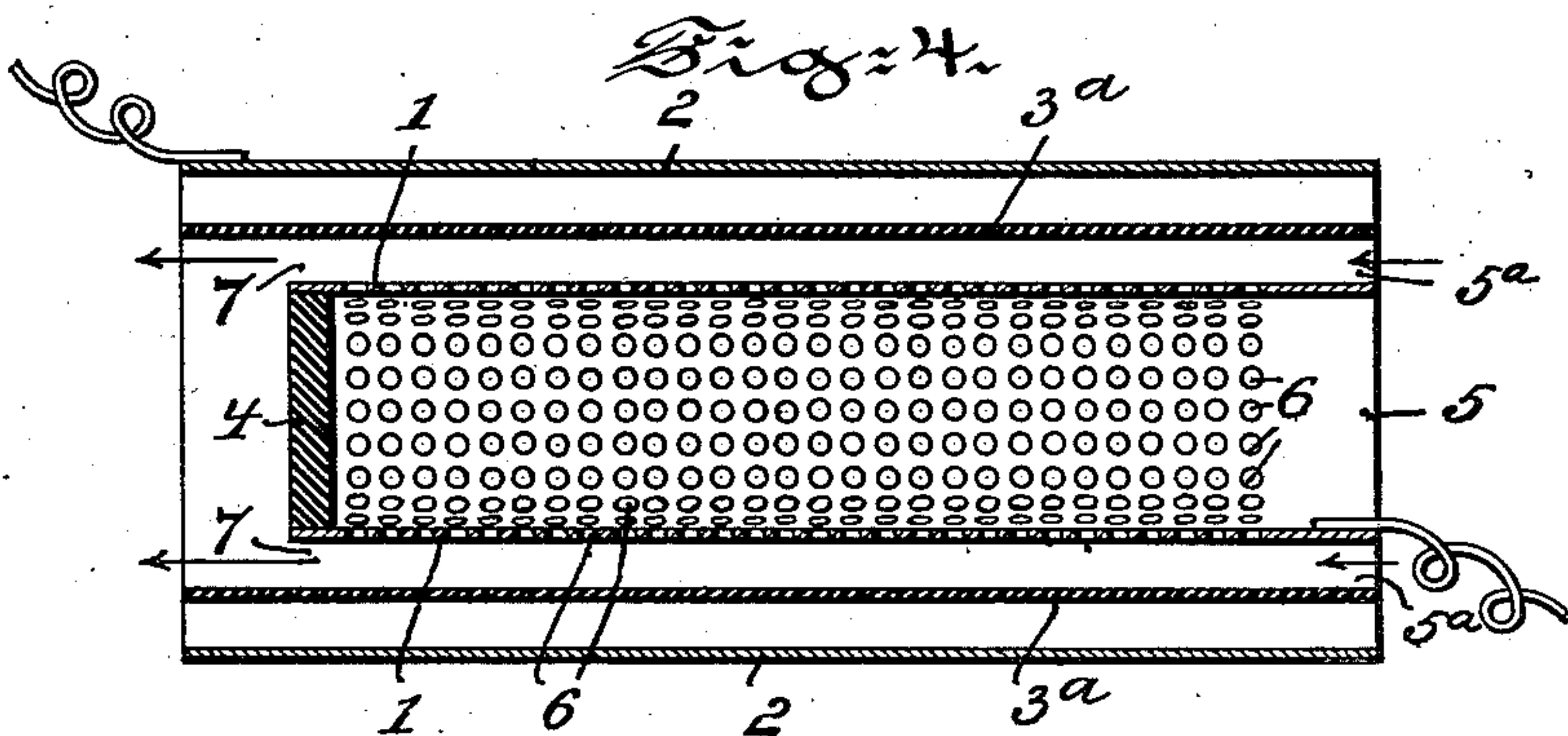
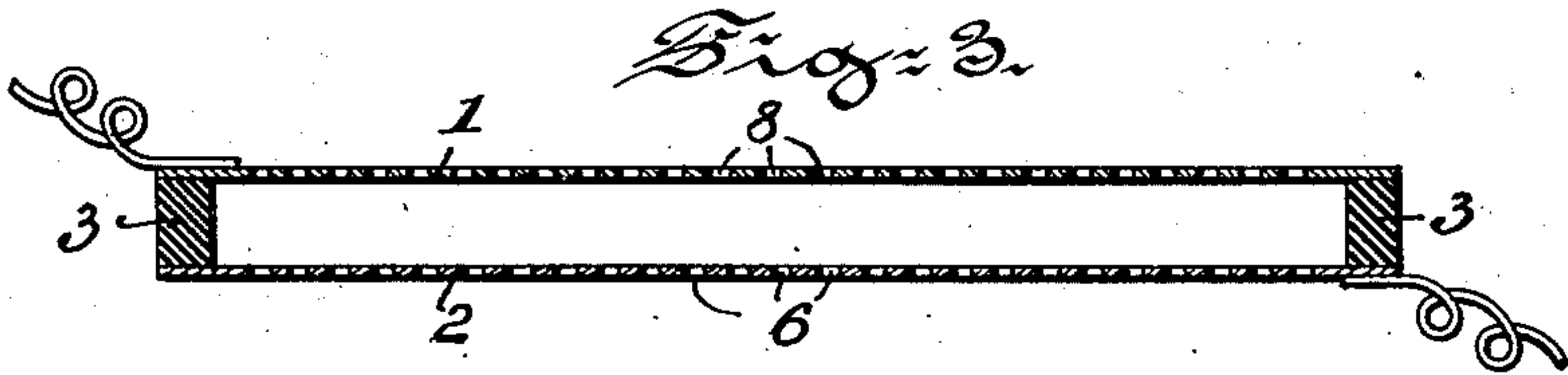
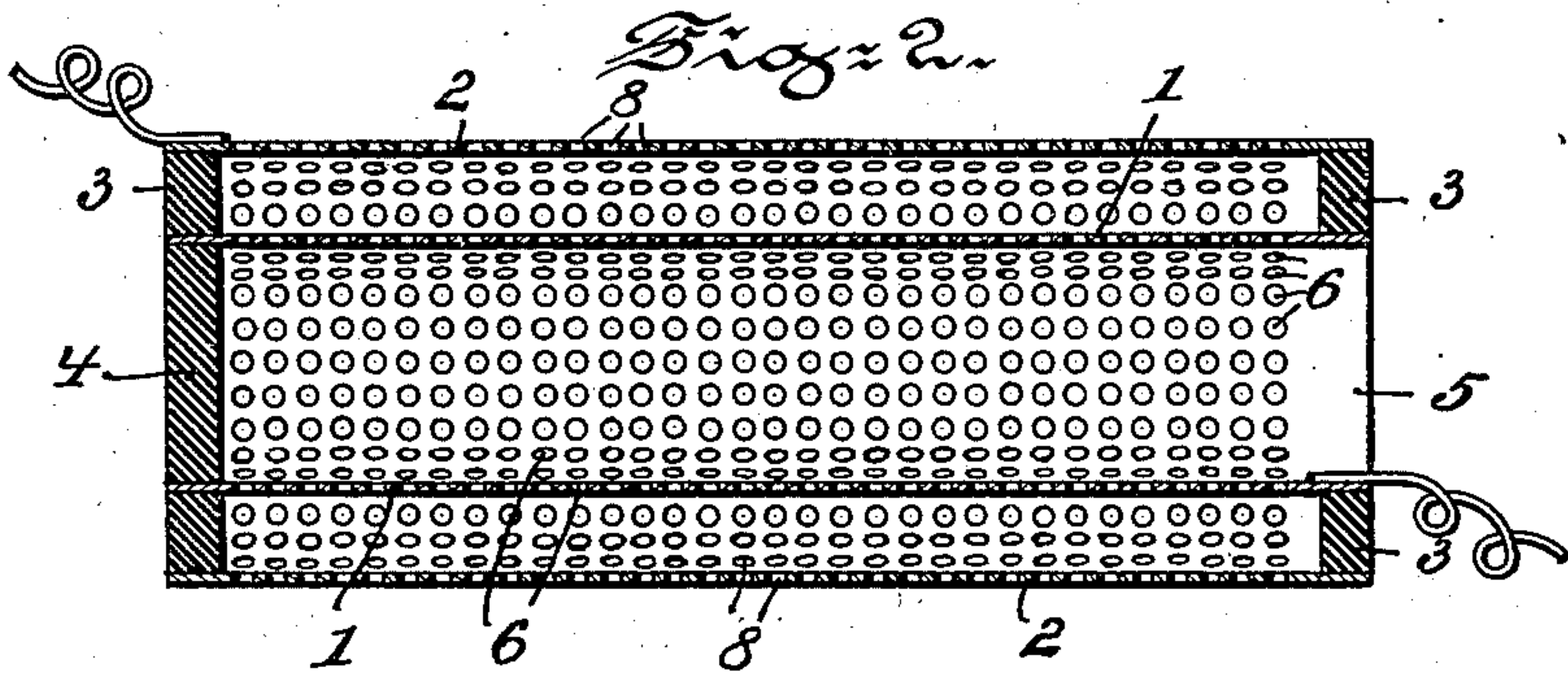
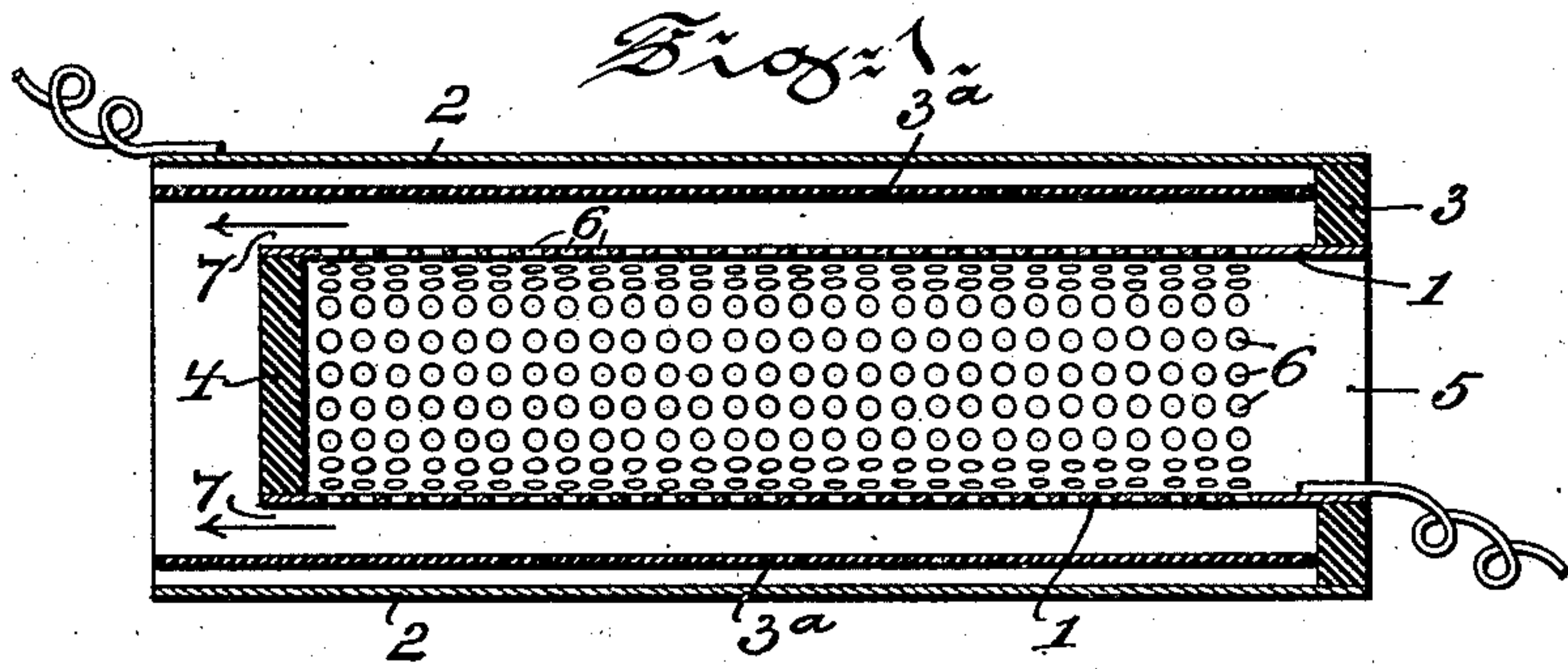


J. H. BRIDGE.  
 APPARATUS FOR ELECTRICALLY TREATING AIR AND OTHER GASES.  
 APPLICATION FILED APR. 30, 1907.

935,457.

Patented Sept. 28, 1909.

3 SHEETS—SHEET 1.



WITNESSES:

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 Thomas M. Smith

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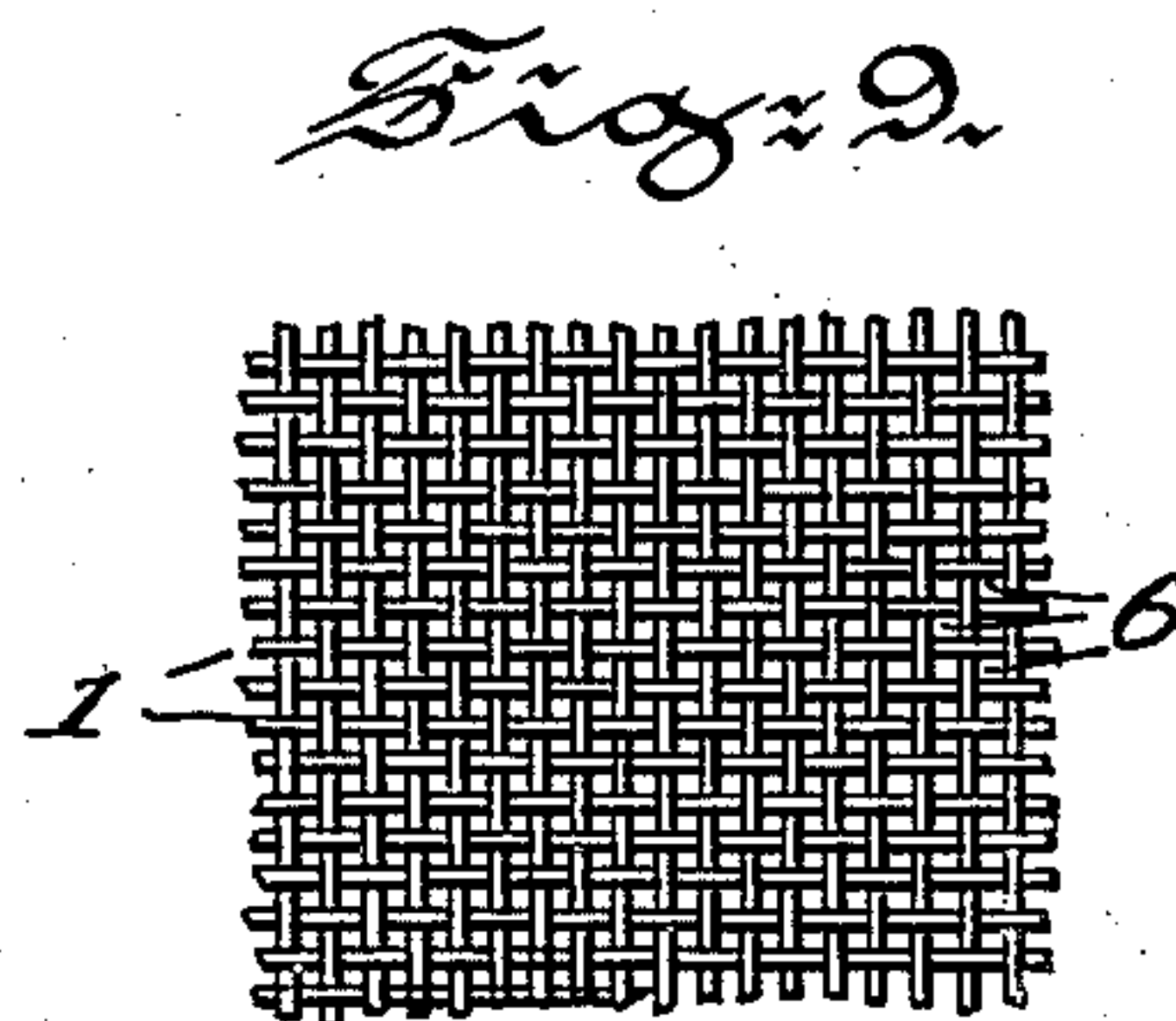
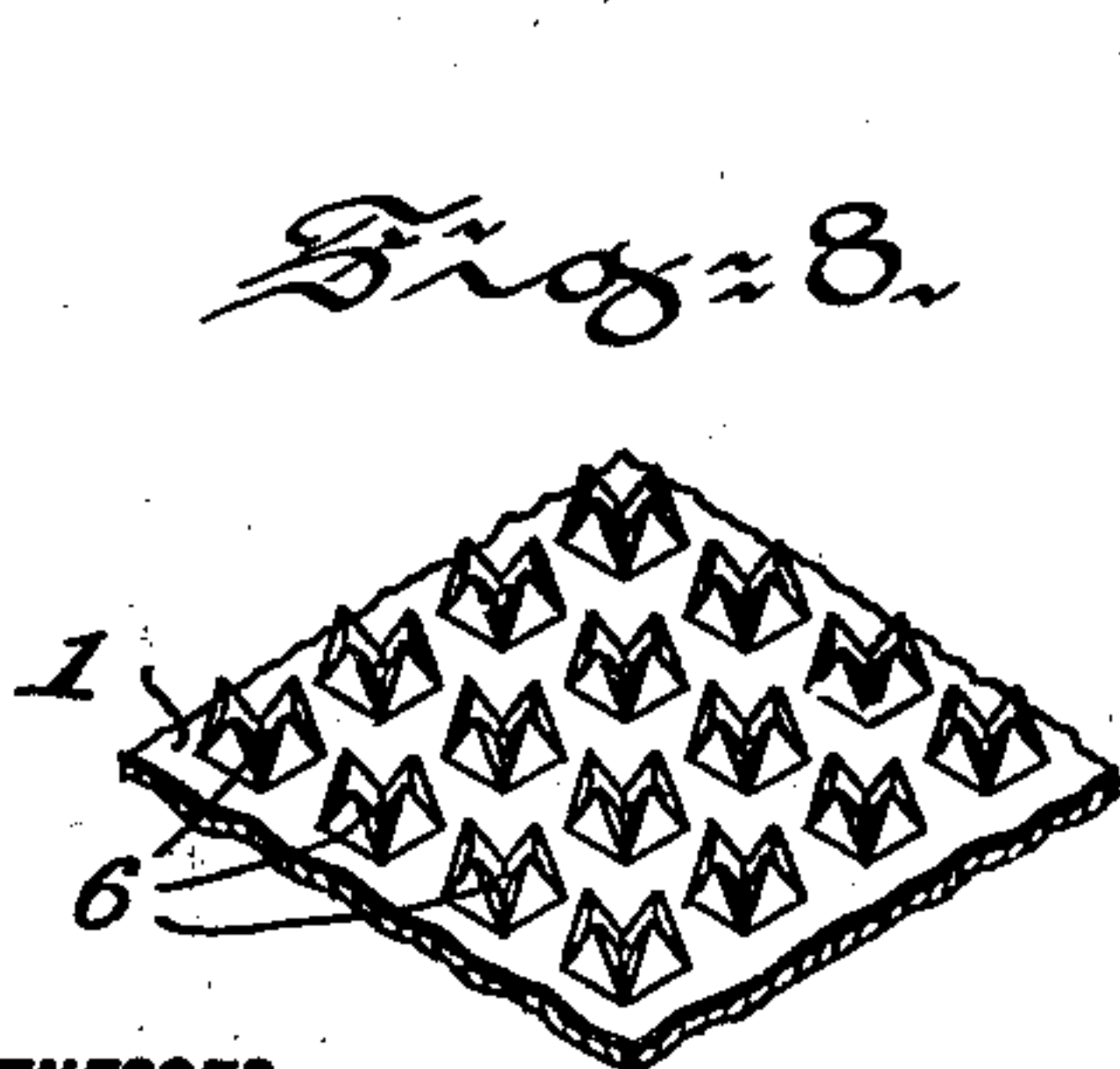
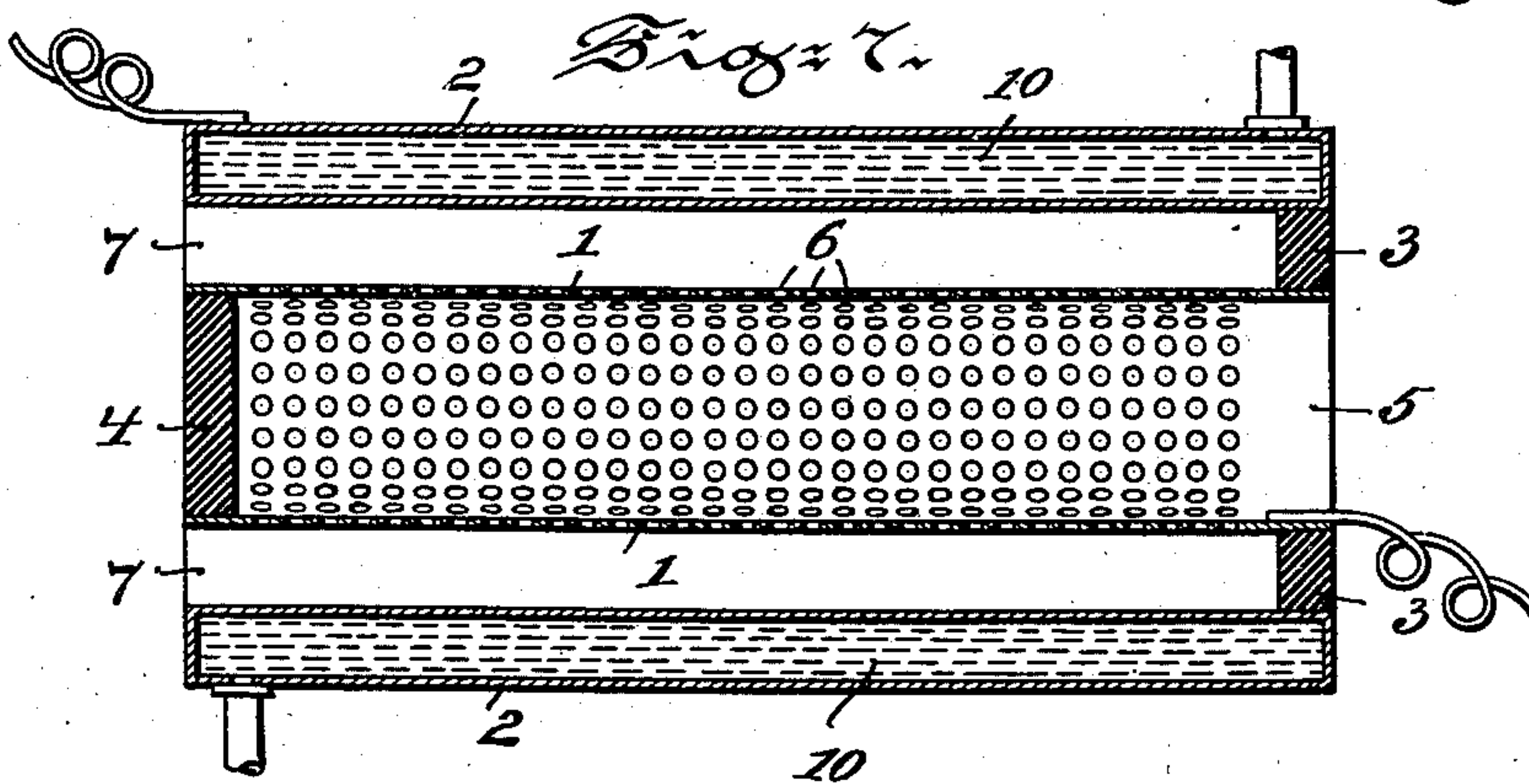
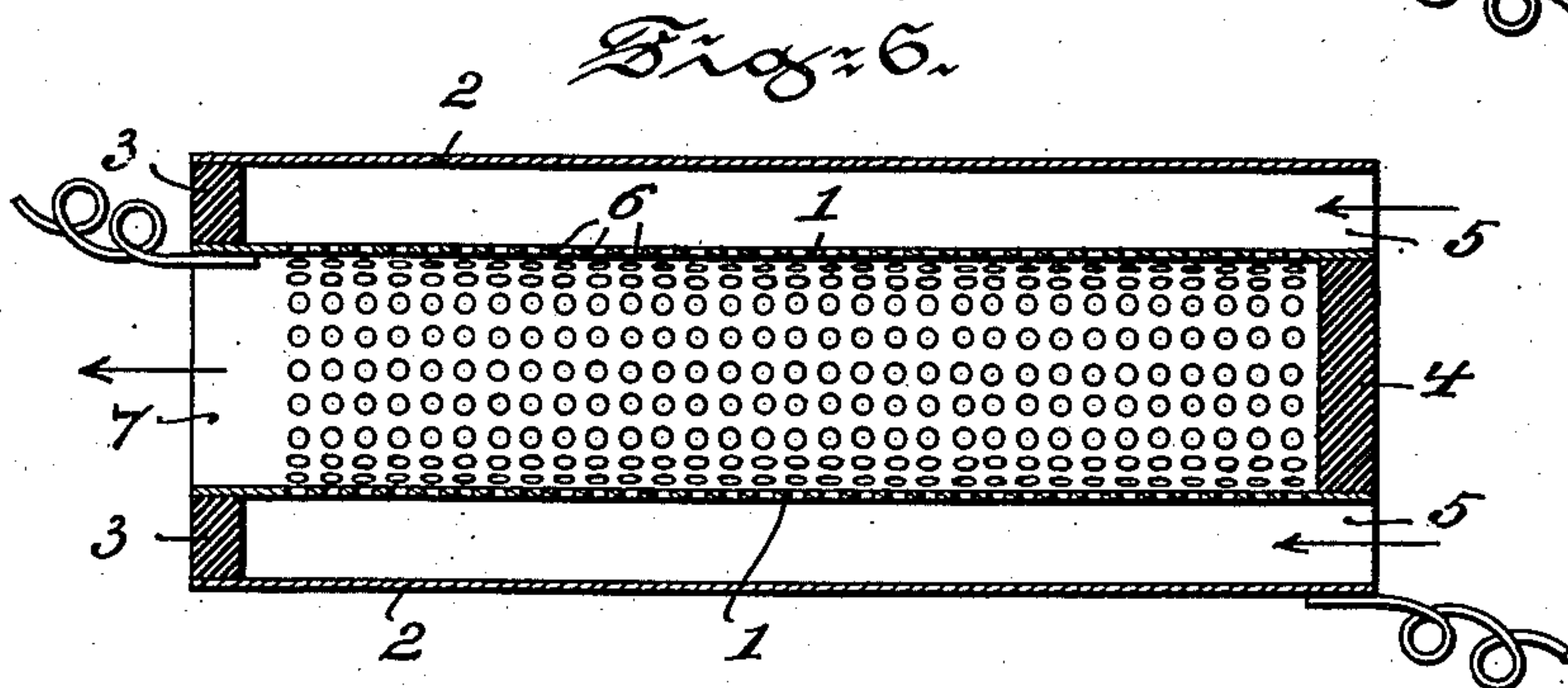
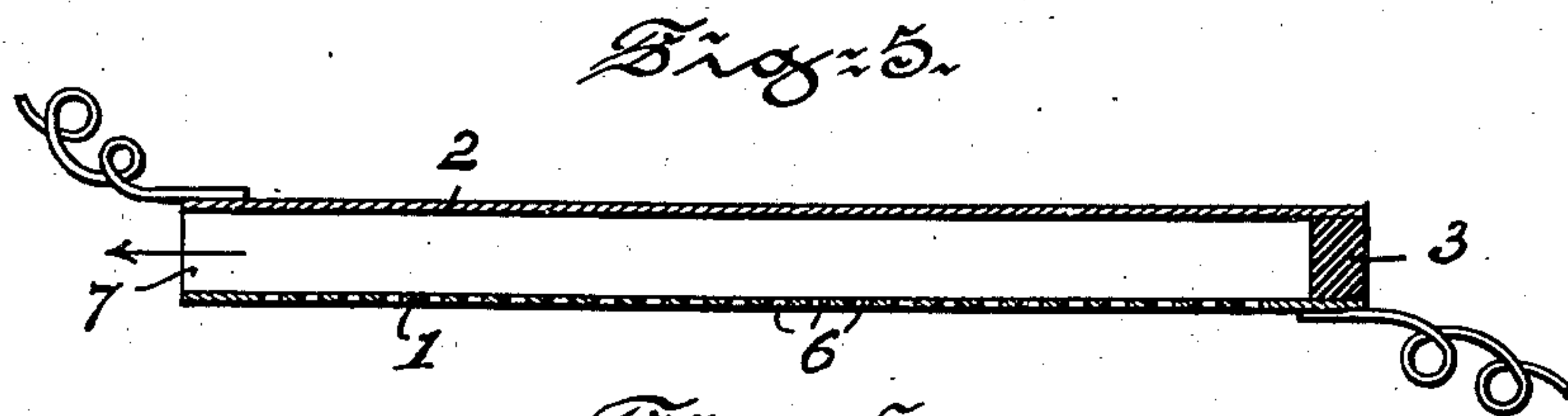
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3 SHEETS—SHEET 2.



WITNESSES:

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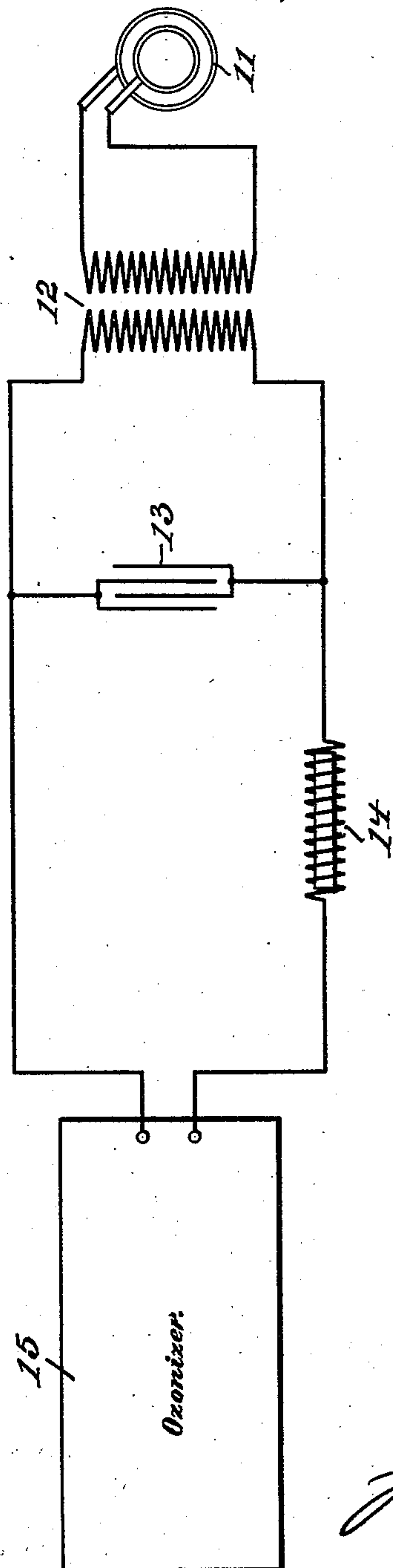
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3 SHEETS—SHEET 3.

*Fig. 10.*



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# UNITED STATES PATENT OFFICE.

JAMES HOWARD BRIDGE, OF PHILADELPHIA, PENNSYLVANIA.

APPARATUS FOR ELECTRICALLY TREATING AIR AND OTHER GASES.

935,457.

Specification of Letters Patent. Patented Sept. 28, 1909.

Application filed April 30, 1907. Serial No. 371,035.

*To all whom it may concern:*

Be it known that I, JAMES HOWARD BRIDGE, a subject of the King of England, but having declared my intention of becoming a citizen of the United States, and now residing at the city of Philadelphia, in the county of Philadelphia and State of Pennsylvania, have invented certain new and useful Improvements in Apparatus for Electrically Treating Air and other Gases, of which the following is a specification.

My invention has relation to means for electrically treating air or other gases; and in such connection it relates to various forms of ozone-producing apparatus adapted for the conduct of the mode of electrically treating air or other gases as described and claimed in United States Letters Patent granted to me under the No. 832,767 dated October 9th, 1906.

In particular the present invention relates to ozonizing apparatus, comprising means for conducting air or other gases transversely through an electrode, in finely divided streams substantially in the path of multitudinous electric discharges, so that each minute air stream is surrounded by one or more electric discharges, to insure an intimate contact of the air or other gases with such electric discharges.

The principal objects of my present invention are, first, to convert the oxygen of the air into ozone by means of an electric discharge, or to modify other gases by conducting the same from one side of a perforated means to the other side through the perforations, thus projecting or drawing them substantially into the electric discharges passing between such perforated means and other means; second to guide the air or other gas so that the same is subdivided into small streams, and each stream passed substantially into the path of electric discharges at the place on the electrode near where the discharges originate; third, to so adjust the electrical means that discharges take place thereon at points surrounding the perforations through which air or gas is passed, in minute streams, so that each stream passes substantially into the core of a discharge; fourth, to interpose baffles, checks or other guides in the air or gas currents, to prevent their reaching the discharging surface of an electrode, except through the perforated body of such electrode and to cause such air currents to pass into and out

of discharges occurring thereon; fifth, to pass the air or gas in fine streams through the perforations of an electrode directly into the core of multitudinous discharges originating thereon, and then to lead it out of the influence of the discharges by passing it through perforations of the same electrode or of an opposing electrode; sixth, to pass air or other gas along the surface of a discharging electrode so as to draw additional air or gas, by aspiration, through perforations in the said electrode from the opposite side thereof, to be ozonized; seventh, to prevent the formation of arc and spark discharges in an ozonizer, comprising one or more perforated electrodes, by interposing a dielectric body between said electrodes; and eighth, to place in the electric current of an ozonizer comprising one or more perforated electrodes, means for preventing the formation of arcs and sparks, and substantially restricting the apparatus to the production of the silent brush discharge.

The nature and scope of my present invention will be understood by reference to the accompanying drawings, forming part hereof, in which—

Figures 1 to 7 inclusive, are sectional views of different forms of electrodes embodying features of my invention. Figs. 8 and 9 are respectively, perspective and plan views of certain modifications of my said invention; and Fig. 10, is a diagrammatic view of an ozonizing apparatus illustrated in connection with a source of electric energy emanating from a dynamo, with one of the types of the electrodes of Figs. 1 to 9 inclusive embodying features of my said invention, in application.

Referring to the drawings with reference to Fig. 1, 1 is a tubular perforated electrode within a containing electrode 2, near which a dielectric body 3<sup>a</sup>, is placed. The perforated electrode 1, is closed at 4, so that air or gas admitted at the open end 5, is forced through the perforations 6, and after passing through the electric discharges taking place near the rims of said perforations, escapes at 7, as indicated by the arrow. The course of the air may be reversed, by simply running the same in opposite directions as will be apparent from the arrangement of parts in said figure.

With reference to Fig. 2, 2 is a tubular perforated electrode, inclosing a similar tubular perforated electrode 1. Air passes



in at 5, and flows through the perforations 6, directly into the discharge passing between the electrodes 1 and 2, and then passes out of the discharge through the perforations 8. At the points marked 3 and 4, are bodies interposed to prevent the passage of air or gas, except as indicated. It is also apparent that the course of the air stream through the apparatus of this figure may be reversed.

With reference to Fig. 3, 1 and 2 are perforated electrodes properly insulated by interposing frames or bodies 3, between the same. Air passes in fine streams through the perforations 6, into the electric discharges occurring between the electrodes 1 and 2, and out of them through the perforations 8.

With reference to Fig. 4, 2 is an electrode containing first a dielectric body 3<sup>a</sup>, and a perforated electrode 1. Air is admitted at 5 and 5<sup>a</sup>, and passes in part through the perforations 6, to be electrified by the discharges passing between the electrodes 1 and 2, and escapes ozonized at 7. Air entering at 5<sup>a</sup>, draws additional air by aspiration through the perforations 6, in the electrode 1, from the inner or under side thereof.

With reference to Fig. 5, 1 is a flat perforated electrode separated from an opposed electrode 2, by an insulating body 3, which also serves to prevent the admission of air or gas to the discharges passing between 1 and 2, except through the perforations 6. After ozonization the air escapes at 7.

With reference to Fig. 6, 2 is an electrode opposed to a perforated electrode 1, and separated therefrom by an insulating body 3. Air is passed through the opening 5, into the discharges passing between 1 and 2, and out of the same by the perforations 6, and emerging from the apparatus at 7. The respective positions of the electrodes may be reversed.

With reference to Fig. 7, 1 is a perforated electrode inclosed by a solid electrode 2, which also forms part of a chamber 10, containing a cooling fluid. The electrodes in each of the foregoing cases, may be flat, curved or tubular.

With reference to Figs. 8 and 9, 6 are perforations, which may be used, in carrying out one of the features of my present invention. In particularly Fig. 8, the perforations 6, are surrounded by elevated points or projections, at the terminals of which electric discharges occur, when the apparatus is in action. In particularly Fig. 9, is indicated a wire-gauze, the openings 6, of which serve the function of perforations, while the raised metallic parts adjacent thereto, serve as points of discharge for the electric current passing between said gauze and a second electrode, not shown.

With reference to Fig. 10, the ozonizing apparatus previously described is shown as

connected with a source of electric energy. The electric current originates in the dynamo 11, and is preferably an alternating single phase current of not less than 60 cycles and 110 volts. In the transformer 12, of known make, the voltage is raised to 7500 volts, and a further increase to 10,000 volts takes place in the condenser 13, which is of any known make. At 14, is a resonator of the usual type, to multiply the electric vibrations passing therethrough; or if desired as indicated here, choke-coils of any usual construction may be placed in the circuit at this point to regulate and equalize the current. In the ozonizer 15, the silent brush discharge is produced, and polymerizes the oxygen passed into its influence through the perforations of the electrodes already described.

The use in the circuit supplying ozone apparatus of condenser to raise the voltage and resonator or choke-coils to multiply the electrical vibrations, or to regulate the current, is old in the art, and no claim to novelty is here made in this connection; but their application to controlling or regulating discharges passing between perforated electrodes of the kind herein described is new, and the claim to novelty herein made is in respect to this combination.

The operation of the apparatus hereinbefore described is the same as to all the different forms of such apparatus, whether the air or gas is drawn, sucked or forced through the same, in either direction, as will be apparent to those skilled in the art to which this invention appertains, without further description of such operations.

Having thus described the nature and objects of my invention what I claim as new and desire to secure by Letters Patent is:—

1. An ozonizer, containing a tubular electrode having a plurality of perforations through which air or gas may be passed in fine streams from one side of the electrode to the other, substantially into a multiplicity of electric discharges originating on the surface of said electrode at points adjacent to said perforations, so that the separate gas-streams may be substantially surrounded by such electric discharges and thereby modified.

2. An ozonizer, containing a perforated electrode adapted to allow air or other gas to pass into a plurality of discharges originating thereon, and then to be led through the said perforations in fine streams to the other side of the electrode out of the influence of said discharges.

3. An ozonizer, containing an electrode having a multiplicity of perforations through the walls thereof, for the passage of air or other gas in fine streams from one side of the electrode to the other, so that each stream is substantially surrounded by



discharges originating around said perforations and in close proximity thereto, in combination with means for reuniting the separate gas streams and leading them out of the  
5 discharges.

4. An ozonizer, comprising perforated electrodes so arranged in relation to each other that air or other gas under treatment is forced to pass in multitudinous streams  
10 through perforations into the interior of annular discharges originating around said perforations, so as to be brought into intimate contact with said discharges, in combination with means for reuniting the separate gas streams and leading them away  
15 from the discharge.

5. An ozonizer, comprising a perforated tubular electrode inclosed in a second tubular electrode and so arranged that an electric discharge passing between the said electrodes assumes a substantially annular form  
20 around the perforations in said electrode to more or less surround air or gas passing therethrough.

6. An ozonizer formed of concentric tubular electrodes, containing perforations in the walls thereof through which air or other gas may pass in fine streams so that each air stream is substantially surrounded by electric discharges passing between said electrodes.  
25 30

7. An ozonizer, containing a perforated tubular electrode so arranged in relation to air supply and means of producing the silent electric discharge that the said discharge proceeds to or from the rims of the perforations in said electrode, and more or less surrounds the currents of air or other gas passing therethrough.  
35 40

8. An ozonizer, comprising electrodes so arranged in relation to each other and to the air supply that air under treatment passes through perforations in the walls of said electrodes, so as to be brought into contact  
45 with electric discharges passing between said electrodes.

9. An ozonizer, comprising one or more perforated electrodes, and means for leading air or other gases along the surface of one of said electrodes in such way as to draw by aspiration additional air in fine streams from the other side of such electrode, through the perforations therein, to be thus brought into the influence of the discharges passing between said electrodes.  
50 55

10. An ozonizer, comprising perforated electrodes through which, in succession, air or other gas may be passed in fine streams, while each stream is substantially surrounded by electric discharges passing between said electrodes.  
60

11. An ozonizer, comprising a perforated electrode opposite to a second perforated electrode, and means for causing air or other gas to pass in fine streams through the per-  
65

forations of one electrode and then in fine streams through the perforations of the opposed electrode, while substantially surrounded by electric discharges passing between said electrodes.  
70

12. An ozonizer, consisting of an electrode opposed to a second electrode with perforated walls, and means for directing air or other gas between the electrodes and then through the perforations of the second electrode, in fine streams, so that each stream is more or less surrounded by electric discharges occurring at or adjacent to the rims of said perforations.  
75

13. In an ozonizer containing a perforated electrode through which the air passes and an opposed electrode, a dielectric body placed between said electrodes so as to prevent arc and spark discharges.  
80

14. In combination with an ozonizer containing one or more perforated electrodes through which the air passes, means for preventing the formation of arc and spark discharges and substantially restricting the apparatus to the production of the silent brush discharge.  
85 90

15. An ozonizing apparatus, comprising one or more perforated dischargers, through the perforations of which air or other gas is led into and then out of electrical discharges proceeding therefrom.  
95

16. An ozonizing apparatus comprising an electrode containing perforations adapted to permit the passage of air or other gas, in fine streams, through the same directly into discharges passing between said electrode and a second electrode, and then out of the discharges through perforations in the second electrode, in combination with a condenser in shunt to increase the voltage of the current and a resonator in series in the circuit to multiply the electric vibrations passing therethrough.  
100 105

17. An ozonizer comprising the combination of a hollow electrode provided with perforations through which air passes and at the rims of which the electrical discharge occurs, a tubular electrode surrounding the first named electrode and from which the ozonized air is withdrawn, electrical connections for the electrode, and a dielectric interposed between said electrodes, substantially as described.  
110 115

18. An ozonizer comprising a hollow electrode with perforations through which air passes and at the rims of which electrical discharges occur, a second tubular electrode surrounding the first named electrode and provided with a dielectric applied to its surface and from which ozonized air is withdrawn, and electrical connections for the electrodes, substantially as described.  
120 125

19. In an ozonizer a hollow electrode through which air is fed and which is provided with perforations, and from the rims  
130



of which silent or brush electrical discharges occur, in combination with means for producing such electrical discharges and leading off the ozonized air transversely of the discharges whereby intimate contact is insured, substantially as described.

In witness whereof, I have hereunto set

my signature in the presence of two subscribing witnesses.

JAMES HOWARD BRIDGE.

Witnesses:

EMMA D. CHAPPELL,  
THOMAS M. SMITH.