Feb. 24, 1931. C. W. J. HEDBERG ET AL 1,794,074

PRECIPITATOR CLEANING DEVICE

Filed June 19, 1926 4 Sheets-Sheet 1

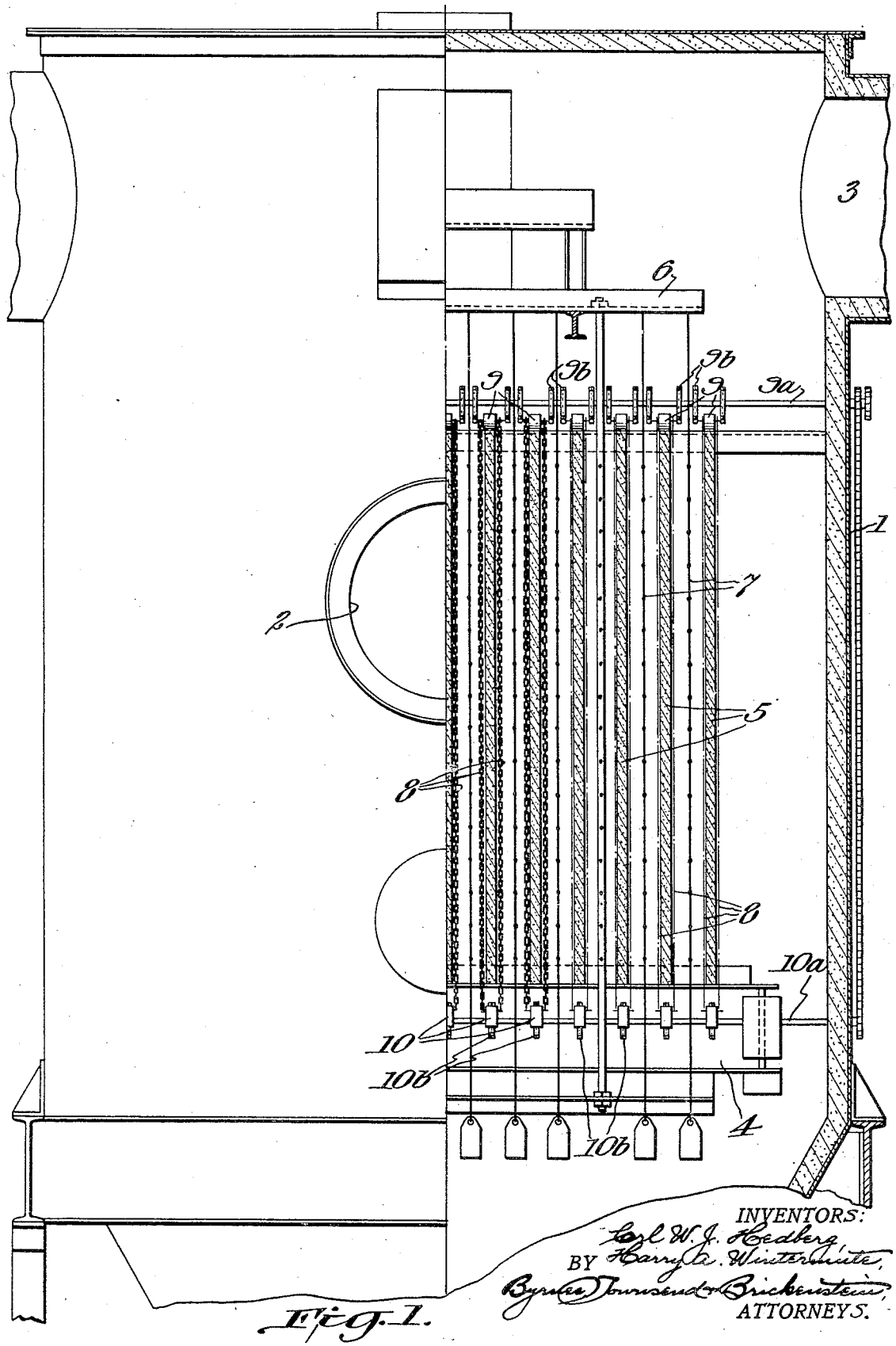

Fig. 1.

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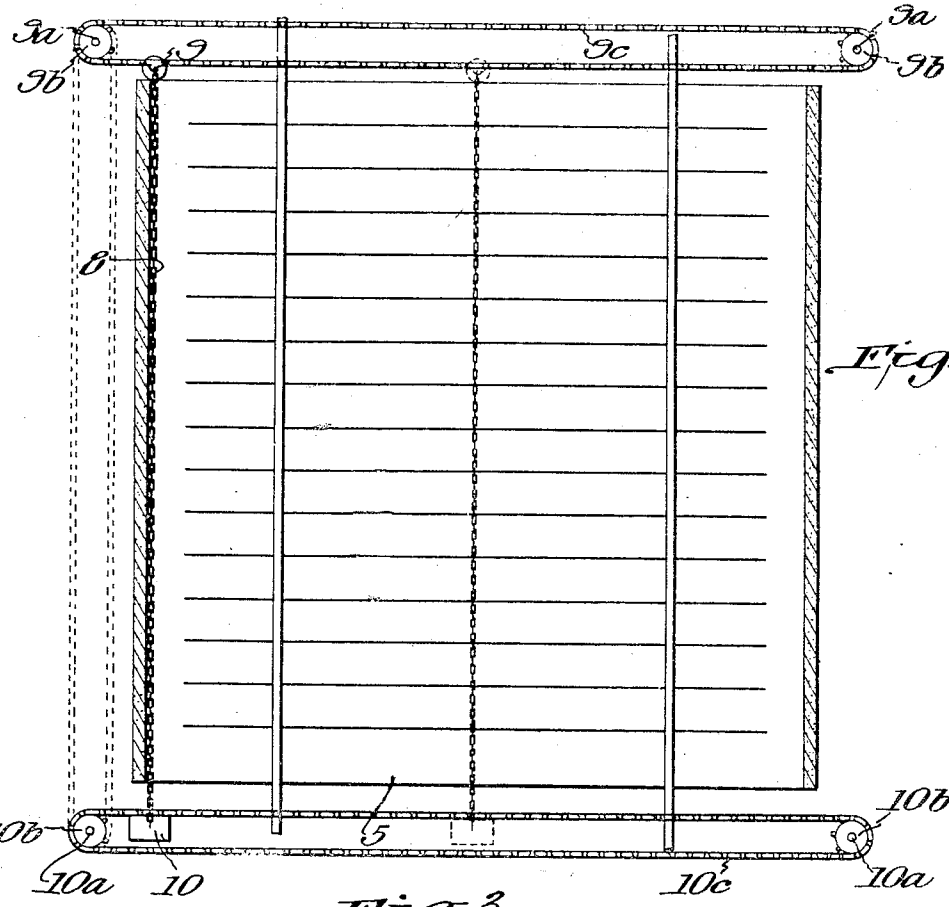


Fig. 2.

Fig. 3.

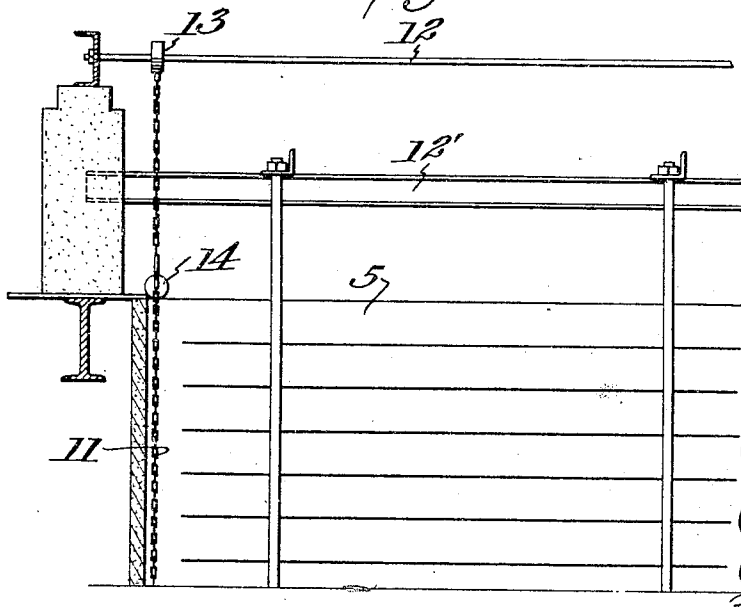
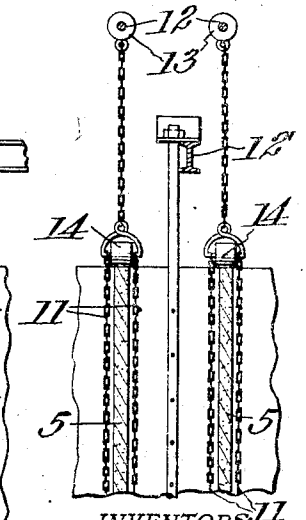


Fig. 4.



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PRECIPITATOR CLEANING DEVICE

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Fig. 5.

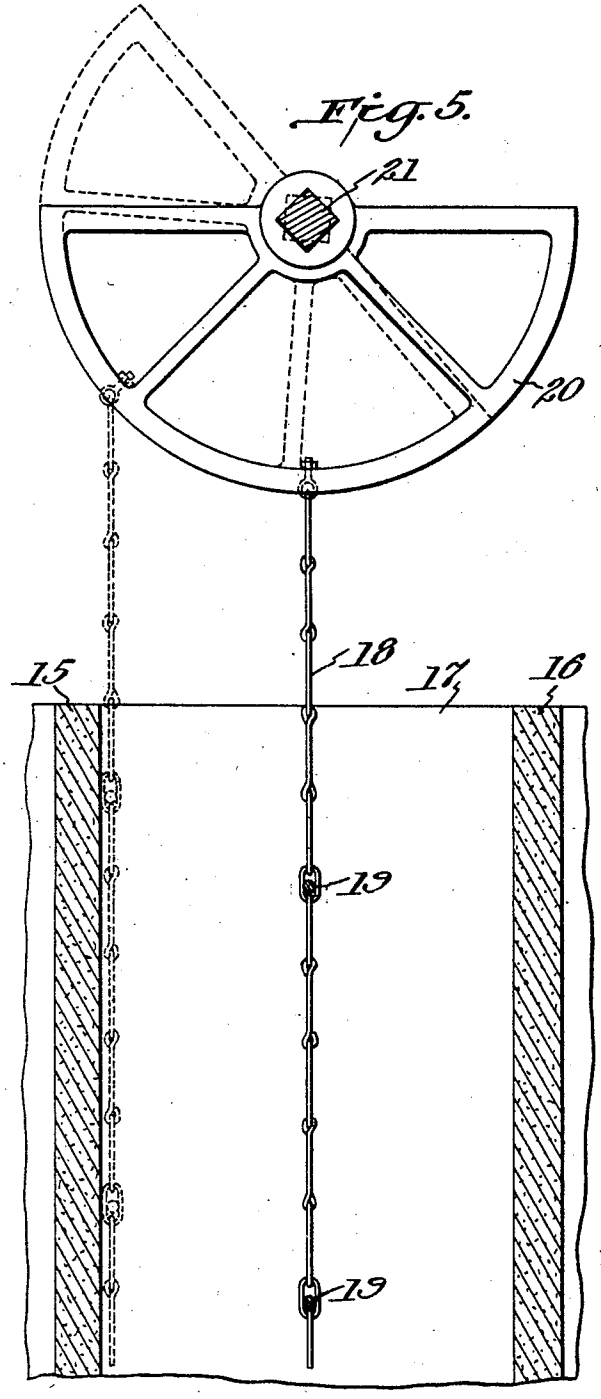
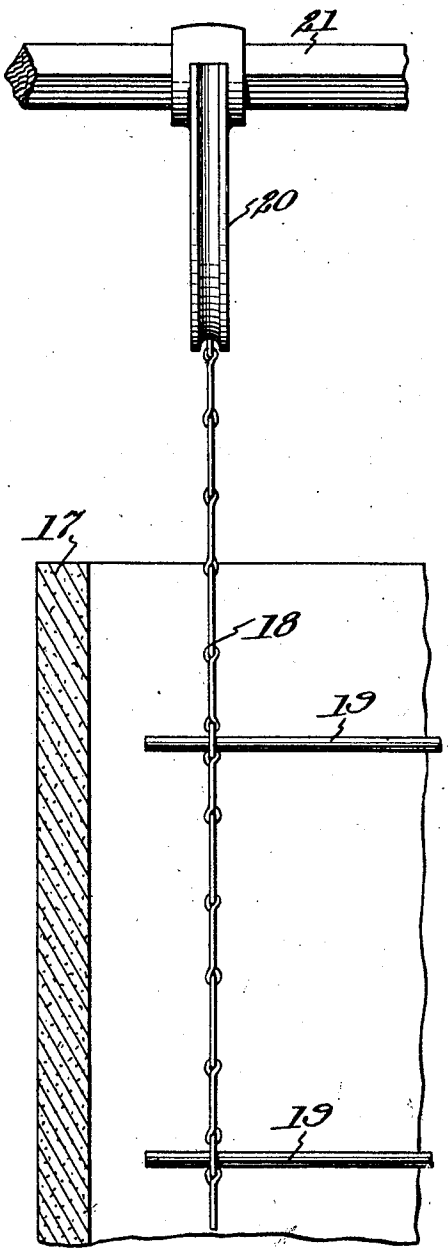


Fig. 6.



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PRECIPITATOR CLEANING DEVICE

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Fig. 7.

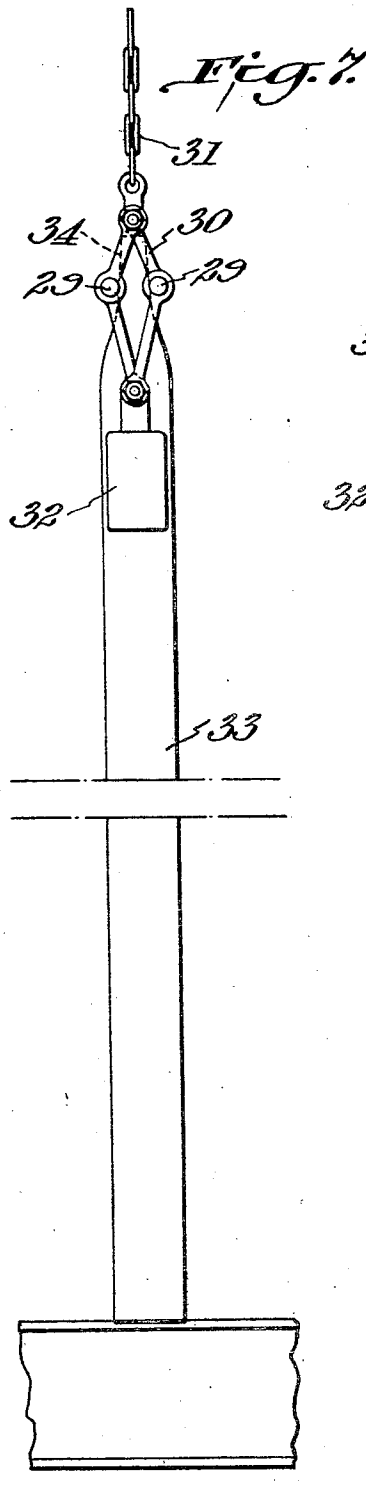
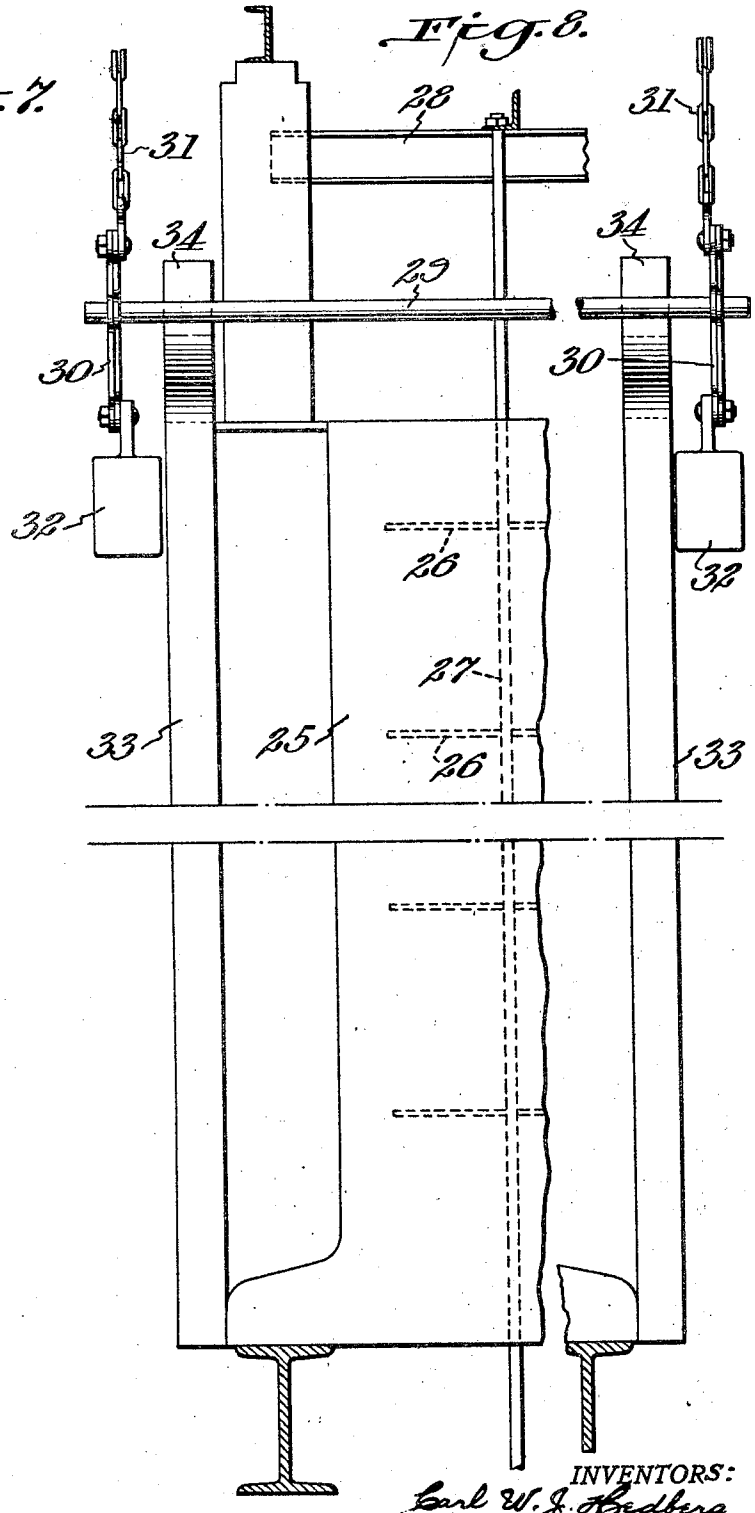


Fig. 8.



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UNITED STATES PATENT OFFICE

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PRECIPITATOR CLEANING DEVICE

Application filed June 19, 1926. Serial No. 117,092.

This invention relates to electrical precipitators and more in particular to apparatus for cleaning the collecting electrodes.

The object is apparatus for uniformly removing material from plate electrodes.

It is a particular object to provide mechanism for removing from plate electrodes deposit which is not readily removed by ordinary means.

The invention, the principle of operation on which it is based and the advantages resulting therefrom will be fully described in connection with the accompanying drawings and the points of novelty will be particularly defined by the claims.

In the drawings:

Fig. 1 is a view partly in elevation and partly in section embodying one form of the invention;

Fig. 2 is a fragmentary section at right angle to Fig. 1;

Fig. 3 is a fragmentary sectional view showing a modified form of the invention;

Fig. 4 is a fragmentary sectional view taken at right angle to Fig. 3;

Fig. 5 is a fragmentary sectional view of another embodiment of the invention;

Fig. 6 is a fragmentary sectional view taken at right angle to Fig. 5;

Fig. 7 is a fragmentary edge view representing still another form of the invention; and

Fig. 8 is a fragmentary elevation thereof.

In Fig. 1 is shown what may be called a typical modern plate treater. For the sake of general understanding it may be stated that within a casing 1, which has gas inlets 2 and outlets 3 is mounted upon beams 4 a plurality of plates 5 in uniformly spaced relation. From a framework 6 are suspended the discharge electrodes 7 disposed in the spaces provided by the plates 5 which are the collecting electrodes.

The particular mechanism for cleaning the plate electrodes 5, shown in Figs. 1 and 2, is a pair of chains 8 for each plate. These chains are supported by a roller 9 normally resting upon the upper edge of the plate and are disposed on opposite sides of the plate, the lower end carrying a weight 10. The arrangement is such that the chains are in contact with the plate.

To provide means for moving the cleaning units, we provide two shafts 9*a* above the plates 5 and extending at right angles to said plates. These shafts carry a plurality of sprocket wheels 9*b*. In the embodiment shown there are two sprocket wheels for each plate 5. Upon each sprocket wheel there is provided a continuous chain and the two chains on opposite sides of each plate carry the roller for that plate, as clearly seen in Figs. 1 and 2. With this construction, all cleaning chains 8 can be simultaneously moved across their respective plates by rotation of the proper shaft 9*a*.

At the lower end of plates 5, two similar horizontal shafts 10*a* are provided, carrying sprocket wheels 10*b*. One sprocket wheel is provided for each plate 5, and a continuous chain 10*c* is mounted upon each sprocket, as seen in Fig. 2. Each weight 10 is connected to its respective cross-chain 10*c*, so that all the weights 10, and thereby the cleaning chains 8, can be moved across the plates 5 by rotation of the proper shaft 10*a*. It is thus possible to drag the cleaning chains from above or below the plates 5, and in some cases a more thorough cleaning may be obtained by alternately dragging from above and below.

It is sometimes desirable to move chains 8 simultaneously from above and below and to accomplish this, it is merely necessary to connect one shaft 9*a* with a shaft 10*a*, by means of a chain drive, as seen in Figs. 1 and 2. It is obvious that other means could be used for synchronizing the top and bottom drives, such as shafting with bevel gears thereon. It is also obvious that other means of drive may be used at the top and bottom, such as rack and pinion, or pneumatic piston. We do not wish to be limited to the specific structure shown, but merely show such drives for illustration only, and include within the scope of our invention all mechanical equivalents of such means.

While the treater is in operation all the cleaning units are disposed at one end of the plates out of the sphere of action of the discharge electrodes, as shown in Fig. 2. When

the cleaning operation is to be carried out, the rollers 9 are moved along the upper edges of the plates from one side to the other as often as is necessary to effect the required cleaning action. The electrical action is preferably suspended while the cleaning operation is performed.

The weights 10 may be proportioned to bring about any desired pressure action of the chains upon the plates, depending largely upon the nature of the deposit.

The arrangement shown in Figs. 3 and 4 is generally similar to that shown in Figs. 1 and 2. However, the chains 11 are supported upon bars 12 or the like above the support 12′ for the discharge electrodes, as for instance by means of rings or collars 13. This arrangement makes it possible to move a plurality or all of the chains at the same time. The cleaning members 11 may be moved over the electrodes 5 by links or chains attached to the collars 13, or to the chains depending therefrom, and operated by mechanism similar to that designated by numerals 9*a*, 9*b*, 9*c*, 10*a*, 10*b*, and 10*c* of Fig. 1, or the collars 13 may be moved along the rods 12 by any other suitable mechanism.

As indicated, rollers 14 may be used as before. However, there is room for various changes in respect to the particular arrangement.

Figs. 5 and 6 show a form of mechanism in which the discharge electrodes may be used for cleaning the collecting electrodes. Plates 15 and 16 represent a pair of collecting electrodes defining a gas duct 17. The discharge electrodes for this gas duct comprise two or more chains 18 or other flexible conducting carriers for the electrodes 19 proper which are rods extending transversely of the duct.

Instead of being supported from a stationary support as is usual, we support each chain from a segmental element 20 in the nature of a part of a sheave mounted upon a transverse rod 21. For a two-chain support for the electrodes 19, two elements 20 are used mounted in the desired spaced relation on the rod 21 (only one chain being shown in Fig. 6).

To operate the cleaning mechanism, the discharge electrodes are first disconnected from the source of current, as is obvious, and then the shaft 21 is turned first in one direction to clean plate 15 and then in the opposite direction to clean plate 16. By turning the shaft 21, the discharge electrode mechanism is brought into contact with the plates and the up-and-down movement effected by further turning the shaft 21 causes the electrodes 19 to sweep up and down along the plate to remove the deposit. By bodily moving the elements along the shaft in one or the other direction, the range of the cleaning action may be extended. The shaft 21 may be angularly moved by the usual crank or, if desired, any form of mechanical movement may be used, as is obvious. The principal and important thing is the movement of a discharge system of the character disclosed, in such a way as to remove the deposit from the plates. All details that may be used in addition thereto are mere matters of expediency and do not form any part of the patentable novelty. The segmental element 20 may have a diameter substantially equal to the distance between the plates 15 and 16 or a little greater.

In Figs. 7 and 8, we have shown a form of construction in which horizontal cleaning elements are moved vertically from top to bottom and are normally kept in an inoperative position above the plates.

The plate 25 represents one of a plurality of collecting electrodes, as indicated in Fig. 1, and the discharge electrode system including the transverse discharge members 26, the pendant supporting members 27 and the support 28 is preferably the same as shown in Fig. 1, but may be of any other construction.

The cleaning mechanism comprises a pair of rods or bars 29 supported at opposite ends by toggle joints 30, the upper ends of which are suported on chains 31 or the like, while the lower ends carry weights 32.

At each end of the plate 25 is a vertical guide 33 of substantially the same width as the thickness of the plate and in alignment with the plate. This guide has above the upper edge of the plate a tapering portion 34.

The operation is as follows:

Normally the mechanism is substantially in the position shown in Figs. 7 and 8. The weight 32 causes the rods 29 to press against the surfaces of the guides which on the portion 34 are so related that the rods 29 are preferably within the planes defined by the surfaces of the plate 25 or at least do not project beyond these planes. There is considerable latitude in this respect, the object being to place the rods 29 out of the sphere of action of the discharge electrodes and more particularly out of reach of the pendant portions 27 of the system shown.

To effect the cleaning operation, the chains 31 which may be wound upon sheaves or drums, are lowered thereby, allowing the rods to move downwardly along the guides 33, the weight 32 drawing the bars against the edges of the guides with a force with each generally proportional to the weight. The rods are thus caused to move over the surfaces of the plates or even in contact therewith, the scraping action of the rods again being a function of the weight 32. The rods may be moved up and down as often as desired to satisfy the particular conditions, and after the cleaning operation is completed the rods are moved back into the operative position above the plates.

In the foregoing we have shown various

forms of cleaning devices operable to move over the surface of the collecting electrodes to remove deposit therefrom and normally in a position permitting the normal operation of the treater. The forms shown are intended to merely illustrate the general character of a larger class of devices available for the purposes of the invention and to particularly show some of the forms well adapted for the practical requirements.

It is understood that instead of gravity action mechanical means may be employed to press the cleaning elements against the plates, as for instance springs or the like. The cleaning or scraping elements may assume many different forms. There is practically no limit in respect to the mechanism for imparting movement to the cleaning devices proper to effectively cover the whole area of the plates.

We claim:

1. In an electrical precipitator, the combination with a collector electrode having a substantially vertical planar surface against which separated material collects, of means for removing deposits of material from said collector electrode, said means comprising a support located above said collector electrode, a flexible cleaning device suspended from said support and due to gravity lying substantially in a plane parallel to the surface of said collector electrode, and means for moving said cleaning device over the surface of said electrode.

2. In an electric precipitator of the plate-treater type, the combination with a plate electrode, of a cleaning device mounted for movement over the surface of the plate electrode and a weight associated with said device tending to press the same into contact with the plate electrode.

3. In an electric precipitator of the plate-treater type, the combination with a plate electrode, of means on opposite sides of the plate electrode, disposed to be moved as a unit over the opposite surfaces thereof, and means tending to press the said means into contact with the surfaces.

4. In an electrical precipitator, a collecting electrode having a collecting surface, discharge electrode means spaced from and opposing said collecting surface, a cleaning device, and means for moving said cleaning device between said collecting electrode and said discharge electrode means and over said collecting surface.

5. An electrical precipitator as set forth in claim 4, in which the cleaning device comprises weighted members.

6. In an electrical precipitator of the plate treater type, a plate electrode, discharge electrode means spaced from and opposing a surface of said plate, a cleaning device extending substantially entirely across said surface of the plate in one direction, and means for moving said cleaning device bodily and transversely between said plate and said discharge electrode means and over substantially the entire area of said surface.

7. In an electrical precipitator, a collecting electrode having a collecting surface, discharge electrode means spaced from and opposing said collecting surface, a cleaning device, and means for moving said cleaning device between said collecting electrode and said discharge electrode means and over said collecting surface, and for also moving said cleaning device out of position between said collecting electrode and said discharge electrode means.

8. In an electrical precipitator of the plate-treater type, a plate electrode, discharge electrode means spaced from and opposing a surface of said plate, a cleaning device extending substantially entirely across said surface of the plate in one direction, and means for moving said cleaning device bodily and transversely between said plate and said discharge electrode means, and over substantially the entire area of said surface, and for also moving said cleaning device out of the space between said plate and said discharge electrode means.

9. In an electrical precipitator, a collecting electrode having a collecting surface, discharge electrode means spaced from and opposing said collecting surface, a cleaning device, means for moving said cleaning device between said collecting electrode and said discharge electrode means and over said collecting surface, and means associated with said cleaning device tending to press the same into contact with said collecting electrode.

10. In an electrical precipitator, a collector electrode, a discharge electrode, and means for moving said discharge electrode over the surface of said collector electrode to remove deposits therefrom.

11. The invention as set forth in claim 10 wherein said collector electrode comprises a plurality of flexibile suspension members and horizontal rods secured to and extending transversely of said suspension members; and said means comprises an angularly-displaceable support for the upper ends of said suspension members.

In testimony whereof, we affix our signatures.

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