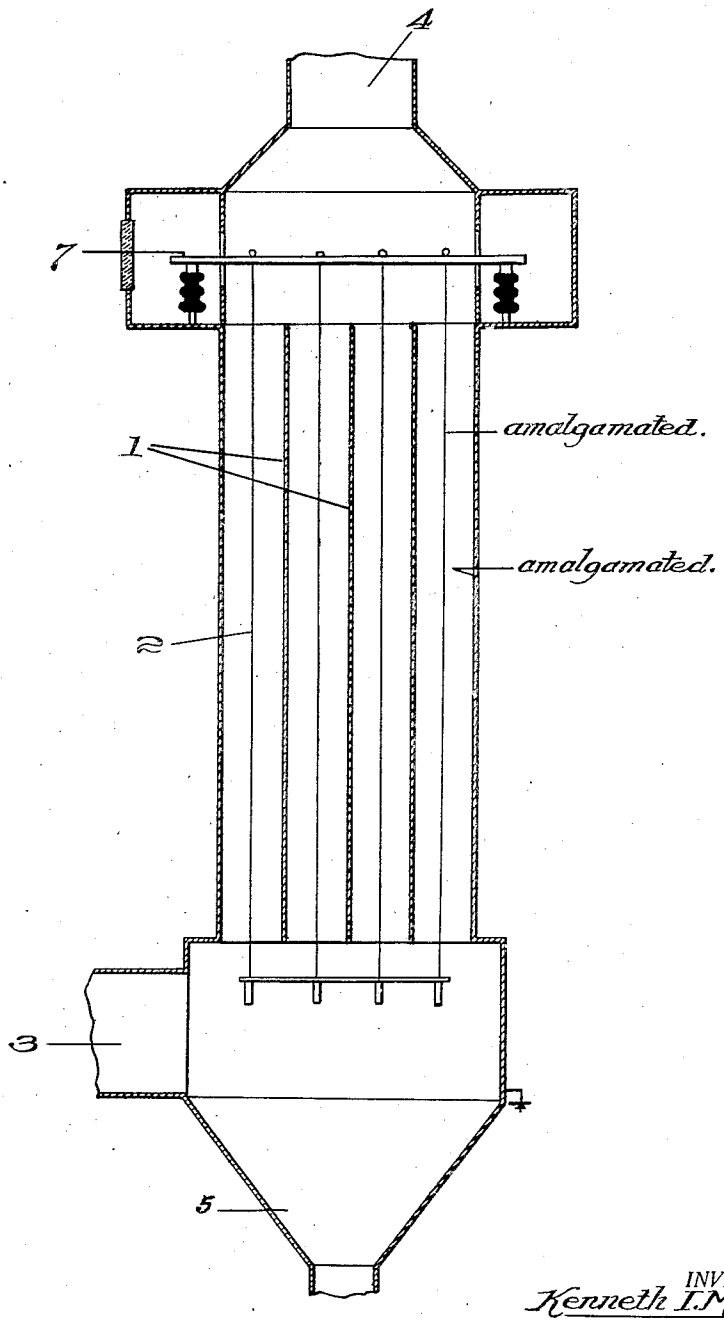
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APPARATUS FOR ELECTRICAL TREATMENT OF GASES CONTAINING CORROSIVE MATERIAL AND MERCURY

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UNITED STATES PATENT OFFICE

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APPARATUS FOR ELECTRICAL TREATMENT OF GASES CONTAINING CORROSIVE MATERIAL AND MERCURY

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This invention relates to means for electrical treatment of gases containing corrosive material and mercury, and particularly to apparatus for subjecting such gases to electrical action to precipitate suspended material therefrom.

The main object of the present invention is to prevent or minimize the effect of corrosive gases on metallic electrodes used in such apparatus, by providing such electrodes with amalgamated or mercury coated surfaces adapted to resist the corrosive action. A further object of the invention is to provide for such amalgamation or coating by operation of the mercury bearing gases on the electrodes.

The accompanying drawing is a vertical section of an electrical precipitator according to my invention.

Apparatus for treatment of gases by high tension electrical field, for example, for the purpose of precipitating suspended material therefrom, comprises in general, discharge electrode means, opposing electrode means, means for maintaining high potential difference between the discharge and opposing electrode means and means for passing gases to be treated between such electrodes.

The discharge electrodes are generally of relatively small area and great length, being for example, wires, rods or chains, and it will be understood that it is necessary to make said electrodes of metal in order to obtain the necessary conductivity and mechanical strength, iron or steel having been generally used for that purpose. The opposing or so-called collecting electrodes are also generally made of metal, such as iron or steel plates, screens or rod curtains. In some cases, however, it has been found practicable to use semi-conducting material, such as cement, concrete, terra cotta or wood, for the collecting electrodes particularly when there is sufficient moisture or acid material in the fumes to materially assist conduction.

In the treatment of gases bearing mercury fumes arising from mercury distillation apparatus for the purpose of separation of suspended dust, or for the purpose of precipitation of condensed mercury particles, it has been found that there is a serious corrosive effect on the electrodes, when the same are made of metal, such as iron or steel. The gases passing from a furnace, particularly of the rotary kiln type, such as is now in use (see Bureau of Mines Bulletin 222, Duschak and Schuette, 1925), contain, in addition to residual air, and products of combustion, corrosive materials including sulphurous and/or sulphuric acid fumes, as well as mercury vapor and/or mercury compounds, and the acid fumes referred to exert such powerful corrosive action on metal electrodes as to require frequent replacement thereof. I have discovered that this corrosive action may be done away with or minimized by providing the electrodes with an amalgamated coating or surface adapted to resist the corrosive action. For this purpose I prefer to make the metallic electrodes of such an apparatus of amalgamable metal, such as copper, or to coat them with such a metal. Such an electrode when exposed to contact with the gases bearing corrosive agents and mercury vapor and/or mercury compounds, becomes automatically coated with mercury or with copper-mercury amalgam, and the resulting coating successfully resists the corrosive action of the acid fumes. If desired, the electrodes having surfaces of amalgamable material may be coated or treated with mercury or other mercury compound before being put into operation, but in general this is not necessary as the amalgamation takes place automatically and rapidly in the ordinary operation of the apparatus, by the action of the mercury and/or mercury compound present in the gases brought into contact with the electrodes.

In applying my invention to electrical precipitators in which the discharge electrodes consist of wires, rods or chains, I make such electrodes of copper, or other amalgamable metal or of other metal such as iron or steel coated with copper or similar metal adapted to become amalgamated upon contact with mercury or compounds thereof, under conditions existing in an electrical precipitator exposed to corrosive gases. In case it is de-

sired that the collecting electrodes of an electrical precipitator shall also be of metal, I prefer to also make said collecting electrodes of amalgamable metal, such as copper or to coat them with such metal, the collecting electrodes, for example, being made of plates, screens or rod-curtains of copper or of iron or steel coated with copper. The accompanying drawing illustrates conventionally an electrical precipitator of a typical form in which the collecting electrodes 1 and discharge electrodes 2 are formed of metal, such as described, having amalgamated surfaces, said precipitator having the usual gas inlet means 3, outlet means 4 for the cleaned gas, and means 5 for receiving precipitated material, and suitable electrical connections indicated at 7 being provided for maintaining the high potential difference between the electrodes. In many cases it is found practicable to use semi-conducting materials, such as concrete, terra cotta, masonry or wood for the collecting electrodes, it having been found that the conductivity of such electrodes under conditions existing in the electrical precipitation of suspended material from mercury recovery furnaces, is sufficient for the purpose of electrical precipitation, it being understood that the discharge incident to the electrical precipitation operation involves only a small current flow and the high resistance of the collecting electrode is, therefore, not inimical to successful operation. The semiconducting material specified are in general substantially immune to corrosive action, so that in such cases the objects of my invention are sufficiently attained by providing the discharge electrodes alone with an amalgamated coating.

In the operation of the electrical precipitator on gases containing mercury and/or mercury compounds, the gases to be treated are passed between the discharge and collecting electrodes, and the metallic electrodes being of copper or copper coated as described become amalgamated by the action of the mercury and/or mercury compounds in the gases or in case the said electrodes have already been superficially amalgamated as described, the action of the mercury content of the gases will tend to reinforce the amalgamated coating or to renew it in case of injury thereto, so that in any case the amalgamated coating on the electrodes is maintained in effective mercury coated condition during the operation of the apparatus, thereby preventing or minimizing the corrosive effect of the gases on the electrodes, the effect of such gases on the mercury coating being negligible.

I claim:

1. An electrical precipitator comprising discharge and collecting electrodes, said discharge electrodes consisting of metal and the surfaces thereof being amalgamated.

2. An electrode for electrical precipitators consisting of metal and having its surface amalgamated.

In testimony whereof I have hereunto subscribed my name this 7th day of March, 1929.

KENNETH I. MARSHALL.