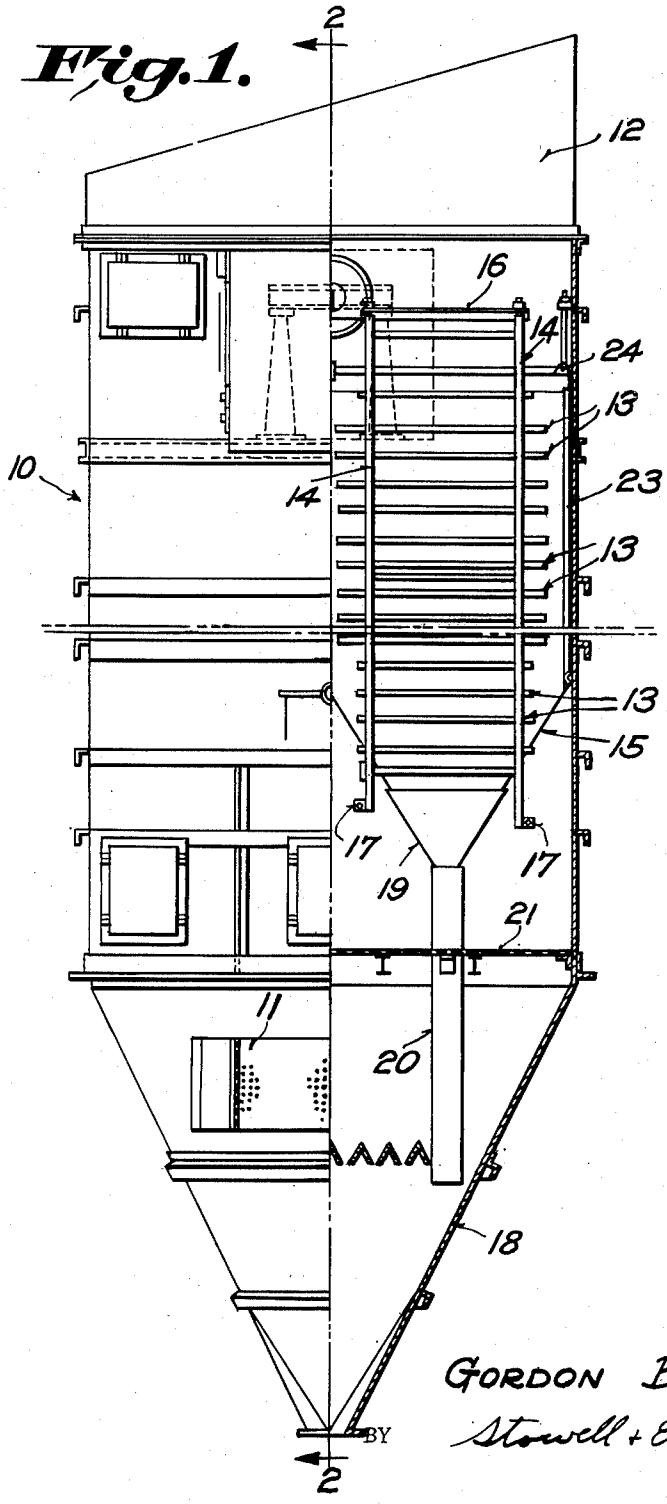
May 13, 1952 G. BUSFIELD 2,596,526

ELECTRICAL PRECIPITATOR

Filed April 25, 1950 4 Sheets-Sheet 1

Fig. 1.



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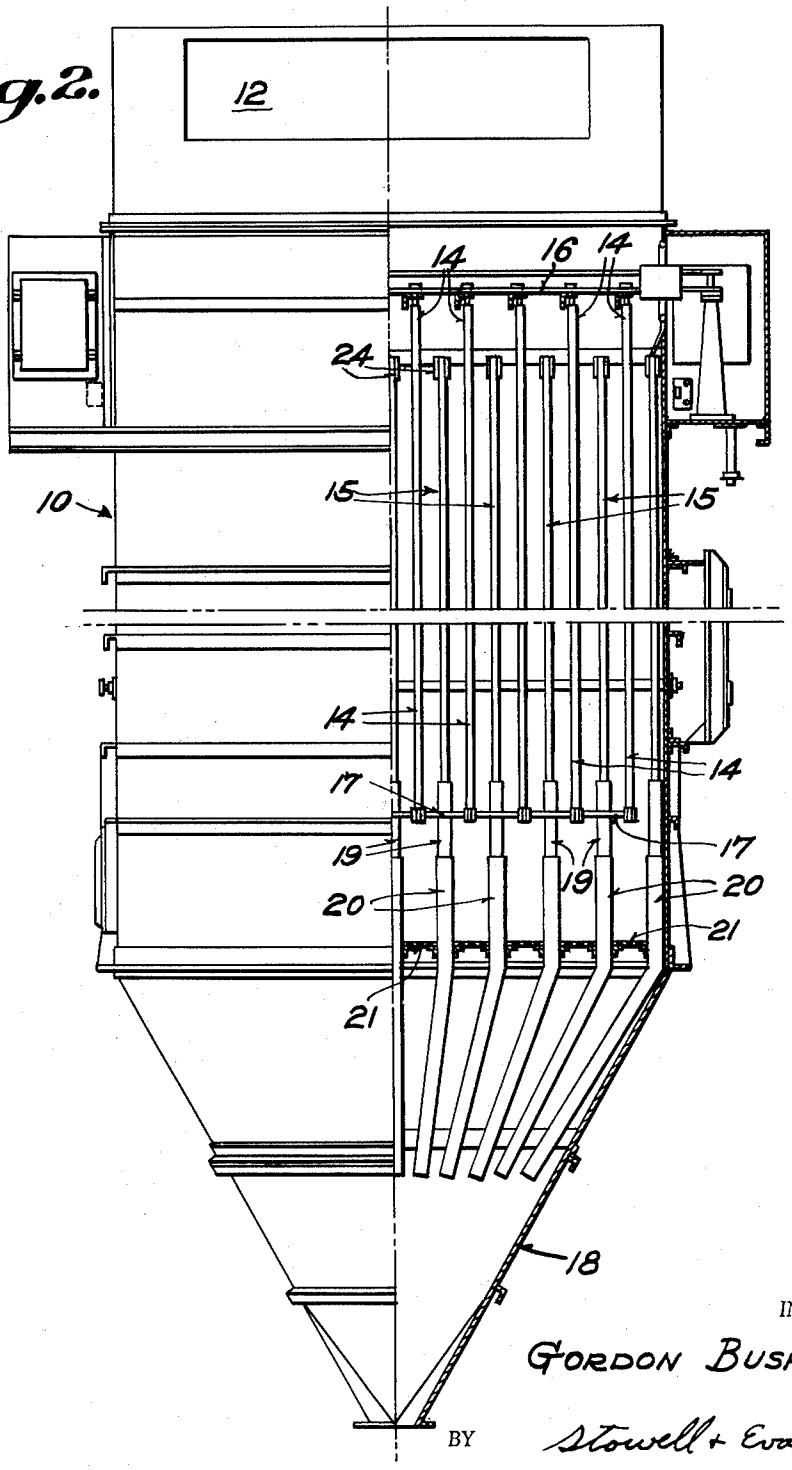
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Fig. 2.



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Fig. 3.

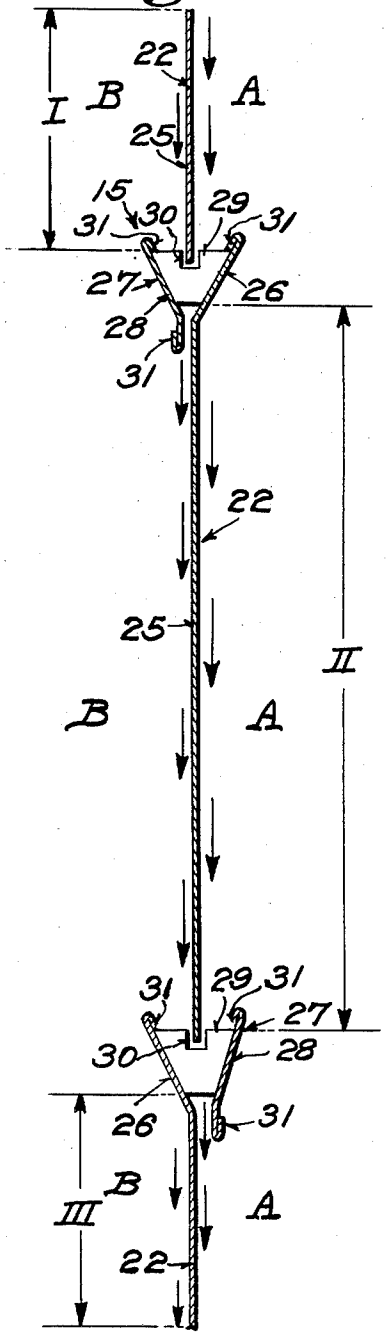
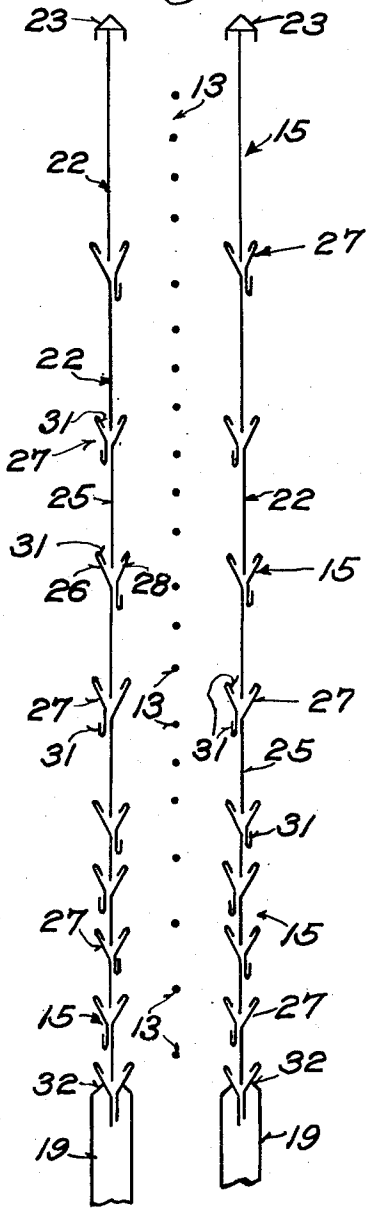


Fig. 4.



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ELECTRICAL PRECIPITATOR

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Fig. 5.

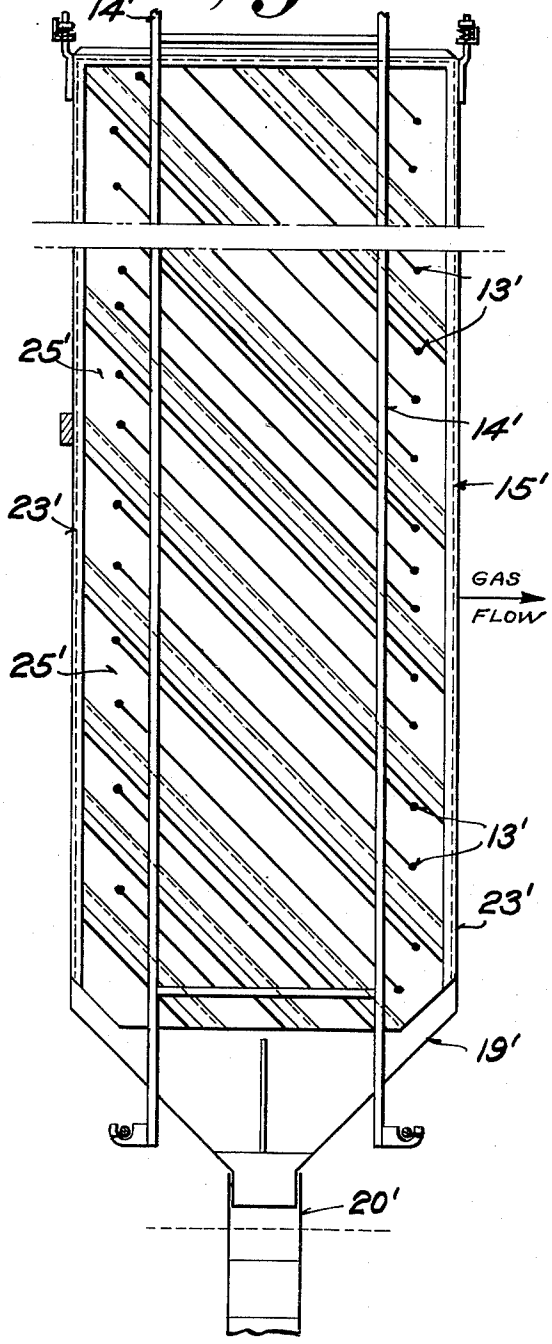
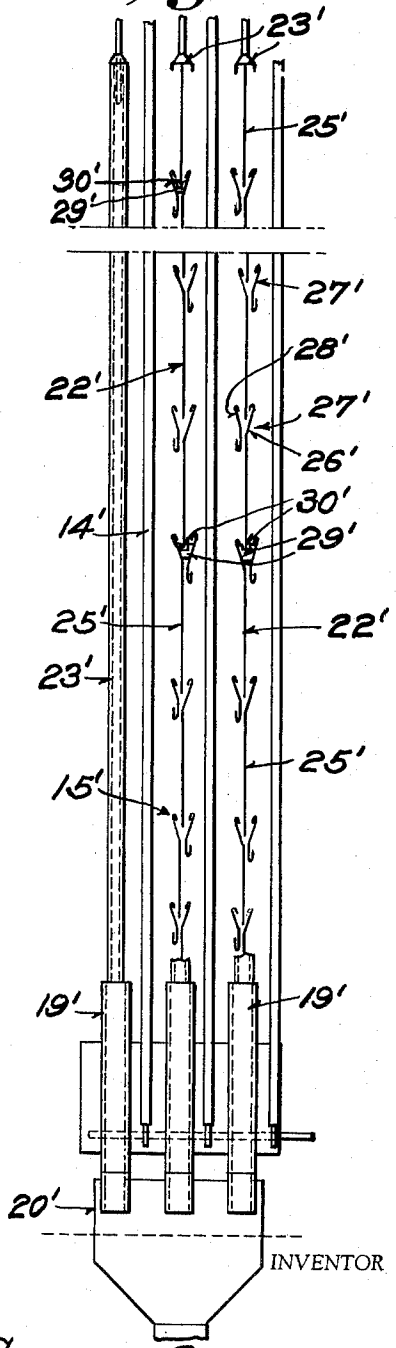


Fig. 6.



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UNITED STATES PATENT OFFICE

2,596,526

ELECTRICAL PRECIPITATOR

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Application April 25, 1950, Serial No. 158,023

4 Claims. (Cl. 183—7)

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This invention relates to electrical precipitation apparatus for the separation of suspended materials from gas.

More particularly the invention relates to collecting electrode structures for electrical precipitators of the Cottrell type, providing a strong, light-weight, sectional electrode particularly useful for large size electrical precipitators.

An object of the invention is to provide a collecting electrode of high material collecting efficiency, which will occupy only a minimum of space in the precipitator.

A further object is to provide such an electrode which may be assembled or dismantled in sections whereby the cost and time required for installation and repairs is greatly diminished.

Another object of the invention is to provide a collecting electrode having means for directing the flow of precipitated material close to the electrode surface.

A further object is to provide means for directing the fall of precipitated material into alternate zones of heavy and light dust concentrations at the electrode surface thereby providing a substantially uniform precipitating action throughout the length of the collecting electrode.

These and other objects and advantages are provided by the collecting electrode of the invention comprising a plurality of superimposed sections, each section comprising a plate, a member projecting angularly upward from the upper edge of the plate and extending above the lower edge of the next higher plate in the structure, an angularly disposed baffle member spaced from the upwardly projecting member and cooperating therewith to define a trough extending along the lower edge of the next higher plate and open along the lower apex thereof adjacent the upper edge of the plate.

The invention will be more particularly described with reference to the illustrative embodiments of the invention shown in the accompanying drawings in which:

Fig. 1 is a vertical elevation in partial section of a vertical flow precipitator employing collecting electrodes constructed in accordance with the principles of the invention;

Fig. 2 is a vertical elevation of the precipitator of Fig. 1 in partial section on line 2—2 of Fig. 1;

Fig. 3 is an enlarged fragmentary view of an electrode of the invention;

Fig. 4 shows another form of construction in enlarged diagrammatic section of the electrodes;

Fig. 5 is an enlarged fragmentary side view of a discharge and collecting electrode adapted to

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be employed in a horizontal flow precipitator; and

Fig. 6 is a fragmentary end section of the electrodes shown in Fig. 5.

Referring to the drawings and in particular to Figs. 1, 2 and 3, 10 is the shell or casing of a vertical flow electrical precipitator having a gas inlet 11 and outlet 12. Within the casing parallel discharge electrodes 13 are shown supported by an electrode supporting frame 14 suspended vertically between the collecting electrodes 15 of the invention.

The upper ends of the discharge electrode frames 14 are connected to the high tension electrical system of the precipitator through bus bar and electrode spacer 16, while a retaining frame 17 is shown at the lower ends of the electrodes 13 to secure them from lateral displacement and from swinging from side to side in the gas stream.

Precipitated material is collected at the lower end of the precipitator in a hopper 18. A plurality of dust chutes 19 and 20 direct the precipitated material from the lower ends of the collecting electrodes 15 through the incoming gas stream and perforated gas distribution plate 21 to the collecting hopper.

The collecting electrodes of the invention comprise a plurality of interlocking sections 22 encompassed by a rectangular frame 23 provided with hanger means 24 adapted to support the electrode within the precipitator. Each section, as more clearly shown in Fig. 3 of the drawings, comprises a plate 25 having a warped upper portion 26 extending outwardly at about 30° to the vertical along the upper edge of the plate. This angularly projecting portion of the plate 25 forms one side of a funnel shaped trough 27 which is coextensive with the upper edge of the collecting electrode. A baffle plate 28 similarly coextensive with the upper edge of the electrode forms the other side of the dust collecting trough 27. In the preferred form of the invention the lower ends of the baffle members are extended below the bends of the angular upper portion 26 of the plate section. These extensions aid in keeping the falling dust close to the surface of the electrodes.

Tie plates 29 secure baffle members 28 in spaced relationship to the angularly projecting edges of the collecting plates. Slots 30 centrally disposed in the tie plates 29 are adapted to receive the lower end of the next succeeding plate 25, whereby the various sections of the collecting electrodes 15 are interlocked one above another, each section providing a precipitating zone having extended collecting surfaces.

The upper edges of the plate projections 26 and the upper and lower edges of the baffle plate 28 may be provided with smoothly rounded edges or the edges 31 may be bent inwardly as more clearly illustrated in Fig. 3 to reduce the tendency toward back-corona discharge and "arc-overs" along these edges.

To provide for more even distribution of precipitated material and a more efficient collecting unit the angular upper portion of each section of the electrode is alternately projected to one side and to the other. The arrows shown in Fig. 3 are diagrammatic representations of the fall path and the magnitude of the precipitated dust along the surface of the collecting electrode. On side A of section I there is a heavy fall of dust particles comprising all of the material precipitated from both sides of all of the sections above together with the material collected in the zone IA. The material fall on side IB is light comprising only the dust precipitated in zone IB. In section II the fall of precipitated material reverses sides at the collecting trough with the heavier material fall on side IIB and a light fall on side IIA. At each succeeding lower section the heavy and light flows alternate between sides A and B of the electrode. Thus material-laden gases passing upwardly between the collecting electrodes will always pass through a predetermined number of collecting zones having a light material fall and a high collecting capacity.

In Fig. 4 of the drawings a modified form of the invention is shown wherein the sectional collecting plates 25, which form the collecting zones of the electrode are of varying heights, the section plates becoming progressively shorter from the upper most section downwardly. This construction when employed in an up draft precipitator gives several zones where the collected dust concentration is light along the plates at a point where the grains of dust per cubic foot of gas is the heaviest and also it provides for better gas baffling where the dust fall is the heaviest.

In operation hot dust-laden gases enter the precipitator through gas inlet 11, and flow upwardly between the dust chutes 19 and 20. These chutes divide the incoming gas into streams, and aid in baffling the gas away from the precipitated dust at the points 32 where the dust enters the chutes from the collecting electrodes. As the gas passes between the discharge and collecting electrodes 13 and 15 respectively the suspended dust particles become ionized and are precipitated upon the surface of the collecting electrodes.

When the collecting electrodes are vibrated or rapped the precipitated dust falls from the plates toward the next lower zone, hitting the funnel shaped trough 27 between each plate section. These troughs aid, along with the effect of the corona discharge, in keeping the dust fall close to the surface of the electrodes and when the ionized dust particles strike the trough in their fall their electro-static charge is removed whereby the particles start through the next precipitating zone free of charge, permitting more efficient dust separation as there are no charged particles at the plate surface to buck corona discharge coming from the discharge electrodes. The precipitated dust after passing through the lowest collecting zone enters dust chutes 19 and 20 at 32 and then the precipitator dust hopper 18.

With reference to Figs. 5 and 6 of the drawings it will be seen that the principles of the invention are equally adaptable for use on precipitators operating with horizontal gas flow. In the illustrative embodiments shown in Figs. 5 and 6, parallel discharge electrodes 13' are shown angularly supported by a vertical supporting frame 14' suspended between the collecting electrodes 15'. The individual discharge elements 13' are disposed upon their supporting frame at such an angle that all of the incoming dust laden gas must pass between at least one, preferably three, discharge electrodes and their complementary collecting plates.

The collecting electrodes 15' comprise a plurality of superimposed sections, within a rectangular frame 23' adapted to support the electrode sections within the precipitator. Each section of the electrode comprises a plate 25' angularly disposed within the frame 23' at the same angle as the complementary discharge electrodes. These plates, as in the vertical flow precipitators, have funnel shaped troughs 27' coextensive with the upper edge of the plate sections. The troughs likewise being formed from an outwardly projecting portion 25' of the plate 25' and a baffle plate 28', secured in spaced relationship to the plate projection by tie plates 29'. Slots 30' centrally disposed in the tie plates 29' receive the lower end of the next succeeding plate 25', whereby the electrode sections are interlocked one above another, each section providing a precipitating zone angularly disposed to the gas flow.

The angularly disposed upper portion of each plate of the electrode may advantageously be alternately projected to one side and to the other to provide for more even distribution of the precipitated material and a more efficient collecting unit, as hereinbefore described with reference to the form of the invention shown in Figs. 1 through 4 of the drawings.

Each of the collecting electrodes are provided with dust chutes 19' and 20' at their lower ends for directing the precipitated material from the lower ends of the electrodes to the precipitator dust hopper, not shown in Figs. 5 and 6.

From the foregoing description it will be seen that the present invention provides a novel collecting electrode construction whereby the aims, objects and advantages of the invention are fully accomplished.

It will be evident that various modifications may be made in the construction of the electrode and in the form and number of plate sections and dust collecting troughs. For example, both sides of the collecting troughs may be constructed of baffle plates secured to a substantially plane collecting plate, and the discharge of precipitated material from the troughs need not alternate from one side of the electrode to the other as shown by way of illustration in the drawings.

I claim:

1. A collecting electrode structure comprising a plurality of superimposed sections; each section comprising a plate; members projecting angularly upward, alternately toward one side of the electrode structure then toward the other side, from the upper edge of each of said plates and extending above the lower edge of the next higher plate in the structure; an angularly disposed baffle member spaced from said upwardly projecting member and cooperating therewith to define a trough extending along the lower edge of said next higher plate and open alternately toward one side of the electrode structure then toward the other side, along the lower apex of the trough adjacent the upper edge of the plate.

2. A collecting electrode structure compris-

ing a plurality of superimposed sections; each section comprising a plate, each of said plates being progressively shorter from the uppermost section downwardly; members projecting angularly upward, alternately toward one side of the electrode structure then toward the other side, from the upper edge of each of said plates and extending above the lower edge of the next higher plate in the structure; an angularly disposed baffle member spaced from said upwardly projecting member and cooperating therewith to define a trough extending along the lower edge of said next higher plate and open alternately toward one side of the electrode structure then toward the other side, along the lower apex of the trough adjacent the upper edge of the plate.

3. A collecting electrode structure comprising a plurality of superimposed sections; vertical support members for said sections; each section comprising a plate supported angularly between said support members; members projecting angularly upward, alternately toward one side of the electrode structure then toward the other side, from the upper edge of each of said plates and extending above the lower edge of the next higher plate in the structure; an angularly, disposed baffle member spaced from said upwardly projecting member and cooperating therewith to define a trough extending along the lower edge of said next higher plate and open, alternately toward one side of the electrode structure then toward the other side, along the lower apex of the trough adjacent the upper edge of the plate.

4. A collecting electrode structure comprising a plurality of superimposed sections; vertical support members for said sections; each section comprising a plate supported angularly between said support members; each of said plates being progressively shorter from the uppermost section downwardly; members projecting angularly upward, alternately toward one side of the electrode structure then toward the other side, from the upper edge of each of said plates and extending above the lower edge of the next higher plate in the structure; an angularly, disposed baffle member spaced from said upwardly projecting member and cooperating therewith to define a trough extending along the lower edge of said next higher plate and open, alternately toward one side of the electrode structure then toward the other side, along the lower apex of the trough adjacent the upper edge of the plate.

GORDON BUSFIELD.

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