Oct. 4, 1932. C. B. CLYNE 1,880,811

METHOD OF MAKING COLLECTING ELECTRODES FOR ELECTRICAL PRECIPITATORS

Original Filed Dec. 11, 1926 2 Sheets-Sheet 1

Fig. 1.

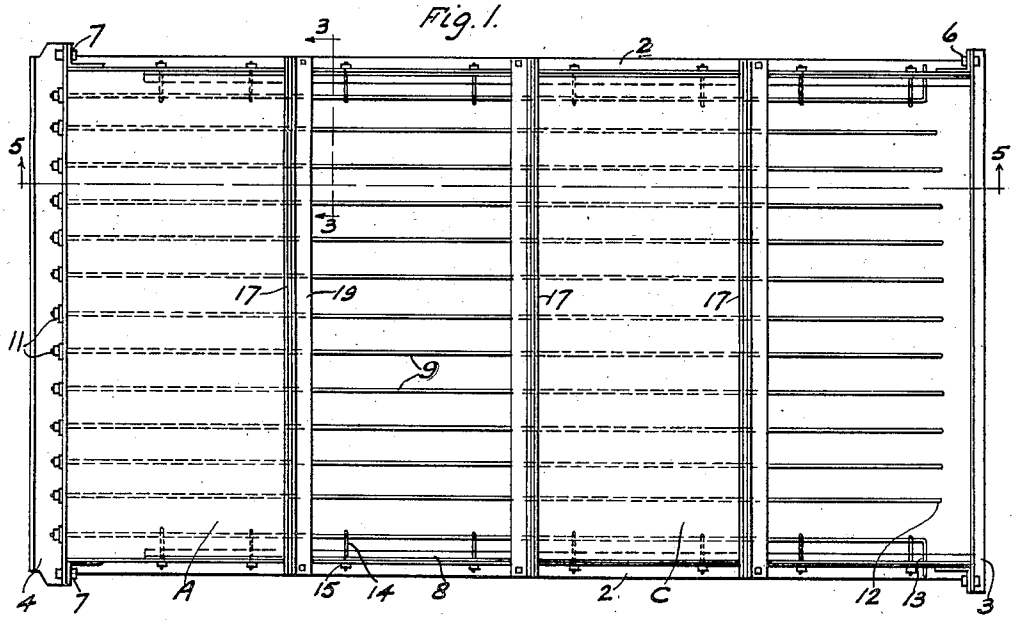


Fig. 3.

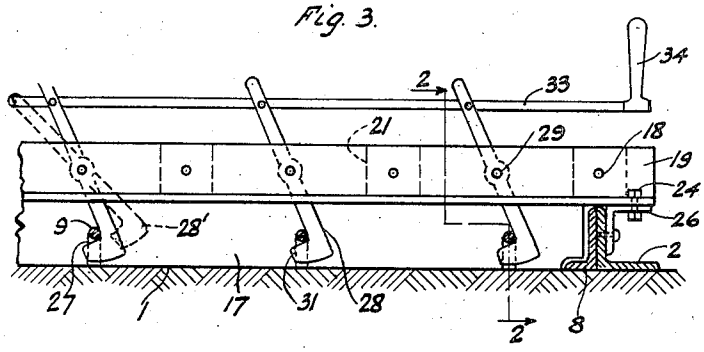


Fig. 2

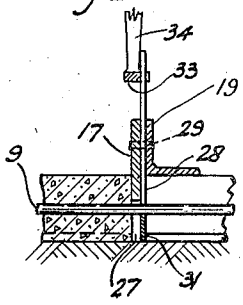
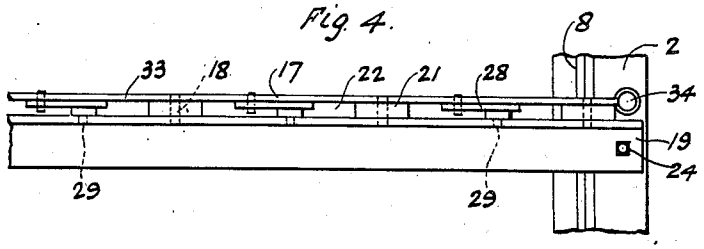


Fig. 4.



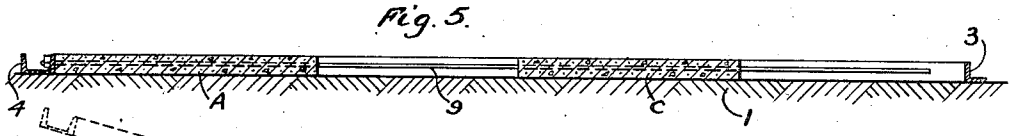
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Original Filed Dec. 11, 1926 2 Sheets-Sheet 2

Fig. 5.



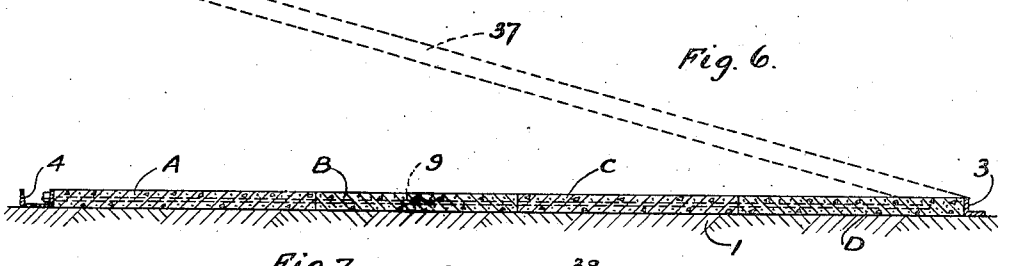


Fig. 6.

Fig. 7.

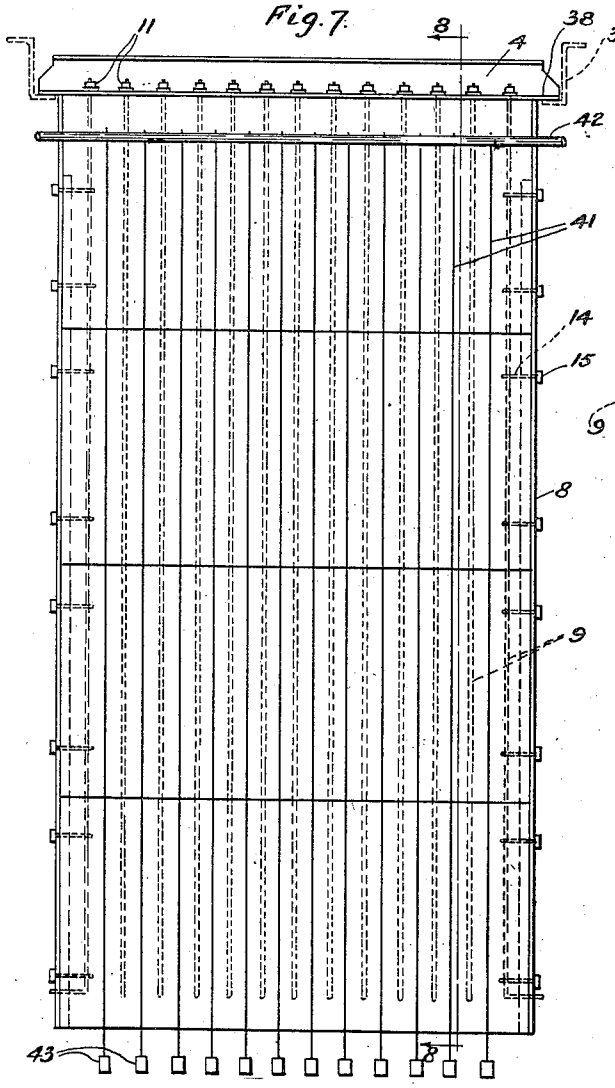
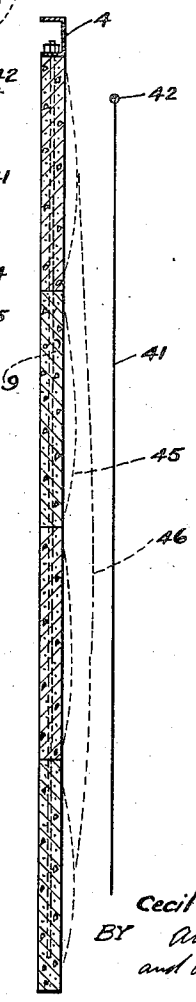


Fig. 8.



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UNITED STATES PATENT OFFICE

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METHOD OF MAKING COLLECTING ELECTRODES FOR ELECTRICAL PRECIPITATORS

Original application filed December 11, 1926, Serial No. 154,228. Divided and this application filed May 8, 1930. Serial No. 450,861.

This invention relates to the art of electrical precipitation of suspended particles from gases and particularly to a novel method of making a collecting electrode for use in electrical precipitation apparatus. This application is a division of my application Serial No. 154,228, filed December 11, 1926.

The chief object of the invention is to provide a simple and economical method of forming a collecting electrode of the plate type which combines good electrical properties with advantageous mechanical properties resulting from such method of forming, making it especially adapted for use in electrical precipitation.

It has heretofore been proposed, in United States patent to F. H. Viets, No. 1,569,595, to cast each collecting electrode as an integral slab or plate of concrete or other electrically semi-conducting cementitious material with a metallic supporting member at one edge thereof (such edge being the top of the electrode when placed in position for use) and with metallic reenforcing members connected to said metallic supporting member and extending perpendicularly thereto and embedded within the material of which the plate is formed so as to extend vertically when the plate is in position for use and serve as embedded conductors for the electric current as well as reenforcing means. It has been found, however, that plates constructed in this manner have a marked tendency to warp or buckle when hot gases are passed in contact therewith, and as these electrodes are usually of relatively large dimensions, for example, 8 to 12 feet in vertical length, such warping causes an appreciable lateral displacement between the top and bottom and the intermediate portion of the electrode. In certain cases this displacement has been found to be as great as an inch or more and as the spacing between the collecting electrode and the adjacent discharge electrode members is usually about 3 or 4 inches, more or less, it is obvious that this lateral displacement of portions of the collecting electrode may often cause serious disturbances in the electrical field. Certain portions of the collecting electrode are brought much closer to the discharge electrode members than other portions, so that the electrical field is not uniform throughout all portions of the collecting electrode surface and there is a tendency to arcing or disruptive discharge at the portions of the collecting electrode which are displaced toward the discharge electrode members, particularly in case of accumulation of a deposit of precipitated material upon such portions of the electrodes. This objection may be overcome by forcibly cracking the collecting electrode plates along a plurality of equally spaced lines perpendicular to their length, but such cracking operation, after the plates are in position, is a tedious and costly process and unless it is carried out with the utmost care there is a possibility of chipping off portions of the plates during such operation.

A particular object of my invention is to eliminate the disadvantages resulting from warping of collecting electrodes formed of cementitious material and at the same time eliminate the necessity of forcibly cracking such electrodes after they are installed.

The collecting electrode made in accordance with my invention comprises a plurality of plate sections of electrically semi-conducting cementitious material formed with their edges abutting closely against one another but unbonded, and reenforcing means common to all of said sections and embedded or cast therein. Said reenforcing means advantageously comprise a plurality of metallic reenforcing members each extending through all of the sections and perpendicular to the abutting edges thereof and embedded in the material of which such sections are composed. Such embedded reenforcing members are preferably all connected at one end to a metallic supporting member lying along the outer edge of one of the end sections. The method which I use for making such a collecting electrode consists in first casting alternate plate sections thereof, of concrete or other suitable cementitious material, in substantially horizontal position in a common horizontal plane and spaced from one another, about common metallic reenforcing members disposed in said horizontal

plane, so as to leave open spaces between such alternate sections, permitting such sections to attain an initial set such as to prevent firm bonding therewith of new cementitious material poured in contact therewith, then pouring the intervening sections in the open spaces between the sections first cast and also about said reenforcing members, so as to form a complete electrode plate in substantially horizontal position, allowing said plate to set and acquire sufficient strength to permit the same to be raised to vertical position, and then lifting one end of said plate upwardly to move the plate bodily to vertical position.

The accompanying drawings illustrate the method of making collecting electrodes according to my invention, and referring thereto:

Fig. 1 is a plan view of the form used in casting the collecting electrodes with the first set of alternate sections already cast therein.

Fig. 2 is a section on line 2—2 in Fig. 3.

Fig. 3 is a section on line 3—3 in Fig. 1.

Fig. 4 is a plan view of the parts shown in Fig. 3.

Fig. 5 is a section on line 5—5 in Fig. 1.

Fig. 6 is a similar view after all of the sections have been cast.

Fig. 7 is a front elevation of a completed collecting electrode in the position in which it is mounted in an electrical precipitating apparatus.

Fig. 8 is a section on line 8—8 in Fig. 7.

The form for use in casting the electrode plates may be placed on any suitable flat surface, for example, a concrete floor or plate indicated at 1. The form comprises side members 2 and end member 3 consisting, for example, of metal angle bars. The other end of the form is provided by a member 4 consisting, for example, of a metal channel member which is adapted to form the supporting member at the upper end of the finished electrode plate. Side and end members 2 and 3 may be bolted together as indicated at 6 and the end member 4 may also be bolted to side members 2 as indicated at 7. I also prefer to provide metallic stiffening members 8 consisting, for example, of metal angle bars, at the sides of the electrode plate. Suitable reenforcing means, such as a plurality of reenforcing bars or rods 9 of any suitable cross-section, for example, twisted square rods are connected at one end to the channel member 4 as by means of nuts 11 and are disposed longitudinally within the form at such height as to lie substantially in the central plane of the completed plate. Said reenforcing rods terminate a short distance from the other end of the form as indicated at 12 and the two rods adjacent the sides of the form may have their ends bent outwardly so as to pass through angle bars 8 as indicated at 13. A plurality of eye bolts 14 are fitted over each of the two reenforcing rods adjacent the sides of the form and pass through angle bars 8 and 2 and may be provided at their outer ends with nuts 15.

At suitable intervals along the length of the form I provide transverse form members consisting, for example, of flat metal strips 17 lying in substantially vertical planes so as to form end walls for the first set of alternate sections to be poured. For this purpose I preferably provide means for securely connecting said transverse form members to the side members of the form and for permitting said transverse form members to be removed from their positions after the first set of alternate sections have been cast. For example, each of the members 17 may be secured as by rivets 18 to an angle bar 19, a plurality of filler plates 21 being preferably placed between the member 17 and angle bar 19 so as to leave spaces 22 between said filler plates and above the respective reenforcing rods 9. The horizontal faces of angle bars 19 are adapted to rest upon the side members 2 of the form so as to insure that the flat members 17 are disposed in substantially vertical planes. Said angle bars preferably project somewhat beyond said side members and may be connected as by means of bolts 24 to spacing brackets 26 riveted or otherwise connected to said side members.

The flat strips 17 may be provided with vertical notches 27 adapted to fit over the reenforcing rods 9 when the transverse form members are placed in position. In order to prevent the concrete or other material from passing through said notches a plurality of closure members 28 may be pivotally mounted as at 29 and may be provided with portions 31 adapted to be moved into position to close the openings provided by said notches or into position away from said notches as indicated in dotted lines at 28′ in Fig. 3 so as to permit the transverse form members to be removed without interference by rods 9. The closure members 28 may all be pivotally connected to an operating bar 33 provided with handle 34 whereby all of said members may be moved at one operation into either of the two positions above mentioned.

The method of forming electrode plates in the apparatus above described is as follows: The parts are first assembled in the positions shown in Figs. 1 to 4 inclusive, and the first set of alternate sections are then poured. With the arrangement shown the transverse form members 17 are disposed in proper positions for casting section A, between the supporting channel 4 and the first of said transverse members, and section C between the other two of said transverse members. The concrete or other cementitious material to be used in forming the plate is mixed to the proper consistency and poured into these two

sections of the form and scraped off flush with the upper edges of the side members 2. The plate is then in the condition shown in Fig. 1.

The sections so formed are then allowed to obtain an initial set which may require varying periods, for example, from 8 to 24 hours, more or less, depending upon the material used. After these sections have obtained such initial set, bolts 24 may be removed, closure members 28 moved to positions such as 28′ and the transverse form members may then be lifted out of their positions so as to leave the spaces between the sections first cast free for pouring the remaining sections as indicated in Fig. 5.

The remaining sections B and D are then cast in the same manner as before, so as to produce a sectional plate as shown in Fig. 6. It should be noted that since sections A and C are permitted to assume an initial set before pouring sections B and D, the respective sets of sections will be unbonded to one another at their adjoining edges, as fresh concrete or similar cementitious material will not produce a firm bond with the same kind of material after it has taken an initial set.

The entire plate is left in the form for a sufficient time to acquire the strength necessary to permit it to be raised to vertical position. When such strength has been acquired the side and end form members 2 and 3 are removed by disconnecting bolts 6 and 7 and nuts 15. The plate may then be lifted to an upright or vertical position, preferably by raising the end to which the supporting member 4 is connected, in the manner indicated in dotted lines at 37 in Fig. 6.

The finished plate then has the appearance shown in Figs. 7 and 8. The nuts 15 may be replaced on eye bolts 14 so as to hold the stiffening angle bars 8 in position by connecting them to the reenforcing bars 9 at the respective sides of the plate. Such plates may be mounted and supported in any suitable manner. The supporting member 4 advantageously projects beyond the sides of the plate as indicated at 38 so as to rest upon suitable supporting means, such as Z bars 39.

One advantage of the resulting collecting electrode is that the sections, while unbounded, are in close contact with one another at all points along their abutting edges, so that the reenforcing rods 9 are well protected where they pass from one section into the next. This prevents exposure of any portions of said rods to the electric field and causes the desired layer of semi-conducting material to be interposed in all portions of such field. If any large cracks were left between the sections, a direct exposure of the rods 9 to the electric field would result, thus providing paths of less resistance and causing concentration of the current at these points.

I have also shown in Figs. 7 and 8 the relative position of the discharge electrode means with respect to the collecting electrode means in an electrical precipitator, in order to more clearly explain the advantages of my invention. Such discharge electrode means comprise a plurality of vertical wires or fine rods 41 mounted on suitable supporting members 42 and provided at their lower ends with tensioning weights 43. Said discharge electrode means are, as shown in Fig. 8, disposed at a suitable distance from the face of the collecting electrode means, so as to set up an electrical field between said electrode means upon application of a high potential difference thereto. It is highly desirable that the spacing of the discharge electrode means from the collecting electrode be as nearly uniform throughout the electrical field as is possible in order to maintain uniform conditions of ionization and hence of precipitation. I have indicated in dotted lines at 45 in Fig. 8 an exaggerated position of the several sections of the collecting electrode caused by warping thereof, and I have also indicated in dotted lines at 46 the position which would be occupied by the collecting electrode in case of an even less degree of warping if the plate consisted of a single integral slab. It is obvious that the non-uniformity of the electrical field will be much greater in the latter case than in the former, due to the much greater proximity of the central portion of the collecting electrode to the discharge electrodes.

The cementitious material used in forming electrode plates as above described may consist of Portland cement concrete or other concrete, or any suitable cement or plaster composition, containing any desired added material such as asbestos or other fibrous material, carbon or other electrically conducting material, or the like, or in general may consist of any electrically semi-conducting cementitious material.

The breaking of the plate along the lines between adjacent sections, in order to produce the result shown at 45 in Fig. 8, may occur of its own accord due to the warping action or it may be accomplished forcibly if desired, either before or after the plates are mounted in the precipitator, but in any event only a relatively small force will be required to effect such breaking as compared to that required to break an integrally cast plate.

I claim:

The method of making a collecting electrode for electrical precipitators which comprises first casting a plurality of plate sections of cementitious material in substantially horizontal position in a common horizontal plane, about common reenforcing means and spaced apart longitudinally of

said reenforcing means, allowing such sections to acquire an initial set such as to prevent bonding therewith of fresh cementitious material, then casting additional plate sections of cementitious material about the portions of said reenforcing means between said first-named sections and abutting the edges of said first-named sections, so as to form a substantially continuous reenforced plate of cementitious material, allowing said material to set, and then raising one end of said plate upwardly to move the same bodily to vertical position.

In testimony whereof I have hereunto subscribed my name this 26th day of April 1930.

CECIL B. CLYNE.