R. B. RATHBUN.

METHOD OF REMOVING SOLIDS SUSPENDED IN MOVING GASES.

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1,381,660. Patented June 14, 1921.

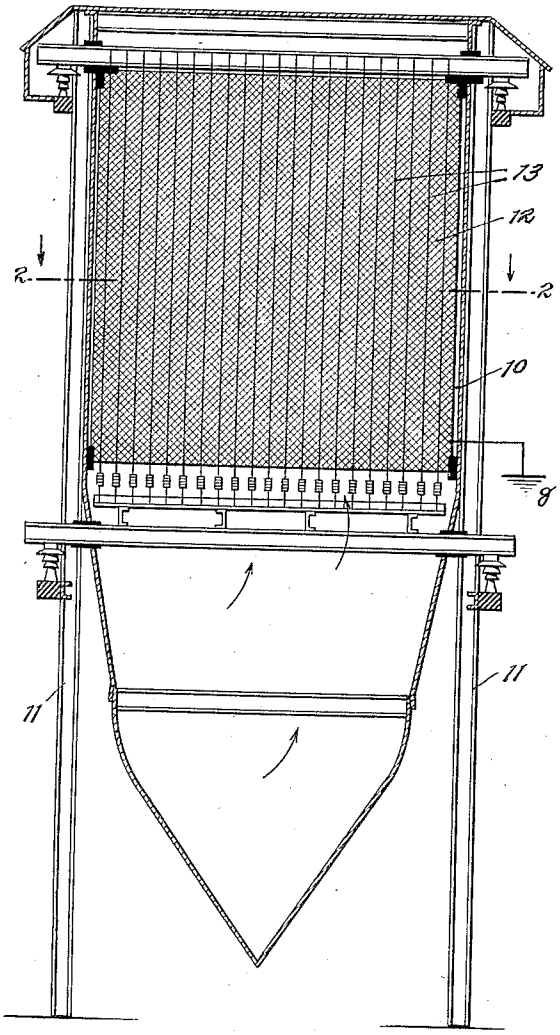


Fig. 1.

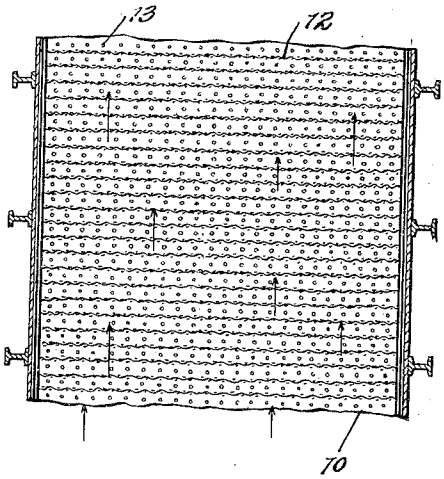


Fig. 2.

WITNESS

Ross Buxton Rathbun INVENTOR

BY

Messmer & Austin ATTORNEYS

UNITED STATES PATENT OFFICE.

ROSS BUXTON RATHBUN, OF SALT LAKE CITY, UTAH.

METHOD OF REMOVING SOLIDS SUSPENDED IN MOVING GASES.

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To all whom it may concern:

Be it known that I, Ross Buxton Rathbun, a citizen of the United States, and resident of Salt Lake City, in the county of Salt Lake and State of Utah, have invented certain new and useful Improvements in Methods of Removing Solids Suspended in Moving Gases, of which the following is a specification.

The invention relates in general to an improvement in the art of precipitating solids suspended in moving gaseous streams in which art the gaseous streams are passed through an electro-static field and specifically relates to a new form of electrode for use in connection with this treatment of gases.

The primary object of this invention is to improve the efficiency of electrical precipitation and incidental to this general desideratum it is a further object of the invention to reduce the cost of both the original installation of the system and the succeeding cost of operation.

Various other objects and advantages of the invention will be in part obvious from an inspection of the accompanying drawings and in part will be more fully set forth in the following particular description of one form of mechanism embodying my invention, and the invention also consists in certain new and novel features of construction and combination of parts hereinafter set forth and claimed.

In order to illustrate one form of apparatus capable of carrying out the new mode of treatment, reference is made to the accompanying drawing, in which—

Figure 1 is a vertical transverse sectional view through a gas conducting flue or chamber equipped with a preferred embodiment of my invention; and

Fig. 2 is a horizontal sectional view through the same and taken on the line 2—2 of Fig. 1.

In the accompanying drawing, there is shown a flue chamber 10 mounted on supports 11 and for the purpose of this disclosure this chamber may be considered as any of the gas conducting flues found in metallurgical plants.

A plurality of fine meshed wire screens 12 are positioned in the conduit 10 and spaced apart in the direction of the flow of the gas therethrough as indicated by the arrows in Fig. 2. These screens are electrically coupled together, insulated from the active electrode and grounded at g to form the passive electrode. Both electrodes constitute the collecting agency for receiving the ionized particles as they are passed through the electro-static field. The active electrode elements are formed of a plurality of fine wires 13, positioned between each pair of screen electrodes and spaced apart from each other and from the screen electrodes. These wires, constituting the elements of the active electrode, are electrically connected to a suitable source of electric energy as is usual with known types of these devices.

The gas streams bearing the suspended solids are passed through influence of the strong electric field created and the fine particles of fume are agglomerated into a larger mass and these together with the larger particles, commonly called flue dust receive a charge by contacting with the surrounding ionized gas. The charged particles in the strong electro-static field are attracted to the passive electrode from which they are precipitated as is usual in such operations. A certain amount of solids charged with opposite polarity are precipitated on the active electrode as well.

By means of a device of this character there is attained an increased efficiency due among other considerations to the fact that the surface of the passive electrode is small compared with the solid surface in other types of such devices. This construction provides for a concentration of the electrostatic lines of force where they join the wires of the screens, increasing the potential gradients in their vicinity and thereby increasing the zone of ionization. There results a materially improved rate of dust precipitation per unit area and per unit weight of electrode and the loss of draft due to friction is reduced and the temperature conserved. There also results an economy in the use of this improved device in that the screen and wire sets can be mounted in any convenient flue or conduit, thus avoiding the necessity of special construction to accommodate the treater. Further as there is but little metal in the screens and their cost is much less than the cost of similar areas of

metal plate, there is a material saving in the cost of installation and replacement of the screen electrodes over the relatively higher cost of the plate electrodes.

While I have shown and described and have pointed out in the annexed claims, certain novel features of my invention, it will be understood that various omissions, substitutions and changes in the form and details of the device illustrated and in its operation may be made by those skilled in the art without departing from the spirit of the invention.

Having thus described my invention, I claim:

1. In the art of removing solids from gaseous bodies, the process which consists in passing all particles of a body of gas along substantially parallel lines and through a series of electro-static fields disposed in the direction of flow of the gas so that all of the gas will be compelled to pass through more than one field and equally treated, each of said fields characterized by having lines of force which extend in the general direction of flow of the gases and in which the lines of force converge to increase the potential gradient and thus increase the zone of ionization.

2. In the art of removing solids from gaseous bodies, the process which consists in subjecting all portions of the gas equally to the action of an electro-static field in which the lines of force converge toward a plurality of passive lines spaced apart transversely of the line of gas flow and causing all of the gas to move between said passive lines and substantially in the mean general direction of said lines of force.

3. In the art of electrical precipitation of solids from gases in which an active electrode element and a plurality of spaced apart passive electrode elements having perforations therein are employed, the process which consists in passing the gases through said perforations and in a direction to cause them to move in parallel lines from one of the electrode elements to the other substantially in the direction of the lines of force between the electrode elements.

4. In the art of electrical precipitation of solids from gaseous streams, the process which consists in creating a series of electrostatic fields in each of which the lines of force converge in sets and pass in one direction from a plurality of perforated passive electrodes and causing the gaseous stream to traverse said fields and at right angles to the plane of the passive electrodes substantially in the mean direction of said lines of force while limiting the flow of gas to the electrostatic field whereby all particles of the gas will be subjected to the electric treatment.

5. In a device of the class described, the combination with means for causing gases to traverse a straight path, of a plurality of screens disposed transversely across said path coextensive with the cross-section of the path and spaced apart in the direction of flow of the gases passing therethrough, a plurality of sets of transversely spaced apart electrodes disposed between adjacent screens and spaced from said screens to create an electro-static field between each electrode and the adjacent screens and to act as collectors for collecting the dust precipitated from the gases.

6. In a device of the class described, the combination of a conduit for gases, means for creating an electro-static field in said conduit, said means including a screen constituting a passive electrode disposed transversely across said conduit and provided with openings to permit the passage of the gases therethrough, and a wire constituting an active electrode spaced from said passive electrode and coacting therewith to form an electro-static field to precipitate solids from the passing gases and means for causing the gases to pass at right angles to and through the plane of the screen and in a direction from the screen to the wire.

7. In a device of the class described, the combination of a plurality of parallel spaced apart metallic screens, constituting passive electrode elements, a plurality of active electrode elements disposed between adjacent pairs of screens, said active elements being spaced apart transversely to permit gases to pass between the same and being spaced from the screens and means for directing all of the gases successively through the meshes of the screen electrode elements.

8. In a device of the class described, the combination of a plurality of parallel spaced apart metallic screens, constituting passive electrode elements, a plurality of active electrode elements in the form of fine wires disposed between adjacent pairs of screens, said active elements being spaced apart to permit gases to pass between the same and being spaced from the screens and means for directing gases perpendicularly through the meshes of the screen electrode elements and between the active electrode elements, said screens being connected electrically and grounded and said active electrodes designed to be connected to a source of electric energy.

9. In a device of the class described, the combination of a gas conduit and means for creating an electro-static field of uniform intensity entirely across in said conduit, said means including electrodes of relatively large exposed surface extending entirely across the path of the gases in said conduit and with the elements thereof spaced apart and permitting the gases to flow therethrough and other electrodes of relatively small exposed surface spaced from the large

surface electrodes lengthwise of the conduit and exposed on each side to the large surface electrodes.

10. In a device of the class described, the combination of a gas conduit and means for creating an electro-static field in said conduit, said means including electrodes extending across the path of the gases in said conduit and with the elements thereof spaced apart and permitting the gases to flow therethrough, alternate electrodes being in the form of wire mesh screens and the intermediate electrodes being in the form of wires spaced apart transversely of the length of the gas conduit.

Signed at Salt Lake in the county of Salt Lake and State of Utah this 23rd day of September, A. D. 1918.

ROSS BUXTON RATHBUN.