Sept. 26, 1944. E. H. R. PEGG 2,359,149

SMALL SIZE HIGH CAPACITY ELECTRICAL DUST-PRECIPITATORS

Filed May 7, 1942 4 Sheets-Sheet 1

Fig. 1.

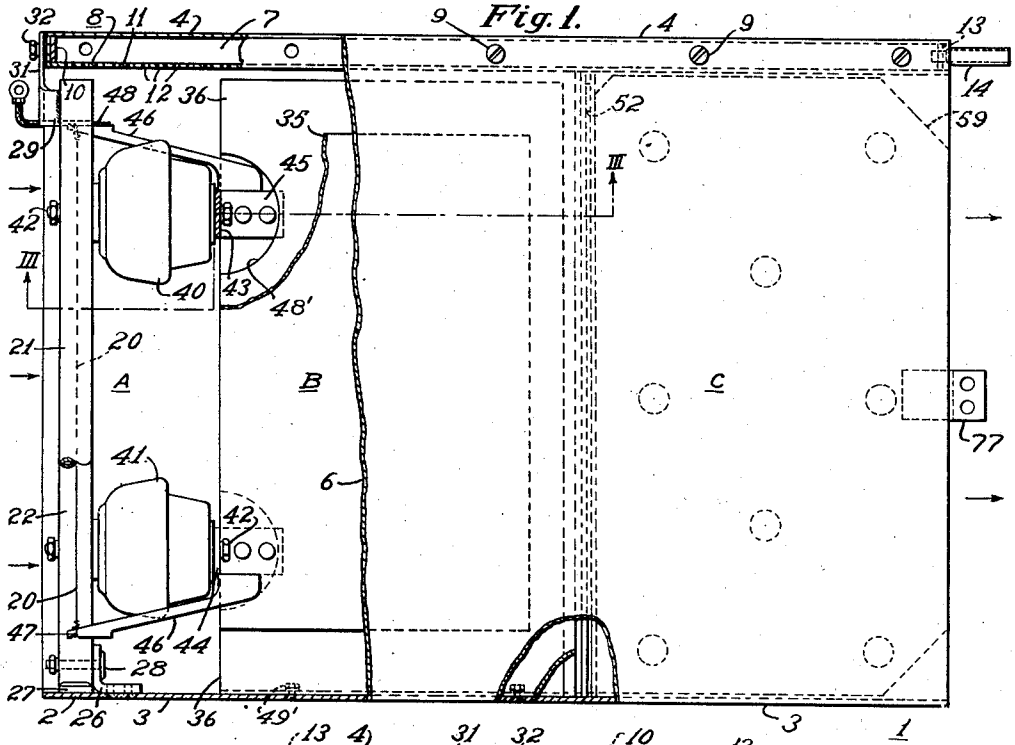
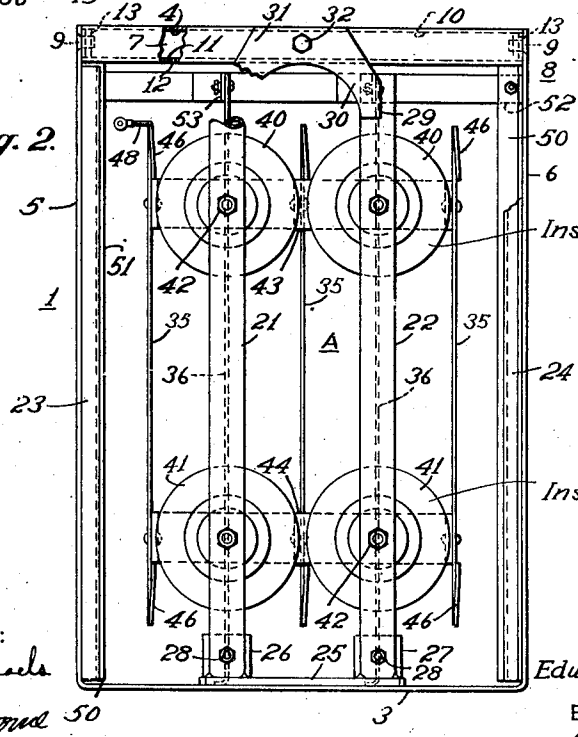


Fig. 2.



WITNESSES:
Edward Michaels
Wm. C. Grooms

INVENTOR
Edward H.R. Pegg.
BY
B. L. Zanguill
ATTORNEY

Sept. 26, 1944. E. H. R. PEGG 2,359,149

SMALL SIZE HIGH CAPACITY ELECTRICAL DUST-PRECIPITATORS

Filed May 7, 1942 4 Sheets-Sheet 2

Fig. 3.

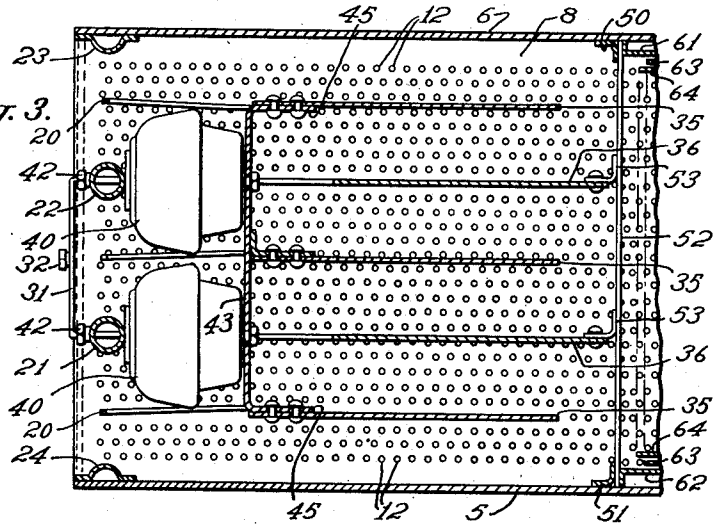


Fig. 4.

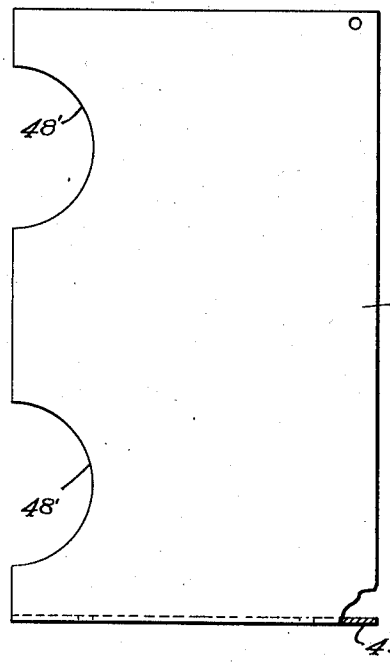
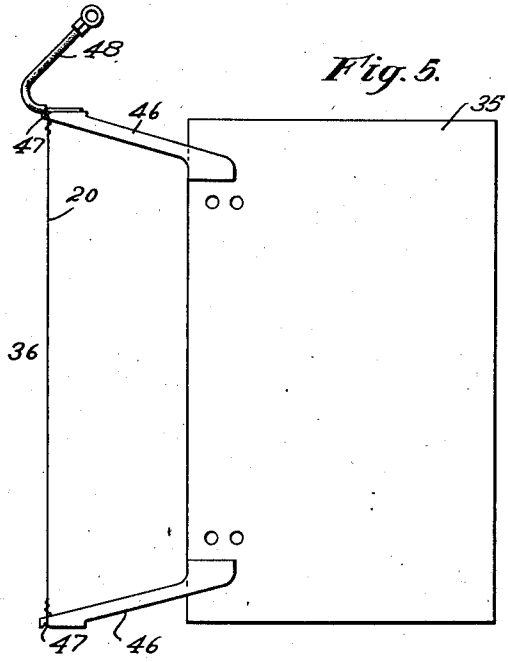


Fig. 5.



WITNESSES:

Edward Michaels

Wm. C. Groome

INVENTOR

Edward H. R. Pegg.

BY

B. L. Zangrill

ATTORNEY

Sept. 26, 1944. E. H. R. PEGG 2,359,149

SMALL SIZE HIGH CAPACITY ELECTRICAL DUST-PRECIPITATORS

Filed May 7, 1942 4 Sheets-Sheet 3

Fig. 6.

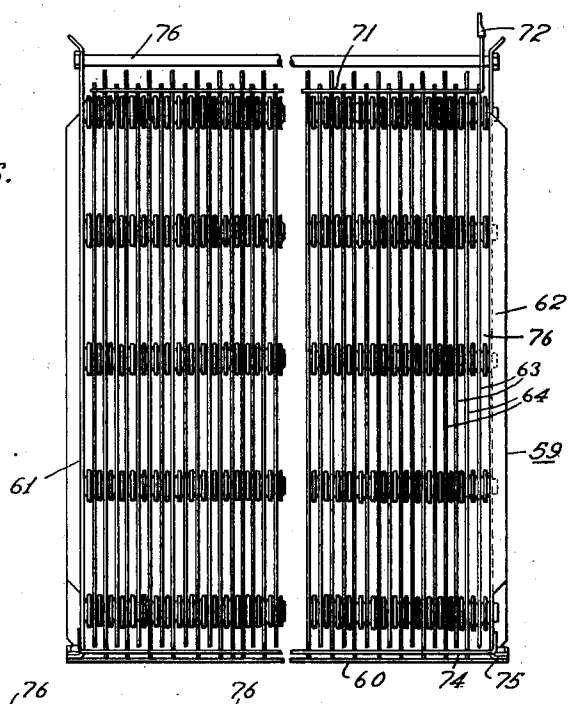


Fig. 7.

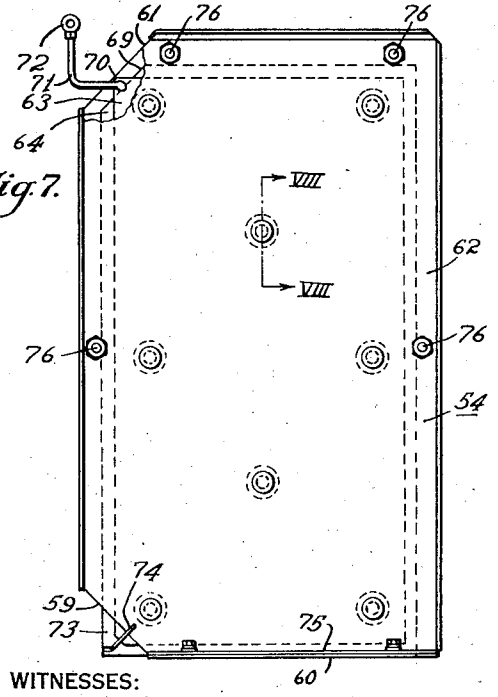
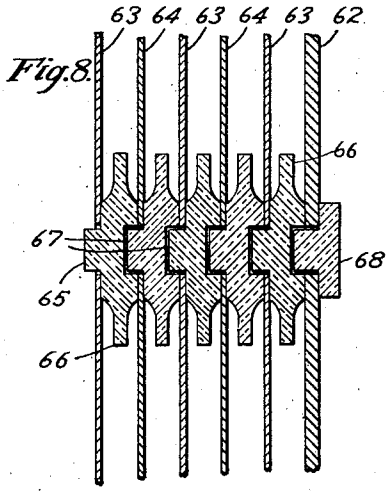


Fig. 8.



WITNESSES:

Edward Michaels

Wm. C. Groome

INVENTOR

Edward H. R. Pegg.

BY

B. L. Zanguill

ATTORNEY

Sept. 26, 1944. E. H. R. PEGG 2,359,149

SMALL SIZE HIGH CAPACITY ELECTRICAL DUST-PRECIPITATORS

Filed May 7, 1942 4 Sheets-Sheet 4

Fig. 9.

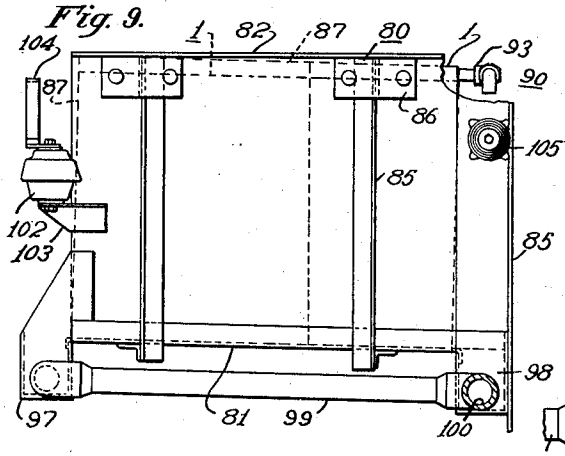


Fig. 10.

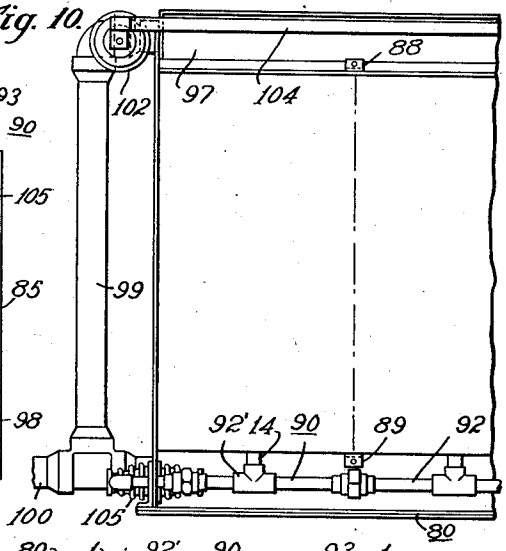


Fig. 11.

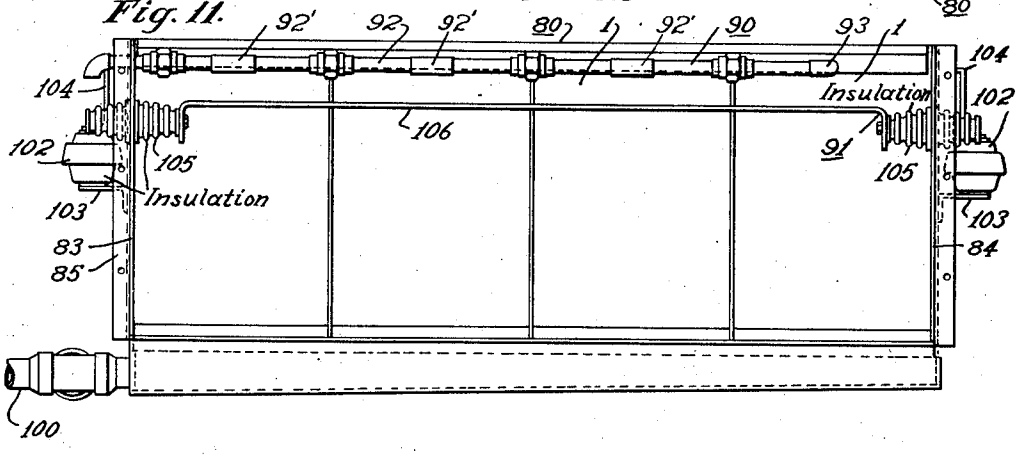


Fig. 12.

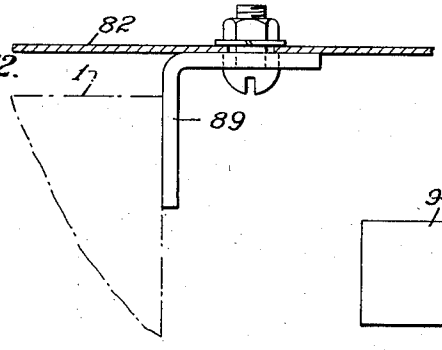
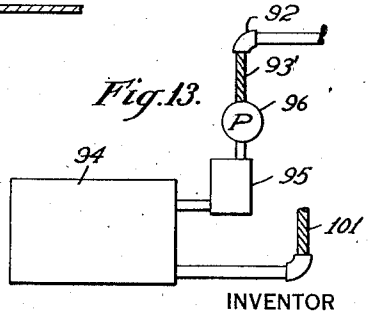


Fig. 13.



WITNESSES:

Edward Michaels

Wm. C. Groome

INVENTOR

Edward H.R. Pegg.

BY.

B. L. Langwill

ATTORNEY

Patented Sept. 26, 1944 2,359,149

UNITED STATES PATENT OFFICE

2,359,149

SMALL-SIZE HIGH-CAPACITY ELECTRICAL DUST PRECIPITATOR

Edward H. R. Pegg, Lakewood, Ohio, assignor to Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa., a corporation of Pennsylvania

Application May 7, 1942, Serial No. 442,052

14 Claims. (Cl. 183—7)

My invention relates generally to electrical precipitators for removing foreign particulate matter from a flowing gas; but more particularly relates to an air-cleaning electrical dust-precipitator for removing dust-particles of relatively largely different sizes from an air-stream; by dust-particles, or some similar term, meaning foreign particulate matter carried in a gas, which is capable of being electrically precipitated or removed from the gas.

This application is in the nature of an improvement on a dust-precipitator embodiment shown and claimed in the G. W. Penney patent-application Serial No. 382,852, filed March 12, 1941, assigned to the assignee of this application.

An object of this invention is to provide a relatively small-size precipitator of relatively high cleaning capacity.

A further object of this invention is to provide a small-size dust-precipitator which can be easily and cheaply manufactured and assembled.

A further object of my invention is to provide a precipitator-cell comprising a casing having a gas-cleaning or dust-removing means including electrode-means providing an initial dust-charging zone, an intermediate zone in which the relatively larger-size charged dust-particles are precipitated, and a final zone in which the remaining relatively smaller-size charged dust-particles are precipitated; in which precipitator-cell the various electrode-means comprising the zones are compactly arranged so that the overall dimensions of the cell are minimized.

It is a further object of my invention to provide a precipitator-cell having dust-removing means including precipitator-electrodes upon which the precipitated dust collects, in which precipitator-cell the precipitator-electrodes can be thoroughly and effectively cleaned by a discharge of a cleaning liquid spread over the dust-removing means.

Still another object of my invention is to provide a precipitator-cell of such characteristics that a plurality of them can be readily arranged side by side in a housing to form a complete dust-precipitator.

A still further object of my invention is to provide a housing for a plurality of smaller precipitator-cells, having means by which the various electrode-means of each precipitator-cell can be advantageously supported and electrified, and having means through which the liquid for cleaning the electrode-means is conveniently supplied, and used liquid can be conveniently led away.

Other objects, methods, features and innovations of my invention, in addition to those heretofore mentioned, will be discernible from the following description thereof which is to be taken in conjunction with the accompanying drawings. These drawings are on various scales, and some views have parts omitted in the interest of clarity of illustration. In these drawings:

Figure 1 is a side elevation, with parts broken away, of a precipitator-cell.

Fig. 2 is an end view of the gas-inlet end of the precipitator-cell.

Fig. 3 is a sectional view substantially on the line III—III of Fig. 1.

Fig. 4 is an elevational view of a relatively uninsulated or ground precipitator-plate utilized in the intermediate dust-precipitating zone.

Fig. 5 is an elevational view of a relatively insulated precipitator-plate associated with the precipitator-plate of Fig. 4.

Fig. 6 is an end view of a dust-precipitating means of the final zone, which is adapted to be inserted into the casing of the precipitator-cell.

Fig. 7 is a side view, with parts broken away, of the dust-precipitating means of Fig. 6.

Fig. 8 is an enlarged sectional view, taken substantially on the line VIII—VIII of Fig. 7, showing the manner in which the relatively insulated and uninsulated precipitator-plates of the dust-precipitating means of Fig. 6 are assembled.

Fig. 9 is a side elevational view of a housing adapted to contain a plurality of precipitator-cells.

Fig. 10 is a plan view of the upstream portion of such housing, with its top wall removed.

Fig. 11 is an end elevational view of the housing and precipitator-cells therein, looking at it from the downstream side or outlet end.

Fig. 12 is a detail view showing means for fixing the precipitator-cells in the housing, and

Fig. 13 is a schematic view of a system for supplying cleaning liquid to the precipitator-cells for cleaning their various electrode-means.

Figs. 1 through 8 show generally the construction of a unit precipitator-cell adapted more particularly for cleaning an air-stream flowing in the direction of the arrows shown in Fig. 1. The percipitator-cell is indicated in its entirety by the reference numeral 1, and comprises an open-ended rectangular-prismatic casing 2 having a relatively flat bottom wall 3, a relatively flat top wall 4, and relatively flat side walls 5 and 6.

A relatively shallow liquid-distributing compartment or chamber, indicated in its entirety by the reference numeral 7, is formed substantially completely across the top of the casing 2.

The chamber 7 is formed by the top wall 4 and a shallow pan 8 secured to the side walls 5 and 6 by a plurality of spaced countersunk screws 9 passing through walls of the pan and screwing into threaded holes in bars 10 secured across the inside walls of the pan. Pan 8 has a bottom wall 11 provided with a large number of equally spaced perforations or holes 12 (Fig. 4) providing numerous liquid discharge-openings. A downstream wall 13 of the chamber 7 is provided with a single liquid-inlet stub-pipe 14 adapted to be connected to a liquid-supply system.

The precipitator-cell includes a gas-cleaning or dust-removing means which comprises, in this embodiment, three zones inside the casing 2. A zone A, at the upstream end of the casing, is the ionizing or dust-charging zone; a zone B, immediately after the zone A in the direction of gas-flow, is a dust- precepitating zone which serves to remove the dust-particles of relatively larger size; and a zone C, at the downstream end of the casing, is a second dust-precipitating zone which serves to remove charged dust-particles of relatively smaller size. The zone A, for charging the dust-particles in the gas stream, comprises cooperating discharging and nondischarging electrode-means; the zone B comprises a relatively few widely-spaced alternately relatively insulated and uninsulated precipitating-electrodes in the form of relatively rigid plates; and the zone C comprises relatively closely spaced precipitating-electrodes in the form of plates which may be either rigid or somewhat flexible.

The discharging and nondischarging electrode-means of zone A form an ionizing means which comprises a plurality of spaced discharging ionizing wires 20 insulatedly supported between spaced tubular nondischarging ground-electrodes 21 and 22 and semicylindrical nondischarging ground-electrodes 23 and 24. The ground-electrodes are equally spaced across the front end of the casing 2 with the ground-electrodes 23 and 24 unitary with the casing sizes 5 and 6, respectively. Each ionizing wire 20 is disposed substantially equi-distant from and between a pair of consecutive ground-electrodes. For supporting the ground-electrodes 21 and 22, the bottom wall 3 of the casing has secured thereto a member 25 provided with short curved seats 26 and 27 which respectively receive ends of the ground-electrodes 21 and 22, each of which has holes thereat so that each end can be fastened to its associated seat by securing means comprising bolts 28. Each of the opposite ends of the ground-electrodes 21 and 22 has welded thereto, or otherwise secured, an edge of a flange 29 turned from a leg 30 of a U-shaped member 31 whose cross leg is bolted by a bolt 32 to a wall of the chamber 7. Consequently, the ground-electrodes 21 and 22 can be removably supported in the casing 2.

The precipitating-electrodes of the dust-precipitating means of zone B comprises relatively insulated plates 35 and relatively uninsulated plates 36 arranged in alternate relation; a plate 35 being in back of, or on the downstream side of, each ionizing wire 20, and a plate 36 in back of each of the ground-electrodes 21 and 22. The precipitator-plates 35 and 36 have been shown as planar and solid, but they could obviously be bent or otherwise formed. The sides 5 and 6 of the casing 2, facing a plate 35, also function as precipitating-electrodes for this dust-precipitating means. Consequently there are as many precipitator-plates, in effect, in zone B as there are electrodes in zone A.

A feature of my invention resides in a novel sub-assembly for the dust-charging means and dust-precipitating means of zones A and B, which permits it to be readily mounted in the casing 2 while at the same time keeping to a minimum the longitudinal length required for the zones A and B. To this end each of the ground-electrodes 21 and 22 has secured thereto a pair of insulators 40 and 41 spaced along its length, the corresponding insulators on the two ground-electrodes being transversely aligned. The insulators are secured to the ground-electrodes by means of bolt and nut securing means 42.

The securing means 42 of the associated transversely aligned insulators 40 also fasten a transverse metallic bar 43 to the ends of the insulators 40 on the downstream side thereof; and a similar bar 44 is similarly fastened to the associated insulators 41. Bars 43 and 44 span the distance between the outermost relatively insulated plates 35, and are provided with small longitudinally-turned end flanges and small intermediate metal angles 45 secured thereto, to which the upstream edge portions of the plates 35 are symmetrically fastened by rivets or otherwise, each plate 35 being supported by both bars 43 and 44.

Each plate 35 has secured to each of its upstream corners a conducting arm 46 which extends upstream, the arms being of such length that they terminate approximately at the place where the associated ionizing wire 20 is to be located. The associated ionizing wire 20 is strung between the arms 46 of each plate 35, and is fastened thereto. Notches 47 are provided in the arms to facilitate securing the ends of the ionizing wires to the arms.

From the structure described, it is evident that the ground-electrodes 21 and 22, all the plates 35 and all the ionizing wires 20 are part of a subassembly supported by the ground-electrodes 21 and 22 inside the casing 2, with the plates 35 and ionizing wires 20 in conducting relation and properly insulated from the ground-electrodes and from the casing, because the plates 35 are shorter than the transverse dimension of the casing between the bottom wall 3 and the wall 11, which define and guide the gas stream. A single connector-lead 48, secured to any insulated metallic part of the subassembly unit, can electrify or charge all the ionizing wires and all the plates 35. In the embodiment disclosed, the connector-lead is secured to an arm 46, near the gas-inlet of the casing 2.

The relatively uninsulated or ground plates 36 are somewhat longer and wider than the plates 35. The plates 36 extend transversely for substantially the full height of the casing between the bottom wall 3 and the wall 11 of the chamber 7; and extend longitudinally, in the gas-flow direction, beyond the plates 35. The upstream edges of the plates 35 and 36 are transversely substantially aligned, the grounded plates 36 being provided with semicircular cutouts 49' about the bars 43 and 44 for providing adequate air-insulation between such bars and the grounded plates. The cutouts 49' also permit the grounded plates 36 to be disposed longitudinally toward the insulators 40 and 41 which support the insulated plates 35. Each ground plate 36 is secured inside the casing at its lower edge and an upper upstream corner.

The lower edge of each plate 36 is turned to provide a flange 49 having spaced holes therein through which each of which a screw 49' passes, the screw being countersunk in the exterior surface of the bottom wall 3 of the casing and provided with a nut for fastening the flange 49 to this bottom wall. Narrow metal upright angles 50 and 51 are secured respective to the side walls 5 and 6 of the casing, extending for substantially the internal height thereof; and a narrow metal securing bar 52 is secured between and spans the angles 50 and 51. The securing bar 52 has an edge near the wall 11 of the chamber 7, and a flat side spaced slightly from the downstream edges of the plates 36. Securing means comprising small angles 53 are fastened to the bar 52 and to an upper downstream corner of the plates 36, the angles 53 having elongated holes to accommodate variations in the disposition of the edges of the plates 36.

The dust-precipitating means of zone C comprises another subassembly unit 59 (Figs. 6–8) having a relatively stiff bottom plate 60 to which are fastened relatively stiff outwardly flanged side plates 61 and 62. The alternately relatively insulated and uninsulated precipitator-plates 63 and 64, respectively, are supported between the sides 61 and 62, the sides 61 and 62 also functioning as relatively uninsulated precipitator-plates. The sides 61 and 62 and the plates 63 and 64 are each provided with a plurality of staggered holes, each of which receives a protuberance 65 of an insulating spacer 66 provided with an indentation groove 67 on its other side, which receives a protuberance 65 of the adjacent spacer, such protuberance 65 passing through an associated hole in a plate. The end spacers 68, however, for one side 62, are flat finished instead of being provided with grooves 67. The ground plates 64 are longer in width and length than the insulated plates 66 and the edges of the former project beyond the edges of the latter substantially completely around their peripheries except at corners which are formed to permit a power source to be connected to each series of like plates. To this end a downstream corner of each ground plate 64 is trimmed as at 69 so that a corner 70 of the insulated plates 63 extend outwardly beyond the trimmed corners thereat. Each corner 70 is provided with a slot or hole for receiving a conducting wire 71 conductively secured to the insulated plates and terminating in a connector-lead 72.

The ground plates 64 rest on the metal bottom plate 60, but to ensure a good electrical connection, a downstream corner of each insulated plate 63 is cut away and the protruding corners 73 thereat of the ground plates are conductively connected to a conducting wire 74 conductively secured to the sides 61 and 62.

For clamping the relatively insulated and uninsulated plates 63 and 64 between the sides 61 and 62, a side 62 may be provided with elongated holes in one of its flange 75, which is fastened to the bottom 60 by screws passing therethrough, the side 62 sliding toward the side 61 as the two are clamped together by means of clamping rods 76, the side 61 being fixedly fastened to the bottom 60. No top is provided for the dust-precipitating means of zone C, so that it is open at a top and on its downstream and upstream ends. The dust-precipitating means of zone C is of such size that when disposed in the casing 2 the upper edge thereof is closed to the bottom wall 11 of the chamber 7, and the upstream end is close to the downstream end of the dust-precipitating means of zone B.

In assembling the precipitator-cell, angles 50 and 51, bar 52 and the grounded plates 36 of zone B are secured in place. The subassembly unit built about the ground electrodes 21 and 22 is then fastened in place, the plates 35 sliding between the plates 36. The dust-precipitating assembly unit 59 for the zone C is then slid into the casing 2 from downstream end, with the flanges of the sides 61 and 62 abutting the angles 50 and 51 and the bar 52, and the bottom plate 60 of the subassembly unit 49 resting on the bottom-wall 3 of the casing. One or more small adjustable clamps 77, associated with each of the casing side walls 5 and 6 and each of the sides 61 and 62 are utilized for fixing the subassembly unit 59 inside the casing.

While each precipitator-cell is utilizable per se for gas cleaning, I prefer to provide a housing for a plurality of such cells, the housing being suitably constructed for correlation with the operating parts of the precipitator-cells.

Referring more particularly to Figs. 9–12, the housing 80 is open-ended in the gas-flow direction and is slightly longer in this direction than the precipitator-cells 1 supported in the housing side by side. The housing 80 has a bottom 81, sloped downwardly in the direction of gas-flow, a top 8, sides 83 and 84, and suitable exterior reinforcing and supporting means 85 which are not shown in all the figures. In Fig. 9, securing brackets 86 are secured to certain members 85, so that completed dust-precipitator unit, embracing the housing 80, can be mounted in a suitable system. In this embodiment the housing is of such size that the completed dust-precipitator unit can be installed in the ventilating system of a Pullman lounge car.

The housing 80 is of a width to hold four precipitator-cells side by side, as shown in Fig. 11. The vertical upstream edges of the precipitator-cells are almost flush with the upstream end of the housing but because of the sloped bottom 81, assume a slightly tilted position indicated by the dotted line 87 in Fig. 9. A plurality of spaced fixed angles 88 (Fig. 10) are secured to the underneath downstream edge of the top 82 of the housing, each angle being adapted to be abutted by the vertical edges of a pair of adjacent casings 2 of adjacent precipitator-cell. Adjustably fastenable angles 89 abut the opposite edges of such sides, being movable along the top wall for securely fixing the cells 1 in place. As shown in Fig. 12, each angle 89 may be secured to the top 82 of the housing by means of a bolt and screw device slidable in an elongated hole in the top 82. Any open spaces between adjacent precipitator cells 1 and between the precipitator-cells and the housing can be caulked to bar gas-flow therethrough.

The downstream side of the housing extends beyond the cells to provide an end space in which is disposed a liquid-supply pipe means 90 and bus-bar means, indicated in its entirety by the reference numeral 91, through which the relatively insulated plates of the dust-precipitating means of the zone C can be excited.

The liquid-supply means 90 comprises a pipe 92 provided with a plurality of T's 92' and an elbow 93 which are connected to the respective stub-pipes 14 of the liquid-distributing chamber 7. The inlet end of the pipe 92 is adapted to be coupled to a flexible pipe connection 93' leading to a liquid-container 94 when the dust-precipi-

tator is to be cleaned, and is adapted to be uncoupled after such cleaning operation.

I prefer to use a viscous liquid, such as oil, for cleaning the various electrode-means of the dust-precipitator at suitable intervals. It is desirable to thoroughly wash the electrode-means without streaking. To accomplish this without increasing the cubic content of the completed dust-precipitator, I prefer to make the holes 12 in the bottom wall 11 of the chamber 7 of small size, about .050 inch in diameter, and spaced about .250 inch between centers. By supplying oil at low pressure to the oil-chambers 7, the oil flows out of the holes 12, forming falling streams which fall mostly because of gravity; but the upper ends or sources of these streams are not always underneath the holes but actually migrate about them, thereby completely covering the upper longitudinal area of each precipitator-cell.

However, it is desirable to keep the supply of oil to the oil chamber 7 clean because the small holes 12 may otherwise quickly clog. Consequently, I insert an oil filter 95 in the supply-pipe connection 93', preferably before the pump 96 which pumps oil to the supply-pipe 92 for distribution to the various oil chambers 7. When the electrode-means are washed the oil discharged from the bottom 11 reaches the various electrodes of the precipitator-cells, flowing downwardly to the bottom wall of the precipitator-cell and then into a transversely-sloped trough 97 at the upstream end of the housing 80 and a similarly sloped trough 98 on the downstream side of the housing, the slope of the bottom of the cells, which rest on the sloped bottom 81 of the housing, directing most of the oil to the trough 98. Outlet pipes 99 convey the used oil to an attachment 100 of a coupling to which can be connected and disconnected a flexible pipe connection 101 leading back to the container 94.

For energizing the various relatively insulated electrodes of the precipitator-cells, it is necessary to apply high voltage to the subassembly unit comprising the ionizing wires 20 and the precipitating-electrodes 35, and to apply high voltage to the precipitating-electrodes 63.

To this end an insulator 102 is mounted at each side of the housing 80, at the downstream edge; being supported by a bracket 103 extending outwardly from the housing. The tops of the insulators 102 support a bus-bar 104 extending across the front of the housing, air-insulated therefrom. By connecting each connector-lead 48 of each precipitator-cell to this bus-bar, the ionizing wires 20 and the high voltage plates 35 can be charged or energized.

The energizing means 91 at the rear end of the housing comprises a pair of insulators or insulating bushings 105, each of which is respectively secured on the downstream protruding edge of the associated side walls 83 or 84 of the housing. A conducting bus-bar 106 is secured to and spans the pair of insulators 105. By connecting the connector-leads 72 to the various precipitator-cells to this bus-bar 106 the relatively insulated precipitator-plates 63 can be charged.

From the foregoing it is evident that I have provided a very compact electrical dust-precipitator which can be easily and readily washed and can be properly suitably energized. The spacing between the precipitating electrodes follows that described in the aforesaid G. W. Penney patent-application, and a unit such as herein described can clean a large volume of air relative to the volume of air cleaned by prior devices of similar size. Very little space is not utilized in the precipitator herein described, and by utilizing an external source of liquid-supply for cleaning the electrode-means the size of the dust precipitator unit is further reduced.

While I have described my invention in its present preferred form, it is obvious that the various teachings thereof are applicable to other forms and are subject to modification.

I claim as my invention:

1. A gas-purifying precipitator for electrically removing gas-borne dust-particles from a stream of flowing gas, comprising gas-duct means comprising a casing having a first wall and a pair of side walls angularly extending from the first wall, gas-cleaning means in said gas-duct means for charging gas-borne dust-particles and precipitating charged dust-particles, said gas-cleaning means comprising a dust-precipitating means including a plurality of spaced alternately relatively insulated and uninsulated plate-electrodes between and substantially parallel to said side walls, fastening means for substantially abuttingly securing an edge of the relatively uninsulated plate-electrodes to said first wall, and relatively narrow bar means secured to said side walls, spanning said plate-electrodes, for securing an opposite corner of said relatively uninsulated plate-electrodes.

2. A device of the class described, comprising an open-ended substantially horizontal housing means for a gas-flow, a plurality of precipitator-cells supported side by side in said housing, each of said precipitator-cells comprising dust-charging means and dust-precipitating means, said dust-charging means comprising non-discharging electrode-means and cooperating relatively insulated ionizing electrode-means, said dust-precipitating means comprising a plurality of alternately relatively insulated and uninsulated precipitating electrodes, insulatedly supported bus-bar means extending across one end of said housing means, means for conductively connecting the ionizing means of each of said precipitator-cells directly to said bus-bar means, insulatedly supported bus-bar means extending across the other end of said housing means, and means for conductively connecting relatively insulated precipitating-electrodes of each of said precipitator-cells directly to the last said bus-bar means.

3. A device of the class described, comprising an open-ended substantially rectangular-prismatic housing for a gas-flow, said housing having substantially flat top, bottom and side walls, in excess of two substantially rectangular-prismatic individual precipitator-cells supported side by side in said housing, each of said precipitator-cells having therein a plurality of electrode-means for dust-charging and dust-precipitation, said precipitator-cells being of slightly less length in the longitudinal gas-flow direction than said housing, an insulator means secured to walls of said housing which extend beyond said precipitator-cells in the line of gas-flow, single relatively narrow bus-bar means supported by said insulator means across and outside of said precipitator-cells and connector-means electrically connecting said bus-bar means to an electrode-means in each of said precipitator-cells.

4. A device of the class described, comprising

a housing means for a substantially horizontal gas flow, said housing having a sloped bottom wall, a plurality of rectangular precipitator-cells supported on said bottom wall, side by side in said housing means, each of said precipitator-cells comprising dust-charging means and dust-precipitating means, said dust-charging means comprising non-discharging electrode-means and cooperating relatively insulated ionizing electrode-means, said dust-precipitating means comprising a plurality of spaced alternately relatively insulated and uninsulated upstanding precipitating-electrodes, distributing means for distributing a treating liquid over said precipitating-electrodes and the spaces therebetween, pipe-means for supplying liquid to said distributing means, collecting means, associated with said bottom wall, for collecting distributed liquid, and means for removing collected liquid from said collecting means.

5. A device of the class described, comprising a housing means for a substantially horizontal gas flow, a plurality of rectangular precipitator-cells supported side by side in said housing means, each of said precipitator-cells comprising dust-charging means and dust-precipitating means, said dust-charging means comprising nondischarging electrode-means and cooperating relatively insulated ionizing electrode-means, said dust-precipitating means comprising a plurality of spaced alternately relatively insulated upstanding and uninsulated precipitating-electrodes, said housing means having a sloped bottom wall, said precipitator-cells resting on said bottom wall, distributing means for distributing a treating liquid over said precipitating-electrodes and the spaces therebetween, pipe-means for supplying liquid from outside said housing means to said distributing means, and a common trough extending across an end of said housing means at the lower end of said sloped bottom wall, for collecting distributed liquid.

6. Means for charging dust-particles in a flowing gas-stream and for precipitating charged dust-particles from the gas-stream, comprising elongated ground electrode-means substantially transverse to the direction of gas-flow, precipitating electrode-means, insulator means fastened solely to and between said ground electrode-means and said precipitating electrode-means for securing them together in relatively insulated relation, an ionizing electrode-means carried solely by said precipitating electrode-means substantially parallel to and in insulated discharging relation to said elongated ground electrode-means.

7. An electrical dust-precipitator comprising a casing having side walls, an elongated ground electrode-means, means for supporting said elongated ground electrode-means between a pair of said wide walls of said casing, insulating means carried by said elongated ground electrode-means, relatively insulated precipitating electrode-means supported solely by said insulating means, between said side walls, on the downstream side of said elongated ground electrode-means, and ionizing electrode-means supported solely by said relatively insulated precipitating electrode-means substantially parallel to and in insulated discharging relation to said elongated ground electrode-means.

8. An item for an electrical dust-precipitator, comprising an ionizing electrode and a pair of spaced elongated non-discharging electrodes cooperative with said ionizing electrode for providing a dust-charging electrostatic field, insulating means carried solely by said pair of elongated electrodes, a plurality of spaced precipitating-electrodes, and means extending transverse to said elongated electrodes, attached to said insulating means, for supporting said precipitating-electrodes in insulated spaced relation with respect to said elongated electrodes.

9. An electrical dust-precipitator comprising wall-means for defining boundaries of a gas-flow path for a gas-stream, means for charging gas-borne dust-particles and precipitating charged gas-borne dust particles, comprising ionizing electrode-means and non-discharging electrode-means cooperative with said ionizing electrode-means for providing a dust-charging electrostatic field, said non-discharging electrode-means comprising a pair of spaced elongated electrodes, means associated with said wall-means, for supporting said elongated electrodes in the gas-stream path, insulating means carried solely by said pair of elongated electrodes, a plurality of spaced precipitating-electrodes, means attached to said insulating means, spanning said precipitating-electrodes, for supporting them on the downstream side of said non-discharging electrode-means, in insulated spaced relation to said wall-means and said non-discharging electrode-means, and means secured to said precipitator-electrodes for supporting said ionizing electrode-means.

10. An electrical dust-precipitator comprising wall-means for defining boundaries of a gas-flow path for a gas-stream; upstream means for charging gas-borne dust-particles comprising a pair of spaced elongated electrodes transverse to the gas-stream path; insulating means secured to said spaced elongated electrodes; downstream precipitating means for precipitating charged gas-borne dust-particles, comprising a plurality of spaced alternately relatively insulated and uninsulated precipitator-plates; and means for supporting said relatively insulated precipitator-plates from said insulating means.

11. An electrical dust-precipitator comprising wall-means for defining boundaries of a gas-flow path for a gas-stream; means for charging gas-borne dust-particles comprising a pair of spaced elongated electrodes transverse to the gas-stream path; insulating means comprising an insulator secured to and on the downstream side of each of said elongated electrodes; bar means secured to and across said insulators; precipitating means for precipitating charged gas-borne dust-particles, comprising a plurality of spaced alternately relatively insulated and uninsulated precipitator-plates; said bar means comprising means for supporting said relatively insulated precipitator-plates, certain of said relatively uninsulated precipitator-plates having cutout portions; and means for supporting said certain of said relatively uninsulated plates with said cutout portions about said bar means.

12. An electrical dust-precipitator comprising wall-means for defining boundaries of a gas-flow path for a gas-stream; upstream means for charging gas-borne dust-particles comprising ionizing electrode-means and non-discharging electrode-means cooperative with said ionizing electrode-means for providing a dust-charging electrostatic field, said non-discharging electrode-means comprising a pair of spaced elongated electrodes transverse to the gas-stream path; means for securing said elongated elec-

trodes to said wall-means; insulating means sesured to said spaced elongated electrodes; downstream precipitating means for precipitating charged gas-borne dust-particles, comprising a plurality of spaced alternately relatively insulated and uninsulated precipitator-plates; means for supporting said relatively insulated precipitator-plates from said insulating means; and means carried by certain of said relatively insulated precipitator-plates for supporting said ionizing electrode-means in insulated discharging relation to said non-discharging electrode-means.

13. An electrostatic dust-precipitator comprising wall-means for defining outer boundaries of a gas-flow path for a gas-stream; dust-charging means comprising ionizing electrode-means and non-discharging electrode-means spaced from said wall-means; dust-precipitating means spaced from said dust-charging means, comprising precipitating electrode-means spaced from said wall-means and spaced from said non-discharging electrode-means in a gas-flow direction; insulating means spaced from said wall-means for insulating said non-discharging electrode-means with respect to said precipitating electrode-means, said insulating means comprising an insulator in the space between said non-discharging electrode-means and said precipitating electrode-means, said insulator being in the gas-flow path, said insulating means comprising means for securing a portion of said insulator to said non-discharging electrode-means, and comprising means for securing another portion of said insulator, which is spaced from said one portion, to said precipitating electrode-means, whereby said non-discharging electrode-means and said precipitating electrode-means may constitute a single item of structure.

14. A structural item for an electrical dust-precipitator, comprising an elongated non-discharging electrode, a precipitating plate spaced from said electrode; and insulating means for relatively insulating said electrode with respect to said plate, said insulating means comprising an insulator between said electrode and said plate, said insulating means further comprising fastening means for securing a first portion of said insulator to said electrode and for securing another portion of said insulator, which portion is spaced from said first portion, to said plate, with an edge of the plate, nearest said electrode, and the length-direction of said electrode being in substantially parallel planes.

EDWARD H. R. PEGG.