *l* (see Fig. 7) carried by the supply pipe *e* for the fluid to be treated in the apparatus and constituting with the concentric wall of the lower chamber *h* an annular space in which an intense electrical field is created.

The cylindrical body *l* may be replaced by one or more disks *m* carried either by the axial electrode *b* (see Fig. 8) or by the wall of the lower chamber *h* (see Fig. 9).

It must be understood that the methods of execution above described are only given by way of example and that the form, the dimensions and the details of construction of the present system of improved apparatus for the electrical separation of substances in suspension in a gaseous or liquid fluid may be modified according to the use for which it is required.

Claims:

1. Apparatus for the electrical separation of suspended particles from a fluid, comprising an inlet and an outlet for the fluid, a tubular electrode therebetween, a second electrode comprising a wire extending along the axis of said tubular electrode, an insulator for supporting said wire at the end of the apparatus remote from the outlet, and means adapted to coöperate with one of said electrodes to maintain an electric field between said fluid inlet and said insulator.

2. Apparatus for the electrical separation of suspended particles from a fluid, comprising an inlet and an outlet for the fluid, a perforated tubular electrode therebetween, a second electrode comprising a wire of greater length than said tubular electrode and extending axially therethrough, insulators for supporting said wire at both ends thereof, and means adapted to coöperate with one of said electrodes to maintain an electric field between said fluid inlet and the insulator nearer said inlet.

3. Apparatus for the electrical separation of suspended particles from a fluid, comprising an inlet and an outlet for the fluid, a tubular electrode therebetween, a second electrode comprising a wire extending along the axis of said tubular electrode, an insulator for supporting said wire at the end of the apparatus remote from the outlet, a

casing surrounding said electrodes and said insulator, and means adapted to coöperate with one of said electrodes to maintain within said casing an electric field between said fluid inlet and said insulator.

4. Apparatus for the electrical separation of suspended particles from a fluid, comprising an inlet and an outlet for the fluid, a perforated tubular electrode therebetween, a second electrode comprising a wire of greater length than said tubular electrode and extending axially therethrough, insulators for supporting said wire at both ends thereof, a casing surrounding said electrodes and said insulators, and means adapted to coöperate with one of said electrodes to maintain within said casing an electric field between said fluid inlet and the insulator nearer said inlet.

5. Apparatus for the electrical separation of suspended particles from a fluid, comprising an inlet and an outlet for the fluid, a tubular electrode therebetween, a second electrode comprising a wire extending along the axis of said tubular electrode, an insulator for supporting said wire at the end of the apparatus remote from the outlet, a casing including a chamber inclosing said tubular electrode and a chamber inclosing said insulator, and means within the first mentioned chamber for coöperating with one of said electrodes to maintain an electric field between said fluid inlet and said insulator.

6. Apparatus for the electrical separation of suspended particles from a fluid, comprising an inlet and an outlet for the fluid, a tubular electrode therebetween, a second electrode comprising a wire extending along the axis of said tubular electrode, an insulator for supporting said wire at the end of the apparatus remote from the outlet, and an auxiliary tubular electrode in alinement with the first mentioned tubular electrode and adapted to coöperate with said wire to maintain an electric field between said fluid inlet and said insulator.

7. Apparatus for the electrical separation of suspended particles from a fluid, comprising an inlet and an outlet for the fluid, a tubular electrode therebetween, a second electrode comprising a wire extending along the axis of said tubular electrode, an insulator for supporting said wire at the end of the apparatus remote from the outlet, and an auxiliary tubular electrode comprising an extension of the first mentioned electrode beyond the fluid inlet and adapted to coöperate with said wire to maintain an electric field between said fluid inlet and said insulator.

8. Apparatus for the electrical separation of suspended particles from a fluid, comprising a casing, a perforated tubular electrode in said casing, a second electrode comprising a wire extending along the axis of said tubular electrode, an inlet for the fluid opening into said tubular electrode at an intermediate point thereof, an outlet for the fluid opening into said casing at a point beyond one end of said tubular electrode, and an insulator for said wire located at the end of said casing remote from said fluid outlet.

The foregoing specification of our improvements in apparatus for the electrical separation of substances in suspension in a fluid, signed by us, this 2nd day of May, 1918.

GEORGES GALLOT.
PAUL POUSSIN.

Witnesses:
JOHN F. SIMONS,
FRANÇOIS WEBER.