Sept. 29, 1942. C. W. J. HEDBERG 2,297,555

ELECTRIC PRECIPITATOR

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Fig. 3.

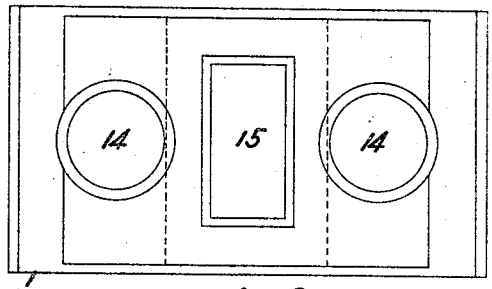


Fig. 1.

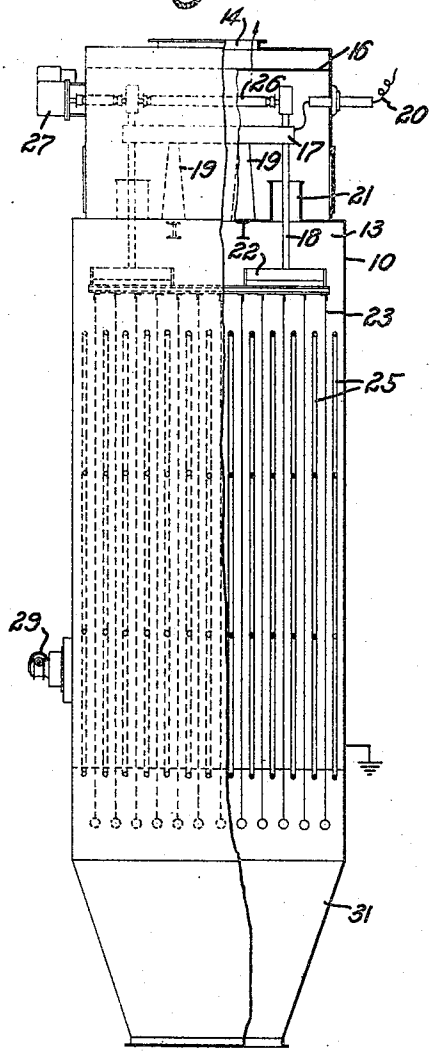
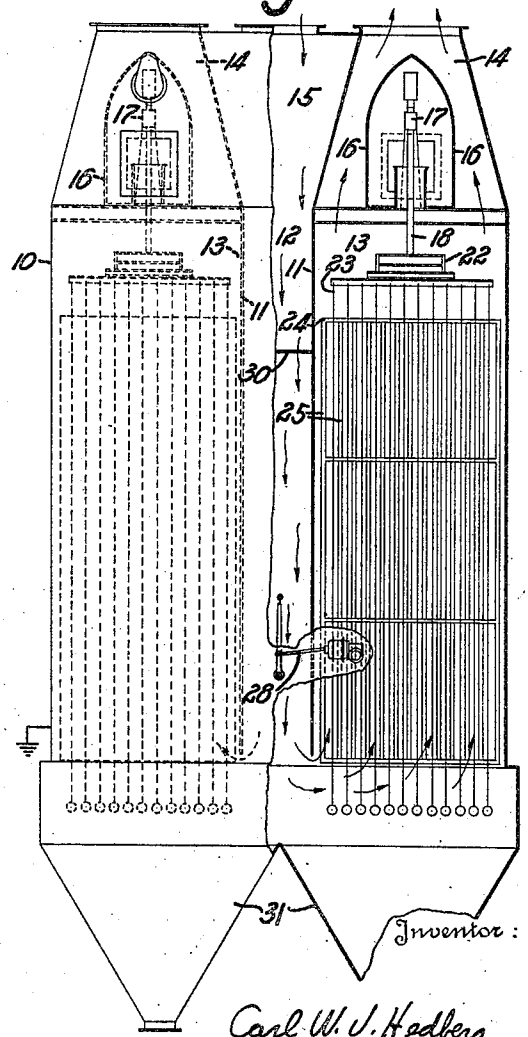


Fig. 2.



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Fig. 6.

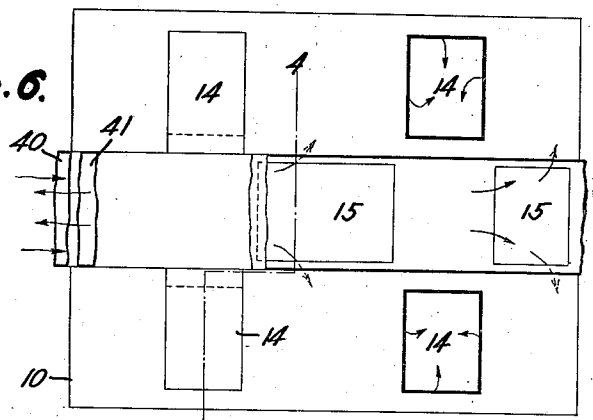


Fig. 4.

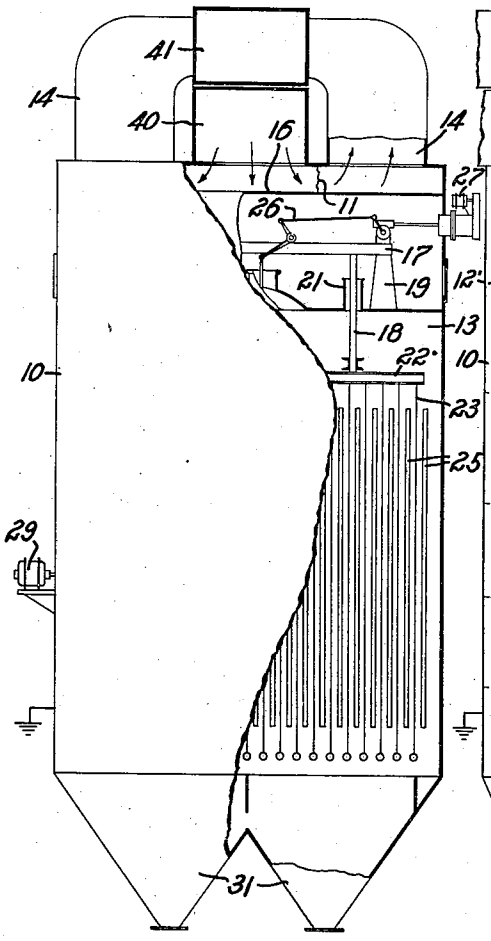
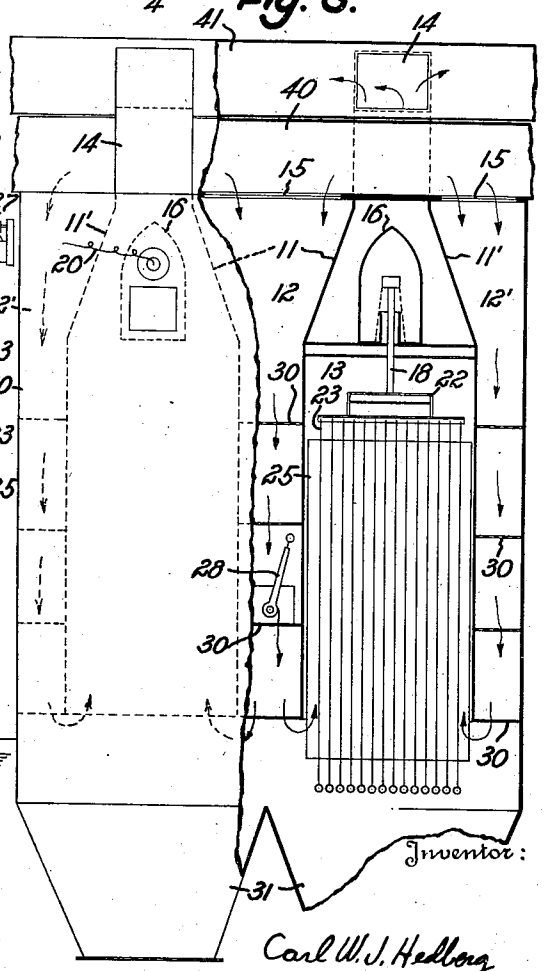


Fig. 5.



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UNITED STATES PATENT OFFICE

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ELECTRICAL PRECIPITATOR

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Application August 5, 1940, Serial No. 351,465

3 Claims. (Cl. 183—7)

This invention relates to an electrical precipitator for the removal of suspended particles from gases. It is especially adapted to meet conditions which make it necessary or desirable to enter or leave the precipitator in a vertical direction and is particularly suitable for the treatment of gases carrying suspended particles of such characteristics that it is advantageous to subject the gases to electrical treatment during vertical, and especially upward, flow.

A principal purpose of the invention is the provision of a vertical flow electrical precipitator wherein the gases are brought into and out of the precipitator at the top thereof.

A further purpose of the invention is to provide an electrical precipitator in which gas inlet and outlet means are provided which do not require any additional floor space over that required by the precipitator itself whereby substantial savings in space requirements are obtained. A further object of the invention is the provision, in simple and economical manner, of an electrical precipitator in which the conditions, particularly the temperature of the gas during treatment may be maintained substantially uniform and in which the heat content of the gases may be conserved during treatment. Other purposes and advantages of the invention will appear from the following description of the invention which comprises a casing, one or more substantially vertical partition members within the casing extending from the top of the casing to a point adjacent to and spaced from the bottom of the casing to provide at least one duct extending from the top of the casing to the bottom portion thereof, and at least one treating chamber open to the bottom portion of the casing, spaced discharge electrode and collecting electrode assemblies within the casing, a conduit for supplying gases to be treated to the upper end of said duct from directly above the casing, and a conduit for withdrawing treated gases from the upper end of said chamber. Advantageously supporting and electric power supply means for the discharge electrode assembly are positioned in a box extending across the upper portion of the treating chamber or across the conduit leading therefrom and provided at the bottom with openings into the treating chamber. The bottom portion of the precipitator casing is preferably of conical or pyramidal shape to provide a receptacle for the collection of precipitated material.

Advantageously a plurality of partition members are provided within the precipitator casing to divide it into a plurality of treating chambers separated by downtake ducts or with downtake ducts on two opposite sides of each treating chamber, whereby greater uniformity of gas distribution and greater uniformity of temperature within the chambers may be attained. Uniformity of gas distribution may also be advanced by providing suitably shaped perforated plates or guide members in the downtake ducts or at the bottom end thereof.

The invention will be more particularly described for the purpose of illustrating the principles of the invention with reference to the accompanying drawings in which:

Fig. 1 is an end elevation in partial section;

Fig. 2 is a side elevation in partial section; and

Fig. 3 is a plan view, of an electrical precipitator embodying the principles of the invention; and

Fig. 4 is an end elevation in partial section;

Fig. 5 is a side elevation in partial section; and

Fig. 6 is a plan view in partial section of another embodiment of the invention.

In Figs. 1, 2 and 3, 10 is the precipitator casing and 11 are partition members dividing it into a downtake duct 12 and two precipitator chambers 13. Extending upward from the precipitator casing are outlet conduits 14 communicating with the upper end of the chambers 13 and inlet conduit 15 communicating with the upper end of downtake duct 12.

Extending through each of outlet conduits 14 are insulator boxes 16, containing discharge electrode supporting members 17, 18 carried on insulators 19 and supplied with high potential electric power from a source, not shown, by conductor 20. Support members 18 extend through openings 21 in the insulator boxes 16 into chambers 13 and are there attached to frame members 22 of the discharge electrode assembly including discharge elements 23.

Collecting electrode assemblies 24 including rod members 25 are positioned in the precipitator chambers spaced from the discharge electrode assemblies and connected to the grounded shell 10.

Rapping mechanism 26 for rapping the discharge electrode assemblies is mounted in insulator boxes 16 and actuated by motor 27. The collecting electrode assemblies are rapped by mechanism 28 actuated by motor 29.

Perforated plate 30 is mounted in duct 12 to increase the uniformity of distribution of the gas. The lower portion of the casing is formed by cone-shaped bins 31.

The gas to be treated enters inlet conduit 15, passes downward through duct 12, and around the lower edge of partitions 11 into the lower portion of precipitator chambers 13. In passing around the lower edge of the partitions 11 the larger and heavier particles carried by the gas are deposited in bins 31 because of the centrifugal effect of the change in direction of flow and because of the decreased velocity of flow on passing into the precipitator chambers. On passing upwards through chambers 13 between the collecting electrodes the remaining particles are precipitated on the collecting electrodes by the action of the electric field maintained between the electrode assemblies and the precipitated material falls, especially on rapping the electrodes into bins 31. The cleaned gases pass around insulator boxes 16 through outlet conduits 14.

It will be seen that the introduction and removal of the gas is effected entirely from above the precipitator casing, that due to the extensive heat transfer contact between the downtake duct and the precipitator chambers a high uniformity of temperature of the gases during the treating operation is provided, which prevents channeling and uneven precipitation, and that the highly effective upward vertical flow of gases through the electric precipitating field is provided in combination with high heat conservation and with a maximum economy of space utilization.

In the precipitator shown in Figs. 4, 5 and 6, casing 10 is divided by partition members 11, 11' into central downtake duct 12, lateral downtake ducts 12' and precipitator chambers 13. Gases to be treated are supplied directly to the downtake ducts 12, 12' through inlet openings 15' in supply conduit 40, and treated gases are led from the top of the precipitator chambers 13 to take-off conduit 41 through outlet conduits 14.

The remaining elements of the precipitator are similar to the elements bearing like numerals in Figs. 1, 2 and 3.

In this form of the invention, the precipitator chambers are in heat exchange contact on opposite sides thereof with the incoming stream of gases to be treated so that both the conservation of heat content of the gases and the uniformity of temperature in the treatment zone are increased.

I claim:

1. An electrical precipitator comprising a casing, substantially vertical partition members within said casing extending from the top of said casing to a point adjacent to and spaced from the bottom of said casing to provide at least one duct extending from the top of said casing to the bottom portion thereof and at least one treating chamber open to the bottom portion of said casing, spaced discharge electrode and collecting electrode assemblies within said chamber, conduit means for supplying gases to be treated to the upper portion of said duct from directly above said casing, conduit means for withdrawing treated gases from the upper end of said chamber, means providing a box extending across the upper portion of said treating chamber and communicating with said chamber solely through openings in the bottom of said box, and discharge electrode supporting and power supplying means in said box and extending through said openings to support and energize the discharge electrode assembly in said treating chamber.

2. An electrical precipitator comprising a casing, substantially vertical partition members within said casing extending from the top of said casing to a point adjacent to and spaced from the bottom of said casing to provide at least one duct extending from the top of said casing to the bottom portion thereof and at least one treating chamber open to the bottom portion of said casing, spaced discharge electrode and collecting electrode assemblies within said chamber, conduit means for supplying gases to be treated to the upper portion of said duct from directly above said casing, conduit means for withdrawing treated gases from the upper end of said chamber, means providing a box extending across said withdrawing conduit means above said treating chamber and communicating with said chamber solely through openings in the bottom of said box, and discharge electrode supporting and power supplying means in said box and extending through said openings to support and energize the discharge electrode assembly in said treating chamber.

3. An electrical precipitator comprising a casing, substantially vertical partition members within said casing extending from the top of said casing to a point adjacent to and spaced from the bottom of said casing to provide at least two vertical ducts and a vertical treating chamber therebetween within said casing and with the bottom ends of said ducts in communication with the lower portion of said treating chamber, spaced discharge electrode and collecting electrode assemblies within said chamber, conduit means for supplying gases to be treated to the upper ends of said ducts from directly above said casing, conduit means for withdrawing gases from the upper end of said chamber, means providing a box extending across the upper portion of said treating chamber and communicating with said chamber solely through openings in the bottom of said box, and discharge electrode supporting and power supplying means in said box and extending through said openings to support and energize the discharge electrode assembly in said treating chamber.

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